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ARTICLES IN THIS ISSUE

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Pandemic threat, Ostrom Threshold and pre-emptive public goods: why East Asia performed better in the COVID-19 crisis

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The COVID-19 pandemic is an eminent threat posed by nature to the survival of the whole community. The cost X it imposes upon the community can be mitigated by the community's pre-emptive public goods: an early warning system, capacity for monitoring, contact tracing and isolating infected persons, the strength of its public health system and the cultivated readiness to cooperate with anti-COVID protocols. The community provides these public goods in a nonstrategic game N (Nature) where the probability of a "bad outcome" (being symptomatically infected) falls with the total spending on pre-emptive public goods. Aside from N, members of the community play an Economic Dilemma Game (*EDG*), a symmetric Prisoner's Dilemma Game (*PDG*) with strategy set (C, D), where the community earns its economic income which in turn provides the financing of the pre-emptive public goods. Games *EDG* and N are fused into a composite game *N+EDG* by defining the probability of a good outcome as increasing with the level of public goods financing. *N+EDG* has the same strategy set (C, D) as *EDG* but the payoffs of players are composite: the payoff from *EDG* less the expected share of the pandemic cost to the members. We show that there is a threshold pandemic cost X_0 (Ostrom threshold) so that if $X \geq X_0$, the *N+EDG* has dominant strategy in C. At the cooperative equilibrium, the community is at its peak strength: economic output from *EDG* is largest and the contribution to pre-emptive public good is highest. A severe-enough cost of the pandemic threat as perceived by the group (i) causes players to exhibit an altruistic phenotype (choosing C every time) and (ii) leads to the lowest probability of a bad outcome. We argue that previous experience with pandemics in the last two decades on top of a higher tendency to follow authority in East Asia supported both the provision of better pre-emptive public goods and the higher abidance with anti-COVID protocols. These explain better performance.

JEL Classification: C72, D01, D02
Key Words: Pandemic cost, Ostrom threshold, COVID-19, Pre-emptive public goods, Altruistic behavioral phenotype

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1. Introduction

The world of 2021 is still viciously beset by the Coronavirus 2019 pandemic. What is slowly coming out is that some countries are more successful at handling the pandemic, incurring less toll in morbidity and mortality than others. The East Asian countries China, Taiwan Province of China, South Korea, Singapore, Hongkong and Vietnam appear to be consensus top anti-COVID performers. Many affluent western countries Belgium, Italy, Spain, the United Kingdom, Russia and the USA fared relatively worse. Why did some countries respond like coiled springs to the emerging threat - detecting infections early and resolutely containing (testing, tracking, isolating and social distancing) while others waffled until it was too late?

Ma, Wang, and Wu [2021] have documented the comparative performance of select East Asian countries versus select Western countries. We quote their reading: "Our analysis shows that East Asia's success, compared with the six selected Western societies, can be attributed to stronger and more prompt government responses, as well as better civic cooperation… In addition to rapid and systematic government responses, citizens in East Asia… were generally more compliant with government mandates for mask-wearing, improving personal hygiene, and maintaining physical distance than citizens in the selected Western countries". They also attribute the latter to a stronger cultural adherence to state-issued protocols among East Asians than counterparts in the West.

The issue of how culture may affect the responses to severe natural threats like COVID-19 has been lately explored. Van Babel et al. [2020] identify important insights from social and behavioral science to guide public decision makers for effective response to COVID-19. Gelfand et al. [2020] has shown using data up to April 4, 2020 that the interaction between "cultural tightness" and "government effectiveness" correlates highly and robustly with lower growth of infection and lower death rate from COVID-19 pandemic. They define cultural tightness to be the society's capacity to adhere to norms and obey mandates from the center. To model the emergence of cultural tightness, they employ numerical Evolutionary Game Theory (EGT) model to simulate the comparative success of two populations, one culturally tight and another culturally loose, in forging cooperation and coordination in social dilemma games. Detecting and containing the spread of pandemics such as the COVID-19 is one such dilemma game. Social dilemma games like the Prisoner's Dilemma Game (*PDG*) are those strategic games where the players' pursuit of their individual self-interest leads to the sacrifice of community interests; for example, members who insist on accustomed physical proximity and intimacy interactions become spreaders and raise the transmission rate of the COVID-19 virus thus harming the community. Roos et al. [2015] has shown how groups that face high degree of threats develop stronger norms for social interaction, higher capacity for norm abidance and penalty for deviance using numerical EGT modelling. Smaldino et al. [2013] used agent-based simulation to demonstrate that in the long-run, harsh environments select for cooperative phenotypes but in the short-run, selfish phenotypes may thrive because the sudden loss of resources lead to demise. All this is in agreement with the variability selection hypothesis (Potts [1996;1998], Potts and Faith [2015]), which finds that changes in hominin morphology and advances in primitive tool technology seemed most rapid when climate fluctuation is most severe which in turn inspire rapid adaptations. Adaptability to extreme changes in the environment is the by-word in variability selection hypothesis. Indeed, many hominin groups may have become extinct for failure to adapt to severe climate fluctuation which supports the alternative adage "survival of the most adaptable". The most employed adaptation is genetic adaptation where climate change favor one allele that is better adapted. Allele (gene form) adaptation however happens across many generations and presupposes that remnants of the species survive. The latter means the current generation adapt well-enough to enable a viable remnant to survive and procreate.

To ensure that some members of the species survive to pass on the gene pool requires a coping mechanism employed by the current population; one is to evolve new institutional structures and behaviors that conduce towards stronger and wider cooperation among the extant population to outlast the changed environment [Smithsonian National Museum of Natural History 2018]. The threatened population itself responds directly exploiting the innate malleability of the species rather indirectly through gene selection which is anyway impossible if none of present population survives. *Homo sapiens* survived because, through innumerable climate distresses, the remnants of the current generation survived by cultural and institutional innovation. One such monumental innovation is cooperation on a much larger scale. Cooperation among larger and larger number of individuals and groups was the root cause of why *homo sapiens* survived while other hominids such as the Neanderthals and Denisovans did not. It allowed *homo sapiens* to occupy more and more diversified environments and geographies that act as insurance against climate stresses. This is the celebrated thesis of historian Juval Harari in the bestselling volume *Sapiens* [Harari 2014].

Elinor Ostrom and her group (Ostrom [1990; 2000], Ostrom et al. [1994]) have amply demonstrated that the failure of cooperation called "tragedy of the commons" in the management of a common resource need not always be the fate of collectives. There are exceptions to the so-called "zero contribution hypothesis" of Olson [1964]. The Ostrom group has identified the conditions that make for collective action success: small communities, face-to-face repeated interactions, relative homogeneity of members, limited exit possibility, an evolved regime that punishes deviance, and finally the salience of the threat and cost of failure (Ostrom [1990; 1999; 2007]). Ostrom salience is the the severity of the harm to the well-being of the community and thus of members in case of failure to respond cooperatively. To mitigate the likelihood of failure, the community evolves institutions of norms and enforcement for deviance. Ostrom [2000] and others (e.g. Fehr and Fischbacher [2002]) favor some pro-social tendencies, say, strong reciprocity or conditional cooperation, to explain the emergence of cooperation in common pool resource management. Conditional cooperation could be viewed as a behavioral phenotype springing from the same basic genotype that also supports self-oriented behavior.

In this paper, we enquire how cooperation, the anchor of, as it were, a coiled spring community response to threats, can be attained even in the absence of pro-social tendencies. We are especially interested in the role of the Ostrom salience in making cooperation the best reply to itself even among intrinsically selfish agents. Our interest revolves around short-horizon cooperative response by the threatened generation rather than the long-horizon cross-generation response implied in allele selection. The overwhelming imperative is for a viable remnant of the current threatened population to survive to pass on the gene pool.

The common model to generate cooperative outcomes is evolutionary game theory (EGT). The EGT models employs Malthusian replication and Darwinian selection and thus require long time horizons to bear fruit - the slow recession through non-replication of the non-cooperative gene. To survive as a species, the currently threatened generation has to ensure that a viable remnant of the group outlasts the climate distress to pass on the gene pool. The model offered here dispenses with such baggage as allele selection and replication.

The following story reveals that perhaps the same human agents can manifest self-regarding or group-regarding behavior depending upon which best equips the agent for survival in the surrounding physical or social milieu. In other words, the ambient environment dictates the behavioral phenotypes that get expressed.

Previous to 458 BC, Roman society, after a period of relative external success and peace, turned inwards, as it were, and was rent by an ideological conflict. One party, the Plebians, was beginning to demand expanded rights from the ruling party, the Patricians. Lucius Quinctus Cincinnatus, a citizen of recognized military prowess and the leader of the Patricians, opposed the demands. When the Patricians lost, Cincinnatus was deprived of wealth and influence and forced into self-exile on the other side of the Tiber River where he lived as a humble farmer. In Darwin's words, the early Romans after early success had become a "selfish and contentious people" and Roman society became socially incoherent. In 458 BC, Rome became severely threatened by an invasion from neighboring tribes/groups, the Aequi and Sabines. The Roman Senate, in the face of the eminent threat of possible subjugation and slavery for all, set aside ideological differences and hurriedly offered Cincinnatus the dictatorship of Rome (*Magister Populi*) for a period of six months on condition that he raises and leads an army in defense of Rome. Cincinnatus accepted the commission, raised an army and repulsed the invasion in 17 days. Having done so, he promptly resigned his commission and returned to his farm. He repeated the feat years later (468 BC) when Rome was once more threatened by a social disorder stemming from a conspiracy to install a king. Cincinnatus became an icon of civic virtue for the world then and now. This oscillation between behavioral phenotypes occurred within one generation. But the capacity to set aside selfish differences and re-cohere in the face of an eminent threat, was the true seed of the future Roman Empire. This empire however collapsed a thousand years later when Romans lost, what historian Edward Gibbons (1776-79) called "civic virtue". After a thousand years luxuriating in wealth and a sense of invincibility, the threat of the barbarians knocking at the door lost its sting. The defense of the realm was increasingly entrusted to paid mercenaries and conscripted former barbarians rather than to citizen-soldiers. Rome fell in 458 BC.

In this paper, we investigate how a heightened awareness of a severe exogenous natural threat, in this case a pandemic, whose ravages can be mitigated by pre-emptive public goods, can (i) make agents switch from selfish behavior to a cooperative behavior, increasingly identifying individual well-being with group well-being and in so doing (ii) help the community attain its peak strength in terms of pre-emptive public goods.

In Section 2, we fuse the Economic Dilemma Game (*EDG*), a symmetric *PDG*, and a non-strategic game *N* pitting the community against a Nature instanced here by a pandemic. The community can mitigate the harm of the pandemic by arming itself with pre-emptive public goods (*PEPG*). Failure to be adequately armed results in a higher probability of a "bad outcome" (everyone gets a symptomatic infection). The probability of the good outcome (either nobody gets infected or everyone gets only asymptomatic infection) rises with the resources, assessed from members' payoffs in the *EDG*, to finance the pre-emptive public goods. Free riding in *EDG* results not only in paltry economic payoffs but paltry contribution to and inadequate *PEPG* resulting in a higher probability of a bad outcome. The composite game is called the *"N+EDG"*.

We ask what threat level makes cooperation in the *N-EDG* a dominant strategy. We introduce the concept of the "Ostrom threshold", the cost of the pandemic in excess of which cooperation is the best reply to itself. The Ostrom threshold demarcates the social space: on one side, selfishness is king and on the other cooperation is king. A large enough cost of the pandemic can make every member a "critical" decision maker rendering *free riding* an inferior strategy and cooperation the dominant strategy. In Section 4, we conclude.

2. The Economic Dilemma Game

Players *A* and *B* are self-interested members of a group, who play an economic dilemma game, exemplified by the Humean Farmer Dilemma Game. This is a social dilemma game where two farmers face the strategy set (*C*, *D*); "*C*" stands for "Cooperate, that is, help harvest the other farmer's crop" and "*D*" means

"Don't help". If they manage to cooperate, they thrive; if they do not, they languish. We label this game the Economic Dilemma Game (*EDG*). *EDG* is a symmetric Prisoner's Dilemma Game as shown in Table 1 below, with $a > b > c > d$. With both A and B being self-interested maximizers, the Nash equilibrium of the *EDG* is (D, D). The pursuit of myopic selfish interest leads to a non-cooperative and a welfare-inferior outcome payoff profile (c, c). The symmetric nature of the game is just for convenience; non-symmetric *PDG* can be accommodated trivially.

TABLE 1. Payoff matrix of *EDG*

A \ *B*	*C*	*D*
C	*b, b*	*d, a*
D	*a, d*	*c, c*

3. The Non-strategic Pandemic Game *N*

The community is threatened by a deadly pandemic. For simplicity let A and B be the only members of the community. The entry of the pandemic into the community cannot be stopped. But the damage caused by the pandemic can be mitigated by the resources the community is able to deploy for *PEPG* (pre-emptive public goods): a well-funded early-warning system, ample hospital facilities, strong monitoring, contact-tracing and isolation of infected persons, a culture of affinity to comply with government protocols. *PEPG* have to be financed by contribution from community members.

Let P be the probability of a good outcome of a pandemic, and $(1 - P)$ the probability of a bad outcome. By "good outcome" we mean "no infection for all or only asymptomatic infection for all". By "bad outcome" we mean "symptomatic infection for all". Good or bad outcome applies equally to everyone. The cost of the pandemic to the community (and indeed all the identical communities) is fixed $X > 0$ times the probability of a bad outcome; we assume that the cost of the community is born equally by A and B, i.e., the cost to each of two members is half the cost to the community. Ostrom's condition of membership homogeneity makes this assumption plausible. Likewise, no member can evade this exaction simply by exiting the group's jurisdiction following Ostrom's no exit condition. Resources to build and upkeep the pre-emptive public goods is raised through a contribution rate t, $0 < t < 1$, assessed against individual member payoff in the economic game *EDG*. This is a fully symmetric information game.

The aggregate contribution R for the pre-emptive public goods increases the probability P of a good outcome. Letting R_0 be a fixed parameter representing the "fury of the pandemic", say, the transmission rate of the virus, its mortality per infection rate or the duration at which those infected remain spreaders. We adopt a simple Tullock structure for the probability of success:

$$P = R / [R + R_0]. \tag{1}$$

The collection $\{P, X, R, R_0, t\}$ we call N a game played by the community against Nature, in this case, manifested as COVID-19 pandemic. Since Nature does not respond to the community's action, N is a non-strategic game. From (1) we know that the community's spending R for pre-emptive public goods raises the probability of a good outcome P; R_0 represents the pandemic's fury and is a *black swan* event. Each farmer pays the expected amount [(X/2) × the likelihood of a bad outcome] which neither A nor B can escape by simply exiting the group.

The punishment for shirking one's obligation in *EDG* comes not from other members but from a third party, Nature, that visits the community. N is the type of game that the people of Netherlands ("Nederlanders" literally means "lowlanders") have been playing for centuries against the North Sea. The Dutch have been farming and prospering under the shadow of the dikes they built to reduce the damage from the fury of the North Sea.

4. The Composite Game

We can fuse the *EDG* and N into a single composite game, *N+EDG*, by defining the total *PEPG* contribution R collected from all members as assessments against the payoffs in the *EDG*:

$$R(i, j) = t(U_A(i, j) + U_B(i, j)),\ i, j = C, D \tag{2}$$

$U_A(i, j)$ and $U_B(i, j)$ are the fitness of A and B, respectively which are identical to payoffs of A and B, in the *EDG* under strategy profile (i, j) in Table 1. For example, from Table 1, we have $U_A(C,C) = b = U_B(C, C)$, $U_A(C, D) = d$, $U_B(D, D) = c$. Likewise, we have $R(C, C) = t(b + b)$ for (C, C) and $R(C, NC) = t(d + a)$, etc. The probability of the good outcome is:

$$P(\mathrm{i}, j) = R(i, j)/[R(i, j) + R_0]. \tag{3}$$

<u>*Definition 1*</u>: The Ostrom Threshold of the *N+EDG* is the pandemic cost X_0, $0 \leq X_0 < \infty$, such that if $X \geq X_0$, C is a best reply to C for both players and strictly so if $X > X_0$.

<u>*Remark 1*</u>: Ostrom's "salience" resonates with the Ostrom threshold, X_0, beyond which behavior becomes cooperative.

<u>Remark 2</u>: The Ostrom threshold demarcates the social space where cooperation is the dominant strategy. The lower is the Ostrom threshold X_0, the easier it is for cooperation to be attained in *N+EDG*. Indeed if *A* and *B* happen to be blood brothers, X_0 may be zero.

The expected utility of *A* under (*C*, *C*) in the *N+EDG* is:

$$EU_A(C, C) = U_A(C, C)(1 - t) - (X/2)\,[1 - P(C, C)]. \tag{4}$$

Now $P(C, C) = t(2b)/[t2b + R_0]$. Thus, substituting the corresponding payoffs from Table 1, the expected fitness of *A* can be written as:

$$EU_A(C) = b(1 - t) - (X/2)[1 - (2bt/(2bt + R_0))]. \tag{5}$$

Equation 5 says that by choosing *C*, the expected fitness of *A* consists of $b(1 - t)$ (*A*'s fitness with cooperation in non-pandemic times) less his share in the expected cost of the pandemic. *A*'s individual fitness (5) is now intimately related to how the group performs against the pandemic. This echoes the concept of "inclusive fitness" in evolutionary biology [Bowles 2004; Wilson and Wilson 2008]. With *D*, *A*'s expected fitness is thus:

$$EU_A(D) = a(1 - t) - (X/2)[1 - (t(d + a)/(t(d + a) + R_0)]. \tag{6}$$

Note that *A*'s expected fitness in (5) and (6) is in each case a composite of the individual payoff in *EDG* and his share of the group's expected loss. Equating (5) and (6), we have:

$$(X/2)\{t(d + a)[t(d + a) + R_0]^{-1} - t(b + b)[b + b) + R_0]^{-1}\} = (1 - t)(a - b). \tag{7}$$

This equality condition ensures that *C* is a weakly best reply to *C* or (*C*, *C*) is a weakly dominant Nash equilibrium of the *N+EDG.*

<u>Remark 3</u>: The Ostrom Threshold is that level of pandemic cost X_0 such that (7) holds.

The main result concerns the condition for the existence of the Ostrom Threshold for the game in question:

<u>Proposition</u>: (Existence of the Ostrom Threshold) The composite game *N+EDG* has an Ostrom threshold if and only if $(b+b) > (a+d)$ in the original *EDG*.

<u>Proof</u>: (if) Suppose $(b+b) > (a+d)$, Consider the following:

$$X_0 = -\,2(1 - t)(a - b)[H_2/H_1], \tag{8}$$

where $H_1 = tR_0[(a + d) - (b + b)] < 0$ and $H_2 = (t(d + a) + R_0)(t(b + b) + R_0)$ is clearly positive but less than ∞, since $(1 - t) > 0$ and $(a - b) > 0$ by *N+FDG*. So $X_0 > 0$ but less than ∞, as required for an Ostrom threshold. Now X_0 solves (7) which ensures that C is weakly best reply to C for A. By symmetry, it also does the same for B. Furthermore, for every $X > X_0$, $EU_A(C, C) > EU_A(NC, C)$ or C is strictly best reply to C for all players. Thus, X_0 is clearly the Ostrom threshold for the *N+EDG*. (Only if) Suppose the inequality condition $(b+b) < (a+d)$ instead holds for the *N+EDG*. The $H_1 > 0$ and $X_0 < 0$ violating the condition for the Ostrom threshold.

Remark: The condition $[(b+b) > (a+d)]$ is of some interest. The economic dilemma game should be such that the cooperative solution rewards the whole community better than if at least one player reneges. Note that the *EDG* can be a proper dilemma game even if the condition does not hold, that is, when $(d > (b+b-a)$ while $a < b)$ resulting in $(b+b) < (a+d)$. In this case, the opportunist (one who plays D when the other plays C) is very highly rewarded. Thus, cultures that highly reward opportunism may not exhibit Ostrom thresholds and may not attain the coiled spring feature. Cultures that highly reward cooperativism may attain the coiled spring feature. Cultures which privilege the group over the individual would naturally be more in tune with $(b+b) > (a+d)$. The proof can be trivially tweaked to accommodate a non-symmetric game.

We have shown that when the community faces the cost X of the pandemic in excess of the Ostrom threshold, the *N+EDG* transforms into a game with cooperation as the dominant strategy. The necessary and sufficient condition is that the Utilitarian social welfare at (C, C) exceeds those at (C, D) or (D, C) in the original *EDG*.

The community is at its peak strength at (C, C): its economic output is at its highest and it is contributing the largest to its anti-COVID insurance. At (C, C) the community becomes as if it were a "coiled spring" ready to pounce on pandemic intrusion. This state of readiness is attained and sustained by a threat level in excess of the Ostrom threshold. At this point, every member though inherently self-regarding acts "as if" altruistic as a way to advance his/her own personal welfare.

Note that the size of X can be a shared subjective valuation in the mind of the public. This subjective valuation depends in part on past experience with pandemics which gives an idea of how likely and how severe they will be. Likewise, trusted leadership can stoke the citizenry's subjective valuation to levels exceeding X_0 thus enabling stronger government actions that drive government effectiveness in Gelfand et al [2020]. Consequently, government effectiveness may itself be just reflecting the anti-COVID frenzy in the polity. The combination of effective government and a citizenry primed by past experience and trust of authorities results in what Gelfand et al. [2020] calls culturally "tight societies". Members of culturally tight societies submit better to harsher measures than members of looser societies. Of course, the coiled spring feature of tight societies can also be used by a demagogue for anti-social ends like making war.

The Romans in 450 BC formed one such coiled spring or tight societies forged by a heightened sense of identity and vulnerability that allowed them to coalesce to repulse eminent threats from other tribes despite previous fractious internal state of affairs. The Romans of 450 AD by contrast, having experienced centuries of peace and luxury coupled with an increasingly confused identity in a diverse multi-ethnic society, could not maintain the same sense of urgency and vulnerability. This in turn resulted in crumbling pre-emptive public goods. Such was instantiated by the defense of the realm being increasingly entrusted to paid mercenaries or conscripted barbarians rather than to citizen-soldiers. A thousand years of the *Pax Romana*, of luxury and a sense of invincibility may also have selected the sterner martial spirit of previous generations for Darwinian extinction. By 450 AD, the Roman society had become absorbed more by infighting for bigger shares in the imperial pie (rent-seeking) [Olson 1983] rather than by outfighting and bringing the barbarians to heel.

It is now a widely documented fact that East Asian countries fared better sometimes than Western countries in managing the COVID-19 Crisis. The question is why? Ma et al. [2021] documents which responses were stronger; a more timely government response combined with better civic cooperation was found in their list of East Asian countries (Hong Kong, Taiwan, China, South Korea, Singapore and Vietnam) than in their list of Western countries (UK, Italy, France Spain, Belgium, Germany, USA, Sweden, Denmark). They also resort to East Asian culture in the form of civic cooperation within communities, a culture as well more in tune with the authorities. Our take is that these East Asian societies apart from having a culture that is more in tune with its leadership also had a greater exposure to the ravages of pandemics of the last two decades leading to a more heightened sense of vulnerability making the sacrifice of personal comfort associated with protocol abidance more acceptable. It was a marriage between Nietszche ("What doesn't kill you makes you stronger") and Confucius (*Song* or loyalty to the state).

5. Summary

The model on offer here differs decidedly from the more long-run *EGT* models which depends on Malthusian replication and allele selection to explain the emergence of "tight societies" consisting of cooperators. Rather than just produce offspring more adapted allele-wise to the new difficult environmental situation, in our model, the current population itself employs species behavioral malleability by changing its behavior and institutions. Under duress, agents discard the selfish behavior and adopt the cooperative behavior. Some may call this "as if" altruism especially if the subjects revert back to self-seeking after the threat is lifted. If the threat is perceived to be long-lasting or recurrent, this "as if" altruism may become institutionalized and normalized.

The model features a community with two initially self-interested agents *A* and *B* normally interacting in an economic game characterized by a social dilemma where the Nash equilibrium delivers an inferior welfare outcome. The pandemic threatens to impose a cost $X > 0$ upon the community. The community cannot stop the spread of the pandemic *per se* but it can erect pre-emptive public goods that mitigate the damage caused by the pandemic. In other words the pre-emptive public goods can result in a "good outcome" defined as "no infection or asymptomatic infection for all"; the bad outcome is "symptomatic infection for all". The community thus plays a non-strategic game *N* against Nature by erecting such pre-emptive public goods.

Spending for pre-emptive public goods reduces the probability of the bad outcome of the pandemic having to be financed from revenues assessed upon the individual payoffs in the *EDG*. Thus, free riding in *EDG* incurs the additional cost of the risk of getting the bad outcome of the pandemic. Fusing together the *EDG* and *N* results in a game we call *N+EDG* where players face the strategy set (*C, D*) as in the *EDG* but the payoffs are each a composite as it accounts for the expected cost of the pandemic. The assumptions employed in the *N+EDG* echo the Ostrom assumptions for successful avoidance of the tragedy of the commons. For instance, the assumptions of equal sharing of the cost of the pandemic echoes relative homogeneity and difficulty of exit in Ostrom. Punishment for deviance exists but is now meted by Nature rather than by members themselves.

We introduce the concept of the "Ostrom threshold" which is the cost of the pandemic in excess of which cooperation in the *N+EPD* is a best reply to itself. The cost of the pandemic in excess of the Ostrom threshold transforms the *N+EPG* from a simple *PDG* to a game where cooperation is the dominant strategy. We give the necessary and sufficient condition for the existence of the Ostrom threshold for the *N+EPG*: that the utilitarian welfare is highest under full cooperation than under some free riding. Note that agents still exhibit selfish phenotype below the Ostrom threshold; and the cooperative phenotype above the threshold. The model can easily be generalized to more than two agents and for other eminent threats.

Why do some societies respond to an eminent threat like coiled springs while others dilly-dally until it's too late? The coiled spring feature towards a threat comes from the heightened sense of vulnerability to and immediacy of the threat. This feature is not costless since members of the community contribute to the provision of the pre-emptive public goods sacrificing present consumption and accustomed comfort in the process. Political consensus towards the provision of pre-emptive public goods is easier to reach and government anti-COVID protocols tend to be effective with the strong tailwind of civic cooperation.

Since four of the six pandemics in the last two decades originated and did most damage in East Asia, the heightened anxiety they left behind among East Asians combined with a more developed cultural tendency to cooperate with the authorities partly explains why the best performers against COVID-19 in deaths per million population are East Asian [Ma, Wang, and Wu 2021].

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How influential are COVID–19 data points? A fresh look at an estimated small scale DSGE model for the Philippines

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Shocks emanating from the global pandemic continue to reshape the macroeconomic landscape—dimming national growth prospects, prolonging widespread financial distress among households, firms, and governments and heightening uncertainty. Using a small-scale New Keynesian Dynamic Stochastic General Equilibrium (DSGE) model for the Philippines, we examine the model's sensitivity to COVID-19 datapoints or extreme observations. Relative to estimates during the base period (2002Q1 to 2019Q4), the inclusion of extreme datapoints worsens the model's log data density progressively, from the consideration of the first quarter of 2020 to the full sample – an indication that shock propagation mechanisms associated with COVID–19 and other natural disasters should be integrated into the model. Even with the inclusion of said extreme observations, however, the model's parameters are identified, provided identification schemes are evaluated at posterior median estimates. Judging from the sets of parameter estimates relative to the base sample, the effects of extreme observations are found to be non–uniform, especially the size of the shocks. But there are other parameters, notably those that are embedded in the Taylor rule, which are relatively as stable as some household related parameters. These results imply that the size of standard errors for demand, supply, and monetary policy shocks adjust to partially capture the impact of extreme datapoints.

JEL classification: E12, E32, E52
Keywords: small-scale DSGE model, Philippines, Bayesian estimation, historical decomposition

1. Introduction

The Philippines' growth performance prior to the onset of the COVID-19 pandemic has been robust, spanning two decades since registering the last known recession in the late 90s. Weeks prior to the start of quarantine regimes, the country saw how destructive and disruptive the eruption of Taal volcano was. Official economic accounts indicated that the eruption's effects have been amplified by tourism declines partly attributable to brewing pandemic concerns at that time. With the country experiencing significantly negative growth from

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the second to fourth quarters of 2020, several stylized business cycle facts have emerged. First, the pandemic has spawned unprecedentedly large demand (drastic reductions in consumption) and supply (reduction in labor supply) shocks, both of which resulted in contractions that have been quick, deep, and staggering– a sizeable 16.5 percent contraction in the second quarter of 2020 followed by a 11.5 percent contraction in the third quarter. Fourth quarter growth did not offer any respite either, as the economy plunged by 9.5 percent. Non-pandemic emergencies such as the African Swine Fever epidemic, which started to devastate the hog stock starting in the first quarter of 2020, caused price spikes. Second, the speed with which the pandemic has affected industries–even the traditionally sheltered ones, has been unprecedentedly rapid. Third, the country, as the rest of the world, reacted strongly to counter pandemic effects through aggressive monetary, fiscal, and health policy interventions, resulting in mobility restrictions, massive social expenditures and historically low interest rates.

Several models of varying degrees of sophistication came out during the pandemic. Such models have integrated epidemiological features into macroeconomic models belonging to the neoclassical and DSGE strands. Various papers by Eichenbaum, Rebelo, and Trabandt [2020a; 2020b; 2020c] showed how several susceptible-infected-recovered (SIR)- based scenarios (e.g., reproduction rates, social distancing, quarantine rules, vaccination rates) associated with the pandemic could sway macroeconomic fortunes.

In contrast to the aforementioned model features, this paper's main objective is to account for the empirical performance of the New Keynesian DSGE model when influential pandemic datapoints are included in the estimation sample. It is beyond this paper to formally include COVID-19–related processes that identify the nature of demand and supply shocks. Notwithstanding such limitations, the paper endeavors to measure the size of the shocks. In a way, this paper is related to the recent work of Lenza and Primiceri [2020] who were among the first researchers to investigate the empirical implications of extreme observations associated with COVID-19 on vector autoregression estimates. We believe that this is a worthy empirical undertaking for two reasons. First, relative to the base sample (2002Q1–2019Q4), evidence may be informative as to how extreme observations or COVID-19 datapoints can induce changes in the structural parameters of an estimated small–scale DSGE model that does not formally incorporate well-known transmission mechanisms for health contagion and natural disasters (e.g., Taal volcano eruption and Typhoon Goni in the fourth quarter of 2019). Second, we could also examine the respective contributions of supply, demand, and monetary policy shocks to observed output growth using historical decompositions to highlight robustness considerations when extreme observations are accounted for. In these exercises, we analyze historical decompositions pertaining to observed output growth outcomes generated using the base (2002Q1–2019Q4) and full (2002Q1–2020Q4) samples, respectively.

Given influential datapoints, we need to be able to ascertain the degree of model sensitivity and verify adequacy. We are interested in measuring the respective sizes of demand, supply, and monetary policy shocks, as more extreme observations are added. Given the aggressive role of the Bangko Sentral ng Pilipinas (BSP)[1], we would like to know whether there have been significant changes in the parameters of the Taylor rule. For firms, the duration of the pricing cycle may also be of interest, given that crises could potentially alter the timing of price changes. On the part of households, it may be worth examining whether elasticity–based measures such as the Frisch labor supply elasticity and intertemporal elasticity of substitution have changed due to shifting preferences or expectations induced by uncertainties spawned by the pandemic.

The paper follows the usual organizational design. Section 2 details the structure of the New Keynesian DSGE model. Section 3 discusses some preliminaries associated with the Bayesian estimation framework and identifies some issues. Discussions pertaining to parameter estimates and other dynamic outcomes are found in Section 4. Section 5 details some robustness strategies and results associated therewith. The final section concludes, identifies limitations, and provides directions for future research.

2. The model

We follow the small–scale, closed economy New Keynesian DSGE model used in An and Schorfeide [2007]; Rubaszek and Skrzypczyński [2008]; and Herbst and Schorfeide [2016]. The artificial economy is populated by three well–known actors, namely: homogeneous households, firms, and monetary policymakers. Households consume the final good, generate earnings by working in a perfectly competitive labor market, and invest their savings by purchasing bonds. They also own firms and as a result, derive dividend income therefrom. Firms are of two types, namely: intermediate goods firms, which operate with market power, and a final goods firm, which remains competitive. The final goods firm bundles together intermediate goods to produce the final good. Cognizant of the role of output and inflation gaps in interest rate determination, monetary policymakers use the Taylor rule.

Three core equations constitute the New Keynesian DSGE model, namely: a dynamic IS curve, a Phillips curve, and a monetary policy rule.[2] Together, they determine the dynamic path of output, prices, and short–term nominal interest rates [Rubaszek and Skrzypczyński 2008].

[1] BSP is the central monetary authority and the institution that regulates the currency and monetary policy of the Republic of the Philippines.

[2] As noted in Herbst and Schorfeide [2016], iterating the consumption Euler equation forward implies that output is a function of the sum of expected future real returns on bonds (p. 16). The New Keynesian Phillips curve links real economic activity to inflation. Iterating the New Keynesian Phillips curve forward implies that inflation is a function of the expected discounted sum of the future output gap.

2.1. Households

Following usual treatment in the literature (Herbst and Schorfeide [2016]; Rubaszek and Skrzypczyński [2008]), there is a continuum of households indexed by $i \in (0,1)$. Households maximize utility subject to a budget constraint. Households are assumed to form external, not deep habits, thereby necessitating the inclusion of the habit–adjusted level of consumption in the utility function.

Following An and Schorfeide [2007], the household derives utility from consumption relative to a habit stock A_t. The utility function of the i^{th} household follows the CRRA specification:

$$U_{i,t} = E_t \sum_{s=0}^{\infty} \beta^{t+s} \epsilon_{t+s}^{D} \left\{ \frac{\left(C_{i,t+s}^{h}/A_{t+s}\right)^{1-\sigma}}{1-\sigma} - \upsilon_L \frac{N_{i,t+s}^{1+\varphi}}{1+\varphi} \right\} \tag{1}$$

where $N_{i,t}$ is the household's labor supply, φ is the inverse of the Frisch labor supply elasticity, and σ is the inverse of the intertemporal elasticity of substitution (IES). As explained in Rubaszek and Skrzypczyński [2008], $U_{i,t}$ is an increasing function of $C_{i,t}$ after having accounted for the fraction of past consumption and adjusted for technology growth, g. This is shown by the following process:

$$C_{i,t}^{h} = C_{i,t} - \theta_h (1+g) C_{t-1} \tag{2}$$

where θ_h is a fraction of past consumption. When the fraction θ_h equals zero, the objective function reverts to the familiar one.

$$U_{i,t} = E_t \sum_{s=0}^{\infty} \beta^{t+s} \epsilon_{t+s}^{D} \left\{ \frac{\left(C_{i,t+s}/A_{t+s}\right)^{1-\sigma}}{1-\sigma} - \upsilon_L \frac{N_{i,t+s}^{1+\varphi}}{1+\varphi} \right\} \tag{3}$$

The demand shock is specified as an autoregressive linear process:

$$\epsilon_t^{D} = \left(1-\rho_D\right)\bar{\epsilon}^{D} + \rho_D \epsilon_{t-1}^{D} + \sigma_D \eta_t^{D} \tag{4}$$

which has the following log–linearized form:

$$\hat{\epsilon}_t^{D} = \rho_D \hat{\epsilon}_{t-1}^{D} + \sigma_D \eta_t^{D} \tag{5}$$

The household receives labor payments and dividends. They consume and pay $P_t C_t$ or invest in securities. The constraint is specified as

$$P_t C_{i,t} + B_{i,t} = R_{t-1} B_{i,t-1} + W_t N_{i,t} + Div_{i,t} \tag{6}$$

Maximizing (1) with respect to consumption and bonds, subject to the constraint (6), leads to the specification of the dynamic IS curve. The first order condition associated with $B_{i,t}$ is

$$\mu_t = E_t \beta R_t \mu_{t+1} \tag{7}$$

The first order condition for $C_{i,t}$ is

$$\beta^t \epsilon_t^D (C^h_{i,t}/A_t)^{-\sigma} (1/A_t) = \mu_t P_t \tag{8}$$

Performing the necessary substitutions, we have

$$\beta^t \epsilon_t^D \frac{1}{P_t}\frac{1}{A_t}\left(C^h_{i,t}/A_t\right)^{-\sigma} = E_t\left\{\beta^{t+1}\epsilon^D_{t+1}\frac{1}{P_{t+1}}\frac{1}{A_{t+1}}R_t\left(C^h_{i,t+1}/A_{t+1}\right)^{-\sigma}\right\} \tag{9}$$

Equation 9 can be expressed as

$$\left(C^h_{i,t}/A_t\right)^{-\sigma} = \beta E_t\left\{\frac{A_t}{A_{t+1}}\frac{\epsilon^D_{t+1}}{\epsilon^D_t}\pi^{-1}_{t+1}R_t\left(C^h_{i,t+1}/A_{t+1}\right)^{-\sigma}\right\} \tag{10}$$

The intra-temporal condition for labor is given by

$$\beta^t \epsilon_t^D \upsilon_L N^{\varphi}_{i,t} = \mu_t W_t \tag{11}$$

Combining Equation 11 with 8, we have

$$\upsilon_L N^{\varphi}_{i,t} = (C^h_{i,t}/A_t)^{-\sigma} (W_t/A_t P_t) \tag{12}$$

2.2. Firms

This section heavily borrows from Rubaszek and Skrzypczyński [2008], Herbst and Schorfeide [2016], and McCandless [2008]. The goods market is characterized by nominal rigidities in price adjustments. There are two types of firms, namely: final goods and intermediate goods firms. According to Herbst and Schorfeide [2016], the set–up allows the introduction of price– setting. Indexed by $j \in [0,1]$, intermediate goods firms produced differentiated goods which are sold to the competitive final goods firm. However, there are two types of intermediate goods firms. Firms belonging to the first type can set prices optimally per period. The second type of firms follows a certain rule of thumb in setting prices, implying that pricing histories are used. The non–zero probability that a firm is unable to set prices optimally is ζ. The constant returns to scale (CRS) production technology of the perfectly competitive final goods firm is specified as:

$$Y_t = \left[\int_0^1 (Y_{j,t})^{1-\frac{1}{\theta}} dj\right]^{\frac{1}{1-\frac{1}{\theta}}} \tag{13}$$

where $\theta \in (0,\infty)$ represents the elasticity of substitution among intermediate inputs. Given the intermediate goods inputs, the final goods firm maximizes profits, taking as given the prices of intermediate goods. The price at which the final good is sold is

$$P_t = \left[\int_0^1 (P_{j,t})^{1-\theta} dj\right]^{\frac{1}{1-\theta}} \tag{14}$$

Accordingly, the final goods firm's demand for the intermediate good is given by

$$Y_{j,t} = [P_{j,t}/P_t]^{-\theta}\, Y_t \tag{15}$$

For each intermediate goods firm, the production function is assumed to depend only on labor and is subject to constant returns to scale technology.

$$Y_{j,t} = A_t\, \epsilon_t^S\, N_{j,t} - FC_t \tag{16}$$

where A_t represents a deterministic trend gt, ϵ_t^S is a covariance–stationary shock with the form

$$\epsilon_t^S = (1-\rho_S)\bar{\epsilon}^S + \rho_S \epsilon_{t-1}^S + \sigma_S \eta_t^S \tag{17}$$

and $FC_t = Y_t/\theta$ is the fixed costs to ensure that profits are zero in equilibrium.

Technology shocks reduce marginal costs while the input price increases them. The marginal cost of the firm could be derived by minimizing total labor cost subject to the feasibility constraint.

$$MC_{j,t} = W_t / A_t\, \epsilon_t^S \tag{18}$$

Instantaneous profits are given by

$$D_{j,t} = (P_{j,t} - MC_{j,t})\, [P_{j,t}/P_t\,]^{-\theta}\, Y_t - (P_t\, Y_t/\theta) \tag{19}$$

Using the framework on sticky prices by Calvo [1983], some firms can optimize, with nonzero probability, while others follow rules of thumb. The proportion of firms able to set prices optimally is 1-ζ. For those who cannot reoptimize, the Rubaszek and Skrzypczyński [2008] pricing rule next period is

$$P_{j,t+1} = \{(\pi_t)^{\iota}\, (\overline{\pi})^{1-\iota}\} P_{j,t} \tag{20}$$

where non-optimizing firm prices P_{t+1} are indexed to steady–state inflation rate $\bar{\pi}$ and a fraction of the last period's excessive inflation rate. If the said firm has not changed its price s periods into the future, the pricing rule is

$$P_{j,t+s} = (P_{t+s-1}/P_{t-1})^{\iota}\,(\bar{\pi})^{s(1-\iota)}\,P_{j,t} \tag{21}$$

Note that when $\iota = 0$, we have the following pricing rule:

$$P_{j,t+s} = (\bar{\pi})^{s}\,P_{j,t} \tag{22}$$

For optimizing firms, they choose price such that their present value of discounted intertemporal profits is maximized.

$$\max_{P_{j,t}} E_t \left\{ \sum_{s=0}^{\infty} \zeta^s\, Q_{t,t+s} D_{j,t+s} \right\} \tag{23}$$

where $Q_{t,t+s}$ is the stochastic discount factor. Inserting equations (19) and (22) into equation (24), we have

$$\max_{P_{j,t}} E_t \left\{ \sum_{s=0}^{\infty} \zeta^s\, Q_{t,t+s} \left[\left(P_{j,t} \left[\frac{P_{t+s-1}}{P_{t-1}} \right]^{\iota} (\bar{\pi})^{s(1-\iota)} - MC_{j,t} \right) \left(\frac{P_{j,t} \left[\frac{P_{t+s-1}}{P_{t-1}} \right]^{\iota} (\bar{\pi})^{s(1-\iota)}}{P_{t+s}} \right)^{\iota} - \frac{P_t Y_t}{\theta} \right] Y_{t+s} \right\} \tag{24}$$

The first order condition associated with the optimizing firm is given by

$$E_t \left\{ \sum_{s=0}^{\infty} \zeta^s\, Q_{t,t+s} Y_{t+s} \left(\tilde{P}_{j,t} \left[P_{t+s-1/P_{t-1}} \right]^{\iota} (\bar{\pi})^{s} - [\theta/\theta\text{-}1] MC_{t+s} \right) \right\} = 0 \tag{25}$$

The price level is equal to

$$P_t = [\zeta(P_{t-1}(P_{t-1}/P_{t-2})^{\iota} - \pi^{1-\theta} + (1-\zeta)(\tilde{P}_{j,t})^{1-\theta}]^{1/1-\theta} \tag{26}$$

2.3. Monetary policy

The monetary policy maker's objective is to maintain price and output stability.

$$r_t/r = (r_{t-1}/\bar{r})^{\gamma}[(\pi_t/\bar{\pi})^{\gamma_\pi}(Y_t/Y_{t-1})^{\gamma_{AY}}]^{1-\gamma} exp(\sigma_M \epsilon_t^M) \tag{27}$$

where $\bar{r}$ is the steady state interest rate and $\bar{\pi}$ is the inflation target. ϵ_t^M is a monetary policy shock. Note that specification (27) follows the output growth rule version of the Taylor rule as discussed in Schorfeide and An [2007].

2.4. Closing the model

To close the model, we will closely follow Sims [2014]. In equilibrium, B_t=B_{t+1}=0. The real household budget constraint is written as follows:

$$C_t = (W_t/P_t)\, N_t + (Div_t/P_t) \tag{28}$$

Since Div_t/P_t represents the dividends from intermediate goods firms, then

$$Div_t/P_t = \int_0^1 \{(P_{j,t}/P_t)Y_{j,t} - w_t N_{j,t}\}\, dj \tag{29}$$

Since $\int_0^1 = N_{j,t} = N_t$, we have

$$Div_t/P_t = \int_0^1 \{(P_{j,t}/P_t)Y_{j,t}\}\, dj - w_t N_t \tag{30}$$

Substituting $w_t N_t$ into the constraint, we have

$$C_t = \int_0^1 \{(P_{j,t}/P_t)Y_{j,t}\}\, dj \tag{31}$$

Using the optimal demand function and integrating over firms, the following condition closes the model:

$$Y_t = C_t \tag{32}$$

3. Estimation of the New Keynesian System

3.1. Putting them together

Based on Rubaszek and Skrzypczyński [2008], we have the system of log–linearized equations.

$$\hat{\pi}_t = (\beta/1{+}\iota\beta)\, E_t\hat{\pi}_{t+1} + (\iota/1{+}\iota\beta)\hat{\pi}_{t-1} + [(1{-}\zeta\beta)(1{-}\zeta)/(1{+}\iota\beta)\,\zeta]\widehat{mc}_t \tag{33}$$

$$\widehat{mc}_t = \sigma\hat{c}_t^h + \varphi\widehat{N}_t - \sigma_S\hat{\epsilon}_t^S \tag{34}$$

$$\hat{r}_t = \rho\hat{r}_{t-1} + (1{-}\rho)\left(i_\pi\hat{\pi}_t + i_{AY}\left(\hat{y}_t - \hat{y}_{t-1}\right)\right) + \sigma_M\eta_t^M \tag{35}$$

$$\hat{c}_t^h = 1/1{+}\theta_h\left(\hat{y}_t - \theta\hat{y}_{t-1}\right) \tag{36}$$

$$\hat{c}_t^h = -\sigma^{-1}\left[\widehat{R}_t + E_t\hat{\pi}_{t+1} + \sigma_D\left(\hat{\epsilon}_{t+1}^D - \hat{\epsilon}_t^D\right)\right] + \hat{c}_{t+1}^h \tag{37}$$

Equation (33) is called the Phillips curve. It establishes the temporal connections between economic activity and price inflation. Equation (35) is called the Taylor rule, which shows how the monetary authority could react to adverse shocks, depending on its sensitivity to inflation gaps and output gaps. The IS curve requires both the habits formation equation (36) and the Euler equation (37).

Log–linearizing the production function, $\hat{y}_t - \hat{\epsilon}_t^S = \hat{N}_t$. Substituting the log–linearized habits equation into (34) and (37), and the modifying the Phillips curve accordingly, we have the 3–equation New Keynesian DSGE model.

$$\hat{\pi}_t = \frac{\beta}{1+\iota\beta} E_t\hat{\pi}_{t+1} + \frac{\iota}{1+\iota\beta}\hat{\pi}_{t-1} + \frac{(1-\zeta\beta)(1-\zeta)}{(1+\iota\beta)\zeta}\left\{\frac{\sigma}{1-\theta_h}\hat{y}_t - \frac{\sigma\theta}{1-\theta_h}\hat{y}_{t-1} + \varphi\left\{\hat{y}_t - \sigma_S\hat{\epsilon}_t^S\right\} - \sigma_S\hat{\epsilon}_t^S\right\} \tag{38}$$

$$\hat{y}_t = \frac{1}{1+\theta_h}\hat{y}_{t-1} - \frac{1-\theta_h}{1+\theta_h}\sigma^{-1}\left[\hat{R}_t + E_t\hat{\pi}_{t+1} + \sigma_D\left(\hat{\epsilon}_{t+1}^D - \hat{\epsilon}_t^D\right)\right] + \frac{1}{1+\theta_h}E_t\hat{y}_{t+1} \tag{39}$$

$$\hat{r}_t = \rho\hat{r}_{t-1} + (1-\rho)\left(i_\pi\hat{\pi}_t + i_{AY}\left(\hat{y}_t - \hat{y}_{t-1}\right)\right) + \sigma_M\epsilon_t^M \tag{40}$$

3.2. Important steps

To set up estimation, the system of three equations consists of log-linearized equations (38), (39), and (40). Solution methods can now be used to determine the equilibrium law of motion for the endogenous variables output, inflation, and interest rates. As noted in Herbst and Schorfeide [2016], the solution should be expressed as a first order vector autoregressive model. In matrix notation, we have

$$\begin{bmatrix}\hat{\pi}_t\\ \hat{y}_t\\ \hat{r}_t\end{bmatrix} = \Phi_{yy}(\theta)\begin{bmatrix}\hat{\pi}_{t-1}\\ \hat{y}_{t-1}\\ \hat{r}_{t-1}\end{bmatrix} + \Phi_\epsilon(\theta)\begin{bmatrix}\epsilon_t^S\\ \epsilon_t^D\\ \epsilon_t^M\end{bmatrix}$$

which could be written as

$$X_t = \Phi_{yy}(\theta)\, X_{t-1} + \Phi_\epsilon(\theta)\epsilon_t,\ \epsilon_t \sim iidN(0,\Omega_t) \tag{41}$$

where the matrices $\Phi_{yy}(\theta)$ and $\Phi_\epsilon(\theta)$ are functions of the structural parameters of the model.

Central to DSGE estimation is the construction of likelihood function which relates the model variables to a set of observables. It combines the vector autoregressive representation of the solution with a set of measurement equations, which link the set of model variables to the set of observables.

The measurement equations could be simply written as:

$$log(y_t^{data}) - log(y_{t-1}^{data}) = \mu_y + 100(\hat{y}_t - \hat{y}_{t-1}) \tag{42}$$

$$R_t^{data} = \mu_R + 100\hat{r}_t \tag{43}$$

$$\pi_t^{data} = \mu_\pi + 100\bar{\pi}_t \tag{44}$$

The probability distribution of the innovations of the exogenous shock processes is deemed important [Herbst and Schorfeide 2016]. The measurement equations could be written collectively as

$$Y_t = \Psi(\theta)X_t + u_t \tag{45}$$

Both state and measurement equations are needed to constitute the state–space representation of the log–linearized DSGE model. As remarked in Herbst and Schorfeide [2016], and Guerron– Quintana and Nason [2013], the specification of the distribution of errors is critical. If the distribution of structural innovations is Gaussian, the Kalman filter can be used to recursively compute for the means and covariance matrices, allowing for the evaluation of the likelihood function.

3.3. The Bayesian method

Bayesian methods will be used to estimate some of the key parameters of the model. In the literature, Bayesian methods are empirically appealing with the parameters assumed to be random, contrary to the classical assumption that the model is generated by an underlying data generating process (DGP). The DSGE model, under the Bayesian framework becomes the DGP.[3]

The objective of classical methods is to estimate unknown parameters that are assumed to be true. Bayesian methods overcome the inherent difficulty in maximum likelihood estimation to include non–sample information and avoid intricacies involved when the distributional assumption is inconsistent with the data. As noted in Villaverde [2010], sometimes it is not interesting to determine the significance of parameter estimates in repeated samples. Bayesian analysis requires the prior distribution, the data and the likelihood function in order to derive the posterior distribution (see Guerron–Quintana and Nason [2013]).

Estimating parameters in a DSGE model relies on the construction of a likelihood function and the prior distribution. Given the data or observables, we would like to construct the posterior, which consists of the sum of two parts, namely: the log likelihood and the log prior. The value of the parameters at which the log posterior is maximized is known as the posterior mode. But the solution is not analytical, and estimation requires simulation methods, specifically the Metropolis-Hastings Markov Chain Monte Carlo, which specifies the posterior distribution as the target distribution, from which Markov Chains are formed.

[3] We are cognizant of the fact that identification problems continue to beset the DSGE framework. We don't address them here but interested readers could learn more from Canova and Sala [2009], and Beltran and Draper [2008].

3.4. The priors

Two components of the posterior distribution are needed to evaluate the Bayesian likelihood function. These are the likelihood of observing the data given parameters and the prior distribution. The latter is associated with the state of knowledge or a priori beliefs about the parameters, which are not found in the sample. The update to this belief is provided by the likelihood function, which proves critical in deriving the posterior distribution. We follow Del Negro and Schorfeide [2008], Guerron–Quintana and Nason [2013], and Herbst and Schorfeide [2016] by dividing the parameters into three sets. The first set collects the intercept parameters in the measurement equations. The second set includes parameters that are associated with primitives such as preferences, technology, and market structure. The third set consists of AR(1) coefficients and standard deviations of shocks.

$$\Theta_{SS} = [\mu_y \;\; \mu_R \;\; \mu_\pi] \tag{46}$$

$$\Theta_{ENDO} = [\theta_h \;\; \sigma \;\; \phi \;\; \iota \;\; \gamma_R \;\; \gamma_\pi \;\; \gamma_{\Delta y}] \tag{47}$$

$$\Theta_{EXO} = [\rho_D \;\; \rho_S \;\; \sigma^S \;\; \sigma^D \;\; \sigma^M] \tag{48}$$

As noted in Guerron–Quintana and Nason [2013], and Rubaszek and Skrzypczyński [2008], parameters associated with habits, price setting, and the persistence parameters have priors defined by the beta distribution, which restricts priors to the open unit interval. The priors on the standard deviations are drawn from the inverse–gamma distribution, which is unbounded, and has support on the open interval excluding zero. The priors on the intercept parameters were taken from the gamma and normal distributions.

We follow Beltran and Draper [2008]. The prior distribution for Calvo pricing should cover low and high estimates of the slope of the Phillips curve. For this purpose, we use the Beta(0.8,0.1) distribution. A uniform distribution with lower bound 0 and upper bound 1 was tried but the model failed to converge. The indexation parameter's prior distribution is Beta(0.7,0.1). This covers the absence of any indexation to full indexation. For the discount rate, we need to ensure that moderately high and high values should be covered. For this reason, we chose Beta(0.9, 0.01). The model requires tight prior for habit persistence parameter. We chose Beta(0.8, 0.05). The risk aversion parameter's prior distribution is Gamma(1,1.2), indicating greater uncertainty. It is centered at 1 and it includes values as large as 10. The Frisch labor supply elasticity's prior distribution is Gamma(2,0.5). This is consistent with micro studies on the said parameter. The interest rate persistence in the Taylor rule has been assumed to have come from the uniform distribution with lower bound 0 and upper bound 1. We followed

Schorfeide and An [2007]. For the response of interest rate to inflation, we chose a tight prior, Gamma(1.5, 0.05). For the response of interest rate to output growth, we also chose a tight prior, Gamma(0.125, 0.05). This is consistent with the robustness of the said parameter. Persistence of demand and supply shocks have uniform prior distributions, with lower bound zero and upper bound 1. These priors are based on Herbst and Schorfeide [2016].

4. Data, results & interpretation

4.1. The data

To estimate the structural parameters of the DSGE model, we will use the full–likelihood approach. The number of observables matches the number of shocks. By subscribing to the Bayesian perspective, the DSGE model represents our data–generating process. Data were obtained from the Philippine Statistics Authority's (PSA) OpenStats and BSP websites. For the observables, we computed the quarterly growth rate of deseasonalized real gross domestic product (with 2018 as the base year), used the applicable Consumer Price Index (CPI) to compute for inflation, and 91–day Treasury bill rates converted to quarterly frequency. To establish robustness and align our methodology to BSP's inflation targeting framework, we use CPI data to compute for the quarterly inflation rates, and the overnight reverse repurchase rate (ORRP). For consistency, we rebase CPI using 2018 as the base year. All variables have been demeaned. Dynare was used to construct the likelihood and estimate the parameters.[4]

To know more about the effects of uncertainty emanating from COVID-19 observations, we initially compare parameter estimates that respectively pertain to base and full samples. Our entire sample period covers the quarters 2002Q1 thru 2020Q4 to be consistent with BSP's inflation targeting framework.[5] The first sample pertains to the period 2002Q1–2019Q4. This sample does not factor in the effects of the pandemic quarters yet but may have already captured the impact of natural calamities during the 4th quarter of 2019. The full sample encompasses the entire sample period. We generated 200,000 draws from the target posterior distribution. Following statistical procedures, the usual tests of convergence have been implemented, leading to satisfactory results. The number of Markov Chain Monte Carlo (MCMC) chains is pegged at 2. The posterior means and medians as well as the 5 and 95 percentile values of the High Posterior Density (HPD) for all estimated parameters are shown in Tables 2 to 5 in the Appendix.

[4] The author benefited from the Matlab and Dynare codes written by Matthias Trabandt, which was shared with participants in CEMFI's Summer School 2020 Course entitled: "Computational Tools for Macroeconomists. The said code has been modified to align it to Rubaszek & Skrzypczyński's model.

[5] I would like to thank the anonymous referee for pointing this out.

4.2. Structural parameter estimates

For some parameters, full sample-based estimates have exhibited minimal deviations relative to their counterparts in the base sample. To learn more about the robustness properties of the NKDSGE model, we created three samples. The first sample expands the base sample by including the first quarter of 2020. The second sample includes 2 quarters of 2020 to the base sample. Apparently, this sample is associated with the onset of the enhanced community quarantine (ECQ) protocol – the highest level of mobility restrictions. The third sample includes the first three quarters of 2020, plausibly capturing the quarantine easing implemented during the third quarter.

Table 1 shows the respective estimates associated with the base sample (2002Q1–2019Q4). We reported both posterior mean and median estimates, but it is the latter that survives standard identification tests in Dynare. In all our discussions, we will use posterior median estimates. First, the estimated discount factor β, which is associated with the growth years is expectedly high at 0.90. With the inclusion of COVID-19 quarters, the subsequently estimated discount factors appear to have minimally deviated from the base sample's posterior median estimates.[6]

TABLE 1. Prior distribution and estimates of structural parameters: base sample

	Prior type	Prior Mean	Prior Std Dev	Post. Mean	Post. Median	95% HPD	
Households							
Discount factor (β)	Beta	0.90	0.05	0.90	0.90	0.80	0.98
Habit persistence (θ_h)	Beta	0.80	0.05	0.94	0.94	0.89	0.97
Inverse of the Intertemporal Elasticity of substitution (σ)	Beta	1.00	1.20	0.60	0.58	0.31	0.92
Frisch labor supply elasticity (φ)	Beta	2.00	0.50	2.21	2.17	1.26	3.21
Firms							
Calvo prices (ζ)	Gamma	0.80	0.10	0.66	0.66	0.51	0.80
Price indexation (ι)	Gamma	0.70	0.20	0.48	0.44	0.10	0.94
Central Bank							
Interest rate smoothing (ρ)	Uniform	0.00	1.00	0.82	0.82	0.76	0.88
Inflation response (γ_π)	Gamma	1.50	0.05	1.55	1.55	1.45	1.65
Output growth response ($\gamma_{\Delta y}$)	Gamma	0.13	0.05	0.13	0.12	0.04	0.23
Persistence							
Persistence parameter Demand (ρ_D)	Uniform	0.00	1.00	0.86	0.87	0.69	0.98

6 This observation may be attributed to the inability of data to update the prior distribution for the discount factor in samples that included extreme observations.

TABLE 1. Prior distribution and estimates of structural parameters: base sample (continued)

	Prior type	Prior Mean	Prior Std Dev	Post. Mean	Post. Median	95% HPD	
Persistence parameter Supply (ρ_S)	Uniform	0.00	1.00	0.73	0.75	0.49	0.90
Shocks							
Monetary shock std (σ_M)	Inverse Gamma	0.50	Inf	0.41	0.40	0.31	0.51
Demand shock Std (σ_D)	Inverse Gamma	3.00	Inf	2.84	2.62	1.53	4.82
Supply shock Std (σ_S)	Inverse Gamma	3.00	Inf	2.18	2.04	1.01	3.79
Intercepts							
Mean inflation (μ_π)	Gamma	1.00	0.20	0.88	0.87	0.57	1.22
Mean Tbill rate (μ_R)	Gamma	1.00	1.00	0.99	0.99	0.28	1.69
Mean output growth ($\mu_{\Delta y}$)	Normal	0.03	0.09	0.05	0.05	0.00	0.11

Second, the estimate on the degree of habit persistence in normal times is very high at 0.94. Including the third and fourth quarters of 2020 reduced the persistence of past consumption. The significant drop in external habits may be indicative of a much faster economic adjustment [Villaverde 2010].

Third, in contrast to the limited variation in the discount rate, there have been significant changes in household–based elasticities. Our estimate of ϕ shows that the Frisch elasticity of labor supply fell by 44 percent after the inclusion of all extreme observations to the base sample. This means that the pandemic has reduced the degree of responsiveness of labor supply to changes in the wage rate. This is in line with microeconomic evidence (Villaverde [2010]; Chetty, Guren, Manoli and Weber [2011]). In addition, the estimated inverse of the intertemporal elasticity of substitution (IES) parameter σ was halved, from 0.57 to 0.26, implying a 119 percent growth in the IES.[7] The tremendous increase in the IES is consistent with households substituting future consumption in favor of current consumption in the face of tremendous uncertainty.[8]

Fourth, the posterior estimates for the Calvo price parameter highlight stability. The estimated values of the indexation parameters are moderate, with significant reductions occurring when the first two quarters of 2020 are accounted for. The indexation parameter has significantly increased relative to the base estimate of 0.45 to 0.60 plausibly due to the Taal volcano eruption and strict quarantine regimes which were set up during the 2nd quarter. Full sample-based estimates are comparable with the base model estimate.

[7] Hall [1988] remarked that the magnitude of the change in consumption in response to a shift in expectations of the real interest rate determines the elasticity measure.

[8] I am grateful to a referee for pointing this out.

Fifth, the coefficients for the Taylor rule have been consistent with those observed in the literature, and collectively bolster the claim of monetary authority efficiency in dealing with economic crises. The coefficient of inflation across samples exhibits stability. This indicates that the BSP respects the Taylor rule. The coefficient on output is quite low but nonetheless, shows a positive response. As remarked in Villaverde [2010], this is a sign that the central bank smooths changes in nominal interest rates over time.

Finally, no parameter has been more affected by the inclusion of COVID-19 datapoints than the size of the shocks (i.e. standard deviations). According to Lenza and Primiceri [2020], extreme observations are associated with volatility. The inclusion of COVID-19 datapoints has unambiguously increased the volatility of output growth significantly and inflation minimally. Note that the standard deviation estimates are quite high even prior to the inclusion of COVID-19 datapoints. This was due to growth slowdown induced by slow disbursements in 2010, leading to the crafting of a controversial yet effective executive measure known as the Disbursement Acceleration Program (DAP). With the inclusion of COVID-19 datapoints, supply and demand shocks appear to be orders of magnitude higher than monetary policy shocks, thereby largely counteracting the pandemic–mitigating potential of monetary policy. What is noteworthy is that the size of demand and supply shocks appeared to be highest when the first two quarters of 2020 have been included. Results also indicate that shocks have persisted until the fourth quarter of 2020.

4.3. Historical decomposition

Suppose we ask the following question: What would have happened if supply shocks have driven the data exclusively? This kind of counterfactual question requires a tool for structural analysis known as historical decomposition. This is an important tool for understanding the impact of extreme observations. A succinct description of what historical decompositions can do is provided in Wong [2017]. He wrote that "historical decompositions provide an interpretation of historical fluctuations in the modelled time series through the lens of the identified structural shocks" [Wong 2017:1]. The Kalman smoother is a two–sided filter, which implements a backward recursive algorithm. It requires the implementation of the Kalman filter, and through a backward algorithm, estimates are further refined. It decomposes the historical deviations of the endogenous variables (output growth) from their respective steady state values into the contribution coming from demand, supply, and monetary policy shocks. We account for the respective roles of demand, supply, and monetary policy shocks in historical decompositions of observed output growth.

We focus on the dynamics of observed output growth and show how extreme observations affect the ability of shocks to explain output growth trajectory. Figure 1 shows that during the growth years, positive supply shocks played a big role in sustaining growth. Prior to 2020, supply and demand shocks have robust positive contributions as well. As shown in Figure 2, monetary policy shocks alone could not explain the trajectory of output growth. Nor do demand shocks. As shown in Figure 4, evidence seem to affirm the importance of supply shocks in the NKDSGE model. For the full sample, shock components could not individually explain the trajectory of output growth. Large fluctuations in output growth translates into relatively smaller shock contributions. As shown in Figure 8, however, it is clear that supply shocks have done a better job explaining output growth starting in 2019Q3 up to the fourth quarter of 2020.[9]

FIGURE 1. Decomposition of observed output growth: base sample

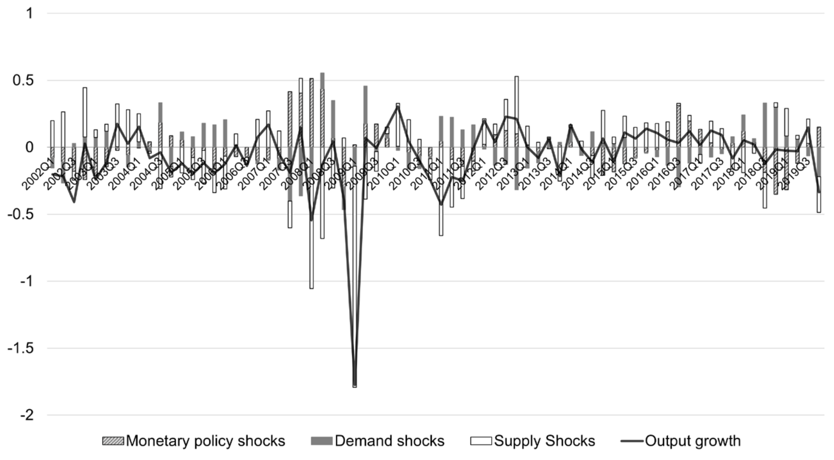
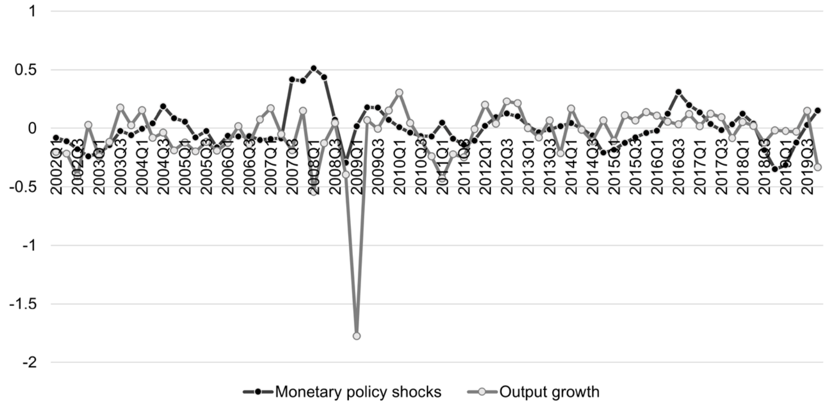


FIGURE 2. Decomposition of observed output growth: monetary policy shocks only



[9] The results should be interpreted with caution, as the log data likelihood becomes more negative (or deteriorates) once extreme observations are included. This implies that the structure of the DSGE model works well for the base sample but clearly, it is unable to capture important aspects associated with disasters and the pandemic.

FIGURE 3. Decomposition of observed output growth: demand shocks only

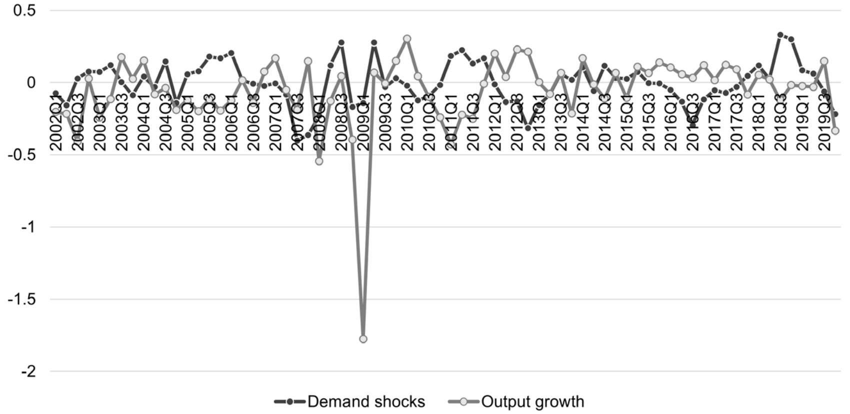


FIGURE 4. Decomposition of observed output growth: supply shocks only

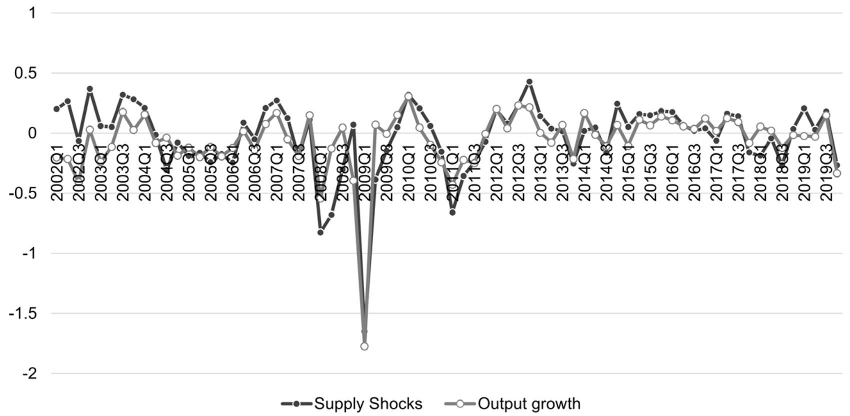


FIGURE 5. Decomposition of observed output growth: base sample

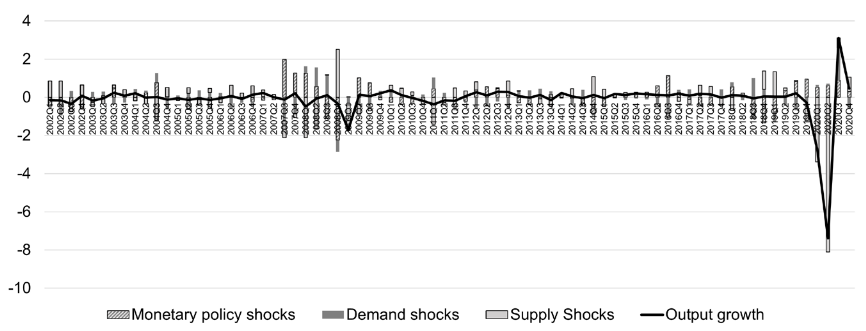


FIGURE 6. Decomposition of observed output growth: monetary policy shocks only

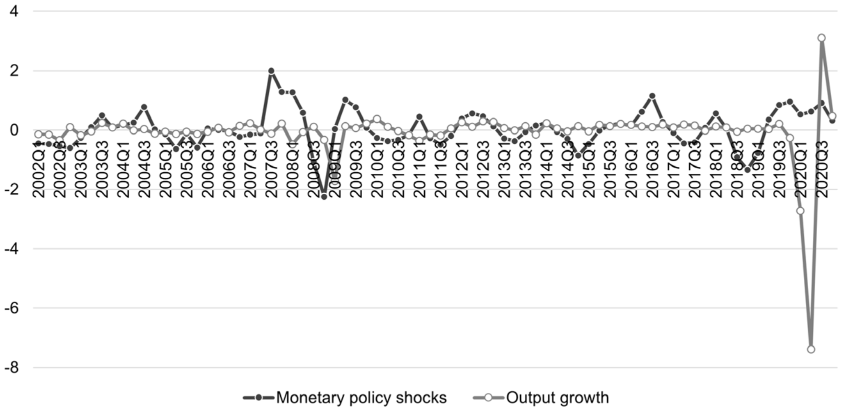


FIGURE 7. Decomposition of observed output growth: demand shocks only

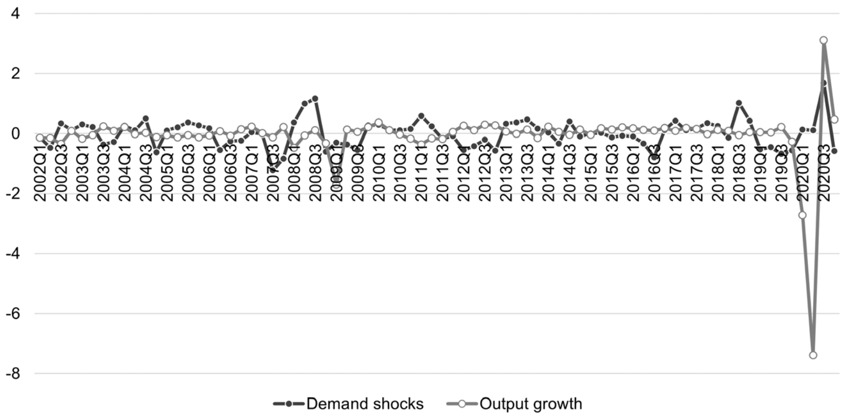
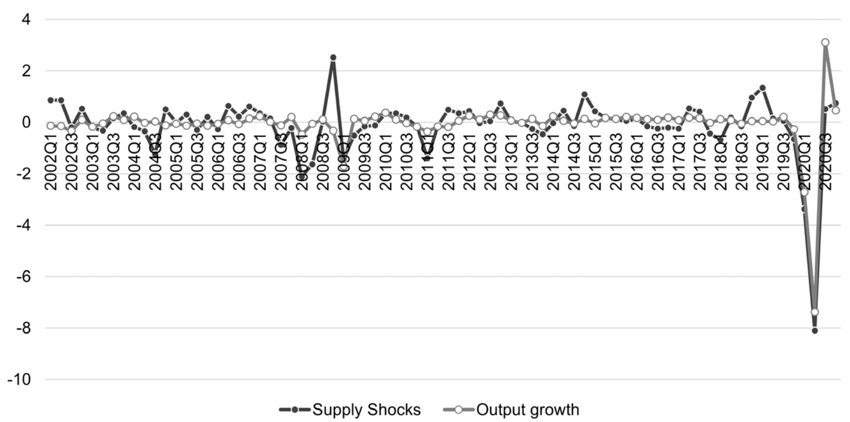


FIGURE 8. Decomposition of observed output growth: supply shocks only



5. Concluding remarks

The main objective of the paper is to empirically ascertain how influential or extreme observations affect key parameters estimates and shock contributions (via Kalman smoother) in an estimated small–scale New Keynesian DSGE model. Expectedly, extreme observations have their own way of influencing results, some of which render the NKDSGE model inadequate. As expected, deep parameters that pertain to the discount factor have been affected minimally. In contrast, habit persistence declined after including pandemic quarters. Relative to base–sample estimates, we find tremendous increase in IES estimates after using the full sample. Key parameters from the Taylor rule have changed minimally as well, plausibly indicating monetary authority efficiency in mitigating adverse shocks propagated by the pandemic. It turns out that one way to account for such extreme observations is to appropriately scale (via Bayesian estimation) demand, supply, and monetary policy shocks.

There are obvious model shortcomings. First, the model does not integrate formal structures that identify how COVID-19 related processes could influence labor supply, consumption, and production decisions. Differences in parameter estimates may be signaling either robust behavior or limited or weak parameter identification. Second, some exogenous shocks have been excluded. This may explain why historical decomposition estimates associated with the base sample fail to track the trajectory of output growth when extreme observations have been admitted. Third, while the parameters were all identified at the posterior median, results also indicate that there is tremendous model uncertainty.

For future work, the model will be refined to properly reflect how the current pandemic has affected macroeconomic outcomes. The labor bloc is envisioned to reflect labor market dynamics in the formal and informal sectors, since the pandemic has affected these sectors differently. We will also strengthen the fiscal bloc of the model by considering the integration of non-Ricardian households and by focusing on endogenous fiscal policy (spending, transfers, and deficits), complementarities between private and public capital, and labor market outcomes–key structures/features that played important roles in shaping Philippine macroeconomic dynamics during the pandemic period.

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Appendix

TABLE 2. Prior distribution and estimates of structural parameters: 2002Q1 – 2020Q1

	Prior type	Prior Mean	Prior Std Dev	Post. Mean	Post. Median	95% HPD	
Households							
Discount factor (β)	Beta	0.90	0.05	0.79	0.90	0.79	0.98
Habit persistence (θ_h)	Beta	0.80	0.05	0.89	0.93	0.89	0.97
Inverse of the Intertemporal Elasticity of substitution (σ)	Gamma	1.00	1.20	0.29	0.56	0.29	0.93
Frisch labor supply elasticity (φ)	Gamma	2.00	0.50	1.33	2.22	1.33	3.32
Firms							
Calvo prices (ζ)	Beta	0.80	0.10	0.55	0.68	0.55	0.80
Price indexation (ι)	Beta	0.70	0.20	0.22	0.60	0.22	0.99
Central Bank							
Interest rate smoothing (ρ)	Uniform	0.00	1.00	0.78	0.83	0.78	0.88
Inflation response (γ_π)	Gamma	1.50	0.05	1.45	1.55	1.45	1.65
Output growth response ($\gamma_{\Delta y}$)	Gamma	0.13	0.05	0.05	0.13	0.05	0.25
Persistence							
Persistence parameter Demand (ρ_D)	Uniform	0.00	1.00	0.73	0.94	0.73	0.99
Persistence parameter Supply (ρ_S)	Uniform	0.00	1.00	0.51	0.73	0.51	0.90
Shocks							
Monetary shock std (σ_M)	Inverse Gamma	0.50	Inf	0.31	0.38	0.31	0.48
Demand shock Std (σ_D)	Inverse Gamma	3.00	Inf	1.81	3.60	1.81	10.19
Supply shock Std (σ_S)	Inverse Gamma	3.00	Inf	1.40	2.53	1.40	4.26
Intercepts							
Mean inflation (μ_π)	Gamma	1.00	0.20	0.56	0.87	0.56	1.23
Mean Tbill rate (μ_R)	Gamma	1.00	1.00	0.26	0.96	0.26	1.67
Mean output growth ($\mu_{\Delta y}$)	Normal	0.03	0.09	0.00	0.07	0.00	0.14

TABLE 3. Prior distribution and estimates of structural parameters: 2002Q1 – 2020Q2

	Prior type	Prior Mean	Prior Std Dev	Post. Mean	Post. Median	95% HPD	
Households							
Discount factor (β)	Beta	0.90	0.05	0.89	0.90	0.78	0.98
Habit persistence (θ_h)	Beta	0.80	0.05	0.93	0.93	0.87	0.97
Inverse of the Intertemporal Elasticity of substitution (σ)	Gamma	1.00	1.20	0.49	0.46	0.22	0.83
Frisch labor supply elasticity (φ)	Gamma	2.00	0.50	2.22	2.18	1.30	3.16
Firms							
Calvo prices (ζ)	Beta	0.80	0.10	0.55	0.68	0.55	0.80
Price indexation (ι)	Beta	0.70	0.20	0.22	0.60	0.22	0.99
Central Bank							
Interest rate smoothing (ρ)	Uniform	0.00	1.00	0.82	0.82	0.77	0.88
Inflation response (γ_π)	Gamma	1.50	0.05	1.55	1.55	1.45	1.65
Output growth response ($\gamma_{\Delta y}$)	Gamma	0.13	0.05	0.16	0.15	0.05	0.28
Persistence							
Persistence parameter Demand (ρ_D)	Uniform	0.00	1.00	0.92	0.96	0.75	0.99
Persistence parameter Supply (ρ_S)	Uniform	0.00	1.00	0.71	0.73	0.41	0.92
Shocks							
Monetary shock std (σ_M)	Inverse Gamma	0.50	Inf	0.40	0.39	0.31	0.49
Demand shock Std (σ_D)	Inverse Gamma	3.00	Inf	4.45	4.21	1.79	7.80
Supply shock Std (σ_S)	Inverse Gamma	3.00	Inf	3.98	3.78	2.01	6.34
Intercepts							
Mean inflation (μ_π)	Gamma	1.00	0.20	0.89	0.88	0.56	1.24
Mean Tbill rate (μ_R)	Gamma	1.00	1.00	0.92	0.91	0.19	1.62
Mean output growth ($\mu_{\Delta y}$)	Normal	0.03	0.09	0.15	0.15	0.04	0.26

TABLE 4. Prior distribution and estimates of structural parameters: 2002Q1 – 2020Q3

	Prior type	Prior Mean	Prior Std Dev	Post. Mean	Post. Median	95% HPD	
Households							
Discount factor (β)	Beta	0.90	0.05	0.89	0.90	0.79	0.98
Habit persistence (θ_h)	Beta	0.80	0.05	0.82	0.83	0.74	0.90
Inverse of the Intertemporal Elasticity of substitution (σ)	Gamma	1.00	1.20	0.30	0.28	0.13	0.48
Frisch labor supply elasticity (φ)	Gamma	2.00	0.50	2.06	2.02	1.17	3.05
Firms							
Calvo prices (ζ)	Beta	0.80	0.10	0.65	0.65	0.51	0.79
Price indexation (ι)	Beta	0.70	0.20	0.48	0.47	0.12	0.90
Central Bank							
Interest rate smoothing (ρ)	Uniform	0.00	1.00	0.80	0.80	0.72	0.86
Inflation response (γ_π)	Gamma	1.50	0.05	1.55	1.55	1.45	1.65
Output growth response ($\gamma_{\Delta y}$)	Gamma	0.13	0.05	0.16	0.15	0.05	0.27
Persistence							
Persistence parameter Demand (ρ_D)	Uniform	0.00	1.00	0.96	0.96	0.92	0.99
Persistence parameter Supply (ρ_S)	Uniform	0.00	1.00	0.73	0.73	0.52	0.92
Shocks							
Monetary shock std (σ_M)	Inverse Gamma	0.50	Inf	0.44	0.43	0.34	0.56
Demand shock Std (σ_D)	Inverse Gamma	3.00	Inf	4.59	3.98	1.90	9.52
Supply shock Std (σ_S)	Inverse Gamma	3.00	Inf	2.16	2.08	1.25	3.35
Intercepts							
Mean inflation (μ_π)	Gamma	1.00	0.20	0.90	0.88	0.57	1.24
Mean Tbill rate (μ_R)	Gamma	1.00	1.00	1.00	0.99	0.30	1.73
Mean output growth ($\mu_{\Delta y}$)	Normal	0.03	0.09	0.08	0.08	0.00	0.17

TABLE 5. Prior distribution and estimates of structural parameters: full sample

	Prior type	Prior Mean	Prior Std Dev	Post. Mean	Post. Median	95% HPD	
Households							
Discount factor (β)	Beta	0.90	0.05	0.89	0.90	0.79	0.98
Habit persistence (θ_h)	Beta	0.80	0.05	0.84	0.84	0.76	0.91
Inverse of the Intertemporal Elasticity of substitution (σ)	Gamma	1.00	1.20	0.27	0.26	0.11	0.46
Frisch labor supply elasticity (φ)	Gamma	2.00	0.50	2.09	2.05	1.21	3.08
Firms							
Calvo prices (ζ)	Beta	0.80	0.10	0.66	0.66	0.52	0.79
Price indexation (ι)	Beta	0.70	0.20	0.47	0.44	0.12	0.90
Central Bank							
Interest rate smoothing (ρ)	Uniform	0.00	1.00	0.80	0.81	0.73	0.87
Inflation response (γ_π)	Gamma	1.50	0.05	1.55	1.55	1.46	1.65
Output growth response ($\gamma_{\Delta y}$)	Gamma	0.13	0.05	0.15	0.15	0.05	0.27
Persistence							
Persistence parameter Demand (ρ_D)	Uniform	0.00	1.00	0.96	0.96	0.91	0.99
Persistence parameter Supply (ρ_S)	Uniform	0.00	1.00	0.76	0.77	0.56	0.96
Shocks							
Monetary shock std (σ_M)	Inverse Gamma	0.50	Inf	0.44	0.43	0.33	0.56
Demand shock Std (σ_D)	Inverse Gamma	3.00	Inf	4.28	3.97	1.85	7.31
Supply shock Std (σ_S)	Inverse Gamma	3.00	Inf	2.22	2.12	1.22	3.48
Intercepts							
Mean inflation (μ_π)	Gamma	1.00	0.20	0.89	0.88	0.56	1.22
Mean Tbill rate (μ_R)	Gamma	1.00	1.00	0.96	0.96	0.27	1.66
Mean output growth ($\mu_{\Delta y}$)	Normal	0.03	0.09	0.08	0.08	-0.01	0.19

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Targeting 'highly vulnerable' households during strict lockdowns

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In this brief article, we attempt to quantify the number of households in the country which are 'highly vulnerable' to hunger and poverty due to sudden and highly restrictive lockdowns, such as the enhanced community quarantine, and other social distancing measures, as well as estimate the budget that will be needed to address their vulnerability. 'Highly vulnerable' households are defined in this study as those unlikely to have incomes during strict lockdown periods because of the employment characteristics of their employed members and which likely have little or no savings to tide them over. Using nationally-representative household data, we define a job loss index to identify the employment characteristics that are most sensitive to the lockdown measures, and given these employment characteristics, identify the 'highly vulnerable' households. Depending on the pre-lockdown income threshold eligibility used, we estimate the number of 'highly vulnerable' households in the country at anywhere from 7.4 million to 11.3 million. At ₱5,000 per 'highly vulnerable' household, the estimated costs amount to ₱36.9 billion to ₱56.5 billion, again depending on the income threshold used. We also propose a way for the government to operationalize the process of identifying and helping 'highly vulnerable' households.

JEL classification: I32, I38; H53
Keywords: social protection, vulnerable households, poverty, targeting, COVID-19, lockdown

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1. Introduction

Most countries in the world have implemented some form of strict movement restrictions or hard lockdowns as a means to control the spread of COVID-19. In the Philippines, the strictest form of movement restriction has been termed the enhanced community quarantine or ECQ.[1] The ECQ was imposed in Metro Manila, initially on March 16, 2020, but this was soon expanded to the whole of Luzon from March 17 to May 15, 2020. This was further extended in Metro Manila, CALABARZON, most of Central Luzon, and a few more high-risk provinces up to May 30, 2020.

Afterwards, ECQs were implemented selectively in parts of the country whenever the surge in cases threatened the viability of the healthcare system, including in Metro Manila and nearby provinces at the end of March 2021 up to mid-April. In between, laxer forms of lockdowns or community quarantines were put in place.

ECQs, although likely necessary to slow down the spread of COVID-19, have resulted in much hardship for those whose livelihoods were affected by the mobility restrictions (Meo et al. [2020]; UN [2020]). ECQs have underscored the grave vulnerability of individuals and households in highly affected economic sectors, especially those reliant on so-called non-standard forms of employment and with little or no access to social protection. According to the Social Weather Stations, for example, the incidence of hunger in the country nearly doubled from the pre-pandemic period (8.8 percent in December 2019) to the ECQ period (16.7 percent in May 2020). The increase in hunger incidence was especially high in Metro Manila (7.3 percent to 19.4 percent), where movement restrictions were most strictly implemented [SWS 2020].

As a stop-gap response to provide quick relief to households adversely affected by the harsh lockdown measures, the government, through the Social Amelioration Program (SAP) of the Department of Social Welfare and Development (DSWD) in the Bayanihan to Heal as One Act of 2020 (Republic Act No. 11469), allotted around ₱200 billion for 18 million households (75 percent of the total number of households).[2] Each household was allocated ₱5,000 to ₱8,000 per month for two months, depending on the prevailing minimum wage in the locality. While SAP was supposed to be implemented in April and May 2020, there were significant delays, as well as some duplications and other issues, in the delivery of cash transfers to households that were not in the DSWD's conditional cash transfer program due to the lack of comprehensive household registry [Cho et al. 2020]. Given the government's limited budget constraint, a mechanism for targeting the most vulnerable households – who tend

[1] See https://www.officialgazette.gov.ph/downloads/2021/03mar/20210328-OMNIBUS-Guidelines-RRD.pdf for a typology of the various kinds of lockdowns imposed in the Philippines.

[2] See https://www.dbm.gov.ph/index.php/secretary-s-corner/press-releases/list-of-press-releases/1647-dbm-releases-p199-975-billion-for-dswd-social-amelioration-program.

to be the more disproportionately adversely affected by lockdown measures – is thus needed for any future similar eventualities.

This article is an attempt to do the following: first, to quantify the number of 'highly vulnerable' households due to the pandemic and lockdown, and who are likely to need financial assistance, whether from the government (national or local), the private sector, or civic organizations; second, to estimate the amount of money that will be needed to address this vulnerability; and third, to propose a methodology for operationalizing the targeting of 'highly vulnerable' households.[3]

2. Data

For the analysis, we use the various nationally-representative household surveys of the Philippine Statistics Authority (PSA), especially the Labor Force Surveys (LFS), both pre-pandemic and during the pandemic. The LFS, which is considered to be representative up to the regional level, is conducted quarterly in the Philippines in the months of January, April, July, and October, and is the official source of official employment statistics in the country.[4]

The timing of the conduct of the LFS, which was continued through the various community quarantines, means that employment data was collected during the period of strict lockdown in April 2020. By comparing employment data before the pandemic (January 2020 and prior) and during the ECQ and even post-ECQ, it is possible to identify types of 'vulnerable' employment or those that were more likely to be lost due to the ECQ and the pandemic in general.

For the subsequent analysis, we use mainly the April 2019, July 2019, January 2020, April 2020, and July 2020 LFS. In Table 1, we present some summary information on these various LFS.

As supplementary source of information, we also use the merged LFS and Family Income and Expenditure Survey (FIES) of 2015-2016 to obtain information that is used to categorize households and workers by income group.

[3] We acknowledge that the observed effects on employment are a result of a combination of the lockdown measures, the rather voluntary social distancing measures undertaken by individual members of households and the mitigating effects of other government responses, such as wage subsidies and other support to businesses. However, as will be apparent later on, the lockdown measures at their height took a predominant role in explaining the adverse effects on employment.

[4] Beginning February 2021, in order to monitor the impact of the pandemic on employment, the PSA is also conducting a monthly LFS in the months when there is no quarterly LFS. The sample size is smaller, however, and is mainly to generate national-level estimates. See https://psa.gov.ph/content/psa-approves-conduct-2021-updating-list-establishments-ule-0

TABLE 1. Sample statistics

	Apr-19	Jul-19	Jan-20	Apr-20	Jul-20
Total no. of households	40,310	39,371	41,351	41,558	41,839
Total no. of individuals	172,284	175,438	178,140	176,469	176,355
Total no. of employed individuals	68,274	69,545	71,073	56,830	68,853
Total no. individuals in paid employment*	63,672	64,724	66,243	52,553	62,938
Average no. in paid employment per household	1.6	1.6	1.6	1.3	1.5

*Paid employment excludes unpaid family workers.
Sources of data: Authors' notes.

3. Defining 'highly vulnerable' households

The vulnerability we are considering is the vulnerability of certain households to hunger and poverty, stemming from their inability to earn income due to restrictions on activity from the ECQ (and stemming from the pandemic more broadly) and the characteristics of their members' jobs.

Although all households share in the difficulties that come with strict lockdowns, some households are much more vulnerable than others. Here we define a 'highly vulnerable' household in a very specific way. A 'highly vulnerable' household is one which (1) belongs to a low-income group, where low-income is defined in terms of a household total or per capita income threshold, and (2) does not have or is not likely to have (in the case of a forward-looking identification) at least one member in paid employment during a strict lockdown. A household member is in paid employment if he or she is in any of the following types of employment: paid job in government or the private sector (including private households and family-owned business); self-employment either as an employer or an own-account worker; and overseas employment.

The reason for considering households instead of individuals in the giving of assistance is that a household can have multiple employed members. Although the loss of job by any one member increases the hardship of a household, having at least one other member with a paid job provides some insulation from distress. The reason for considering only low-income households in terms of per capita income is two-fold: first these households are likely to have little if any savings to tide them over during a lockdown; and second, the combination of limited fiscal space, especially with reduced tax intake during the pandemic, and uncertainty about the length of the lockdown and the economic malaise that accompanies a lockdown, suggests household targeting is necessary.

Figures 1a and 1b show the estimated number and the estimated share of households with no member in paid employment from April 2019 to July 2020, as calculated from the various LFS in the period. The first thing to note is that even in regular times, or before the pandemic, a subset of households numbering about two million nationally or about nine percent of all households, already reported not having any member in paid employment, as can be seen from the black bar up to January 2020. Most of these are households reliant on pensions, domestic or foreign transfers from non-household members, as well as investment dividends.

But during the ECQ, this number jumped to five million households or 21 percent of all households, or an increase of about three million households (or 150 percent). By July 2020, when the lockdowns were eased, the number of households with no member in paid employment declined to 2.6 million, which was still 22 percent higher compared to the pre-pandemic level of 2.1 million (January 2020). This does not even take into account the decline in the quality of employment post pandemic, as evidenced, for instance, by the rise in underemployment rate from 14.8 percent in January 2020 to 18.9 percent in April 2020, and at 17.3 percent in July 2020.

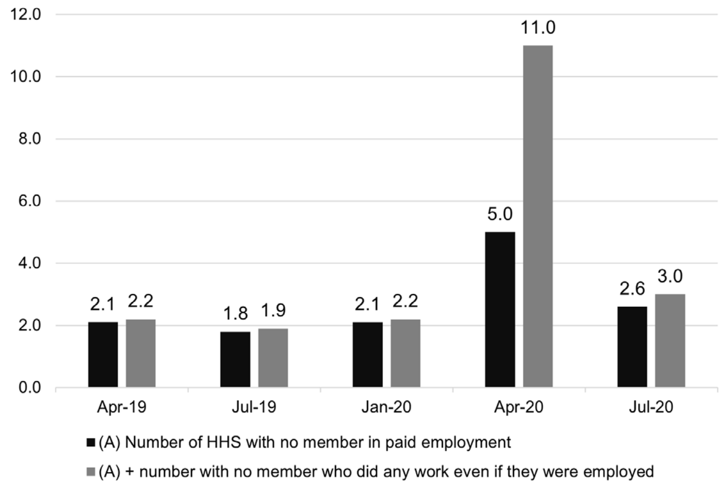
Moreover, if one also considers among those with no paid employment, those who reported not being able to do any work during the ECQ even if they reported having a job, the number of households with no member in paid employment shoots up to 11 million (450 percent higher than pre-pandemic level).[5] Of course, some of these workers, especially those in regular and white collar jobs, might have received salaries even if they did not do any work during the period, and so the 11 million is likely an overestimate of households with no paid employment.

Figures 1a and 1b identify 'highly vulnerable' households after the fact, or after the ECQ has been imposed and workers have already lost their jobs. In practice, this poses difficulties as this requires conducting data collection via household enumeration during an ECQ, when data collection is difficult to do because of social distancing and limits on transportation. This will likely mean a delay in the identification of the 'highly vulnerable' households and a delay in the distribution of much-needed aid.

An alternative is to have a forward-looking system of identifying 'highly vulnerable' households by tagging those households whose employed members are in paying jobs with a high chance of being lost during a hard lockdown. We show how this could be done in the next section.

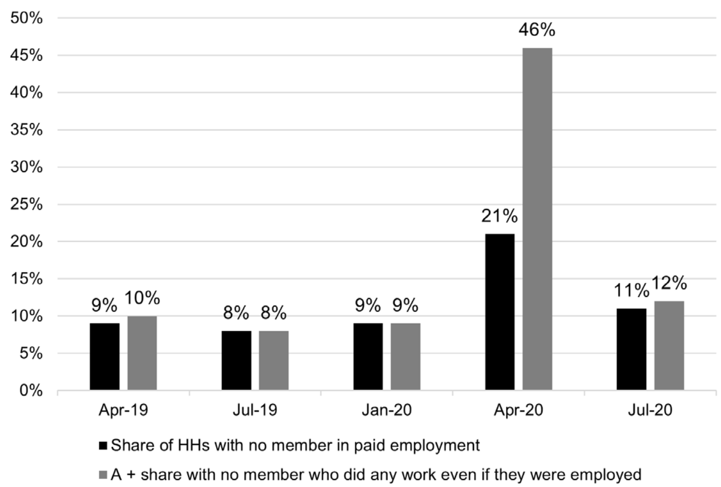
[5] This is the grey bar in Figure 1.

FIGURE 1a. Number of households with no member in paid employment (in millions)



Source: Authors' computations based on LFS.

FIGURE 1b. Share of households with no member in paid employment



Source: Authors' computations based on LFS.

4. Identifying vulnerable employment

While the job losses during the ECQ cut across different classes of workers, economic sectors, and occupations, some groups were more heavily affected than others. Here, we identify the characteristics of paid employment that were more likely to be lost during the ECQ.[6]

4.1. Class of worker

We first look at the levels of paid employment by class of worker for the periods April 2019, January 2020, and April 2020. The January 2020 LFS is the last one before the pandemic and the lockdown. The April 2019 LFS figures are included to allow for year-on-year comparison.

Table 2a shows the largest decline in paid employment from January 2020 to April 2020 was among employers (-39 percent) and *employees in private establishments* (-26 percent).[7] Among the self-employed, it is notable that the decline varies widely between the *self-employed in the agriculture sector* (basically unchanged) and the *self-employed in the non-agriculture sector* (-21 percent).

In terms of the contribution to total loss in paid employment, by far the biggest shares are by *employees in private establishments* (69 percent of total loss) and the *self-employed in the non-agriculture sector* (17 percent).

Because a subgroup may have a big contribution to total job loss simply because it is a big subgroup, we also compute what we labeled the job loss index (JLI). The JLI is simply the ratio of the *contribution to total decline in paid employment during the lockdown to the share to total paid employment pre-lockdown*. A JLI greater than one for a subgroup means the subgroup experienced a disproportionately large loss in paid employment during the lockdown. A JLI less than one means the subgroup experienced a disproportionately small loss in paid employment during the lockdown. And a JLI equal to one means the subgroup experienced a loss in paid employment that is proportional to its size. The two subgroups with the highest JLIs are *employers* (1.9) and *employees in private establishments* (1.3).

[6] Some of the changes from quarter to quarter could of course be expected to be frictional, as some workers shift jobs even without a pandemic or lockdown. The study is not able to distinguish these frictional changes from the changes due to the pandemic or lockdown. But based on historical data, this could be expected to be a small fraction of the changes that occurred in the pre- to post-lockdown period.

[7] A year-on-year comparison can take into account possible seasonality in the pattern of paid employment. There are two disadvantages, however, (1) it is not able to take into account possible structural changes that may have occurred between April 2019 and April 2020, and (2) the weights in the April 2019 LFS were based on population projections from the 2010 Population Census, whereas the weights in the April 2020 LFS were based on the 2015 Population Census, which complicates direct comparisons of the magnitudes between the two surveys. Note, however, that the results will be almost identical if comparisons were made between the April 2019 and April 2020 LFS as shown in Annex Tables 2a to 2d. The main differences are that in the year-on-year comparisons, *financial and insurance activities and real estate activities* do not anymore fall among the highly vulnerable employment sectors, and *clerical support workers*, *service and sales workers*, and *elementary occupations*, would not be classified among the highly vulnerable occupations, which are replaced by *technicians and associates*.

We identify subgroups with JLI greater than one, regardless of the contribution to total decline in paid employment as among those in vulnerable employment. But we also include subgroups with only a proportional share in paid job loss (JLI equal to 1) but which contribute substantially to total paid job loss (arbitrarily set to be at least ten percent). Using these criteria, the subgroups based on class of worker that can be considered vulnerable employment are these three subgroups: employees in private establishments; the self-employed in non-agriculture; and employers.

TABLE 2a. Paid jobs and paid jobs lost during the ECQ by class of worker (in millions)

Class of worker	Apr-19	Jan-20	Apr-20	% change from January 2020 to April 2020	(A) Contribution to total decline in paid employment (January 2020 to April 2020)	(B) Share in total employ-ment in January 2020	Job loss index: (A)/(B)
Employee in private household	1.8	1.9	1.6	-16%	4%	5%	0.8
Employee in private establishment	21.0	21.9	16.2	-26%	69%	55%	1.3
Employee in government/ government corporation	3.9	3.9	3.5	-10%	5%	10%	0.5
Self-employed in non-agriculture sector	7.2	6.7	5.2	-21%	17%	17%	1.0
Self-employed in agriculture sector	4.5	4.5	4.5	0%	0%	11%	0.0
Employer	1.1	1.0	0.6	-39%	5%	3%	1.9
With pay worker in family-owned business	0.11	0.12	0.10	-16%	0.2%	0.3%	0.8
Total	39.56	39.89	31.70	-21%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

4.2. Sector of employment

Meanwhile, by sector of employment, large employment declines were observed in *Arts* (-50 percent), *Accommodation and food service* (-37 percent), *Electricity, gas, steam, and air conditioning supply* (-36 percent), *Construction* (-30 percent), *Financial and insurance activities* (-30 percent), *Information and communication* (-27 percent), *Manufacturing* (-25 percent), *Transportation and storage* (-24 percent), *Wholesale and retail trade* (-24 percent), and *Real estate activities* (-22 percent), as shown in Table 2b. Note that most of these sectors entail work that either are difficult to do from home, such as *Transportation*, *Construction*, *Retail trade*, *Manufacturing*, and *Arts*, or are highly sensitive to the general level of economic activity, which is also highly affected by a lockdown, such as *Electricity*, *Financial activities*, and *Real Estate*.

In terms of the contribution to total loss in paid employment, the biggest shares are by *Wholesale and retail trade* (22 percent of total loss), *Construction* (15 percent), *Manufacturing* (11 percent), and *Transportation* (10 percent), and even *Agriculture* (10 percent).

The sectors that have JLI greater than one, ordered in terms of decreasing contribution to total paid job loss are the following: *Wholesale and retail trade*, *Construction*; *Manufacturing*; *Transportation and storage*; *Accommodation and food services*; *Financial activities*; *Arts*; *Electricity*; *Information*; and *Real estate*. In the absence of any other sector that has a contribution to paid job loss which is at least 10 percent and a JLI equal to one, these are the same subgroups that are considered vulnerable sectors of employment.

TABLE 2b. Paid jobs and paid jobs lost during the ECQ by sector of employment (in millions)

Class of worker	Apr-19	Jan-20	Apr-20	% change from January 2020 to April 2020	(A) Contribution to total decline in paid employment (January 2020 to April 2020)	(B) Share in total employment in January 2020	Job loss index: (A)/(B)
Agriculture, forestry and fishing	7.9	8.2	7.4	-10%	10%	21%	0.5
Mining and quarrying	0.2	0.2	0.2	-17%	0.4%	0.5%	0.8
Manufacturing	3.4	3.5	2.6	-25%	11%	9%	1.2
Electricity, gas, steam and air conditioning supply	0.2	0.2	0.1	-36%	1%	0%	1.7
Construction	4.2	4.0	2.8	-30%	15%	10%	1.5
Wholesale and retail trade, repair of motor vehicles and motorcycles	7.6	7.7	5.8	-24%	22%	19%	1.2

TABLE 2b. Paid jobs and paid jobs lost during the ECQ by sector of employment (continued)

Transportation and storage	3.5	3.4	2.6	-24%	10%	9%	1.2
Accommodation and food service activities	1.8	1.9	1.2	-37%	8%	5%	1.8
Information and communication	0.4	0.4	0.3	-27%	1%	1%	1.3
Financial and insurance activities	0.5	0.6	0.4	-30%	2%	2%	1.4
Real estate activities	0.2	0.2	0.2	-22%	1%	1%	1.1
Professional, scientific and technical activities	0.3	0.3	0.2	-13%	0%	1%	0.6
Administrative and support service activities	1.7	1.7	1.5	-10%	2%	4%	0.5
Public administration and defense, compulsory social security	2.8	2.8	2.5	-11%	4%	7%	0.5
Education	1.2	1.3	1.1	-15%	3%	3%	0.7
Human, health, and social work activities	0.6	0.6	0.5	-18%	1%	1%	0.9
Arts, entertainment and recreation	0.4	0.4	0.2	-50%	2%	1%	2.4
Other activities	2.6	2.7	2.1	-20%	7%	7%	1.0
Total	39.56	39.89	31.70	-21%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

4.3. Occupation

By broad occupational groups, substantial declines were recorded among *Crafts and related workers* (-34 percent), *Service and sales workers* (-25 percent), *Plant and machine operators* (-24 percent), and *Clerical support workers* (-24 percent), as shown in Table 2c.[8] The first three occupational subgroups contain jobs that for the most part are not suitable for work-from-home as they either require the use of equipment at the place of work or need access to the goods they are selling at their place of work. Clerical support workers might have been highly affected because many are employed in short-term contracts or work arrangements and could easily be laid-off if no work is needed or can be done.

[8] We exclude *Armed forces occupations* even if the calculated decline was high because of the very small sample size and the possibility that the observed change is simply due to sampling error. In fact, the estimate of those in *Armed forces occupations* has been volatile based on previous LFS. A priori, there is also no reason why *Armed forces occupations*, which would be mainly if not entirely a government job, would be greatly affected by lockdowns.

In terms of the contribution to total loss in paid employment, the biggest shares are by *Service and sales workers* (24 percent of total loss), *Elementary occupations* (24 percent), *Crafts and related workers* (13 percent), *Plant and machine operators* (10 percent), and *Managers* (10 percent).

The occupational groups that have JLI greater than one, ordered in terms of decreasing contribution to total paid job loss are the following: *Service and sales workers*; *Crafts and related workers*; *Plant and machine operators*; and *Clerical support workers*. Additionally, those in *Elementary Occupations* and *Managers* have contribution to paid job loss which is at least 10 percent and a JLI equal to one. Based on the criteria described above, these six subgroups are considered vulnerable occupation groups.

4.4. Basis of payment

By basis of payment (which applies only to workers who are employees), there was a large decline in paid employment among those *paid per day*, *per hour*, or *per piece* (-27 percent), as shown in Table 2d. The same subgroup also has a disproportionately large contribution to total loss in paid employment (56 percent), and is the only subgroup with JLI greater than one. This means that based on basis of payment, the subgroup paid *per day*, *per hour*, or *per piece* is considered vulnerable employment based on occupation.

To summarize, vulnerable employment is characterized by the following: by class of worker, those who are employees in private establishments, those who are employees in the non-agricultural sector, and those who are employers; by sector of employment, those who are in *Wholesale and retail trade*, *Construction*, *Manufacturing*; *Transportation and storage*, *Accommodation and food services*, *Financial activities*, *Arts*, *Electricity*, *Information*, and *Real estate*; by occupation, those who work as *Service and sales workers*, *Crafts and related workers*, *Plant and machine operators*, *Clerical support workers*, those in *Elementary Occupations*, or *Managers*; and by basis of payment for those who are employees, those who are *paid per day*, *per hour*, or *per piece*.[9]

Operationally, we employ the following definition for vulnerable employment:

- Those who are private sector employees, self-employed in non-agriculture, or employers, who are in one of the vulnerable sectors or in one of the vulnerable occupations identified using the JLI; and
- Those who are *paid per day*, *per hour*, or *per piece*, regardless of sector of employment or occupation.

[9] Though we analyzed the characteristics of paid employment only at the national level, the same methodology can also be applied at different levels of disaggregation, including at the regional level. It is possible that the characteristics of vulnerable employment will differ somewhat across regions. We do not show the regional differences here because the tables will be too numerous, but to illustrate this point, Annex Table 2d shows the sectors identified as having vulnerable employment, applying the same methodology used above, when the data is disaggregated by island groupings (with Luzon divided into 2): NCR; Other Luzon; Visayas; and Mindanao. Note that there are some differences in the identified sectors across island groups.

TABLE 2c. Paid jobs and paid jobs lost during the ECQ by occupation

Class of worker	Apr-19	Jan-20	Apr-20	% change from January 2020 to April 2020	(A) Contribution to total decline in paid employment (January 2020 to April 2020)	(B) Share in total employment in January 2020	Job loss index: (A)/(B)
Managers	4.6	4.0	3.1	-21%	10%	10%	1.0
Professionals	2.3	2.5	2.0	-20%	6%	6%	1.0
Technicians and associate professionals	1.8	1.6	1.3	-18%	3%	4%	0.9
Clerical support workers	2.5	2.8	2.2	-24%	8%	7%	1.1
Service and sales workers	7.3	7.8	5.9	-25%	24%	20%	1.2
Skilled agricultural, forestry and fishery workers	5.0	4.9	4.8	-2%	1%	12%	0.1
Craft and related trades workers	3.4	3.2	2.1	-34%	13%	8%	1.6
Plant and machine operators and assemblers	3.4	3.4	2.6	-24%	10%	9%	1.2
Elementary occupations	9.2	9.6	7.6	-20%	24%	24%	1.0
Armed forces occupations	0.09	0.102	0.073	-28%	0.4%	0.3%	1.4
Total	39.56	39.89	31.70	-21%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

TABLE 2d. Paid jobs and paid jobs lost during the ECQ by basis of payment

Basis of employment	Apr-19	Jan-20	Apr-20	% change from January 2020 to April 2020	(A) Contribution to total decline in paid employment (January 2020 to April 2020)	(B) Share in total employment in January 2020	Job loss index: (A)/(B)
Monthly	10.5	10.7	8.6	-20%	33%	39%	0.9
Per day, per hour, per piece	12.3	13.0	9.5	-27%	56%	47%	1.2
Other (in kind, commission, other)	3.9	4.0	3.3	-18%	11%	14%	0.8
Total	26.75	27.76	21.37	-23%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

For purposes of succeeding discussions, we define ‘vulnerable households’ as households where all the paid employed members are in vulnerable employment due to the pandemic and lockdown measures, as characterized above. The ‘highly vulnerable’ households, meanwhile, are low-income ‘vulnerable households’. In the next section we estimate the number of vulnerable households and ‘highly vulnerable’ households and estimate how much it will cost per month of ECQ to support them.

There have been other attempts in the past to define ‘highly vulnerable’ households. Our definition differs from these previous definitions in its specific focus on the impact of the pandemic and lockdowns on their vulnerability. Albert and Vizmanos [2018], for example, defines a vulnerability to poverty index which is constructed using the merged 2015 LFS-FIES, taking into account household characteristics, particularly those that are relevant to identifying poor households, demographic and regional characteristics, exposure to severe price and weather (storm) shocks. Accordingly, their vulnerability index places workers in the agricultural and fishery sector, namely, fishermen and farmers as belonging to highly vulnerable sectors; while urban dwellers, whose nature of employment and thus livelihoods are less susceptible to the usual adverse supply shocks, are less vulnerable to falling into poverty than rural workers. In this pandemic, however, the reverse is true: the agriculture, forestry and fishery sector belong to what are regarded as low-risk sectors, which are sectors considered essential and not as sensitive to social distancing measures; while urban workers were more affected due to the stricter lockdown measures implemented in more densely populated areas [ILO 2020].

5. Estimate of ‘highly vulnerable’ households and budget needed to support them during ECQ

Applying the operational definition of vulnerable employment to the January 2020 LFS, we estimate the number of ‘highly vulnerable’ households based on different per capita income thresholds. The January 2020 LFS itself, however, does not contain household income information. To estimate the share of vulnerable households belonging to different income thresholds, we use instead the merged 2015-2016 LFS-FIES data and simply assume that the per capita income threshold shares of vulnerable households that were obtained for that dataset are still applicable to the January 2020 LFS.[10]

Table 3 contains the estimated number of ‘highly vulnerable’ households using different per capita income thresholds by region.[11] Based on a threshold equal to

[10] At the time of writing this report, the PSA’s merged 2018-2019 FIES-LFS microdata was not yet available.

[11] The thresholds that were chosen were illustrative. Other possible per capita income thresholds that can be used are the regional or even provincial total (or food) poverty lines generated by the PSA. Based on the 2018 poverty statistics issued by the PSA, 12 percent of households in the country were poor. This would appear to be very low thresholds, however, as even many normally non-poor households, when subjected to sudden unemployment of members due to the ECQ, could very easily fall into poverty. Based on the 2018, for example, even a household in the sixth decile is only able to save (total income minus total expenditure) ₱37,000, on average, which is only about one-and-a-half times the annual national per capita poverty threshold, whereas the average family size at that decile is 4.3.

the 50th percentile of per capita income determined at the national level, 'highly vulnerable' households total about 7.4 million nationally, equivalent to about 38 percent of all households in the country, of which about half a million are in NCR, and 3.7 million are in Luzon. Based on a threshold equal to the 60th percentile of per capita income, 'highly vulnerable' households total about 8.9 million nationally, equivalent to about 45 percent of all households in the country, of which close to 800 thousand are in NCR, and 4.8 million are in Luzon. Finally, based on a threshold equal to the 75th percentile of per capita income, 'highly vulnerable' households total about 11.3 million nationally, equivalent to about 56 percent of all households in the country, of which 1.4 million are in NCR, and 6.6 million are in Luzon.

Using the estimated number of 'highly vulnerable' households in Table 3, we compute for the total budget needed to support 'highly vulnerable' households per month of ECQ. Assuming a budget of ₱5,000 per 'highly vulnerable' household per month, and using the 50th percentile threshold, the estimated budget needed is ₱36.7 billion for the entire country, ₱2.5 billion for Metro Manila alone, and ₱18.4 billion for the whole of Luzon. Using the 60th percentile threshold, the estimated budget needed is ₱44.7 billion for the entire country, ₱3.9 billion for Metro Manila alone, and ₱23.8 billion for the whole of Luzon. And using the 75th percentile threshold, the estimated budget needed is ₱56.5 billion for the entire country, ₱6.9 billion for Metro Manila alone, and ₱32.8 billion for the whole of Luzon. An increase in the amount of aid per household, say from ₱5,000 to ₱6,000 will simply increase the estimated costs proportionately.

TABLE 3. Estimated number of 'highly vulnerable' households (in thousands)

Region	Number of Vulnerable HHs (VHs)	Estimated number of VHs belonging to poorest		
		50% of HHs in terms of per capita income	60% of HHs in terms of per capita income	75% of HHs in terms of per capita income
NCR	2,429	495	786	1,384
CAR	182	94	114	141
Region 1	628	358	437	541
Region 2	395	239	287	351
Region 3	1,932	789	1,058	1,465
CALABARZON	2,458	935	1,230	1,731
MIMAROPA	359	245	278	322
Region 5	662	514	567	615
Region 6	983	637	727	867
Region 7	958	597	687	804
Region 8	505	393	430	469
Region 9	395	304	333	369
Region 10	613	423	479	544

TABLE 3. Estimated number of 'highly vulnerable' households (continued)

Region 11	777	455	543	643
Region 12	618	467	519	578
ARMM	240	230	235	239
CARAGA	269	204	222	246
Philippines	14,403	7,379	8,932	11,308

Sources of data: Authors' computations using January 2020 LFS and applying shares based on income thresholds from merged 2015-2016 LFS-FIES.

TABLE 4. Estimated cost of providing ₱5,000 cash aid to 'highly vulnerable' households (in ₱ millions)

	VHs belonging to poorest		
Region	50% of HHs in terms of per capita income	60% of HHs in terms of per capita income	75% of HHs in terms of per capita income
NCR	2,476	3,930	6,920
CAR	470	569	707
Region 1	1,790	2,186	2,704
Region 2	1,196	1,437	1,755
Region 3	3,945	5,292	7,326
CALABARZON	4,677	6,149	8,656
MIMAROPA	1,227	1,391	1,609
Region 5	2,570	2,833	3,074
Region 6	3,183	3,637	4,333
Region 7	2,984	3,436	4,020
Region 8	1,964	2,148	2,343
Regionn 9	1,518	1,666	1,846
Region 10	2,113	2,395	2,718
Region 11	2,275	2,715	3,214
Region 12	2,337	2,595	2,889
ARMM	1,151	1,176	1,194
CARAGA	1,021	1,108	1,230
Philippines	36,895	44,662	56,539

Sources of data: Authors' computations using the PSA's various labor force surveys.

Some refinements are possible. For example, how much a household receives could be made dependent on the size of the household, either a fixed amount per household member, or, alternatively, a fixed amount plus an amount dependent on the size of the household. The amount that is provided to a household can also be set to be equal to the amount that is needed to move them out of either the food poverty line or the total poverty line. Because the food and total poverty lines vary across provinces and regions, which is meant to take into account differences in standards of living across provinces and regions, this means that 'highly vulnerable' households in different places could receive different amounts even if they are of the same household size. For instance, Table 5 shows the estimated cost of providing cash aid equivalent to the monthly poverty threshold per individual in 'highly vulnerable' households.[12] The total costs are approximately double the estimated amounts needed to provide each 'highly vulnerable' household ₱5,000. Of course, under this set-up, households receive different amounts depending on their household size and the region where they live.

Note that the estimated budget needed to address the needs of the 'highly vulnerable' households can be expected to rise the longer the lockdown period is put in place, as more households become 'highly vulnerable' due to depleted savings or the loss of jobs from an extended economic downturn, both local and global, or even a spike in the cost of goods, which will raise the poverty line.

TABLE 5. Estimated cost of providing cash aid equivalent to monthly regional poverty threshold to each individual in 'highly vulnerable' households (in ₱ millions)

	VHs belonging to poorest		
Region	**50% of HHs in terms of per capita income**	**60% of HHs in terms of per capita income**	**75% of HHs in terms of per capita income**
NCR	5,349	8,488	14,945
CAR	720	871	1,083
Region 1	3,864	4,719	5,839
Region 2	2,138	2,569	3,137
Region 3	8,150	10,933	15,136
CALABARZON	10,363	13,625	19,182
MIMAROPA	2,141	2,427	2,807
Region 5	5,157	5,686	6,168
Region 6	5,890	6,731	8,018
Region 7	5,869	6,758	7,906
Region 8	3,817	4,175	4,553
Region 9	2,948	3,236	3,587
Region 10	3,835	4,347	4,934
Region 11	4,325	5,160	6,109
Region 12	4,263	4,734	5,270
ARMM	2,766	2,826	2,871
CARAGA	2,116	2,296	2,548
Philippines	73,709	89,581	114,094

Sources of data: Authors' computations using the PSA's various labor force surveys.

[12] See Annex Table 1 for the regional monthly poverty thresholds used. These were computed as the PSA's monthly poverty threshold in 2018 adjusted for the estimated inflation.

In Table 6, we compare the actual number of households given the first tranche of SAP and the total amount of the first-tranche aid that was disbursed to the total identified 'highly vulnerable households' in this paper and the estimated cash aid they will require per month, which were taken from Tables 4 and 5. This paper's 'highly vulnerable households' was equivalent to only 65 percent of the actual households that received cash aid from the SAP. The rate varies by region. In NCR, Region 3, and CALABARZON, where the lockdowns were longest, the estimated number of highly vulnerable households was equivalent to about 80 percent of those who actually received cash aid. In the other regions, the shares were between 50 percent and 60 percent. This suggests that the more prevalent targeting issue during the SAP distribution was likely leakage rather than under coverage, and that leakage was more extensive in regions where the lockdowns were less strict. The total estimated cost of providing each member of highly vulnerable households an amount equal to the regional poverty line was 116 percent of what was actually disbursed. In most regions, the share exceeded 100 percent. For these regions, what it implies, especially given the finding of possible leakage, is that households did not receive an amount sufficient to raise them above the poverty line assuming they had no other source of income during the lockdown period.[13]

6. Operationalization

The data we used in the previous sections are the FIES of the PSA, which are anonymized, apart from being just sample-based, and so cannot be used to identify which actual households are 'highly vulnerable'.

Instead, what can be used is the *Listahanan* 3 (or future *Listahanans*) of the DSWD's National Household Targeting System for Poverty Reduction (NHTS-PR), which collects information on 16.1 million households in the country on variables similar to those in the LFS and the FIES. *Listahanan* 3 has greater coverage and enables a more flexible definition of the poverty threshold than its earlier versions. The *Listahanans* 1 and 2, as well as the then still-yet-to-be completed *Listahanan* 3 were used by DSWD to identify 6.7 million households that were eligible to receive cash transfers under the *Bayanihan Law*.[14] But for the rest, the government had to rely on local government units (LGUs) for identification, which caused most of the delay as most LGUs undertook a new wave of data collection.

[13] At the moment there is no available data to test whether those that actually received cash aid from the SAP would also be the highly vulnerable households as identified by our methodology.

[14] The DSWD identified the following poor and vulnerable households and individuals: (i) 4.3 million households included in the 4Ps, using *Listahan* 1, 2, 3 (yet incomplete); (ii) 2.2 million poor households not included under the 4Ps, using *Listahanan* 1 and 2; (iii) 2.9 million indigent senior citizens, using information from local government unites and local DSWD offices; and (iv) 7.7 million informal workers and daily wage earners from DSWD estimates. See the Social Amelioration Program Guidelines as of April 13, 2020. Retrieved from: https://www.adb.org/sites/default/files/linked-documents/43407-017-sd-05.pdf

TABLE 6. Comparison of actual SAP disbursement with estimated needed to target highly vulnerable HHs

	Actual from DSWD		Based on suggested methodology in this paper					
					Estimated cost (in ₱ millions)			
Region	Actual Number of HHs given SAP (in millions)	Actual SAP Disbursements (1st tranche) (in ₱ millions)	Number of Vulnerable HHs belonging to poorest 75% in terms of per capita income (in millions)	As % of actual HHs given SAP	₱5k per HH	As % of actual SAP disbursements	Total cash aid equivalent to monthly regional poverty threshold per HH member	As % of actual SAP disbursements
NCR	1.777	13,917	1.384	78%	6,920	50%	14,945	107%
CAR	0.249	1,288	0.141	57%	707	55%	1,083	84%
Region 1	0.982	5,071	0.541	55%	2,704	53%	5,839	115%
Region 2	0.676	3,570	0.351	52%	1,755	49%	3,137	88%
Region 3	1.795	11,269	1.465	82%	7,326	65%	15,136	134%
CALABARZON	2.236	14,112	1.731	77%	8,656	61%	19,182	136%
MIMAROPA	0.589	2,684	0.322	55%	1,609	60%	2,807	105%
Region 5	1.138	5,196	0.615	54%	3,074	59%	6,168	119%
Region 6	1.454	8,289	0.867	60%	4,333	52%	8,018	97%
Region 7	1.312	7,486	0.804	61%	4,020	54%	7,906	106%
Region 8	0.830	3,774	0.469	56%	2,343	62%	4,553	121%
Regionn 9	0.711	3,136	0.369	52%	1,846	59%	3,587	114%
Region 10	0.892	4,992	0.544	61%	2,718	54%	4,934	99%
Region 11	0.950	5,345	0.643	68%	3,214	60%	6,109	114%
Region 12	0.911	4,221	0.578	63%	2,889	68%	5,270	125%
ARMM	0.474	1,975	0.239	50%	1,194	60%	2,871	145%
CARAGA	0.479	2,142	0.246	51%	1,230	57%	2,548	119%
Philippines	17.457	98,465	11.308	65%	56,539	57%	114,094	116%

Sources of data : DSWD (https://public.tableau.com/views/SAPMonitoringDashboardforEmergencySubsidyunderAICS/Dashboard1?:display_count=no&:showVizHome=no)

The *Listahanan* 3 likely already includes most of the poor households in the country, owing to its wide coverage. This database should suffice, or if not, should be enhanced to identify the ‘highly vulnerable’ households as defined above or even using a modified or refined definition during lockdowns, not just in the current pandemic but in possible future ones. This would mean, among others, collecting the necessary employment information from the household members.

As was done to some extent, the DSWD should also first identify who among the current 4Ps beneficiaries, already known to be poor, are also part of the ‘highly vulnerable’ population as defined above and supplement their regular benefits with a top-off that is in accordance with the amount determined by government that these households should get.[15] Doing so will reduce the possibility of ‘leakage’ or ‘inclusion error’, or of identifying those not (or not yet) ‘highly vulnerable’ as among the ‘highly vulnerable’, which can happen if there is too much leeway in identifying the beneficiaries. This is in line with what the Indonesian government did when it increased the annual payout per beneficiary of the *Program Keluarga Harapan* (conditional cash transfer program) by 25 percent, and shifted from quarterly to monthly disbursements [Theis et al. 2020].

7. Concluding remarks

In this paper, we define “highly vulnerable” households as those unlikely to have income during strict lockdown periods because of the employment characteristics of their employed members and which likely have little or no savings to tide them over during the lockdown.

Using the merged 2015 FIES and 2016 LFS, we show that the employed members of these ‘highly vulnerable’ households are likely to be private sector employees, self-employed in non-agriculture, or employers, who are also in one of the vulnerable sectors or in one of the vulnerable occupations, which were identified using a job loss index (defined as the ratio of the contribution to total decline in paid employment during the lockdown to the share to total paid employment pre-lockdown) derived using the January-April 2020 LFS; plus, those who are *paid per day*, *per hour*, or *per piece*, regardless of sector of employment or occupation.

Depending on the pre-lockdown income threshold eligibility used, we estimate the number of ‘highly vulnerable’ households to be between 7.4 million and 11.3 million. At ₱5,000 per ‘highly vulnerable’ household, the estimated costs amount to ₱36.9 billion to ₱56.5 billion, again depending on the income threshold used. The estimated cost doubles or increases thereabouts if per capita aid equivalent to the poverty threshold in the region of residence of the ‘highly vulnerable’ household were instead to be given.

[15] We thank Dr. Joseph Capuno of the UP School of Economics for this suggestion.

Finally, the employment characteristics that were identified to determine "highly vulnerable" households are not meant to be exhaustive, but merely directive – to give policymakers a sense of the factors that should be considered in determining households with sources of livelihood which are highly sensitive to lockdown measures. Moreover, this does not mean that government aid should be given exclusively to these households given the pandemic's sweeping effects on the economy, but that identification and allocation of aid towards 'highly vulnerable' households should be prioritized given that these households are already disadvantaged to begin with and are disproportionately affected by the lockdown, and thus more susceptible to hunger.

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Annex

ANNEX TABLE 1. Estimated monthly poverty threshold

Region	Estimated monthly poverty threshold, 2021
NCR	2,701
CAR	2,342
Region 1	2,540
Region 2	2,357
Region 3	2,522
CALABARZON	2,622
MIMAROPA	2,187
Region 5	2,298
Region 6	2,305
Region 7	2,419
Region 8	2,352
Region 9	2,410
Region 10	2,335
Region 11	2,440
Region 12	2,354
ARMM	2,595
CARAGA	2,386
Philippines	2,424

Author's computations based on PSA's 2018 regional poverty lines adjusted for estimated inflation.

ANNEX TABLE 2a. Paid jobs and paid jobs lost during the ECQ by class of worker (in millions)

Class of worker	Apr-19	Jan-20	Apr-20	% change from April 2019 to April 2020	(A) Contribution to total decline in paid employment (April 2019 to April 2020)	(B) Share in total employment in April 2019	Job loss index: (A)/(B)
Employee in private household	1.8	1.9	1.6	-14%	3%	5%	0.7
Employee in private establishment	21.0	21.9	16.2	-23%	61%	53%	1.1
Employee in government/ government corporation	3.9	3.9	3.5	-9%	5%	10%	0.5
Self employed in non-agriculture sector	7.2	6.7	5.2	-27%	25%	18%	1.4
Self employed in agriculture sector	4.5	4.5	4.5	0%	0%	11%	0.0
Employer	1.1	1.0	0.6	-46%	7%	3%	2.3
With pay worker in family-owned business	0.11	0.12	0.10	-6%	0.1%	0.3%	0.3
Total	39.56	39.89	31.70	-20%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

ANNEX TABLE 2b. Paid jobs and paid jobs lost during the ECQ by sector of employment (in millions)

Class of worker	Apr-19	Jan-20	Apr-20	% change from April 2019 to April 2020	(A) Contribution to total decline in paid employment (April 2019 to April 2020)	(B) Share in total employment in April 2019	Job loss index: (A)/(B)
Agriculture, forestry and fishing	7.9	8.2	7.4	-7%	7%	20%	0.4
Mining and quarrying	0.2	0.2	0.2	-8%	0.2%	0.4%	0.4
Manufacturing	3.4	3.5	2.6	-23%	10%	9%	1.2
Electricity, gas, steam and air conditioning supply	0.2	0.2	0.1	-38%	1%	0%	2.0
Construction	4.2	4.0	2.8	-34%	18%	11%	1.8
Wholesale and retail trade, repair of motor vehicles and motorcycles	7.6	7.7	5.8	-23%	23%	19%	1.2
Transportation and storage	3.5	3.4	2.6	-27%	12%	9%	1.4
Accommodation and food service activities	1.8	1.9	1.2	-33%	8%	4%	1.6
Information and communication	0.4	0.4	0.3	-39%	2%	1%	2.4
Financial and insurance activities	0.5	0.6	0.4	-19%	1.3%	1.4%	0.9
Real estate activities	0.2	0.2	0.2	-12%	0.3%	0.5%	0.5
Professional, scientific and technical activities	0.3	0.3	0.2	-19%	1%	1%	1.0
Administrative and support service activities	1.7	1.7	1.5	-12%	3%	4%	0.6
Public administration and defense, compulsory social security	2.8	2.8	2.5	-12%	4%	7%	0.6
Education	1.2	1.3	1.1	-2%	0%	3%	0.1

ANNEX TABLE 2b. Paid jobs and paid jobs lost during the ECQ by sector of employment (in millions) (continued)

Human, health, and social work activities	0.6	0.6	0.5	-18%	1%	1%	0.9
Arts, entertainment and recreation	0.4	0.4	0.2	-54%	3%	1%	3.0
Other activities	2.6	2.7	2.1	-16%	5%	6%	0.8
Total	39.56	39.89	31.70	-20%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

ANNEX TABLE 2c. Paid jobs and paid jobs lost during the ECQ by occupation (in millions)

Class of worker	Apr-19	Jan-20	Apr-20	% change from April 2019 to April 2020	(A) Contribution to total decline in paid employment (April 2019 to April 2020)	(B) Share in total employment in April 2019	Job loss index: (A)/(B)
Managers	4.6	4.0	3.1	-32%	19%	12%	1.9
Professionals	2.3	2.5	2.0	-13%	4%	6%	0.6
Technicians and associate professionals	1.8	1.6	1.3	-25%	6%	4%	1.4
Clerical support workers	2.5	2.8	2.2	-15%	5%	6%	0.7
Service and sales workers	7.3	7.8	5.9	-20%	18%	18%	0.9
Skilled agricultural, forestry and fishery workers	5.0	4.9	4.8	-5%	3%	13%	0.3
Craft and related trades workers	3.4	3.2	2.1	-36%	16%	9%	1.9
Plant and machine operators and assemblers	3.4	3.4	2.6	-23%	10%	9%	1.2
Elementary occupations	9.2	9.6	7.6	-17%	19%	23%	0.8
Armed forces occupations	0.09	0.102	0.073	-14%	0.1%	0.2%	0.6
Total	39.56	39.89	31.70	-20%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

ANNEX TABLE 2d. Paid jobs and paid jobs lost during the ECQ by basis of payment (in millions)

Basis of payment	Apr-19	Jan-20	Apr-20	% change from April 2019 to April 2020	(A) Contribution to total decline in paid employment (April 2019 to April 2020)	(B) Share in total employment in April 2019	Job loss index: (A)/(B)
Monthly	10.5	10.7	8.6	-18%	36%	39%	0.9
Per day, per hour, per piece	12.3	13.0	9.5	-23%	52%	46%	1.1
Other (in kind, commission, other)	3.9	4.0	3.3	-16%	12%	15%	0.8
Total	26.75	27.76	21.37	-20%	100%	100%	

Sources of data: Authors' computations using the PSA's various labor force surveys.

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COVID-19, job loss, and underemployment: who is affected?

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This paper seeks to examine the short-term adverse effects of the labor market disruptions caused by the COVID-19 pandemic on employment by estimating and comparing the probability of job loss, underemployment, and employment gain in January, April, and July 2020. Using data from the Philippine Labor Force Survey, we find that the workers who were most vulnerable to job loss and underemployment amid the COVID-19 pandemic are male, less educated, and those working in sectors that are either with limited operational capacity or not allowed to open at all. On a positive note, the results also suggest that males and less-educated individuals are more likely to gain employment after being jobless in the previous quarter. A policy recommendation is to establish an institutionalized social insurance program, such as an unemployment insurance facility, to protect a wider range of workers from the negative shocks to the labor market.

JEL classification: J21, J60
Keywords: COVID-19, unemployment, underemployment

1. Introduction

This paper seeks to examine the short-term adverse effects of the labor market disruptions caused by the COVID-19 pandemic on employment. Several governments implemented containment measures to mitigate the spread of the virus, including school and workplace closures, mobility restrictions, travel bans, and suspension of public transportation. While restrictions on movement have eased months after the pandemic broke out,[1] the share of workers living in countries with some form of workplace closure remains high at more than 90 percent as of January 2021 [International Labour Organization (ILO) 2021]. This is because social distancing is still required even in the absence or the easing

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[1] Under the Oxford Coronavirus Government Response Tracker project, Hale et al. [2021] developed a daily index that quantifies the strictness of government policies. This is called the Stringency Index which has a range of 0 (least strict) to 100 (strictest). From a peak average of 79.6 in 184 countries on April 18, 2020, the average Stringency Index stands at only 56.5 as of March 1, 2021.

of lockdown policies—with the contact-intensive jobs being the most likely to be affected by social distancing measures [The ASEAN Secretariat 2020]. Global labor income is estimated to have fallen which could weaken private consumption, exacerbating the contraction in global aggregate demand (ILO [2021]; World Bank [2021]). On top of household income, business income has also been reduced by the economic downturn due to COVID-19 and lockdowns which can lead to the downsizing or closure of affected firms, reduced working hours, and retrenchment of workers [The ASEAN Secretariat 2020]. Finally, the disruptions in the supply chain affected the supply of inputs and led to lower operational capacity of factories which, in turn, can generate negative impact on labor [The ASEAN Secretariat 2020]. The ILO [2021] estimated that global working hours declined by 8.8 percent in 2020 relative to that in the fourth quarter of 2019, which is equivalent to a loss of 255 million full-time jobs.

Estimating the preliminary impact of containment measures and social distancing requirements on employment usually deals with identifying the individuals who can work from home (e.g., Boeri et al. [2020]; Delaporte and Peña [2020]; Dingel and Neiman [2020]; Hatayama et al. [2020]; Mongey et al. [2020]; Saltiel [2020]). These studies mostly find that it is the economically vulnerable groups who are less likely to work in jobs that are amenable to work-from-home arrangements and are more likely to work in high-contact jobs—i.e., the individuals with less education, with lower income even before the pandemic, working in the informal sector, and with little access to social insurance (Delaporte and Peña [2020]; Hatayama et al. [2020]; Mongey et al. [2020]; Saltiel [2020]). From a policy perspective, having the means to examine who are the workers that cannot work from home can be used to target the individuals who need social protection the most [Dingel and Neiman 2020]. However, it should be recognized that the existing estimates suggest that most of the jobs cannot still be completely done at home,[2] and limited access to technology can constrain how much work can be performed at home. Thus, the potential effect of the pandemic on employment prospects identified by these studies may be lower than the actual effect on the labor market.

Some studies are concerned with the effect of the current pandemic and lockdowns on actual labor market flows. Using the Australian Longitudinal Labor Force Survey, Guven et al. [2020] find that the COVID-19 pandemic and national lockdown reduced labor force participation, full-time employment, and weekly

[2] Dingel and Neiman [2020] estimate that only 37 percent of the jobs in the US can be completely performed at home. Boeri et al. [2020] observe that such share ranges from around 24 to 31 percent in Europe. Lower-income countries also appear to have a lower potential to do remote work. In their study of 23 Latin American and Caribbean countries, Delaporte and Peña [2020] estimate that the share of individuals who can work from home ranges from seven percent in Guatemala to 16 percent in Bahamas. Using the World Bank's Skills Toward Employability and Productivity (STEP) survey in ten low- and middle-income countries, Saltiel et al. [2020] find that the share of individuals that can work from home ranges from 5.5 percent in Ghana to 23 percent in China.

working hours, as well as increased unemployment and underemployment. The negative effects on labor force participation and working hours appear to be smaller for workers who have longer tenure, have more education, and are employed in jobs suitable for work-from-home (WFH) arrangements. In contrast, immigrants, those who cannot work from home, and those who have shorter tenure are more likely to be unemployed because of the lockdown. In Italy, Casarico and Lattanzio [2020] observe that the workers who had heavily suffered from the previous recession—the young, temporary, and low-skilled workers—are also the ones who are more likely to lose their jobs due to the current pandemic. Similar implications are obtained by Kikuchi et al. [2021] in Japan in which the negative shocks of the current pandemic are stronger for the pre-pandemic economically disadvantaged groups, particularly the women, the contingent workers, the low-skilled individuals, and those engaged in social and non-flexible jobs.

Although preliminary estimates on the potential of the labor force to perform WFH arrangements were carried out for the Philippines (e.g., Generalao [2020]; Gaduena et al. [2020]), to our knowledge, this is the first paper that attempts to empirically test and determine the characteristics of the individuals who are more vulnerable to job loss and underemployment associated with the COVID-19 pandemic, lockdown policies, and disruptions in labor markets. We ask the following questions: Who are more likely to lose their jobs during the pandemic? Who are more likely to become underemployed? Lastly, who are more likely to gain employment after experiencing unemployment? The Philippines has arguably implemented one of the strictest COVID-19-related containment measures in the world. As of March 22, 2021, only 15 out of 184 countries reached the highest level of Hale et al.'s [2021] COVID-19 Stringency Index. This includes the Philippines which posted a score of 100 for 40 days from March 22, 2020 to April 4, 2020.[3] The enhanced community quarantine (ECQ) was first implemented in Luzon, including the National Capital Region (NCR), in March 17, 2020 amid the increases in COVID-19 cases in the country. In the following weeks, the rest of the Philippines has been placed under a community quarantine of varying degrees depending on the geographic area. In terms of guidelines which have been varying over time, the modified general community quarantine (MGCQ) is the least strict and the ECQ is the strictest level of community quarantine. In the middle of the spectrum are the general community quarantine (GCQ) and the modified enhanced community quarantine (MECQ). The general idea of the quarantine guidelines is that sectors that are deemed essential by the government face looser restrictions to limit the impediments to the flow of basic needs of the people in the middle of a lockdown. On the other hand, the sectors identified as non-essential are imposed with more austere measures to sustain social

[3] The other 14 countries are Argentina (34 days), Cuba (38 days), Dominican Republic (20 days), El Salvador (26 days), Georgia (27 days), Honduras (79 days), India (27 days), Jordan (34 days), Kuwait (21 days), Libya (41 days), Oman (2 days), Serbia (31 days), Sri Lanka (22 days), and Suriname (4 days).

distancing. The COVID-19 pandemic, lockdown measures, and reduced economic activity are linked to the steep increase in the unemployment rate to 17.6 percent and the historically low labor force participation rate at 55.7 percent in April 2020. In the same month, the Philippine Statistics Authority estimated that 88.1 percent of the inactive unemployed[4] cited the ECQ, the lockdown, or the COVID-19 pandemic as the reason for not looking for work.

Nonetheless, even with the easing of the community quarantine in the second half of 2020, economic activity has remained low. By June 2020, most parts of the country had already been transitioned to the less stringent GCQ but, according to the Google Mobility Trends data, the mobility of people was still much muted relative to the period before the pandemic.[5] There was still a large discrepancy between the pre-pandemic average capacity utilization rate for manufacturing and what was observed in the past year. The Purchasing Managers' Index also suggested that contraction in business conditions of the manufacturing, services, retail and wholesale had remained almost throughout 2020.

Using the data from the Labor Force Survey conducted in January, April, and July 2020, we estimate and compare the probability of job loss, underemployment, and gaining employment between the survey round right before the pandemic and the two survey rounds corresponding to the first months of the pandemic. We find that the workers who were most vulnerable to job loss and underemployment amid the COVID-19 pandemic are males, the less educated, and those who had been working in sectors that are either with limited operational capacity or not allowed to open at all. On a positive note, the results also suggest that the males and the less-educated individuals are more likely to gain employment after being jobless in the past quarter.

This paper is organized as follows: Section 2 compares the economic and labor statistics before and during the first year of the pandemic. Section 3 discusses the methodology applied in this paper. Section 4 presents the results. Section 5 concludes the paper.

2. Aggregate economic and labor statistics: pre-pandemic vs. pandemic data

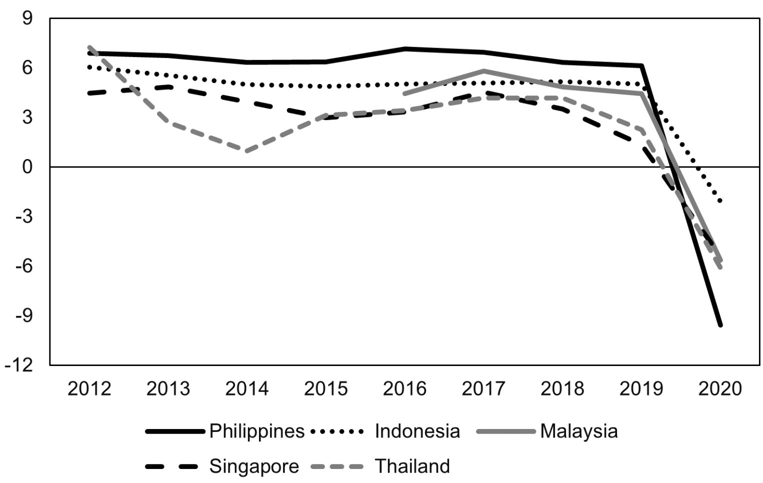
The COVID-19 pandemic has unprecedented impact on the Philippine economy and labor market. Comparing the Philippines with the other large ASEAN countries, real gross domestic product (GDP) had been growing at the fastest rate since 2013 until right before the pandemic year (Figure 1). The robust growth of the Philippine economy in the past years was gravely interrupted by the pandemic

[4] The inactive unemployed refers to the people without jobs who are not looking for work but are available for work should a job opportunity arrive. In contrast, the active unemployed refers to the people without jobs who are looking and are available for work.

[5] This is based on the "COVID-19: Google Mobility Trends" which can be accessed online at https://ourworldindata.org/covid-google-mobility-trends.

with the country exhibiting the sharpest decline in real GDP growth. Disruptions in economic production had been evident since April 2020 (Table 1). While the monthly production volume of manufacturing has been showing negative growth since early 2019, it decreased by 64.8 percent in April 2020 and by as much as 72.8 percent in July 2020. Also, the average capacity utilization rate for manufacturing fell to 46.3 percent in April 2020 from an average of around 70 percent in the past year, before picking up in the second half of 2020. It is not just the manufacturing sector that suffered when the pandemic broke out. The Purchasing Managers' Index (PMI) for services and wholesale and retail fell to below 50, indicating pessimism in business conditions. The PMI increased in later months but still suggested, albeit lower degree of, pessimism. In the World Bank's survey of firms in July 2020, Piza and Lee [2020] find that 40 percent of firms reported temporary suspension of operations, while 15 percent reported permanent closure. It also seems that the micro, small, and medium-sized enterprises (MSMEs), in particular, have been heavily affected by the lockdown policies and the slow recovery in the business environment [Shinozaki and Rao 2021].

FIGURE 1. GDP growth rate (%)—selected ASEAN countries



Source: Author's calculations using data from www.ceicdata.com.

TABLE 1. Selected monthly indicators of economic activity

Indicator	2019				2020			
	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Volume of production index, y-o-y growth rate (%)	3.4	-2.0	-48.3	-2.0	-3.4	-64.8	-72.8	-25.4
Average capacity utilization rate for manufacturing (%)	72.5	72.7	72.0	70.6	72.6	46.3	61.5	60.0
Purchasing Managers' Index (PMI)								
Overall	54.9	53.8	53.0	53.6	55.0	27.5	44.9	47.2
Manufacturing	53.9	52.6	51.6	51.7	54.6	30.6	48.8	47.3
Services	57.3	54.5	54.4	55.9	56.4	23.7	42.4	48.9
Retail and wholesale	53.1	52.6	51.1	50.8	54.6	31.2	45.1	44.8

Sources of data: Philippine Statistics Authority for the production index and capacity utilization rate data, Bangko Sentral ng Pilipinas for the PMI data.

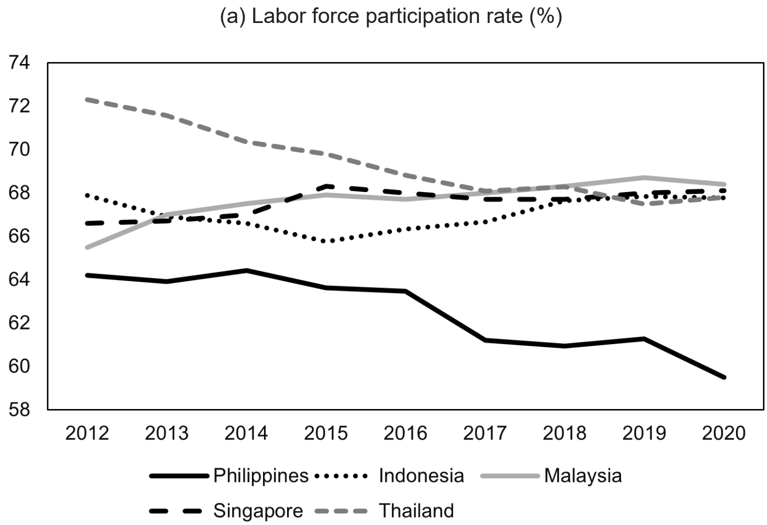
The effect of the pandemic on economic output and activities coincided with the more severe deterioration of labor market outcomes in the country. Between 2012 and 2020, aside from showing the lowest labor force participation rates and the highest unemployment rates in the past decade among the largest member countries of the Association of Southeast Asian Nations (ASEAN), the Philippines exhibited the most prominent decline in the labor force participation rate and increase in the unemployment rate in 2020 (Figure 2). The deterioration in economic conditions led the government to reduce the economic growth target from 7-8 percent to 6.5-7.5 percent and to raise the unemployment rate target from 3-5 percent to 7-9 percent by 2022.[6]

Figure 3 shows a more detailed trend in the quarterly labor force participation rate, unemployment rate, and underemployment rate from January 2007 to October 2020, covering the period of the 2007-2008 Global Financial Crisis, the high-growth years in the mid-2010s, and the first year of the current pandemic. The labor force participation rate had been mostly following a declining trend since April 2014, but the dip in April 2020 was too pronounced such that it was assessed as the lowest in the history of the Philippine labor market [PSA 2020, November 11]. Although the labor force participation rate seemingly recovered in July 2020 amid the relaxation of the community quarantine in several parts of the country, the 2.2-percentage-point decline in October 2020 may imply that the decision of the working-age population to participate in the labor market has yet to stabilize. Aside from the historically low labor force participation rate, the unemployment rate surged to double digits at 17.6 percent in April 2020. Even during the 2007-2008 Global Financial Crisis and eurozone debt crisis in which external demand considerably slowed down, the unemployment rate remained at

[6] Based on the "Updated Philippine Development Plan 2017-2022" in http://pdp.neda.gov.ph/wp-content/uploads/2021/02/20210218-Pre-publication-copy-Updated-Philippine-Development-Plan-2017-2022.pdf.

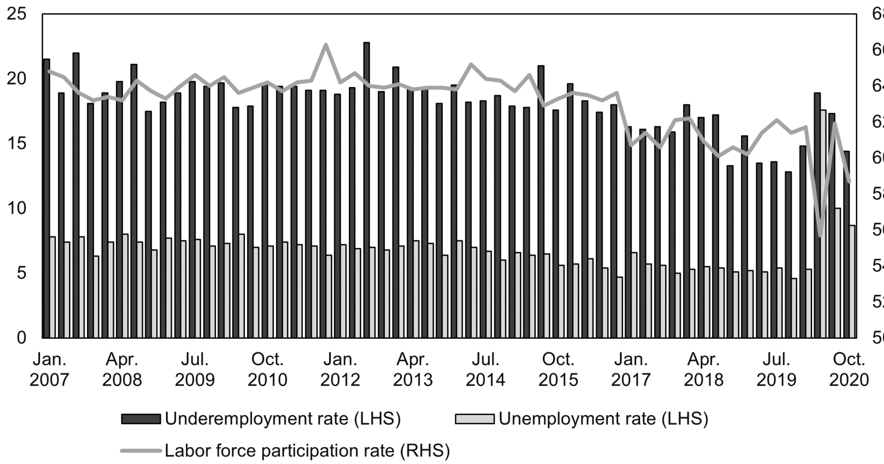
one-digit levels. The striking drop in the labor force participation rate and the rise in the unemployment rate in April 2020 suggest that the extent and the rate of job loss during the pandemic is much more severe than in the previous global recession. Furthermore, the underemployment rate rose to nearly 20 percent in April 2020 when it had registered some improvements a year before the pandemic occurred.

FIGURE 2. Labor market statistics—selected ASEAN countries



Source: Author's calculations using data from www.ceicdata.com.

FIGURE 3. Labor force participation rate, unemployment rate, and underemployment rate
(January 2007 – October 2020, %)



Note: LHS means left-hand scale. RHS means right-hand scale.
Sources of data: Philippine Statistics Authority.

Another way to look at aggregate job loss is to calculate employment growth. Table 2 presents the year-on-year growth of employment by major occupational group in 2020. The decline in employment is observed in all occupations, but the extent greatly varies. The most severely hit occupation during the onset of the lockdown appears to be the craft and related trades workers whose employment contracted by 36.2 percent. What is striking is that even the higher-skilled occupations—i.e., managers, professionals, and technicians and associate professionals—were not spared by the pandemic. The least hit is the occupation of skilled agricultural, forestry, and fishery workers which recorded a fall of only 1.5 percent in April. It is also the only civilian occupation that posted an expansion in the next two quarters, which could be attributed to the essential production of food.

Employment growth is also disaggregated by sector in Table 3. Similar to what is observed in the occupational breakdown, double-digit negative growth can be seen in almost all sectors—even in the high-employment-growth sectors prior to the pandemic like utilities and accommodation and food service activities. The sector that is most severely hit by the pandemic is the arts, entertainment, and recreation sector, which can be understood as largely non-essential. The least affected ones appear to be the agriculture, human health, and social work activities sectors, which are the least-restricted sectors by the community quarantine policies given their role in food production and health and emergency frontline services, respectively. Seemingly contrary to what is commonly found in work-from-home literature, the sectors that are expected to have a large share of jobs that can be done at home also exhibited significant declines in employment, including information and communication, financial and insurance activities, and professional, scientific and technical activities.[7]

While the impact of the pandemic on employment outcomes is observed across the board, the degree of susceptibility appears to vary which we aim to estimate in the succeeding sections.

TABLE 2. Employment growth by occupation between 2019 and 2020 (y-o-y)

Occupation	Jan	Apr	Jul	Oct
Managers	-21.7	-31.4	-23.8	-25.6
Professionals	6.6	-13.0	-9.6	-7.1
Technicians and associate professionals	-10.6	-25.7	-22.6	-4.0
Clerical support workers	11.0	-16.3	-5.8	-11.0
Service and sales workers	18.4	-20.5	-2.7	-1.8
Skilled agricultural, forestry, and fishery workers	8.8	-1.5	16.0	13.1
Craft and related trades workers	-5.2	-36.2	-9.8	-11.8
Plant and machine operators and assemblers	8.9	-23.9	5.2	-8.7
Elementary occupations	5.9	-14.4	1.9	-7.0
Armed forces occupations	23.2	-12.2	27.1	26.7

Note: According to the Philippine Statistics Authority, the population projections based on the 2015 Population Census has been adopted in estimating labor statistics since January 2020. Hence, the 2019 estimates based on the 2015 Population Census were used in the calculations.
Sources of data: Author's calculations using data from the Philippine Statistics Authority's Labor Force Survey statistical tables.

[7] Dingel and Neiman [2020] estimate that 80 percent, 76 percent, and 72 percent of the jobs in the professional, scientific and technical services, finance and insurance, and information, respectively, can be completely done at home.

TABLE 3. Employment growth by sector between 2019 and 2020 (y-o-y)

Sector	Jan	Apr	Jul	Oct
Agriculture	9.2	-3.4	11.7	0.7
Mining and quarrying	1.0	-3.9	19.2	-3.2
Manufacturing	-1.4	-24.4	-8.9	-17.0
Electricity, gas, steam, and air conditioning supply	10.6	-42.8	12.2	-14.5
Water supply; sewerage, waste management and remediation activities	-20.9	-29.5	-5.0	23.2
Construction	-2.6	-33.3	0.3	-4.9
Wholesale and retail trade; repair of motor vehicles and motorcycles	7.3	-23.8	4.0	-0.7
Transportation and storage	-0.5	-27.1	-10.2	-18.9
Accommodation and food service activities	11.1	-35.3	-36.0	-33.2
Information and communication	-9.5	-41.8	-28.8	5.0
Financial and insurance activities	6.4	-20.2	-0.4	-6.7
Real estate activities	-18.3	-13.8	-17.2	-25.7
Professional, scientific and technical activities	-16.2	-21.9	-19.6	-6.9
Administrative and support service activities	4.5	-14.2	-11.6	2.5
Public administration and defense; compulsory social security	7.4	-9.5	-9.2	-11.4
Education	7.0	0.01	-6.7	5.2
Human health and social work activities	8.2	-18.7	10.8	1.8
Arts, entertainment, and recreation	0.5	-54.8	-73.0	-38.2
Other service activities	-3.4	-15.7	-13.1	-5.6

Note: According to the Philippine Statistics Authority, the population projections based on the 2015 Population Census has been adopted in estimating labor statistics since January 2020. Hence, the 2019 estimates based on the 2015 Population Census were used in the calculations.
Sources of data: Author's calculations using data from the Philippine Statistics Authority's Labor Force Survey statistical tables.

3. Methodology

3.1. Data and sample

This study uses the Labor Force Survey (LFS) conducted by the Philippine Statistics Authority every first month of the quarter until the end of 2020.[8] It is a household-based survey which samples more than 40,000 households, collecting both demographic and socioeconomic information at the individual level. Demographic information includes age, sex, relationship to the household head,

[8] In February 2021, the Philippine Statistics Authority started conducting the monthly LFS in between the quarterly rounds to generate more frequent national-level labor market statistics amid the COVID-19 pandemic. The original quarterly rounds of the survey are used to produce representative data both at the national and regional level.

marital status, and highest educational attainment. The socioeconomic variables help determine the employment status of working-age individuals, describe the nature of the job of individuals who had a job during the reference week, and indicate the job search efforts and availability for work of individuals who did not have a job during the reference week. Moreover, to identify the experienced unemployed, individuals that did not have work during the reference week were asked to report their last occupation if applicable. The reference week refers to the seven days preceding the date of the visit of the enumerator to the household. The LFS also gathers data on whether the individual had a job during the preceding quarter and, if he or she did have a job, the sector where the individual belonged to. In the absence of longitudinal labor market data, we utilize the information on the activity in the preceding quarter to the survey period to determine the possible flow from employment to non-employment and vice-versa. The sample used in this study consists of individuals aged 15 to 64 years old and who are not employed in the armed forces.

We choose the first three survey rounds in 2020 to compare the employment pattern before and during the first months of the COVID-19 pandemic. The January round provides the employment pattern right before the pandemic occurred. The April round covers the period wherein the Philippines entered a technical recession and the most stringent containment measures were put in place by the government as the immediate response to the rising COVID-19 cases in the country. By the July round, the ECQ imposed in many parts of the country, including NCR, had already been lifted, but economic growth remained at two-digit contraction.

3.2. Estimation strategy

With the immediate contraction in employment amid the decline in aggregate demand, the community quarantine, and the social distancing measures associated with the on-going COVID-19 pandemic, we seek to answer the following questions. Who are more likely to lose their jobs during the pandemic? Who are more likely to become underemployed? Finally, who among the unemployed are likely to gain employment? As we have seen in the previous section, a large share of the working-age population became unemployed and had dropped out of the labor force as soon as the pandemic broke out and the ECQ was implemented in Luzon. Nonetheless, we also have to consider the improvements in the labor market observed when the ECQ measures were lifted and replaced by less stringent quarantine rules. The tendency to become underemployed is another aspect that we look into given the surge in the underemployment rate. We recognize that the severity of the effect of the labor market disruptions on employment will likely be heterogenous given the varying degrees of demand to goods and services produced by labor type, restrictions applied to different sectors, risks of physically reporting to work, and capacity to do remote work.

Given the objectives of the study, three equations will be estimated: the probability of job loss, the probability of underemployment, and the probability of gaining employment. Equation 1 is estimated to analyze the determinants of the probability of job loss.

$$\begin{aligned} jobloss_i = {} & \beta_0 + \beta_1 survey_i + \beta_2 male_i + \beta_3 male_i \times survey_i + \beta_4 age_i + \\ & \beta_5 age_i \times survey_i + \beta_6 urban_i + \beta_7 urban_i \times survey_i + \beta_8 educ_i + \\ & \beta_9 educ_i \times survey_i + \beta_{10} skill_i + \beta_{11} skill_i \times survey_i + \beta_{12} tele_i + \\ & \beta_{13} tele_i \times survey_i + \beta_{14} capacity_i + \beta_{15} reg_i + \beta_{16} sec_i + u_i \end{aligned} \tag{1}$$

$jobloss_i$ is a binary variable that is equal to 1 if individual i was unemployed during the reference week but had a job in the previous quarter. On the other hand, it is equal to 0 if individual i was employed during the reference week and had a job in the previous quarter. We note that individuals who reported that they did not have a job in the previous quarter are excluded from the sample for Equation 1, so the probability of job loss during the reference week is conditional on being employed in the previous quarter.

$survey_i$ pertains to the survey round which individual i participated in. $male_i$ is a dummy variable equal to 1 if individual i is male and 0 if female. age_i refers to age bracket dummies:15-24 (base group), 25-34, 35-44, 45-54, and 55-64. $educ_i$ refers to the education dummies: lower than junior high school (base group), junior high school graduate, senior high school graduate, incomplete post-secondary, post-secondary graduate, incomplete college, and college graduate. $urban_i$ is a dummy variable equal to 1 if the individual lives in an urban area and 0 if in a rural area. reg_i refers to the region dummies.

$skill_i$ denotes the category of skill level attached to the one-digit occupational code that is based on the 2012 Philippine Standard Occupational Classification (PSOC). The 2012 PSOC is compliant with the methodology of the 2008 International Standard Classification of Occupation (ISCO-08) which assigns skill levels 1 (lowest) to 4 (highest). Using the ISCO-08's classification, "managers", "professionals", and "technicians and associate professionals" are identified as high-skilled occupations; "clerical support workers", "services and sales workers", "skilled agricultural, forestry, and fishery workers", "craft and related trades workers", and "plant and machine operators and assemblers" as medium-skilled occupations; and "elementary occupations" as low-skilled occupation. If individual i was employed during the reference week, then occupation refers to the current primary occupation of this individual. If individual i did not have a job during the reference week, we utilize the data on previous occupation.

$tele_i$ refers to the potential teleworkability of individual i's occupation which is equal to 1 if it is teleworkable and 0 if not. We apply Dingel and Neiman's [2020] job classification. However, the jobs in their classification are generated based on O*NET's codes, so we need to match the occupations to the 2012 PSOC definition. First, we matched the O*NET's codes with ISCO-08's codes and then matched ISCO-08's codes with the 2012 PSOC codes. Second, the occupations in Dingel and Neiman [2020] are defined at the four-digit level while the codes in the LFS are defined at the two-digit level, so we aggregated the four-digit codes to two-digit codes. If more than 50 percent of the jobs in the four-digit level under the same two-digit occupational code are classified as teleworkable, we mark that two-digit occupational code as potentially teleworkable; otherwise, potentially non-teleworkable.

$capacity_i$ denotes the operational capacity of the two-digit sectoral code of the 2009 Philippine Standard Industrial Classification (PSIC). Operational capacity refers to the degree to which workers are allowed to physically report to work. Three classifications are applied here: (1) fully open if all workers are allowed to physically report to work, (2) limited capacity if only a percentage of workers are allowed to physically report to work, and (3) fully closed if the establishment is not allowed to operate and thus no workers will report on-site. We based the assignment of operational capacity on the official guidelines published by the government and the level of community quarantine implemented in each region. The Memoranda from the Executive Secretary dated March 16[9] and 18,[10] 2020 were used for the April 2020 LFS round, and the Omnibus Guidelines on the Implementation of Community Quarantine in the Philippines with Amendments as of July 2, 2020[11] was used for the July 2020 LFS round. We relied on the description of the industries in the official guidelines in matching the two-digit PSIC code with the applicable operational capacity classification, so the matching process is subject to our assessment. Furthermore, in cases where the level of community quarantine is different in certain provinces or cities in a region, we apply the level that conforms to the greater part of the region. Since there is no community quarantine in place before the pandemic, all sectors were characterized as fully open in January 2020.

sec_i denotes the sections in the 2009 PSIC. Mining and quarrying; manufacturing; electricity, gas, steam and air-conditioning supply; water supply, sewerage, waste management and remediation activities; and construction are merged under the industry sector. If individual i was employed during the reference week, then sec_i refers to the sector where he or she is currently working in. If individual i did not have a job during the reference week, we utilize the data on the sector where he or she was working in the previous quarter.

We interacted certain variables with the survey round dummies to test whether the predicted probability significantly differs between the pre-pandemic data

[9] See https://www.officialgazette.gov.ph/downloads/2020/03mar/20200316-MEMORANDUM-FROM-ES-RRD.pdf.
[10] See https://www.officialgazette.gov.ph/downloads/2020/03mar/20200318-MEMORANDUM-FROM-ES-RRD.pdf.
[11] See https://www.officialgazette.gov.ph/downloads/2020/06jun/20200702-omnibus-guidelines-on-the-implementation-of-community-quarantine-in-the-philippines.pdf.

and ECQ data, and between pre-pandemic data and post-ECQ data. The variables $capacity_i$, reg_i, and sec_i are not interacted with the survey round dummies to avoid perfect collinearity. u_i is the error term.

Equation 2 is estimated to analyze the determinants of the probability of underemployment.

$$\begin{aligned} underemp_i = {} & \alpha_0 + \alpha_1 survey_i + \alpha_2\, male_i + \alpha_3 male_i \times survey_i + \alpha_4 age_i + \\ & \alpha_5 age_i \times survey_i + \alpha_6 urban_i + \alpha_7 urban_i \times survey_i + \alpha_8 educ_i + \\ & \alpha_9 educ_i \times survey_i + \alpha_{10} skill_i + \alpha_{11} skill_i \times survey_i + \alpha_{12} tele_i + \\ & \alpha_{13}\, tele_i \times survey_i + \alpha_{14} capacity_i + \alpha_{15}\, prevjob_i + \alpha_{16}\, prevjob_i \times survey_i + \\ & \alpha_{17}\, reg_i + \alpha_{18}\, sec_i + e_i \end{aligned} \tag{2}$$

$underemp_i$ is a binary variable that is equal to 1 if individual i is considered underemployed during the reference week and 0 if not. The definition of the independent variables is the same as in Equation 2, except that $skill_i$, $capacity_i$, and sec_i refer to their current employment arrangements, as the sample in this equation consists of employed individuals only. $prevjob_i$ denotes whether individual i had a job in the previous quarter or not. e_i is the error term.

Equation 3 is estimated to analyze the determinants of the probability of employment.

$$\begin{aligned} employ_i = {} & \gamma_0 + \gamma_1 survey_i + \gamma_2 male_i + \gamma_3 male_i \times survey_i + \gamma_4 age_i + \\ & \gamma_5 age_i \times survey_i + \gamma_6\, urban_i + \gamma_7\, urban_i \times survey_i + \gamma_8 educ_i + \\ & \gamma_9 educ_i \times survey_i + \gamma_{10} reg_i + v_i \end{aligned} \tag{3}$$

$employ_i$ is binary variable that is equal to 1 if individual i did not have a job in the previous quarter but became employed during the reference week. It is equal to 0 if individual i did not have a job in the previous quarter and was considered unemployed during the reference week. Hence, the probability of employment is conditional on not having a job in the previous quarter. The same definition of variables in Equation 1 is applied here.

A potential empirical concern in investigating the determinants of these three outcomes is the presence of sample selection bias, because we cannot observe the given outcomes of people who are not working or not in the labor force. To address this concern, the probit model with sample selection is applied in investigating the determinants of the given outcomes. The selection equation estimates the probability of working and is run against the following variables: survey period, gender, age, education, urban or rural, region, and the instrumental variable which is the presence of children aged less than five years old in the household where the individual belongs to. We hypothesize that the presence of young children in the household lowers the likelihood of working.

4. Results and discussion

4.1. Job loss

The estimates of the equation on the probability of job loss are presented on the second column of Table 4 and the average marginal effects are plotted in Figure 4. While there is no significant gender difference in job loss in January and July, men are more likely to lose their jobs in April. Older people are less likely to lose their jobs in all survey rounds, especially in April where the average marginal effects between the older age brackets and the youngest age bracket further widened. This may imply that longer labor market experience provides stronger job security amid negative shocks to the labor market. People living in urban areas are more likely to lose their jobs in July, but urbanity is not a significant determinant of job loss in January and April. There is mostly no significant difference in the probability of job loss in January and July between the least educated workers and the more educated workers, except the senior high school graduates and college graduates who faced a higher likelihood of job loss. However, in April, college graduates and post-secondary graduates became less likely to experience job loss, while those who have not finished their post-secondary studies were less likely to lose their jobs compared to the least educated workers.

Medium- and high-skilled workers were less likely to experience job loss than low-skilled workers in January. The probability of job loss in April and July is not significantly different from that of January for the medium-skilled workers. On the other hand, the difference in job loss between high-skilled workers and low-skilled workers increased from January to April. The potential teleworkability of one's own occupation is not significant in explaining job loss, but the operational capacity of a sector is. Workers in a fully closed sector are more likely to lose their jobs, more so in April.

It seems that the deviation from the probability of job loss from January, which is the pre-ECQ period, is mostly observed in April, the ECQ period. The affected workers in the ECQ period were likely males, the young, and those who worked in sectors that were not allowed to operate at all. In contrast, better-educated and high-skill workers were likely more secured in keeping their employment status during the ECQ period. Nonetheless, as expected, workers in fully closed sectors were shown to more likely experience job loss even in July, the post-ECQ period.

TABLE 4. Estimates of the probit models with sample selection

Variables	Job loss	Underemployment	Employment
Survey round (base: January)			
April	0.766*** (0.051)	-0.228*** (0.058)	-0.320*** (0.091)
July	-0.182** (0.062)	-0.013 (0.047)	0.189* (0.087)
Male	-0.004 (0.046)	0.183*** (0.022)	0.307*** (0.081)
Male × Survey round			
April	0.081* (0.032)	0.035 (0.022)	0.139* (0.058)
July	0.024 (0.040)	0.021 (0.019)	0.091 (0.049)
Age group (base: 15-24)			
25-34	-0.350*** (0.035)	0.120*** (0.022)	-0.006 (0.053)
35-44	-0.595*** (0.040)	0.170*** (0.022)	0.270*** (0.067)
45-54	-0.613*** (0.043)	0.141*** (0.023)	0.183* (0.076)
55-64	-0.574*** (0.052)	-0.006 (0.025)	-0.010 (0.112)
Age group × Survey round			
25-34 × April	0.183*** (0.042)	-0.028 (0.032)	-0.212** (0.073)
35-44 × April	0.327*** (0.046)	-0.024 (0.032)	-0.318*** (0.086)
45-54 × April	0.265*** (0.050)	-0.020 (0.030)	-0.214* (0.094)
55-64 × April	0.295*** (0.059)	-0.067 (0.036)	0.091 (0.078)
25-34 × July	0.106* (0.051)	-0.015 (0.030)	0.089 (0.061)
35-44 × July	0.178** (0.056)	-0.033 (0.030)	0.075 (0.070)
45-54 × July	0.139* (0.061)	-0.064* (0.031)	0.091 (0.078)
55-64 × July	0.165* (0.073)	-0.080* (0.034)	0.027 (0.094)
Urban	-0.012 (0.027)	-0.193*** (0.014)	-0.191*** (0.045)
Urban × Survey round			
April	0.009 (0.030)	0.114*** (0.019)	0.047 (0.057)
July	0.161*** (0.037)	0.189*** (0.018)	0.053 (0.048)

TABLE 4. Estimates of the probit models with sample selection (continued)

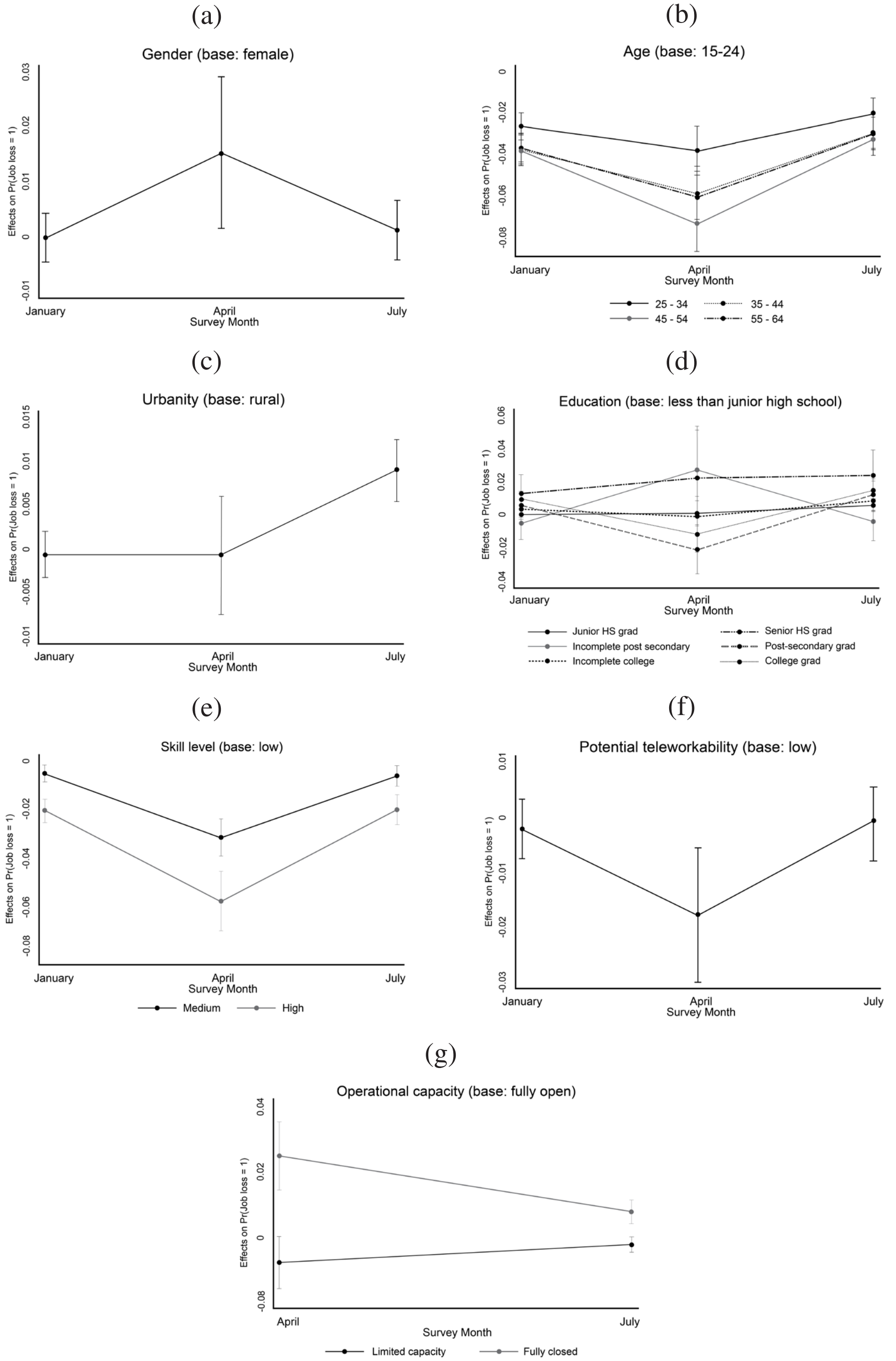
Variables	Job loss	Underemployment	Employment
Education (base: lower than junior high school)			
Junior high school graduate	0.014 (0.034)	-0.126*** (0.016)	-0.369*** (0.058)
Senior high school graduate	0.238** (0.088)	0.013 (0.060)	-0.287 (0.149)
Incomplete post-secondary	-0.121 (0.139)	-0.045 (0.060)	-0.129 (0.176)
Post-secondary graduate	0.118 (0.065)	-0.117*** (0.034)	-0.516*** (0.104)
Incomplete college	0.079 (0.049)	-0.203*** (0.025)	-0.556*** (0.075)
College graduate	0.184*** (0.046)	-0.285*** (0.024)	-0.457*** (0.073)
Education × Survey round			
Junior high school graduate × April	-0.008 (0.039)	0.071** (0.023)	0.091 (0.079)
Senior high school graduate × April	-0.131 (0.108)	-0.122 (0.079)	0.171 (0.182)
Incomplete post-secondary × April	0.249 (0.152)	0.058 (0.083)	-0.081 (0.225)
Post-secondary graduate × April	-0.226** (0.077)	0.090 (0.049)	-0.073 (0.150)
Incomplete college × April	-0.079 (0.056)	0.119*** (0.035)	0.210* (0.100)
College graduate × April	-0.243*** (0.052)	0.127*** (0.031)	-0.016 (0.089)
Junior high school graduate × July	0.102* (0.049)	0.054** (0.022)	0.221** (0.066)
Senior high school graduate × July	0.123 (0.123)	-0.053 (0.079)	0.104 (0.165)
Incomplete post-secondary × July	0.040 (0.200)	0.074 (0.082)	-0.294 (0.201)
Post-secondary graduate × July	0.097 (0.097)	0.029 (0.049)	0.060 (0.117)
Incomplete college × July	0.080 (0.067)	0.092** (0.033)	0.274*** (0.084)
College graduate × July	0.067 (0.063)	0.031 (0.031)	0.215** (0.073)
Skill level (base: low skill)			
Medium skill	-0.083** (0.030)	-0.037* (0.015)	-
High skill	-0.504*** (0.062)	0.065* (0.027)	-

TABLE 4. Estimates of the probit models with sample selection (continued)

Variables	Job loss	Underemployment	Employment
Skill level × Survey round			
Medium skill × April	-0.065 (0.034)	-0.012 (0.022)	-
High skill × April	0.211** (0.062)	-0.093* (0.039)	-
Medium skill × July	-0.002 (0.043)	0.059** (0.021)	-
High skill × July	0.136 (0.087)	0.041 (0.039)	-
Potential teleworkability	-0.044 (0.058)	-0.075** (0.027)	-
Potential teleworkability × Survey round			
April	-0.049 (0.066)	0.027 (0.039)	-
July	0.024 (0.082)	0.025 (0.039)	-
Operational capacity (base: fully open)			
Limited capacity	-0.040 (0.021)	0.119*** (0.013)	-
Fully closed	0.120*** (0.026)	0.179*** (0.019)	-
Has previous job	-	-0.025 (0.051)	-
Has previous job × Survey round			
April	-	0.174*** (0.051)	-
July	-	-0.065 (0.039)	-
Region dummies	Yes	Yes	Yes
Sector dummies	Yes	Yes	No
Number of observations	161,714	167,068	18,525

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$. Standard errors are in parentheses.
Note: In the three regressions, the likelihood ratio test rejects the null hypothesis that the selection equation and outcome equation are independent of each other. The instrumental variable (presence of young child in the household) is significantly negative at the 0.1 percent level in all equations.

FIGURE 4. Average marginal effects with 95-percent confidence intervals—job loss



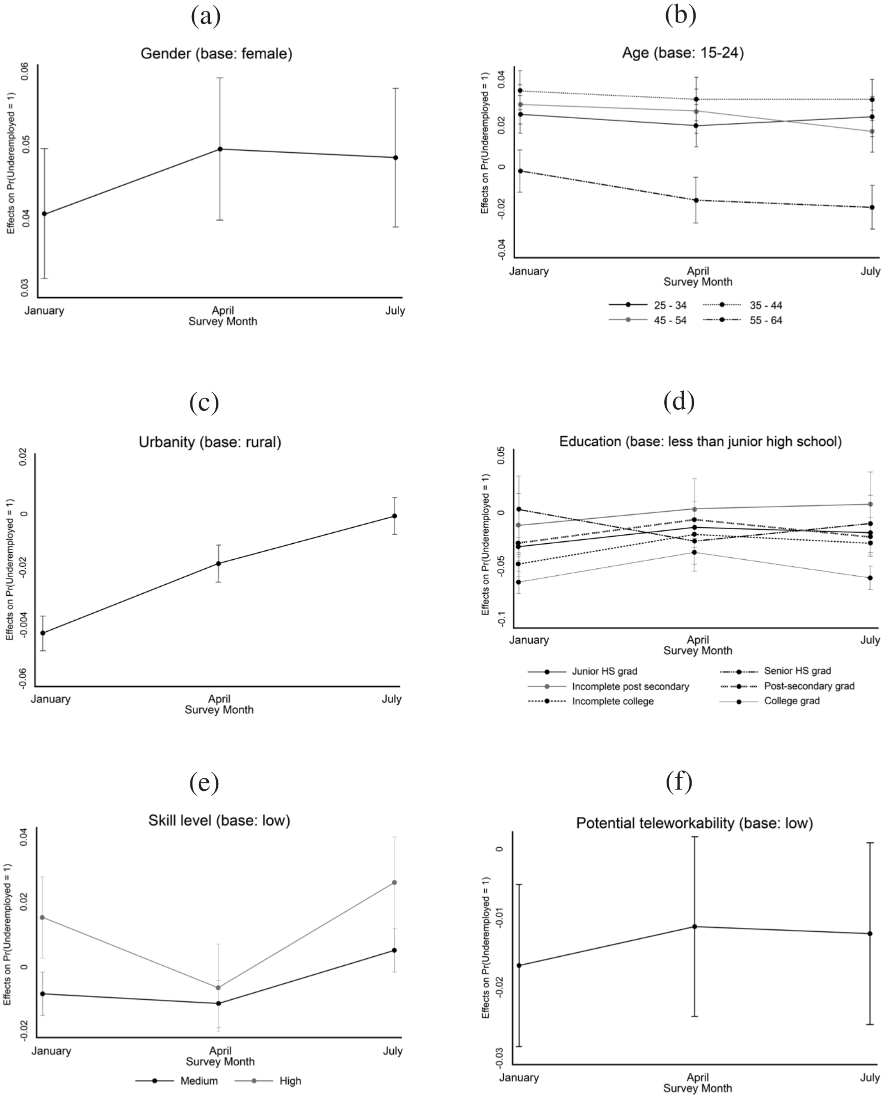
4.2. Underemployment

The estimates of the equation on the probability of underemployment are shown in the third column of Table 4 and the average marginal effects are plotted in Figure 5. Men were more likely than women to become underemployed before and during the pandemic, although the male probability of underemployment compared to that of females in April and July is not significantly different from what was seen in January. Except for the oldest age bracket, older workers tend to become underemployed, but in July, the oldest age bracket had become less likely to be underemployed and the probability of underemployment for workers aged between 45 and 54 years relative to that of the youngest age bracket declined. Workers in urban areas were less likely to become underemployed than those in rural areas in January and April, but the advantage of workers in urban areas in terms of lower likelihood of underemployment declined in April and was no longer significant in July. Better-educated workers were less likely to become underemployed compared to workers that have lower than junior high school education. However, the advantage of lower probability of underemployment of college graduates relative to the least-educated workers fell from January to April, while that of workers who did not finish college fell from January to April and July.

Medium-skilled workers were less likely to become underemployed than low-skilled workers in January and April, but the likelihood of probability of underemployment of medium-skilled workers relative to low-skilled workers was no longer significant in July. High-skilled workers, on the other hand, were consistently more likely to be underemployed than low-skilled workers. Those whose occupations are potentially teleworkable were less likely to be underemployed in January and this likelihood was not significantly different from what was observed in April and July. Furthermore, workers in sectors that were not fully operational were more likely to be underemployed, more so for those in fully closed sectors. In terms of employment continuity, we observe that having a job in the previous quarter is not significant in determining underemployment probability in January and July. However, workers who were surveyed in April and had a job in the previous quarter were more likely to be underemployed than those who did not have a job in the previous quarter. The April estimates are consistent with the aggregate labor statistics that the mean hours of work fell to less than 40 hours in this period, and a considerable share of the workers had a job but were not working.

The pattern of underemployment appears to be mostly the same across survey periods for certain worker types, including by gender, age, education, skills, and potential teleworkability. This result suggests that the workers who were vulnerable to underemployment prior to the pandemic were mostly the same workers who were also susceptible to such condition during the pandemic. Nonetheless, restrictions in operational capacity appeared to contribute to the likelihood of underemployment. Furthermore, it appears that while workers were able to retain their employment during the ECQ period, there was a higher tendency for these workers to be underemployed.

FIGURE 5. Average marginal effects with 95-percent confidence intervals—underemployment



4.3. Gaining employment

Following the loosening of community quarantine restrictions, the labor force participation rate rose, and the unemployment rate declined from April to July, so we also look at the workers who are likely to gain employment. The estimates of the equation on the probability of gaining employment are shown in the fourth column of Table 4 and the average marginal effects are plotted in Figure 6. While males were more likely to experience job loss, they were also more likely to gain employment during the reference week if they were jobless in the past quarter. This likelihood significantly increased from January to April. Middle-aged workers were more likely to gain employment than the youngest workers. Although this likelihood declined in April, it was not significantly different in July compared to January. Workers living in urban areas were less likely to be employed in January, and the difference in the likelihood in employment by urbanity is not significantly different across survey periods. Better-educated workers were less likely to gain employment in January, but the lower likelihood for those who reached college narrowed in July.

In which occupation, sector, and class of employment did these individuals obtain jobs? Table 5 shows the distribution of workers who gained employment in the current quarter from being jobless in the past quarter. The employment structure in the Philippines has always been skewed towards lesser skill jobs, and the occupations in which jobless individuals find employment are also evident of this pattern. Between January and July, the majority of jobless individuals had become employed in elementary occupations, and the share of these workers had even become more prominent in April. Services and sales workers, and skilled agricultural, forestry, and fishery workers were the other top occupations wherein people gain employment. By sector, the top ones which absorbed employment were the agriculture, industry, and wholesale and retail trade sectors. There was a surge of individuals obtaining employment in the agriculture sector in April, although this waned in July as the surge in gaining employment was observed in the industry sector. In terms of class of workers, the share of jobless individuals absorbed by private establishments sharply dropped in April, and there seems to be some shift towards working without pay in family-owned businesses. This may be attributed to the closure of most private establishments in April, especially in Luzon. Nonetheless, by July when quarantine guidelines were loosened, nearly 60 percent of the jobless individuals in the past quarter managed to obtain employment in private establishments. The share of previously jobless individuals becoming self-employed and working without pay in family-owned businesses also fell in July. Therefore, we can discern that the huge labor market disruptions in April led to people gaining employment in lower-quality jobs under more precarious working conditions. In spite of this, some improvements in labor market conditions can increase the opportunity of jobless individuals to gain employment in a more stable working environment.

FIGURE 6. Average marginal effects with 95-percent confidence intervals—employment

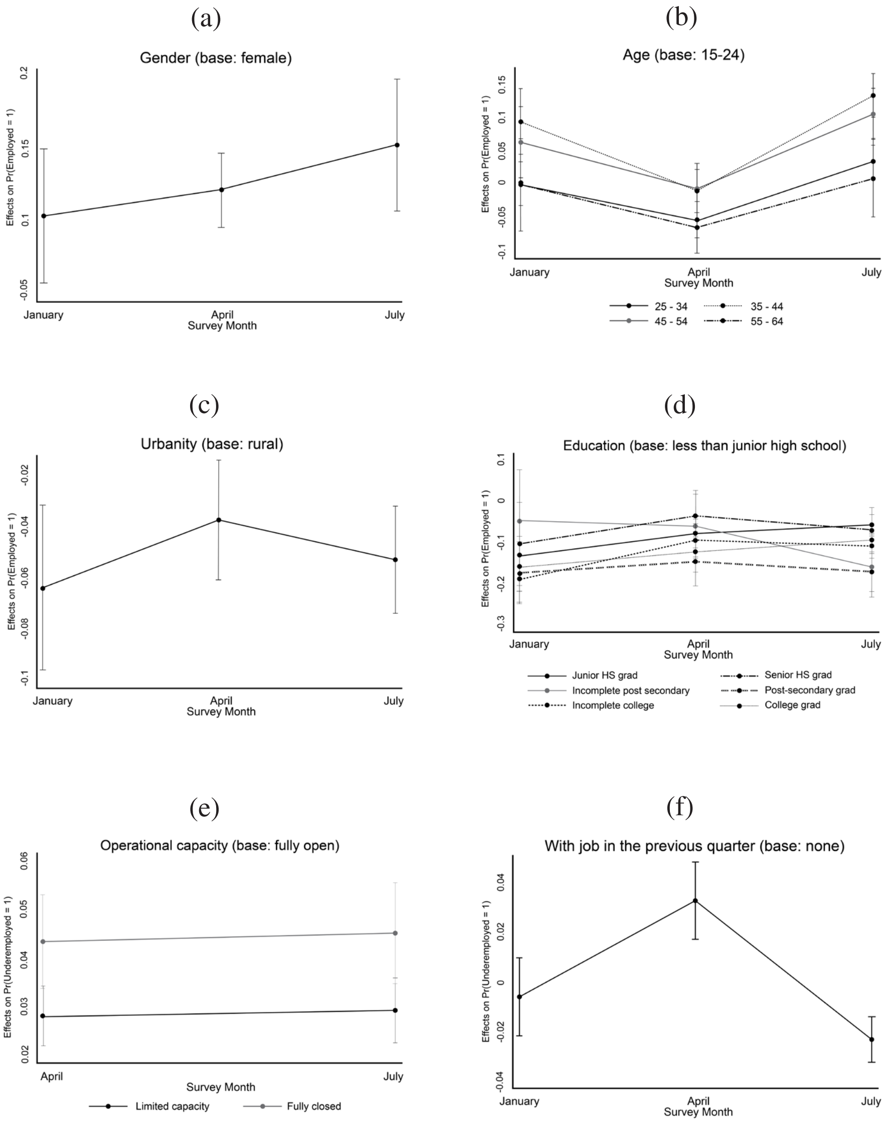


TABLE 5. Distribution of workers who gained employment in the current quarter from being jobless in the past quarter (share to total, %)

	January	April	July
Occupation			
Managers	10.0	7.6	7.6
Professionals	5.1	3.6	4.4
Technicians and associate professionals	3.7	2.4	3.0
Clerical support workers	5.5	5.2	5.9
Service and sales workers	17.3	15.1	19.4
Skilled agricultural, forestry, and fishery workers	11.5	14.0	7.3
Craft and related trades workers	6.8	5.2	10.1
Plant and machine operators and assemblers	4.8	4.9	8.8
Elementary occupations	35.2	42.1	33.5
Sector			
Agriculture	30.6	40.4	19.0
Industry	20.6	16.3	25.9
Wholesale and retail trade; repair of motor vehicles and motorcycles	21.5	20.1	21.4
Transportation and storage	5.3	6.0	8.4
Accommodation and food service activities	4.3	2.0	5.3
Information and communication	0.8	0.8	1.0
Financial and insurance activities	1.0	0.8	1.3
Real estate activities	0.3	0.2	0.4
Professional, scientific and technical activities	0.8	0.3	0.8
Administrative and support service activities	1.9	2.6	3.2
Public administration and defense; compulsory social security	6.0	6.7	3.2
Education	2.8	1.5	2.8
Human health and social work activities	1.3	0.7	0.9
Arts, entertainment, and recreation	0.8	0.2	0.5
Other service activities	1.9	1.5	5.9
Class of worker			
Private household	0.5	0.5	3.6
Private establishment	54.8	45.1	59.4
Government	8.2	8.3	5.3
Self-employed	25.0	25.2	23.0
Employer	1.1	1.4	1.5
With pay in family-owned business	0.2	0.2	0.3
Without pay in family-owned business	10.1	19.4	7.0

Source: Author's calculations based on the Labor Force Survey.

5. Conclusion

This paper seeks to determine the workers that were more severely affected by the COVID-19 pandemic and the containment measures implemented in the Philippines by analyzing the probability of job loss, underemployment, and employment in January 2020 (data right before the pandemic), April 2020 (data right after the pandemic broke out and when the strictest containment measures were in place), and July 2020 (data when containment measures were loosened to some degree and some improvements in the labor market were observed). Our findings can be summarized as follows. First, the workers who were more heavily affected by job loss during the ECQ period were males and younger individuals. In contrast, the better-educated and high-skilled workers were more likely to be secured in keeping their employment status. Second, workers who tend to become underemployed prior to the pandemic were also mostly the same workers vulnerable to underemployment during the first months of the pandemic. These are males, older workers, the lesser educated, and those working in occupations that are not likely to be teleworkable. Third, the restrictions in operational capacity placed on establishments in response to the COVID-19 pandemic have increased the probability of both job loss and underemployment. For instance, although the probability of job loss by worker characteristic is not significantly different in July compared to January, workplace restrictions can still contribute to job loss. Fourth, taking the implications of the job loss and underemployment results together, the most vulnerable workers to the labor market disruptions due to the pandemic appear to be males, the lesser-skilled workers, and those working in sectors either with limited operational capacity or those that are not allowed to open at all. Fifth, the results also suggest that males and the less-educated individuals were more likely to gain employment after being jobless in the past quarter.

The policy responses of the government to the rising unemployment rates and business closures have included wage subsidies for critically-affected businesses, the self-employed, and the repatriated overseas Filipino workers (OFWs); financial assistance to micro-, small- and dedium-sized stablishments (MSMEs); cash-for-work programs; and seminars on shifting to online businesses [ILO 2020]. These discretionary policies, however, are subject to inside lags. Therefore institutionalized measures to protect the welfare of workers from labor market disruptions, such as unemployment insurance, should be highly considered. Currently, one-time payment to members of the Social Security System and monthly payments of up to six months to public-sector employees are given to those who are involuntarily separated from employment. These existing measures would not be enough amid a recession of this magnitude, especially when the public-sector share is small relative to total employment and around a quarter of the workers are self-employed. Moreover, the advantage of an unemployment insurance facility is that it will provide quick relief to displaced workers even in the absence of discretionary policies.

A limitation of the study is the absence of information on when—or at least the reason why—people changed or lost their jobs. The data indicates that nearly four percent of the surveyed individuals in the LFS have changed industries from the past quarter to the reference week. On the one hand, if these individuals managed to gain employment shortly after losing their jobs because of the pandemic, then the probability of job loss due to the pandemic might be underestimated. On the other hand, if these individuals lost their jobs before the pandemic occurred, then the probability of job loss due to the pandemic might be overestimated.

We also emphasize that the results only infer the short-term adverse effects of the pandemic on employment. Longer unemployment spells, which are not explored here, can lead to the deterioration of skills and labor market productivity, making reemployment more difficult for the severely affected individuals. This is especially true in the current recession for at least two reasons. First, currently, there is little sign of the economy recovering and getting back to pre-pandemic levels in the near term, which will hamper the improvement in labor demand and business conditions. Second, flexible work arrangements could likely remain for a while amid the persistently high COVID-19 cases and continued implementation of containment measures in the country. Hence, aside from establishing a social insurance system that has wider coverage of workers, improvement in the capacity to perform remote work can also be considered.

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Measuring the telework potential of jobs: evidence from the International Standard Classification of Occupations

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The coronavirus disease (COVID-19) pandemic has triggered and accelerated the shift of firms and businesses to adopt flexible alternative work arrangements such as teleworking or working from home (WFH) set-ups. To effectively transition to the 'new normal' of work, this paper measures the telework potential of jobs or the degree to which a job can be feasibly done at home or offsite. Using the task-based framework, this paper constructs continuous 'teleworkability' indices by implementing a classification process of the occupational tasks listed in the International Standard Classification of Occupations 2008 (ISCO-08) and based on the telework indicators in the literature. The correlates of these indices are estimated. Also, the indices are applied to Philippine occupations. The primary contribution of this paper is the set of 'teleworkability' indices for all 427 occupations (4-digit ISCO) to describe the telework potential of jobs in countries which pattern their local occupational codes to ISCO-08.

JEL classification: J22, J21, J20
Keywords: telework, work arrangements, tasks, occupations, labor market

1. Introduction

The coronavirus disease (COVID-19) pandemic has had unprecedented social and economic impacts worldwide — disrupting international and domestic labor markets, disproportionately affecting certain industries and vulnerable workers, resulting in workplace closures, significant declines in working-hours and labor income losses. To stem its transmission in workplaces [Lan et al. 2020], governments have implemented stringent workplace closures [ILO 2020a], which triggered and accelerated the shift of firms and businesses to adopt flexible alternative work arrangements such as teleworking or working from home (WFH) set-ups. Teleworking or telecommuting refers to a flexible work arrangement, wherein a worker performs his duties and responsibilities, and other authorized activities, from an approved

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alternative worksite (e.g., home, telework center) with the use of telecommunication and computer technologies [Republic Act No. 11165 or the Telecommuting Act].

Technological advances brought about by digitalization and the advent of the fourth industrial revolution, coupled with COVID-19, have transformed the nature of work by changing how specific tasks of occupations are performed. Unlike the traditional human capital models, the task-based framework treats occupations or jobs as bundles of tasks rather than as discrete categories, wherein a particular task may be performed by domestic labor, foreign labor (through offshoring), or capital in a workplace (onsite or offsite), according to the usual efficiency criteria. Some of its applications include the analyses of the implications of automation, offshoring, and immigration on employment, skill transferability, and returns to task-specific skills [Generalao 2019]. The framework also implies that some of the tasks of an occupation, which was generally perceived to be impossible to be done at home or offsite, can be performed offsite or at home. For instance, being a doctor has been usually categorized and recognized as an occupation which has always been done on-site or in a medical facility. But to limit the transmission of COVID-19, there have been reports that some of the tasks performed by doctors, such as consulting and prescribing medicines, have been increasingly done offsite [Department of Health 2020]. Given the intricacies and dynamics of the evolving labor market, there is merit to go beyond conventional understanding of occupations and human capital.

Since the peak of the COVID-19 transmission in the first quarter of 2020, burgeoning literature on identifying which jobs are 'teleworkable' or feasible to be done at home or offsite can be observed in the context of different country and development contexts. This is a testament to the growing interest among researchers and policymakers in exploring the plausibility of jobs to be done at home to effectively transition to the 'new normal' of work. Specifically, most studies involve classifying which jobs are 'teleworkable' or not, while relatively few measure the telework potential of a job or the degree to which it can be feasibly done at home or offsite. This is an important step needed to be undertaken to effectively transition to the 'new normal' of work and formulate policies that enable a safe and alternative work environment.

2. Telework literature

Most telework literature are in the context of individual countries such as in the United States (Dingel and Neiman [2020]; Mongey et al. [2020]; Hensvik et al. [2020]; Leibovici et al. [2020]); United Kingdom [British Office for National Statistics 2020]; Norway [Holgersen et al. 2020]; Argentina [Foschiatti and Gasparini 2020]; Portugal [Martins 2020]; Uruguay [Guntin 2020]; Philippines [Gaduena et al. 2020]) while some analyze multiple countries (ILO [2020b]; Sanchez et al. [2020]; Brussevich et al. [2020]; Gottlieb et al. [2020]; Hatayama et al. [2020]; Boeri et al. [2020]). Each study used a unique set of datasets to classify a job as 'teleworkable' and to estimate the number of workers in these jobs (Table 1). The commonly used datasets are Occupational Information Network (O*NET), Programme for the International Assessment of Adult Competencies (PIAAC), Skills Towards Employability and Productivity (STEP), American Time Use Survey (ATUS), and household and labor force surveys.

TABLE 1. Summary of telework literature by country/ies and datasets used

Literature	Country/ Countries	Datasets used
Dingel and Neiman [2020]	United States	O*NET
Mongey et al. [2020]	United States	Current Population Survey (CPS);
		Panel Study of Income Dynamics (PSID);
		O*NET;
		American Time Use Survey
Hensvik et al. [2020]	United States	American Time Use Survey
Leibovici et al. [2020]	United States	American Community Survey;
		O*NET
Office for National Statistics [2020]	United Kingdom	Annual Population Survey
Holgersen et al. [2020]	Norway	ISCO-08
Foschiatti and Gasparini [2020]	Argentina	O*NET;
		Permanent Household Survey
Martins [2020]	Portugal	Personnel Tables
Guntin [2020]	Uruguay	O*NET;
		Continuous Household Survey
Gaduena et al. [2020]	Philippines	Merged Family Income and Expenditure Survey (FIES) and Labor Force Survey (LFS) data;
		O*NET
ILO [2020]	118 countries	Labor force surveys
Brussevich et al. [2020]	35 countries	Occupation-level classification of feasibility of working from home derived by Dingel and Neiman [2020] for the US;
		Individual-level data from the OECD's Programme for the International Assessment of Adult Competencies (PIAAC)
Sanchez et al. [2020]	107 countries	Occupational-level data for 107 countries from the ILO;
		Individual-level data from labor force surveys
Gottlieb et al. [2020]	57 countries	Labor force and household surveys

TABLE 1. Summary of telework literature by country/ies and datasets used (continued)

Literature	Country/ Countries	Datasets used
Hatayama et al. [2020]	53 countries	Surveys of Adult Skills of Programme for the International Assessment of Adult Competencies (PIAAC);
		STEP (Skills Towards Employability and Productivity);
		Labor Market Panel Surveys (LMPS)
Boeri et al. [2020]	Various European countries (Italy, France, Germany, Spain, Sweden, UK)	O*NET;
		Survey of the Italian Statistical Office and National Institute for Public Policy Analysis (INAPP)

Source: Author's compilation.

The most commonly cited and adopted 'telework' or WFH measure is the binary classification of US occupations by Dingel and Neiman [2020]. It has been applied by Sanchez et al. [2020], Brussevich et al. [2020], Gottlieb et al. [2020], Boeri et al. [2020], Foschiatti and Gasparini [2020], Guntin [2020], and Gaduena et al. [2020] in different country and regional contexts. The primary data sources Dingel and Neiman [2020] used are the "Work Context" and "Generalized Work Activities" surveys of the O*NET. If at least one of the following selected conditions in the surveys are met, then the job is not feasible to be done at home. The conditions in the "Work Context" survey include working outdoors every day, weekly exposure to diseases, infections, burns, etc., infrequent email usage, requires walking and running. On the other hand, the conditions in the "Generalized Work Activities" survey are performance of physical activities, operating, maintaining and repairing vehicles, mechanized devices, or equipment are working with the public. They classified an O*NET US occupation as either feasible to be done at home or not and combined these with information from the US Bureau of Labor Statistics (BLS) on the aggregate frequency of these occupations and their corresponding area and industry codes. They found that the 37 percent of US jobs can be plausibly performed at home to significantly vary across cities and industries. They also employed an alternative classification scheme, which manually assigns an occupation values of 0, 0.5 or 1 based on introspection. This alternative measure estimated that approximately 32 percent of all US jobs can be performed almost entirely at home.

Hatayama et al. [2020] constructed a continuous WFH index of occupations in 53 countries using multiple datasets, which are the Surveys of Adult Skills of the PIAAC of Organization for Economic Co-operation and Development (OECD), STEP of World Bank, and Labor Market Panel Surveys (LMPS). In their classification process, they used four task indices which are related to manual, face to face, information and communication technology (ICT) use and internet connection. However, contrary to the methodology of Dingel and Neiman [2020], they did not use the classification criterion of at least one sufficient condition but instead argue that the more (less) these WFH conditions are met, the lower (higher) the plausibility of a given job to be carried out at home.

Internet access as a key determinant in determining the 'teleworkability' of an occupation is highlighted by Sanchez et al. [2020]. Moreover, Mongey et al. [2020] account for physical proximity in analyzing the 'teleworkability' of US occupations by merging the occupational information from O*NET and Occupational Employment Statistics (OES) of the US Bureau of Labor Statistics. To determine heterogeneity across demographic characteristics, they matched these with the Current Population Survey (CPS) and the Panel Study of Income Dynamics (PSID).

On the other hand, ILO [2020b] uses the Delphi approach, which asks labor market specialists to calculate the probabilities that an occupation category can be feasibly done at home, for 118 countries. To reduce the potential idiosyncratic effects of each respondent, the estimates are pooled. Then, household surveys and labor market administrative data are used to provide the employment profiles for each occupation group. For countries with available occupational data at least at the 3-digit level, a single standard was used, which is the International Standard Classification of Occupations (ISCO-08). Similarly, in Norway, Holgersen et al. [2020] involved respondents from an online labor marketplace, Amazon Mechanical Turk (MTurk), to evaluate the likelihood that the tasks of occupations outlined in ISCO-08 be performed from home. However, it must be noted that in occupations where there are both 'teleworkable' and 'non-teleworkable' tasks, respondents are obliged to come up with a binary index by deciding which set of tasks constitute the substantial part of the occupation of interest.

In the context of the Philippine labor market, Gaduena et al. [2020] estimated the telework potential of Philippine jobs by directly applying the WFH classification of Dingel and Neiman [2020]. The matching of Philippine and US occupations are based on Francisco et al. [2020]. They found that 105 out of 408 unique occupations (25.7 percent) in the Philippine Standard Occupational Classification (PSOC) can be performed at home. Using the merged 2015 Family Income and Expenditure Survey (FIES) and 2016 Labor Force Survey (LFS), they determined that only about 12 percent of the employed workers are in 'teleworkable' occupations. They also described the demographic and employment-related characteristics of workers in these occupations and their industry distribution.

However, amidst this expanding strand of 'telework' literature, there are still gaps. First, applying the binary index of Dingel and Neiman [2020] to other countries, especially cross-country comparisons (i.e., matching 5-digit SOC level for US to 1- to 2-digit ISCO), is problematic for two reasons. Heterogeneity across narrower occupational groups (5-digit SOC) is lost when its WFH classification is applied to broader groups (1- to 2-digit ISCO). Also, the cross-country differences in the production processes and technological capacity makes the comparison in terms of the 'teleworkability' of the same occupation questionable. Second, there are relatively few studies in the context of low-income countries which can be attributed to the lack of quality data, experts, and data infrastructure. Finally, except for a few studies (Hatayama et al. [2020]; Mongey et al. [2020]; Leibovici et al. [2020]), the primary goal has been to classify which jobs can be done at home, by constructing binary 'teleworkability' or WFH indices. This ignores the possibility that some tasks of a particular job can be done at home. This suggests that a continuous 'teleworkability' index is more useful and relevant than the binary index. This study attempts to address these gaps by adopting a task-based framework and constructing continuous 'teleworkability' indices of occupations.

3. Telework classification of occupational tasks

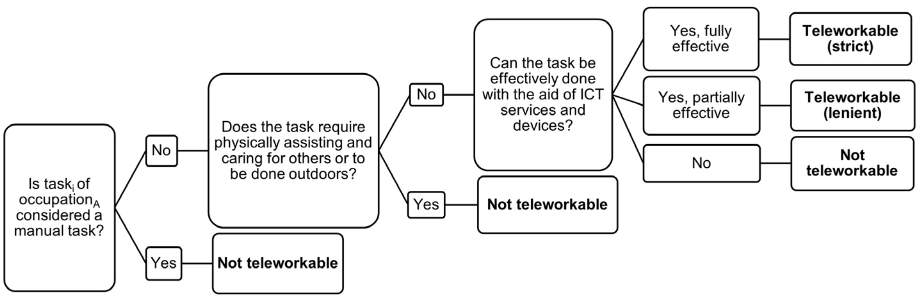
To apply the task-based framework, this study uses the International Standard Classification of Occupations 2008 (ISCO-08) of the International Labour Organization (ILO) which contains the needed task information of occupations. It also provides internationally comparable occupational data. It is a four-level hierarchically structured classification that allows jobs to be classified into 436-unit groups (4-digit), 130 minor groups (3-digit), 43 sub major groups (2-digit) and ten major groups (1-digit). Only 427 occupations are included in the analyses because the other nine occupations do not have task information. These are the services managers not elsewhere classified, process control technicians not elsewhere classified, other artistic and cultural associate professionals, sales workers not elsewhere classified, handicraft workers not elsewhere classified, stationary plant and machine operators not elsewhere classified, commissioned armed forces officers, non-commissioned armed forces officers, and armed forces occupations (other ranks).

The first step in deriving the 'teleworkability' indices requires individually classifying each of the 3,281 tasks performed in all 427 occupations as 'teleworkable' or 'non-teleworkable.' Each task will undergo the classification process depicted in Figure 1. There are three rounds in this classification process which aim to classify the task as belonging to one of the following categories:

1. Manual (Autor et al. [2003]; Spitz Oener [2006]; Antonczyk et al. [2009]; Generalao [2019]; Dingel and Neiman [2020]; Foschiatti and Gasparini [2020])
2. Outdoors (Dingel and Neiman [2020]; Foschiatti and Gasparini [2020]; Boeri et al. [2020])

3. Assisting and caring for others (Acemoglu and Autor [2011]; Dingel and Neiman [2020]; Firpo et al. [2011]; Jensen and Kletzer [2010]; Foschiatti and Gasparini [2020])
4. Use of ICT devices and services [e.g., internet connection] (Sanchez et al. [2020]; Hatayama et al. [2020]; Jensen and Kletzer [2010])
5. Teleworkable (strict)
6. Teleworkable (lenient)

FIGURE 1. The telework classification process of tasks



Source: Author's illustration.

Table 2 lists some of the relevant keywords used in the literature to guide the classification process. Note that in the first round of the process, we can use the results of the task classification process of Generalao [2019] because his task classification process of occupations is also based on ISCO-08 and classified occupations as manual (e.g., non-routine or routine manual). The last two columns of Table 2 suggest that a task which involves some sort of directing, supervising, leading, negotiating, is not 'teleworkable' because it is not effective if not done onsite. We also identify some keywords that pertain to tasks that can still be carried over through the use of ICT services and devices, but only partially effective. For instance, we can observe the prevalence of entertainment shows done virtually. Although it results in diminished entertainment experience of the viewers, the task is still performed. Hence, we add the keywords: act or perform. The next step requires us to randomly verify at least 10 percent of the tasks classified.

TABLE 2. Selected keywords used in the classification process

Manual	Outdoors/ Onsite	Assisting and Caring for Others	Use of ICT Devices and Services	
			Effectivity Issue	*Partial Effectivity Issue*
Equip or operate	Deliver	Nurse	Direct	Consult
Repair or renovate	Escort	Heal	Supervise	Advise
Install	Inspect	Treat	Lead	Represent
Clean	Secure	Disease	Negotiate	Preside
Serve	Monitor	Administer	Evaluate	Confer
Pack	Sort	Care	Discipline	Liaise
Fabricate	Examine	Observe	Assessing (context-based)	Buy or sell (context-based)
Transport	Distribute	Diagnosing	Oversee	Collaborate
Stock	Travel	Conducting	Manage	Act or perform

Source: Compilation of the author from multiple sources.

After the classification process of all tasks, the 'teleworkability' score of Occupation A is calculated following Equation 1. In order to compare the scores across occupations, we normalize these values with mean zero and standard deviation equal to one.

$$Score_{\mathrm{A}} = (Number\ of\ teleworkable\ tasks/Total\ number\ of\ tasks) \times 100 \qquad (1)$$

For better understanding of the classification process, the case of aged care service managers (ISCO-08 4-digit code: 1343) is examined (Table 3). There are ten tasks performed by aged care service managers. As previously mentioned, in the first round, we use the task type classification of Generalao [2019] to classify manual tasks as 'non-teleworkable.' Since no tasks have been identified as either non-routine manual or routine manual, all the tasks survive the first round. Now we check whether each task satisfies any of the keywords we listed before. To effectively monitor procedures, direct, supervise and evaluate the work activities of the staff, an aged care service manager must be on-site. Since one of its tasks requires negotiating, then that particular task faces an effectivity issue. On the other hand, the last task of budget planning and report preparation can be effectively done at home.

TABLE 3. Telework task classification of aged care service managers

Task	Task type (Source: Generalao [2019])	Type	Teleworkable classification	
			Lenient	Strict
Providing overall direction and management for a service, facility, organization or centre;	Routine cognitive	Partial effectivity issue	Teleworkable	Not leworkable
Developing, implementing and monitoring procedures, policies and performance standards for nursing, personal care, technical and administrative staff;	Non-routine analytical	Outdoors/ On-site	Not Teleworkable	Not Teleworkable
Establishing objectives and evaluative or operational criteria for units they manage;	Non-routine interpersonal	Partial effectivity issue	Teleworkable	Not Teleworkable
Directing or conducting recruitment, hiring and training of personnel;	Non-routine analytical	Effectivity issue	Not Teleworkable	Not Teleworkable
Coordinating and administering welfare programs and care services for the elderly;	Non-routine interpersonal	Teleworkable	Teleworkable	Teleworkable
Liaising with other health and welfare providers, boards and funding bodies to coordinate the provision of services;	Routine cognitive	Partial effectivity issue	Teleworkable	Not Teleworkable
Directing, supervising and evaluating the work activities of medical, nursing, technical, clerical, service, maintenance and other personnel;	Non-routine analytical	Outdoors/ On-site	Not Teleworkable	Not Teleworkable
Advising government bodies about measures to improve health and welfare services and facilities;	Non-routine interpersonal	Partial effectivity issue	Teleworkable	Not Teleworkable
Representing the organization in negotiations, and at conventions, seminars, public hearings and forums;	Non-routine analytical	Effectivity issue	Not Teleworkable	Not Teleworkable
Controlling administrative operations such as budget planning, report preparation, and expenditure on supplies, equipment and services.	Non-routine interpersonal	Teleworkable	Teleworkable	Teleworkable

The results of the telework task classification process of all occupations are available upon request from the author.
Source: Author's classification process.

4. 'Teleworkability' indices of occupations

To compare the 'teleworkability' across occupations, the values derived from Equation 1 are then normalized. Table 4 shows the comparison of three occupations; namely, aged care service managers, security guards, and financial analysts, in terms of 'teleworkability.' Regardless of definition, security guards perform tasks that are classified as 'non-teleworkable' while the tasks of financial analysts are all 'teleworkable.' The definition seems to play a role in the 'teleworkability' of an aged care services manager. If the lenient definition is adopted, then 50 percent of its tasks are 'teleworkable.' If the strict one is used, then only 30 percent of its tasks are deemed 'teleworkable.' These results clearly suggest that the most 'teleworkable' occupation among the three is the financial analyst, followed by aged care services manager, and then the security guard. Applying this classification process across all occupations results in the estimation of the 'teleworkability' scores of all 427 occupations listed in Table A1 in the Appendix.

The distribution of occupations by 'teleworkability' or telework potential is presented in Table 5. Out of the 427 occupations, only 35 to 43 occupations (8 to 10 percent) have tasks that are all classified as 'teleworkable.' On the other hand, a higher number of occupations, 152 to 157 (35 to 37 percent) only require performance of 'non-teleworkable' tasks. The rest of the occupations consists a combination of both 'teleworkable' and 'non-teleworkable' tasks and comprises the largest share (54 to 55 percent). If we lower the threshold from 100 percent to only 80 percent of tasks, then there will be an additional 23 to 26 occupations from the base list of occupations.

Table 6 lists all the occupations where all tasks are classified as 'teleworkable'. These are occupations that primarily involve non-routine cognitive tasks, which involve analysis and interpretation of data and information and creative thinking, and routine cognitive tasks such as repetitive tasks and that require accuracy in execution. The last column pertains to the additional occupations included if we use the lenient definition.

TABLE 4. 'Teleworkability' scores of selected occupations by classification

Classification	Aged Care Services Managers		Security Guards		Financial Analysts	
	%	Normalized Values	%	Normalized Values	%	Normalized Values
Teleworkable (lenient)	50	0.517	0	-0.989	100	2.023
Teleworkable (strict)	30	0.011	0	-0.954	100	2.263

Source: Results of author's calculations.

TABLE 5. Distribution of occupations by 'teleworkability' score

Threshold (%)	Telework classification			
	Strict		Lenient	
	Total	% (n= 427)	Total	% (n= 427)
100	35	8.2	43	10.07
≥ 80	58	13.58	69	16.16
≥ 60	90	21.08	109	25.53
≥ 40	148	34.66	168	39.34
≥ 20	220	51.52	225	52.69
≥ 0	270	63.23	275	64.4
0	157	36.77	152	35.6

Source: Results of author's calculations.

TABLE 6. Occupations with 100 percent 'teleworkable' tasks by classification

Strict				Lenient
Legal Professionals Not Elsewhere Classified	Web and Multimedia Developers	Clearing and Forwarding Agents	Coding, Proof-reading and Related clerks	Town and Traffic Planners
Systems Administrators	Database Designers and Administrators	Web Technicians	Inquiry Clerks	Advertising and Marketing Professionals
Announcers on Radio, Television and Other Media	Computer Network Professionals	Debt Collectors and Related Workers	Statistical, Finance and Insurance Clerks	Policy Administration Professionals
Translators, Interpreters and Other Linguists	Software and Applications Developers and Analysts Not Elsewhere Classified	Data Entry Clerks	Bank Tellers and Related Clerks	Database and Network Professionals Not Elsewhere Classified
Systems Analysts	Economists	General Office Clerks	Typists and Word Processing Operators	Actors
Financial Analysts	Credit and Loans Officers	Scribes and Related Workers	Clerical Support Workers Not Elsewhere Classified	Musicians, Singers and Composers
Authors and Related Writers	Government Social Benefits Officials	Personnel Clerks	Payroll Clerks	Commercial Sales Representatives
Financial and Investment Advisers	Government Tax and Excise Officials	Accounting and Bookkeeping Clerks	Contact Centre Salespersons	Contact Centre Information Clerks
Applications Programmers	Employment Agents and Contractors	Secretaries (general)	Coding, Proof-reading and Related clerks	

Source: Results of author's classification process.

On the other hand, Table 7 enumerates selected occupations where all of its tasks are considered 'non-teleworkable'. These occupations are mostly non-routine manual and routine manual in nature. Non-routine manual occupations involve the performance of tasks that are associated with finger and hand dexterity, spatial orientation, and operating vehicles or mechanized devices, while routine manual occupations are highly dependent on the speed of equipment and controlling machines and processes.

TABLE 7. Selected occupations with 100 percent 'non-teleworkable' tasks (strict classification)

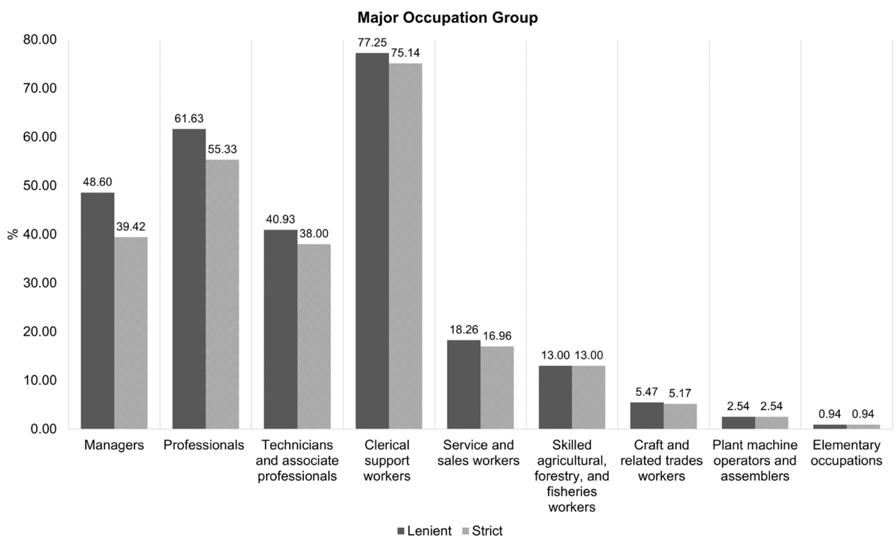
Chemical and Physical Science Technicians	Bartenders	Building Frame and Related Trades Workers Not Elsewhere Classified	Dairy Products Makers	Food and Related Products Machine Operators
Civil Engineering Technicians	Domestic Housekeepers	Floor Layers and Tile Setters	Fruit, Vegetable and Related Preservers	Glass and Ceramics Plant Operators
Construction Supervisors	Companions and Valets	Glaziers	Cabinet-makers and Related Workers	Bus and Tram Drivers
Chemical Processing Plant Controllers	Fashion and Other Models	Building Structure Cleaners	Fumigators and Other Pest and Weed Controllers	Earthmoving and Related Plant Operators
Agricultural Technicians	Forestry and Related Workers	Agricultural and Industrial Machinery Mechanics and Repairers	Craft and Related Workers Not Elsewhere Classified	Crane, Hoist and Related Plant Operators
Forestry Technicians	Deep-sea Fishery Workers	Bicycle and Related Repairers	Chemical Products Plant and Machine Operators	Domestic Cleaners and Helpers
Air Traffic Controllers	Bricklayers and Related Workers	Electrical Mechanics and Fitters	Fiber Preparing, Spinning and Winding Machine Operators	Cleaners and Helpers in Offices, Hotels and Other Establishments
Air Traffic Safety Electronics Technicians	Concrete Placers, Concrete Finishers and Related Workers	Electrical Line Installers and Repairers	Bleaching, Dyeing and Fabric Cleaning Machine Operators	Crop Farm Laborers
Ambulance Workers	Carpenters and Joiners	Butchers, Fishmongers and Related Food Preparers	Fur and Leather Preparing Machine Operators	Garden and Horticultural Laborers

Source: Results of author's classification process.

5. Correlates of 'teleworkability' or telework potential

Figure 2 summarizes the average 'teleworkability' scores of occupations by major occupation group (ISCO-08 1-digit). As expected, those occupations under the clerical support workers, professionals, and managers recorded the highest telework potential. It is lowest among elementary, plant machine operators and assemblers, and craft and related trade workers. The results of the classification process are also intuitive in terms of skill level and formal education requirement (Figures 3 and 4). That is, the higher (lower) the skill level and formal educational requirement that an occupation entails, the higher (lower) its telework potential.

FIGURE 2. Average 'teleworkability' by major occupation group, ISCO-08

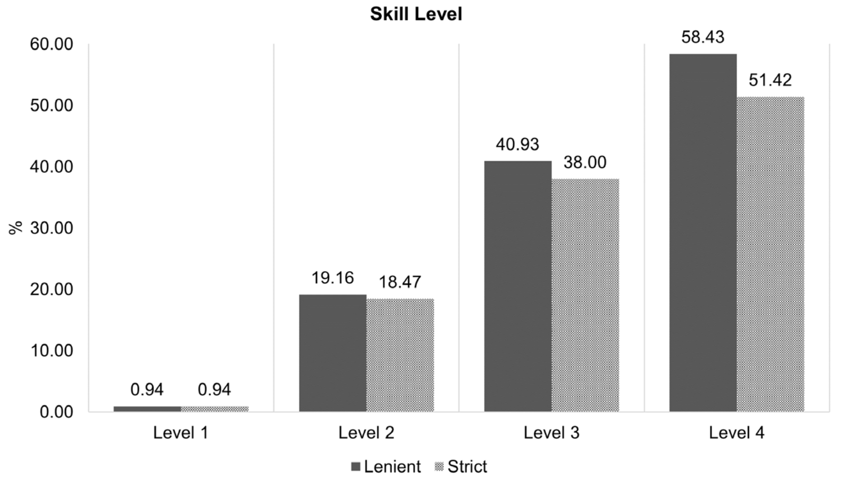


Notes: The means of the teleworkability indices are calculated within major occupation groups. Color shows details about the teleworkability index classification adopted.
Source: Author's calculations.

6. Application of the 'teleworkability' indices: case of Philippine jobs

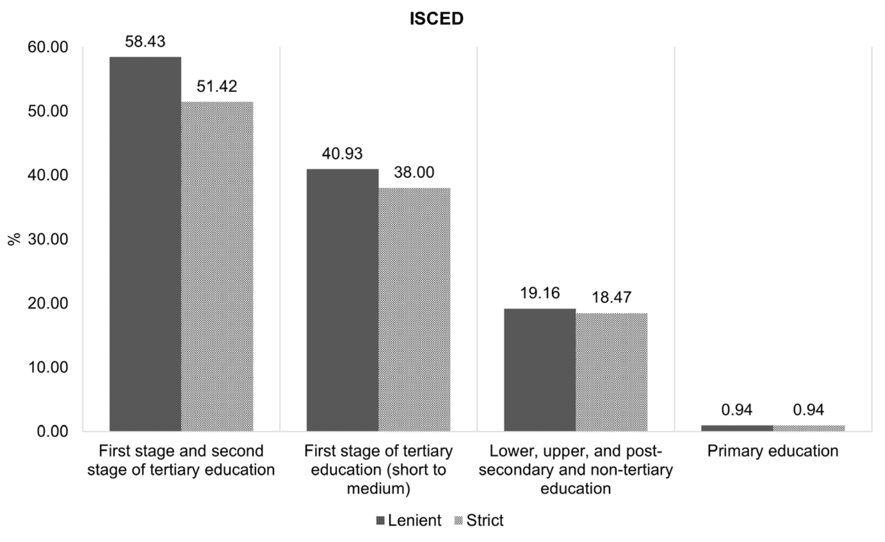
The 'teleworkability' indices we developed from ISCO-08 can be applied to Philippine jobs for two important reasons. The local occupational code in the Philippines, the 2012 Philippine Standard Occupational Classification (PSOC), is basically patterned after ISCO-08 with few modifications. This allows us to match 4-digit ISCO-08 with that of 4-digit PSOC. Moreover, in terms of task contents, there is no significant difference among ISCO-08, PSOC and BLE Career Guide as elaborated by Generalao [2019].

FIGURE 3. Average 'teleworkability' by skill level, ISCO-08



Notes: The means of the teleworkability indices are calculated within skill levels. Color shows details about the teleworkability index classification adopted.
Source: Author's calculations.

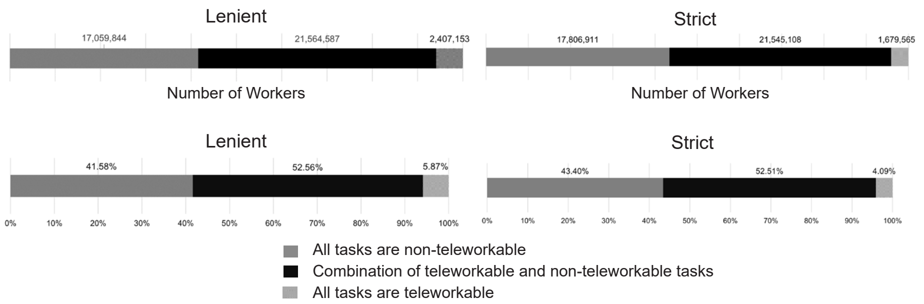
FIGURE 4. Average 'teleworkability' by formal education requirement, ISCED-97



Source: Author's calculations.

This study estimates that only 1.7 to 2.4 million workers or 4 to 6 percent of the employed workers are in occupations where all tasks are 'teleworkable.' On the other hand, 17 to 18 million (42 to 43 percent) are in occupations where all tasks are 'non-teleworkable.' The majority of workers, about 22 million or 53 percent, are in occupations with a mix of the two types of tasks (Figure 5).

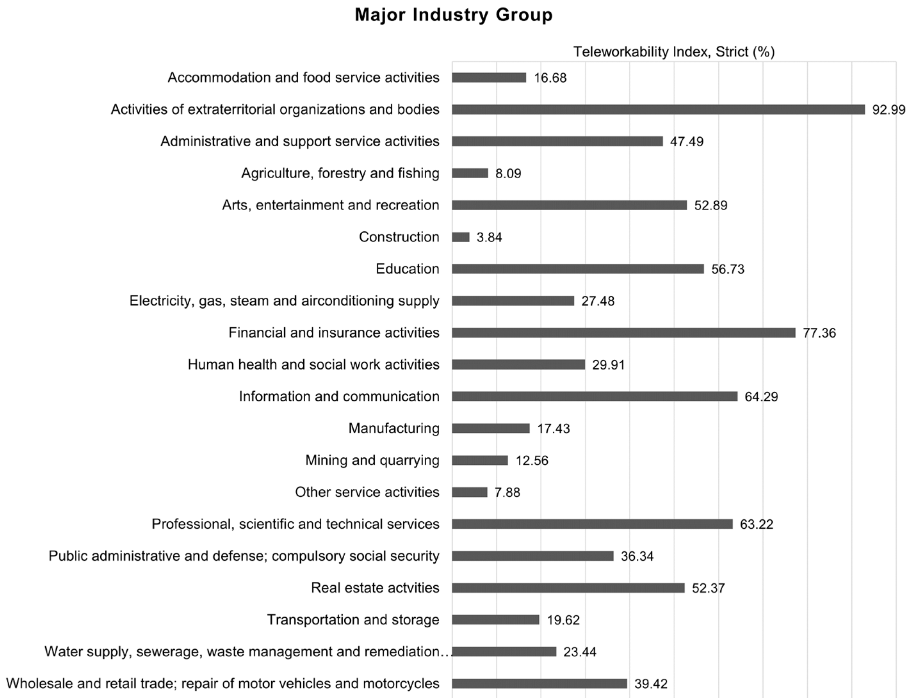
FIGURE 5. Distribution of workers by 'teleworkability' classification



Source: Author's calculations.

The weighted average 'teleworkability' of occupations across industries are presented in Figure 6. Occupations in the construction, other services, agriculture and mining industries recorded the lowest average telework potential. On the other hand, occupations with the highest telework potential are in the industries of information and communication, financial and insurance, and extraterritorial organizations. These results have important implications on the magnitude of labor market disruptions caused by pandemics, such as COVID-19. To stem the transmission of the virus, international and domestic borders and physical workplaces were temporarily closed in varying degrees multiple times and for an uncertain period of time. Workers employed in occupations with high risk of transmission (i.e., requires close contact and presence in physical offices and workplaces, etc.) will be disproportionately at heightened risk of experiencing job disruptions, such as massive lay-offs, furloughs, and reduced working hours. In fact, ILO (2020c) identified the industries facing the highest risk of job disruption due to the COVID-19 crisis, namely, manufacturing; transportation and storage; accommodation and food service activities; arts, entertainment and recreation; and tourism. Using the latest available data, the study also found that the industries under this risk classification recorded the highest actual job losses and reductions in working hours. Unsurprisingly, Figure 6 shows that these industries are also those with occupations with the lowest telework potential. Thus, these findings can potentially guide policymakers in determining which industries can be excluded in lockdown or community quarantine measures. In terms of income support, the government can use the telework classification to restructure and prioritize the aid distribution among workers affected by the pandemic.

FIGURE 6. Weighted average 'teleworkability' of Philippine occupations by major industry group, 2018



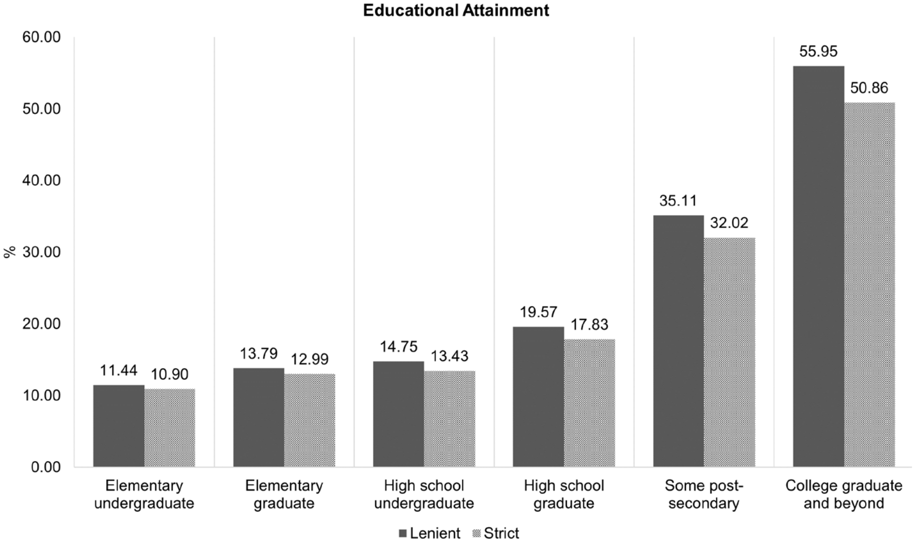
Source: Author's calculations.

The relationship between the telework potential of Philippine jobs and the educational attainment of workers is consistent with that of ISCO-08. That is, individuals with higher educational attainment are employed in jobs with higher telework potential (Figure 7). This suggests that workers who are better educated are less likely to suffer from workplace closures and quarantine protocols imposed to contain the transmission of COVID-19. Also, more educated individuals are better positioned to reap the benefits of technological advances, coupled with the circumstances of the pandemic, as firms and businesses transition to alternative work arrangements, such as teleworking. The government can facilitate this shift by equipping workers with the necessary skills to upskill and reskill through engagement in technical and vocational education and training (TVET).

Finally, it is expected to see that highly 'teleworkable' jobs are predominantly located in developed regions such as National Capital Region (NCR), CALABARZON, and Central Luzon while those with jobs with low telework potential are in less developed ones which include Bicol, ARMM, SOCCSKSARGEN, Zamboanga Peninsula, and Cagayan Valley (Figure 8). The unequal development and access to ICT devices and services across regions reflect the disparity in the quality of jobs available to the workforce. Investments in adequate ICT infrastructure, especially among geographically isolated and disadvantaged areas, can level the playing field and spur growth in higher skilled, better paying, 'teleworkable' jobs.

As previously noted, this is not the first attempt to estimate the telework potential of Philippine jobs. Gaduena et al. [2020] estimated that 25.7 percent of the total number of unique occupations (408 4-digit PSOC) can be done at home. Also, they found that a smaller proportion, 12 percent of the total number of employed workers are currently working in these occupations. They relied on the WFH classification of US occupations by Dingel and Neiman [2020] and matched these with Philippine occupations to derive a binary WFH or 'teleworkable' index. However, their index may suffer from two issues as elaborated in a previous discussion in this paper. The first one is the difference in the work profiles and ICT infrastructure between the two countries which may lead to inaccurate estimates of WFH classification. The second is the binary nature of the index which disregards the possibility that there are certain tasks of an occupation that can be feasibly done at home.

FIGURE 7. Weighted average 'teleworkability' of Philippine jobs by educational attainment of workers, 2018

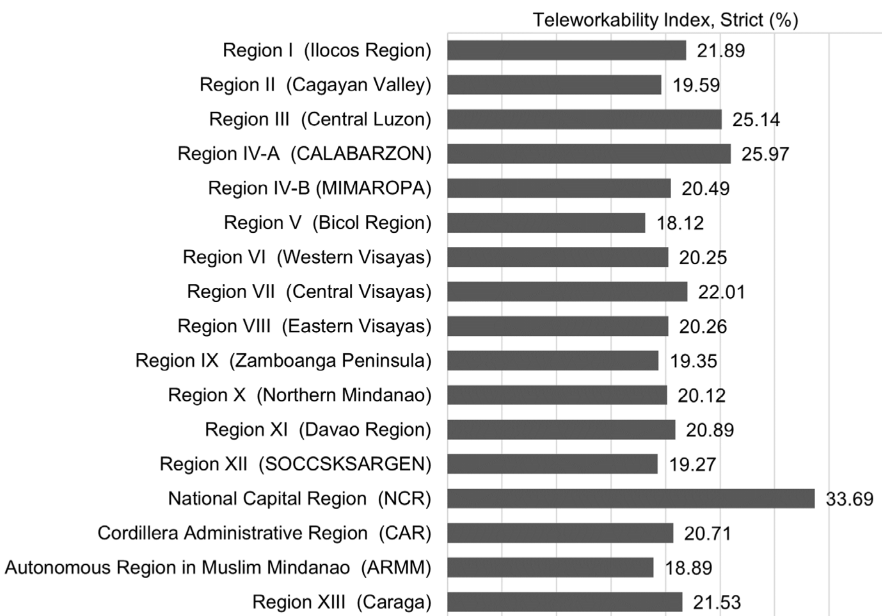


Source: Author's calculations.

Nevertheless, the indices developed in this study also have key limitations. There are other unaccounted factors in the index developed which affect the degree to which a task can be performed offsite. These include the level of internet connectivity in the alternative worksite and the availability and quality of ICT devices. Thus, increased productivity is not necessarily guaranteed and may even decline from these accelerated work adjustments. Clear monitoring and implementing guidelines for alternative work arrangements (e.g., teleworking), derived from exhaustive consultations and review, are needed to properly guide employers and employees with their corresponding rights, duties, and responsibilities.

There are also drawbacks from the dataset and methodology used to derive the indices. For one, due to the nature of the task contents elaborated in ISCO-08, the relative intensity of each task in each occupation are unaccounted for. That is, we do not have information on how more frequent and thus more intensive a task of a particular occupation. Another limitation is the relatively static nature of the task contents in ISCO-08. Finally, the method we used assumes that the ICT infrastructure in the country of interest can effectively support teleworking.

FIGURE 8. Weighted average 'teleworkability' of Philippine occupations by region, 2018



Notes: Using the 2018 labor force survey (LFS), the teleworkability indices are calculated within regions among employed workers. The estimates are weighted using sampling weights.
Source: Author's calculations.

7. Conclusions and ways forward

Together with fast-paced technological advances, COVID-19 has transformed the nature of work by changing how specific tasks are performed. The resulting pandemic has triggered and accelerated the shift of firms and businesses to adopt flexible alternative work arrangements such as teleworking or WFH set-ups. Effectively harnessing these developments and transitioning to the 'new normal' of work require an understanding of the telework potential of jobs or the degree to which a job can be feasibly done at home or offsite. However, most studies in the growing telework literature identified which jobs are 'teleworkable' or plausible to be done at home or offsite using a binary WFH index. This ignores the possibility that some tasks of a particular job can be feasibly done at home. Thus, this study adopts the task-based framework by constructing continuous 'teleworkability' indices.

Using the occupational task contents of ISCO-08, this study derives two 'teleworkability' indices, the values of which, quantify the telework potential of jobs. The correlates of these occupations, in terms of occupational groups, skill level, and formal education requirement, are also determined. Also, the indices are applied to Philippine occupations where distributions across industries, job and individual characteristics are also estimated.

The findings of this paper can potentially aid both the public and private sectors to restructure the nature of certain jobs. This can lead to the reduction of work hours onsite, spur improvements in work productivity, and decongest physical infrastructures, especially in densely populated areas. In addition, as high-income countries increase their propensity to offshore 'teleworkable' jobs for cost and efficiency purposes, this growth in international demand may expand opportunities for capable and quality domestic workers to gain more productive and higher paying jobs. However, to fully realize this potential, an adequate ICT infrastructure must be put into place. Effective training and social protection policies must exist to help the school-to-work and work-to-work transitions of the labor force. Laws should also be crafted to ascertain and institutionalize the protection of the rights of teleworkers.

The indices developed in this study have key limitations which include unaccounted factors, such as the level of internet connectivity in the alternative worksite and the availability and quality of ICT devices. Moreover, the dataset used, ISCO-08, does not account for the relative intensity of each task in each occupation and the tasks are relatively static in nature. Thus, assigning weights to the tasks of an occupation can be further explored to improve the 'teleworkability' indices developed. Incorporating the ICT infrastructure of particular regions or countries in the index can also significantly improve the measure. Finally, the indices derived in this study can be applied not only to Philippine jobs but to local jobs of countries which pattern their local occupation classification with ISCO-08.

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Appendix

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
2411	Accountants	87.5	75	1.6467	1.4585
4311	Accounting and Bookkeeping Clerks	100	100	2.0232	2.2627
3313	Accounting Associate Professionals	83.33	83.33	1.5212	1.7266
2655	Actors	100	85.71	2.0232	1.8032
3343	Administrative and Executive Secretaries	87.5	87.5	1.6467	1.8606
2431	Advertising and Marketing Professionals	100	77.78	2.0232	1.5479
1222	Advertising and Public Relations Managers	25	25	-0.2357	-0.1497
1343	Aged Care Services Managers	50	30	0.5173	0.0111
1311	Agricultural and Forestry Production Managers	16.67	16.67	-0.4867	-0.4178
7233	Agricultural and Industrial Machinery Mechanics and Repairers	0	0	-0.9887	-0.9539
3142	Agricultural Technicians	0	0	-0.9887	-0.9539
7127	Air Conditioning and Refrigeration Mechanics	25	25	-0.2357	-0.1497
3154	Air Traffic Controllers	0	0	-0.9887	-0.9539
3155	Air Traffic Safety Electronics Technicians	0	0	-0.9887	-0.9539
7232	Aircraft Engine Mechanics and Repairers	10	10	-0.6875	-0.6322
3153	Aircraft Pilots and Related Associate Professionals	14.29	14.29	-0.5584	-0.4944
3258	Ambulance Workers	0	0	-0.9887	-0.9539
6129	Animal Producers Not Elsewhere Classified	22.22	22.22	-0.3194	-0.2391
2656	Announcers on Radio, Television and Other Media	100	100	2.0232	2.2627
6123	Apiarists and Sericulturists	28.57	28.57	-0.1281	-0.0349
2514	Applications Programmers	100	100	2.0232	2.2627
1312	Aquaculture and Fisheries Production Managers	7.69	7.69	-0.757	-0.7065
6221	Aquaculture Workers	40	40	0.2161	0.3327
2621	Archivists and Curators	30	30	-0.0851	0.0111
8219	Assemblers Not Elsewhere Classified	20	20	-0.3863	-0.3106
5161	Astrologers, Fortune-tellers and Related Workers	33.33	33.33	0.0153	0.1183
3421	Athletes and Sports Players	12.5	12.5	-0.6122	-0.5518

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
2266	Audiologists and Speech Therapists	42.86	42.86	0.3021	0.4246
2641	Authors and Related Writers	100	100	2.0232	2.2627
7512	Bakers, Pastry-cooks and Confectionery Makers	0	0	-0.9887	-0.9539
4211	Bank Tellers and Related Clerks	100	100	2.0232	2.2627
5132	Bartenders	0	0	-0.9887	-0.9539
5142	Beauticians and Related Workers	25	25	-0.2357	-0.1497
7234	Bicycle and Related Repairers	0	0	-0.9887	-0.9539
2131	Biologists, Botanists, Zoologists and Related Professionals	37.5	37.5	0.1408	0.2523
7221	Blacksmiths, Hammersmiths and Forging Press Workers	14.29	14.29	-0.5584	-0.4944
8154	Bleaching, Dyeing and Fabric Cleaning Machine Operators	0	0	-0.9887	-0.9539
4212	Bookmakers, Croupiers and Related Gaming Workers	80	80	1.4208	1.6194
7112	Bricklayers and Related Workers	0	0	-0.9887	-0.9539
3521	Broadcasting and Audiovisual Technicians	28.57	28.57	-0.1281	-0.0349
7411	Building and Related Electricians	25	25	-0.2357	-0.1497
2161	Building Architects	66.67	55.56	1.0193	0.8331
5153	Building Caretakers	25	25	-0.2357	-0.1497
9313	Building Construction Labourers	0	0	-0.9887	-0.9539
7119	Building Frame and Related Trades Workers Not Elsewhere Classified	0	0	-0.9887	-0.9539
7133	Building Structure Cleaners	0	0	-0.9887	-0.9539
8331	Bus and Tram Drivers	0	0	-0.9887	-0.9539
3339	Business Services Agents Not Elsewhere Classified	83.33	83.33	1.5212	1.7266
1219	Business Services and Administration Managers Not Elsewhere Classified	40	40	0.2161	0.3327
7511	Butchers, Fishmongers and Related Food Preparers	0	0	-0.9887	-0.9539
3323	Buyers	70	40	1.1197	0.3327
7522	Cabinet-makers and Related Workers	0	0	-0.9887	-0.9539
8322	Car, Taxi and Van Drivers	12.5	12.5	-0.6122	-0.5518
7115	Carpenters and Joiners	0	0	-0.9887	-0.9539
2165	Cartographers and Surveyors	50	37.5	0.5173	0.2523
5230	Cashiers and Ticket Clerks	62.5	62.5	0.8938	1.0565

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
8114	Cement, Stone and Other Mineral Products Machine Operators	10	10	-0.6875	-0.6322
3434	Chefs	20	20	-0.3863	-0.3106
3111	Chemical and Physical Science Technicians	0	0	-0.9887	-0.9539
3116	Chemical Engineering Technicians	60	60	0.8185	0.976
2145	Chemical Engineers	50	50	0.5173	0.6544
3133	Chemical Processing Plant Controllers	0	0	-0.9887	-0.9539
8131	Chemical Products Plant and Machine Operators	0	0	-0.9887	-0.9539
2113	Chemists	44.44	44.44	0.35	0.4757
1341	Child Care Services Managers	44.44	44.44	0.35	0.4757
5311	Child Care Workers	12.5	12.5	-0.6122	-0.5518
9312	Civil Engineering Labourers	0	0	-0.9887	-0.9539
3112	Civil Engineering Technicians	0	0	-0.9887	-0.9539
2142	Civil Engineers	14.29	14.29	-0.5584	-0.4944
9112	Cleaners and Helpers in Offices, Hotels and Other Establishments	0	0	-0.9887	-0.9539
5151	Cleaning and Housekeeping Supervisors in Offices, Hotels and Other Establishments	12.5	12.5	-0.6122	-0.5518
3331	Clearing and Forwarding Agents	100	100	2.0232	2.2627
4419	Clerical Support Workers Not Elsewhere Classified	100	100	2.0232	2.2627
4229	Client Information Workers Not Elsewhere Classified	66.67	66.67	1.0193	1.1905
4413	Coding, Proof-reading and Related clerks	100	100	2.0232	2.2627
3322	Commercial Sales Representatives	100	71.43	2.0232	1.3436
3253	Community Health Workers	20	20	-0.3863	-0.3106
5162	Companions and Valets	0	0	-0.9887	-0.9539
3513	Computer Network and Systems Technicians	83.33	83.33	1.5212	1.7266
2523	Computer Network Professionals	100	100	2.0232	2.2627
7114	Concrete Placers, Concrete Finishers and Related Workers	0	0	-0.9887	-0.9539
3332	Conference and Event Planners	71.43	57.14	1.1627	0.8841
1323	Construction Managers	45.45	36.36	0.3804	0.2158
3123	Construction Supervisors	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
4222	Contact Centre Information Clerks	100	83.33	2.0232	1.7266
5244	Contact Centre Salespersons	100	100	2.0232	2.2627
5120	Cooks	16.67	16.67	-0.4867	-0.4178
7549	Craft and Related Workers Not Elsewhere Classified	0	0	-0.9887	-0.9539
8343	Crane, Hoist and Related Plant Operators	0	0	-0.9887	-0.9539
2659	Creative and Performing Artists Not Elsewhere Classified	25	25	-0.2357	-0.1497
3312	Credit and Loans Officers	100	100	2.0232	2.2627
9211	Crop Farm Labourers	0	0	-0.9887	-0.9539
3351	Customs and Border Inspectors	37.5	25	0.1408	-0.1497
7513	Dairy Products Makers	0	0	-0.9887	-0.9539
2653	Dancers and Choreographers	50	33.33	0.5173	0.1183
4132	Data Entry Clerks	100	100	2.0232	2.2627
2529	Database and Network Professionals Not Elsewhere Classified	100	87.5	2.0232	1.8606
2521	Database Designers and Administrators	100	100	2.0232	2.2627
4214	Debt Collectors and Related Workers	100	100	2.0232	2.2627
6223	Deep-sea Fishery Workers	0	0	-0.9887	-0.9539
3251	Dental Assistants and Therapists	12.5	12.5	-0.6122	-0.5518
2261	Dentists	16.67	16.67	-0.4867	-0.4178
2265	Dieticians and Nutritionists	71.43	57.14	1.1627	0.8841
3254	Dispensing Opticians	25	25	-0.2357	-0.1497
9111	Domestic Cleaners and Helpers	0	0	-0.9887	-0.9539
5152	Domestic Housekeepers	0	0	-0.9887	-0.9539
5243	Door-to-door Salespersons	42.86	42.86	0.3021	0.4246
3118	Draughtspersons	87.5	87.5	1.6467	1.8606
9332	Drivers of Animal-drawn Vehicles and Machinery	0	0	-0.9887	-0.9539
5165	Driving Instructors	50	33.33	0.5173	0.1183
2342	Early Childhood Educators	33.33	22.22	0.0153	-0.2391
8342	Earthmoving and Related Plant Operators	0	0	-0.9887	-0.9539
2631	Economists	100	100	2.0232	2.2627
1345	Education Managers	36.36	27.27	0.1066	-0.0766
2351	Education Methods Specialists	70	70	1.1197	1.2977

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
8212	Electrical and Electronic Equipment Assemblers	20	20	-0.3863	-0.3106
3113	Electrical Engineering Technicians	50	50	0.5173	0.6544
2151	Electrical Engineers	50	33.33	0.5173	0.1183
7413	Electrical Line Installers and Repairers	0	0	-0.9887	-0.9539
7412	Electrical Mechanics and Fitters	0	0	-0.9887	-0.9539
3114	Electronics Engineering Technicians	42.86	42.86	0.3021	0.4246
2152	Electronics Engineers	25	25	-0.2357	-0.1497
7421	Electronics Mechanics and Servicers	22.22	11.11	-0.3194	-0.5965
9629	Elementary Workers Not Elsewhere Classified	0	0	-0.9887	-0.9539
3333	Employment Agents and Contractors	100	100	2.0232	2.2627
2149	Engineering Professionals Not Elsewhere Classified	22.22	22.22	-0.3194	-0.2391
2263	Environmental and Occupational Health and Hygiene Professionals	40	40	0.2161	0.3327
3257	Environmental and Occupational Health Inspectors and Associates	50	40	0.5173	0.3327
2143	Environmental Engineers	44.44	22.22	0.35	-0.2391
2133	Environmental Protection Professionals	42.86	42.86	0.3021	0.4246
2132	Farming, Forestry and Fisheries Advisers	41.67	25	0.2663	-0.1497
5241	Fashion and Other Models	0	0	-0.9887	-0.9539
9411	Fast Food Preparers	0	0	-0.9887	-0.9539
8151	Fibre Preparing, Spinning and Winding Machine Operators	0	0	-0.9887	-0.9539
6111	Field Crop and Vegetable Growers	18.18	18.18	-0.441	-0.3691
4415	Filing and Copying Clerks	60	60	0.8185	0.976
2654	Film, Stage and Related Directors and Producers	42.86	42.86	0.3021	0.4246
1211	Finance Managers	62.5	37.5	0.8938	0.2523
2413	Financial Analysts	100	100	2.0232	2.2627
1346	Financial and Insurance Services Branch Managers	81.82	63.64	1.4756	1.093
2412	Financial and Investment Advisers	100	100	2.0232	2.2627
5411	Firefighters	16.67	16.67	-0.4867	-0.4178
9216	Fishery and Aquaculture Labourers	0	0	-0.9887	-0.9539
3423	Fitness and Recreation Instructors and Programme Leaders	16.67	16.67	-0.4867	-0.4178

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
7122	Floor Layers and Tile Setters	0	0	-0.9887	-0.9539
7515	Food and Beverage Tasters and Graders	20	20	-0.3863	-0.3106
8160	Food and Related Products Machine Operators	0	0	-0.9887	-0.9539
5246	Food Service Counter Attendants	12.5	12.5	-0.6122	-0.5518
6210	Forestry and Related Workers	0	0	-0.9887	-0.9539
9215	Forestry Labourers	0	0	-0.9887	-0.9539
3143	Forestry Technicians	0	0	-0.9887	-0.9539
9333	Freight Handlers	0	0	-0.9887	-0.9539
7514	Fruit, Vegetable and Related Preservers	0	0	-0.9887	-0.9539
7544	Fumigators and Other Pest and Weed Controllers	0	0	-0.9887	-0.9539
8155	Fur and Leather Preparing Machine Operators	0	0	-0.9887	-0.9539
3433	Gallery, Museum and Library Technicians	44.44	44.44	0.35	0.4757
9611	Garbage and Recycling Collectors	0	0	-0.9887	-0.9539
9214	Garden and Horticultural Labourers	0	0	-0.9887	-0.9539
6113	Gardeners, Horticultural and Nursery Growers	16.67	16.67	-0.4867	-0.4178
7532	Garment and Related Patternmakers and Cutters	16.67	16.67	-0.4867	-0.4178
4110	General Office Clerks	100	100	2.0232	2.2627
2211	Generalist Medical Practitioners	45.45	45.45	0.3804	0.5082
2114	Geologists and Geophysicists	33.33	33.33	0.0153	0.1183
8181	Glass and Ceramics Plant Operators	0	0	-0.9887	-0.9539
7315	Glass Makers, Cutters, Grinders and Finishers	7.69	7.69	-0.757	-0.7065
7125	Glaziers	0	0	-0.9887	-0.9539
3354	Government Licensing Officials	80	80	1.4208	1.6194
3359	Government Regulatory Associate Professionals Not Elsewhere Classified	50	50	0.5173	0.6544
3353	Government Social Benefits Officials	100	100	2.0232	2.2627
3352	Government Tax and Excise Officials	100	100	2.0232	2.2627
2166	Graphic and Multimedia Designers	80	80	1.4208	1.6194
5141	Hairdressers	25	25	-0.2357	-0.1497
9331	Hand and Pedal Vehicle Drivers	0	0	-0.9887	-0.9539
9121	Hand Launderers and Pressers	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
9321	Hand Packers	0	0	-0.9887	-0.9539
7318	Handicraft Workers in Textile, Leather and Related Materials	0	0	-0.9887	-0.9539
7317	Handicraft Workers in Wood, Basketry and Related Materials	0	0	-0.9887	-0.9539
3259	Health Associate Professionals Not Elsewhere Classified	25	25	-0.2357	-0.1497
5321	Health Care Assistants	0	0	-0.9887	-0.9539
2269	Health Professionals Not Elsewhere Classified	12.5	12.5	-0.6122	-0.5518
1342	Health Services Managers	40	20	0.2161	-0.3106
8332	Heavy Truck and Lorry Drivers	16.67	16.67	-0.4867	-0.4178
5322	Home-based Personal Care Workers	0	0	-0.9887	-0.9539
1411	Hotel Managers	10	10	-0.6875	-0.6322
4224	Hotel Receptionists	77.78	33.33	1.3539	0.1183
7111	House Builders	0	0	-0.9887	-0.9539
1212	Human Resource Managers	54.55	36.36	0.6542	0.2158
6224	Hunters and Trappers	0	0	-0.9887	-0.9539
3132	Incinerator and Water Treatment Plant Operators	0	0	-0.9887	-0.9539
2141	Industrial and Production Engineers	50	30	0.5173	0.0111
7422	Information and Communications Technology Installers and Servicers	14.29	14.29	-0.5584	-0.4944
3511	Information and Communications Technology Operations Technicians	37.5	37.5	0.1408	0.2523
2434	Information and Communications Technology Sales Professionals	71.43	28.57	1.1627	-0.0349
1330	Information and Communications Technology Services Managers	72.73	54.55	1.2018	0.8006
3512	Information and Communications Technology User Support Technicians	77.78	77.78	1.3539	1.5479
2356	Information Technology Trainers	83.33	83.33	1.5212	1.7266
6222	Inland and Coastal Waters Fishery Workers	0	0	-0.9887	-0.9539
4225	Inquiry Clerks	100	100	2.0232	2.2627
7124	Insulation Workers	0	0	-0.9887	-0.9539
3321	Insurance Representatives	50	50	0.5173	0.6544
3432	Interior Designers and Decorators	70	60	1.1197	0.976
7313	Jewellery and Precious metal Workers	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
2642	Journalists	90	90	1.722	1.941
2612	Judges	28.57	28.57	-0.1281	-0.0349
9412	Kitchen Helpers	0	0	-0.9887	-0.9539
2162	Landscape Architects	66.67	55.56	1.0193	0.8331
8157	Laundry Machine Operators	0	0	-0.9887	-0.9539
2611	Lawyers	40	40	0.2161	0.3327
3411	Legal and Related Associate Professionals	60	60	0.8185	0.976
2619	Legal Professionals Not Elsewhere Classified	100	100	2.0232	2.2627
3342	Legal Secretaries	85.71	85.71	1.593	1.8032
1111	Legislators	62.5	50	0.8938	0.6544
2622	Librarians and Related Information Professionals	44.44	44.44	0.35	0.4757
4411	Library Clerks	16.67	16.67	-0.4867	-0.4178
3141	Life Science Technicians (excluding Medical)	15.38	15.38	-0.5253	-0.459
8344	Lifting Truck Operators	0	0	-0.9887	-0.9539
6121	Livestock and Dairy Producers	15.38	15.38	-0.5253	-0.459
9212	Livestock Farm Labourers	0	0	-0.9887	-0.9539
8311	Locomotive Engine Drivers	0	0	-0.9887	-0.9539
4412	Mail Carriers and Sorting Clerks	0	0	-0.9887	-0.9539
2421	Management and Organization Analysts	55.56	55.56	0.6846	0.8331
1120	Managing Directors and Chief Executives	72.73	63.64	1.2018	1.093
9329	Manufacturing Labourers Not Elsewhere Classified	0	0	-0.9887	-0.9539
1321	Manufacturing Managers	50	41.67	0.5173	0.3863
3122	Manufacturing Supervisors	50	50	0.5173	0.6544
2120	Mathematicians, Actuaries and Statisticians	80	80	1.4208	1.6194
3115	Mechanical Engineering Technicians	37.5	37.5	0.1408	0.2523
2144	Mechanical Engineers	42.86	14.29	0.3021	-0.4944
8211	Mechanical Machinery Assemblers	20	20	-0.3863	-0.3106
3214	Medical and Dental Prosthetic Technicians	30	20	-0.0851	-0.3106
3212	Medical and Pathology Laboratory Technicians	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
3256	Medical Assistants	40	40	0.2161	0.3327
3211	Medical Imaging and Therapeutic Equipment Technicians	0	0	-0.9887	-0.9539
3252	Medical Records and Health Information Technicians	50	50	0.5173	0.6544
3344	Medical Secretaries	87.5	87.5	1.6467	1.8606
9621	Messengers, Package Deliverers and Luggage Porters	16.67	16.67	-0.4867	-0.4178
8122	Metal Finishing, Plating and Coating Machine Operators	0	0	-0.9887	-0.9539
7211	Metal Moulders and Coremakers	0	0	-0.9887	-0.9539
7224	Metal Polishers, Wheel Grinders and Tool Sharpeners	0	0	-0.9887	-0.9539
8121	Metal Processing Plant Operators	0	0	-0.9887	-0.9539
3135	Metal Production Process Controllers	14.29	14.29	-0.5584	-0.4944
7223	Metal Working Machine Tool Setters and Operators	0	0	-0.9887	-0.9539
2112	Meteorologists	44.44	44.44	0.35	0.4757
9623	Meter Readers and Vending-machine Collectors	14.29	14.29	-0.5584	-0.4944
3222	Midwifery Associate professionals	25	25	-0.2357	-0.1497
2222	Midwifery Professionals	25	25	-0.2357	-0.1497
8112	Mineral and Stone Processing Plant Operators	0	0	-0.9887	-0.9539
8111	Miners and Quarriers	0	0	-0.9887	-0.9539
3117	Mining and Metallurgical Technicians	37.5	37.5	0.1408	0.2523
9311	Mining and Quarrying Labourers	0	0	-0.9887	-0.9539
2146	Mining Engineers, Metallurgists and Related Professionals	33.33	22.22	0.0153	-0.2391
1322	Mining Managers	60	50	0.8185	0.6544
3121	Mining Supervisors	60	60	0.8185	0.976
6130	Mixed Crop and Animal Producers	40	40	0.2161	0.3327
9213	Mixed Crop and Livestock Farm Labourers	0	0	-0.9887	-0.9539
6114	Mixed Crop Growers	18.18	18.18	-0.441	-0.3691
8341	Mobile Farm and Forestry Plant Operators	0	0	-0.9887	-0.9539
7231	Motor Vehicle Mechanics and Repairers	0	0	-0.9887	-0.9539
8321	Motorcycle Drivers	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
7312	Musical Instrument Makers and Tuners	0	0	-0.9887	-0.9539
2652	Musicians, Singers and Composers	100	87.5	2.0232	1.8606
3221	Nursing Associate professionals	0	0	-0.9887	-0.9539
2221	Nursing Professionals	30	30	-0.0851	0.0111
9622	Odd-job Persons	0	0	-0.9887	-0.9539
3341	Office Supervisors	50	33.33	0.5173	0.1183
2267	Optometrists and Ophthalmic Opticians	28.57	28.57	-0.1281	-0.0349
2355	Other Arts Teachers	60	60	0.8185	0.976
9129	Other Cleaning Workers	0	0	-0.9887	-0.9539
2353	Other Language Teachers	50	50	0.5173	0.6544
2354	Other Music Teachers	72.73	72.73	1.2018	1.3854
8183	Packing, Bottling and Labelling Machine Operators	0	0	-0.9887	-0.9539
7131	Painters and Related Workers	0	0	-0.9887	-0.9539
8143	Paper Products Machine Operators	0	0	-0.9887	-0.9539
2240	Paramedical Practitioners	22.22	22.22	-0.3194	-0.2391
4213	Pawnbrokers and Money-lenders	40	40	0.2161	0.3327
4313	Payroll Clerks	100	100	2.0232	2.2627
7535	Pelt Dressers, Tanners and Fellmongers	0	0	-0.9887	-0.9539
5329	Personal Care Workers in Health Services Not Elsewhere Classified	0	0	-0.9887	-0.9539
5169	Personal Services Workers Not Elsewhere Classified	0	0	-0.9887	-0.9539
2423	Personnel and Careers Professionals	80	60	1.4208	0.976
4416	Personnel Clerks	100	100	2.0232	2.2627
5164	Pet Groomers and Animal Care Workers	0	0	-0.9887	-0.9539
3134	Petroleum and Natural Gas Refining Plant Operators	0	0	-0.9887	-0.9539
3213	Pharmaceutical Technicians and Assistants	11.11	11.11	-0.654	-0.5965
2262	Pharmacists	53.85	46.15	0.6331	0.5307
2633	Philosophers, Historians and Political Scientists	62.5	62.5	0.8938	1.0565
3431	Photographers	37.5	37.5	0.1408	0.2523
8132	Photographic Products Machine Operators	0	0	-0.9887	-0.9539
3119	Physical and Engineering Science Technicians Not Elsewhere Classified	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
2111	Physicists and Astronomers	54.55	45.45	0.6542	0.5082
2264	Physiotherapists	14.29	14.29	-0.5584	-0.4944
3255	Physiotherapy Technicians and Assistants	16.67	0	-0.4867	-0.9539
7123	Plasterers	0	0	-0.9887	-0.9539
8142	Plastic Products Machine Operators	0	0	-0.9887	-0.9539
7126	Plumbers and Pipe Fitters	20	20	-0.3863	-0.3106
3355	Police Inspectors and Detectives	0	0	-0.9887	-0.9539
5412	Police Officers	0	0	-0.9887	-0.9539
2422	Policy Administration Professionals	100	85.71	2.0232	1.8032
1213	Policy and Planning Managers	44.44	22.22	0.35	-0.2391
7314	Potters and Related Workers	9.09	9.09	-0.7149	-0.6615
6122	Poultry Producers	16.67	16.67	-0.4867	-0.4178
3131	Power Production Plant Operators	0	0	-0.9887	-0.9539
7311	Precision-instrument Makers and Repairers	0	0	-0.9887	-0.9539
7321	Pre-press Technicians	14.29	14.29	-0.5584	-0.4944
2341	Primary School Teachers	60	50	0.8185	0.6544
7323	Print Finishing and Binding Workers	0	0	-0.9887	-0.9539
7322	Printers	11.11	11.11	-0.654	-0.5965
5413	Prison Guards	0	0	-0.9887	-0.9539
2163	Product and Garment Designers	55.56	55.56	0.6846	0.8331
7543	Product Graders and Testers (excluding Foods and Beverages)	33.33	33.33	0.0153	0.1183
4322	Production Clerks	60	60	0.8185	0.976
1349	Professional Services Managers Not Elsewhere Classified	55.56	44.44	0.6846	0.4757
5419	Protective Services Workers Not Elsewhere Classified	20	20	-0.3863	-0.3106
2634	Psychologists	66.67	66.67	1.0193	1.1905
2432	Public Relations Professionals	87.5	62.5	1.6467	1.0565
8171	Pulp and Papermaking Plant Operators	0	0	-0.9887	-0.9539
8312	Railway Brake, Signal and Switch Operators	0	0	-0.9887	-0.9539
3334	Real Estate Agents and Property Managers	71.43	57.14	1.1627	0.8841
4226	Receptionists (general)	60	60	0.8185	0.976
9612	Refuse Sorters	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
3413	Religious Associate Professionals	33.33	0	0.0153	-0.9539
2636	Religious Professionals	44.44	22.22	0.35	-0.2391
1223	Research and Development Managers	50	37.5	0.5173	0.2523
1412	Restaurant Managers	40	40	0.2161	0.3327
1420	Retail and Wholesale Trade Managers	57.14	57.14	0.7324	0.8841
7215	Riggers and Cable Splicers	0	0	-0.9887	-0.9539
7121	Roofers	0	0	-0.9887	-0.9539
8141	Rubber Products Machine Operators	0	0	-0.9887	-0.9539
1221	Sales and Marketing Managers	62.5	50	0.8938	0.6544
5242	Sales Demonstrators	40	40	0.2161	0.3327
4414	Scribes and Related Workers	100	100	2.0232	2.2627
2330	Secondary Education Teachers	72.73	72.73	1.2018	1.3854
4120	Secretaries (general)	100	100	2.0232	2.2627
3311	Securities and Finance Dealers and Brokers	80	80	1.4208	1.6194
5414	Security Guards	0	0	-0.9887	-0.9539
1112	Senior Government Officials	88.89	77.78	1.6886	1.5479
1114	Senior Officials of Special-interest Organizations	66.67	66.67	1.0193	1.1905
5245	Service Station Attendants	25	25	-0.2357	-0.1497
8153	Sewing Machine Operators	0	0	-0.9887	-0.9539
7533	Sewing, Embroidery and Related Workers	0	0	-0.9887	-0.9539
7213	Sheet Metal Workers	0	0	-0.9887	-0.9539
9334	Shelf Fillers	0	0	-0.9887	-0.9539
8350	Ships' Deck Crews and Related Workers	0	0	-0.9887	-0.9539
3152	Ships' Deck Officers and Pilots	0	0	-0.9887	-0.9539
3151	Ships' Engineers	0	0	-0.9887	-0.9539
7536	Shoemakers and Related Workers	15.38	15.38	-0.5253	-0.459
8156	Shoemaking and Related Machine Operators	0	0	-0.9887	-0.9539
5223	Shop Sales Assistants	20	0	-0.3863	-0.9539
5222	Shop Supervisors	25	25	-0.2357	-0.1497
5221	Shopkeepers	57.14	42.86	0.7324	0.4246
7542	Shotfirers and Blasters	9.09	9.09	-0.7149	-0.6615
7316	Signwriters, Decorative Painters, Engravers and Etchers	35.71	35.71	0.087	0.1949

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
1344	Social Welfare Managers	60	40	0.8185	0.3327
2635	Social Work and Counselling Professionals	36.36	27.27	0.1066	-0.0766
3412	Social Work Associate Professionals	40	40	0.2161	0.3327
2632	Sociologists, Anthropologists and Related Professionals	66.67	66.67	1.0193	1.1905
2519	Software and Applications Developers and Analysts Not Elsewhere Classified	100	100	2.0232	2.2627
2512	Software Developers	87.5	62.5	1.6467	1.0565
2352	Special Needs Teachers	72.73	54.55	1.2018	0.8006
2212	Specialist Medical Practitioners	41.67	41.67	0.2663	0.3863
3422	Sports Coaches, Instructors and Officials	54.55	54.55	0.6542	0.8006
1431	Sports, Recreation and Cultural Centre Managers	44.44	44.44	0.35	0.4757
7132	Spray Painters and Varnishers	0	0	-0.9887	-0.9539
5211	Stall and Market Salespersons	28.57	28.57	-0.1281	-0.0349
4312	Statistical, Finance and Insurance Clerks	100	100	2.0232	2.2627
3314	Statistical, Mathematical and Related Associate Professionals	87.5	87.5	1.6467	1.8606
8182	Steam Engine and Boiler Operators	0	0	-0.9887	-0.9539
4321	Stock Clerks	40	40	0.2161	0.3327
7113	Stonemasons, Stone cutters, Splitters and Carvers	0	0	-0.9887	-0.9539
9510	Street and Related Services Workers	0	0	-0.9887	-0.9539
5212	Street Food Salespersons	20	20	-0.3863	-0.3106
9520	Street Vendors (excluding Food)	0	0	-0.9887	-0.9539
7214	Structural Metal Preparers and Erectors	0	0	-0.9887	-0.9539
6310	Subsistence Crop Farmers	0	0	-0.9887	-0.9539
6340	Subsistence Fishers, Hunters, Trappers and Gatherers	0	0	-0.9887	-0.9539
6320	Subsistence Livestock Farmer	0	0	-0.9887	-0.9539
6330	Subsistence Mixed Crop and Livestock Farmers	0	0	-0.9887	-0.9539
1324	Supply, Distribution and Related Managers	41.67	33.33	0.2663	0.1183
4227	Survey and Market Research Interviewers	40	40	0.2161	0.3327
9613	Sweepers and Related Labourers	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
2522	Systems Administrators	100	100	2.0232	2.2627
2511	Systems Analysts	100	100	2.0232	2.2627
7531	Tailors, Dressmakers, Furriers and Hatters	0	0	-0.9887	-0.9539
5312	Teachers' Aides	14.29	14.29	-0.5584	-0.4944
2359	Teaching Professionals Not Elsewhere Classified	81.82	54.55	1.4756	0.8006
2433	Technical and Medical Sales Professionals (excluding ICT)	75	66.67	1.2703	1.1905
3522	Telecommunications Engineering Technicians	60	60	0.8185	0.976
2153	Telecommunications Engineers	28.57	28.57	-0.1281	-0.0349
4223	Telephone Switchboard Operators	80	80	1.4208	1.6194
8159	Textile, Fur and Leather Products Machine Operators Not Elsewhere Classified	0	0	-0.9887	-0.9539
7516	Tobacco Preparers and Tobacco Products Makers	0	0	-0.9887	-0.9539
7222	Toolmakers and Related Workers	27.27	27.27	-0.1672	-0.0766
2164	Town and Traffic Planners	100	50	2.0232	0.6544
3324	Trade Brokers	66.67	50	1.0193	0.6544
3230	Traditional and Complementary Medicine Associate Professionals	33.33	16.67	0.0153	-0.4178
2230	Traditional and Complementary Medicine Professionals	28.57	28.57	-0.1281	-0.0349
1113	Traditional Chiefs and Heads of Villages	14.29	14.29	-0.5584	-0.4944
2424	Training and Staff Development Professionals	87.5	62.5	1.6467	1.0565
2643	Translators, Interpreters and Other Linguists	100	100	2.0232	2.2627
4323	Transport Clerks	33.33	33.33	0.0153	0.1183
5112	Transport Conductors	0	0	-0.9887	-0.9539
5111	Travel Attendants and Travel Stewards	0	0	-0.9887	-0.9539
4221	Travel Consultants and Clerks	85.71	85.71	1.593	1.8032
5113	Travel Guides	11.11	11.11	-0.654	-0.5965
6112	Tree and Shrub Crop Growers	18.18	18.18	-0.441	-0.3691
4131	Typists and Word Processing Operators	100	100	2.0232	2.2627
5163	Undertakers and Embalmers	16.67	16.67	-0.4867	-0.4178
7541	Underwater Divers	0	0	-0.9887	-0.9539

TABLE A1. 'Teleworkability' scores of all 427 occupations (4-digit ISCO-08) by telework classification (continued)

ISCO-08 (4-digit)	Occupations	'Teleworkability' score		Normalized score	
		Lenient	Strict	Lenient	Strict
2310	University and Higher Education Teachers	88.89	88.89	1.6886	1.9053
7534	Upholsterers and Related Workers	8.33	0	-0.7377	-0.9539
3315	Valuers and Loss Assessors	20	20	-0.3863	-0.3106
9122	Vehicle Cleaners	0	0	-0.9887	-0.9539
2250	Veterinarians	11.11	11.11	-0.654	-0.5965
3240	Veterinary Technicians and Assistants	10	0	-0.6875	-0.9539
2651	Visual Artists	62.5	62.5	0.8938	1.0565
2320	Vocational Education Teachers	60	60	0.8185	0.976
5131	Waiters	0	0	-0.9887	-0.9539
9624	Water and Firewood Collectors	0	0	-0.9887	-0.9539
8152	Weaving and Knitting Machine Operators	0	0	-0.9887	-0.9539
2513	Web and Multimedia Developers	100	100	2.0232	2.2627
3514	Web Technicians	100	100	2.0232	2.2627
7212	Welders and Flame Cutters	0	0	-0.9887	-0.9539
8113	Well Drillers and Borers and Related Workers	0	0	-0.9887	-0.9539
9123	Window Cleaners	0	0	-0.9887	-0.9539
8172	Wood Processing Plant Operators	0	0	-0.9887	-0.9539
7521	Wood Treaters	0	0	-0.9887	-0.9539
7523	Woodworking Machine Tool Setters and Operators	16.67	16.67	-0.4867	-0.4178

Source: Author's calculations.

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Life in the times of the COVID-19 pandemic: the experiences and responses of households in Guimaras and Miagao, Iloilo

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This paper assesses the experience and responses to the COVID-19 pandemic of households in the province of Guimaras and the municipality of Miagao to gain insights and lessons that can be applied during similar disruptions in the future. Survey data using a questionnaire were collected in July to early August 2020 from 580 households in Guimaras and 401 households in Miagao using convenience sampling. As a health threat, COVID-19 caused many households to feel unsafe and worried. The COVID-19 pandemic has highlighted the economic vulnerability of households to disruptions affecting their livelihood and income sources. The effects on loss of livelihood and income sources were worse with lower-income households whose income status and the ability to meet basic needs were worse than the pre-pandemic period. The paper recommends several approaches and interventions to improve household resilience and to be better prepared for similar challenges and threats in the future.

JEL classification: D10, I12, I18
Keywords: COVID-19 response, vulnerability, household assessment

1. Introduction

A year after the COVID-19 pandemic was declared on March 11, 2020, the Philippines recorded 607,048 cases, 546,671 recoveries, and 12,608 deaths [DOH 2021]. The Philippines is among the worst-performing countries in controlling the cases, ranking second to Indonesia in Southeast Asia in terms of highest officially reported COVID-19 cases [WHO 2021].

As COVID-19 cases continue to climb[1], the economic numbers continue to slide. Based on the latest available statistics for 2020 [PSA 2021], the unemployment rate was 10.3 percent or 4.5 million people without work, the annual inflation rate

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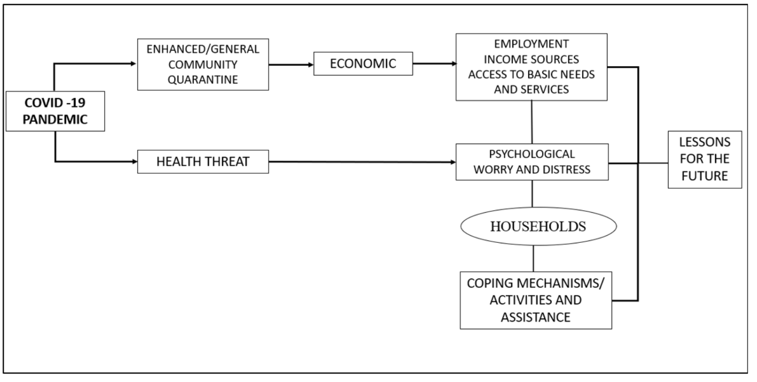
[1] In the province of Guimaras, the COVID-19 cases started to rise during the month of July 2020, while in the municipality of Miagao the surge in COVID cases started as early as April of the same year.

was 2.6 percent (vs. 2.5 percent in 2019), and the Gross Domestic Product (GDP) dropped by 9.5 percent (vs. 6 percent positive growth in 2019). This is the largest GDP drop in the country since 1946 and reported as the deepest in Southeast Asia. After ₱126.75 billion approved loans from the Asian Development Bank, World Bank, Asian Infrastructure Investment Bank, and the DOH Bayanihan Project for the vaccination program, less than 1 percent of the needed doses have arrived in the country as of February 2021. With the slow pace of the vaccine rollout, it is expected to take time to vaccinate 60 to 70 million of the country's 108 million population to attain herd immunity.

The COVID-19 pandemic is considered an exogenous shock that affects households. The impact of this shock transpired in two ways: (1) as a health threat and (2) through the implemented restriction measures. Concerns related to safety and social isolation imposed by quarantine measures contribute to the stress and anxiety experienced by the general population [Saladino et al. 2020]. In the survey conducted by Warren et al. [2020], 30 percent of the study participants reported developing mental health symptoms since the start of the quarantine. Low socioeconomic status is one of the risk factors associated with anxiety and depression related to COVID-19 [Luo et al. 2020]. The fear of contracting the virus causes household members to feel anxious about their health and safety and can negatively affect their well-being and mental health. Stress, if not managed, can be debilitating and have long-term impacts.

The country's experience with the COVID-19 pandemic has exposed the weaknesses of its health, social, and economic systems. Like many countries, the Philippines imposed "community quarantine" to contain the spread of the virus by restricting the mobility of people and by halting all forms of transportation (air, water, land), particularly during the first three months of its imposition. The mobility and transportation restrictions led to economic difficulties among households. According to McKibbin and Fernando [2020], COVID-19 affected households, business sectors and the government through its effects on labor supply, production cost, consumer demand, and public health expenditures. Specifically, COVID-19 affects households through various channels including loss of employment or reduced working hours, loss of sales and income of a household, inability to travel to work, increased need to stay at home to look after children or sick household members, higher prices, lack of availability of staple items, and reduced access to school [Morgan and Trinh 2021]. During the implementation of enhanced and general community quarantine, many business establishments had to cease their operations temporarily or permanently. As a result, many individuals lost their jobs and income sources, while those involved in the informal sector were equally vulnerable to income losses. The loss of employment and income sources had negative implications on households' ability to meet their basic needs. Households' access to basic services was also constrained due to travel restrictions and border closures. Households engaged in various coping activities to get by during the quarantine. Aid provided by different sources were essential in alleviating the economic challenges faced by the households. However, the pandemic management response is being largely left to the local government units, creating different policy responses.

FIGURE 1. Conceptual Framework of the study



While the effects of COVID-19 pandemic at macro level are well known, not much is known about households' experiences and responses to it, particularly in low-and-middle-income countries [Janssens et al. 2020]. This is particularly true in the Philippines where much of the focus has been on the macroeconomy or the national-level impact of the pandemic. The lack of studies that provide a local perspective in the broader COVID-19 pandemic experience has resulted in limited information on the joint effects of COVID-19 and community quarantine policies on households. According to Martin [2020], a household-level assessment can capture the distributional impacts and better account for the household's coping mechanism in response to the effect of the pandemic. As shown by the previous discussions, the experience of households during pandemic time can provide important insights into the localized impacts of COVID-19. Valuable lessons can be gleaned that can be useful in preparing for similar threats in the future and in developing strategies to reduce economic vulnerability of households during stress and normal times. This highlights the importance of household-level assessment in the context of COVID-19 in drawing a better picture of the impacts of the pandemic and restrictions on households.

In this light, this study was conducted to assess the experience and responses to the COVID-19 pandemic of households in the province of Guimaras and the municipality of Miagao in Iloilo Province. The aim is to gain insights into the households' experiences and responses in guiding decisions and actions to improve the current situation, and to prepare for similar threats and disruptions in the future. The study is an addition to the growing literature on the effects of the COVID-19 pandemic, but with emphasis on the experience of the household at the local level. Given the restrictions on face-to-face interactions, survey data were collected from July to August 2020 using a questionnaire. Due to the use of convenience sampling method, the data collected and the conclusions and information generated are only true for the households covered by the study. Nonetheless, the lessons derived can still be important for localities.

2. Methodology

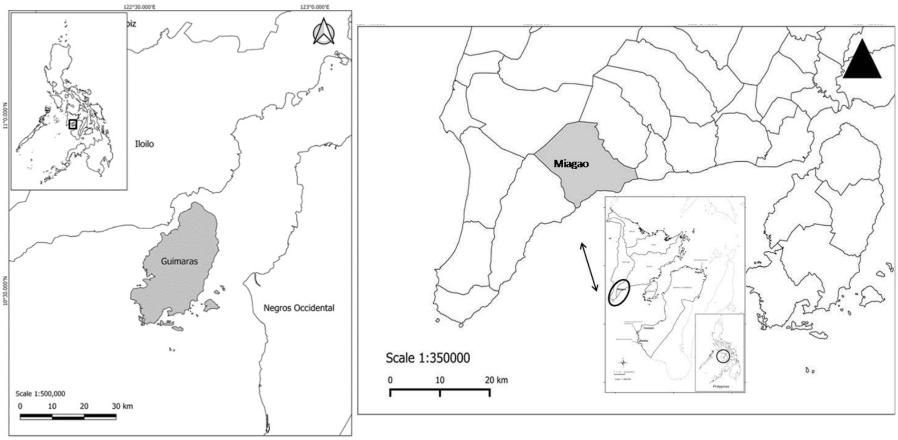
2.1. Study area

The study covers households in the province of Guimaras and the municipality of Miagao in Iloilo Province. These two local government units (LGUs) were chosen to illustrate cases of households in LGUs impacted later (Guimaras) and earlier (Miagao) by COVID-19. The Guimaras case can inform and provide lessons on the vulnerability of undiversified and fragile economies in pandemic context. On the other hand, the Miagao case can provide information and lessons on how households in LGUs earliest hit by COVID-19 are getting by or living under pandemic.

Guimaras Province is the last province in the Western Visayas Region to implement the enhanced community quarantine (ECQ) measure from April 15 to April 30, 2020, and to have recorded local transmission that happened in late July 2020. Beginning May 1, 2020, the province was placed under general community quarantine (i.e., less restrictive policies on mobility than ECQ). Despite the late implementation of ECQ in the province, its economy was already affected when neighboring provinces of Iloilo and Negros Occidental were placed under ECQ as early as the middle of March 2020. Residents of the province employed in the establishments in Iloilo City or Bacolod City that temporarily or permanently closed were out of jobs, and those with regular jobs faced difficulties in travelling outside of the province due to border controls and limited transportation facilities. As of March 11, 2021, Guimaras has recorded 343 COVID-19 cases, 314 recoveries, and 6 deaths. Guimaras reported a population of 175,613 in 2015.

On the other hand, the municipality of Miagao in the southern Iloilo province was one of the first municipalities to record active cases and the first mortality case due to COVID-19. Miagao, like the rest of the municipalities in the province of Iloilo, was placed under ECQ from March 17, 2020 until May 15, 2020. Thereafter, lesser restrictions were imposed. Miagao is the host municipality of two universities: University of the Philippines Visayas and Iloilo Science and Technology University (Southern Iloilo Campus). The cancellation of face-to-face classes and the closure of local establishments in Iloilo City have caused disruptions to many local establishments in the municipality as well as to the local transport sector. As of March 11, 2021, Miagao has recorded 202 COVID-19 cases, 187 recoveries, and 3 deaths. Miagao reported a population of 67,565 in 2015.

FIGURE 2. Map of the study areas



Source: Authors requested GIS expert M. Orquejo to develop these maps.

2.2. Data

Primary survey data were collected for this study. Data included sources of information related to COVID-19, response soon after the declaration of ECQ, frequency of feeling of safety and of worry (not at all, a few times, a number of times, all the time), sources of worry, level of anxiety experienced (scale of 1 to 10 with 1 as no anxiety and 10 as extreme anxiety), activities conducted during the period, access to basic services (banks/money courier, pharmacy, grocery, wet market, health facilities, government offices), perceived household income status (current vs. pre-pandemic), adequacy in meeting basic needs (e.g., food, drinking water, medicine; compared to pre-pandemic), coping strategies, effect on employment (presence of household members who were temporarily or permanently out of work resulting from COVID-19 responses), support received (kind and from whom), adequacy of the support received, and perception of the future.

2.3. Data collection method, survey participants, and questionnaire

The data for this study were remotely gathered, utilizing Google Form for the online survey questionnaire. Hard copies of the questionnaire were also distributed to households in accessible barangays in Miagao (450 copies) and Guimaras (400 copies). The survey ran from July 2020 to early August 2020. Prior to the data collection period, permissions were secured from the Provincial Government of Guimaras and the Municipal Government of Miagao.

The content of the online and hardcopy (4 pages) survey questionnaires for Miagao and Guimaras was similar. It had three sections: 1) personal information of the participants and the socioeconomic characteristics of the families; 2) their general experience (e.g., feeling of safety and worry, sources of information, income level, employment, coping mechanisms, assistance received) during the E/GCQ period; and 3) prospect for the future. The online and the hard copy of the questionnaire were pilot tested with ten persons each to assess the ease of accomplishing the form, ease of comprehension of questions, and the length of time needed to accomplish the form. Data collection was conducted with the help of volunteers in the barangay who were trained for the work. Upon receiving the questionnaire from the researchers, they were instructed to distribute the questionnaire. Depending on the availability of the household respondent to answer the questionnaire, the volunteers either had to wait upon their visit for the accomplished form or return on another day to pick it up.

In selecting the study participants, convenience sampling was employed. The participants were those who volunteered to respond to the survey questionnaire online or using the hard copy form. The survey participants were of legal age and representing a household. There was a total of 981 survey participants in both online and printed questionnaire surveys, of which 580 were from Guimaras (279 online; 301 printed) and 401 were from Miagao (32 online; 369 printed). The 580 survey participants in Guimaras were from the municipalities of Jordan (36 percent), Buenavista (28 percent), San Lorenzo (26 percent), Sibunag (6 percent), and Nueva Valencia (5 percent). In Miagao, the survey participants were from 41 out of the 119 barangays. The distribution of samples per study site is summarized in Table 1.

TABLE 1. Distribution of sample per study site

	Sample	% of the sample
Guimaras		
Municipality		
Buenavista	161	27.80
Jordan	207	35.70
Nueva Valencia	27	4.70
San Lorenzo	153	26.40
Sibunag	32	5.50
Total	580	100
Miagao		
Barangay		
Alimodias	2	0.50
Bacauan	1	0.25
Bagumbayan	1	0.25
Banuyao	9	2.24
Baybay Norte	2	0.50
Baybay Sur	45	11.22
Bolho	4	1.00

TABLE 1. Distribution of sample per study site (continued)

	Sample	% of the sample
Calagtangan	1	0.25
Calampitao	64	15.96
Cawayanan	12	2.99
Damilisan	10	2.49
Damilisan	1	0.25
Dingle	15	3.74
Gines	19	4.74
Igbugo	3	0.75
Igcabito-on	14	3.49
Igdalaquit	1	0.25
Igsoligue	11	2.74
Igtuba	10	2.49
Kirayan Norte	9	2.24
Lanutan	6	1.50
Malagyan	51	12.72
Maninila	9	2.24
Maringyan	2	0.50
Mat-y	11	2.74
Naclub	1	0.25
Narat-an	9	2.24
Narorogan	26	6.48
Naulid	1	0.25
Oyungan	11	2.74
Palaca	2	0.50
San Fernando	1	0.25
San Rafael	12	2.99
Sapa	3	0.75
Tabunacan	12	2.99
Tacas	2	0.50
Tan-agan	1	0.25
Ubos Ilawod	3	0.75
Ubos Ilaya	2	0.50
Ubos Ilaya	1	0.25
Valencia	1	0.25
Total	401	100

2.4. Statistical analysis

Descriptive statistics such as frequencies, percentages, and univariate analysis (cross-tabulations) were used to analyze the gathered data. Tests of means such as ANOVA and Chi-square tests were also conducted, when appropriate, to determine significant differences or relationships across groups or parameters. ANOVA was used to test for significant differences in the level of distress experienced by households of different income groups. The result indicates whether income level has a significant relationship to the level of distress experienced by households. Furthermore, Chi-square tests were performed to evaluate possible significant relationships between qualitative parameters (e.g., effect on employment, income status during E/GCQ, access to basic needs) across different income groups.

3. Results and discussion

3.1. Socioeconomic profile of the survey participants

The socioeconomic profile of all the survey participants and their households are presented in Table 2. More women (76 percent) participated in the survey than men (24 percent). On average, the study participants were in their late 30s and living in a household with five members. Households who were beneficiaries of the Pantawid Pamilyang Pilipino Program (4Ps) comprised 17 percent of the total survey participants.

Six in every ten households earned a monthly income of less than or equal to ₱11,000, which means they were poor. The percentage of households in this income bracket was higher in Miagao (64 percent) than in Guimaras (56 percent). Moreover, the fraction of households that were near-poor or those earning a monthly income between ₱11,001 and ₱30,000 was almost the same for Guimaras (23 percent) and Miagao (25 percent). Few households in Miagao (8 percent) and in Guimaras (10 percent) had a monthly income of greater than ₱30,000.

Less than 10 percent of households had an OFW household member. During the pandemic, remittances declined with the loss of employment of OFWs or due to difficulty in sending remittances, attributable either to decreased demand for labor or quarantine protocols [Abueg 2020].

A significant number of households likewise had members who belonged to the vulnerable groups including children aged five years old and below (33 percent), senior citizens (33 percent), persons with disabilities (8 percent), and those who were chronically ill (12 percent).

TABLE 2. Socioeconomic profile of the study participants, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Gender						
Male	251	25.59	133	22.93	118	29.43
Female	711	72.48	440	75.86	271	67.58
LGBT+	17	1.73	5	0.86	12	2.99
Prefer not to say	2	0.20	2	0.34	0	0
Household monthly income						
>₱30,000	87	8.87	56	9.66	31	7.73
₱11,001 to ₱30,000	231	23.55	132	22.76	99	24.69
≤ ₱11,000	595	60.65	338	58.28	257	64.09
Prefer not to say	68	6.93	54	9.31	14	3.49
4Ps beneficiary	171	17.43	99	17.07	72	17.96
With OFW member	208	21.20	130	22.41	78	19.45
With PWD member	77	7.85	51	8.79	26	6.48
With senior member	327	33.33	184	31.72	143	35.66
With chronically ill member	118	12.03	74	12.76	44	10.97
With child aged≤5	321	32.72	205	35.34	116	28.93
With child aged 6 to 17	557	56.78	321	55.34	236	58.85
Age	40.13		38.56		41.66	
Household size	4.84		4.67		5.08	

3.2. Sources of COVID-19 related information

The common sources of COVID-19 related information by the survey participants were the television (90 percent), radio (80 percent), relatives, household, and friends (79 percent), Facebook and Twitter (79 percent), and the internet (60 percent). Government websites were less popular (46 percent). The printed media was the least cited source of information (16 percent).

The impact of COVID-19 depends on the action of everyone and on the quality of information that people possess. People act on what they know. Access to accurate and reliable information during the pandemic or any stress situation can keep people calm and informed on what to do to keep themselves safe from the virus (Lee and Mun [2020]; Zhong et al. [2020]; Reddy and Gupta [2021]).

Communicating to the public as part of the public policy against COVID-19 should still harness the mass media in local areas, particularly TV and radio. News media tends to provide reliable information on COVID-19 [Bridgman et al. 2020]. However, there is significant danger of misinformation as popular social media platforms were highly common information sources. Misinformation is rampant in social media (Bridgman et al. [2020]; Kulke [2020]; Pennycook et al. [2020]) given the inadequate, if not lack of, content monitoring [Li and Su 2015]. The use of unregulated social media as COVID-19 source is a health risk, particularly by being a source of COVID-19 conspiracy beliefs [Allington et al. 2020], as well as information on risk factors and preventative treatments [Baum et al. 2020].

TABLE 3. Sources of information about COVID-19 of the study participants, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=80)	%	No. (n=401)	%
Television	883	90.01	538	92.76	345	86.03
Radio	786	80.12	482	83.10	304	75.81
Relatives, household, friends	771	78.59	470	81.03	301	75.06
Social media	769	78.39	463	79.83	306	76.31
Internet	586	59.73	361	62.24	225	56.11
Government websites	451	45.97	304	52.41	147	36.66
Newspaper	156	15.90	97	16.72	59	14.71

3.3. Experience during the E/GCQ period

3.3.1. Response soon after the declaration of the pandemic and the ECQ

As soon as the pandemic was declared on March 11, 2020 and the ECQ was implemented by provinces in the Western Visayas Region (except for Guimaras) by March 17, 2020, households in both Guimaras (98 percent) and Miagao (89 percent) stayed tuned to the news to keep informed and updated (Table 4). They also sent messages to their relatives and friends about staying safe (90 percent). This implies the importance of conveying information via family relationships, as well as a demonstration of social support.

The households in both Guimaras (83 percent) and Miagao (77 percent) also calmly received the news and prepared the essential items (e.g., vitamins, medicines, disinfectants, food, water). Overall, the households had a positive immediate response to the threat of COVID-19 and the ECQ.

3.3.2. Feeling of safety, worry, and distress

Feeling safe means having the feeling of stability, and freedom from fear or anxiety wherever the person is and what the person does. From the declaration of the pandemic to the time of the survey, 27 percent of the survey participants indicated that they felt safe all the time, while 74 percent felt safe in varying frequencies: 21 percent a number of times, 27 percent a few times, and 26 percent did not feel safe at all (Table 5). These indicated that the quarantine measures were inadequate to provide individuals or households with a feeling of safety all the time. Although the distribution pattern was the same in Miagao and Guimaras, a higher share of survey participants who reported that their household did not feel safe at all was observed in Miagao (35 percent) than in Guimaras (20 percent).

Moreover, few (5 percent) survey participants reported to have not been worried at all from mid-March to the time of the survey. Among the study participants, 40 percent reported being worried all the time, 30 percent were worried a number of times, and 20 percent were worried a few times. Three-fourths of the households in Miagao were worried all the time (51 percent) or a number of times (25 percent). These proportions were just slightly higher than for the households in Guimaras, of which 40 percent reported to be worried all the time and 33 percent worried a number of times. They were worried about different things such as whether they or their relatives will get infected with COVID-19, how they will survive during the E/GCQ, worried about food, financial concerns, work, and the disruption in the education of the children.

TABLE 4. Response of the study participant after declaration of ECQ, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Tuned in for latest news about COVID-19	921	93.88	566	97.59	355	88.53
Messaged relatives and friends to stay safe	884	90.11	522	90.00	362	90.27
Calm	787	80.22	480	82.76	307	76.56
Stocked vitamins, medicines, and disinfectants	780	79.51	460	79.31	320	79.80
Stocked food, water and other essentials	735	74.92	442	76.21	293	73.07
Panicked	224	22.83	140	24.14	84	20.95

TABLE 5. Distribution of the participants in terms of feeling of safety during the E/GCQ period, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Felt safe during E/GCQ						
All the time	260	26.50	167	28.79	93	23.19
A number of times	202	20.59	137	23.62	65	16.21
A few times	264	26.91	160	27.59	104	25.94
Not at all	255	25.99	116	20.00	139	34.66
Worried during E/GCQ						
All the time	437	44.55	233	40.17	204	50.87
A number of times	293	29.87	192	33.10	101	25.19
A few times	200	20.39	122	21.03	78	19.45
Not at all	51	5.20	33	5.69	18	4.49

The higher percentage of households in Miagao than in Guimaras that felt not safe all the time and also worried all the time may be due to Miagao as being among the first municipalities to record active cases and also deaths from COVID-19 in the region. During the time of the survey, Guimaras was just experiencing local transmission of cases for the first time.

On a scale of 1 to 10, the survey participants from Guimaras and Miagao were asked to rate the level of distress or anxiety they and their household members have felt (Table 6). Among the survey participants in Guimaras, the mean level of anxiety was 7, across all children in the household it was 6, and across all members in the household, it was 7. The scores meant a moderately high level of stress. The level of stress did not differ much across household income levels. Among the survey participants in Miagao, their level of stress, particularly those from lower-income groups, were higher compared to those from Guimaras (7.47 vs. 7.04). The same mean level was observed across children in the household and across all members of the household.

In times of uncertainty such as the COVID-19 pandemic, feeling safe is difficult because of several unknowns and uncertainties, especially during the early months of the pandemic. People are not sure how safe they are from the virus, who has the virus, how one's body will respond to the virus, or when the pandemic is ending. The uncertainties are more and challenging among the poor for they are also uncertain on how they will put food on the table and earn income as economic activities are deliberately limited under the community quarantine. According to Luo et al. [2020], lower socioeconomic status is one of the risk factors associated with anxiety and depression related to COVID-19. Moreover, quarantine and isolation can increase stress and anxiety.

These feelings of not being safe and worrying are expected in these times. They are uncomfortable but also helpful in a pandemic situation [UCSF Department of Psychiatry and Behavioral Sciences 2021]. These feelings, if managed well, can move people to protect themselves by observing protection protocols, bond with others from a distance, cope with the situation, and slow down the spread of the virus. However, if the stress is high and cannot be managed, it can be debilitating. The survey result of Warren et al. [2020] found that 30 percent of the study participants reported developing mental health symptoms since the start of the quarantine.

TABLE 6. Mean level of anxiety of the study participants and other members of their household, by income group, Guimaras and Miagao, 2020

	Guimaras			Miagao		
	Level of distress of the participant	Level of distress across all children in the household	Level of distress across all members in the household	Level of distress of the participant	Level of distress across all children in the household	Level of distress across all members in the household
All	7.08	6.40	7.11	7.44	6.75	7.38
Low	7.04	6.41	7.14	7.47	6.95	7.51
Mid	7.00	6.19	7.90	7.55	6.83	7.31
High	7.09	6.45	7.09	6.61	5.00	6.48
Unspecified	7.52	6.89	7.22	7.93	6.50	7.64
F	1.00	1.02	0.25	1.87	5.05	1.95
Prob>*F*	0.3922	0.3811	0.8635	0.1346	0.0019	0.1206

Notes: Income groups: Low –with monthly income ≤ ₱11,000; Mid – with monthly income of ₱11,001 to ₱30,000; High – with monthly income of > ₱30,000; Unspecified–those who answered prefer not to say.

3.3.3. Observed precautionary measures against COVID-19

Households from both Guimaras and Miagao were compliant with the minimum health protocols against COVID-19 (Table 7). The top five preventive measures practiced were: observing physical distancing when going out (99 percent), frequent washing of hands (98 percent), wearing of masks (98 percent), maintaining clean surroundings (97 percent), and staying at home most of the time (96 percent). This was similar to the findings of the Institute of Global Health Innovation [2020] and Warren et al. [2020] showing that Filipinos are compliant with public health advisories mandated by the national and local authorities. According to Prasetyo et al. [2020], people's intent to follow the prescribed preventive measures is significantly associated with positive health behaviors. The effectiveness of these preventive measures is indirectly affected by people's understanding of COVID-19. This underscores the importance of having an informed citizenry in minimizing the transmission of COVID-19.

TABLE 7. Protective measures undertaken by the households against COVID-19, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Practice of physical distancing	969	98.78	576	99.31	393	98.00
Frequent washing of hands	965	98.37	569	98.1	396	98.75
Wearing of mask	961	97.96	569	98.1	392	97.76
Maintain clean surroundings	952	97.04	567	97.76	385	96.01
Stayed at home	944	96.23	561	96.72	383	95.51
Tuned in for latest news	942	96.02	565	97.41	377	94.01
Conscious of physical feelings	869	88.58	521	89.83	348	86.78
Stock essentials	836	85.22	496	85.52	340	84.79
Stock medicines	824	84.00	487	83.97	337	84.04
Disinfect house	810	82.57	464	80	346	86.28

3.3.4. Access to basic services

Public health response to the virus such as the quarantine measures, travel restrictions and the practice of social distancing, has restricted people's mobility which hampered access to basic services. Households found it difficult to access the grocery stores (69 percent) and the wet markets (61 percent) during the quarantine period (Table 8). Health service providers like clinics (62 percent) and pharmacies (60 percent) were also difficult to access. Other services that majority of the households had difficulty accessing were government offices (53 percent), banks (51 percent), and money couriers (50 percent). A higher percentage of households in Miagao than in Guimaras reported having difficulty accessing the wet market (73 percent vs. 62 percent) and the groceries (79 percent vs. 69 percent).

The results imply that the mobility restrictions that were implemented worked. During the implementation of enhanced community quarantine in Guimaras, locals were required to secure a quarantine pass issued by their barangays to travel in and out of the province. Likewise, senior citizens and minors were fully restricted from going out for belonging to as a vulnerable group. Limited public transportation was also a factor that contributed to the difficulty in accessing basic services. The practice of social distancing in public vehicles resulted in fare hikes and discouraged travel. Fear of contracting the virus also deterred people from going out. Similarly, in Miagao, a home quarantine pass was issued by barangays to every household allowing them to travel within and outside of the municipality.

TABLE 8. Frequency distribution of the participants having difficulty accessing different basic services, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Money courier	477	48.62	290	50.00	187	46.63
Wet market	648	66.06	354	61.03	294	73.32
Groceries	715	72.88	400	68.97	315	78.55
Clinics	606	61.77	357	61.55	249	62.09
Pharmacy	595	60.65	346	59.66	249	62.09
Government services	537	54.74	313	53.97	224	55.86
Banks	461	46.99	293	50.52	168	41.90

3.3.5. Effects on employment and income sources

As expected, the livelihood and household income sources were affected by the mobility restrictions imposed. In both the study sites, 30 percent of the households had members who were temporarily out of work (Table 9) during the implementation of E/GCQ, and many of those households belonged to the lower income bracket (60 percent). Moreover, a small fraction of the survey participants reported permanent employment loss, with 8 percent in Guimaras and 13 percent in Miagao, respectively. The effect on the informal sectors was worse with 43 percent of the households reported losing their sources of income.

Based on the latest labor force survey, there were 15.6 million Filipinos employed in the informal sector, accounting for 38 percent of the total working population. Informal workers are more vulnerable during this time of the pandemic because of their lack of job security (i.e., usually the first to be laid off), and low income [Pitoyo et al. 2020]. Furthermore, the lack of income replacement and saving among informal workers make them also susceptible to food insecurity (FAO [2020]; ILO [2020]). In 2020, there were 4.5 million Filipinos without work [PSA 2021].

The impact of the pandemic was likewise evident in the households with OFWs due to a significant drop in remittances. In the case of Guimaras and Miagao, there were 68 participants (34 for each study sites) who reported having OFW household members who lost employment during the quarantine. This represented 6 and 8 percent of the local households participating in the survey in Guimaras and Miagao, respectively. This was similar to the national situation of 14-20 percent drop in remittance inflow in the country (Murakami et al. [2020]; World Bank [2020]). The reduction in remittances was primarily due to the decline in labor demand and restriction measures in other countries, hindering OFWs from sending money [Abueg 2020] or some becoming unemployed and forced to return home.

TABLE 9. Percentage distribution of the survey participants who had lost employment and income sources during E/GCQ period across income groups, 2020

Income Levels	Guimaras (n=580)				Miagao (n=401)			
	Loss employment temporarily (n=192)	Loss employment permanently (n=51)	Lost sources of income (n=248)	OFW out of employment (n=34)	Loss employment temporarily (n=135)	Loss employment permanently (n=51)	Lost sources of income (n=153)	OFW out of employment (n=34)
Low	60.42	58.54	68.95	46.34	68.15	60.78	71.24	47.06
Mid	18.75	15.85	15.32	29.27	21.48	31.37	20.26	41.18
High	7.81	3.66	4.44	19.51	4.44	1.96	3.92	11.76
Unspecified	13.02	21.95	11.29	4.88	5.93	5.88	4.58	0
Prob>χ^2	7.5057	21.9495	33.0495	27.2159	7.5391	4.7118	9.2064	31.644
P-value	0.057	0.000	0.000	0.000	0.057	0.194	0.027	0.000

Note: Income groups: Low –with monthly income ≤₱11,000; Mid – with monthly income of ₱11,001 to ₱30,000; High – with monthly income of >₱30,000; Unspecified–those who answered prefer not to say..

TABLE 10. Distribution of study participants in terms of their perceived income status during E/GCQ, Miagao and Guimaras, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Better	51	5.20	20	3.45	31	7.73
Same	367	37.41	223	38.45	144	35.91
Worse	563	57.39	337	58.10	226	56.36

The decline in remittances left recipient households vulnerable to poverty and difficulty meeting their basic needs (ADB [2020]; Diao and Mahrt [2000]).

It is commonly known that many residents of Guimaras work in either Iloilo City, Bacolod City or in nearby municipalities in Iloilo and Negros Occidental. When the neighboring provinces implemented E/GCQ, the livelihoods and income sources of many locals were affected. With mobility and transportation restriction, many business establishments that temporarily closed or adjusted their business operations. Moreover, being dependent on tourism, the local economy of Guimaras was severely affected by the decline in tourist arrivals. The cancellation of the annual Manggahan festival in May 2020, and the temporary closure or adjusted business operation of local establishments also contributed to the decline in local employment.

3.3.6. Income status of households

Loss of employment and income sources seriously affect household income. This was true for the 57 percent of the survey participants that reported their household's income to have worsened during the pandemic compared to the levels before the pandemic (Table 10). This was slightly higher in Guimaras (58 percent) than in Miagao (56 percent). Furthermore, 37 percent of the study participants said that their income was during the pandemic was the same as before. Few (5 percent) reported having better income status during pandemic than pre-pandemic time.

The percentage of the study participants who reported that their income status worsened was lower compared to the 83 percent of the households that reported the same in Metro Manila and Cebu City in May 2020 [UNDP Pulse Survey 2020]. These two key cities in the country had most of the COVID-19 cases and had longer lockdown periods. Moreover, other countries such as Kenya (73 percent), Uganda (66 percent) [Kansiime 2021], and Vietnam (66 percent) [Tran et al. 2020] also reported high rates of households whose economic status worsened during the pandemic.

By income groups, the lower income households became poorer (Table 11). The household's pre-COVID income level and perceived income status during E/GCQ were found to be significantly related based on the result of the chi-square tests for both study sites ($\chi^2 = 72.1955$; $p = 0.000$). Majority of the poor households perceived their income status worsened during E/GCQ (66 percent); with a slightly higher percentage recorded in Guimaras (69 percent) than in Miagao (62 percent). The percentage of households reporting to have worsened income status during the pandemic compared to pre-pandemic went higher when moving from high-income households (>₱30,000 monthly income) to middle-income households (above ₱11,000 to ₱30,000), and to low-income families. For Guimaras, these were 27 percent, 40 percent, and 69 percent, respectively. For Miagao, these were 29 percent, 48 percent, and 69 percent, respectively. For both sites, these were 28 percent, 44 percent, and 69 percent, respectively.

TABLE 11. Percentage distribution of study participants' perceived income status during E/GCQ across different income groups, Miagao and Guimaras, 2020

	Pooled				Guimaras				Miagao			
	Income groups				Income groups				Income groups			
Income status	Low (n=595)	Mid (n=231)	High (n=87)	Unspecified (n=68)	Low (n=338)	Mid (n=132)	High (n=56	Unspecified (n=54)	Low (n=257)	Mid (n=99)	High (n=31)	Unspecified (n=14)
Better	4.71	5.19	8.05	5.88	2.07	5.30	3.57	7.41	8.17	5.05	16.13	0
Same	29.41	51.08	64.37	26.47	29.29	54.55	69.64	24.07	29.57	46.46	54.84	35.71
Worse	65.88	43.72	27.59	67.65	68.64	40.15	26.79	68.52	62.26	48.48	29.03	64.29
	Pearson $\chi^2(6)$ = 72.1955 P- value = 0.000				Pearson $\chi^2(6)$ = 63.2195 P-value= 0.000				Pearson $\chi^2(6)$ =20.8732 P-value = 0.002			

Note: Income groups: Low –with monthly income ≤ ₱11,000; Mid – with monthly income of ₱11,001 to ₱30,000; High – with monthly income of > ₱30,000; Unspecified–those who answered prefer not to say.

TABLE 12. Percentage distribution of families' level of adequacy of needs across different income groups

	Pooled				Guimaras				Miagao			
	Income Levels				Income Levels				Income Levels			
Level of Adequacy	Low (n=595)	Mid (n=231)	High (n=87)	Unspecified (n=68)	Low (n=338)	Mid (n=132)	High (n=56)	Unspecified (n=54)	Low (n=257)	Mid (n=99)	High (n=31)	Unspecified (n=14)
Less than adequate	62.86	35.5	18.39	54.41	67.16	31.82	23.21	62.96	57.2	40.4	9.68	21.43
No change	29.58	50.22	55.17	35.29	28.11	61.36	55.36	24.07	31.52	35.35	54.84	78.57
More than adequate	7.56	14.29	26.44	10.29	4.73	6.82	21.43	12.96	11.28	24.24	35.48	0
	Pearson $\chi^2(6)$ = 99.6641 *P*- value = 0.000				Pearson $\chi^2(6)$ = 88.0337 *P*-value= 0.000				Pearson $\chi^2(6)$ =46.2085 *P*-value = 0.000			

Note: Income groups: Low –with monthly income ≤ ₱11,000; Mid – with monthly income of ₱11,001 to ₱30,000; High – with monthly income of > ₱30,000; Unspecified–those who answered prefer not to say.

These results are consistent with the findings of previous studies, (e.g., Enriquez and Goldstein [2020], Gallo and Raitano [2020], Lau et al. [2020]) showing that the economic consequences of COVID-19 fall heavily on the poorest sector of society. Being at the bottom of the socioeconomic ladder, poor households are already suffering from multiple deprivations, which make them more susceptible to the adverse economic impacts of COVID-19 [Lustig 2020]. This implies that households falling below or along the poverty threshold are more likely to fall deeper into poverty during the pandemic. The World Bank [2020] already projected that an additional 2.7 million people will fall into poverty in the country because of this pandemic.

3.3.7. Adequacy of meeting basic needs

With the restrictions from implementation of E/GCQ, the household's supply of basic needs was affected. The results of the chi-square tests showed that families' level of adequacy of basic needs and income level were significantly associated in Guimaras ($\chi^2 = 88.0337$; $p = 0.000$) and Miagao ($\chi^2 = 46.2085$; $p = 0.000$) or combined ($\chi^2 = 99.6641$; $p = 0.000$). The percentage of households reporting not meeting adequate basic needs during the pandemic compared to the pre-pandemic period went higher when moving from high income households (>₱30,000 monthly income), to middle income households (above ₱11,000 to ₱30,000), and to low-income families (Table 12). For Guimaras, these were 23 percent, 32 percent, and 67 percent, respectively. For Miagao, these were 10 percent, 40 percent, and 57 percent, respectively. For both sites, this was 28 percent, 44 percent, and 69 percent, respectively. Poor households were more likely to experience liquidity constraint during this time of the pandemic, hindering them from acquiring adequate supply of basic goods. Conversely, the percentages of households having adequately or more than adequately met their basic needs were higher for more economically better off ones.

Karpman et al. [2020] noted that low-income households deliberately reduced their spending on food as a response to the COVID-19 crisis. Such finding is similar to the survey results of Warren et al. [2020] showing that low-income households in the Philippines are more likely to reduce their food portion sizes at mealtime as well as the number of meals in a day compared to wealthier households. UNDP Pulse Survey [2020] showed that more than half of the surveyed households in NCR and Cebu City reported having experienced food insecurity. Hence, low-income households are more susceptible to food insecurity during the pandemic (Das et al. [2020]; Elsahoryi et al. [2020]). According to Kansiime et al. [2020], the worsening food security experienced by the households in Kenya and Uruguay during the COVID-19 pandemic was caused by income losses, decrease in purchasing power, and reduced access to markets due to restrictions.

3.4. Coping

3.4.1. Coping mechanisms

The COVID-19 and the community quarantine are shocks that adversely affected the livelihoods of families. The loss or reduction of income posed an additional burden. The survey participants identified household coping mechanisms during the E/GCQ. Coping mechanisms were strategies that the households used to manage the difficulties brought about by the pandemic. These involved the use of existing resources, relying on external sources, and engaging in activities that help them get by during the quarantine. The ranking of common coping strategies differed by income group (Table 13). In Guimaras, households earning a monthly income greater than ₱30,000 and those earning from ₱11,001 to ₱30,000 had similar top three coping strategies: reliance on income (93 percent and 86 percent, respectively), availment of government assistance (77 percent and 76 percent, respectively), and dip into savings (both 63 percent). For households with a monthly income of less than ₱11,000, the top three coping strategies were: availment of government assistance (79 percent), reduction of consumption (73 percent), and reliance on income (72 percent).

In Miagao, the households earning a monthly income greater than ₱30,000 coped by relying on income (81 percent), dipping into savings (74 percent), and reducing consumption (35 percent). Among households earning a monthly income from ₱11,001 to ₱30,000, their top three coping strategies were availment of government assistance (83 percent), relying on income (75 percent), and reducing consumption (65 percent). For households with monthly income of less than ₱11,000, the top three coping strategies were availment of government assistance (83 percent), reliance on income (67 percent), and reduction of consumption (65 percent).

Reliance on income and availment of government assistance were the two most common coping strategies for all households by income groups in the two study sites. This underscored the importance of government support during the pandemic, especially to the lower-income households. Reduction in consumption was seen in all income groups in Miagao, but it was only seen among the lowest-income group in Guimaras. Moreover, more households from lower-income group availed of help from the private sector.

Households engaged in different activities to cope with challenges (e.g., fear, stress, boredom, feeling of isolation) during the quarantine (Table 14). These were to pray more frequently (94 percent), accepting the situation and embracing changes (94 percent), working on chores at home (93 percent), bonding with household members (90 percent), working on things for which one had no time before (89 percent), and home gardening (87 percent). The same pattern of coping activities was observed in both Guimaras and Miagao.

TABLE 13. Percentage distribution of study participants in terms of their coping mechanisms across different income groups, Guimaras and Miagao, 2020

	Pooled				Guimaras				Miagao			
	Income groups				Income groups				Income groups			
Income status	Low (n=595)	Mid (n=231)	High (n=87)	Unspecified (n=68)	Low (n=338)	Mid (n=132)	High (n=56)	Unspecified (n=54)	Low (n=257)	Mid (n=99)	High (n=31)	Unspecified (n=14)
Rely on income	69.75	80.95	88.51	60.29	71.60	85.61	92.86	59.26	67.32	74.75	80.65	64.29
Dip into savings	49.58	58.44	66.67	48.53	56.21	62.88	62.50	51.85	40.86	52.53	74.19	35.71
Resorted to borrowing	60.34	35.93	20.69	45.59	61.24	34.09	23.21	48.15	59.14	38.38	16.13	35.71
Reduce consumption	69.58	49.35	31.03	67.65	72.78	43.94	28.57	66.67	65.37	56.67	35.48	71.43
Avail donation from the private sector	34.29	21.65	17.24	41.28	31.07	22.73	19.64	46.30	38.52	20.2	12.9	21.43
Avail government assistance	80.67	76.19	60.92	72.06	78.99	75.76	76.79	66.67	82.88	76.77	32.26	92.86
Avail assistance from relatives	50.92	44.59	22.99	54.41	48.22	44.70	26.79	53.70	54.47	44.44	16.13	57.14

Note: Income groups: Low –with monthly income ≤ ₱11,000; Mid – with monthly income of ₱11,001 to ₱30,000; High – with monthly income of > ₱30,000; Unspecified–those who answered prefer not to say.

TABLE 14. Coping activities of the study participants, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=80)	%	No. (n=401)	%
Praying more frequently	923	94.09	550	94.83	373	93.02
Embraced the situation	919	93.68	557	96.03	362	90.27
Worked on chores at home	911	92.86	554	95.52	357	89.03
Bonded more with the household	886	90.32	530	91.38	356	88.78
Worked on things that had no time for before	876	89.30	530	91.38	346	86.28
Started home gardening	854	87.05	506	87.24	348	86.78
Became more creative	836	85.22	500	86.21	336	83.79
Connected with relatives and friends more often	803	81.86	476	82.07	327	81.55
Watched TV more frequently	780	79.51	483	83.28	297	74.06
Helped/participated in works to fight COVID	750	76.45	447	77.07	303	75.56
Surfed the net more frequently	641	65.34	383	66.03	258	64.34
Did more leisurely readings	501	51.07	321	55.34	180	44.89
Donated goods or money	348	35.47	195	33.62	153	38.15

The quarantine provided more time for households to bond and do things their members did not have time for before. In both study areas, most household members accepted the situation and started productive activities (e.g., gardening, chores, creative works). They also engaged in activities inside the home, fostering a close social relationship among household members. Such activities serve as an avenue for household members to talk about their worries related to the pandemic [Salin et al. 2020]. Engaging in these activities can also reduce psychological stress and anxiety, particularly among children [Leung et al. 2020].

3.5. Assistance received

During the ECQ, households received assistance from various sources. In both Guimaras and Miagao, majority of the households received assistance from the barangay and municipal government, and the Department of Social Welfare and Development (DSWD) (Table 15). The least frequent sources of assistance were from the private sector, the Department of Labor and Employment (DOLE), and relatives.

TABLE 15. Percentage of study participants in terms of the number of times they received assistance from different sources, Guimaras and Miagao, 2020

	Guimaras					Miagao				
Source	None	Once	Twice	Thrice	More than 3 times	None	Once	Twice	Thrice	More than 3 times
Barangay	11.38	42.41	20.17	7.59	18.45	10.47	23.69	42.89	13.72	9.23
Municipal	11.38	10.17	28.62	25.52	24.31	37.41	19.95	6.23	29.93	6.48
DSWD	54.31	35.00	5.52	1.03	4.14	33.67	40.65	2.99	19.95	2.74
DOLE	93.97	4.48	0.17	1.38	0	92.52	4.99	2.49	0	0
Private	86.38	10.00	2.10	0.52	1.03	83.54	11.22	4.49	0	0.75
Relatives	69.14	13.28	6.90	3.10	7.59	60.10	15.71	11.47	2.24	10.47

In Guimaras, local governments started to distribute relief assistance on April 15, 2021, the start of ECQ in the province. Miagao, on the other hand, was ahead in relief distribution because Iloilo province was placed under ECQ on March 17, 2020. In-kind relief assistance included rice, canned goods, noodles, sugar, coffee, fresh meat and vegetables. Face masks and other hygiene products were also distributed by the local government and national agencies such as the DSWD and DOLE. Beneficiaries of the Pantawid Pamilya Pilipino Program (4Ps) automatically qualified for the cash assistance from the SAP program amounting to ₱6,000 during the first tranche. Others also received cash assistance under the Social Amelioration Program (SAP) if they qualified. The identification of beneficiaries and the distribution of SAP, however, was marred by controversy. Households found the assistance they received to be inadequate for their needs.

National government support arrived after more than a month from the declaration of community quarantine, signifying the lack of systematic program planning and action to support the households during disruptions. The local government supplied food subsidies designed as short-term coping strategies to address immediate challenges brought about by the pandemic.

While the households received assistance from different sources, most were temporary relief assistance, which were enough to support the households for days in a week. The cash subsidy provided by the government through the SAP provided immediate relief to household beneficiaries. However, for households who depend on their daily wage earnings for subsistence, medium-term assistance is needed. The government should target programs that would restore jobs and enable the informal sector to resume earning income. A long-term solution to the problems of unemployment, vulnerability, and marginalization of households is needed.

3.6. Perception of the future and preferred assistance

The participants were asked about the assistance they perceived they need to enjoy a better economic situation in the future. The top responses were discounted utility bills (87 percent), cash assistance (82 percent), employment program (79 percent), and cash for work (77 percent) (Table 16).

TABLE 16. Frequency distribution of the participants in terms of needs to enjoy better economic situation in the future, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Discounted utility bills	851	86.75	512	88.28	339	84.75
Cash assistance	805	82.06	473	81.55	332	83.00
Employment program	773	78.80	464	80.00	309	77.25
Cash for work	757	77.17	442	76.21	315	78.75
More resilient banking system	631	64.32	409	70.52	222	55.50
Credit	577	58.82	353	60.86	224	56.00
Wide availability of Gcash, Paymaya	570	58.10	361	62.24	209	52.25

When asked about their expectation of their income status for the rest of the year, the survey participants perceived their income to be the same (49 percent), worse (36 percent), and better (14 percent) than the current time (Table 17).

TABLE 17. Frequency distribution of the participants in terms of expected income status for the rest of the year, Guimaras and Miagao, 2020

	Pooled		Guimaras		Miagao	
	No. (n=981)	%	No. (n=580)	%	No. (n=401)	%
Better	140	14.27	69	11.90	71	17.71
Same	483	49.24	281	48.45	202	50.37
Worse	358	36.49	230	39.66	128	31.92

The lack of confidence about the pandemic ending soon caused the participants to expect the pandemic to last longer. According to Christelis et al. [2020], the fear of the financial impact of the COVID-19 pandemic reduces people's marginal propensity to consume, thereby reducing household expenditure. Given the financial uncertainty caused by COVID-19, people might choose to further delay or limit their consumption (precautionary saving) (Byrne et al. [2020]; Christelis et al. [2020]) and cause a more severe effect on the country's output. This was evident by the 9.5 percent decline in the country's Gross Domestic Product

(GDP) for 2020. This highlights the importance of households' confidence in the economy and perception that the government is in control of the situation.

4. Conclusions and recommendations

The COVID-19 pandemic and the policy response of "community quarantine" (ECQ/MECQ/GCQ/MGCQ), which basically meant "stay at home", have affected households in Guimaras and Miagao that participated in the study. The situation not only highlighted long-existing problems (i.e., inequality, poverty, vulnerability, marginalization), but also provides a chance to learn and make change for the future.

The COVID-19 pandemic posed a serious threat to the livelihoods of households. The effects of livelihood and income loss were worse among lower-income households, who felt that their income status and ability to meet their basic needs were worse than the pre-pandemic period. The households mainly coped by consuming less (a host of other problems) and availing of external support. While short-term responses of providing food and financial assistance have been helpful, long-term support to address not only pandemics such as COVID-19 but also other stressors will require developing more resilient families. If low-income households are left behind in recovery efforts, it will be the "worst normal".

The pandemic has likewise emphasized the urgency for household resilience. Households should be able to respond to stresses even if resources are strained. Inequalities should be reduced by well-targeted actions by considering the heterogeneity in livelihood trajectories and unequal social vulnerability. Specifically, there is a need to refocus and reallocate funds towards programs, including social safety net schemes, for low-income households to protect or help them recover from the adverse impact of COVID-19.

Several approaches/interventions are recommended to improve the resilience of families. The first approach is to restore consumer confidence by prioritizing their health and safety. The main policy instrument of the government of ECQ has brought about severe impacts on the economy. It will be an effective strategy if it is accompanied by mass testing, contact tracing, quarantine and isolation, vaccination, and cash assistance to give people purchasing power so they remain in their homes during the quarantine. Without these other interventions accompanying it, the ECQ will not be effective. The second approach is to strengthen households through the social network of friends, relatives, and neighbors – social capital. The strengthening and formation of social capital can serve as both a social safety net and a bridge toward the transition to financial inclusion. The third approach is financial inclusion through savings, credit, digital payment products, and insurance that has all been found to increase resilience and cut risk. The fourth approach is the provision of access to social protection measures such as government health insurance and social security.

A limitation of the study is that due to travel restrictions and lack of face-to-face interactions, it was not possible to conduct more comprehensive surveys and other supplementary data collections to fully understand the experience and responses of families. Once the situation allows, it is therefore recommended that a more in-depth data collection be conducted of households to gain more knowledge about the impact and responses to COVID-19 among households.

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National Health Insurance Program financing during the COVID-19 pandemic: financial viability and the burden of paying for NHIP benefits

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This paper examines the state of National Health Insurance Program (NHIP) financing during the COVID-19 pandemic in the Philippines, an event which coincides with the implementation of the Universal Health Care (UHC) mandates on restructuring the NHIP premium schedule, providing immediate eligibility to NHIP benefits, and expanding member benefits. Using the ratio of total expenditures to total revenues as the measure of financial viability, it shows that the NHIP remains financially viable during the COVID-19 pandemic year of 2020. Projections for 2021 however show that NHIP financial viability may be adversely affected by the significantly higher number of COVID-19 cases with the negative effect mitigated only if COVID-19 benefit claim patterns remain as weak as observed for 2020. On the revenue side, the potential for a lower premium is observed to be offset by the higher rates in the UHC mandated premium schedule. On the expenditure side, potential increases associated with the implementation of immediate eligibility and the introduction of COVID-19 benefits are mitigated by lower NHIP benefit utilization due to reduced mobility and access to health facilities. Secondary analysis on who has to bear the burden of paying for NHIP benefits, however, shows that the implementation of UHC financing initiatives may heighten adverse incentives on members' willingness to pay premiums. Using the benefit expenditure-premium contribution ratio as the measure for the burden of paying for NHIP benefits, it is shown that the Formal Economy sector shoulders the burden of funding the NHIP benefits of the Informal Economy and Sponsored sectors.

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1. Introduction

The National Health Insurance Program (NHIP) which is managed by the Philippine Health Insurance Corporation (PhilHealth), a government corporation attached to the Department of Health (DOH), provides social health insurance to Filipinos[1]. Recognizing the key role of the NHIP in the health care financing sector, the Universal Health Care (UHC) Act identifies three NHIP financing initiatives for implementation in 2020[2], namely: (a) the restructuring of the premium schedule, (b) the provision of immediate eligibility to all Filipinos[3], and (c) the expansion of member benefits[4]. The first initiative (a) is expected to increase premium contribution revenues as the revised premium schedule mandated increases in both the premium rates and the applicable reference income cap. Unlike (a), the second initiative (b) is anticipated to increase both premium contribution revenues as well as benefit payment expenditures due to enrolment and benefit utilization increases. Lastly, the third initiative (c) is expected to increase benefit payment expenditures with the introduction of new benefits.

The role of financing in health care reforms and the introduction of measures to ensure the financial sustainability of social insurance programs are well documented in other countries' experiences such as Egypt [Nandakumar et al. 1999], Croatia [Vončina et al. 2012], Korea [Kang et al. 2012], Ghana [Wang et al. 2017], and Indonesia [Prabhakaran et al. 2019]. Moreover, financial viability reviews such as that by Okungu et al. [2017] have examined the feasibility of financing mechanisms in the implementation of UHC by modelling contributory arrangements, revenue flows, and expenditures.

Unfortunately, 2020 also marked the onset of the COVID-19 pandemic in the Philippines. In mid-March the Philippine government imposed mobility restrictions and isolation measures, collectively referred to as community quarantine, which reduced economic activity and prospectively limited both premium contribution collections and the utilization of NHIP benefits. According to the Department of Labor and Employment, about 1.19 million workers were displaced from work in April 2020 by COVID-19. The use of health care services was also adversely affected, with the Philippine Hospital Association reporting both a stark decrease in bed occupancy and a significant decline in outpatient census compared to 2019 [Almora 2020]. As of May 2021, the country continues to impose mobility restrictions as the pandemic continued.

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1 2017 National Demographic and Health Survey Final Report, Philippine Statistical Authority.

2 The implementing rules and regulations of the Universal Health Care Act took effect on October 2019.

3 Based on PhilHealth circular no. 2019-0010, immediate eligibility shall apply to all services provided in PhilHealth accredited or contracted public facilities and in basic accommodations in PhilHealth accredited or contracted private health care institutions.

4 Implementing Rules and Regulations of the Universal Health Care Act (RA 11223) Section 8 Program Membership.

Although the pandemic experience is quite recent, a number of studies have examined the COVID-19 pandemic implications on many financing landscapes, including that for health. The World Bank [2020] projects a deep global economic contraction as a result of the COVID-19 pandemic. Fiscal sustainability challenges are anticipated for countries with contributory social health insurance schemes given the detrimental effects of the pandemic on labor market conditions. With the anticipated increase in unemployment and poverty, the World Bank estimates US$70 million in potential additional spending in the Philippines to cover the contributions lost due to unemployment as well as subsidies for those who are impoverished due to the pandemic. On one hand, in terms of health spending, the World Health Organization [2020] cites lower health spending for routine health services in some countries despite health budget increases. On the other hand, a technical note by Sugimoto and Windsor [2020] discusses expected increases in COVID-19 related claims concurrent with a deferral of non-urgent health care, while the effect of the pandemic on premium collections remains unclear. The decrease in non-COVID claims in the Philippines was noted in the study of Ulep et al. [2021] which observed a large decline in medical claims in 2020. This decline is presumed to be caused by mobility restrictions, fear of contracting COVID-19, decline in income, and the reduction or closure of other non-essential medical services in facilities.

The analysis of COVID-19 pandemic shocks from these earlier studies indicates three key revenue and expenditure effects, namely: (a) the reduction in premium revenues due to lower capacity to pay on the part of members, employers, sponsors, and government; (b) the reduction in benefit expenditures due to restricted access and treatment-seeking behavior; and (c) the increase in benefit expenditures due to NHIP benefits financing the utilization of COVID-19 care.

The coincidence of the COVID-19 pandemic and the implementation of UHC financing initiatives confounds the potential determination of changes in premium revenues and benefit expenditures attributable to these two events. For example, the increase in premium collections due to the higher premium rates may be offset by reduced premium collections due to lower capacity to pay on the part of workers. Accordingly, it will be difficult to disentangle the marginal effects of the pandemic and UHC implementation. Without micro-level individual data on the utilization and financing of health services, it would be impossible to employ multivariate statistical methods that facilitate the disentangling of pandemic and UHC implementation effects. Thus, a limitation of the study is that the analysis will not be able to decompose the combined revenue and expenditure effects associated with the onset of the pandemic and UHC implementation, with the exception of added expenditures due to COVID-19 benefit packages. As such, the paper presents the state of NHIP revenue and expenditure streams during the COVID-19 pandemic as UHC initiatives are being implemented, rather than identify specific pandemic and UHC implementation effects.

The paper examines the NHIP revenue and expenditure streams through an accounting framework that defines financial viability in terms of changes to its reserve fund. These additions or subtractions to the reserve fund constitute the net difference between revenues and expenditures which to a large extent accrue from premium contributions and benefit payments to Direct Contributors – Formal and Informal Economy member sectors – and Indirect Contributors – Indigent, Senior Citizen and Sponsored member sectors - as well as Lifetime Members sector.

Rather than describe the effect of UHC financial initiatives and the onset of the COVID-19 pandemic on the state of NHIP finances in terms of revenues and expenditures, the paper examines effects in terms of the financial viability of the NHIP and the financial burden of paying for NHIP benefits. Accordingly, financial viability is measured as the total expenditures-total revenues ratio. This ratio describes the relative difference between total expenditures and total revenues, with indications of financial viability being adversely affected when total expenditures exceed total revenues. On the other hand, the financial burden of paying for NHIP benefits is measured through two indicators. These are the benefit payment-premium contribution ratio and the lifetime member equity. The benefit payment-premium contribution ratio represents the relative difference between the value of benefits received and the amount of premium paid by member sector, i.e., whether a member sector is a net recipient or payer of NHIP benefits. The lifetime member equity on the other hand reflects the pension fund character of the UHC which distinguishes it from the typical pay-as-you-go health insurance scheme where membership is applied on a per-year basis contingent on whether the member or a third-party sponsor pays the premium. Accordingly, the lifetime member equity represents the implicit subsidy provided by all member sectors other than Lifetime Members to support the provision of NHIP to Lifetime Members.

An important NHIP concern is the amount of additional benefit expenditures due to the introduction of the COVID-19 benefit packages and how this affects the financial viability of the NHIP. As such, a segment of the analysis is devoted to estimating the amount of additional COVID-19 benefit expenditures and its effect on financial viability. The succeeding sections of this paper present framework, data, methodology, results, discussion, summary of findings and conclusion.

2. Framework

2.1. Accounting framework

The capacity of the NHIP to provide benefits is defined by the accounting identity, that given the year the total expenditures are equal to total revenues plus changes to the reserve fund (see Equation 1). This relationship implies that when total expenditures exceed total revenues then excess expenditures need to be supported by drawdowns from the reserve fund. Conversely, an addition to the reserve fund occurs when total expenditures are less than total revenues. All financial indicators are on an annual basis.

$$Total\ Expenditures = Total\ Revenues + \Delta Reserve\ Fund \tag{1}$$

The NHIP accounting framework identifies total revenues as composed of premium contributions and interest and other incomes, and identifies total expenditures as composed of benefit payments and administrative expenses (see Equations 2 and 3).

$$Total\ Revenues = Premium\ Contribution + Interest\ and\ Other\ Incomes \tag{2}$$

$$Total\ Expenditure = Benefit\ Payment + Administrative\ Expenses \tag{3}$$

The same accounting framework further classifies premium contribution collections and benefit payment expenditures in terms of membership sectors. The main categories of members are Direct and Indirect Contributors, and Lifetime Members. Accordingly, total premium contributions and total benefit payment expenditures are defined by Equations 4 and 5.

$$Premium\ Contribution = Premium\ Contribution_{Direct} + Premium\ Contribution_{Indirect} \tag{4}$$

$$Benefit\ Payment = Benefit\ Payment_{Direct} + Benefit\ Payment_{Indirect} + Benefit\ Payment_{Lifetime} \tag{5}$$

The Direct Contributors, as defined by the UHC law, refer to PhilHealth members who are gainfully employed and are bound by an employer-employee relationship or are self-earning, professional practitioners, or migrant workers. Direct Contributors who are bound by employer-employee relationships (i.e., those working in private establishments or government institutions as well as those working as kasambahay or house help, family drivers, and enterprise owners) are those considered under the Formal Sector, and their premiums are collected through the mandatory withholding of contributions for social protection programs. On the other hand, members from the Informal Sector, which include self-earning individuals, migrant workers, Filipinos with dual citizenship, naturalized Filipino citizens and citizens of other countries working and/or residing in the Philippines, are paying their premium contributions on a voluntary basis.

$$Premium\ Contribution_{Direct} = Premium\ Contribution_{Formal} + Premium\ Contribution_{Informal} \tag{6}$$

$$\textit{Benefit Payment}_{Direct} = \textit{Benefit Payment}_{Formal} + \textit{Benefit Payment}_{Informal} \qquad (7)$$

Indirect Contributors refer to PhilHealth members whose premium contributions are subsidized by the national government. This group includes the Indigent (National Household Targeting System (NHTS)-identified poor), Senior Citizens, and Sponsored sectors (poor identified by means other than NHTS). The Indigent sector members are enrolled to the NHIP through the Listahanan system of the Department of Social Welfare and Development while the Senior Citizen sector must register through the Office of the Senior Citizen Affairs or a PhilHealth Local Health Insurance Office. The Sponsored sector members, on the other hand, can register through a Point of Service (POS) system where enrollment is limited to patients in health facilities who were identified to be not NHIP registered.

$$\begin{aligned}\textit{Premium Contribution}_{Indirect} = {} & \textit{Premium Contribution}_{NHTS} + \\ & \textit{Premium Contribution}_{Senior} + \\ & \textit{Premium Contribution}_{Sponsored} \qquad (8)\end{aligned}$$

$$\begin{aligned}\textit{Benefit Payment}_{Indirect} = {} & \textit{Benefit Payment}_{NHTS} + \textit{Benefit Payment}_{Senior} + \\ & \textit{Benefit Payment}_{Sponsored} \qquad (9)\end{aligned}$$

Lifetime Members, while considered as Direct Contributors by the UHC law, operate under a different payment scheme compared to the other membership sectors. The following individuals who are not gainfully employed and who have paid at least 120 months of PhilHealth premiums and the former Medicare Programs of Social Security System (SSS) and Government Service Insurance System (GSIS) are provided Lifetime Member status wherein the member is eligible for NHIP benefits without the need to pay premiums. These are 1) individuals aged 60 years old and above, 2) uniformed personnel aged 56 years old and above, or 3) SSS underground miner-retirees aged 55 years old and above. SSS and GSIS pensioners prior to March 4, 1995 are also eligible to become Lifetime Members. To facilitate the comparison of revenue and expenditure elements, this paper defines the following measures: (1) total expenditures-total revenues ratio, (2) benefit payment-premium contribution ratios, or (3) lifetime member equity. A paper by Yevutsey and Aikins [2010] also used similar measures in assessing the financial viability of a district mutual health insurance scheme in Ghana. The authors used the expense ratio or the ratio of administrative cost to annual premium collected, and the claims ratio defined as the ratio of medical claims with the total premium collected.

2.2. Measures of the State of NHIP Financing

This paper defines NHIP financial viability in terms of the relative difference between NHIP expenditures and revenue which is expressed as the total expenditures-total revenues ratio (see Equation 10).

$$\textit{total expenditures} - \textit{total revenues ratio} = \textit{Total expenditures} \,/\, \textit{Total revenues} \quad (10)$$

This ratio describes the relative difference between total expenditures and total revenues with financial viability adversely affected when total expenditures exceed total revenues. That is, financial viability is negatively affected when the total expenditures-total revenues ratio exceeds 1 as this implies a drawdown from the reserve fund. On the other hand, an opposite conclusion is reached when the total expenditures-revenues ratio is less than 1.

The burden of paying for NHIP benefits is described by two measures: the benefit payment-premium contribution ratio and the lifetime member equity (see Equations 11 and 12).

$$\textit{Benefit payment-premium contribution ratio}_{sector} = \frac{\textit{Benefit payment}_{sector}}{\textit{Premium contribution}_{sector}} \quad (11)$$

$$\textit{Lifetime Member Equity} = \frac{\textit{Benefit payment}_{Lifetime}}{\Sigma \textit{Premium contribution}_{sector}} \quad (12)$$

The benefit payment-premium contribution ratio is interpreted differently from the total expenditures-total revenues ratio. Rather than describe financial viability, the benefit payment-premium contribution ratio represents the relative difference between the value of benefits received by a particular member sector and the amount of premium that the member sector has paid or contributed to the NHIP. The benefit payment-premium contribution ratio can thus be regarded as an indicator of whether a particular member sector is a net recipient of NHIP benefits as when the value of benefits received exceeds premiums paid (ratio greater than 1), or is a net payer of NHIP benefits as when the value of benefits received is less than premiums paid (ratio less than 1).

The lifetime member equity, on the other hand, reflects the pension fund character of the NHIP which distinguishes it from the typical pay-as-you-go health insurance scheme, where membership is applied on a per-year basis contingent on whether the member or a third-party sponsor pays the premium. Accordingly, the lifetime member equity can be viewed as a return to excess premium payments made during an earlier period. This implies, however, that during the earlier periods the member must have received less in benefits compared to premiums paid.

3. Data and methodology

3.1. NHIP revenue and expenditure data and projection methodology

The analysis of NHIP revenues and expenditures streams before and during the COVID-19 pandemic utilizes data from various published and unpublished PhilHealth reports. The 2015-2018 revenue and expenditure data are from the restated financial statements of PhilHealth that are published on the 2016-2019 Annual Audit Reports of the Commission on Audit. Due to recognized delays in claims processing, the restated financial statements (which are published alongside the succeeding year's audited financial statements) are used instead of the current year audited financial statements because the former uses more updated financial data. For 2019 revenue and expenditure data, the restated 2019 financial statement included in the 2020 unpublished audited PhilHealth financial statement as of February 23, 2021 is used.

The 2020 premium contribution and benefit expenditure data are directly lifted from PhilHealth 2020 Stats and Charts. Data on interest and other income and administrative expenses are sourced from PhilHealth's 2020 unpublished financial statement. As data on benefit payment for Lifetime Members are not available, the reported paid claims for Lifetime Members in the 2020 Stats and Charts are used instead. Given that Lifetime Members are no longer required to pay premiums, the corresponding source of funds for their NHIP benefit use is drawn from the Retirement Fund component of the Reserve Fund. On the expenditure side, adjustments to benefit payments are applied to proportionately distribute the benefit payments released through the internal reimbursement mechanism (IRM). This IRM amount represents a portion of the substantial aid provided to accredited health care institutions directly hit by the COVID-19 pandemic that had clear and apparent intent to continuously operate during the pandemic in order to provide continuous health care services to Filipinos. The use of IRM in response to the COVID-19 pandemic has been enabled by the issuance of PhilHealth Circular no. 2020-0007 last March 2020[5]. While most of the funds allocated through the IRM have already been classified under the corresponding recipient member sector, a relatively small portion of the IRM amounting to ₱3.7 billion remain unclassified in the 2020 Stats and Charts. To allow for year-on-year comparison and calculation of benefit payment to premium ratios, the unclassified portion of the IRM is proportionately distributed across benefit payments per membership sector, which includes paid claims for Lifetime Members (see Equation 13).

[5] The implementation of IRM was suspended by PhilHealth on August 14, 2020 to facilitate further review of the process.

$$Adjusted\ benefit\ payment_{sector2020} = Benefit\ Payment_{type2020} + \left(IRM_{2020} \times \frac{Benefit\ payment_{type2020}}{\Sigma Benefit\ payment_{type2020}} \right) \quad (13)$$

Projections for the 2021 premium contributions vary per membership type due to differences in assumptions. Considering that the implementation of the UHC-mandated premium schedule has been suspended in 2021[6], the only adjustment in the revenue projections involves accounting for population growth in select member sectors. Table 1 shows the historical membership data of PhilHealth from 2015-2020. The membership data are directly lifted from the 2015-2020 PhilHealth Stats and Charts.

TABLE 1. PhilHealth membership count per sector, 2015-2020

Membership Sector	2015	2016	2017	2018	2019	2020
Direct Contributors	17,293,737	17,896,999	25,981,453	27,768,288	28,963,233	29,369,259
Formal Sector	13,869,211	14,636,188	14,903,502	15,989,829	16,748,991	16,737,134
Informal Sector	3,424,526	3,260,811	11,077,951	11,778,458	12,214,242	12,632,125
Indirect Contributors	23,208,135	23,334,850	23,602,334	26,048,181	24,378,400	23,432,516
Indigent	15,288,583	14,641,685	14,329,442	15,718,882	12,834,955	12,794,699
Senior	5,868,005	6,245,583	6,899,207	7,531,326	8,070,076	8,332,032
Sponsored	1,049,921	1,217,941	1,127,692	1,519,424	2,153,992	958,985
Lifetime	1,001,626	1,229,641	1,245,993	1,278,549	1,319,377	1,346,800
Total	40,501,872	41,231,849	49,583,787	53,816,469	53,341,633	52,801,775

Sources of data: PhilHealth Stats and Charts 2015-2020.

The projected revenue from the Formal sector is calculated by inflating the 2020 Formal Economy sector premium collection with the ratio of 2019 Formal Economy sector member count to 2020 (see Equation 14). This suggests that Formal Economy sector member count is expected to return to its 2019 level by 2021 in consideration of a slight improvement in economic growth that can be expected following the increase in economic activities due to gradual lifting of community quarantine rules. On the other hand, the revenue from the Informal Economy sector for 2021 is projected to stay at the 2020 level with the assumption that collection rate from voluntary payment will not change. In the case of Indirect Contributors, premium subsidies for Indigent and Sponsored members are expected to remain at the 2020 level in 2021, following the assumption that

[6] Based on PhilHealth's Official Statement on the implementation of adjusted contribution rate for CY 2021, the premium rate of 3.5 percent for 2020 is retained in 2021 but increase in the monthly basic salary ceiling still adopted the 2021 ceiling prescribed in the UHC law.

registration rate of Indigent and Sponsored members will not change in 2021. Projected 2021 premium subsidy for Senior Citizens sector is calculated by inflating the 2020 senior citizen subsidy with the ratio of 2020 Senior Citizen sector member count to that in 2019, suggesting that the number of senior citizen members will grow at the same rate observed in 2020 (see Equation 15). Interest and other income are assumed to remain unchanged from 2020 to 2021.

$$Projected\ premium\ contribution_{Formal2021} = Premium\ contribution_{Formal2020} \times \left(\frac{Member\ count_{Formal2019}}{Member\ count_{Formal2020}}\right) \tag{14}$$

$$Projected\ premium\ contribution_{Senior2021} = Premium\ contribution_{Senior2020} \times \left(\frac{Member\ count_{Senior2020}}{Member\ count_{Senior2019}}\right) \tag{15}$$

To project the 2021 benefit payments per membership category, the 2020 benefit payments are adjusted using the growth rate of paid claims based on the year of admission from 2016 to 2019. These ratios are calculated by dividing the current year paid claims amount by the previous year paid claims amount (see Equation 16). Table 2 shows the historical claims amount from 2016 to 2019. The 2021 projected benefit payments to Lifetime Members, however, is assumed to stay at the 2020 level.

$$Projected\ benefit\ payment_{sector2021} = Benefit\ payment_{sector2020} \times \left[\frac{\left(\frac{Paid\ claims_{sector_{2017}}}{Paid\ claims_{sector_{2016}}} + \frac{Paid\ claims_{sector_{2018}}}{Paid\ claims_{sector_{2017}}} + \frac{Paid\ claims_{sector_{2019}}}{Paid\ claims_{sector_{2018}}}\right)}{3}\right]^2 \tag{16}$$

TABLE 2. Claims amount per membership sector, 2016-2019 (in pesos)

Membership Sector	2016	2017	2018	2019
Formal Sector	24,140,781,505	24,392,639,788	23,831,238,616	24,870,211,102
Informal Sector	20,860,675,358	21,654,117,230	21,221,422,850	21,079,248,867
Indigent	21,191,698,801	20,477,790,445	21,274,558,824	20,548,359,071
Senior Citizen	18,371,153,623	21,043,465,420	21,806,226,437	22,425,205,253
Lifetime	6,334,462,215	6,284,256,575	6,134,660,654	5,994,160,074
Sponsored	11,434,444,693	10,664,597,380	11,914,561,782	15,348,344,535

Sources of data: 2016 to 2019 PhilHealth Corporate Dashboard tables as of April 2021.

3.2. COVID-19 case projections, benefit use and payments estimates

Given that the projection methodology for the 2021 benefit payments employs the average annual growth in benefit payments and that the number of COVID-19 cases is significantly higher in 2021, there is a need to adjust the projected 2021 benefit payments to account for a possible higher growth rate in benefit payments due to COVID-19. This adjustment involves projecting utilization and benefit payments corresponding to the COVID-19 benefit packages – community isolation, inpatient cases of varying severity, and reverse transcription polymerase chain reaction (RT-PCR) testing with varying service inclusions (Table 3).

TABLE 3. PhilHealth COVID-19 benefit packages and package amounts

Benefit Package Type	Package Code	Package Amount (in ₱)
Community Isolation Package	C19CI/C19CIS	22,449
Inpatient Packages	C19IP1 (Mild pneumonia)	43,997
	C19IP2 (Moderate pneumonia)	143,267
	C19IP3 (Severe pneumonia)	333,519
	C19IP4 (Critical pneumonia)	786,384
Packages for SARS-CoV-2 testing by RT-PCR	C19T1	3,409
	C19T2	2,077
	C19T3	901

Sources of data: PhilHealth Circulars 2020-0009, 2020-0017, 2020-0018.

This study estimates NHIP COVID-19 benefit package payments through a two-step procedure. First, the total number of individuals tested for COVID-19 as well as the total number of COVID-19 cases in 2021 are projected, considering the population eligible to avail of the COVID-19 testing and community isolation/ inpatient packages, respectively. The second step involves projecting the amount of benefit package payments in 2021 for each type of COVID-19 benefit package type, using 2020 use rate estimates as reference.

3.3. Projecting COVID-19 case and testing counts

Actual data[7] for the period of 2020, as well as January to April 2021, was extracted from the DOH Data Drop dated April 28, 2021. The DOH Data Drop is a compilation of relevant COVID-19 information collected and disseminated by the DOH in compliance with its duty to publish timely, true, accurate, and updated key information. The DOH Data Drop is published daily, linked to the DOH COVID-19 Tracker page, and and it comprises multiple datasets on COVID-19 case counts,

[7] COVID-19 actual case data for 2021 covers the period of January 1 to April 28, while actual testing data covers the period January 1 to April 27.

health facility capacities, and testing counts. Two datasets were used in this study: the Case Information dataset which is extracted daily from the COVID-19 Information System by the DOH Epidemiology Bureau at 12 noon and uses case investigation forms as the primary data source; and the Testing Aggregates dataset which are from collated daily laboratory results released as of 6 pm.

The COVID-19 case counts are obtained from the Case Information dataset and refer to the number of total COVID-19 cases as reported by the DOH. The total number of individuals tested for COVID-19 is obtained from the Testing Aggregates dataset. Cumulative counts of unique individuals tested as of a given date are used in this study. Testing counts are disaggregated into individuals tested by Philippine Red Cross (PRC) Laboratories and individuals tested by COVID-19 Testing Centers. These are counted separately since the payment scheme implemented for PRC testing laboratories is based on a Memorandum of Agreement with PhilHealth and not on PhilHealth Circular no. 2020-0017 "Benefit Package for SARS-CoV-2 testing using RT-PCR (Revision 1)."

The estimated numbers for the remaining period of April up to December 31, 2021 are derived from the average number of new cases or unique individuals tested per day from January to April and projected to the rest of the year. This assumes that the number of cases for the rest of the year will, on average, be similar to case counts from January to April 2021. Adjustments[8] to the 2021 projected case counts were made to account for the effect of the current COVID-19 vaccination efforts (see Equations 17 and 18).

Totals for 2021 are estimated by adding the actual number of cases and individuals tested to date and the projected numbers of cases and individuals to be tested until the end of the year.

$$\textit{Projected number of cases}_{\textit{Apr to Dec } 2021} = \frac{\textit{Average number of individuals tested per day}_{\textit{Jan to Apr } 2021} \times \textit{number of days remaining in } 2021}{1 + (\textit{vaccine efficacy x vaccine coverage})} \tag{17}$$

$$\textit{Projected number of individuals tested}_{\textit{Apr to Dec } 2021} = \textit{Average number of individuals tested per day}_{\textit{Jan to Apr } 2021} \times \textit{number of days remaining in } 2021 \tag{18}$$

[8] We assume a 50 percent vaccine efficacy and 10 percent vaccine coverage of the entire population by end of the year based on authors' calculations given the current vaccine allocation and the anticipated number of vaccines to be delivered to and administered by the national government by the end of the year.

3.4. Projecting 2021 COVID-19 benefit package claims

Data received from PhilHealth on the COVID-19 benefit package claims includes claims received in 2020 that were extracted from the PhilHealth Claims Database as of Jan 14, 2021. One limitation in the use of this extracted data is that claims for patients who were infected and/or discharged in 2020 but which were filed[9] in 2021 are excluded from the data.

Estimates of the number of claims and amount of COVID-19 benefit payments in 2021 are calculated on the basis of use rates corresponding to the various COVID-19 benefit packages in 2020. Use rates refer to the proportion of individuals who were able to claim specific COVID-19 benefits, meaning, individuals who have filed claims and whose claims are paid by PhilHealth, among all the individuals eligible to receive the benefits. In particular, use rates were calculated using the total number of COVID-19 cases in 2020 and cumulative counts of unique individuals tested in 2020 as denominators for the Community Isolation Unit (CIU)/inpatient benefit claims and the COVID-19 testing claims, respectively (see Equation 19).

$$\textit{Benefit package use rate}_{\textit{benefit package type}} = \frac{\textit{Number of benefit package claims}_{2020,\textit{benefit package type}}}{\textit{Total number of cases or individuals tested}_{2020}} \tag{19}$$

The adjusted 2020 use rates are then applied to the projected case and testing counts for 2021. This assumes that the proportion of the individuals who are availing of the COVID-19 benefit packages in 2021 will be similar to that in 2020 given that there have been no new policy issuances from PhilHealth with regards to the COVID-19 benefit packages. Thus, there are no anticipated changes in the implementation of PhilHealth's existing COVID-19 policies.

Two scenarios were considered in adjusting the use rates. The first scenario (low-end estimate) considers the present situation where the number of paid claims for COVID-19 benefit packages is low. Under this scenario, the estimated 2020 use rate based on the number of paid claims is used to calculate the number of claims in 2021. An inflation factor of ten percent is used to account for the number of pending claims that are still expected to be paid. The second scenario (high-end estimate) utilizes the estimated 2020 use rate based on the number of paid and pending[10] claims. This assumes that all currently pending claims will be processed and paid by PhilHealth.

The projected number of claims for the COVID-19 CIU and inpatient benefit packages is calculated as the product of the projected number of COVID-19 cases in 2021 multiplied by the corresponding use rates for each benefit package. Similarly, the projected number of claims for the COVID-19 testing packages is calculated as the projected number of individuals tested in 2021 multiplied by the estimated use rates (see Equation 20).

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[9] PhilHealth allows claims to be filed within 60 days after date of patient discharge (Section 46 of RA 7875).

[10] Claims tagged with claim status "RTH," "Approved for Payment", and "In-Process" in the extracted PhilHealth COVID-19 claims data are classified as "Pending".

$$\begin{aligned}&\textit{Number of benefit package claims}_{2021,\textit{benefit package type}} = \\ &\quad \textit{Projected number of cases or individuals tested}_{2021} \times \\ &\quad \textit{benefit package use rate}_{\textit{benefit package type}}\end{aligned} \tag{20}$$

The projected amount of COVID-19 benefit payments for each benefit package type is then calculated by multiplying the projected number of claims by the corresponding benefit package amount or case rate[11]. (see Equations 21 and 22)

$$\begin{aligned}&\textit{Benefit package total claim amount}_{2021,\textit{benefit package type}} = \\ &\quad \textit{Number of benefit package claims}_{2021,\textit{benefit package type}} \times \\ &\quad \textit{case rate}_{\textit{benefit package type}}\end{aligned} \tag{21}$$

The total COVID-19 benefit payments for the various benefit package types is calculated as the sum of the total claim amounts of each type of benefit package (see Equation 22).

$$\begin{aligned}&\textit{Total COVID-19 benefit payments}_{\textit{year}} = \\ &\quad \sum \textit{Benefit package total claim amounts}_{\textit{benefit package type}}\end{aligned} \tag{22}$$

3.5. Adjustments to the 2021 net revenue estimates

The projected COVID-19 benefit payments for 2021 are used to adjust the 2021 total expenditure and net revenue estimates. First, the COVID-19 benefit payments are abstracted from the projected 2021 benefit expenditures by multiplying the actual COVID-19 2020 benefit payments reported in the OCOO data by the 2020-2021 benefit payment growth rate which is used as the inflation factor (see Equation 23).

$$\begin{aligned}&\textit{COVID-19 benefit payments in } 2021 \textit{ projected benefit expenditures} = \\ &\quad \textit{Total COVID-19 benefit payments}_{2020} \times \textit{inflation factor}\end{aligned} \tag{23}$$

This amount is subtracted from the projected 2021 benefit expenditures, and the difference is added to the COVID-19 benefit payment estimates to arrive at the adjusted 2021 projected benefit expenditures (see Equation 24).

$$\begin{aligned}&\textit{Adjusted projected benefit expenditures}_{2021} = \textit{Projected benefit expenditures}_{2020} - \\ &\quad \textit{COVID-19 benefit payments in } 2021 \textit{ projected benefit expenditures} + \\ &\quad \textit{Total COVID-19 benefit payments}_{2021}\end{aligned} \tag{24}$$

[11] Case rates for PhilHealth benefit packages are based on current PhilHealth guidelines, i.e. PhilHealth Circulars 2020-0009, 2020-0017, 2020-0018; case rate for Philippine Red Cross Laboratories is based on the Memorandum of Agreement with PhilHealth.

4. Results and discussion

4.1. Analysis of NHIP revenue and expenditure streams before and during the COVID-19 pandemic

4.1.1. Historical NHIP revenue and expenditure streams

TABLE 4. Revenue by membership sector for 2015-2019 (in pesos)

Membership Sector	2015	2016	2017	2018	2019
Premium Contributions					
Direct Contributors	47,374,227,259	52,928,020,253	57,478,065,426	74,339,259,039	77,378,850,588
Formal	40,558,515,410	47,964,407,088	49,542,046,363	66,869,781,334	69,074,001,510
Informal	6,815,711,849	4,963,613,165	7,936,019,063	7,469,477,705	8,304,849,078
Indirect Contributors	52,386,727,540	50,897,778,585	49,968,972,845	59,749,573,806	69,395,038,148
Indigent - NHTS	36,257,956,800	34,682,688,000	33,860,356,800	37,157,479,200	30,407,623,000
Senior Citizens	13,045,051,200	13,044,616,800	13,045,051,000	18,674,391,216	33,868,279,600
Sponsored	3,083,719,540	3,170,473,785	3,063,565,045	3,917,703,390	5,119,135,548
Total Premium Contributions	99,760,954,799	103,825,798,838	107,447,038,271	134,088,832,845	146,773,888,736
Interest and Other Income	7,093,891,589	5,835,386,425	5,852,075,305	6,742,430,076	8,128,422,262
Total Revenue	**106,854,846,388**	**109,661,185,263**	**113,299,113,576**	**140,831,262,921**	**154,902,310,998**

Sources of data: PhilHealth 2015-2019 Financial Statements, 2020 Financial Statement unpublished draft as of February 23, 2021.

Premium contribution revenue has been growing from 2015 to 2019, as demonstrated in Table 4. Significant increases are noted between 2017 and 2018 amounting to ₱26 billion due to higher premium collections from the Formal Economy sector[12], followed by ₱14 billion increase between 2018 and 2019 due to higher premium subsidies for the Senior Citizen sector[13]. The proportion of premiums accounted for by Direct Contributors has also been increasing relative to the proportion accounted for by Indirect Contributors during the period 2015-2019.

Likewise, total benefit payments have been growing from 2015 to 2019, as illustrated in Table 5. In contrast to premium contributions, the increases in benefit payments are largely accounted for by Indirect Contributors as benefit payments for Direct Contributors have remained relatively unchanged. Interest income from investments and administrative expenses have remained relatively unchanged from 2015 to 2019.

[12] PhilHealth Annual Report 2017 and PhilHealth Stats and Charts 2018.

[13] During the same period, premium schedules also increased for Senior Citizens from ₱2,400 to ₱3,120 per annum (as per DOH Budget Folio).

TABLE 5. Benefit payments by membership sector for 2015-2019 (in pesos)

Membership Sector	2015	2016	2017	2018	2019
Benefit Payments					
Direct Contributors	46,001,894,598	45,630,777,330	45,860,390,868	46,147,058,314	48,822,061,536
Formal	24,922,914,693	24,867,012,076	24,317,341,611	24,427,851,224	26,616,078,252
Informal	21,078,979,905	20,763,765,254	21,543,049,257	21,719,207,090	22,205,983,284
Indirect Contributors	53,223,530,625	56,499,919,046	51,674,470,119	58,013,038,633	64,201,896,627
Indigent - NHTS	25,896,272,119	19,687,975,690	21,105,362,722	27,511,238,757	32,931,215,186
Senior Citizens	19,914,306,807	25,105,666,775	20,949,323,856	20,649,020,746	21,364,596,140
Lifetime Members			8,881,787,900	8,796,365,924	12,276,862,300
Sponsored	7,412,951,699	11,706,276,581	9,619,783,541	9,852,779,130	9,906,085,301
Total Benefit Payments	99,225,425,223	102,130,696,376	106,416,648,887	112,956,462,871	125,300,820,463
Administrative Expenses	6,197,037,625	7,782,019,982	6,645,298,055	6,850,134,819	12,938,660,054
Total Expenditure	**105,422,462,848**	**109,912,716,358**	**113,061,946,942**	**119,806,597,690**	**138,239,480,517**

Sources of data: PhilHealth 2015-2019 Financial Statements, 2020 Financial Statement unpublished draft as of February 23, 2021.

NHIP revenues and expenditures from 2015 to 2017 were approximately the same magnitude, but NHIP revenues grew much larger than expenditures in 2018 and 2019. Hence, the total expenditures-total revenues ratio has been declining, from approximately equal to 1 in the 2015-2017 period to noticeably lower than 1 in 2018-2019, as demonstrated in Table 6.

TABLE 6. Benefit payment-premium contribution ratios by membership sector

Membership Sector	2015	2016	2017	2018	2019
Direct Contributors	0.97	0.86	0.80	0.62	0.63
Formal	0.61	0.52	0.49	0.37	0.39
Informal	3.09	4.18	2.71	2.91	2.67
Indirect Contributors	1.02	1.11	1.03	0.97	0.93
Indigent - NHTS	0.71	0.57	0.62	0.74	1.08
Senior Citizens	N/A	N/A	1.61	1.11	0.63
Sponsored	2.40	3.69	3.14	2.51	1.94
Aggregate Benefit/Premium Ratio	0.99	0.98	0.99	0.84	0.85
Lifetime Member Equity	N/A	N/A	0.08	0.07	0.08
Expenditure to Revenue Ratio	0.99	1.00	1.00	0.85	0.89

Sources of data: Authors' calculations based on PhilHealth 2015-2019 Financial Statements.

Examining the ratios per member sector, it can be seen that the benefit payment-premium contribution ratio for Direct Contributors is consistently less than 1 and declining over time, indicating Direct Contributors are net payers of NHIP benefits. Specifically, members under the Formal Economy sector are distinctly net payers with the associated benefit payment-premium contribution ratio well below 1 and continuously declining over the 2015-2019 period. Members under the Informal Economy sector, however, are net recipients of NHIP benefits with the associated benefit payment-premium contribution ratio is consistently greater than 1, although lesser in magnitude in 2017-2019 compared to 2015-2016. This may be due to adverse selection in the Informal Economy sector, where enrolled contributing members consist of those with higher health risks[14].

Indirect Contributors, while net recipients of NHIP benefits in 2017, became net payers in 2018. The trend, however, differs across the member sectors classified as Indirect Contributors. The Indigent sector was a net payer until 2018 and became a net recipient in 2019. The Senior Citizen sector was a net recipient in 2017 and 2018, and became a net payer in 2019, mainly due to the large premium rate increase in the subsidy for the sector paid by the national government in 2019. The Sponsored Program sector is clearly a net recipient of NHIP benefits although the associated benefit payment-premium contribution ratio has been declining since 2016. The observation of benefit payment-premium contribution ratios well in excess of 1 for the Sponsored sector is expected since by design, registration is through the POS system. The vulnerability with the POS mechanism is that registration is made at the point where the registrant utilizing health services has a risk or probability of incurring health expenditures equal to 1, which is well above the risk of using care for the general population.

Benefit payments for the Lifetime Member sector from 2017 to 2019 is distinctly above zero (lifetime member equity ratio is around 0.08)[15], which implies either a drawdown from the reserve fund or implicit subsidies from the other membership sectors.

4.1.2. NHIP 2020 and 2021 revenue and expenditure streams during the COVID-19 pandemic

Table 7 shows that total revenues increased between 2019 and 2020, more likely because of the UHC-mandated increases in the premium schedule implemented by December 2019[16]. Table 7 also indicates a minimal increase in total revenues from

[14] The determination of adverse selection however will require establishing that the risk profile of those enrolled under the Informal Economy sector is different as compared to the representative risk profile of the population segment from which members under the Informal Economy sector are drawn from, an assessment beyond the scope of this paper.

[15] Similar to the observation on the possible occurrence of adverse selection this observation will also be undertaken in a separate paper.

[16] This is pursuant to PhilHealth Circular no. 2019-0009 entitled "Premium Contribution Schedule in the National Health Insurance Program (NHIP) Pursuant to R.A. No. 11223 Known as the 'Universal Health Care Act'".

2020 to 2021. Again, this is possibly accounted for the decision to put on hold the UHC-mandated premium increases in 2021 because of the COVID-19 situation.

TABLE 7. Estimated 2020 and projected 2021 NHIP revenue and expenditure streams (in pesos)

Membership Sector	2019 Restated PhilHealth Financial Statement	2020 PhilHealth Stats and Charts	2021 Projected Revenue and Expenditure
Premium Contributions			
Direct Contributors	77,378,850,588	85,569,185,891	85,624,428,073
Formal	69,074,001,510	77,978,899,294	78,034,141,476
Informal	8,304,849,078	7,590,286,597	7,590,286,597
Indirect Contributors	69,395,038,148	63,425,436,284	64,437,453,021
Indigent - NHTS	30,407,623,000	30,290,011,200	30,290,011,200
Senior Citizens	33,868,279,600	31,177,190,000	32,189,206,737
Sponsored	5,119,135,548	1,958,235,084	1,958,235,084
Total Premiums	146,773,888,736	148,994,622,175	150,061,881,095
Interest and Other Income	8,128,422,262	9,113,372,620	9,113,372,620
Total Revenue	**154,902,310,998**	**158,107,994,795**	**159,175,253,715**
Drawdown from Retirement Fund component of Reserve Fund		*5,466,917,817*	*5,466,917,817*
Benefit Payments			
Direct Contributors	48,822,061,536	54,688,731,572	55,372,443,479
Formal	26,616,078,252	20,377,594,403	20,801,110,263
Informal	22,205,983,284	34,311,137,169	34,571,333,216
Indirect Contributors	64,201,896,627	66,053,877,831	71,322,078,024
Indigent - NHTS	32,931,215,186	30,507,613,503	29,922,385,328
Senior Citizens	21,364,596,140	28,025,012,122	32,087,730,169
Lifetime Members	12,276,862,300	5,466,917,817	5,466,917,817
Sponsored	9,906,085,301	7,521,252,206	9,311,962,527
Total Benefit Payments	125,300,820,463	126,209,527,220	132,161,439,321
Administrative Expenses	12,938,660,054	7,144,713,938	7,144,713,938
Total Expenditure	**138,239,480,517**	**133,354,241,158**	**139,306,153,259**

Sources of data: PhilHealth 2020 Stats and Charts and PhilHealth CY 2020 Financial Statement unpublished draft as of February 23, 2021; Authors' calculations.

TABLE 8. Benefit payment to premium ratio for 2020 estimates and 2021 projections of revenue and expenditure streams (in pesos)

Membership Sector	2019	2020 PhilHealth Stat and Charts	2021 Projected Revenue and Expenditure
Direct Contributors	0.63	0.64	0.65
Formal	0.39	0.26	0.27
Informal	2.67	4.52	4.55
Indirect Contributors	0.93	1.04	1.11
Indigent - NHTS	1.08	1.01	0.99
Senior Citizens	0.63	0.90	1.00
Sponsored	1.94	3.84	4.76
Aggregate Benefit to Premium ratio	0.85	0.85	0.88
Lifetime Member Equity	0.08	0.04	0.04
Expenditure to Revenue Ratio	0.89	0.84	0.88

Sources of data: Authors' calculations.

An inspection of the total expenditures-total revenues ratios for the period 2019-2021 in Table 8 shows a declining trend. This suggests that the provision of COVID-19 benefits has not adversely affected the financial viability of the NHIP and its capacity to provide social health insurance services at least for 2020[17]. Aggregate benefit payment-premium contribution ratios in 2020 and 2021 are relatively close to the 2019 estimate. This implies that for 2020 and 2021, infusions rather than draw downs are expected for the NHIP reserve fund.

Direct Contributors from the Formal Economy sector are still net payers based on the 2020 estimates and 2021 projections, implying that the sector continues to bear the burden of subsidizing the benefits of net recipient member sectors, particularly the Informal Economy and Sponsored sectors. Given the implementation of UHC-mandated immediate eligibility and the use of the POS mechanism to facilitate implementation of immediate eligibility then it is possible that majority of new registrants to these sectors are users or patients of health facility services rather than the general pool of workers in the informal labor market or the non-NHIP registered poor.

For Indirect Contributors, the estimated benefit payment-premium contribution ratio of the Senior Citizen sector for 2020 is higher than that of 2019. This is possibly due to the decrease in premium subsidy and almost ₱6.7 billion increase in benefit payments corresponding to the Senior Citizen sector. Thus in contrast to the prior declining trend, the benefit payment-premium contribution ratio for the Senior Citizen sector increased in 2020 and is projected to approximately

[17] For 2021, an adjustment to account for the higher number of COVID-19 cases needs to be incorporated.

1.0 in 2021, thereby indicating that premium subsidies will be adequate to cover the projected benefit payments for the Senior Citizen sector. Likewise, increases in the benefit payment-premium contribution ratio for the Sponsored sector are estimated, with an increase from 1.94 in 2019 to 3.84 in 2020 and potentially to 4.76 in 2021. Given the use of the POS to facilitate immediate eligibility, this raises the concern of magnified adverse selection which appears to be observable even in the analysis of 2015-2019 historical data.

The lifetime member equity declined from 0.08 in 2019 to 0.04 and is expected to stay at 0.04 in 2021. This is driven more by the decline in benefit payments due to the possible COVID-19 pandemic effect that inhibited treatment-seeking in health facilities.

Looking back at Table 7, it appears that the trend of increasing total benefit payments may have been inhibited by the COVID-19 pandemic even with the implementation of the COVID-19 benefit packages. Given, however, the increasing trend in COVID-19 cases, it will be important to undertake a separate assessment of incremental benefit payments corresponding to the said COVID-19 benefit packages, namely: the testing, CIU, and inpatient benefit packages. The subsequent analysis takes into consideration the large increase in COVID-19 cases in 2021 compared to 2020.

4.2. Adjustments to projected COVID-19 benefit payments

Due to a surge in COVID-19 cases beginning in March 2021, actual case counts as of April 2021 already exceed the total number of cases in 2020. Actual[18] and projected number of COVID-19 cases and individuals tested for COVID-19 for the years 2020 and 2021 are presented in Table 9. It is estimated that in 2021, 2.99 million individuals will have been tested by PRC laboratories, 11.25 million individuals will have been tested in other COVID-19 testing centers, and 1.62 million individuals will have been infected by the disease.

Claims data for COVID-19 benefits are further examined to ascertain the corresponding use rates of each of the COVID-19 benefit packages. Table 10 summarizes the paid and pending[19] claims, as well as the use rates for all PhilHealth COVID-19 benefits for 2020 including: the CIU, inpatient packages, testing packages, and COVID-19 testing under the Philippine Red Cross.

[18] COVID-19 case data uses date of onset of symptoms and date of specimen collection as reference date following DOH COVID-19 tracker reporting. Date report confirmed is used as a proxy for individuals with no data on date of symptom onset and date of specimen collection. COVID-19 testing counts are based on cumulative number of unique individuals tested as of a specific reference date.

[19] Claims tagged with claim status “RTH,” “Approved for Payment”, and “In-Process” in the extracted PhilHealth COVID-19 claims data are classified as “Pending”.

TABLE 9. Estimated and projected number of COVID-19 cases and unique individuals tested, 2020-2021

Period	Number of COVID-19 cases	Number of unique individuals tested	
		Testing Centers	Philippine Red Cross Laboratories
2020	480,286	4,978,635	1,428,629
January - April 2021	540,209	3,606,191	957,282
April - Dec 31, 2021	1,076,930	7,643,892	2,029,111
2021	1,617,139	11,250,083	2,986,393

Sources of data: Authors' calculations based on DOH COVID-19 Data Drop as of April 28, 2021.

TABLE 10. PhilHealth COVID-19 benefit claims and estimated use rates, 2020

PhilHealth Benefit Packages	Claims Count			Use rates of PhilHealth Benefit Packages		Proportion of Claims Filed among Total Cases or Individuals Tested
	Paid Claims	Pending Claims	Total Number of Claims Filed	based on Paid Claims	based on Paid + Pending Claims	
Community Isolation Package	439	12,376	13,978	0.09%	2.67%	2.91%
Inpatient Packages	6,851	39,244	47,642	1.43%	9.60%	9.92%
FRP (Full financial risk protection)	2,290	6,670	9,256	0.48%	1.87%	1.93%
MILD	652	7,001	7,965	0.14%	1.59%	1.66%
MODERATE	2,498	15,422	18,403	0.52%	3.73%	3.83%
SEVERE	995	6,619	7,932	0.21%	1.59%	1.65%
CRITICAL	416	3,532	4,086	0.09%	0.82%	0.85%
Testing Centers	122,118	312,130	451,480	6.27%	8.72%	9.07%
C19T1	70,730	167,660	247,255	1.42%	4.79%	4.97%
C19T2	46,721	102,218	153,350	0.94%	2.99%	3.08%
C19T3	4,667	42,252	50,875	0.09%	0.94%	1.02%
Philippine Red Cross, TOTAL	817,963	-	-	57.26%	57.26%	N/A

Sources of data: PhilHealth Corporate Dashboard, Authors' calculations.

Examining the proportion of paid and pending claims relative to the total number of COVID-19 cases (for the CIU or inpatient packages) or individuals tested (for the testing packages), use rates of COVID-19 benefit packages were seen to be highest for the inpatient packages at 9.60 percent, followed by testing packages at 8.72 percent, and the CIU package at only 2.67 percent. This low use rate of the CIU package may be further contextualized by the low number of accredited CIU facilities that filed claims[20] for the CIU benefit. Out of 711 accredited CIU facilities in December 2020[21], there were only about 178 unique facilities that filed CIU benefit claims in 2020 or about 25 percent of the total number of accredited CIU facilities. In comparison, 44 percent of PhilHealth-accredited hospitals[22,23,24] filed claims for the COVID-19 inpatient benefit packages, while 76 percent and 123 percent of the testing labs licensed/accredited by DOH[25] and PhilHealth, respectively, filed claims for testing benefits[26].

Among the inpatient packages, the Moderate Pneumonia (COVID-19) package was most utilized with a corresponding use rate of 3.73 percent, while the Critical Pneumonia (COVID-19) package was least utilized at 0.82 percent. This most likely reflects how the majority of COVID-19 cases present as mild symptoms, at about 95 percent as identified by the DOH[27], as well as the relatively low number of critical COVID-19 cases. On the other hand, testing through the PRC which is counted separately from the other testing packages had a use rate of 57.26 percent, the highest among all the COVID-19 testing benefits provided by PhilHealth. Based on this number, PRC is the largest provider of COVID-19 testing covered by PhilHealth in 2020.

As of the date of data extraction, only 25 percent of all claims received in 2020 for the COVID-19 benefit packages have been paid, while 71 percent of the claims are still pending. Payment rate, defined as the proportion of claims paid among all claims filed, of the testing packages was highest among the COVID-19 benefits in 2020, at 27 percent. The inpatient benefit packages and the CIU package showed payment rates of 14 percent and three percent in 2020, respectively.

The 2020 use rates for the various COVID-19 benefit packages presented above are utilized in projecting benefit package use in 2021. This assumes that the 2020 trends in benefit use, that is, individuals who file claims for and are able to avail of COVID-19 benefits from PhilHealth, will hold in 2021.

For 2021, two scenarios for COVID-19 benefit payments are explored. Table 11 illustrates the projected number of claims and estimated benefit payments for each of the COVID-19 benefit packages for each scenario. In the first scenario, where the use rates of COVID-19 benefits are lower and based primarily on the number of claims in 2020 that have been paid to date, the estimated amount of COVID-19

[20] Claims tagged with claim status "RTH," "Approved for Payment", "In-Process", and "Denied" in the extracted PhilHealth COVID-19 claims data are treated as "filed".
[21] "List of Accredited Community Isolation Units as of December 31, 2020" PhilHealth website; downloaded February 3, 2021.
[22] List of Accredited Level 1 Hospitals as of December 31, 2020; downloaded 3 Feb 2021.
[23] List of Accredited Level 2 Hospitals as of December 31, 2020; downloaded 3 Feb 2021.
[24] List of Accredited Level 3 Hospitals as of December 31, 2020; downloaded 3 Feb 2021.
[25] DOH Health Facility Registry; downloaded February 3, 2021.
[26] Further context that must be noted in interpreting the data is that as of the time of writing, there was no current PhilHealth guidance on cartridge-based PCR testing, there may be facilities with on-going accreditation, and that the DOH facility data was extracted as of February 2021. Guidance on cartridge-based PCR testing was subsequently published on May 26, 2021.
[27] DOH COVID-19 data drop as of 28 April 2021; downloaded April 29, 2021.

benefit payment is around ₱10.7 billion. In the second scenario, where the use rate of COVID-19 benefits is higher and assumes that all remaining pending claims will be paid, the estimated amount of COVID-19 benefit payment is around ₱38.4 billion.

TABLE 11. Projected 2021 claim counts and claim amounts

Benefit Package	Total Claim Counts		Case Rate (in pesos)	Total Claim Amounts (in pesos)	
	Low	High		Low	High
Community Isolation Package	1,626	43,149	22,449	36,500,736	968,641,396
Inpatient Packages	16,893	125,035		3,872,457,267	28,781,775,882
MILD	2,415	25,768	43,997	106,245,553	1,133,710,562
MODERATE	9,252	60,337	143,267	1,325,496,853	8,644,334,961
SEVERE	3,685	25,637	333,519	1,229,090,214	8,550,290,440
CRITICAL	1,541	13,293	786,384	1,211,624,647	10,453,439,919
Testing Centers	303,541	981,258		850,991,098	2,630,917,869
C19T1	175,809	538,683	3,409	599,333,819	1,836,371,208
C19T2	116,132	336,553	2,077	241,205,247	699,021,237
C19T3	11,600	106,022	901	10,452,032	95,525,425
Philippine Red Cross	1,709,862	1,709,862	3,500	5,984,517,445	5,984,517,445
Total COVID-19 Benefit Payments	**2,031,922**	**2,859,304**		**10,744,466,545**	**38,365,852,593**

Sources of data: Authors' calculations

Using the incremental COVID-19 benefit payments projected for 2021, adjustments to the 2021 revenue are made. Table 12 shows the net revenue across the COVID-19 benefit payment scenarios. Scenarios 1 and 2, corresponding to the low and high COVID-19 benefit payment projections for 2021, are presented.

Examining these scenarios, assuming that COVID-19 benefit use in 2021 follows a trend similar to 2020, the NHIP revenue will be able to accommodate the prospective COVID-19 benefit payments for 2021 only if benefit payments remain low. In the low-end scenario, the NHIP 2021 total expenditures-total revenues ratio will approximately be 0.91 and net revenue is estimated to be ₱14.5 billion. However, in the high-end scenario where benefit use is higher, the 2021 total expenditures-total revenues ratio is estimated to be 1.08 with a corresponding deficit amounting to ₱13.1 billion that would need to be drawn from the NHIP reserve fund.

It is noted however, that the number of claims filed for the COVID-19 benefit packages comprise only a small proportion of the total number of COVID-19 cases and individuals tested. Increases in the number of claims filed for COVID-19 benefit packages due to a surge in COVID-19 cases may lead to greater COVID-19 spending and a greater fund deficit, more adversely affecting the financial viability of the

NHIP. Given this possibility, there may be a need to revisit the premium and benefit mechanisms to make the NHIP resilient to benefit expenditure shocks associated with health emergencies, such as the COVID-19 pandemic. The resilience of the NHIP becomes more pertinent in view of ensuring adequate financial risk protection is provided to all Filipinos in line with the UHC Act.

TABLE 12. Net premium revenue across COVID-19 benefit scenarios (in pesos)

Projected 2021 Benefit Payments with no adjustments		
	Scenario 1	Scenario 2
Total Revenue	159,175,253,715	159,175,253,715
Total Expenditures	139,306,153,259	139,306,153,259
Net Revenue for 2021 Projections	**19,869,100,456**	**19,869,100,456**
Projected 2021 Benefit Payments adjusted with COVID-19 benefit payment estimates		
Total Revenue	159,175,253,715	159,175,253,715
Adjusted Total Expenditures	144,647,909,400	172,269,295,448
Net Revenue adjusted based on COVID-19 benefit payment estimates	**14,527,344,314**	**(13,094,041,733)**
Aggregate Benefit Payment to Premium Contribution Ratio	**0.92**	**1.10**
Expenditure to Revenue Ratio	**0.91**	**1.08**

Sources of data: Authors' calculations.

5. Summary of findings and conclusion

This paper examines the state of NHIP financing in cognizance of the implementation of UHC-mandated financing initiatives on restructuring the NHIP premium schedule, providing immediate eligibility to NHIP benefits, and expanding member benefits, as well as, the pandemic engendered effects of reduced capacity to pay premium contributions, lower treatment seeking rates and the new COVID-19 benefit packages affect.

Using the total expenditures-total revenues ratio as measure of financial viability, the analysis of 2020 data shows that the NHIP remains financially viable with an estimated total expenditures-total revenues ratio of 0.84. Projections for 2021, however, show a potentially different situation because of the potentially higher number of COVID-19 cases in 2021[28]. If the proportion of processed COVID-19 claims increases significantly from the 25 percent figure in 2020, then NHIP financial viability is likely to be adversely affected with an estimated total expenditures-total revenues ratio of 1.08 for the high-end scenario, thereby indicating possible deficits for the NHIP. It is only if COVID-19 benefit claim patterns continue to remain as

[28] Even in the middle of 2021 the number of COVID-19 cases reported by the DOH was already twice the number of cases reported for 2020.

weak as in 2020 that a low-end scenario remains financially viable with estimates the total expenditures-total revenues ratio to be at 0.91.

Another concern raised in this paper is the possibility that the implementation of UHC financing initiatives may heighten adverse incentives on member willingness to pay premiums. Using the benefit expenditure-premium contribution ratio as the measure for the burden of paying for NHIP benefits, it is shown that the Formal Economy sector shoulders the burden of funding the NHIP benefits of the Informal Economy and Sponsored sectors. This appears to be due to the application of the POS mechanism as the enrollment system to support the implementation of immediate eligibility whereby the new registrants to the NHIP possess the common characteristic of utilizing care upon enrolment and registration reminiscent of the adverse selection problem.

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The COVID-19 outbreak and its impact on business establishments: a study on challenges and strategic approaches

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The Management Association of the Philippines (MAP) commissioned the School of Economics of the University of Asia and the Pacific (UA&P) to conduct a study aimed at understanding the impact of the COVID-19 outbreak on various industry sectors and to draw possible policy measures for both government and private institutions to help the affected sectors deal with the pandemic's negative effects and gradually return to stable business operations. An online survey of pre-selected thirty-three (33) representatives from key priority sectors which recorded sharp contractions in the first two quarters of 2020 and which had a share to GDP of above 1 percent was conducted. To validate the survey results, stakeholder interviews were also conducted with more than 10 firms via the zoom video conferencing platform.

The survey results confirmed the negative impact of the pandemic at the firm-level (i.e., decrease in employee compensation, decline in headcount, loss of revenue and other liquidity crunches, prolonged collection periods, problems in logistics, delayed or cancelled projects and disrupted supply chains and access to labor; among others). Some have had to close branches or altogether cease operations.

The sudden and likely permanent shift towards digitization of operations has disrupted operations and exerted pressure to digitally transform business operations in order to survive in the so-called "new normal." Moreover, this requires investments in equipment and training. Additional costs and investments are also needed to meet health and safety standards and protocols. Thus, required assistance commonly cited by firms were loans, subsidies, and tax relief.

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In the short term, the national government must restore consumer confidence and deploy its fiscal powers to stimulate aggregate demand. With assistance, business can invest in platforms and meeting health and safety protocols for workers and customers to return to work and patronize their business, whether on site or online.

Resuscitating the economy is not solely the responsibility of government. It also requires solidarity and coordinated response from the private sector. Over the long term, both government and business must build more resilient organizations and strategies. This would include adopting digital transformation by both private and public sectors for a more nimble and agile economy.

Business may also revisit the concept of "coopetition". The interconnectedness of each industry calls for a more collaborative approach among businesses. When firms who have been negatively affected by the pandemic recover, this can also increase the rate at which the economy bounces back.

JEL classification: O1, L1, L2
Keywords: pandemic, coronavirus, entrepreneurs, economic effects, strategies

1. Introduction

It has been over a year since the COVID-19 virus arrived on Philippine shores in the first quarter of 2020. In an effort to contain its spread, the economy was placed under the enhanced community quarantine (ECQ), restricting mobility and economic production. As the economy fell into recession, but with positive news of decline in active cases, the National Government (NG) eventually placed Metro Manila and several provinces under the general community quarantine (GCQ) which allowed businesses to re-open, albeit at limited capacity. The primary objective was to revive the economy.

The prolonged restrictive measures during the pandemic dramatically limited business activities of enterprises and therefore affected their liquidity and overall operational efficiency. Despite the easing of mobility protocols, majority of the firms, both in manufacturing and services sectors, have experienced reduction in sales and revenues, forcing them to make adjustments in their workforce (e.g., retrenchment/layoffs, reduced working hours, reduced salaries and benefits, work from home (WFH), no work/no pay arrangements, etc.), including challenges in production scheduling, logistics, and the entire gamut of their operation.

The effect of the pandemic was more pronounced among small and microenterprises that are highly dependent on the cash economy than it was for medium and large enterprises who have better operational systems and financial resources to counter the challenges and stay in the market.

The Management Association of the Philippines sought the assistance of a study team from the UA&P School of Economics to conduct a survey of key businesses to better understand the impact of the lockdown and the plight of business.

The research objective of the study was to understand how the pandemic and the resulting lockdown affected businesses. Another objective was to solicit directly from the business sector what assistance they needed to survive the crisis. Interviews were also conducted with some of the respondents to gain a fuller understanding of their responses. By analyzing the data and responses, the study team sought to propose policies that the government could implement, in partnership with the business sector, to alleviate the situation. At the same time, strategies were proposed that the business sector could undertake.

The above insights are discussed in greater detail in the next section which describes the survey conducted among representatives of priority industry sectors and consultations with key informants. The results of the survey and the stakeholders interviews are then presented and the paper concludes with its recommendations.

As this study commenced, the Asian Development Bank (ADB) had completed its own study survey on the impact of the pandemic.[1] The ADB survey covered many more sectors, with more respondents. This study confirms some findings of the ADB survey. While this study found similar impacts with the ADB study qualitatively, the quantitative results could differ.[2] The lockdown in the wake of the pandemic slashed firms' sales and led to production cuts, workforce reduction, and business closures. In terms of policy assistance, tax relief, loans, subsidies for costs (e.g. utilities) were frequently cited by businesses in the MAP-UA&P survey as well as the ADB study.

2. The survey and stakeholder consultations

The team identified the sectors which recorded sharp contractions in the first two quarters of 2020 and which had a share to GDP of above 1 percent (see Table 1). The sectors were consistent with the result of a paper by Terosa and U [2020][3] that used input-output analysis to prioritize sectors with high multipliers for both output and employment and were therefore deemed high impact sectors.

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[1] Asian Development Bank, *The COVID 19 Impact on Philippine Business: Key Findings from the Enterprise Survey*, ADB, Manila, July 2020.

[2] For instance, Fig 15 on page 15 of the ADB survey report suggests 19.9 percent of its respondents did not change wage payments while 43 percent in this survey reported no changes in salaries. The difference in sample size and sectors covered by the respective surveys would likely result in large differences in quantitative results.

[3] Terosa, Cid L. and U, Peter L. *Prioritizing Sectors of the Philippine Economy*, Recent Economic Indicators, Business Economics Club, UA&P, August 2020 Issue

TABLE 1. High impact sectors

Food Manufactures sector
Accommodation sector and Food Service Activities sector
Construction
Wholesale and Retail Trade and Maintenance and Repair of Motor Vehicles
Transport sectors

Source of data: Authors' notes.

The inclusion of Food Manufactures sector coincides with and reinforces the Inter-Agency Task Force's (IATF) inclusion of food among the initial list of essential businesses. The rationale applies also to the Accommodation and Food Service Activities sector, which includes both hotels as well as restaurants. The 2017 Annual Survey of Philippine Business and Industry (ASPBI) of the Philippine Statistics Authority shows that Restaurants and Mobile Food Service Activities accounted for 61.5 percent of the sector's value-added while Short Term Accommodation Activities accounted for 32.2 percent. Thus, both subsectors account for practically all the sectors' value-added.

Hotels were ordered closed during the ECQ while restaurants were allowed to offer take out services. Even if hotels were allowed to re-open, these would likely not see a lot of foreign travelers as air travel worldwide remains restricted. It would have to rely solely on domestic tourism. Meanwhile, social distancing will limit dine-in revenues and blunt the contribution of the sector to economic recovery. This will be true, though, of many other sectors.

The Construction sector, because of its strong linkages and high employment share, merits support too. The same holds true for the Wholesale and Retail Trade and Maintenance and Repair of Motor Vehicles. The 2017 ASPBI preliminary results for the sector show that Retail Trade accounts for about 42.7 percent of this sector's value added. Much of retail trade activities probably occurs in malls. From the start of the ECQ, malls had shut down operations and opened only those portions housing essential stores. While malls have re-opened, many retail establishments within them remain closed. In many malls, only establishments considered essential like groceries, supermarkets, drugstores, and hardware stores are open. This is another sector whose contribution to the economy will be handicapped under current conditions due to social distancing requirements.

The Transport sectors were hit hard by the quarantine as they were generally prohibited from normal operations and most of the population were confined to their residences. Among the transport sectors, Land Transport ranks highest, followed by Air Transport. Few will probably argue against allowing the Land Transport sector to operate again, as most workers rely on it to get to work. Maintaining social distancing will be a challenge though and means reduced capacities, a challenge that the Air Transport sector faces as well. Airlines face the additional problem of a depressed travel market in the short term.

The research team conducted a survey among 33 representatives from key priority sectors. The respondents, who are key officials and representatives of industry associations, were pre-selected and invited to answer self-administered questionnaires on-line. To validate the survey results, the team also conducted stakeholder consultations with more than 10 firms via the Zoom Video Conferencing platform. Due to time constraints, convenience sampling was used.

TABLE 2. Breakdown of survey respondents

Construction	18%
Hotel and Accommodation	15%
Wholesale and Retail	9%
Travel and Recreation, Restaurant	18%
Manufacturing (Food/ Non-Food)	32%
Others	9%

Source of data: Authors' notes.

2.1. Profile of respondents[4]

2.1.1. Location of business

The geographic scope of the business establishments in the survey covered the country's three major islands of Luzon, Visayas, and Mindanao: Majority of the firms (80 percent) are operating Luzon-wide—mostly in the National Capital Region (NCR) and CALABARZON, 17.1 percent in the Visayas (Cebu, Aklan and Bacolod), and 2.9 percent in Mindanao (Davao).

Although some companies are Cebu-based, their operations have expanded to NCR and beyond. The survey can be considered having a good geographic coverage because most of the firms included in the survey have business presence in some of the populous provinces and cities of the country.

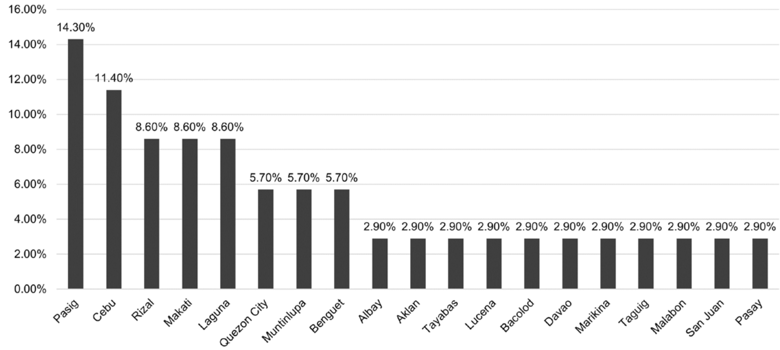
TABLE 3. Business location of the respondents classified according to major island groupings

Business location	Percentage of respondents
Luzon	80%
Visayas	17.1%
Mindanao	2.9%

Source of data: Authors' notes.

[4] Respondents were pre-selected to include top officers of firms and also members or representatives of industry associations. The firms included in the survey belong to micro, small, medium (MSMEs), and large enterprises. Stakeholders consultations (via Zoom meetings) were conducted with one representative from the identified priority sectors.

FIGURE 1. Business location of the respondents classified according to locality



Source of data: Authors' notes.

2.1.2 Number of years in operation

A number of the respondents have long histories operating, coping with and growing during the most challenging periods facing the Philippine economy. Once again, the same companies are facing another but unprecedented crisis. Two of the respondents operated their business for more than 50 years, three have been operating for more than 40 years, three for more than 30 years, eight for more than 20 years and only four are relatively young with less than five years in operations.

Respondents with a business lifespan exceeding 50 years (6.3 percent) include a Cebu-based group of companies with core divisions engaged in fashion and food retailing, wood distribution, real estate and medical services (56 years in business), and an establishment engaged in food services and catering that has been serving Bicolano delicacies in Legaspi City for the past 53 years. (See Table 4)

Companies that will soon reach 50 years of operation include a Makati City-based real estate company that has created large-scale developments in residential condominiums, office buildings, retail and commercial centers, townships and master-planned communities (48 years); a Cebu-based construction company which has a wide range of experience in major engineering and construction projects (45 years); and a hotel operator with its two core businesses in hotels & resorts and hospitality education (43 years).

TABLE 4. Respondents classified according to number of years in operation

Number of years in Operation	Percentage of Respondents
Less than 10 years	21.9%
11-20 years	25.0%
21-30 years	25.0%
31-40 years	12.5%
41-50 years	9.4%
More than 50 years	6.3%

Source of data: Authors' notes.

2.1.3. Employment status

The employment status of workers of respondent-firms is classified as full-time or regular employee, part-time/casual, or contractual. About 30 percent of total respondents classify their labor (100 percent) under full-time or regular employment. These firms are engaged in the restaurant and accommodation (hospitality) sectors and engineering services. Others use a combination of full-time and contractual workers. One company operating for more than 40 years has about 10 percent of its total workforce employed as full-time. Due to the nature of its operations, a manpower services company has almost its entire total workforce (98.9 percent) on contractual or part-time status.

2.1.4. Type of industry

Using the Philippine Standard Industrial Classification (PSIC) to classify the respondents, their distribution according to the kind of productive activities undertaken is shown in Figure 4. The majority of the respondents are classified under Manufacturing Food/Non-food with 24.6 percent of total respondents, followed by Construction, Wholesale and Retail Trade, Restaurants and Food Service, and Other Services[5] with 9.8 percent each. Hotel and Accommodation, Property Development, and Real Estate Activities (Leasing) each had 8.2 percent of total respondents.

TABLE 5. Distribution of respondents by industry classification

Industry Classification	Distribution of Respondents
Property development	8.2%
Other service activities	9.8%
Arts, entertainment and recreation sectors	1.6%
Real estate activities (leasing)	8.2%
Financial and insurance	1.6%
Restaurants and food service	9.8%
Hotel and Accommodation	8.2%
Transportation and Storage	4.9%
Repair of motor vehicles	1.6%
Wholesale retail trade	9.8%
Construction	9.8%
Manufacturing Food/Non-food	24.6%
Agriculture, forestry and fishing	1.6%

Source of data: Authors' notes.

[5] Other services activities include other personal services for wellness, except sports activities, laundry services, repair of computers and communications equipment, and others.

2.2. Impact of COVID-19 on business establishments

2.2.1. Employee headcount

The varying levels of lockdown and community quarantine substantially impacted the workforce. More than half (67 percent) of respondents cut their headcount. The rest retained their labor headcount (27 percent) and a few (6 percent) even increased it.

Two firms in food retail and manpower procurement hired additional labor. Unlike the majority of respondents, both recorded higher demand for their products/service during the quarantine period.

TABLE 6. Respondent changes in their total headcount as a result of the pandemic

Respondent Changes	Total Headcount
Decline in head count	67%
No change	27%
Increase in total headcount	6%

Source of data: Authors' notes.

The extent of the drop in headcount varies by sector (Table 7). One small firm manufacturing souvenir items had to lay-off all its work force as demand for its products ground to a halt.

TABLE 7. Average reduction in headcount by sector

Sectors	Average Reduction in Headcount
Construction	47%
Manufacturing - Non-Food	39%
Manufacturing - Food	14%
Hotel and Accommodation, Recreation	48%
Travel and Recreation	67%

Source of data: Authors' notes.

2.2.2. Salary levels

In terms of salaries, 43 percent of the respondents did not report any changes in the salaries of their remaining employees as of August 2020. Two firms (6 percent) even indicated an increase of salary by 1-10 percent and above 50 percent. These firms are in the manpower and food manufacturing businesses and recorded positive sales during the lockdown. To avoid further retrenchment, some firms did resort to salary cuts.

The remaining 51 percent of the respondents had reduced the salary of their employees (Table 8). The table below shows the percentage of the respondents and the corresponding reduction.

TABLE 8. Extent of salary reduction by sector

Salary Reduction	% of respondents (out of 51%)	Sectors Affected
1-10% decrease	9%	Construction
11-30% decrease	12%	Manufacturing, Construction
31-50% decrease	18%	Hotel and Accommodation, Recreation
More than 50% decrease	12%	Travel and Recreation

Source of data: Authors' notes.

2.2.3. Work hours

Over 64 percent of the respondents reduced work hours with lower production due to lower demand for their products and services. The sectors that reduced headcount and salary and/or benefits are the same ones that also cut work-hours: recreation, travel, restaurant, and construction industries which reported a large number of employees (20 percent and above) affected by reduced work hours.

Some respondents did not change their employees' number of work hours. Majority of these firms are in manufacturing (food and non-food).

2.2.4. Sales revenues

Given the unexpected and prolonged duration of the lockdown, most of the respondents experienced a significant drop in sales and/or revenues. Majority (67 percent of the respondents) were hit hard, with sales from January to August 2020 plunging by 10 percent to as much as 90 percent compared to their sales in the same period in 2019 (Table 9). These affected companies have been in business for about 31 years on average.

TABLE 9. Respondents' change in YOY sales from January to August

Change in sales in YOY	Percentage of Respondents
50-90% decline in sales	52%
10-45% decline in sales	15%
Increase in sales	21%
No change	12%

Source of data: Authors' notes.

Among the hardest hit are the hotel and accommodation, food services, arts, entertainment and recreation sectors. Their year-on-year (YOY) sales registered as much as a 50 percent fall. The construction and manufacturing of non-food sectors also suffered a reduction in sales, especially in the first three months of the lockdown, albeit not as much as firms in the tourism sector. These firms indicated lower sales of 10 percent to as much as 45 percent.

As a response to falling sales and revenues, one of the first items immediately affected is salaries. Majority had slashed their employees' compensation by as much as 31 to 50 percent. Those badly hit reported more than 50 percent slash in the payroll.

Some (21 percent) of the respondents however reported between 20-50 percent increase in sales. Most of these firms are in the food and retail business, and two from construction. The increase in sales was brought about by higher demand for their products, which were considered essential items during the lockdown. The remaining 12 percent of the respondents did not have any changes in their sales revenues.

TABLE 10. Extent of respondent's reduction in sales and the cut in salaries

Decline in Sales	Sectors Affected	Extent Salary Cut
Above 50% decline in sales	Hotel and Accommodation Restaurant and Food Activities Arts, entertainment and recreation	Majority had to scale down salary by 31-50% but a number resorted to a more than 50% cut in salary of their employees
10-50% decline in sales	Construction Manufacturing of non-food	Majority had to scale down salary by 31-50%

Source of data: Authors' notes.

2.2.5. Impact on manpower, salary, and sales

Firms in services (i.e., intangible goods) reported deeper cuts in their employee headcount than manufacturing (i.e., tangible goods). Their sales for January to August 2020 slid by as much as 61 percent from the same period last year. In contrast, manufacturers recorded a lower 44 percent drop in sales.

Services sector firms reported an average 43 percent decline in employment versus an average 30percent drop for manufacturing firms. Consequently, the services sector cut their salary/benefits 22 percent, deeper than firms in the manufacturing sector that reported a lower cut of 18 percent.

Although a majority of the respondents (80 percent) are based in Luzon and the rest are located outside Luzon, the latter experienced more severe contraction in sales during the lockdown, and thus higher reduction in manpower and payroll expenses (see Table 11 for comparison).

TABLE 11. Impact on manpower, salary, and sales classified according to primary area of location

	Luzon	Outside of Luzon
Average % Reduction in manpower	29%	49%
Average % Reduction in salary	13%	33%
Average % Reduction in Sales (from Jan-Aug 2020 vs. 2019)	34%	61%

Source of data: Authors' notes.

2.3. Impact on various areas of business operations

The survey asked respondents to rank from one to three (one being most serious) the impact of various issues impinging on the following areas of business operations: production, transport logistics, workplace safety, sales and marketing. This section reports which issues were most frequently rated respectively as the top three most challenging. See Annex 1 for a more detailed breakdown of the responses.

2.3.1. Production aspects

Disruptions in production activities were a result of COVID-19 quarantines. Majority of the respondents (15.10 percent) ranked as the most challenging (Rank #1) the strict mobility restrictions (lockdowns), cancellation of projects, drop in volume of orders of customers. Ranked #2 by 17.9 percent of the respondents was "Reduced productivity due to scheduling". "Shortage of production workers" was ranked #3 as the most challenging aspect of production by 18.20 percent of the respondents.

2.3.2. Increased cost of raw materials

Despite the decline in demand and sales experienced by most of the sectors in the survey, raw material costs still soared. This can be directly attributed to the cost of moving goods through the various lockdowns and checkpoints. The bulk of respondents noted that raw materials cost had increased: 48 percent said the cost of raw materials jumped 25-50 percent and another 48 percent of the respondents said it increased by less than 25 percent. Another 4 percent of the respondents indicated that the cost of raw materials increased by as high as 75 percent.

TABLE 12. Respondents' response to the impact of the lockdown on their cost of raw materials

Increase cost of raw materials	Percentage of Respondents
More than 75%	4.0%
25-75%	48.0%
Less than 25%	48.0%

Source of data: Authors' notes.

2.4. Scheduling challenges

Scheduling is the process of arranging, controlling and optimizing work and workloads in a production process. The prolonged lockdown and mobility restrictions had affected productivity as firms adjusted their scheduling of operations to accommodate the demands of the lockdown. Majority of the respondents (40.7 percent) said they experienced reduced productivity due to these adjustments. About 30 percentof the respondents said that their productivity fell less than 25 percent, 41 percent said it fell between 25 to 50 percent, while 22.2 percent said productivity slid by 51-75 percent, and 7.4 percent stated it declined by more than 75 percent. Some of the major reasons of productivity declines are the following:

a. LGU lockdowns and transportation freeze (difficulties in transporting materials due to strict government checkpoints),
b. Difficulty in availability of driver/s,
c. Slow release of imported raw materials at ports.

A number of firms mentioned declines in production and delivery activities simply because orders from customers also declined. For orders that did come, fulfilling these orders was a challenge given the reasons stated.

TABLE 13. Percentage of reduction in production due to scheduling changes

Reduced productivity due to scheduling	Percentage of reduction
More than 75%	7.4%
51-75%	22.2%
25-50%	40.7%
Less than 25%	29.6%

Source of data: Authors' notes.

2.5. Transportation and distribution challenges

The lockdown posed serious challenges to firm logistics especially in transportation and distribution. Majority of the respondents (31.50 percent) said that "Limited movement of manpower/personnel" has been the primary reason for their difficulties (Rank #1). This aspect also received the most votes as Rank #2 and was tied in the vote for Rank #3, underscoring its prevalence. "Difficulty/delays in getting transport logistics" was the other aspect tied for the Rank #3 votes.

2.6. Workforce safety concerns

Conducting business as usual while maintaining safety in the workplace is a challenge for business establishments. Punitive measures for those not implementing safety measures pose another risk to business continuity. Majority of the respondents (31.70 percent) identified "Safety protocol required in workstations" as the most challenging (Rank #1) aspect in sustaining their business operations "Safety protocols also figured in a four-way tie for most Rank #2 votes. The other tied aspects were "Major disruption of labor skills", "Adjustment in wages", and "Transforming people operations towards work from home arrangements". This last issue on work from home was also the most cited third significant challenge facing the business (Rank #3).

2.7. Managing sales, marketing, and customer relations

The survey confirmed the adjustments the respondent-firms made to manage the pandemic by ensuring an effective crisis management in sales, marketing, and customer relations—the areas that immediately bore the adverse impact of the pandemic. Customers dramatically shifted their purchasing power towards more essential products and services. Majority of the survey respondents reported that "loss of demand for products and services" had most adversely affected their operations (27.8 percent ranked #1 and 23.4 percent ranked #2), "Scaled down operations" received the most third place votes (25.9 percent).

Survey respondents, particularly those engaged in services like retail trade, restaurants and accommodation, that demand direct in-person interaction took measures and incurred additional costs to reduce the risks of virus transmission among their customers. Meanwhile, the same respondents continue to explore other measures to safeguard their own workforce and to optimize their operations to sustain their business operations.

2.8. Scaled-down operations

Overall, a majority of the respondents reported scaling down their operations. Almost 35 percent of the respondents cut their outputs and/or suspended operations in affected business segments. Retail outlets in food and non-food businesses located in malls experienced very low foot traffic and plunging sales.

The extent of the scaling down varied across business sectors as firms calibrated their operations to mitigate losses and sustain operations due to the dire circumstances. Some 32 percent of the respondents scaled-down their operations by less than 25 percent while close to 20 percent of them by 51 to as much as 75 percent. Unfortunately, others, especially those in retail trade, had no other viable option but to close their outlets.

TABLE 14. Percentage of respondents on the extent of scaling down operations and of loss of demand for products and services due to the pandemic

Scaled-down Operations	Percentage of Respondents	Loss of demand for Products and Services
More than 75%	15.6%	22.6%
51-75%	18.8%	22.6%
24-50%	34.4%	29.0%
Less than 25%	31.3%	25.8%

Sources of data: Authors' notes.

2.9. Scaled-up operations

While many scaled down their operations, a few managed instead to scale-up their operations by immediately adopting alternative solutions to the lack of access to markets and materials. These respondents in the restaurant and retail trade businesses resorted to contactless delivery options (e.g., on-line ordering and door to door deliveries) especially of essential goods and services.

TABLE 15. Percentage of respondents on scaled-up operations due to COVID-19

Scaled up Operations	Percentage of Respondents
More than 75%	6.7%
51-75%	6.7%
25-50%	26.7%
Less than 25%	60.0%

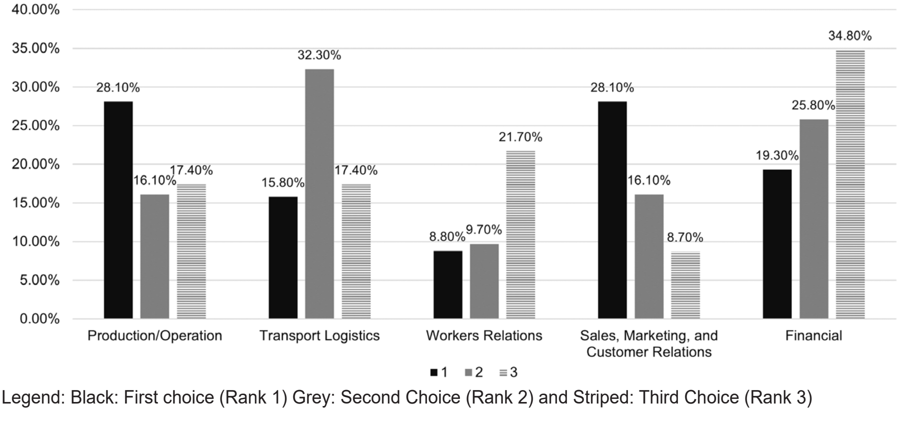
Source of data: Authors' notes.

2.10. Business functions directly affected

In the foregoing discussion, the area of finance had not been touched on. At this point the study includes the financial side of business in looking at the impact of the pandemic.

Following the loss of access to markets and the plunging sales and revenues, the business areas significantly affected were sales, marketing and customer relations and production (Rank #1) followed by transport logistics (Rank #2), and the financial operations (Rank #3).

FIGURE 2. Frequency ranking on most significant area in operations affected by COVID-19



Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

2.11. Financial liquidity crunches

With the loss of sales, reduction in production capacity, and increasing raw material costs, the ultimate impact is on the bottom line and erosion of liquidity. The survey revealed the liquidity pressures facing many respondent-firms. Thirty-one percent (31.3 percent) of the respondents revealed that with the measures they adopted, their financial liquidity would allow them to continue operating for one year and even beyond. Others may immediately face a liquidity crunch if the lockdown and the anemic consumer demand are prolonged: Some 21.9 percent have about 3 months' worth of liquidity, another 18.8 percent have 3 to 5 months, 18.8 percent have 9 to 11 months, and 9.4 percent have 6-8 months. Liquidity management for businesses to remain in business will depend on the measures adopted, the financial structure (i.e., leverage), the extent of the plunge in sales and/or costs of operations, etc.

TABLE 16. Percentage of respondents on financial liquidity for sustainability

How long can your financial liquidity allow you to continue operating your business?	Percentage of Respondents
1 year and beyond	31.3%
9-11 months	18.8%
6-8 months	9.4%
3-5 months	18.8%
Less than 3 months	21.9%

Source of data: Authors' notes.

2.12. Respondent firms' recommendation for policy intervention

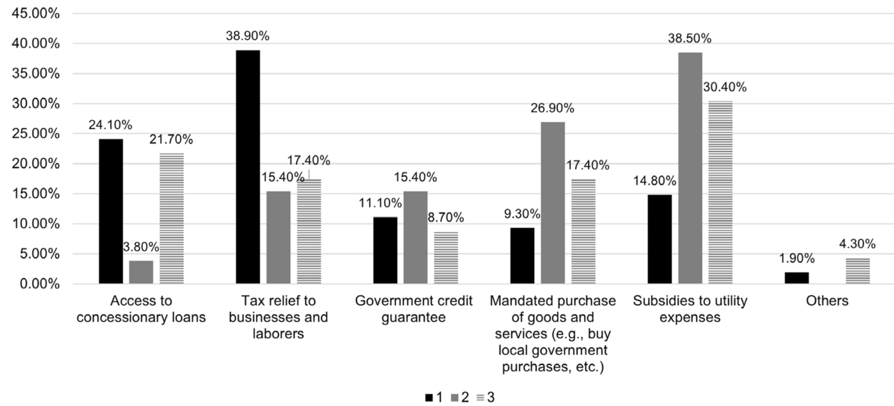
2.12.1. Stimulus packages and other financial aspects

Since businesses are the ones directly and direly affected by the lockdown, and they know better the issues confronting them, hearing out their recommendations can enlighten policy makers on how best to resuscitate their business operations and restart the engines of commerce.

The respondents' recommendations on the stimulus packages the government can push vary. But a clear majority of the respondents (38.9 percent that ranked it as number #1) said that a tax relief to businesses and to laborers would cushion the impact of the crisis and spawn consumer demand. Another 38.50 percent (that ranked it as #2) of the respondents said that subsidies for utility expenses to defray the additional expenses incurred and mitigate the low revenues would significantly help. More than 70 percent of the respondents who are likely leveraged, indicated that low or interest-free loans would also help them address, preserve and maintain their financial liquidity.

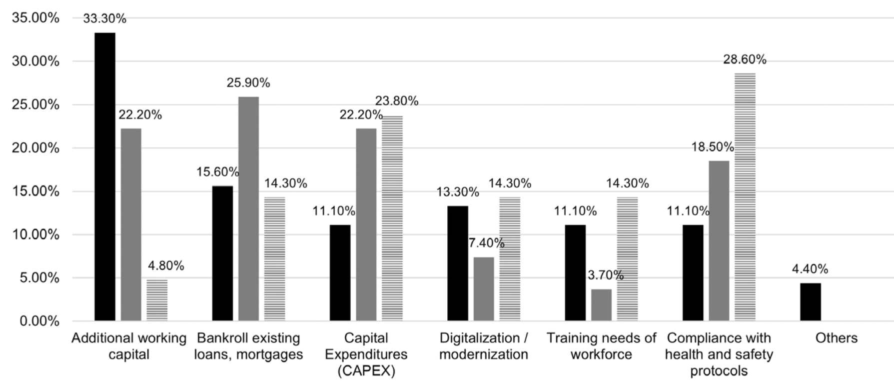
While some of these have been included in the Bayanihan Act, some respondent-firms, likely belonging to the accommodations sectors, specifically mentioned that it would also help if the restrictions on foreign business travelers and foreign visitors be reviewed and eased without compromising the necessary measures to avoid bringing in new infections and/or transmitting the virus to them (visitors). Another respondent firm also suggested for the government to cut mortgage rates of consumers so as to liberate more funds or induce more stimulus.

FIGURE 3. Frequency ranking on financial stimulus package needed by firms



Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

FIGURE 4. Frequency ranking on purpose of loan assistance



Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

With declining sales and dwindling liquidity, a number of the respondents also sought direct financial relief in the form of loans. The bulk of respondents (33.30 percent) said that they need loan assistance for additional working capital (Rank #1), while 15.6 percent need to bankroll existing loans/mortgages (Rank #2) and 28.6 percent just to allocate resources to comply with health and safety protocols

(Rank #3). Low or interest free loans for as much as ₱1-million was cited by micro, small and medium enterprises (MSMEs represented in the accommodation and restaurant sectors) owing to their higher levels of vulnerability and lower resistance.

TABLE 17. Percentage of respondents on preferred terms on loan assistance package

Preferred Terms in loan Assistance Package	Percentage of Respondents
Prolonged principal payment terms	8.3%
Low or interest free loans	70.8%
Prolonged principal payment, low or interest free loans	20.8%
Loan Assistance package needed in ₱	
Above ₱999,000.00	54.3%
₱699,000.00-₱799,000.00	5.7%
Less than ₱500,000.00	40.0%

Source of data: Authors' notes.

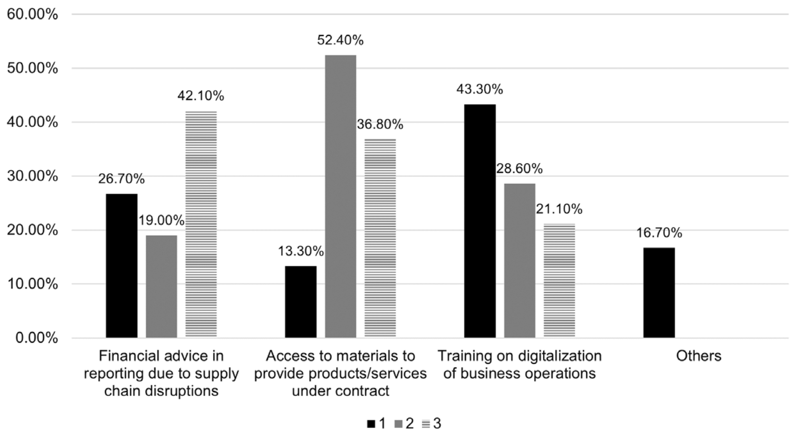
2.12.2. Non-financial aspects

In addition to financial aspects, the respondents also cited the non-financial aspects they need to alleviate their burden. These non-financial aspects serve as the levers that they can use to maximize the value of their core business and to prevent their businesses from going further downhill.

The sudden and likely permanent shift towards digitization of operations within and along the value chain upstream and downstream have disrupted operations and has exerted pressure to digitally transform business operations in order to stay relevant in the so-called "new normal." Almost half of the respondents mentioned that training on business digitization and transformation is essential (Rank #1). From taking the stance "our processes work just fine", most of the respondents are now taking the digitalization route seriously, owing to the shift of end-user markets and suppliers online. A number of respondents representing various sectors such as housing, retail trade and medical diagnostics have started digitization of their processes even prior to the pandemic. This time, the pandemic has compelled them to accelerate the process.

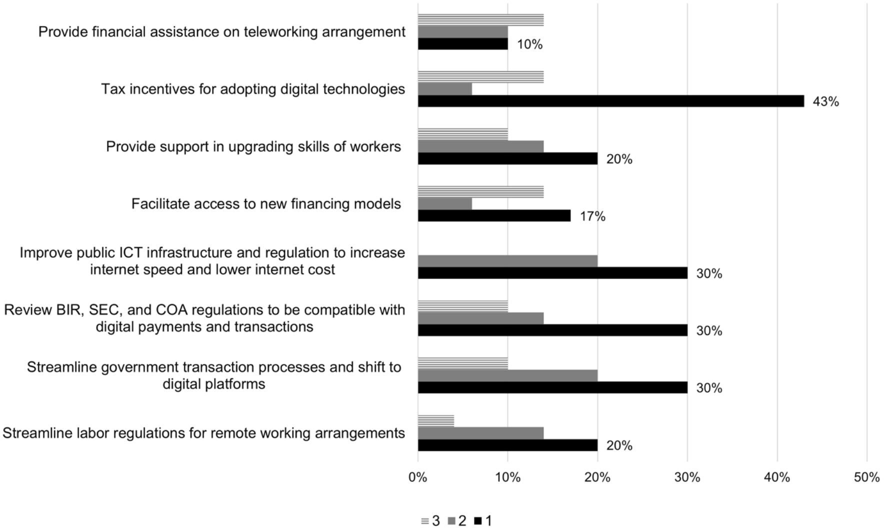
Easing restrictions and allowing more access to raw materials especially those covered under contract was also cited as an important non-financial aspect to relieve pressures facing the respondent firms (Rank #2). A number too are seeking financial advice in reporting due to supply chain disruptions (Rank #3). Another recommendation touched on providing relief from the tedious permits, licenses, particularly involving Bureau of Customs and the ports, and tax assessments can further ease the cost of doing business.

FIGURE 5. Frequency ranking on non-financial aspects needed by firms



Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

FIGURE 6. Frequency ranking on policy measures needed by firms



Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

2.13. Policy response[6]

The survey also offers insights for policy measures to aid in the recovery of the affected sectors. Majority of the firms view tax incentives as an important and appropriate policy response to support their business operations moving forward. About 40 percent of the respondents ranked #1 that tax incentives be extended to those firms investing in digital technologies (Rank #1).

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[6] The policy response options were taken from the ADB study: *The COVID-19 Impact on the Philippine Business Key Findings from the Enterprise Survey* (July 2020).

The respondents also sought government intervention to improve the public ICT infrastructure, specifically to expand coverage, increase internet speed, and lower internet costs. About 30 percent of the respondents encouraged key government agencies they regularly transact with, such as the Commission of Audit (COA), the Bureau of Internal Revenue (BIR), and the Securities and Exchange Commission (SEC), to immediately streamline their processes by shifting to digital platforms. Another suggestion came from 13 percent of the respondents (ranking it #3) who mentioned facilitating access to new financing models such as crowdfunding, peer-to-peer (P2P) lending, including extending financial assistance for teleworking arrangements, as important for them to operate in the new normal.

3. Highlights of stakeholder consultations

This section presents the highlights of the stakeholder consultations with the identified priority sectors of this study. The sectors represented were the housing, construction, wholesale and retail trade, banking, recreation and entertainment sectors. The consultations were conducted among key representatives and industry players via the Zoom Video Conferencing platform. Firm level challenges and impacts arising from the pandemic were generated from the responses.

The consultations further validated and complemented the findings and recommendation from the online survey questionnaire. More importantly, the consultations generated frank responses, especially on the appropriate pandemic policy responses from government and private institutions to bring the affected sectors as well as the economy to recovery.

One frequent call was for the government to manage the lockdown well. Restrictions posed operational challenges and limited workforce and consumer mobility, which reduced productivity and sales. This was especially the case for sectors like wholesale and retail trade and the arts, entertainment and recreation sectors, which are dependent on consumer spending.

Thus, the sectors all recognized the importance of stimulating their consumers to start spending again. Even the housing and construction sector called for measures to help their consumers or buyers. They called for facilitating housing loans and streamlining PAG-IBIG and Home Development Mutual Fund procedures.

To this end, the business sector recognized they also had a role in creating a safe and healthy environment that would inspire consumer confidence to return to their stores. Beyond abiding by strict health protocols, this included investments in health and sanitation equipment for disinfecting premises and to protect customers and workers (PPE, face masks, shields, etc.) Of note also is the recognition of the need for digitalization, including the government.

The business sector realizes that unless consumers start spending again sales revenues will not recover. In that case, even if financial assistance is extended to firms today, they may turn into non-performing loans tomorrow, a danger that the bank stakeholder was cautious about in the consultation.

The lockdown has brought about a shift in consumer buying behavior, as they prioritized essentials like food, health, and wellness, and reduced spending on non-essentials. Businesses also noted the increased trend by consumers to purchase online, thus making it imperative for them to digitize their operations.

Businesses recognize the need to invest in digitalization including training their workers to shift to digital modes of working, e.g., Work-From-Home (WFH). But they also point out that the government should make the move as well. In fact, digitization may be a step towards reducing bureaucracy in procedures when transacting with the government, such as the processing of permits (as cited in the housing and construction sectors' consultation).

Other government assistance that businesses proposed included tax relief, wage and importation subsidies, and even economic stimulus packages for consumers.

Annex 2 summarizes the impact of the lockdown brought on by the pandemic as gleaned from the survey responses and stakeholders' consultations.

4. Conclusion and recommendations

4.1. Lessons from the survey and stakeholder consultations

This study had been initiated by the Management Association of the Philippines to solicit from selected firms how they had been impacted by the pandemic and resulting lockdown. An important objective of the study was to solicit from businesses what assistance they needed to survive this crisis so that these could be communicated to policymakers.

The study confirmed that the pandemic has negatively affected business operations, employment, and revenue following the various levels of community quarantine and lockdown. Some sectors were impacted more than others. For example, the hospitality and accommodation sector showed a greater decline in revenue. The drop in revenue was keenly felt by small enterprises. As a consequence, these firms resorted to reduced salaries, in some cases by about 30-50 percent.

4.2. Assistance requested by businesses

Due to mobility restrictions, some firms had to resort to WFH arrangement which unfortunately, crippled production. Some firms reported difficulty adjusting to this set-up, especially in terms of digital preparedness. Others encountered technical issues like unreliable internet connections, low-quality video calls, and complicated software programs. In cases where firms need their employees on site, additional cost was incurred in providing transport services and temporary lodging. Maintaining health protocols posed another challenge. Firms have to invest in sanitation technology; e.g., thermal scanners and UV disinfection lights.

Among the assistance the firms requested to survive the crisis were: loans (for liquidity, working capital and meeting additional costs), subsidies (e.g., for utility expenses), tax incentives and relief (both for business and labor).

Businesses recognized the need to move to digital or online modes of business. Some needed financial assistance for the necessary investments in equipment and training. Tax incentives were also cited for this purpose. Many businesses cited the need for the government itself to keep pace with digitalization, so as to reduce bureaucracy and streamline the business sector's transactions with government. Lastly, there were also calls for the government to improve the competitiveness of the country's telecommunications industry, including the regulatory aspect.

4.3. Short term responses

4.3.1. Demand pull and supply push policies

The pandemic is both a demand and a supply shock. Thus, it should not be viewed solely on the producer or supply side, especially since the Philippines is a consumption-driven economy.

The survey revealed that most firms suffered huge drops in sales and revenue due to dampened demand. As people stayed at home and could not spend (except on food and other essentials), businesses suffered loss of revenues, leading to loss of jobs and incomes, and even business closures.

The government has to find ways to cushion the shock and get people to spend again. If consumers still do not spend, financial assistance extended to the business sector may just turn into non-performing loans later.

But what will make people spend again? One-time financial assistance to households is not sustainable. Households of workers laid off or furloughed across affected industries will not have income to spur consumer spending. Businesses need to start employing people again, thereby putting income into their wallets and spark spending.

Consumer confidence and mobility should be restored consistent with health protocols being strictly enforced. Though many consumers have resorted to shopping online and having purchases delivered, there will still be consumers who prefer on-site purchase and/or consumption if they feel comfortable going out again. There are also goods and services that are difficult to deliver.

But most people are risk averse and may not be willing to spend because they are worried that if infected by the virus, medical expenses could wipe out their savings. The uncertainty could induce them to save rather than spend.

On the supply side, as the respondents pointed out, curtailment of mobility impacted not just access to customers, but also workforce availability and the logistics of moving their raw materials through supply chains. The workforce scheduling adjustments, including shifting to work from home arrangements affected productivity. The respondents called for consistent quarantine guidelines and protocols, especially as businesses must now invest in making their workplaces compliant with health and safety standards.

Financial assistance can be extended to the firms (subsidies, tax deferrals, soft loans) to enable them to stay afloat and take back their workers. Household spending has fallen also because many workers lost their jobs or suffered salary reductions. The pandemic has posed a vicious cycle: fall in spending means businesses cut production and employment, but the loss of incomes by workers means their households will spend less, and so on.

Government could consider a program partially subsidizing hospitalization costs due to COVID-19. Last March 2020, Philhealth announced it would cover the entire medical expenses of COVID-19 patients. By April, the agency declared it would cease covering the entire amount.[7] The government may not be able to afford shouldering the entire hospital bill, but some 'socialized' health assistance could bolster consumer confidence and loosen the purse strings of households.[8]

Public confidence could further be bolstered by an effective investment campaign to augment health facilities and pursue negotiations to procure vaccines and medicines for combatting COVID-19. The government could wage an information campaign to encourage the public to return to a 'new normal' consistent with health officials' prescribed guidelines.

Countercyclical policies to stimulate economic activity amidst the economic slowdown are necessary. Since physical and human capital formation will be the path on which economic recovery will run, investments in physical infrastructure and human capital formation (e.g., health and education) should continue.

Governance is vital, since resources for economic growth and development have to be managed in ways that will consummate their full potential.

4.4. Long term responses

The national government can shore up the ability of individuals and households to help themselves and society as whole by directly providing opportunities for productive employment through government programs.

To protect gains from recovery, the creation of sustainable and resilient local provinces, cities, and municipalities is indispensable. To enable the country to adapt efficiently to disruptive, adverse, and disintegrative future events, a national directive for sustainable and resilient communities is obligatory.

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[7] Bonz Magsambol, "Getting treated for coronavirus comes with a hefty price tag", Rappler, April 17,2020. https://www.rappler.com/newsbreak/iq/getting-treated-coronavirus-price-tag

[8] Arguably, PhilHealth probably never should have covered 100 percent and certainly should have employed some socialized form of assistance where COVID-19 patients with means would be subsidized less. The amount of medical assistance must also be calibrated so as not to be so generous as to promote complacency.

4.5. Role of Local Government Units

The pandemic should make policymakers, businessmen, investors, and local government units (LGUs) take stock of the importance of urban resilience. Urban resilience shields cities against shocks and stresses. It is the "capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience."[9] According to the Organization for Economic Cooperation and Development (OECD), resilient cities have the ability to absorb, recover and prepare for future shocks (economic, environmental, social & institutional). Hence, to fast track the recovery of the economy and businesses, resilient cities have to be formed and nurtured.

The COVID-19 pandemic has drawn our attention to the Health and Well-being dimension of urban resilience in the Philippines. The challenges and difficulties faced by many LGUs and their residents during the long quarantine period clearly demonstrated that an urban health crisis can lead to a crisis in overall urban resilience. Indeed, the pandemic pushed the resiliency of many local economies, infrastructure, and leadership to the brink. Strengthening urban resilience and giving it powerful traction are therefore timely.

LGUs need to strengthen their facilitatory and regulatory capabilities to serve as conduits for government programs and incentives that will spawn productive employment, profitable businesses, and gainful investment opportunities. Since LGUs provide the physical environment for employment, business, and investment opportunities, they need to ensure that their economic and social infrastructures can shelter these opportunities from future economic, social, environmental, and institutional crises.

Finally, another reason the government should step up its digitalization program was demonstrated by the difficulties experienced early in the pandemic with the distribution of cash assistance and administration of the lockdown (e.g. issuance of quarantine passes etc.). A seamless computerized system (national and LGU) would have simplified identifying the appropriate recipients of aid, and coupled with a digital payment system delivered the aid faster. Such a system would also enable a smoother implementation of the vaccination program.

4.6. Private sector-led initiatives amidst the pandemic

The business landscape has radically changed and continuously evolves. The business and non-government sectors are also expected to set in motion initiatives to jumpstart the engines of growth and recovery. Discussed below are some initiatives firms in the private sector can adopt to help the government jumpstart the economy.

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[9] 100 Resilientcities.org

4.7. Build business resilience

Business resilience is the "ability of an organization to quickly adapt to disruptions while maintaining continuous business operations and safeguarding people, assets, and brand equity".[10] To adapt effectively and efficiently to the demands of the present and future uncertainties, businesses must be nimble, agile, innovative, creative, open to acquire new knowledge, and willing to embrace the so-called "creative destruction" or the new ways of doing business brought about by the disruptions in the business landscape. To achieve these, firms should revisit their strategies and business models and engagement with key stakeholders and business impacts.

4.8. Revisit business strategies and business models

The industry landscape has drastically shifted so that cash flow management as a short-term measure is a basic step to survive the liquidity crunch. But business should not forget to look at the long term in order to thrive. For instance, distribution and logistics as well as supply chain resilience have become an indispensable aspect of the value chain in order to reach both customers and suppliers. Digitization and digital transformation cannot be postponed as more activities within and outside of the business operations are going virtual. Formation of management teams equipped with the right mindset and attitude to adapt to change and motivate people are needed to fast-track business transformation and cultural change in the workplace. The workforce needs to feel that their welfare is primordial and that their special circumstances are appreciated, while at the same time their skills are being retooled and upscaled in order to adapt to activities demanded by the business model, by competition, and new regulations.

When employees feel that they are valued and well taken care of, it creates a sense of belongingness and brings greater employee productivity. While firms cited that the special arrangement for employees and operations translates to additional cost, the long-term benefit would offset the cost in the long run.

4.9. Coopetition

Competitors or firms operating upstream or downstream when they cooperate in pursuit of a common cause can closely collaborate and support each other. "Coopetition" is relevant now more than ever because of the close interdependence between firms regardless of their size and capabilities. Firms help themselves by helping other firms. For example, the larger supplier firms, by extending better terms to their smaller buyers, help themselves in the longer run when the economy bounces back and their buyers start to recover. Mall operators can review their agreements with their loyal tenants to help the latter recover and bounce back.

[10] Anonymous, Definition of Business Resilience, searchcio.techtarget.com.

Others that collect on installment basis, whether banks or non-banks, can extend better terms to their lenders as much as possible until the latter fully recover. Larger firms can also provide non-financial support or pro-bono services such as training and assistance to micro and SMEs.

While it is true that the pandemic has negatively affected most firms, those with more resources should extend a helping hand to firms in distress. This is to keep distressed firms afloat and retain their business and employees. The more firms stay afloat, the higher the economy bounces back.

4.10. Community engagement

The pandemic has dramatically shown that firms can never stand apart from their host communities and from society as a whole. When host communities and societies collapse and crumble under pressure, even the firms suffer. Hence, it is important for firms to build and fortify social support, presence, and social responsibility by undertaking programs that will enable their host communities to cope with the shocks and stresses. Firms can navigate locational or geographical obstacles to risk and crisis management by adopting what Michael Porter calls a shared value mindset.[11]

4.11. Public-Private partnership

Governments around the world are hard-pressed to come up with solutions to problems spawned by the pandemic. Even if the government can provide initiatives and solutions to pandemic-related problems, it may not be able to scale them up because of competing needs. Firms can ease the burden by partnering with the government to expand accessibility and widen the distribution of pandemic-related goods and services. For example, private drug companies should support the development of a rapid, accurate and inexpensive test for the coronavirus.

While the government has progressively eased quarantine restrictions and initiated policy responses to help beleaguered businesses bounce back, firms should continue to frame a broader, more resilient approach to risk management and response capabilities that can best protect their employees and overall business operations. Creating an organization that is strong in the face of adversity requires a new mind-set as the present pandemic shows that companies with superior adaptive capabilities can stay in the business.

4.12. Role of business/industry associations and professional organizations

Many of the proposals involve businesses working together to achieve a common purpose. One potential stumbling block in such efforts could take the

[11] The shared value mindset can be defined as generating economic value in a way that produces value for society by addressing its challenges. (ssir.org/articles/entry/business_collaboration_with_government_does_reward_outweigh_risk)

form of what economists call ‘coordination failure’. Some firms may be reluctant to put their shoulder to the wheel if they are not sure whether other firms will also join them. In the vernacular, this is what we call ‘naghihintayan’. Some firms in the pursuit of narrow interests might also “free-ride” or “free-load',' at the expense of the common good of society.

Business and professional associations can play the critical role of a “facilitator” much like the conductor of an orchestra. The association can become the venue for member firms to work together for a common purpose or serve as a forum for dialogue among members and between other organizations. For example, the mall owners association is better placed to convene the mall owners and hammer out guidelines on rental reprieves or reductions. The specific industry associations are more familiar with the respective industries and would be better placed to help its members come to an agreement of what would be feasible for their industry. The Bankers’ Association of the Philippines, for example, can better coordinate its member banks on length of extensions of debt repayment etc. These associations will also be better placed to monitor the cooperation of members.

As for the free rider problem, where associations cannot impose sanctions, it may nevertheless bring moral suasion and peer pressure to bear on its members to do their part. For example, some scholars have pointed to studies of how peer pressure can play a role in raising debt repayment rates in microcredit.

We believe the Bayanihan spirit can be rekindled at this time of the pandemic in the Philippine business scene. It may just need active ‘Gideons’ from the business and government sector to sound the trumpet call to action and combine their best initiatives to achieve a faster and stronger response towards normalcy and recovery.

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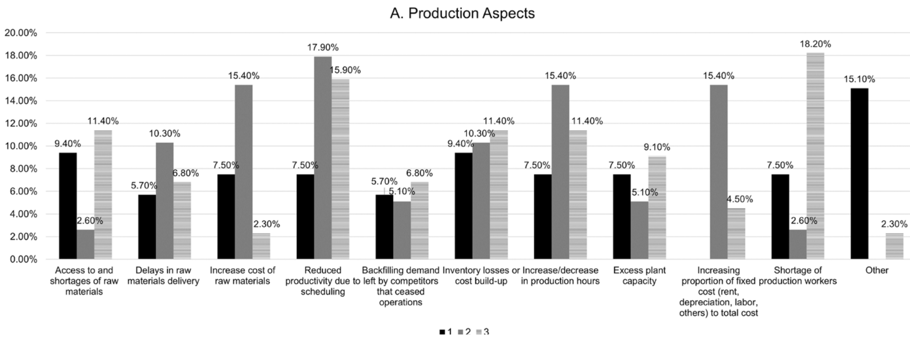
Annex 1. Details of responses to survey

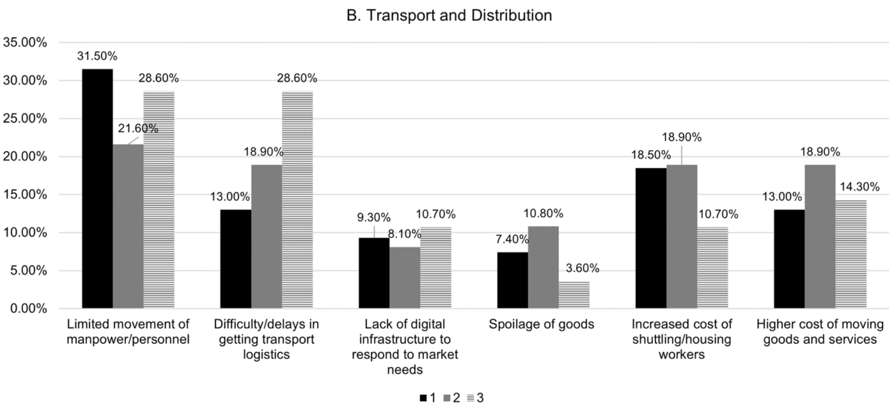
The survey asked respondents to choose and rank the top three issues with "1" being the most important. The following figures present the results (percent of respondents) pertaining to four areas of operations.

FIGURE 7. Frequency ranking of COVID-19 impact on production



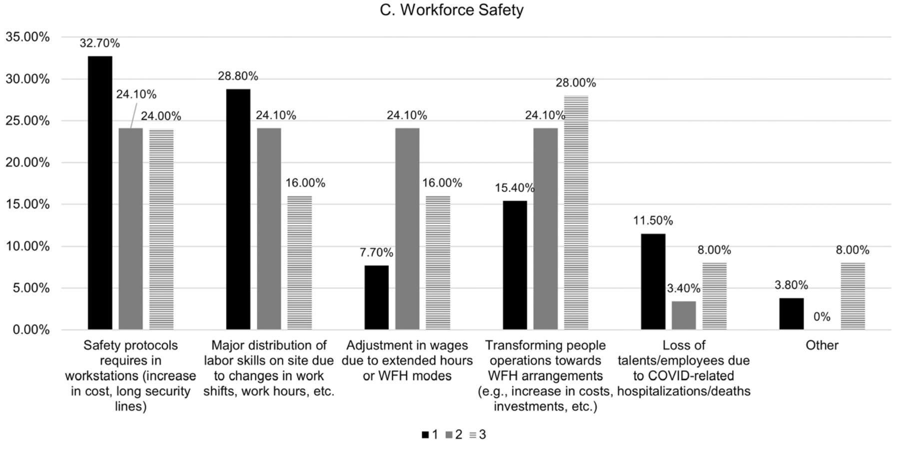
Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

FIGURE 8. Frequency ranking of COVID-19 impact on transport and distribution



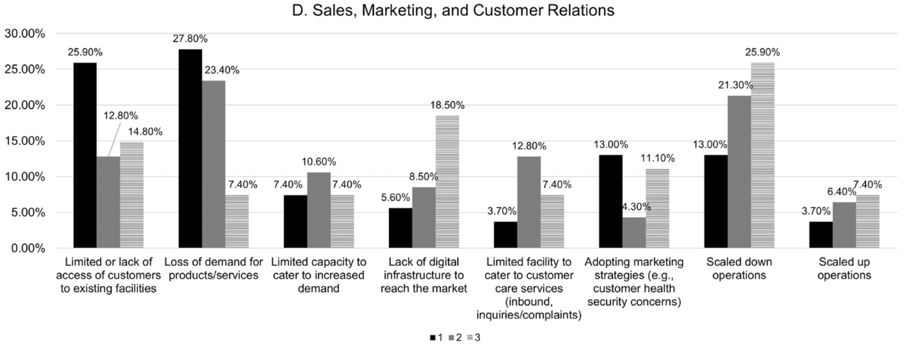
Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

FIGURE 9. Frequency ranking of COVID-19 impact on workforce safety



Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

FIGURE 10. Frequency ranking of COVID-19 impact on operational management in sales, marketing and customer relations



Legend: Black: First choice (Rank 1) Grey: Second Choice (Rank 2) and Striped: Third Choice (Rank 3)

Annex 2. Summary of challenges and recommended intervention

Aspect	Challenges	Intervention needed
Production	Production, especially in the manufacturing and sector, was largely affected due the strict mobility restrictions (lockdowns), cancellation of projects, drop in volume of orders of customers. Conducting business as usual during the virus outbreak while maintaining safety in the workplace is a big challenge for business establishments. Not implementing safety measures poses a tremendous risk to business continuity. Majority of the respondents identified safety protocols as the most challenging in their business operations. A significant number of respondents also pointed to major disruption of labor skills on site due to changes in work shifts, work hours, and others as significantly challenging aspects of their operation. Transforming to Work from Home arrangements with their workers also entailed additional cost in investment and operations.	Clear and consistent health and safety protocols or provide subsidy for the additional cost incurred (provision of masks, alcohol, service and lodging to some employees) DTI to help facilitate the mobility of goods (domestic and international exchange) Government help in improving public ICT infrastructure and regulation to increase internet speed and lower internet cost, including its role in streamlining government transaction processes and shift to digital platforms (especially that of COA, BIR, and SEC) Facilitating access to new financing models (e.g., crowdfunding, peer-to-peer (P2P) lending) and providing financial assistance on teleworking arrangement is also considered a valuable policy response
Sales	Firms in the hotel and accommodation, restaurants, food service activities, arts, entertainment and recreation sub-sectors recorded above 50 percent decline during the pandemic. Sales in the construction and manufacturing sectors likewise recorded losses ranging from 10-45 percent. This has resulted in salary cuts by about 31-50 percent . Low consumer confidence also dampened demand. Demand for most goods and services (except for basic necessities) was low because people preferred to stay at home (afraid to contract the virus) and to hold on to their money amidst the uncertainties of the pandemic.	Tax relief to business and laborers. Subsidies to utility expenses Low or interest free loans will help them address financial liquidity issues. Majority of the respondents indicated that they need loan for additional working capital, bankroll existing loans/mortgages, and to comply with health and safety protocols. More than 50 percent of the respondents said that they need at least ₱1-M loan assistance package. The above will help firms maintain business operations and provide employment NG to promote a visible investment campaign to augment health facilities and continuing negotiations to procure vaccines and medicines for combatting COVID-19. The NG should also pursue an information campaign to encourage the public to return to a ‘new normal’ consistent with health officials’ prescribed guidelines. Provide safety net for those who will possibly contract the virus (subsidy to hospitalization due to COVID-19)

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Disruptions in global value chains due to COVID-19: stylized facts and policy lessons

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This paper provides an early assessment of global value chains (GVCs) amid the disruptive effects of COVID-19 on world trade. Using the Asian Development Bank's updated Multiregional Input-Output Table, key indicators were estimated to identify important stylized facts about the contraction of GVC activities in 2020. Econometric models were also estimated to analyze the disruptive effect of COVID-19 outbreaks and stringent containment measures on GVC trade. The input-output analysis confirms that all major economic sectors suffered large losses, especially services. However, the bulk of the decline in overall GVC trade can still be traced to lower backward transactions in manufacturing. On the aggregate level, stronger backward GVC participation was associated with relatively milder contraction while the opposite was observed for forward participation. The regressions showed that positive growth of GVC trade was less likely in sectors with relatively larger exposure to foreign downstream shocks. Further, the combined effects of stringent containment measures and severe COVID-19 outbreaks also reduced the probability of growth in both backward and forward GVC transactions. These findings indicate that on top of foreign suppliers' internal disruptions (foreign supply shock), weak global consumption (foreign demand shock) and local producers' domestic sourcing problems (local supply shock) contributed to the steep contraction of GVCs in 2020. Against this background, the major challenges to robust recovery were also identified. These include the downside risks of a prolonged pandemic, the resurgence of protectionist tendencies, the strength of global demand, the reconfiguration of broken supply chains, and the ability of countries to coordinate their actions especially with respect to vaccination.

JEL: C64, F14, F60
Keywords: global value chains, COVID-19, supply chain disruptions, inter-country input-output analysis, Philippines

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1. Introduction

The COVID-19 pandemic is a global crisis like no other.[1] The exponential spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) across national boundaries forced countries to close borders and impose strict containment measures in infected communities. The so-called "Great Lockdown" limited the mobility of people and disrupted economic activities in a wide range of sectors. At the extreme, many industries were temporarily paralyzed by economic "sudden stops" due to uncertainties surrounding workplace safety and the availability of inputs and logistics services. Production organized within global value chains (GVCs) was particularly affected as the pandemic transformed efficient supply networks into a coordination nightmare. Manufacturers strongly connected to GVC hubs in East Asia were especially hit, with the region being the first epicenter of COVID-19 outbreaks and among the earliest sites of citywide lockdowns and emergency suspension of factory operations. These hard stops, albeit temporary and short-lived, sent shockwaves across the world economy given the region's central role in many globally-fragmented industries. In its full swing, the pandemic also hit key industrial centers around the world such as the United States (US), Germany, Italy, Spain, Brazil, and India. As a result, cross-border production activities were temporarily suspended or downsized due to the extraordinary challenge of moving goods and services through pandemic-stricken supply chains. Lower spending on "postpone-able" consumption also produced global demand shocks that further dragged GVC operations.

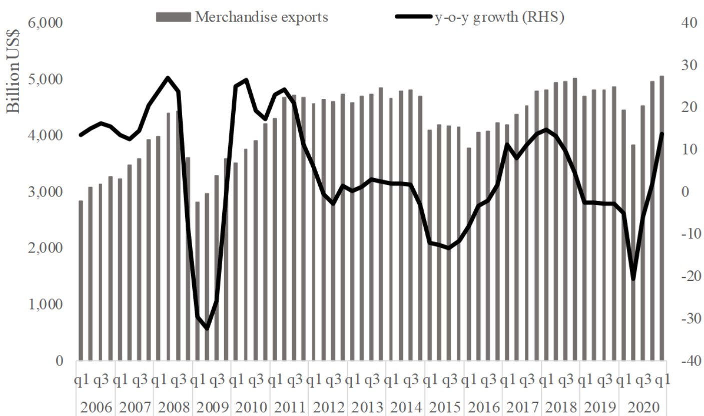
The aftermath of this public health emergency turned global economic crisis has been devastating. Global gross domestic product (GDP) fell by 3.3 percent in 2020, owing to the broad-based downturn in advanced (-4.7 percent) and developing economies (-2.2 percent) [IMF 2021]. Consequently, millions suffered from loss of productive employment and income as multiple establishments were driven out of business. Airlines, transport and shipping companies, hospitality and tourism-related sectors, and manufacturers of postpone-able goods were the early victims of lockdowns. Small and medium enterprises were disproportionately hit than large corporations.

The pandemic exacerbated the excessive volatility of global trade caused by the US-China tariff wars in 2019. According to the World Trade Organization (WTO) [2021], world merchandise exports in nominal dollar terms fell by 8 percent in 2020, the worst decline since the 22-percent collapse in 2009. This contraction reflects the synchronous fall of exports and imports across countries due to the combined effects of supply chain disruptions and weak demand (e.g., petroleum, automotive, consumer and capital goods, and industrial supplies),

[1] According to the World Health Organization (WHO), there are more than 200 million confirmed COVID-19 cases around the world, including more than four million deaths as of July 2021. Close to four billion vaccine doses have been administered worldwide.

especially during the second and third quarters of 2020. Exports of commercial services plunged by 20 percent as international mobility restrictions depressed the travel and transport sectors [WTO 2021]. Figure 1 shows that global merchandise exports have bounced back to pre-pandemic levels although the speed of recovery varies greatly across sectors and regions. Trade in services remains weak, especially with emerging virus variants (e.g., delta and lambda) causing new waves of COVID-19 surges and lockdowns. The uneven access to vaccines and other medical resources also poses threats to global efforts to end the ongoing twin health and economic crises. Calibrated containment measures, efficient testing, tracing, and treatment (T3), and speedy vaccination are key ingredients to rebuild broken supply chains and sustain a robust recovery of GVC trade.

FIGURE 1. Level and growth of world merchandise exports, 2006-2021



Source: WTO.

In an unprecedented turn of events, the pandemic transformed efficient supply chains into a series of hurdles for globally-oriented manufacturers. However, the possibility of this remote event is not totally unthought of. In a World Economic Forum (WEF) survey in 2012, supply chain managers ranked pandemics as the third most serious environmental event (next to natural calamities and extreme weather) that could cause system-wide disruptions to production networks [Doherty and Botwright 2020]. Compared to natural disasters that cripple areas of production in specific locations, global contagions have the potential to halt all types of economic activities in all countries.

We have seen similar systemic disruptions in the past. The collapse of world trade in 2009 was traced to demand shocks from Europe and the US that adversely affected global production through a complex web of financial and trade transactions. Weak output and consumption in major global markets translated to a downward spiral of production in export-oriented emerging economies. In 2011, the flooding in Thailand and the tsunami in Japan caused severe damage in

East Asia's automotive and electronics supply chains. This paralyzed industrial production and resulted in several months of negative export growth in the region. The recent trade tensions between China and the US also slowed down trade and threatened the stability of global production networks due to costly adjustments in world prices, exchange rates, investments, and productivity [Robinson and Thierfelder 2019]. These examples show that the propagation of initially local shocks into a full-blown global crisis has become common in the age of globalization. Seemingly minor risks can have ripple effects through various international transmission channels. As countries grew more interconnected through commercial, financial, and cultural linkages, they also became sensitive to global business cycles and local events that have potential systemic repercussions. Therefore, it is not only when the US or China sneezes that the world catches cold; the trouble may virtually come from anywhere in any form. This time around, it started with a virus.

The current structure of global production networks provides an efficient platform for propagating systemic shocks across borders. Despite the observed deglobalization after the financial crisis in 2008, GVC linkages have generally strengthened from three decades ago due to the internationalization of manufacturing, finance, and investments. For instance, Mendoza [2021] noted that an adverse shock on China's economy can generate a global impact more severe and contagious than twenty years ago. This is well demonstrated by the ongoing US-China tariff wars and the COVID-19 outbreaks which both increased trade costs and disrupted the flow of inputs in international supply chains. Baldwin and Freeman [2020] identified three main channels through which the economic contagion caused by COVID-19 was easily magnified by the current nature of GVCs. First, the major outbreaks happened in key industrial centers in Asia, Europe, and North America, causing disruptions to countries directly linked to these hubs. Second, the difficulty of trading with hard-hit countries affected the operation of domestic producers, and by extension, their local and foreign suppliers (and these suppliers' suppliers). In other words, the interdependence of firms across nations forms an intricate web of production linkages in which seemingly trivial interruptions can be amplified into a full-blown contagion. Third, lower production and escalated global uncertainty further reduced output and income and strained GVC activities due to the "bullwhip" effect of lower consumer and business spending.

This paper provides a preliminary assessment of the performance of GVCs amid the disruptive effects of COVID-19 on the global economy. In particular, this paper uses the updated Asian Development Bank-Multiregional Input-Output Table (ADB MRIOT) to measure key GVC indicators in 2020 and identify important stylized facts based on these estimates. This study also attempts to analyze the disruptive effects of COVID-19 outbreaks and stringent containment measures on GVC trade. To the author's knowledge, this is among the first studies to analyze the performance of GVCs using inter-country input-output (ICIO) data generated in the full swing of COVID-19 in 2020. Given that the pandemic is still ongoing and supply chains remain disrupted in some sectors and countries, an early assessment of the major GVC trends in 2020 provides useful insights to inform new policies and evaluate the effectiveness of existing strategies.

The rest of the paper is organized as follows. The second section analyzes the major trends underlying the key GVC indicators calculated using the ADB MRIOT. In particular, GVC trade was decomposed to trace the sectors, countries, and transactions contributing to the sharp contraction in 2020. A simple econometric model was also estimated to establish a possible link between containment measures, COVID-19 outbreaks, and the performance of GVC trade. The third section discusses the main takeaways from key GVC-related policies implemented at the height of the lockdown. Major challenges to robust recovery were also identified. The paper ends with a summary of findings and some concluding remarks.

2. Global value chains amid COVID-19: some stylized facts

The analysis in this section is based on the framework and method developed in Borin and Mancini [2019], and Belotti, Borin, and Mancini [2020], as applied to the 2019 and 2020 editions of the ADB MRIOT.[2] This ICIO table has 35 sectors and covers 62 countries which collectively accounted for 90 percent of world GDP in 2020. The major advantage of the ADB MRIOT is that key GVC-oriented economies in Asia (e.g., ASEAN, China, Hong Kong, India, Japan, Taiwan, and South Korea) as well as large economies such as the US and Germany are well represented. Thus, it is straightforward to analyze the cross-country impact and spillovers of shocks originating from these global manufacturing hubs.

The definition of GVC trade adopted in the succeeding discussions is derived from Belotti, Borin, and Mancini's [2020] decomposition of a particular country or sector's gross exports using ICIO tables:

$$u_N E_{s*} = \underbrace{\underbrace{DAVAX_{s*} + IAVAX_{s*} + REF_{s*}}_{DVA_{s*}} + DDC_{s*}}_{DC_{s*}} + \underbrace{FVA_{s*} + FDC_{s*}}_{FC_{s*}} \tag{1}$$

where $u_N E_{s*}$ is the gross exports of country s, $DAVAX_{s*}$ is value-added exports (VAX) directly absorbed in the immediate destination, $IAVAX_{s*}$ is VAX indirectly re-exported to third countries, REF_{s*} is called reflection or the portion of VAX that is ultimately absorbed by country s itself, DDC_{s*} is domestic double counted, FVA_{s*} is foreign value added, and FDC_{s*} is foreign double counted. The sum of $DAVAX_{s*}$, $IAVAX_{s*}$, and REF_{s*} is collectively referred to as DVA_{s*} or the domestic

[2] This was implemented using the ICIO package in Stata.

value added in gross exports. The sum of DVA_{s*} and DDC_{s*} is called the domestic content of gross exports (DC_{s*}) while the sum of FVA_{s*} and FDC_{s*} is called the foreign content of gross exports (FC_{s*}). The total GVC-related trade of country s is defined as:

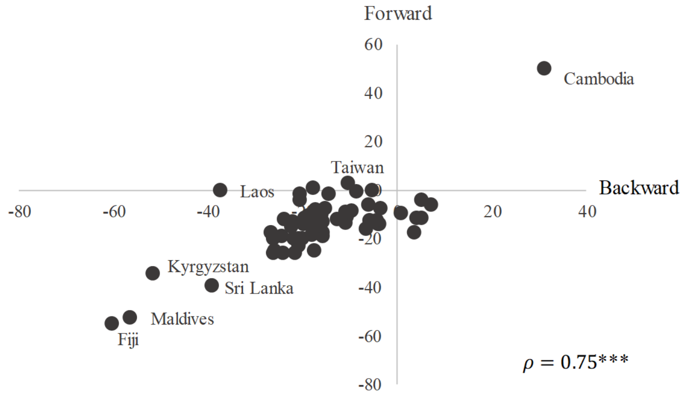
$$GVC_s = \Sigma_{r \neq s} (u_N E_{sr} - DAVAX_{sr}) \quad (2)$$

where $u_N E_{sr}$ is the total bilateral exports of country s to country r. In other words, GVC-related trade excludes the portion of the bilateral exports of country s to country r that is immediately absorbed by the latter. Underlying this formula is the definition of GVC trade as involving transactions that crossed borders more than once [Belotti, Borin, and Mancini 2020]. A country's overall GVC participation rate can be calculated by dividing GVC_s by $u_N E_{s*}$. Further, a standard practice in the literature is to decompose GVC_s into backward and forward GVC trade. The backward component loosely corresponds to the imported content of exports and is mainly comprised of FVA_{s*}. The forward component pertains to the portion of domestic production of country s that was first exported to country r then processed and re-exported. Note that $IAVAX_{s*}$ and REF_{s*} in Equation (1) fall under this category.[3]

Based on these definitions, the author used the updated ADB MRIOT for 2019 and 2020 to assess the performance of GVC trade amid the full swing of COVID-19. Except for Cambodia (34.5 percent), Ireland (4.9 percent), and Luxembourg (7.0 percent), all economies represented in the ADB MRIOT experienced huge declines in GVC transactions in 2020. Figure 2 shows that most countries also endured simultaneous contractions in backward and forward GVC trade. Most notably, small island economies (e.g., Fiji, Maldives, Sri Lanka) and landlocked countries (e.g., Laos and Kyrgyzstan) seem to be the worst hit. For the former, the shocks are mostly likely absorbed through the tourism and business travel channels which suffered major losses due to lockdowns and international travel bans. A key pattern suggested by Figure 2 is that the performances of backward and forward GVC trade seem synchronized. This implies that shocks propagated via GVCs affect a country through interconnected backward and forward channels. Therefore, what was initially a supply shock (e.g., difficulty of importing inputs) eventually hit a country again as a demand shock (e.g., reduced orders). Nevertheless, there were interesting cases where one grew while the other contracted. For instance, Taiwan's forward GVC trade managed to grow by 3.3 percent despite the 10.4 percent fall in backward transactions. This may be partly explained by the strong demand for Taiwan's technology exports due to major adjustments like shifting to online classes and work-from-home arrangements.

[3] Interested readers may refer to Borin and Mancini [2019] and Belotti, Borin, and Mancini [2020] for a more technical derivation of GVC-related indicators.

FIGURE 2. Growth of backward and forward GVC trade in 2020, by country



* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Author's calculation based on the ADB MRIOT 2019-2020.

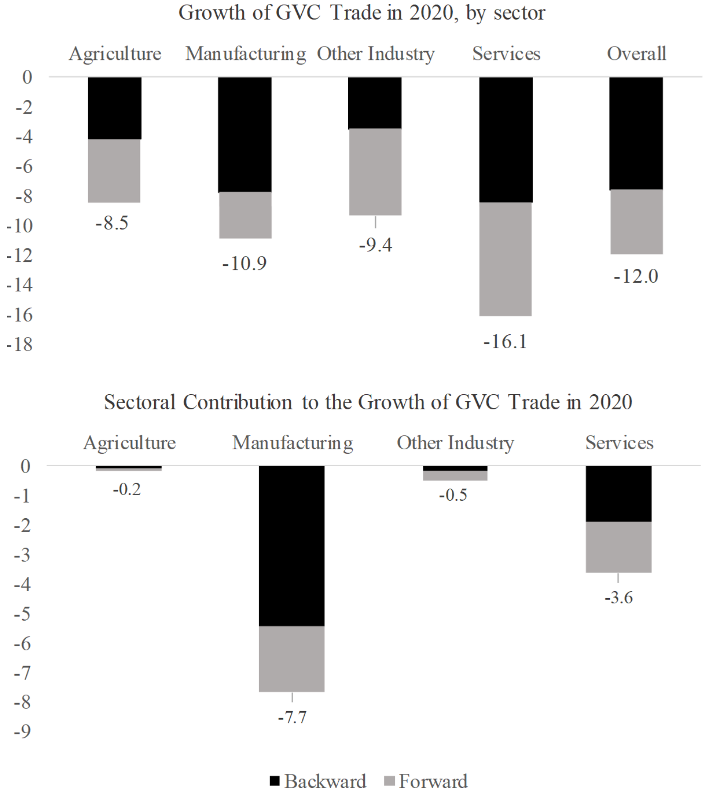
The growth of overall GVC trade in 2020 was then decomposed using the following formula:

$$\left(\frac{GVC_{2020}\text{-}GVC_{2019}}{GVC_{2019}}\right)=\sum_{g=1}^{2}\sum_{s=1}^{62}\sum_{j=1}^{35}\frac{GVC_{gsj,2020}\text{-}GVC_{gsj,2019}}{GVC_{2019}} \tag{3}$$

where g pertains to the type of GVC transaction (i.e., backward and forward), s is country, and j is sector. At the onset, it must be noted that the growth of total GVC trade was calculated based only on the GVC transactions of the 62 economies represented in the ADB MRIOT. The decomposition in Figure 3 shows that all major economic sectors suffered significant blows in 2020. GVC-related trade in services endured the biggest plunge of 16.1 percent. Manufacturing contracted by 10.9 percent while other industrial sectors (i.e., mining and quarrying, construction, and electricity, gas, and water) dropped by 9.4 percent. GVC-related agricultural trade experienced an 8.5 percent fall. However, in terms of contribution to the overall slide of GVC trade, the bottom panel of Figure 3 indicates that the bulk of the losses can still be traced to manufacturing, instead of services. In particular, backward manufacturing GVC trade accounted for 45.4 percent of the total contraction of GVC trade in 2020. This partly reflects the fact that manufacturing was initially hit by domestic supply chain disruptions which restricted the flow of inputs across borders. However, the slump in backward GVC trade in manufacturing may have been partly driven by final demand shocks which reduced the consumption of exports, and by extension, the demand for imported inputs needed to produce these exports. Forward GVC trade in manufacturing contributed an additional 18.8 percent to the overall drop mainly due to shocks from weaker global demand. Services also exerted a significant pull on GVC trade with a 30.5

percent share in the overall contraction. In addition to lost consumption in contact-intensive sectors due to mobility restrictions, weak demand for transport and logistic services also pulled the sector's performance at the height of the lockdowns. Agriculture had the smallest contribution to the slide of GVC transactions mainly due to the sector's limited direct participation in global production networks.

FIGURE 3. Growth of GVC trade in 2020, by sector



Note: The values are based only on the 62 economies represented in the ADB MRIOT
Source: Author's calculation based on the ADB MRIOT 2019-2020.

Somewhat contrary to the picture suggested above, Figure 4 indicates that economies with stronger backward GVC participation in 2019 endured relatively milder contraction of GVC trade in 2020. In contrast, economies with greater forward GVC participation experienced relatively larger declines in GVC trade. The first pattern suggests that greater access to foreign sources of inputs might have helped ease domestic constraints due to local supply chain disruptions. The second pattern implies that overall GVC trade in 2020 was probably weighed down by demand shocks originating downstream. The two figures highlight the complexity of interconnected transactions inside GVCs. Although fragmentation has resulted in globally dispersed production networks that are linked by backward and forward trade in intermediate inputs, global demand still exerts a significant influence on the short run performance of GVCs.[4] To organize ideas, Espitia et al. [2021] identified two types of foreign GVC shocks from the perspective of a particular exporting country (i.e., home). Shocks to source affect home exports that depend on imported inputs (i.e., backward GVC trade). Shocks to destination affect home exports of inputs and final goods to the destination countries (i.e., forward GVC trade). However, via chain reaction, this may indirectly affect the demand for foreign inputs (i.e., backward GVC trade) of import-dependent home exports. Altomonte et al. [2012] call this magnification of downstream shocks the "bullwhip" effect which was also observed during the great trade collapse in 2009.

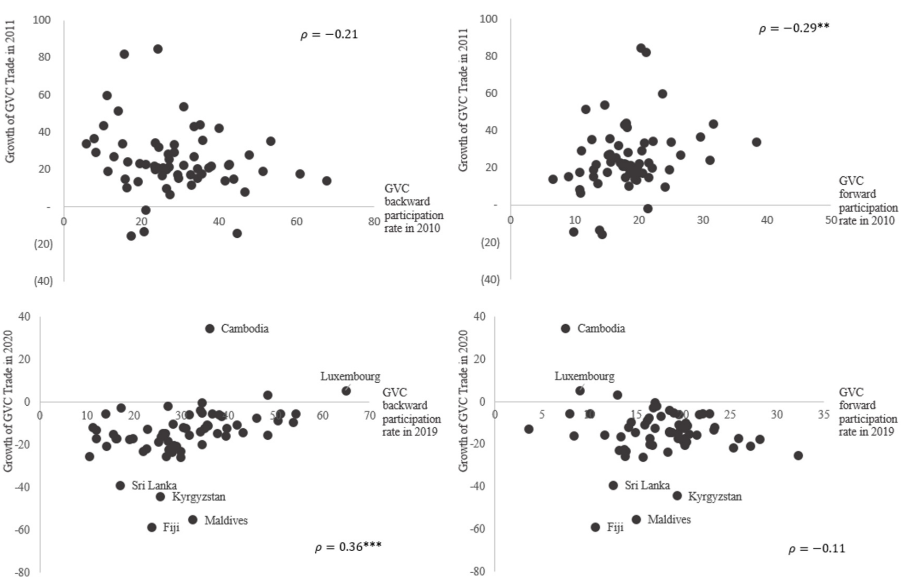
Another interesting observation based on Figure 4 is that the patterns in 2020 are a reversal of the relationships in 2011. Recall that East and Southeast Asia experienced supply chain disruptions in that year due to natural disasters affecting production in several GVC hubs in the region. In 2011, stronger growth of GVC trade was accompanied by higher forward GVC participation rate. The opposite was observed for backward GVC participation. The divergent trends in 2011 and 2020 suggest that the performance of GVC trade tends to vary depending on the nature of the shocks and the transmission channels of these shocks. In 2011, the disruptions were mainly supply-driven and concentrated in certain sectors and locations. In addition, the shocks did not progress into a full blown GVC crisis. This may partly explain the negative relationship between backward participation and GVC growth since the shocks originated from upstream suppliers. In contrast, limited interruptions downstream buoyed the GVC trade in countries with strong forward participation. In 2020, the shocks originated from temporary supply glitches but were soon followed by systemic GVC disruptions due to weak global demand and investments. Accordingly, downstream sectors became important sources of negative spillovers.

Figure 5 illustrates the relationship between the growth of GVC trade in 2020 and the potential exposure of countries to foreign demand and supply shocks before the pandemic hit. The left panel uses FVA's share in gross exports as a measure of potential shocks due to supply disruptions. Intuitively, countries whose exports are highly dependent on foreign inputs will be adversely affected by interruptions of supply from abroad. The right panel uses VAX's share in gross exports as an indicator of potential risks due to foreign demand shocks. While GVC integration allows countries to tap the global consumer base, this also makes them more vulnerable to sudden fluctuations of consumption in foreign markets. The patterns in Figure 5 are broadly consistent with Figure 4. Interestingly, countries with higher FVA share in gross exports experienced less severe GVC contraction.

[4] As Krugman [2015] argued, and in rebuttal of Say's Law, evidence from the global financial crisis shows that economies with persistently weak demand seem to have experienced large losses in potential and actual output.

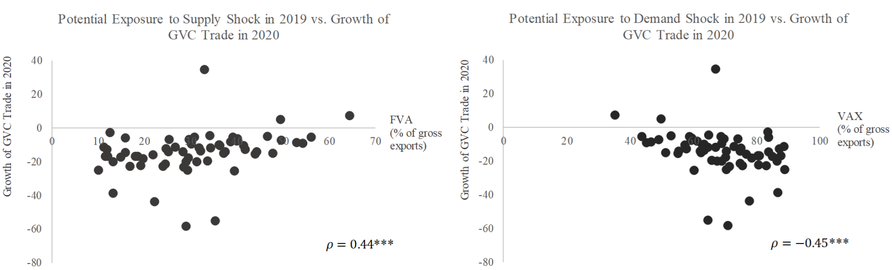
In contrast, the negative performance of exports, and of GVC trade in particular, were associated with shocks originating from the demand side. This is a combination of the reduced demand for inputs and final goods of a country's immediate trading partners as well as the indirect effect of lower consumption in third countries (i.e., the final destinations of value-added exports).

FIGURE 4. GVC participation rate vs. growth of GVC trade



* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Author's calculation based on the ADB MRIOT for 2010-2011 and 2019-2020.

FIGURE 5. Potential exposure to shocks in 2019 vs. growth of GVC trade in 2020

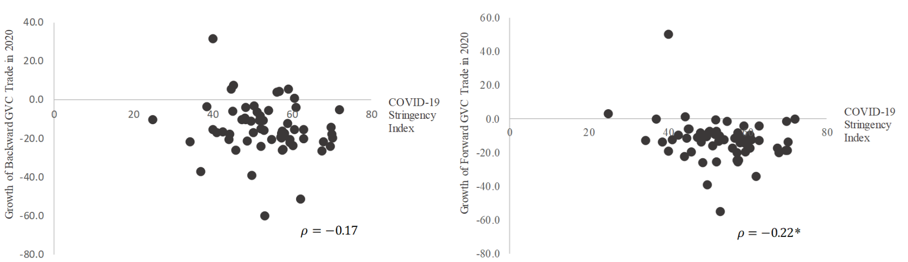


* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Author's calculation based on the ADB MRIOT for 2019-2020.

To establish a possible link between lockdowns, supply chain disruptions, and GVC trade, Figure 6 correlates the growth of backward and forward GVC trade with the average COVID-19 stringency index for 2020. The stringency index is a composite indicator developed by Hale et al. [2021] to provide a comparable cross-country measurement of the strictness of government responses to control COVID-19 outbreaks. The index includes various indicators of containment such as school, workplace and public transport closure, restriction on mass gathering and public events, restriction of internal movement and international travel, and stay-at-home requirements. In addition, the index also incorporates indicators on health systems and economic responses to the pandemic.

Figure 6 indicates that GVC trade contracted the most in countries where governments imposed stricter containment measures in 2020. Forward GVC trade was significantly negatively related with stringent government response to control the transmission of the virus. This may be explained by the fact that containment measures primarily affected domestic production through shutdowns of factories, reduction of operating capacity, and lost productivity of workers who could not report for work due to various reasons (e.g., lockdowns, COVID-19 infection, lack of transport services). This disrupted the operation of local firms, including their ability to supply inputs abroad (i.e., forward GVC trade). A similar negative relationship was observed between backward GVC trade and stringency although the correlation is weaker and insignificant. In line with the foregoing discussion, this suggests that widespread domestic rather than foreign supply chain disruptions aggravated the adverse effects of foreign supply shocks on local and GVC-oriented production.

FIGURE 6. COVID-19 stringency index vs. growth of GVC trade in 2020



* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Author's calculation based on the ADB MRIOT 2019-2020 and Oxford COVID-19 Government Response Tracker

To formalize the preceding observations, the author runs simple logistic regressions using the following binary indicators:

- $G_1 = 1$ if the backward GVC trade of sector j in country s experienced positive growth in 2020;
- $G_2 = 1$ if the forward GVC trade of sector j in country s experienced positive growth in 2020; and
- $G_3 = 1$ if the total GVC trade of sector j in country s experienced positive growth in 2020.

Country-sector pairs were used to increase the sample size. All models were estimated using the same set of three explanatory variables. First, the difference between a particular country-sector pair's VAX/gross exports and FVA/gross exports in 2019 was added as an indicator of the potential vulnerability to GVC shocks before the pandemic hit. A positive (VAX-FVA)/gross exports indicates that a particular country-sector pair has relatively larger exposure to downstream than to upstream shocks. For VAX and FVA, 2019 values were used to reduce the risk of reverse causality. The shock indicators were also combined due to high collinearity. Second, a control for the upstreamness of a country-sector pair in 2019 was added to test whether relative positioning in GVCs affected the growth of backward and forward transactions differently. Following Antras and Chor [2018], upstreamness is defined as the distance of a country-sector pair to final demand. This means that larger index values are associated with higher levels of upstreamness. Third, the containment stringency sub-index was extracted from the main stringency index then interacted with a country's number of COVID-19 cases per million (expressed in natural logarithm) as of December 31, 2020. This variable captures the combined effects of the strictness of the containment measures and the severity of the outbreak on a country-sector pair's GVC activities. The author hypothesizes that this effect is transmitted via the disruptions caused by outbreaks and the consequent loss of productivity due to lockdowns, workplace closures, and mobility restrictions. Table 1 summarizes the estimated marginal effects of the explanatory variables on $P(G_g = 1|x)$, where g pertains to the different types of GVC trade (i.e., backward, forward, and total).

TABLE 1. Logistic regressions for $P(G_g = 1|x)$, marginal effects

	$P(G_1 = 1\|x)$	$P(G_2 = 1\|x)$	$P(G_3 = 1\|x)$
(VAX-FVA)/gross exports in 2019	-0.0012*** (0.0003)	-0.0013*** (0.0003)	-0.0010*** (0.0003)
Upstreamness in 2019	-0.0399** (0.0187)	0.0063 (0.0185)	-0.0280 (0.0180)
Containment stringency*ln (COVID-19 cases/million)	-0.0004* (0.002)	-0.0008*** (0.0002)	-0.0007*** (0.0002)
Sector controls	Yes	Yes	Yes
n	2098	2098	2093
Wald's χ^2	195.20***	187.98***	183.10***
Pseudo R-squared	0.13	0.11	0.11
χ^2 for goodness-of-fit test	2088.28	2080.87	2066.65

*p < 0.10, **p < 0.05, ***p < 0.001.
Note: Figures in parentheses are standard errors.
Source: Author's estimates based on data derived from the ADB MRIOT, Oxford COVID-19 Government Response Tracker, and ourworldindata.org.

The results are broadly in line with the foregoing discussions. First, country-sector pairs that are relatively more exposed to foreign downstream shocks were less likely to experience positive growth of GVC trade in 2020. This indicates that downstream disruptions seem to have played a bigger role in the propagation of shocks due to COVID-19. Note that the early lockdowns both prevented individuals to go to work and to purchase from certain sectors (e.g., contact-intensive services or what de Dios [2020] calls the experience economy). Therefore, the economic sudden stops in 2020 have the elements of both supply and demand shocks which generated further uncertainties through loss of consumer and investor confidence and large-scale business exits. Guerrieri et al. [2020] argued that the economic disruptions initially induced by the pandemic were "Keynesian supply shocks" or supply shocks that generated changes in aggregate demand larger than the original shocks. An important feature that helps magnify this type of shock is the complementarity of activities across sectors and countries due to strong input-output linkages in modern economic structures such as GVCs. Therefore, a negative productivity shock such as lockdowns in key sectors or locations may generate chain reactions that transcend industries and national borders. Further, the employment and income losses due to these shocks may trigger consumption and investment fall, even in industries that are not connected to the affected supply chains.[5]

The econometric results also suggest that relatively upstream country-sector pairs are less likely to grow in backward GVC trade, other things constant. No similar effect was observed for forward GVC trade. This means that for more upstream country-sector pairs, the effect of foreign shocks will manifest mainly in the reduced likelihood of growing in backward GVC transactions (i.e., importing inputs). This seems counterintuitive if the shocks are indeed, for the most part, demand-driven. One possible explanation is that the most upstream country-sector pairs have stronger backward than forward participation to begin with.[6] This highlights the heterogeneous impacts of the supply disruptions across sectors, depending on the source and nature of the shocks on the one hand, and the position and strength of GVC participation on the other hand.

Lastly, the combined effects of stringent containment measures and severe COVID-19 outbreaks reduced the probability of growth in backward and forward GVC trade. This confirms that other things equal, the GVC activities of country-sector pairs operating in more restrictive environments were disrupted by local lockdowns, workplace closure, suspension of transport services, and travel bans. Intuitively, this impacted the ability of domestic producers to operate, and therefore, their demand for inputs. Further, fears of catching the virus resulted

[5] According to Guerrieri et al. [2020], the second important ingredient to generate Keynesian supply shocks is market incompleteness; that is, workers in affected sectors are not fully insured against the shock. Therefore, they become unable to consume from other sectors, even those that are not directly affected.

[6] For country-sector pairs with above average upstreamness, the mean backward and forward GVC shares in gross exports in 2019 are 29 percent and 21 percent, respectively.

in reduced mobility and lower consumption, especially of certain services such as transport, logistics, tourism, and hotel and restaurants. It is worth noting that the joint effect of strict containment measures and severe COVID-19 contagion is stronger for forward than backward GVC trade. This suggests that the effect of domestic supply chain disruptions impacted the ability of local suppliers to produce and export more than their ability to source inputs from abroad. For instance, two World Bank [2020] surveys conducted in July and November 2020 found that an average of 45.5 percent of Philippine firms, particularly in manufacturing, suffered from decreased supply of inputs due to the reduced availability of domestic suppliers. Further, an average of 40 percent and 29.5 percent of firms were affected by the reduced operations and delays experienced by local distributors, respectively. In contrast, only 8.5 percent of firms on average reported that they were affected by the reduced availability of international suppliers, while an average of 15 percent of firms experienced slow customs clearance. This suggests that the reduction in backward trade may not be due to the difficulties arising from foreign input sourcing per se but to the lower demand for imports induced by the combined effects of weak domestic industrial capacity and weak global consumption.

To summarize, the preceding discussion reveals the following stylized facts about the performance of GVCs amid the COVID-19 pandemic:

- The majority of economies suffered from large contractions in GVC trade in 2020, with small island economies and landlocked countries being the worst hit;
- All major economic sectors endured large losses, led by services-related GVC trade which dropped by 16.1 percent. In terms of contribution to overall contraction, the bulk of the losses in GVC trade can still be traced to lower backward transactions in manufacturing instead of services;
- The synchronous fall of backward and forward GVC trade confirms the interconnectedness of transactions in GVCs. The sudden stops in production and consumption generated supply and demand shocks that disrupted the global flow of goods and services. However, the spillovers have differential effects depending on the nature of the shocks and the propagation channels;
- Economies with stronger backward GVC participation in 2019 endured relatively milder contraction of GVC trade in 2020. This suggests that greater access to foreign sources of inputs might have helped ease domestic supply constraints. The opposite was observed for forward GVC participation which implies that demand shocks originating downstream were a major contributor to the disruption of GVC activities in 2020;

- GVC trade, especially forward, contracted the most in countries where governments imposed stricter containment measures in 2020;
- The regression results based on country-sector data further show that:
    - Country-sector pairs relatively more exposed to foreign downstream shocks were less likely to experience positive growth of GVC trade in 2020;
    - Relatively upstream country-sector pairs were less likely to grow in backward GVC trade; and
    - The combined effects of stringent containment measures and severe COVID-19 outbreaks reduced the probability of growth in backward and forward GVC trade.

The picture emerging from these findings is that the economic sudden stops caused by strict containment measures generated local supply disruptions and demand shocks which were propagated globally through the backward and forward trade linkages in GVCs. In addition to foreign suppliers' inability to export due to their own internal disruptions, local producers' scaled down operations due to domestic supply shocks and weak global demand also played big roles in the overall decline in GVC trade in 2020. In this case, stimulating trade will require unprecedented efforts to rebuild not only the production base but also business and consumer confidence.

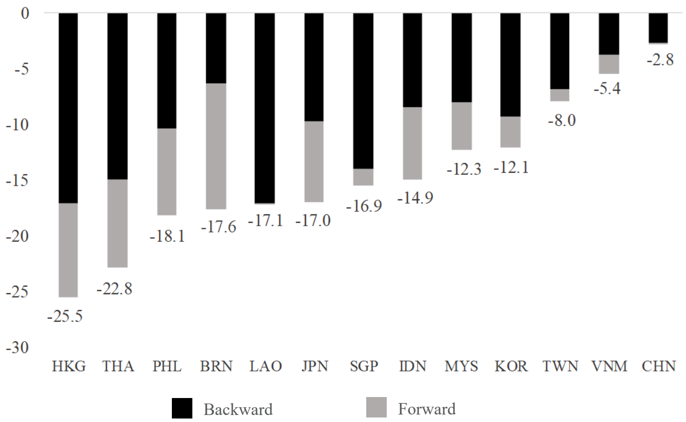
2.1. Performance of Philippine GVC trade amid the COVID-19 pandemic

With an 18.1 percent plunge, the Philippines joins Hong Kong (-25.5 percent) and Thailand (-22.8 percent) as the worst hit economies in East and Southeast Asia. This is in sharp contrast to Cambodia's 34.5 percent surge. Like the rest of the region, the slide in Philippine GVC trade was mainly traced to lower backward transactions which plummeted by 18 percent. As previously discussed, this may be explained by local supply disruptions that resulted in lower demand for imported inputs. Interestingly, China experienced the smallest contraction in the region, despite the country being one of the first sites of major COVID-19 outbreaks, citywide lockdowns, and factory closures. The modest decline of China's GVC trade was entirely due to lower backward transactions, with forward GVC trade even growing marginally by 0.2 percent. This may be partly traced to the fact that China has a very large domestic manufacturing base which allowed its local producers to resume operations despite the foreign supply shocks induced by lockdowns.

Table 2 summarizes the GVC performance of various Philippine sectors in 2020. It can be observed that the impact of the pandemic was broad-based, with the majority of the sectors experiencing double-digit contractions. This confirms that global shocks to GVCs can generate significant impacts on a wide range of economic activities, even in sectors that are not directly connected to global production networks. For instance, Philippine agricultural GVC trade still endured a 19.7 percent decrease despite the relatively limited direct participation in GVCs.

This was traced to lower forward transactions due to weak foreign demand. In manufacturing, both traditional and high-tech sectors suffered significant losses. In particular, GVC trade in food, beverages and tobacco dropped by 8.1 percent due to weak forward transactions. Textile and textile products (-25.1 percent) and leather, leather products, and footwear (-25.0 percent) also posted large declines on account of the sectors' lower usage of imported contents. High-tech manufacturing, which is largely GVC-oriented, also experienced huge drops. In particular, electrical and optical equipment fell by 16.2 percent while transport equipment plunged by 27.4 percent. These two poster industries of GVC trade suffered from the early throes of disrupted supply chains and eroded sales caused by lockdowns. However, the quick resurgence of the demand for auto and consumer electronics shifted the main strain to the supply side, with global production of cars and other electronic goods being held back by lingering global chip shortages [Wu, Savov, and Mochizuki 2021].

FIGURE 7. Growth of GVC trade in East and Southeast Asia in 2020



Source: Author's calculation based on the ADB MRIOT 2019-2020.

GVC trade in several industries still managed to grow in 2020. In particular, GVC transactions in mining and quarrying (6.8 percent) and pulp, paper, paper products, printing, and publishing (8.2 percent) expanded on account of increased backward and forward participation. GVC trade in chemicals and chemical products also soared by 34.5 percent due to higher backward transactions. This may partly capture the increased demand for pharmaceutical products during the early surges in COVID-19 infections.

Backward and forward GVC trade experienced significant losses across all major services sectors. In particular, hotel and restaurants, travel, and tourism were directly hit by lockdowns and international travel bans while the demand for logistics and telecommunication services contracted as manufacturing activities receded. De Dios [2020] explained that the very nature of the lockdowns, i.e., restrictions on mobility and social gathering, adversely affected the consumption of experience goods, and by extension, their services components. Financial intermediation, renting of machinery and equipment, and other business services (e.g., business process outsourcing) also suffered from the interruption of economic activities worldwide. This synchronized fall of manufacturing and services trade in GVCs is consistent with Jones and Kierzkowski's [1990] argument that services form an important "glue" that connects the fragmented activities in global production networks.[7] Intuitively, transport and logistics, telecommunication, finance, and back-office support are essential auxiliary activities that facilitate the seamless flow of tangible and intangible inputs within multinational supply chains. Therefore, supply and demand disruptions in either manufacturing or services can easily imperil the efficient operation of entire GVCs.

TABLE 2. Growth of Philippine GVC trade in 2020, by sector

Sector	Total	Backward	Forward
All sectors	-18.1	-18.0	18.4
Agriculture, hunting, forestry, and fishing	-19.7	-9.9	-25.6
Mining and quarrying	6.8	5.2	7.8
Food, beverages, and tobacco	-8.1	8.8	-21.3
Textiles and textile products	-25.1	-27.0	-9.4
Leather, leather products, and footwear	-25.0	-23.2	-42.5
Wood and products of wood and cork	-16.1	-14.6	-19.2
Pulp, paper, paper products, printing, and publishing	8.2	17.5	1.9
Coke, refined petroleum, and nuclear fuel	-36.4	-58.0	39.7
Chemicals and chemical products	34.5	66.4	-25.0
Rubber and plastics	-21.5	-21.7	-21.2
Other nonmetallic minerals	-5.6	-5.2	-6.7
Basic metals and fabricated metal	-3.3	-6.0	4.1
Machinery, nec	-9.5	-8.8	-12.6
Electrical and optical equipment	-16.2	-17.8	-11.5
Transport equipment	-27.4	-26.1	-30.0
Manufacturing, nec, recycling	-21.7	-22.9	-14.4
Electricity, gas, and water supply	-3.6	-24.1	18.5
Construction	-18.3	-20.6	-10.7
Sale, maintenance, and repair of motor vehicles and motorcycles, retail sale of fuel	-30.1	-31.8	-28.6

[7] The increasing importance of services in the production process is often described as the "servicification" of manufacturing [Kommerskollegium 2010]. Others refer to this phenomenon as "servicizing" [Reisken et al. 1999] and "manuservice" [Bryson and Daniels 2010]. This implies that products manufactured in GVCs can be considered as bundles of goods and services consolidated from various sectors and countries.

TABLE 2. Growth of Philippine GVC trade in 2020, by sector (continued)

Sector	Total	Backward	Forward
Wholesale trade and commission trade, except of motor vehicles and motorcycles	-27.0	-31.7	-25.4
Retail trade, except of motor vehicles and motorcycles, repair of household goods	-30.8	-34.5	-29.4
Hotels and restaurants	-24.3	-24.3	-24.3
Inland transport	-25.2	-30.0	-17.2
Water transport	-36.2	-47.3	-27.7
Air transport	-33.5	-38.8	-18.3
Other supporting and auxiliary transport activities, activities of travel agencies	-25.9	-29.2	-24.7
Post and telecommunications	-26.2	-26.3	-26.1
Financial intermediation	-26.4	-33.3	-24.9
Real estate activities	-28.5	-36.0	-27.4
Renting of M&Eq and other business activities	-24.7	-32.3	-23.0
Public administration and defense, compulsory social security	-19.5	-25.3	-17.9
Education	-22.3	-30.4	-20.6
Health and social work	-20.4	-15.5	-25.5
Other community, social, and personal services	-22.7	-24.3	-21.6

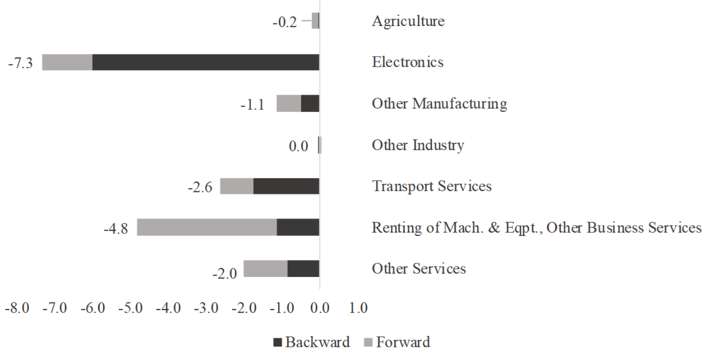
Source: Author's calculation based on the ADB MRIOT 2019-2020.

Figure 8 shows that the decline of Philippine GVC trade in 2020 was mainly traced to electrical and optical equipment, with electronics being the country's largest export item and the sector being deeply seated in the supply chains of large multinational companies. In 2020, electronics accounted for 46.4 percent of the country's total GVC trade. In addition, two-thirds of electronics trade were transacted within GVCs. This made the sector highly exposed to uncertainties in the global electronics market due to factory shutdowns, shortages of raw materials, and sudden fluctuations of demand. Prior to the pandemic, the industry already bore the brunt of the tariff wars. Owing to the "servicification" of manufacturing, transport services, renting of machinery and equipment, and other business services also weighed down the country's GVC activities.

Finally, Figure 9 decomposes the decline of Philippine GVC trade by main partners. Not surprisingly, the country's GVC performance was weakened by lower backward and forward trade with East Asian economies, the region hit hard by the disruptions caused by COVID-19. In particular, China, South Korea, Taiwan, Japan, and Hong Kong collectively accounted for 39.6 percent of the overall drop of Philippine GVC trade in 2020. Figure 9 suggests that East Asian economies contributed to the decline of Philippine GVC trade through lower backward transactions while end markets such as the US and Europe depressed the

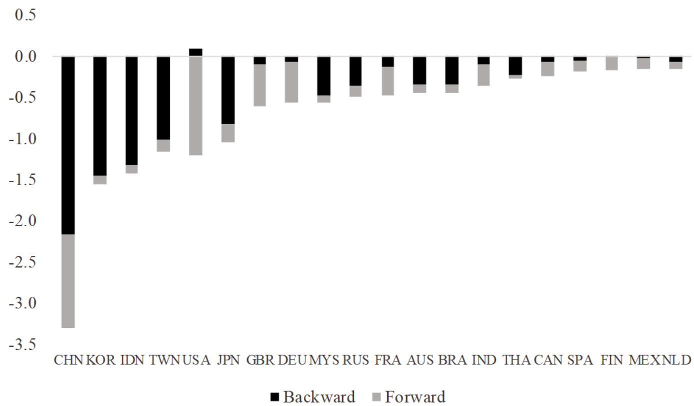
Philippines' forward GVC trade. This highlights the fact that a country, like the Philippines, that is strongly integrated to GVCs can assimilate global shocks from both the demand and supply sides. This also reveals the nature of the Philippines' vulnerabilities to GVC shocks: highly susceptible to regional supply disruptions and directly and indirectly exposed to demand fluctuations in developed countries.

FIGURE 8. Contribution to growth of Philippine GVC trade in 2020, by sector



Source: Author's calculation based on the ADB MRIOT 2019-2020.

FIGURE 9. Contribution to growth of Philippine GVC trade in 2020, by partner



Source: Author's calculation based on the ADB MRIOT 2019-2020.

3. Challenges to recovery

Recovering fully from the slump of GVCs due to COVID-19 is a tough challenge. This will depend on the duration of the pandemic, the downside risks from protectionist tendencies, the strength of the rebound of global demand, the reconfiguration of broken supply chains, and the ability of countries to coordinate policies.

Until the global public health crisis due to COVID-19 is completely under control, resumption to the pre-pandemic economic order is not likely. Although the tradeoff between health and wealth presents a seeming dilemma, experts and policymakers agree that containing the contagion should be the priority and that governments must "do whatever it takes" to put an end to the pandemic. A popular view among economists is that the health and economic objectives should be treated as complementary. As Baldwin [2020] argues, shutting down commercial activities and inducing an economic recession were necessary steps to enforce social distancing and reduce the spread of SARS-CoV-2. Countries that have implemented effective containment measures were able to gradually but cautiously reopen the economy as their epidemic curves started to flatten.

However, going back to business as usual without systematic T3 policies, health interventions, and effective vaccination strategies will only heighten the risks of new outbreaks. This is evident in the experiences of many developing countries like the Philippines, where stringent containment measures remain important instruments in the pandemic response toolkit. However, while lockdowns and social distancing are important measures to control the spread of the virus, the prolonged industrial disruptions that these drastic measures entail can inflict deep scarring on firms' productivity, especially in countries that have not ramped up vaccination efforts. Production lines will remain below capacity as long as some workers are involuntarily prevented from reporting for duty. Even with increased worker mobility or with automation, returning to full operation is difficult when some segments of supply chains continue to be distorted. Firms whose supplies remain interrupted by lockdowns and logistics bottlenecks have no choice but to scale down production until new input sources have been secured. Worse still, the potential spate of bankruptcies and firm exits may exacerbate the rigidity of supply. The multi-speed economic recovery across countries can sustain the lingering volatility in demand.

In the age of geographically fragmented production, malfunctioning supply chains mean broken linkages and interrupted trade flows. While controlling the spread of COVID-19 should be the most critical component of any short-term strategy to lead global factories to recovery, lessons from past supply chain disruptions provide additional insights on how to weather the current crisis. For instance, a WEF study in 2012 suggested the following recommendations to effectively manage supply chain disruptions [Doherty and Botwright 2020]. First, governments and lead firms should jointly conduct rapid and frequent assessments of current and potential risks to production bases and distribution networks. Identifying the sources of these risks is a key step towards implementing coordinated business and policy actions. Second, information sharing is very important given that one's failure can paralyze other firms. In a complex web of production linkages in GVCs, every participating firm may be "too big to fail." Therefore, access to reliable real-time data is important to let suppliers recognize potential risks and emerging threats. Standardized risk measurements should be developed so that red flags can be easily detected. Based on these indicators, suppliers can plan ahead, revise projections, and prepare calibrated responses to various contingencies. Lastly, transparent and effective risk communication is needed to preserve synchrony among all stakeholders. In the current structure of production networks where glitches have inherent systemic effects, the one thing that governments and lead firms should avoid is releasing information that causes disjoint, confusion, and panic within supply chains and beyond. Using standardized indicators and protocols may simplify inter-firm communication.

Another important lesson from this crisis is that protectionist tendencies did not only undermine global efforts to control the contagion, they also pushed GVCs into greater volatility. For instance, the early stages of the outbreaks were accompanied by export restrictions and import duties on essential pharmaceutical and medical supplies such as face masks, protective garments, disinfectants, soaps, and ventilators. The bad news is that health systems around the world rely on personal protective equipment (PPE) trade. For instance, China and the US are each other's major trading partners in terms of PPEs while 90 percent of PPEs sold in EU are imported [Baldwin and Evenett 2020]. However, as Evenett [2020b] puts it, these trade distortions "sickened thy neighbor" by depriving many countries of the critical medical products needed to treat COVID-19 patients and prevent new infections. The double whammy of lower global supply and higher prices disproportionately hurt poorer nations that have inefficient health systems to begin with. Export curbs in big producers also undermined the unilateral reduction of import barriers in some countries. These risks compromised the ability of a country to contain the contagion, which in turn created additional health risks that transcended trade borders. As a result, this generated new waves of outbreaks that led to extended lockdowns, new batches of business closures, and protracted disruptions of domestic and international supply chains.

In addition to pharmaceutical and medical products, many countries also put up different types of barriers in the name of protecting domestic health and food security. As of July 2021, the WTO documented 312 goods-related and 137 services-related trade measures implemented across 116 customs territories.[8] As of August 2021, the WTO has already received 405 notifications related to COVID-19. Ninety percent of these notifications pertain to technical barriers to trade, sanitary and phytosanitary standards, and market access.[9] While some are related to trade facilitation measures that simplify documentary processes (e.g., Australia, New Zealand, EU, South Africa, Brazil, Chile, Costa Rica) and others moved to temporarily relax import restrictions on essential products (e.g., Switzerland, Canada, Bangladesh, Colombia, Brazil, and Ukraine), a handful of notifications explicitly hampered agricultural and medical exports or restricted "high-risk" imports.

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8 See https://www.wto.org/english/tratop_e/covid19_e/covid19_e.htm.

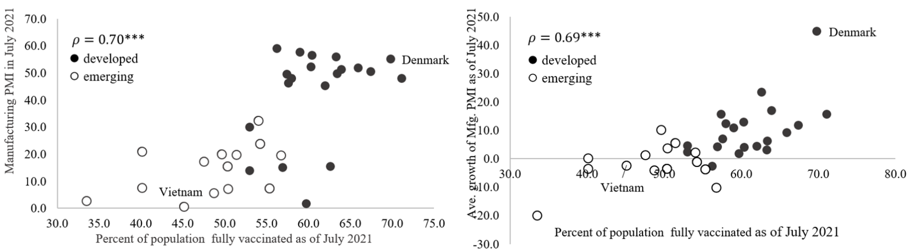
9 See https://www.wto.org/english/tratop_e/covid19_e/notifications_e.htm.

However, lessons from past crises suggest that export restrictions are bad policies. They distort global supply, create artificial shortages in importing countries, and unnecessarily increase the price for everyone. They may also inadvertently discourage local mass production when there are no foreign markets to absorb domestic surplus [Evenett 2020a]. In the case of raw materials and intermediate goods, trade restrictions create bottlenecks in the operations of global production networks that rely heavily on the unhampered flow of inputs within supply chains. Lessons from the US-China tariff wars suggest that the disruptive effects of protectionist policies have the potential to inflict damages not only on the disputing parties but also on peripheral countries that absorb the spillovers via GVC linkages. Putting up trade barriers in the middle of a pandemic is not a good gesture of being one with the international community. They magnify the stress to already fragile trade linkages and negate global efforts to keep GVCs functioning despite supply disruptions. Luckily, the fall of world trade in 2020 was less severe than expected partly due to the overall restraint and prudence of individual countries. As documented by the WTO [2021], many restrictive measures put up at the onset of the pandemic were eventually retracted and new policies supporting freer trade were introduced.

Instead of turning inward, countries should embrace multilateral cooperation as a key component of global efforts to recover from the COVID-19 crisis. The pandemic will persist unless all nations jointly strategize to end the crisis. Instead of export restrictions, trade wars, and competition for vaccines and other medical supplies, governments should realize that coordination is key to make the current structure of globalization work in emergency situations. Still, while everybody loses from coordination failure, world leaders need to demonstrate that smaller nations will have a fair share of the gains from the recovery of global trade and the world economy.

A perfect illustration of this last point is the current state of COVID-19 vaccination around the world. Immunization rates have been uneven, with advanced economies proceeding with their vaccination programs with greater speed and success than developing countries. While several governments in the developed world have started inoculating third booster shots, millions of people in low-income countries have not had their first jabs yet. A key determinant of this disparity is vaccine access which puts poorer nations at a disadvantageous position. Brand consciousness adds another layer of complication, with several countries not keen on accepting workers, tourists, and business travelers inoculated with certain vaccine brands. But these brands, especially Chinese-manufactured shots, are the most widely available vaccines in developing countries. This situation is problematic and undermines the recovery of the global economy in general, and GVCs in particular. For instance, Figure 10 shows that manufacturing purchasing manager's index (PMI) has rebounded stronger and faster in developed countries with higher vaccination rates. In contrast, manufacturing remains relatively weak in developing countries where immunization rates are low. As long as emerging economies stay plagued by recurring outbreaks and lockdowns, their segments of international supply chains will remain volatile which translates to lingering disruptions of global manufacturing. The link between vaccination and GVC resurgence is straightforward. Vaccine inequality heightens the risk of new outbreaks and virus variants, especially in poorer countries with fragile health systems. A protracted pandemic in vaccine-deficient areas means that strict containment measures have to stay in place. But prolonged lockdowns and social distancing can cause a vicious cycle of supply chain disruptions whose spillovers can easily be propagated worldwide through GVC linkages. Therefore, vaccine nationalism and hoarding are counterproductive since the tides of globalization will lead the repercussions home.

FIGURE 10. Vaccination rate vs. manufacturing PMI across countries as of July 2021



* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Sources: CEIC and ourworldindata.org

It is worthwhile reiterating the first law of ecology: everything is connected to everything else. In the context of the current crisis, every thoughtful or reckless action by individuals, businesses, and governments can have repercussions on the global fight against SARS-CoV-2. The COVID-19 pandemic is a global threat that requires global solutions. Unfortunately, the current lack of international cooperation seems harder to resolve than the contagion itself. Critics argue that cooperation deadlock in the face of shared risks is the inherent weakness of global interconnectedness. This argument has merits and must be dealt with in future reconfigurations of GVCs. Until then, teamwork is the best survival strategy available at the world's disposal. That a country puts itself and others in danger by refusing to harmonize its policies should be good enough incentive to cooperate. The message is clear: no country is completely safe until all are safe. Only then can we talk meaningfully about repairing broken trade linkages and building robust supply chains.

4. Concluding remarks

The COVID-19 crisis has exposed both the beautiful and the ugly sides of the current organization of world trade. Owing to the growing interconnectedness of production and consumption in GVCs, seemingly minor risks such as a viral disease can generate ripple effects through the complex web of input and output linkages in global supply chains. We have also seen that the spillovers of systemic GVC disruptions spare no one, even the sectors that are not directly participating in global production networks. This is evident in the synchronous fall of backward and forward GVC trade across countries and major economic sectors, but especially in manufacturing and services. Nevertheless, the severity of the impact still varies depending on the type of GVC participation, the nature of the shocks, and the channels through which the spillovers are propagated.

Given the heightened exposure and sensitivity to global shocks, the COVID-19 pandemic and the US-China trade wars before that have renewed debates on the merits of interconnectedness in GVCs. Arriola et al. [2020] argued that exposure to supply chain risks does not automatically translate into actual economic losses, especially when firms and countries know how to manage these risks. In general, the idea that going inward will make domestic production more resilient and less exposed to foreign shocks has little support in the literature. This is because manufacturers actually lose flexibility by foregoing foreign alternatives and relying solely on local supply chains that are also not immune to obstructions [Miroudot 2020]. Within the context of supply chain disruptions induced by COVID-19, Espitia et al. [2021] found that GVC participation expectedly increased traders' vulnerability to foreign shocks but it also moderated their vulnerability to local shocks. Arriola et al. [2020] noted that re-localizing supply chains may lead to higher costs and heightened output volatility given the limited headroom for adjustments when shocks hit. Evidence from the global recession in 2009 also shows that while countries connected to GVCs were exposed to larger foreign shocks, they also recovered faster after the crisis [Altomonte et al. 2012].

Despite the risks of supply disruptions and demand fluctuations, the available evidence suggests that building more robust supply chains does not mean abandoning their global scope. The danger posed by interconnectedness in GVCs is not the exposure to shocks per se but the lack of strategic harmony among the actors involved. While producers have long recognized the potential gains from linking with international suppliers with established comparative advantage in certain activities, governments have generally been slow to acknowledge the value of policy synchronization in the age of globalization. But a crisis of this magnitude requires the collective action of all nations, not nationalism and protectionism. There is no better time to prove that interconnected economies must be supported by strong global coordination. As they say, don't let a good crisis go to waste.

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Coping strategies of selected MSMEs in Laguna one year after COVID-19

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This paper investigates the coping strategies employed by sample micro, small, or medium enterprises (MSMEs) in Laguna using the SME Competitiveness Grid framework developed by the International Trade Centre (ITC). The paper finds that sample MSMEs in Laguna did not find it easy to access MSME assistance programs, and that many are not even aware that such assistance programs exist. However, most MSMEs were found to be flexible and innovative when it comes to their coping strategies; the most common are through using online platforms and customizing or making new products. The paper also finds that assistance on reduction of fixed and operating costs, improvements in credit access, and greater ease in doing business are the most desired forms of government intervention, consistent with the findings of earlier surveys.

JEL classification: I15; I18; O17
Keywords: COVID-19, MSME, Laguna

1. Introduction

The lockdowns (Enhanced Community Quarantine or ECQ, Modified Enhanced Community Quarantine or MECQ, General Community Quarantine or GCQ) imposed by the Philippine government to stem the transmission of COVID-19 have significantly hampered economic activity. Businesses shut down and workers were side-lined leading to significant income losses. The economy contracted by 9.5 percent for the whole of 2020 as a result of declines in household consumption and investment [Laforga 2021]. The micro, small and medium enterprises (MSMEs) in the Philippines suffered the brunt of the lockdowns and the vulnerability of firms and workers to the economic impacts of the pandemic were magnified.

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This paper takes a look at the coping strategies used by a sample of MSMEs in Laguna. MSMEs are the main focus of the analysis because they can readily reflect the vulnerability of workers to the economic impacts of the pandemic as a result of them also suffering losses due to the shutdown. As such, the paper begins in Section 2 by providing a brief overview of the MSME situation in the country. This paper adopts the SME Competitiveness Grid framework of the International Trade Centre (ITC), and this is described in more detail in Section 3. An online survey of MSMEs in Laguna was conducted based on this framework, to investigate the coping mechanisms of MSMEs in Laguna one year after COVID-19 hit the country, which is described in Section 4, along with the discussions of the corresponding results. The last section concludes and lays down some policy implications.

2. MSMEs, lockdowns, and income vulnerability

The national government sought to help out MSMEs in the course of this pandemic. Included in the first pillar of the government's pandemic response is a ₱1 billion loan program specifically for MSMEs through the Department of Trade and Industry (DTI). The government-owned-and-controlled Small Business Corporation set up the Enterprise Rehabilitation Financing facility under the *Pondo sa Pagbabago at Pag-asenso* (referred to as the COVID-19 P3-ERF)[1], and offered a one-month moratorium on loan payments to MSME borrowers. On top of this, a ₱203 million budget was allocated for enterprise development and livelihood toolkits amounting to between ₱5,000 and ₱8,000 for MSMEs affected by calamities, both natural and human-induced, and health disasters. MSMEs can also benefit from DTI Memorandum Circular No. 20-12, which provides a minimum 30-day grace period for commercial and residential rents due within the ECQ period without interests, fees, penalties, and other charges[2]. DTI also launched the Shared Service Facilities project which aims to help MSMEs enhance their competitiveness by providing the necessary machinery, equipment, and systems, as well as training. These are all intended to boost MSMEs' productive capacities and improve product quality, as well as provide MSMEs with the technological support necessary to cope with the challenges posed by the pandemic. The Bangko Sentral ng Pilipinas (BSP) likewise deferred the implementation of the revised risk-based capital framework applicable to stand-alone thrift banks, rural banks, and cooperative banks to 2023 (from 2022) to allow such banks to continue lending to MSMEs that were hard hit by the ECQ measures [Noble 2020]. Moreover, the first rollout of the Social Amelioration Program could also help MSMEs, directly through the initial ₱35 billion wage subsidies for workers in small businesses affected by the ECQ, which eventually evolved into the Small Business Wage

[1] https://www.dti.gov.ph/news/sbcorp-loan-facility-covid-affected-msmes/ (Accessed 6 May 2020)
[2] https://dtiwebfiles.s3-ap-southeast-1.amazonaws.com/COVID19Resources/COVID-19+Advisories/010820_MC2044.pdf (Accessed May 17, 2021)

Subsidy Program, and indirectly through a cash assistance for displaced workers worth a total of ₱2 billion through the Department of Labour and Employment (DOLE)[3] [Sta. Ana III 2020]. MSMEs can likewise avail of the already existing business loan programs and credit facilities of the Social Security System[4].

It is important to stress the significance of MSMEs to the Philippine economy. To begin with, the 2018 List of Establishments of the Philippine Statistics Authority states that microenterprises are those that have between one to nine employees, small enterprises are those that have between 10-99 employees, and medium enterprises are those that have 100-199 employees. MSMEs had a staggering 99+ percent share in all business enterprises, and employed more than 5.7 million people, which is more than 63 percent of employment in these business enterprises. Services tends to be the dominant sector in MSMEs, both in the number of establishments and employment. The biggest single services subsector is wholesale and retail trade and repair of motor vehicles and motorcycles, which makes up more than 46 percent of the establishments, and employs more than 2.2 million workers. In this subsector, 99.9 percent are MSMEs, employing more than 2 million workers. Wholesale and retail trade and repair of motor vehicles and motorcycles are only allowed to operate in GCQ areas [Parrocha 2020], which implies lingering negative impacts on MSMEs. These highlight the vital role of MSMEs to the economy, making them contributors to economic growth and poverty reduction [PIDS 2016].

For 2018, MSMEs contributed almost 36 percent of value added from registered business enterprises according to the Department of Trade and Industry (DTI)[5]. This suggests that jobs in MSMEs tend to have low productivity, which, at least in theory, results in low wages for those employed. This, in turn, leads to low incomes for households with members who work in MSMEs. The International Labour Organisation [ILO 2017] also identified other problems that make MSMEs in the country vulnerable. One is the lack of adequate technological facilities and research and development, making MSMEs less likely to innovate. Digital tools are seen as crucial for MSMEs to remain competitive amidst the pandemic [BusinessMirror 2020]. Adapting certain business components to online modalities can significantly reduce operations or advertising costs. As mentioned, DTI has recently attempted to address these[6], it (1) developed a Google site to provide information to MSMEs on technology applications, platforms, and other tools and resources available in coping with lockdown conditions[7], (2) offered its own webinars to MSMEs on digital operations[8], and (3) partnered and cooperated with the ITC in offering a free modular course on business handling aspects such

[3] https://www.dole.gov.ph/news/dole-realigns-budget-to-aid-workers/ (Accessed May 6, 2020).
[4] https://www.sss.gov.ph/sss/appmanager/pages.jsp?page=businessloans (Accessed May 18, 2021).
[5] https://www.dti.gov.ph/resources/msme-statistics/ (Accessed May 6, 2020).
[6] https://www.dti.gov.ph/covid19/assistance/ (Accessed May 17, 2021)
[7] The Google site can be accessed using this link: https://sites.google.com/view/tech-resources-for-msmes.
[8] The schedule for such webinars can be seen at DTI's ecommerce Facebook page: facebook.com/dti.ecommerce/

as planning, accessing financial services, digitalisation, etc.[9], (4) started an online trade fair for MSMEs in cooperation with Shopee.PH, and (5) cooperated with Easybuilder.Pro to allow for the waiving of subscription fees for MSMEs when using the platform for creating websites.

However, MSMEs also face incentives not to register so as to avoid taxes and other regulations imposed on them [Chua et al. 2013]. Complex tax regimes impose additional administrative costs for businesses to comply with tax obligations. Registration is further disincentivised by costs incurred from bureaucratic procedures. However, non-registered MSMEs will not have access to credit and technical assistance from the government for technological facilities and R&D, and this can slow down their growth. Lastly, while MSMEs employ 5.7 million people, MSMEs also tend to contribute less to job creation in the short term since 91 percent of small enterprises did not transition to medium-scale category but remained small after 3 years. Moreover, 21 percent of the medium-scale enterprises regressed to small-scale category and only 17 percent became large-scale enterprises[10]. A study showed that the majority of new MSME are "subsistence in nature", and local entrepreneurs do not expect to generate more than 5 jobs in the next few years [ILO 2017].

These discussions imply that MSMEs will be able to provide little help in alleviating the vulnerability of households to income loss by employing some of its members. Filipino households are made more vulnerable to income loss when their income-earning members work in establishments forced to close due to the lockdowns. One such group of workers is made up of those in precarious work, defined as workers whose nature of employment is short-term, seasonal, or casual, or those who work for different employers on a day-to-day or week-to-week basis. In 2018, close to 29 percent of wage and salary workers were in precarious work, which is equivalent to more than 7.5 million people. This is highest in the agriculture sector where precarious employment is at nearly 48 percent. Furthermore, more than 30 percent of workers in private establishments are also precariously employed. These are shown in Table 1.

There are more than 6.3 million short-term, seasonal, or casual workers and almost half are employed in the services sector. Private households and establishments employ a whopping 91 percent of these workers. In 2018, the average real daily basic pay[11] of these workers using 2012 prices was about ₱280 which was lower than that received by all workers on average, as Table 2 shows. For all the major economic sectors and for all worker categories, short-term, seasonal, or casual workers were always paid lower, on average.

[9] The modular course can be accessed using this link: https://ecampus.itcilo.org/enrol/index.php?id=1330

[10] 2009 survey of registered MSMEs [ILO 2017].

[11] Basic pay refers to pay for normal time prior to deductions of social security contributions, withholding taxes, etc. It excludes allowances, overtime and premium pay, commissions, bonuses, benefits in kind, etc. Retrieved from http://openstat.psa.gov.ph/Metadata/3K3F7040 (Accessed May 5, 2020); https://psa.gov.ph/philippine-industry-yls/table/Wage%20Statistics (Accessed May 5, 2020).

TABLE 1. Share of wage and salary workers in precarious work to the total wage and salary workers in 2018 (%)

	Wage and salary workers in precarious work (%)
Total	28.7
Economic sector	
Agriculture	47.8
Industry	36.8
Services	21.0
Employee category	
Private household	30.2
Private establishment	31.1
Government/government corporation	14.3
Own family farm/business	26.2

Source: Decent Work Statistics of the PSA.

TABLE 2. Average real daily basic pay in 2018 in ₱ (2012=100)

	Short-term, seasonal, or casual workers	All workers
Total	280.49	377.64
Economic sector		
Agriculture	194.90	202.37
Industry	311.44	350.78
Services	283.58	426.04
Employee category		
Private household	173.10	185.69
Private establishment	287.40	357.83
Government/government corporation	320.71	627.83
Own family farm/business	232.03	288.01

Source: Decent Work Statistics of the PSA.

To give an initial idea of how households might be vulnerable to income loss arising from the labour and employment shocks caused by the pandemic, the average daily basic pay is used to provide a measure of the cost to a worker who is not able to work and does not receive any form of cash support. Adjusting the ₱280 average real daily basic pay of short-term, seasonal, or casual workers in 2018 to the average prices in 2019, its value will be about ₱337. Further adjusting to the average prices in the three months (March–May 2020) that the ECQ was in effect, the value will be about ₱343, as shown in Table 3. Therefore, such a worker may lose ₱343 every day that she or he does not work, barring receipt of any cash support. Table 3 shows these adjustments for all major economic sectors and all worker categories. For an average worker, the daily loss is larger because an average worker is paid more. The reader should be aware that these are not projections, as what was done was only to adjust 2018 values to prices in 2019 and in March–May 2020 in order to make the 2018 figures comparable to more recent times.

Using March–May 2020 average prices, an average short-term, seasonal, or casual worker can lose more than ₱7,500 per month if she or he is not able to work during the ECQ, or a total income loss of more than ₱18,000 for the whole duration of the ECQ. This total income loss is greater for an average worker, who can lose more than ₱10,000 per month during the ECQ, or a total fall in income of more than ₱25,000. According to the 2018 Family Income and Expenditure Survey (FIES), this will chiefly affect 56 percent of all Filipino families, for whom the main sources of income are wages and salaries. This is most pronounced in NCR, in which wages and salaries are the main sources of income for more than 73 percent of all families. It should be noted that the analysis is limited only to the time period within which the ECQ was in effect, which was from March 15 to May 30, 2020.

TABLE 3. Average real daily basic pay (₱) in 2018 using 2012, 2019 and March and April 2020 average prices

	Short-term, seasonal, or casual workers			**All workers**		
	2012=100	2019=100	March and April 2020 average prices	2012=100	2019=100	March and April 2020 average prices
Total	280.49	337.15	343.04	377.64	453.92	461.85
Economic sector						
Agriculture	194.90	234.27	238.36	202.37	243.25	247.50
Industry	311.44	374.35	380.89	350.78	421.64	429.00
Services	283.58	340.86	346.82	426.04	512.10	521.05
Employee category						
Private household	173.10	208.07	211.70	185.69	223.20	227.10
Private establishment	287.40	345.45	351.49	357.83	430.11	437.63
Government/ government corporation	320.71	385.49	392.23	627.83	754.65	767.84
Own family farm/ business	232.03	278.90	283.77	288.01	346.19	352.24

Source: Authors' calculations using Decent Work Statistics of the PSA.

Furthermore, as previously mentioned, access to credit from the government is something non-registered MSMEs will not be able to exploit. Banks also tend to favour larger borrowers because of bigger interest earnings and lower credit risk [MESMED Council 2018]. Credit is very important to keep MSMEs afloat amidst the pandemic, given the slowdown of economic activity as a result of the ECQ, if they are without cash assistance from the government. Layoffs may happen, amplifying the labour and employment shocks that render households vulnerable to income loss.

Shinozaki and Rao [2021] investigated the immediate impacts of the ECQ on MSMEs by conducting a rapid survey from March 30 to April 16, 2020, as shown in Table 4. For all firm sizes classified under MSMEs in the sample, more than 70 percent suspended operations because of the lockdown measures. The services sector was the hardest hit among economic sectors, where almost 73 percent reported temporary closures. For all firm sizes layoff rates were relatively high, with none below 59 percent. More than two-thirds of MSMEs in manufacturing reported laying off workers, the most prevalent across all economic sectors.

TABLE 4. Share of firms reporting selected business conditions (%)

	Size			Economic Sector		
	Micro	**Small**	**Medium**	**Agriculture**	**Manufacturing**	**Services**
Temporary closures	71.3	76.4	71.6	54	66.6	72.7
Temporary layoffs	68	59.5	78.6	45.4	69.4	67.3
Temporary suspension of wage payments	59.8	36.2	45.8	42.3	61	57.9
Decrease wage payments	16.8	30.6	34.8	20.6	25.5	16.5
Fund to run out in a month	37.8	53.1	61.4	35.1	47.8	37.1
More than 30% decrease in sales	27.7	43.6	41	29.4	35.4	27.7
More than 30% decrease in revenue	26.5	40.8	41	34.7	31.8	26.7

Source: Shinozaki and Rao [2021].

Adopting a mixed-method research approach, Mehrotra et al. [2020] find that shorter operating hours coupled with the number of customers falling by 50 percent reduced the income of MSMEs. A lower number of customers was reported by 86 percent of the enterprises sampled, and 23 percent have closed their operations temporarily. Supply chain disruptions and decline in the volume of sales per customer have further hampered the earning capacity of MSMEs. A decrease in the volume of supplies was reported by 58 percent of enterprises, where the replenishment of stocks is a bigger issue in urban areas, since 81 percent of enterprises were unable to restock to meet the demand. The unavailability of public transport has increased the transportation cost as well as the cost of supplies. One-third of enterprises reported an increase in the cost of both utilities and transportation. Furthermore, 28 percent of enterprises reported an increase in cost of supplies. Also, MSMEs continue to face sharp drops in demand and revenue. Among the top concerns for MSMEs were lack of working capital, supply chain disruptions, loan repayments, and fall of domestic demand [Shinozaki and Rao 2021].

The United Nations Industrial Development Organisation [UNIDO 2020], together with a host of other public and private agencies conducted an online survey of 235 firms in April 28 to May 16, 2020 to assess the socio-economic effects of COVID-19 and the containment measures adopted and identify gaps and areas of improvement in the design of future technical assistance and other packages. Comprising mostly microenterprises from the manufacturing sector, the respondent firms said they had difficulties in coordinating their supply chains. This resulted in half of the firms registering a 40 percent decrease in operating hours, which led to an approximately 50 percent loss of employment, and a 60 percent fall in both production volume and revenue. Exacerbating the problem were the lack of available transport as well as worker anxiety about reporting for duty. Most firms did not have concrete plans on maintaining their operations, especially amidst external shocks.

UNIDO [2020], thus, argues for more accessible and inclusive loan initiatives, especially for the microenterprises that are youth and gender responsive. Robust sustainability aspects are also crucial; likewise, programs that foster innovation and diversification are needed. However, these should be done in conjunction with improvements in the overall quality of digital infrastructure, promotion of technology development and adoption, existence of a digitalised innovation environment, and more focus on investments on green human capital and technologies.

3. Framework

Firms that are more competitive, connected, and flexible are expected to flourish even after the pandemic because the new normal in the business arena will require that firms be more resilient to shocks, embrace digitization opportunities and provide inclusive employment, as well as promote environmental sustainability. The three dimensions in the ITC report [ITC 2020] build in resiliency among the firms and ensure that the firm survives with its business core intact, if not better situated than before. The report identifies three levels of analysis in the ITC framework: firm, business ecosystem, and national environment. Furthermore, ITC [2020] states,

> In particular, the capacity to compete in the short run seems to have reduced exposure to the shock. The capacity to change made it easier to adopt positive coping strategies, and the capacity to connect enabled companies to access information and benefits. If Filipino SMEs are to be made resilient to the next crisis, each of these competitiveness characteristics needs to be better understood and improved.

This paper adopts the framework developed by the ITC [2020], where resilience was analysed using the following three pillars:

1. *Capacity to compete*. This essentially refers to a firm's overall efficiency, in terms of cost and time, as far as quantity and quality are concerned. This also includes factors external to the firm, like access to technical infrastructure. Filipino MSMEs that exhibit stronger management skills, i.e., the ability to organise the flow of inputs and outputs within the company, are more capable of supplying the market requirements, which include the timely delivery of inputs and products. Meanwhile, cash flow practices greatly influence how an enterprise engages with markets and firms which have stronger cash flow management means that the firm can compete on remunerative grounds, for example, by supplying large quantities, offering flexible delivery terms and better-quality products.
2. *Capacity to connect*. This dimension is anchored on the firm's level of connectivity to buyers, suppliers, and institutions. The recent nature of markets implies that firms must connect with their business ecosystem – sector, cluster, or value chain, to know the market dynamics. At the firm level, this implies information gathering (e.g., consumer profiles, suppliers, competitors, products, technologies and government policies), and dissemination (e.g., advertising the firm and its products). This also includes associations that a firm has within the sector it belongs, access to business support organizations, and the existence of information and communications technology infrastructure. This is important because better connected entrepreneurs learn more about their market and create necessary measures to take advantage of it, which helps entrepreneurs thrive and grow.
3. *Capacity to change*. This dimension focuses on the firm's capacity to make adjustments to anticipate or respond to external market forces, and to innovate through investments in human and financial capital. It also includes access to finance to make such investments and intellectual property protection. This dimension then looks at the capacity to adjust by considering the financing, skills, innovation, and intellectual property requirements. By using

> financial resources and strengthening employee skills, innovative activity is spurred, thereby improving the firm's competitiveness standing and building resiliency.

ITC [2020] finds that firms that were more competitive even before the pandemic were less adversely affected. Moreover, those that were better connected to their overall business environment have better access to information and support needed to survive. Moreover, firms with a greater capacity to change using skills, innovation, and financial management were likewise more likely to adopt resilient or agile coping strategies.

For instance, while using personal savings or disposing of assets, temporary employment reduction, and teleworking may appear to be similar, these strategies imply different crisis response approaches. Some coping strategies are relatively better than others when pursuing the long-term health of the firm. These strategies enable firms to survive or even grow stronger. The more resilient firms got through the pandemic with their basic form intact, adopting strategies such as using online facilities, teleworking, or being more flexible with their value chain once the lockdowns were imposed. Also, firms with more R&D activities even before the pandemic tended to be better in making adjustments to cope with the crisis. The capacity to change using financing, skills, and innovation also has positive implications for competitiveness in the long-run [ITC 2020].

Furthermore, Sahoo and Ashwani [2020] assess the effects of COVID-19 on the Indian economy and its impact on MSMEs which they claimed as a pillar of India's manufacturing and trade. Indian MSMEs were hit by the pandemic on both the demand and supply sides, particularly by the sudden collapse of trade. Indian MSMEs mainly supply the country's top exports of labour-intensive products starting from Gems and Jewellery to Garments/Apparel to Sea Food. Similarly, the lockdown affected the imports of raw materials and intermediates which affected the supply chain of the MSME sector. The Indian government provided help for MSMEs through the ₹12 lakh crores (6 percent of GDP) stimulus package, which also intended to help farmers, labourers, and cottage industries. The paper, however, argues that government must ensure that these stimulus packages are indeed directed at the hardest-hit sectors, where firms are in need of interest-free working capital necessary to cover wage costs, interest, and rent. The stimulus measures have provided credit guarantees, but measures to boost demand are likewise needed.

Hurley [2018] reviews the firm competitiveness literature in relation to MSME competitiveness, specifically in small island economies (SIEs). The paper argues that there are significant differences between competitiveness priorities of large firms and those of small island MSMEs. Related literature should deal more with the effects of country-level features on the relationship between competitiveness outcomes and sources of such competitiveness, e.g., human capital management, innovation, strategy implementation, internationalisation, and intellectual and social capital in general, specifically as a mediator in such relationships. Innovation and intellectual capital were found to be the common threads of firm competitiveness in general. The paper also finds that research on social capital in small islands is quite scant, although there is an emerging strand of literature on social capital diaspora that benefits SIE firms. In conclusion, Hurley [2018] states:

> It is important to appreciate that firms in SIEs are not simply mini versions of larger firms; and the MSMEs in small island economies are even more unique because of their business and economic circumstances.

4. The survey

The paper surveys MSMEs in Laguna, to investigate their coping and recovery mechanisms one year after COVID-19 hit the country, and to draw up policy recommendations that may further assist MSMEs to survive the pandemic. The structure of the survey was crafted based on the SME Competitiveness Grid model described in the earlier section. Specifically focusing on the Capacity to Change dimension, the survey questions on coping and recovery strategies adopted by MSMEs centred around their capacity to make adjustments using financing, skills, and innovation. The survey questions on coping and recovery strategies adopted by MSMEs were patterned after the categories specified in ITC [2020]. The online survey was done from March 8 to 25, 2021, via Google Forms. No face-to-face interviews were conducted due to the implementation of community quarantines. A list of business names (*sans* contact information) of MSMEs in Laguna was obtained from the Department of Trade and Industry (DTI) Region 4A[12]. The total number of survey questionnaires that were finally emailed and/or sent to Facebook pages of the MSMEs was 117, and 41 respondents comprised our sample. Since only about 35 percent of the contacted MSMEs responded to the survey, the high attrition rate is a limitation of this paper. Moreover, there are about 40,000 MSMEs registered in Laguna and 41 is admittedly a very small sample. Since the selection of the sample was based on available information online, this can likewise potentially exclude the very small enterprises although the results of the survey show that the majority of the respondents were micro enterprises with less than 5 employees.

The official definition of MSMEs given by the Small and Medium Enterprise Development Council (SMEDC) Resolution No. 1, Series of 2003 is based on asset

[12] Due to data privacy law, this list from DTI R4 did not contain any contact information and the authors spent a considerable amount of time to do online search of names of business owners, their emails, and phone numbers. A significant amount of time was spent on actual contacting of about 117 MSMEs and following up on their responses to our survey.

value excluding land. Thus, micro enterprises are those with asset value less than ₱3 million; small enterprises are those with asset value between ₱3 million and ₱15 million; medium enterprises are those with asset value between ₱15 million and ₱100 million. However, the Philippine Statistics Authority (PSA), in its List of Establishments, classifies MSMEs based on the number of people employed: 1-9 (micro), 10-99 (small), and 100-199 (medium). This paper adopts the NSO definition in classifying the survey respondents.

The profile of the respondents is summarised in Table 5. Almost three-fourths belong to the food sector. Furthermore, nearly a third are in operation for less than 3 years, while over a fourth are in operation between 6-10 years. More than half have less than 5 employees, implying that most of the respondents are microenterprises. As Table 5 shows, more than 90 percent are either micro or small enterprises. Lastly, more than a third come from Los Baños.

Tables 6–11 show the key results of the survey. Table 6 summarises the major impacts of the lockdown measures on working capital. Almost 70 percent of the respondents claimed to have experienced a shortage in working capital to maintain or restart their business. Despite this, close to two-thirds did not try to address this issue by borrowing from banks or other lending institutions. Furthermore, Figure 1 shows that 20 percent of these were the relatively newly established enterprises operating for less than three years, another 20 percent were in operation for 6-10 years, and 15 percent have been in the business for more than 20 years. By size of employment, micro enterprises in the survey with less than 5 employees (44 percent) did not borrow from banks after experiencing shortage of capital (Figure 2). The often-cited reason by the majority (> 50 percent) is the high loan interest rates while a third addressed this issue by using personal funds or selling assets. The responses to COVID-related MSME assistance programs offered are shown in Table 7. Almost 90 percent of the survey respondents were not able to avail of such assistance programs. Moreover, the cross tabulation in Figure 3 reveals that 56 percent of those who were unable to avail of these assistance programs were the micro enterprises with less than 5 employees. Since over half of the respondents do not even know of such assistance programs, it is but logical that they will be unable to avail them; in fact, only about 5 percent reported having an easy time getting access to the related information. Furthermore, a measly 7 percent stated that they found it easy to avail these assistance programs.

TABLE 5. Profile of 41 sample MSMEs in Laguna

	Frequency	%
Type of MSME		
Food	30	73
Non-food	11	27
Total	41	100
Number of years operating		
< 3 years	13	32
3-5 years	4	10
6-10 years	11	27
11-20 years	6	15
> 20 years	7	17
Total	41	100
Current number of employees		
< 5	24	59
5-10	9	22
11-20	5	12
21-100	3	7
Total	41	100
Location of MSME		
Los Baños	14	34
Sta. Rosa	7	17
Calamba City	5	12
Bay	5	12
Alaminos	3	7
San Pablo	2	5
San Pedro	2	5
Others*	3	7
Total	41	100

*Calauan, Victoria, and Cabuyao
Source: Authors' calculations using survey data.

TABLE 6. Impact of the lockdowns on working capital

	Frequency	%
Experienced shortage of working capital to maintain/ restart business		
Yes	28	68
No	13	32
Total	41	100
Borrowed from banks or formal lending institutions for working capital		
Yes	10	36
No	18	64
Total	28	100
Reasons for not borrowing from formal lending institutions for working capital		
High interest rates on loans	10	56
No collateral	4	22
Cannot meet numerous requirements	2	11
Used personal funds/sold assets	6	33
Total	22	122*

*Due to multiple responses
Source: Authors' calculations using survey data.

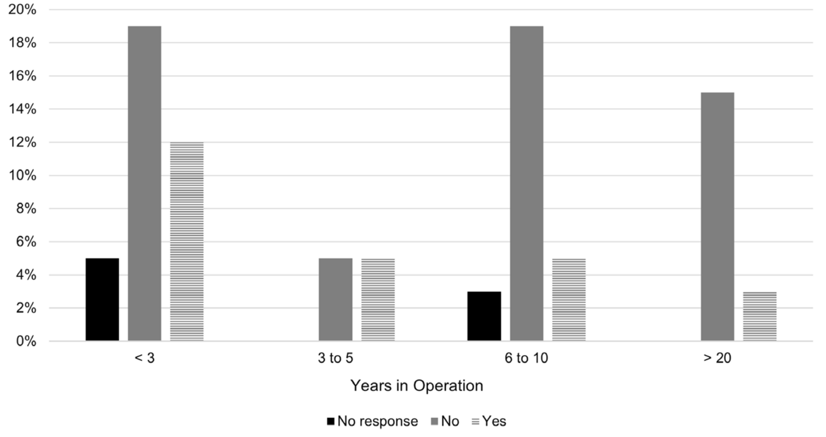
The set of coping and recovery strategies the MSME respondents employed are laid down in Table 8. As previously mentioned, the survey questions were formulated based on the categories specified in the ITC report [2020], shown in Figure 4. These strategies are categorised as retreating, resilient, and agile. Under "Retreating" strategies, what one might call the more passive ways of coping, about 85 percent of the respondents sold assets and used personal savings. The majority of sample respondents who resorted to selling assets and using personal savings as retreating strategy were micro enterprises with less than 5 employees (Figure 5). Respondents also applied more active means of coping. Under "Resilient" strategies, or those strategies that can be considered as employing flexibility to cope, around 85 percent took advantage of online platforms to be able to continue operating. A hefty 63 percent increased marketing efforts. All respondents were likewise innovative, employing what ITC [2020] labelled as "Agile" strategies. Almost all the respondents customised or made new products to keep their businesses afloat. These coping strategies adopted by the respondents seemed to have worked well in general, as Table 9 shows. More than half of the respondents took less than three months to reopen, and approximately 80 percent were back in operation in about 6 months. A cross tabulation in Figure 6 would show that 32 percent of the micro enterprises with less than 5 employees were able to reopen or restart in less than 3 months. However, there were still about a tenth that are yet to return to operation.

TABLE 7. Availment of COVID-related assistance programs

	Frequency	%
Availed of COVID-related assistance program		
Yes	5	12
Type of COVID-related assistance program availed of		
Cash aid for employees from DOLE	1	2
SSS Small Business Low Interest/Cash aid	3	7
SBC Low interest Small Business Loan	1	2
No	13	32
Total	41	100
Ease of availing COVID-related assistance program		
Easy	3	7
Not so easy	15	37
Not easy	23	56
Total	41	100
Ease of access to information and benefits from COVID-related assistance programs		
Easy	2	5
Not so easy	10	24
Not easy	6	15
Not aware of such government assistance program	23	56
Total	41	100

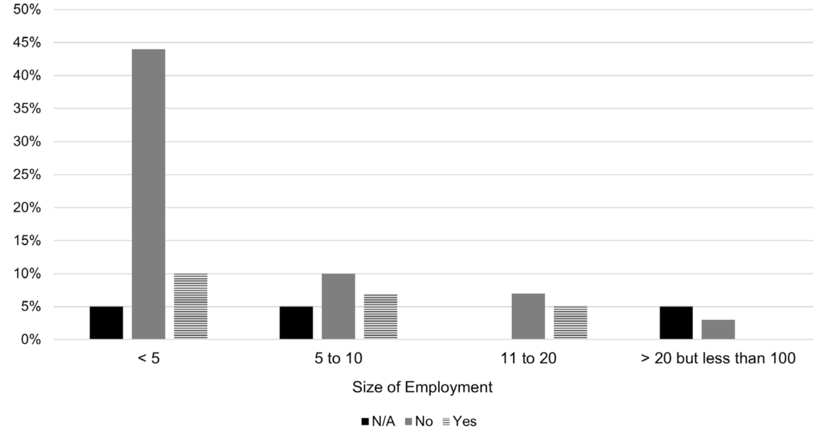
Source: Authors' calculations using survey data.

FIGURE 1. Distribution of 41 MSME respondents who borrowed from banks after experiencing shortage of working capital, by years of operation



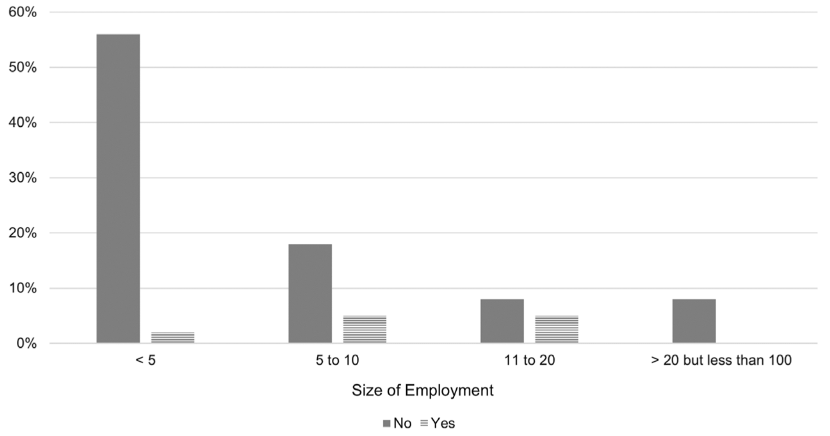
Source: Authors' calculations using survey data.

FIGURE 2. Cross tabulation of 41 sample MSME respondents that did not borrow from banks after shortage in working capital, by size of employment



Source: Authors' calculations using survey data.

FIGURE 3. Cross tabulation of 41 sample respondents who availed of MSME assistance by size of employment



Source: Authors' calculations using survey data.

TABLE 8. Coping strategies adopted

	Frequency	%
Retreating strategies		
Sold assets/used personal savings	35	85
Borrowed money	13	32
Received financial support from family	13	32
Laid off workers	13	32
Filed for bankruptcy	0	0
Total	74	180*
Resilient strategies		
Switched to and/or added online sales	35	85
Increased marketing efforts	26	63
Started sourcing from new suppliers/ cancelled contracts with old suppliers	19	46
Reduced employees temporarily	17	41
Started sourcing from new suppliers	14	34
Resorted to teleworking or work from home	7	17
Rescheduled bank loans	6	15
Reduced salaries and wages temporarily	6	15
Total	116	283*
Agile strategies		
Customised/made new products	40	98
Loaned employees to other businesses	1	2
Total	41	100

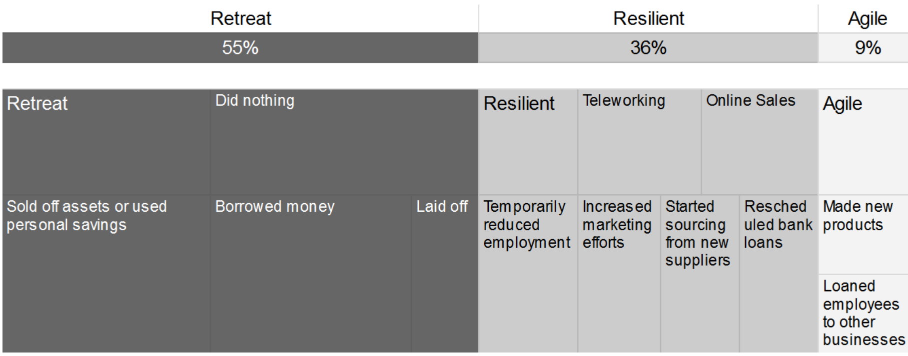
*Due to multiple responses
Source: Authors' calculations using survey data..

TABLE 9. Time it took to reopen their business

Period of time	Frequency	%
< 3 months	21	51
3-6 months	12	29
7-12 months	1	2
Business has not restarted/reopened	4	10
No response	3	7
Total	41	100

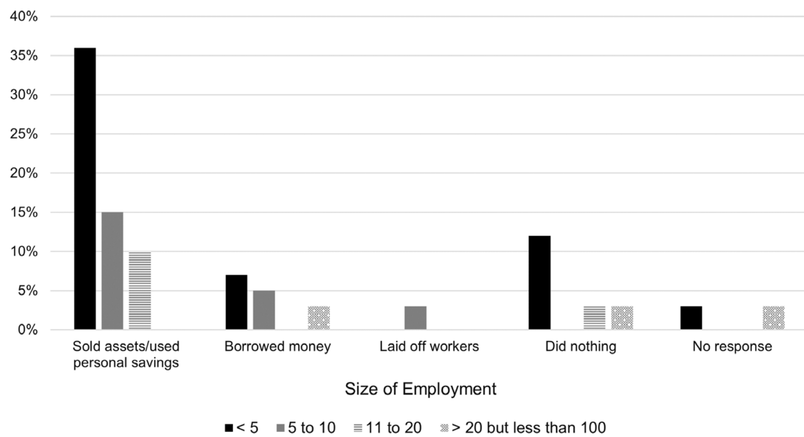
Source: Authors' calculations using survey data.

FIGURE 4. ITC [2020] coping strategy categories



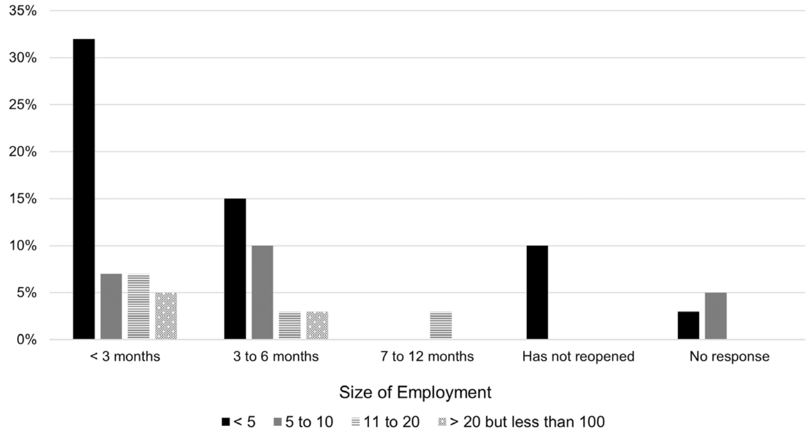
Note: The survey asked: 'Have you adopted any of the following strategies to cope with the crisis? Categorizations: Agile - customized/created new products or loaned employees to other enterprises. Retreat - filed for bankruptcy, laid off employees, sold off assets/used savings, took on new debt or took no action. Resilient - didn't follow a retreat or agile strategies; chose one or more options: temporarily reduced employment; teleworking; rescheduled bank loans; greater marketing; online sales; sourcing from new suppliers; or temporary shutdown.
Source: ITC [2020].

FIGURE 5. Cross tabulation of retreating strategies and size of employment



Source: Authors' calculations using survey data.

FIGURE 6. Cross tabulation of time it took to restart the business, by size of employment



Source: Authors' calculations using survey data.

Table 10 shows the list of government initiatives or policies that respondents found helpful in their recovery process. Here, more than a third found business support, e.g., reduced utility bills, rent, import restrictions, or waiving of government fees, helpful for business. What is glaring to note, however, is that almost half expressed otherwise, stating that neither debt finance, tax reliefs, employment, and business support were particularly helpful. In other words, they could not identify any government initiative or policy that helped them recover during the pandemic crisis. Table 11 shows what the respondents specifically recommend the government should focus to help MSMEs survive the pandemic. A reduction in input prices was stated by about a fifth of the respondents. The next two popular recommendations were improvements in credit access and greater ease of doing business, which are consistent with the findings in other studies It should be noted that more than a third of the respondents did not write down their recommendation. The crosstabulation in Figure 7 shows that the majority of "none" responses come from micro enterprises with less than 5 employees and even from those with 6-10 employees. Perhaps it is also an indication, based from historical experience, that these MSMEs are not too hopeful that government will help them out. This finding can inform government that as far as aiding MSMEs is concerned, national policies and active implementation down to the local government level go hand in hand.

TABLE 10. Government initiatives/policies found most helpful for business

Initiative/Policy	Frequency	%
Debt finance	3	7
Tax relief	7	17
Employment support	5	12
Business support	15	37
None	19	46
Total	49	120

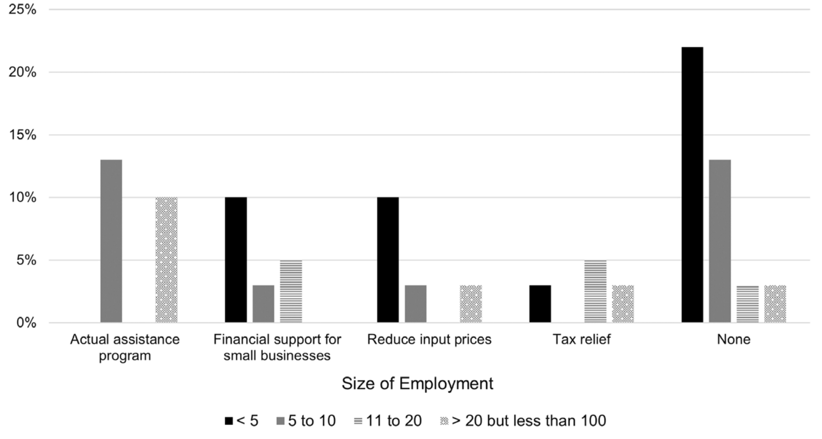
*Due to multiple responses
Source: Authors' calculations using survey data.

TABLE 11. Support or assistance desired from government to hasten recovery

Government support	Frequency	%
Genuine reduction of building rental fees, utilities, fertiliser, and fuel prices	8	20
Easier access to financial/credit support and greater ease of doing business	6	15
Tax relief and discount on business/barangay permits and no interest on arrears	6	15
More assistance programs for MSMEs, employees, and farmers	3	7
Stricter implementation of protocols, checkpoints, testing; concrete, science-backed COVID recovery strategy	2	5
Public transportation for employees during ECQ and GCQ	1	2
No response	15	37
Total	41	100

Source: Authors' calculations using survey data.

FIGURE 7. Cross tabulation of government support needed and size of employment



Source: Authors' calculations using survey data.

To summarise, the respondents of the survey faced the issue of working capital shortage, and when addressing this, found high interest rates on loans as a source of difficulty. A huge majority of the respondents did not avail of such MSME assistance programs; many are not even aware that such assistance programs exist, and generally did not find it easy to access MSME assistance programs. Most MSMEs were flexible and innovative in their coping strategies, the most common of which are through using online platforms and customizing or making new products, and most were back in operation in 6 months, yet some have remained closed one year after the onset of the COVID-19 pandemic in the country. Furthermore, assistance on reduction of input costs, improvements in credit access, and greater ease of doing business are the most desired forms of government intervention.

5. Conclusion and policy implications

There must be measures to reduce the vulnerability of businesses. The paper finds that MSMEs in Laguna did not find it easy to access MSME assistance programs, and that many were not even aware that such assistance programs exist. The paper also finds that assistance on reduction of input costs, improvements in credit access, and greater ease of doing business are the most desired forms of government intervention to help MSMEs to survive the pandemic. The results of the study imply that further assistance must be given to strengthen them and make them more economically resilient. First, the government should exert more effort in providing MSMEs better access to credit. While many schemes to achieve this are already in place, MSMEs will not be able to avail them if they have not registered in such schemes. The government should also improve the respective incentive structure on areas specified in Section 2 to encourage more MSMEs to register. Second, the government should improve information dissemination mechanisms on MSME assistance programs particularly across hierarchy of government policy implementers. Third, since most MSMEs were found to be flexible and innovative when it comes to their coping strategies, particularly through using online platforms and customizing or making new products, the government can likewise focus on assisting, facilitating, and incentivising online approaches in doing business, create programs and trainings on small-scale product innovation, and other ways to provide technical assistance to MSMEs. This can aid MSMEs in their attempts to increase their productivity, increase the prevailing wages, and help their workers earn higher incomes. According to Habito [2020], these measures can also help OFWs to start small business upon returning home from abroad after losing their jobs overseas. Again, non-registered MSMEs will not be able to avail the government's existing programs, hence providing more incentives for MSMEs to register is indeed imperative. Lastly, more focus on enhancing social protection programs to helping vulnerable businesses is necessary, which can also help vulnerable households affected by the COVID-19 pandemic.

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COVID-19 pandemic and the Philippine real estate property cycle: indications of bubble and burst in the "new normal"?

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The Philippines has been one of the countries greatly affected by the COVID-19 pandemic. The country is regarded to be under the world's longest lockdown with an upsurge of cases, and it has also entered into an official recession with record-breaking economic contraction and high unemployment rates, fueling economic uncertainties. These macroeconomic indicators show serious signs of the adversities of the pandemic affecting the real estate development sector. As the real estate sector recalibrates its plans on response, recovery, and resiliency, this paper attempts to provide empirical evidence on the celebrated model in real estate economics proposed by Homer Hoyt and later developed by Glenn R. Mueller: the property cycle. We also provide contextualization on the property cycle empirics under the pandemic, given the sector's reintroduction of the Real Estate Investment Trust (REIT). We argue that the REIT mainly supports the real estate development industry given the adversities of the pandemic and its accompanying recession, as well as an update to the long-term plans of the industry and its players in compliance with the "new normal".

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Keywords: COVID-19 pandemic, real estate investment trust (REIT), property cycle, economics of built environment, "new normal"

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1. Introduction

The Philippines is one of the countries of the world that is significantly affected by the COVID-19 pandemic. The first two quarters of 2020 indicated contraction, signaling an official recession after the Asian Financial Crisis (AFC), worst in the history of its national income accounts [Abueg 2020a]. The recent release of the first quarter macroeconomic indicators of 2021 showed a negative economic growth at -4.2 percent [Philippine Statistics Authority 2021] and remaining to be of the lowest performance relative to counterparts in Southeast Asia [Punongbayan 2021]. In addition to the pandemic struggle of infection containment, the last quarter of 2020 experienced several typhoons that severely affected much of Luzon Island. These natural disasters[1] have contributed to further problems of economic recovery as well as the containment of infections, as affected residents flock into limited spaces designated as evacuation centers. Such limitations in spaces defy the health protocols of physical distancing set forth by the government, and strains the supply of clean and potable water which are essential for sanitation. The series of typhoons also contributed to damages in public infrastructure and agriculture, further depleting the public coffers given the continued efforts of pandemic response.

Given these events, the fourth quarter of 2020 indicated dismal economic figures which has grave consequences in the short run as many scholars have projected. The pandemic (plus other factors) would have probably affected the track of the property cycle in the case of the real estate sector in the Philippines. Incidentally, the "reintroduction" and possible hype of the Real Estate Investment Trust (REIT) during the pandemic months is one of the possible attempts of the players in the sector to keep the real estate initiatives economically afloat and viable.

It is then the aim of this paper to provide empirical evidence on the real property cycle through providing an econometric model given the real estate sector data recorded in the Philippines, as well as to provide an avenue for academic discourse and discussion on the floated worries of some industry players regarding the possibility of the existence of a bubble. This is not an easy task, as it can be recalled from the global experiences and the lessons learned from both the AFC in 1997-99 and the Global Financial Crisis (GFC) in 2007-09. While the Philippines is always on the better side of the GFC learning from the lessons of AFC [Dacanay et al. 2018], the pandemic is a different story as the recession is not induced by economic origin [Abueg 2020a]. It is also important to note that a review done by Mayer [2011] stated that "existing research does not

[1] Note that prior to the pandemic, the year 2020 began with the eruption of the Taal volcano in Batangas, Philippines. Although the effects of the eruption are felt significantly in nearby towns and provinces, it may have also affected the macroeconomy in the first quarter of 2020. Moreover, exactly a week after the aftermath of the Typhon Ulysses (with international name Vamco), the National Disaster Risk Reduction and Management Council estimates that the series of typhoons have caused at least ₱10.1 billion—both in agriculture and infrastructure in the regions of Luzon [CNN Philippines 2020].

yet provide a crisp definition of a housing bubble nor does it allow researchers to predict where or when bubbles can occur". Such absence of a precise and agreed definition further complicates the analysis, and also provides additional debate on the subject matter.

However, we have to emphasize that during the onset of the pandemic, macroeconomic data may have triggered such a property cycle to manifest, as suggested earlier. More particularly, given that the economic sectors are adapting to the "new normal", we highlight economic measures and policies that may remain relevant to the real estate sector in particular (e.g., REIT), and the macroeconomy in general. The current conditions of the pandemic may have fueled uncertainties in modelling, predicting and forecasting property cycles, bubbles, and bursts as noted in the earlier pre-pandemic work of Mayer [2011]. Note that such models of the property cycle by Hoyt [1933], Mueller [1999; 2002] worked on non-pandemic-induced recessions and largely on data from the United States. Given the trends indicated from date reported in Correa and Abueg [2020], we follow these seminal works and motivate the discussion with an attempt to do econometric modelling. We also take into account the pandemic effects in the Philippine case.

2. Methodology

We begin the analysis using macroeconomic data and health-related indicators of the pandemic, guided by the discussion set forth in Correa and Abueg [2020]. We use the data series from official reports provided by the Philippine Statistics Authority (PSA) for economic indicators, and the Department of Health for pandemic-related indicators. A total of 92 quarters will be covered in the empirical tests, beginning from the first quarter of 1998 (1998q1) to the fourth quarter of 2020 (2020q4). To utilize data on quarters prior to year 2000, we used backcasting methods introduced in the Handbook of Backcasting [UN Statistics Division 2018], and guided by official growth rates of the period. We use data covering the post-AFC period, including GFC and the current pandemic-induced recession.

Given that the REIT Act was ratified in 2009 through Republic Act (RA) no. 9856 [Official Gazette of the Philippines 2009] we discuss the timeliness of the revived "hype" of the real sector in investment and trust funds, given that the pandemic-causing economic recession has severely affected incomes of households, profits of businesses, and even the tax revenues of the government. These in turn have serious consequences on loans and mortgage payments that are rolled-out during the years immediately preceding the pandemic [BusinessWorld 2020a]. While it is arguable that the industry players' decision to participate in REIT offerings may be largely based on business motives, it is important to provide some discussion on how industry players perceive this revival attempt given the current health and economic conditions. However, given that the REIT introduction by players is a developing initiative, the paper can only suggest possible influence of the presence of REIT given the law's ratification in 2009, and its revival in 2020. Data regarding real estate companies offering or planning to offer REITs are derived mainly from mainstream media sources via local business news reports and company disclosures. Note, we were also constrained by the lack of a central repository for real estate industry-related data detailing specific and standardized metrics of different facets of the market (e.g., number of newly-built homes according to government-mandated categories, current vacancy and occupancy rates) as well by the non-disclosure policy of real estate industry players concerning other market-related real estate data (aside from date sets required by the government via the PSA). Notwithstanding these limitations, we attempt to describe current real estate market developments and to explain possible repercussions of such developments.

After the presentation of macroeconomic and health indicators as well as the plans and pursuits of the real estate sector, we provide econometric modelling of the property cycle. This aims to provide statistical evidence of the cycle in the Philippine setting, as the indications suggested by Correa and Abueg [2020]. Notably, the second quarter of 2020 has shown the worst performance of the Philippine economy in terms of economic growth and employment, showing a significant indication of such cycle. Given that the paper utilizes only official national data reported by the PSA, we only focus on the financial aspect of the property cycle. Note that early work on property cycles were proposed by Hoyt [1933], with empirical developments provided by Mueller [1999; 2002][2].

Given the attempt to model the property cycle for the Philippines considering the data indications, we state some of the hypotheses surrounding the model. First, the discrepancy between the physical and financial property cycles by Mueller [1999; 2002] suggests an autoregressive process of order 2 (i.e., an AR (2) process) given the sector's recorded gross value added (GVA). Second, we posit that the pandemic may have influenced the decline in the real estate development sector's GVA through the gross domestic product (GDP). The econometric models will also utilize related specifications from other related literature, since the paper is a first attempt to model the property cycle using recorded official GVA data of the sector.

[2] The two-quarter lag is suggested by Mueller [1999] and Mueller [2002] due to the difference in the physical property cycle (the volume of real estate investments), and the financial property cycle (the market value of real estate investments transacted in the economy).

3. Macroeconomics of real estate and the pandemic

3.1. Macroeconomic indicators and the pandemic

The Philippines is one of the top countries of the world in terms of total number of COVID-19 cases and total active COVID-19 cases (net of deaths and recoveries). The extended lockdown in Metro Manila as the epicenter also caused the record-breaking lows of economic growth: four quarters of negative growth of real GDP, with the second quarter at -16.9 percent. This second quarter economic contraction officially brought the country into recession, worse than the recession due to the Asian Financial Crisis, and the lowest since 1946. Additionally, the second quarter of 2020 (given the April Labor force Survey report) registered a record high of 17.7 percent unemployment rate, the highest since its first recording in 1987. While there is an improvement in July (at 10.0 percent unemployment rate), underemployment rate remains significantly high, the unemployment metric quite relevant to the Philippines as a developing country [Abueg 2020b]. Note that annual growth for 2020 was at -9.5 percent, lower than the 1983-85 crisis of the Marcos regime, also the lowest since 1946. To date, the first quarter of 2021 recorded -4.2 percent GDP growth, which is the fifth straight quarter under the pandemic and in a recession. This is midway to the nine quarters of negative GDP growth during the 1983-85 recession.

While there was a 16.51 percent quarter-on-quarter growth in GDP for the fourth quarter of 2020, it is due to two reasons. First, there was gradual reopening of some parts of the country in lieu of the holidays. Second, the low starting value of the GDP in the third quarter exhibits the "base effect" [Abueg 2020b]. Details of the quarterly reports are provided in Table 1 below.

TABLE 1. Real GDP growth rates

Real GDP growth, quarterly	2020q1	2020q2	2020q3	2020q4
Year-on-year	-0.7 (r)	-16.9 (r)	-11.4 (r)	-8.3 (p)
Quarter-on-quarter (nsa)	-15.86	-6.62	0.20	16.51
Real GDP growth, annual	**2019**	6.0 (r)		
	2020	-9.5 (p)		

Legend: p = preliminary, r = revised, nsa = not seasonally adjusted.
Sources of data: Data from PSA, with quarter-on-quarter growth rates from author's calculations.

Construction consistently and increasingly contributes to economic contraction, and by the third quarter, the real estate development sector placed in the top three sectors that contribute to negative economic growth (in Table 2). This is despite the rallying program of the national government beginning 2017 to double-time and intensify public infrastructure creation, dubbed as "Build Build Build".

Suzara et al. [2020] has also shown that apart from the downward revisions to infrastructure spending targets, the Department of Public Works and Highways data show significant amounts of underspending. They have also shown that pre-pandemic data calculations of contributions of public infrastructure spending did not—and was not able to—support the construction sector to propel the economy to desired growth rates and realize a "golden age of infrastructure".

TABLE 2. Real GDP growth rates, and contributions to decline (expenditure side)

Real GDP growth	**2020q1**	**Real GDP growth**	**2020q2**
Year-on-year	**-0.7**	**Year-on-year**	**-16.9**
Change in inventories	-3.6	Manufacturing	-3.9
Durable equipment	-0.6	Construction	-2.5
Construction	-0.5	Transportation & storage	-2.5
Real GDP growth	**2020q3**	**Real GDP growth**	**2020q4**
Year-on-year	**-11.4**	**Year-on-year**	**-8.3**
Construction	-3.3	Household final consumption expenditure	-5.7
Real estate & ownership of dwellings	-1.6	Construction	-4.9
Manufacturing	-1.6	Durable equipment	-2.3

Notes: Construction highlighted to emphasize as consistent (and increasing contribution) to GDP decline in 2020.
Source of data: PSA.

3.2. Updating the real estate sector profile

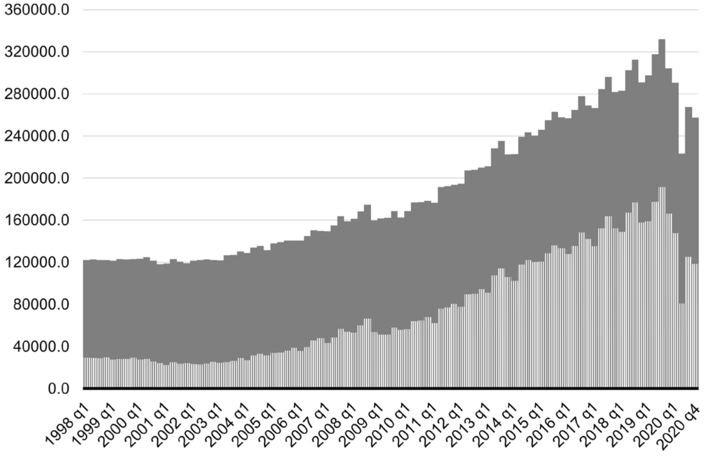
The real estate development industry has indicated remarkable success in the last decade owing to the big contributions of the real estate component of the industry. This is indicated in the boom of the increase in available office spaces (especially for business processing outsourcing or BPOs), new developments in residential areas (especially outside Metro Manila), and new sites for economic zones. Additionally, the predominantly consumerist economy of the Philippine economy which enabled the proliferation of commercial centers and shopping malls—called the "mall culture" [Rico and de Leon 2017]—has expanded into the development of mall complexes, which include office spaces and residential areas whether vertical (condominiums) or horizontal (subdivisions) dwellings. Trends are reflected in Figure1, Figure 2, and Figure 3, which are updated versions of those reported in Correa and Abueg [2020].

In the Philippines the real estate development industry has three components: real estate development (RE), ownership of dwellings (OD), and renting and other business related-activities (RBA). While the RBA subsector has contributed significantly also to the industry, the RE subsector and GDP growth rates have been moving positively, as correlation tests suggest [Correa and Abueg 2020]. The RBA component has also garnered significant increases in the last years due to the increase in foreign nationals residing in the Philippines for work, school, or business endeavors. For instance, before 2015, there has been an increase in Korean nationals who go for business investments, or education, among other reasons. Later years witnessed the influx of Chinese mainlanders to work in offshore gaming operations in the country.

Between the RE and OD subsectors, RE is the more volatile component of the total industry, which may be considered riskier in terms of investments in the sector. Nonetheless, as in Figure 1 and Figure 2, RE subsector is the driving component of growth of the whole industry. We also present an updated profile of GDP versus the RE and OD subsectors in Figure 3. This is in contrast to OD, where growth is relatively stable, and that this demand is arguably guaranteed by the increasing population. Thus, OD is a safer haven of the industry relative to RE. It is also noteworthy to mention that despite the perceived relationship of housing demand to population growth, data suggests a weak negative correlation between these variables [Correa and Abueg 2020].

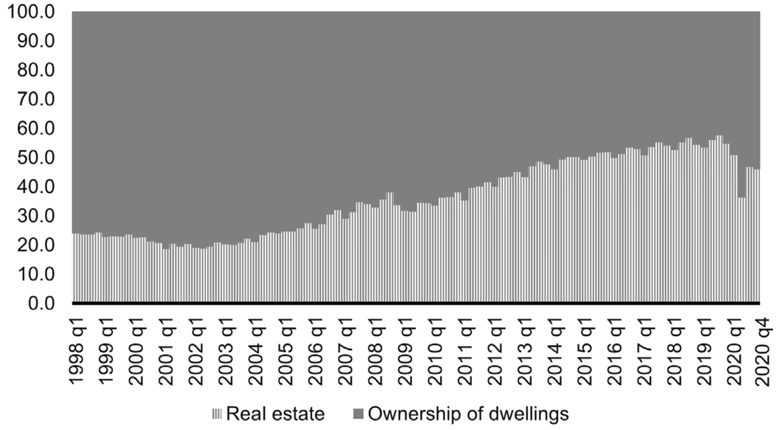
The behavior of the real estate development industry in the last 23 years indicates boom-and-bust under certain macroeconomic conditions. Given the pandemic and the recession, it is appropriate to consider such discussion in light of the historical experiences given AFC and GFC (which are driven by property bubble bursts). Because of the "mall culture", BPOs, and other developments in the economy, there has been a continued increase in real estate development in the last years. And then the pandemic came, which led the economy to the "new normal".

FIGURE 1. GVA of the real-estate sector in 2018 prices, 1998q1-2020q4



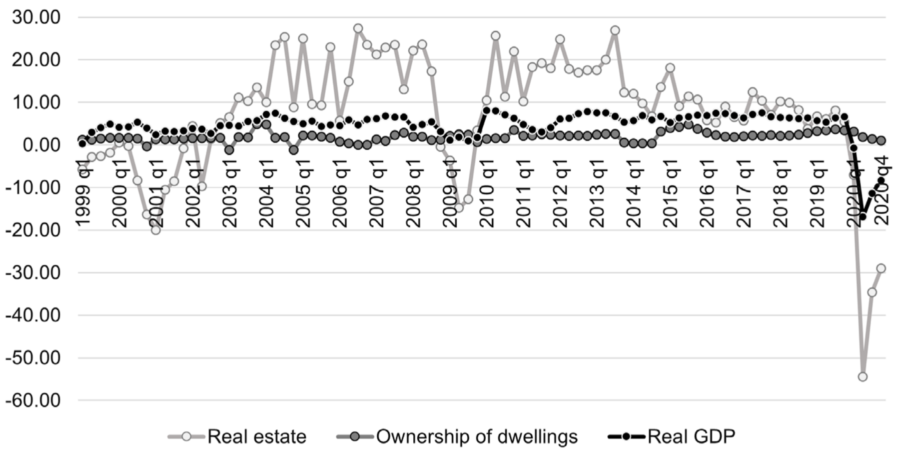
Notes: Quarters prior to 2000 are back casted using official growth rates.
Source: Data from PSA.

FIGURE 2. Share of real estate development and ownership of dwellings as subsectors, to total real estate development sector GVA, 1998q1-2020q4



Notes: Quarters prior to 2000 are back casted using official growth rates.
Source: Data from PSA.

FIGURE 3. Growth of real estate development and ownership of dwellings subsectors, and real GDP growth, 1999q1-2020q4

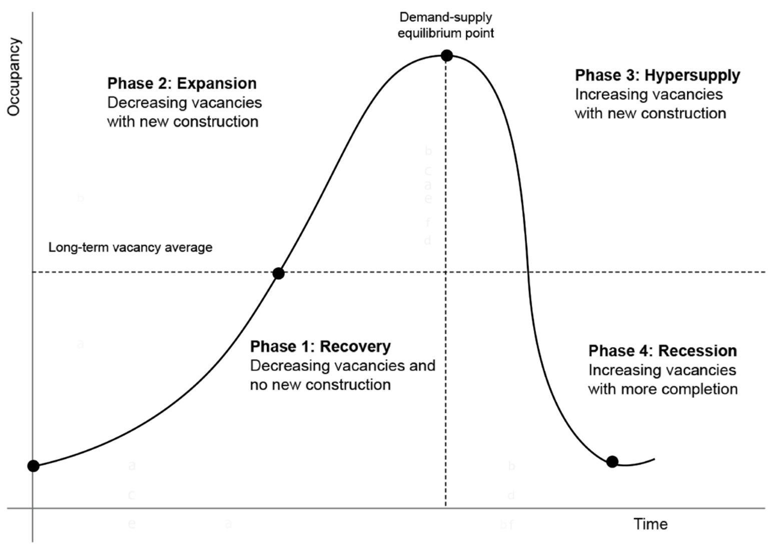


Source: Data from PSA.

3.3. The property cycle and property bubble

In real estate economics, a model that appropriately describes the behavior of real estate development is the property cycle. (Hoyt [1933], Mueller [1999], Mueller [2002]), as shown in Figure 4.

FIGURE 4. The property cycle



Note: Adapted by Correa and Abueg [2020], from Mueller [1999; 2002].

The COVID-19 pandemic that dampened economy in 2020 also affected the real estate development sector. Given the relationship of the sector's growth and economic growth, the pandemic may have triggered an early transition from phase 2 (expansion) to phase 3 (hypersupply) of the property cycle. These are also suggested in official data in Figure 1 and Figure 2. The early transition is further exacerbated with the losses and damages incurred in the aftermath of the series of typhoons that struck the country in October and November. Note that while the epicenter of the pandemic is Metro Manila (the National Capital Region), it is also the top contributing region in terms of value-added for the macroeconomy, together with Central Luzon (Region 3) and CALABARZON (Region 4A). These regions are also significantly affected by the typhoons, which compounds the economic hardships brought forth by the pandemic.

In addition, Mueller [1999] and Mueller [2002] estimate an eighteen-year period to complete a whole property cycle, with at least two quarters lag for the effects to be realized (that is, a difference between the physical and the financial property cycles). In the case of the Philippine real estate development sector, a possible manifestation of this may be found in Table 2, where the sector emerged as second highest contributor to the economic recession. Although this is not isolated, construction (a related sector) has shown consistent and increasing contributions to economic contraction in 2020. Even in pre-pandemic quarters, public infrastructure expenditure programs did not aid in propelling growth in the economy [Suzara et al. 2020].

Industry players have floated various measures for keeping the sector resilient and responsive to the "new normal". One is to adapt investment and trust funds to keep capital resources flowing into the sector. Dubbed as the REIT, it aims to establish investment funds to support endeavors in the real estate development sector. While REIT is similar to the trust funds and investment funds of financial institutions (e.g., banks and investment houses), REIT aims to provide ample support, especially now when the sector faces significant challenges: the pandemic and the aftermath of natural disasters.

With the recession at hand, industry players and analysts fear of a "bursting of a property bubble", that is, the hype of expansion during the years prior to the pandemic will be countered by a sharp expansion/contraction of the sector. Note that the trend in GVA in the real estate may be a basis for a number of industry players to say that the rise in GVA during the pre-pandemic quarters is a development of a property bubble, and the decline during the pandemic quarters may suggest a property bubble burst. The recession has even induced uncertainty among lenders in financial institutions: as incomes are greatly reduced (domestic and foreign), risks of defaulting on property loans are becoming more and more probable [Abueg 2020a]. This is even supported by trends in business and consumer survey reports of the Bangko Sentral ng Pilipinas (BSP), despite the central bank successively reducing its rates for monetary policy. This is despite the fact that legislation has ordered moratorium on charging interests on loans through Republic Act (RA) Nos. 11469 and 11494[3], and also extended deadlines to those affected by the pandemic, whether health-related or due to economic reasons [Abueg 2020a].

While there are empirical indications in the data reflected in Figure 1 and Figure 2 relative to the property cycle in Figure 4, the decline in gross value added (GVA) of both RE and OD subsectors do not necessarily reflect a bubble burst or even a real estate bubble in the first place. Nonetheless, speculation of a bubble previously present and its possible burst cannot be dismissed given the continuous increase in demand in real estate development and infrastructure from local housing demand, commercial and office spaces development, as well as the demand from migrants and long-staying tourists in the last decade. As mentioned, this indication of a significant decrease in the reflected GVA data of the industry (coming from a steady increase during the pre-pandemic years) fueled

[3] RA no. 11469 is dubbed as "Bayanihan To Heal As One Act", while RA no. 11494 is titled as "Bayanihan To Recover As One Act". The themes of the legislation are coming from the idea insinuated in the 2019 Southeast Asian Games the, "We Win As One". The word "bayanihan" denotes community collectivity or communal unity, a trait which is ingrained to Philippine culture. To date, a proposed sequel law is in Philippine Congress, which if enacted, will be known as "Bayanihan to Rebuild As One Act", or "Bayanihan 3" [Abueg 2020b].

speculations of the presence and bursting of the property bubble. This demand on real estate development in the years prior to the pandemic is supported by external demand coming from foreign nationals staying in the country for longer periods.

As the country continues to grapple with the effects of the pandemic, so does the real estate development industry and its subsectors. The booming industry prior to the pandemic is hoped to be sustained or at least kept afloat even in the pandemic-induced recession. This paved the "reintroduction" and increased offering of the REIT by various players. In the next section, we provide a discussion of the REIT and context on a so-called revival, as well as documenting industry players' behavior towards this fund facility for the industry during the current health and economic crisis.

4. The revival of real estate investment trust

4.1. REIT, revisited

A REIT is a market investment facility (trust fund), which is generally a corporation listed in the stock market that owns or manages income-producing real estate. A REIT can own and operate various real estate assets such as residential properties, commercial or retail buildings, office spaces, hospitals, hotels, resorts, and warehouses. Some countries even allow REITs to own and manage public infrastructure such as airports, seaports, land terminals, and tollways [National Tax Research Center 2017]. One unique facet of investing in REITs is their potential for high-yield dividend growth as they are required by law to pay out 90 percent of their income to stockholders, typically paying higher dividends compared to other equities [Likos 2020]. Add to this the advantage of favorable returns as hedge for inflation and easier liquidity, holding REIT shares allows an investor to earn a share of real-estate produced income without exposure to the risks associated with ownership and development of real property.

REIT in the Philippines was made possible by the enactment of the Real Estate Investment Trust Law or RA no. 9856 back in 2009 [Official Gazette of the Philippines 2009]. The law's proponents envisioned for all Filipinos to be able to build and protect their wealth by investing in the ownership of income-generating real estate in the country, with lawmakers also looking to tap into the real estate market as a source of further economic growth and development in the capital markets as evident in successful REIT offerings in countries with mature markets such as Hong Kong, Japan, and Singapore. The idea of introducing REIT in the Philippines was presented via a house bill in Congress as early as July 2007, but the bill took two years before it became a law. At that time, countries were reeling from the GFC that ironically was ignited by subprime mortgage debt causing a real estate bubble [Dehesh and Pugh 2020]. With the signing of the law, the government expected to generate more tax income with this new investment vehicle. Despite providing real estate developers a cheaper source of funding and liquidity in the capital markets, real estate industry stakeholders rejected participating in REIT supposedly due to regulatory impositions. In particular, The Securities and Exchange Commission (SEC) in its issuance of the law's implementing rules and regulations in 2010 then revised in 2011, mandated that on the first year of the REIT's listing public ownership should be at least 40 percent, and then raised up further until the third year. Also in 2011, the Bureau of Internal Revenue (BIR) imposed a 12-percent value-added tax rate on transfer of properties to REITs [Securities and Exchange Commission 2020]. Despite the vision of the law to open up the economy for further investments, it took more than a decade before an actual REIT company was listed in the Philippine Stock Exchange (PSE) and only after the SEC and BIR relaxed their imposed regulations last January 2020. This relaxation of the rules enabled the country to welcome its first ever REIT in the third quarter of 2020.

As the Philippines' first REIT to be listed in the PSE, AREIT, Inc. is 45 percent owned by the public and 54 percent owned by its sponsor Ayala Land Inc., one of the biggest real estate developers in the country. AREIT currently has five properties in its portfolio of real property assets namely: Mckinley Exchange Corporate Center, Ayala North Exchange (ANEx), Solaris One, Teleperformance Cebu, and the 30th Corporate Center [AREIT Inc. 2016] Generally, the real estate asset classes of all five properties revolve around mixed-use developments with emphasis on office, retail and hotel use situated in the Philippines' major central business district (CBD) areas.

After its listing date on August 13, 2020, AREIT shares dropped and closed at 7.78 percent lower than its initial public offering (IPO) price of ₱27.00 which was already lower than its indicative pre-IPO price of ₱30.05 [Almazan, 2020]. Despite the economic uncertainties during the onset of the COVID-19 pandemic, the AREIT's IPO was nonetheless oversubscribed by twice the base offer—implying healthy interest by investors [BusinessWorld 2020b]. The performance of AREIT may be viewed in Table 3.

Interestingly a week after AREIT's listing, other major local real estate players expressed keen interest following suit, including Double Dragon Properties, Vista Land Inc., and Robinsons Land Inc. While these corporations have announced plans to offer their respective REITs as of January 2021, they have yet to formally launch their respective REITs perhaps postponing their plans until market conditions become favorable or due to some commercial or legal considerations. [Reyes 2021]. Although a lot of real estate developers are enticed to offer their own REIT IPOs, not all industry players wish to participate in REITs. We have provided in the appendix a table showing companies that offered and/or are planning to offer REITs. It can be deduced that large-capital real estate companies in the Philippines mainly view REIT offerings as an opportunity to bolster their finances during the pandemic.

TABLE 3. AREIT's asset portfolio in terms of real estate asset class and geographic location

Asset Class	During IPO (2020)	2021	Change
Office (%)	86	87	1
Hotel (%)	7	6	-1
Retail (%)	7	7	0
Total revenue (₱ billion)	2.16	2.64	0.48

Location	During IPO (2020)	2021	Change
Makati City (%)	89	62	-27
Cebu City (%)	11	7	-4
Pasig City (%)	0	31	31
Gross land area (sqm)	170,848	245,819	74,971

Note: Changes are authors' calculations.
Sources of data: Data from disclosed data in report by ABS-CBN [2020].

4.2. Challenges in Philippine real estate market amidst the pandemic

The COVID-19 pandemic has greatly affected the Philippines' real estate market especially the residential condominium sector located in central business districts (CBDs). The majority of owners of such residential properties are overseas Filipino workers who struggle to pay or risk defaulting on their mortgage payments [Dass 2020]. This contributes to the tightening of banks' lending to capital borrowers including that for home loans [Lucas 2021]. Tourism-related property assets are experiencing a period of major decline due to strict quarantine measures imposed by the government since March 2020. While office spaces remain the bulk of the property inventory located in CBDs within Metro Manila, there is a question of whether tenants of such properties can still afford to fulfill their obligations under their lease agreements—especially that of fulfilling mid- to long-term lease contract duration typically observed in office rentals and yearly rent escalation clauses. The shift to work-from-home (WFH) and telecommuting work set-ups for employees has also lessened the demand for such office spaces, not to mention the exodus of online casinos stationed in various residential towers in Metro Manila [BusinessWorld 2020c]. With both residential and office tenants dwindling, mall operators are now dealing with the highest vacancy rates in retail leasing since the AFC with rental rates expected to continue to decline until 2021 as malls suffer a 30-50 percent drop in retail foot traffic [BusinessWorld 2020d]. It is interesting to note that aside from one property in AREIT's portfolio (ANEx) that has yet to achieve full mixed-use tenant occupancy, its property portfolio consisting of hotels, retail and office spaces located in cities with high incidences of COVID-19 cases [Correa and Abueg 2020] could make astute investors wonder whether

AREIT can be profitable in these trying times for the real estate market. AREIT's prospectus states that the proceeds of its IPO and money generated from sale of income-generating real estate to AREIT will be used to fund its sponsor's ongoing and future real estate acquisitions within Metro Manila and other key regions in the Philippines [AREIT Inc. 2020]. This leads investors to conclude that AREIT's parent company will fund its capital acquisitions via equities instead of debt.

Industry pundits are generally pessimistic on the attractiveness of Philippine real estate as an investment this 2021, and real estate investors remain wary of COVID-19's impact on property values, occupancy rates, and all-around trade growth with some even skeptical of published demand for real properties during this recession observed in Southeast Asia. While REIT offers an attractive proposition of acquiring real estate assets without the hassle of owning actual real property, it is also subject to negative factors besetting real estate such as investment risks (e.g., deteriorating property values), interest rate hikes, and low overall market demand. Further, timing REIT offerings during the current pandemic begs the question of how the parent companies of these REITs are going to use the cash earned from this endeavor. Real estate operates in a cyclical manner heavily influenced by market or external forces; and with real estate investing being unattractive to investors during the pandemic, the general value proposition of REIT offerings in the country remains to be seen.

5. Modelling the property cycle

5.1. Model preliminaries and property cycle descriptive statistics

We begin the modelling of the cycle by providing descriptive statistics essential for the property cycle. Table 4 summarizes the real estate development sector from 1998q1 to 2020q4, which fairly indicates the property cycle by comparing Figure 4 with the trends indicated in Figure 1 and Figure 2. RE is growing 4 times relative to OD, and is twice the industry growth. This is despite RE's share being much lower than OD. As noted earlier, the use of official national data reports utilizes the financial property cycle for the econometric modelling.

TABLE 4. Authors' calculations of period averages of macroeconomic indicators

Indicator	Real Estate	Ownership of Dwellings	Industry Total
GVA in million ₱ (1998q1-2020q4)	76046.40	112927.75	188974.15
Percent growth (1999q1-2020q4)	7.54	1.94	3.66
Percent share to total gross value added (1998q1-2020q4)	36.14	63.86	100.00

Source of data: PSA.

5.2. Econometric model of the property cycle

Given the trends and observations in the indicated period, we formulate an autoregressive distributed lag – error correction model (ARDL-ECM) with p lags for the dependent variable y, q_1 lags for the regressor w, the squared term of GDP represented by w^2 to incorporate nonlinearity of the cycle with lags q_2, other weakly exogenous socioeconomic variables x_m with lags q_3, a vector of dummies $\boldsymbol{d}$ representing exogenous shocks or structural breaks, and the Hadamard product of $\boldsymbol{w}$ and $\boldsymbol{d}$ which represents the interaction terms of w and the structural breaks. This specification can be dynamically represented by Kripfganz and Schneider's [2018] conditional error correction form that is reparametrized at time t and is modified as follows:

$$\Delta y_t = (c_0+c_1 t) - \alpha\left(y_{t-1}-\theta_1 w_t-\theta_2 w_t^2-\vartheta x_t\right) + \sum_{i=1}^{p-1}\beta_{1i}\Delta y_{t-i} + \sum_{i=0}^{q_1-1}\beta_{2i}\Delta w_{t-i} + \sum_{i=0}^{q_2-1}\beta_{3i}\Delta w_{t-i}^2 + \sum_{\substack{m=1\\ i=0}}^{q_3-1}\beta_{4i}\Delta x_{m,t-i} + \boldsymbol{\Delta}\mathbf{D}^{\mathrm{T}}\boldsymbol{\phi} + \boldsymbol{\Delta}(\mathbf{w}\circ\mathbf{D})^{\mathrm{T}}\boldsymbol{\gamma} + \varepsilon_t \tag{1}$$

where

y_t	=	GVA of the real estate sector in quarter t
α	=	speed of adjustment to long-run equilibrium
y_{t-i}	=	GVA of the real estate sector in quarter $t-i$
θ_1, θ_2	=	long-run coefficients of w_t and w_t^2
ϑ	=	vector of long-run coefficients of variables x_m
w_t	=	GDP growth rate (year-on-year) in quarter t
w_{t-i}	=	GDP growth rate (year-on-year) in quarter t - i
w_t^2	=	Squared of GDP growth (year-on-year) in quarter t
w_{t-1}^2	=	Squared of GDP growth (year-on-year) in quarter t-i
x_{1t}	=	average non-performing loans ratio (nplratio)for quarter t
x_{2t}	=	average inflation rate (π) for quarter t
x_{3t}	=	average overnight reverse repurchase rate (RRP) for quarter t
D_{09}	=	dummy variable for 2009q1 to 2019q4
D_{20}	=	dummy variable for 2020q1 to 2020 q4
$w \cdot D_{09}$	=	interaction term between GDP growth (year-on-year) and D_{09}
$w \cdot D_{20}$	=	interaction term between GDP growth (year-on-year) and D_{20}

The statistical significance of GDP growth and its squared level will then indicate the existence of a real property cycle in the Philippines. The above model will also allow us to estimate not only the short-run coefficients of the regressors but also their long-run effects, especially of GDP growth and its squared level. We also included the inflation rate to account for general level of prices in the economy, which may influence the accrued GVA of the sector. Also, given the nature of payments on loans and mortgages, we include the country's monetary policy given by the reverse repurchase payments (or RRP) by the Banko Sentral ng Pilipinas (BSP). And given that there are risks to default in the real estate sector and related markets, we incorporate in the model the rate of nonperforming loans (NPLs). In the Philippines, real estate mortgages and loans influence the increase (or decrease) in NPLs as influenced by the state of the macroeconomy.

The other variables included are suggested by or similar to those in the literature on real estate research, particularly those of property insurance and premiums (e.g., [Michael and Zhao 2016]; [Choi, Hardigree and Thistle 2002]). We also considered a previous work on the real estate development sector's GVA by Simbre [2019][4]. We also included two dummy variables: D_{09} to account for post-GFC and coincident with the enactment of RA No. 9586 (REIT law). Another dummy variable D_{20} accounts for the pandemic-induced recession and is coincident with the re-introduction of REIT by industry players. It is hypothesized that 2009 and 2020 are possible breaks in respective timebound data given economic conditions affecting the real estate sector in particular, and the macroeconomy in general.

There are also indications of correlation provided in Correa and Abueg [2020] on output growth and growth in real estate, and population growth and growth in ownership of dwellings. These argue for pursuing a more elaborate econometric model that will estimate the property cycle in the Philippines.

The literature suggests steps that must be taken prior to the estimation of our ARDL-ECM[5].

[4] The paper by Simbre [2019] proposed an empirical work on the real estate development sector using annual data and working only on pairwise correlations of three particular variables. This is cited in Correa and Abueg [2020] that the former is inadequate to claim empirical analysis owing to the studied variables and nature of data. In addition, the latter criticized the former for drawing arguments on the sector and policy prescriptions without adequately providing data and analysis.

[5] First, we need to determine the order of integration $I(n)$ of each variable using the augmented Dickey-Fuller (ADF) test, DFGLS test, and Phillips-Perron (PP) test. Second, if all variables have the same $I(n)$, then we can check the existence of a long-run relationship among them using Johansen and Juselius [1990] cointegration test. Otherwise, if they are a mix of $I(0)$ and $I(1)$ such that no variable is $I(2)$, then we can employ a more flexible cointegration test developed by Pesaran, Shin, and Smith (2001). This approach nonetheless requires the model to pass both the F- and t-tests to reject the null hypothesis of no cointegration. Such occurs when the model's F- and t-statistics are greater than the $I(1)$ bounds determined at least at the 5 percent level of significance for each distribution. If test statistics fall within the $I(0)$ and $I(1)$ bounds identified by the test, then we cannot draw a conclusion on the existence of a long-run relationship between the dependent variable and its covariates. This test uses the Kripfganz and Schneider's [2018] estimation.

The next step is to ascertain the existence and direction of Granger causality between the said variables using an alternative test developed by Toda and Yamamoto [1995][6], requiring a vector autoregressive (VAR) estimation given by the system

$$y_t = \psi_0 + \sum_{i=1}^{p'+m'} \psi_{1i} y_{t-i} + \sum_{i=1}^{p'+m'} \psi_{2i} w_{t-i} + \sum_{i=1}^{p'+m'} \psi_{3i} x_{1,t-i} + \sum_{i=1}^{p'+m'} \psi_{4i} x_{2,t-i} + \sum_{i=1}^{p'+m'} \psi_{5i} x_{3,t-i} + \epsilon_{1t} \quad (2)$$

$$w_t = \varphi_0 + \sum_{i=1}^{p'+m'} \varphi_{1i} w_{t-i} + \sum_{i=1}^{p'+m'} \varphi_{2i} y_{t-i} + \sum_{i=1}^{p'+m'} \varphi_{3i} x_{1,t-i} + \sum_{i=1}^{p'+m'} \varphi_{4i} x_{2,t-i} + \sum_{i=1}^{p'+m'} \varphi_{5i} x_{3,t-i} + \epsilon_{2t} \quad (3)$$

$$x_{1t} = \omega_0 + \sum_{i=1}^{p'+m'} \omega_{1i} x_{1,t-i} + \sum_{i=1}^{p'+m'} \omega_{2i} y_{t-i} + \sum_{i=1}^{p'+m'} \omega_{3i} w_{t-i} + \sum_{i=1}^{p'+m'} \omega_{4i} x_{2,t-i} + \sum_{i=1}^{p'+m'} \omega_{5i} x_{3,t-i} + \epsilon_{3t} \quad (4)$$

$$x_{2t} = \nu_0 + \sum_{i=1}^{p'+m'} \nu_{1i} x_{2,t-i} + \sum_{i=1}^{p'+m'} \nu_{2i} y_{t-i} + \sum_{i=1}^{p'+m'} \nu_{3i} w_{t-i} + \sum_{i=1}^{p'+m'} \nu_{4i} x_{1,t-i} + \sum_{i=1}^{p'+m'} \nu_{5i} x_{3,t-i} + \epsilon_{4t} \quad (5)$$

$$x_{3t} = \mu_0 + \sum_{i=1}^{p'+m'} \mu_{1i} x_{3,t-i} + \sum_{i=1}^{p'+m'} \mu_{2i} y_{t-i} + \sum_{i=1}^{p'+m'} \mu_{3i} w_{t-i} + \sum_{i=1}^{p'+m'} \mu_{4i} x_{1,t-i} + \sum_{i=1}^{p'+m'} \mu_{5i} x_{2,t-i} + \epsilon_{5t} \quad (6)$$

where p' is the maximum number of lags for the model as determined by Akaike information criterion (AIC); and m' is either equal to 1 if variables are a mix of $I(0)$ and $I(1)$, or equal to 2 if they are a mix of $I(1)$ and $I(2)$. If the model is found to be autocorrelated, then we must increase p' until such problem is resolved. We will then test the significance of the coefficients of p' lags for each regressor using Wald test. Rejection of the null hypothesis implies Granger causality between the dependent and independent variables considered.

Finally, we will estimate Equation (1) above using OLS and Kripfganz and Schneider's [2018] ARDL-ECM approach. Those variables found to be non-cointegrated with y_t will be treated as exogenous variables affecting short run dynamics. The significance and specification of the model will also be checked using F-test and Ramsey RESET test, and a series of diagnostics on the residuals will be conducted using Jarque-Bera test for normality, Durbin's alternative test for serial autocorrelation, Cook-Weisberg test for heteroscedasticity, and ARCHLM test for conditional autoregressive heteroscedasticity.

[6] Toda and Yamamoto's [1995] approach is very desirable as it does not require all variables to be of the same order of integration and/or be cointegrated.

5.3. Empirical results

Tables A1 and A2 (in the appendix) present the results of our unit root tests for levels and first differences with the intercept and/or trend included. At least two-unit root tests on the first differences confirmed that all variables are $I(1)$, except for the squared level of GDP growth which was found to be $I(0)$.

Given those findings and that no variable is $I(2)$, we proceeded with Pesaran, Shin and Smith's [2001] bounds test for cointegration since the Johansen-Juselius test is not applicable due to such mixture of $I(n)$. The results of the bounds test are shown in Table A3 and Table A4 in the appendix. We first conducted the test on three versions of y, i.e., its level form, natural log form, and growth rates. On one hand, it was found that the level form is not cointegrated and suffers from misspecification error or omitted variable bias (or even both). On the other hand, no valid conclusion can be drawn on the existence of a long-run relationship when the log form is used. Finally, the bounds test indicated that a long-run relationship exists between y_t and its regressors when its year-on-year growth rate ($\hat{y}$) is considered. No specification error was found with the $\hat{y}$-version, and all diagnostic tests indicated that the residuals are normally distributed, non-serially correlated, and homoscedastic.

The results of the bounds test on the regressors are also reported in Table A3 and Table A4 in the appendix. However, given the finding that only the $\hat{y}$-specification yields a statistically significant long-run relationship, we decided to exclude the level and logarithmic forms of real estate GVA in the subsequent models. Among the independent variables, only GDP growth rate (w) and inflation rate (π) were found to be cointegrated with their respective regressors. No long-run relationship is found when testing the *nplratio* with the rest of the variables; whereas the test failed to draw a conclusion when we considered the RRP-specification. Moreover, these last two models did not yield normally distributed and homoscedastic residuals, in addition to the *nplratio*-model being mis-specified.

We then performed Toda and Yamamoto's [1995] test for Granger causality on the VAR models, which also served as a verification on the findings of the bounds test. As reported in Table 5 below, we found that GDP growth rate Granger causes the growth rate of real estate GVA, but not the other way around. Hence, there is only a unidirectional long-run relationship between GDP growth and real estate GVA growth, which is indicative of a possible real property cycle in the Philippines. The test also pinpointed a unidirectional link between inflation (π) and the overnight RRP. One may recall that RRP is one of the primary monetary policy tools used by the BSP in carrying out its task of stabilizing prices in the country. Hence, the test may lend support on the effectiveness of RRP in bringing about long run impacts to inflation levels. Finally, the test also confirmed the results of the bounds test that no significant long-run relationship exists when *nplratio* and *rrp* are taken as endogenous variables respectively.

TABLE 5. Test for Granger causality

Independent Variables	$\hat{y}$	w	$nplratio$	π	rrp
$\hat{y}$	-	0.93	3.60	2.41	0.70
w	10.10**	-	1.82	0.78	1.84
$nplratio$	0.11	1.09	-	1.13	0.75
π	2.63	0.35	0.90	-	5.10
rrp	0.29	0.70	1.56	7.31*	-

Notes: The symbols *, ** indicate significance at α=5% and α=1% respectively. All figures reported are χ^2-statistics.

To provide empirical evidence of a real property cycle in the Philippines, we ran four estimations of the proposed model shown by Equation (1). We first ran an OLS regression as a consistency check to the main ARDL-ECM estimation (ARDL-ECM1). The latter is further treated with two additional versions namely ARDL-ECM2 and ARDL-ECM3. The former incorporates the dummies D_{09} and $w{\cdot}D_{09}$ to account for the drift and trend created by the post-GFC economy and the enactment of RA No. 9586 (REIT law). The latter adds the dummies D_{20} and $w{\cdot}D_{20}$ to ARDL-ECM2 to account for the structural break arising from the onset of the COVID-19 global pandemic. Table 6 presents the results of these regressions.

Except for ARDL-ECM2, AIC's selection of an AR (2) structure on real estate GVA growth concurs with the findings in Mueller [1999; 2002]. Those studies suggested that there is a lag of two quarters between the physical and financial property cycle. Additionally, as real estate investors and buyers incorporate insurance and premiums in pricing of real property and related investments, empirical evidence also suggest this AR (2) process in property insurance and premiums (e.g., Choi, Hardigree and Thistle [2002], in China). This supports the trends observed by Mueller [1999; 2002] using US data, supporting the earlier work of Hoyt [1933].

As reported in Table 6, all four regressions found that the coefficients of the level and squared of GDP growth rates are statistically significant at the 5 percent level . The estimates thus indicated that there is an inverted-U relationship between real estate GVA growth and GDP growth, which validates the existence of a real property cycle in the country. From the marginal effects of GDP reported in Table 7, we see that a one-percentage point increase in GDP growth rate can increase the real estate GVA growth by about 0.43-0.86 percentage point in the short run. Long-run marginal effects further showed that a similar percentage point increase in GDP growth could translate to about 0.81-1.2 percentage points increase in real estate GVA growth.

TABLE 6. OLS and ARDL-ECM Regressions

	OLS	ARDL-ECM1	ARDL-ECM2	ARDL-ECM3
Optimal lag structure	(2,1,0,0)	(2,1,0,0)	(2,1,0,0)	(4,0,0,0)
Long Run Effects				
ADJ	-0.5290**	-0.5302**	-0.5697**	-0.7217**
w	1.4389**	1.4340**	1.5808**	3.2126**
w^2	-0.0668**	-0.0664**	-0.0614*	-0.0993**
π	-0.0111	-0.0211	-0.1076	-0.1295
Short Run Effects				
$\Delta\hat{y}_{t-1}$	-0.1551*	-0.1538*	-0.1496*	-0.0441
Δw_t	0.4109*	0.4147*	0.3612	
$nplratio$	0.0186	0.0172	-0.0447	-0.0887
rrp	-0.4307	-0.4126	-0.5519*	-0.5901*
D_{09}			-0.9732	0.5540
$w \cdot D_{09}$			-0.1109	-0.3675
D_{20}				-2.6607
$w \cdot D_{20}$				-3.4306**
Δy_{t-2}				0.1226
Δy_{t-3}				0.2144
Constant	1.8351	1.7917	3.4501*	0.8798
***F*-tests**				
R^2	0.7343	0.7350	0.7445	0.7706
Adjusted R^2	0.7067	0.7068	0.7095	0.7281
F-statistic	26.60**	11.084**	11.553**	18.767**
Ramsey RESET test	1.26	1.17	0.48	0.01
χ^2-tests on Residuals				
Jarque-Bera test	1.17	1.24	1.58	0.79
Durbin's Alt test	0.29	0.249	0.045	0.47
Cook-Weisberg test	0.05	0.03	0.16	0.21
ARCHLM test	0.151	0.090	0.242	2.12

Notes: The symbols *, ** indicate significance at α=5% and α=1% respectively and with respect to $I(1)$ bounds for F-statistic in ARDL-ECM. The optimal lag length is determined by Akaike information criterion. Figures reported under χ^2-tests are the χ^2-statistics.

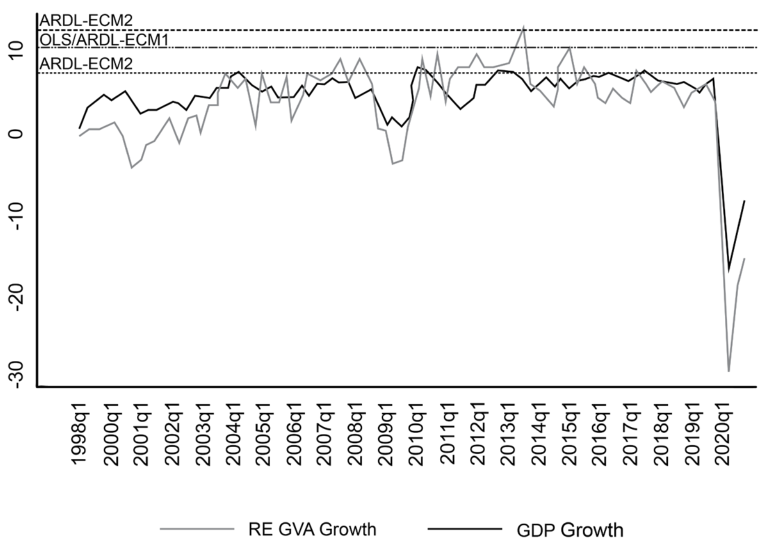
TABLE 7. Marginal effects of GDP growth on real estate GVA growth

	OLS	ARDL-ECM1	ARDL-ECM2	ARDL-ECM3
Long Run $[=\theta_1\text{-}2\theta_2 \cdot E(w)]$	0. 8133**	0.8117**	1.0059*	1.1970*
Short Run $[=(\theta_1/\alpha)\text{-}2(\theta_2/\alpha)\cdot E(w)]$	0.4303*	0.4304*	0.5730	0.8639*
Turning Point $[=\theta_1/(2\theta_2)]$	10.78**	10.80*	12.88	7.47**

Notes: The symbols *, ** indicate significance at α=5% and α=1% respectively. The mean value of GDP growth $E(w)$, which is equal to 4.6858%, is used in computing the marginal effects. The statistical significance of each estimate is checked using Wald test.

Disregarding the structural breaks, the peak of the cycle seems to occur when the GDP growth rate reaches 10.8 percent, although such figure was never recorded in any of the quarters under study. A more plausible estimate of the turning point emerged when we incorporated the dummies for both the post-GFC and the global pandemic. ARDL-ECM3 advances that the peak of the cycle occurred when the year-on-year GDP growth reached 7.47 percent. These turning points are visualized in Figure 5, which emphasizes that the latter critical value is the most plausible one to produce the turning point given the data.

FIGURE 5. Estimated Critical Values of GDP Growth Rates



Except for GDP growth, only the coefficients of the reverse repurchase rate and the interaction term $w \cdot D_{20}$ turned out to be significant at 5 percent, especially when the structural breaks are accounted in the model. According to those models, the RRP has a short-run negative relationship with real estate GVA growth, which is possibly linked with inflation. Also, we note that the RRP is the BSP's monetary policy serving as a benchmark for short-term market interest rates and this would have a more direct effect of the growth in real estate GVA than inflation. In the model, we estimated that a percentage point increase in RRP could lead to about 0.55 to 0.59 percentage point decrease in real estate GVA growth. Ultimately, the statistical significance of the interaction term $w{\cdot}D_{20}$ highlights the degree of the trend-reversing effect of the pandemic on the real estate GVA growth via the GDP growth. The reflected 1 percent level of significance and the relative high magnitude of the negative coefficient highlights the impact of the GDP growths in the quarters of the pandemic in 2020 relative to the considered time horizon of the model (given 92 quarters of data). Additionally, the non-significance of the same dummy as a standalone regressor (i.e., not interacted with other regressors) means that the year per se is irrelevant to the variability of the GVA of the real estate development sector. Such finding may then support the conjecture of many of the industry players that the perceived property bubble in the country burst during the onset of the COVID-19 pandemic, triggering a transition from phase 2 (expansion) to phase 3 (hypersupply)—if not to phase 4 (recession), which is influenced by the macroeconomic conditions as reflected by economic growth rates.

6. Conclusions

The study endeavors to provide empirical evidence on the real property cycle in the Philippines during the period 1998-2020, which data suggests an AR (2) process, consistent with observations of Mueller [1999; 2002] of Hoyt [1933]. This paper also aims to provide an avenue for academic discourse and discussion on the floated worries of some industry players regarding the the presence of the property bubble and its concurrent bursting. It examines the dynamic causal relationship between the year-on-year growth of real estate industry GVA, the GDP year-on-year growth, overnight reverse repurchase rate, inflation rate, and other variables. Using Pesaran, Shin and Smith's [2001] bounds test for cointegration and Toda and Yamamoto [1995] test for Granger causality, findings confirm that there is a long-run unidirectional relationship running from GDP growth to real estate GVA growth and from overnight reverse repurchase rate to inflation rate. The latter may then lend support on the effectiveness of rr as a primary monetary policy tool of the BSP in bringing about long run impacts to inflation levels.

OLS and ARDL-ECM regressions emphasize a long-run inverted-U relationship between GDP growth and real estate GVA growth, indicating the existence of a real property cycle in the Philippines during the period under study. When the structural breaks for post-GFC and the enactment of RA No. 9586 (REIT law) and for the global pandemic are accounted in the model, the study found that the turning point of the cycle occurs when the GDP attains a year-on-year growth of 7.47 percent. Results also show that RRP negatively affects the real estate GVA growth in the short run. The pandemic is also found to have a trend-reversing effect on the real estate GVA growth via the GDP growth, supporting the conjecture that the property bubble in the country may have existed prior to the pandemic, and burst during its onset.

In relation to these perceptions of the industry players and the trends shown by macroeconomic data, industry players have resorted to revive the REIT to keep the industry afloat via capital infusion given the circumstances of the pandemic-induced recession. While the industry demand shows promising trends during the years prior to the pandemic, the REIT may also aid to prevent further adverse effects to the industry players as the country still grapples its way out of the economic contraction. Not only is there an oversupply of real estate property owing to exit of offshore gambling operators, weaker demand also contributes to the problem as unemployment rates made historical high records [BusinessWorld 2020a; BusinessWorld 2020c]. As such, the existing mortgages are at risk of default, which creates a lot of speculation on the state of the country's financial institutions [Noble 2021; Dass 2002]. This is supported by the BSP's report on the increase in non-performing loans [BusinessWorld 2021]. Despite the fact that between RE and OD, the OD is a safe haven of the real estate development industry [Correa and Abueg 2020], but is significantly affected by the economic contraction.

Note that not only housing demand is affected due to the decrease in offshore gaming interests in the country, but also the retail and commerce activity due to the continued lockdown and mobility restrictions. This is even highlighted by the fact the increase in shopping mall vacancies are already close to the levels seen during the AFC [BusinessWorld 2020d]. This will greatly affect the economy (as shown by the macroeconomic indicators during the last five quarters of the pandemic), given the predominantly consumerist base of the macroeconomy [Rico and de Leon 2017].

Noting that REIT is an initiative coming from real estate development industry players, such must be complemented by sound macroeconomic policies that are related to sectors working with this sector (e.g., financial institutions, and government agencies aiding people to securefunds for mortgage and loan payments). The complementation of such policies are drawn from the results of the suggested econometric model. This way, adverse effects of the pandemic and the accompanying recession will be mitigated; and prevent some degree of contagion with financial institutions, consumer and retail sectors, and other economic sectors that work with the real estate especially in this time of the pandemic.

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Appendix

TABLE A1. Unit-Root tests for levels

Variables	ADF Test		DFGLS Test[a]		PP Test[b]	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend
y	-0.435(5)	-2.126(5)	-0.218(4)	-1.621(4)	-0.677(15)	-2.793(15)
$ln(y)$	-0.988(5)	-1.882(5)	-0.035(4)	-1.508(4)	-0.588(11)	-2.822(11)
$\hat{y}$	-2.199(1)	-2.021(1)	-1.881(1)	-2.054(1)	-2.604(9)	-2.438(9)
w	-1.537(1)	-0.904(2)	-2.131(1)	-2.534(1)	-2.080(20)	-1.983(20)
w^2	-4.506(1)**	-5.643(1)**	-0.564(2)	-5.341(1)**	-6.841(20)**	-7.184(20)**
nplratio	-0.643(1)	-1.842(1)	-1.552(1)	-1.707(1)	-1.017(10)	-2.926(10)
π	-2.562(6)	-3.200(6)	-1.370(5)	-3.190(5)*	-2.064(20)	-2.110(20)
rrp	-2.425(1)	-3.673(1)*	0.758(2)	-1.734(2)	-2.112(12)	-2.519(12)

Notes: The symbols *, ** indicate significance at α=5% and α=1% respectively. The figures reported in parentheses are the number of lags which was determined using Schwarz's Bayesian information criterion for ADT and DFGLS, while those of PP Test was determined by automatic bandwidth selection to Newey-West using Bartlett kernel. The figures under PP test columns are the estimates of Z(t).

TABLE A2. Unit-Root tests for first differences

Variables	ADF Test		DFGLS Test[a]		PP Test[b]	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend
y	-3.216(4)**	-2.981(4)	-3.301(3)**	-3.327(3)*	-11.938(20)**	-11.884(20)**
$ln(y)$	-2.482(4)	-2.235(4)	-3.396(3)**	-3.449(3)*	-12.100(20)**	-12.012(20)**
$\hat{y}$	-10.550(0)**	-10.650(0)**	-6.624(1)**	-7.043(1)**	-11.510(20)**	-12.934(20)**
w	-8.248(0)**	-8.304(0)**	-0.785(3)	-6.923(1)**	-8.544(20)**	-8.961(20)**
w^2	-4.758(2)**	-4.825(2)**	-9.807(1)**	-2.750(2)	-29.592(20)**	-29.944(20)**
nplratio	-10.260(0)**	-10.192(0)**	-0.751(3)	-1.344(4)	-10.361(10)**	-10.329(10)**
π	-4.821(5)**	-4.795(5)**	-1.532(4)	-2.963(4)	-5.502(20)**	-5.560(20)**
rrp	-7.827(0)**	-7.842(0)**	-3.473(2)**	-4.263(2)**	-8.148(20)**	-8.930(20)**

Notes: The symbols *, ** indicate significance at α=5% and α=1% respectively. The figures reported in parentheses are the number of lags which was determined using Schwarz's Bayesian information criterion for ADT and DFGLS, while those of PP Test was determined by automatic bandwidth selection to Newey-West using Bartlett kernel. The figures under PP test columns are the estimates of Z(t).

TABLE A3. Pesaran, Shin, and Smith's (2001) Bounds test for cointegration

Variables	y	$ln(y)$	$\hat{y}$
Optimal lag structure	(4,0,3,0,0,0)	(4,0,3,0,0,0)	(2,1,0,0,0,0)
	***F*-test**		
$I(0)$,$I(1)$ Bounds			
At 1%	[3.657, 5.178]		[3.687, 5.141]
At 5%	[2.732, 4.028]		[2.760, 4.010]
R^2	0.9118	0.8560	0.7350
Adjusted R^2	0.8968	0.8317	0.7068
F-statistics	40.948**	25.248**	7.596**
Ramsey RESET test	4.08*	2.39	1.17
	***t*-test**		
$I(0)$,$I(1)$ Bounds			
At 1%	[-3.486, -4.913]		[-3.498, -4.928]
At 5%	[-2.849, -4.199]		[-2.868, -4.226]
t-statistic	-0.384	-3.935	-4.868*
Decision	Accept H_0: not cointegrated	Inconclusive	Accept H_A: cointegrated
	χ^2-tests on Residuals		
Jarque-Bera test	1.54	2.30	1.24
Durbin's Alt test	2.005	2.032	0.249
Cook-Weisberg test	0.35	0.44	0.03
ARCHLM test	1.521	0.317	0.09

Notes: The symbols *, ** indicate significance at α=5% and α=1% respectively with respect to $I(1)$ bounds. The optimal lag length is determined by Akaike information criterion. Figures reported under χ^2-tests are the χ^2-statistics.

TABLE A4. Pesaran, Shin, and Smith's (2001) Bounds test for cointegration (other results)

Variables	w	$nplratio$	π	rrp
Optimal lag structure	(1,2,0,0,1)	(2,1,0,0,0,0)	(2,4,3,3,2,2)	(2,0,0,0,0,2)
		***F*-test**		
$I(0)$,$I(1)$ Bounds				
At 1%	[4.026, 5.460]	[3.635, 5.206]	[3.591, 5.262]	[3.679, 5.150]
At 5%	[2.982, 4.213]	[2.712, 4.042]	[2.671, 4.069]	[2.753, 4.015]
R^2	0.6858	0.1625	0.6639	0.3264
Adjusted R^2	0.6523	0.0731	0.5501	0.2444
F-statistics	5.298**	1.726	6.123**	3.302
Ramsey RESET test	19.56**	8.68**	1.04	2.37

TABLE A4. Pesaran, Shin, and Smith's (2001) Bounds test for cointegration (continued)

		***t*-test**		
$I(0)$,$I(1)$ Bounds				
At 1%	[-3.494, -4.691]	[-3.477, -4.901]	[-3.495, -4.879]	[-3.495, -4.924]
At 5%	[-2.868, -4.006]	[-2.835, -4.179]	[-2. 806, -4.138]	[-2.864, -4.220]
t-statistic	-5.037**	-2.557	-5.398**	-3.573
Decision	Accept H_A: cointegrated	Accept H_0: not cointegrated	Accept H_A: cointegrated	Inconclusive
		χ^2-tests on Residuals		
Jarque-Bera test	5.83	60.99**	3.17	46.73**
Durbin's Alt test	0.247	0.068	0.002	0.140
Cook-Weisberg test	5.43*	10.73	1.26	3.78
ARCHLM test	1.658	4.723*	0.000	9.894**

Notes: The symbols *, ** indicate significance at α=5% and α=1% respectively with respect to $I(1)$ bounds. The optimal lag length is determined by Akaike information criterion. Figures reported under χ^2-tests are the χ^2-statistics.

TABLE A5. Current and upcoming Philippine REITs (as of May 2021)

REIT Name	Projected IPO Value, in ₱ billion	Total Offered Shares for IPO	Listing Date in PSE	Price per Share on listing date, in ₱
Ayala Real Estate Investment Trust, Inc. (AREIT)[a]	13.500	502,570,000	Aug. 13, 2020	27.00
Double Dragon Meridian Park REIT (DDMP REIT)[b]	14.700	6,536,737,316	Mar. 24, 2021	2.25
RL Commercial REIT Inc. (RLC REIT)[c]	26.670	3,647,967,000	Aug. 31, 2021 to Sep. 6, 2021 (tentative)	7.31
Filinvest Land Inc. (FLI) via Cyberzone Properties Inc. (CPI)[d]	14.350	1,793,420,000	no data	8.30
Vista Land and Lifescapes (VLL)[e]	no data	no data	no data	no data

Disclosure sources and notes:
[a] https://ir.ayalaland.com.ph/wp-content/uploads/2020/09/Disclosure-2020-08-06-AREIT-Offer-Period-Completed-vF.pdf
[b] https://www.ddmpreit.com/invest/
[c] https://www.bworldonline.com/robinsons-land-unit-eyes-nearly-p27-billion-in-reit-market-listing/
[d] https://www.bworldonline.com/filinvest-land-unit-seeks-approval-for-reit-offering/
(This REIT listing has an application pending approval from regulatory agencies.)
[e] https://www.philstar.com/business/2021/05/11/2097253/vista-land-plans-reit-listing
(This company has expressed interest in offering a REIT but has yet to formally submit an application.)

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Transportation policy potholes: analyzing Metro Manila's COVID-19 response

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Before the COVID-19 pandemic, the Philippine government was already implementing policies and building infrastructure aimed at improving the country's road-based public transportation system and alleviating impacts of traffic congestion, especially in Metro Manila. However, with the pandemic, new priorities emerged. Public transportation now plays a vital role in controlling the spread of the disease while, at the same time, ensures that essential services are accessible, and public transport providers are sufficiently supported. This paper analyzes the road-based public transportation policies of the government during the pandemic using a multi-dimensional framework. In general, and in principle, we see that the government policies issued are consistent with the recommended transport policies that must be implemented during such crisis. However, there are some strategies that are untimely implemented, such as the mandatory utilization of the integrated terminals, the forced consolidation of transport providers, and the continuing modernization of jeepneys.

JEL classification: L90, L91, R40, R42
Keywords: Road-based public transportation, transportation pandemic response, PUV consolidation and modernization, integrated transport terminals

1. Introduction

Before the pandemic, Metro Manila traffic was a nightmarish experience. In 2019 it was the second most congested metropolitan area in the world, next to Bengaluru, India [TomTom 2019]. The congestion level was at 71 percent which means that during congested hours, travel time increased by 71 percent [TomTom 2019]. The traffic in Metro Manila translated to a societal cost of around USD 20 billion annually. This cost includes lost working hours, additional fuel consumption, health costs caused by air pollution, and loss of investment opportunities [Mettke, Guillen, and Villaraza 2016].

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A significant majority of land trips in Metro Manila rely on buses and jeepneys. About 5,000 intra-city buses operate in the capital. In addition, there are 3,300 provincial buses plying the northern region-Metro Manila corridor and 4,000 provincial buses plying the southern region-Metro Manila corridor. Poorly maintained jeepneys also remain one of the most important transport modes. There are about 35,000 jeepney franchises issued in Metro Manila alone in 2014. Aside from buses and jeepneys, there are utility vehicles (UVs) with almost 9,000 operational franchises in the Metro in 2019 (JICA [2014]; Siy [2019]). The overlaps in some routes of buses, jeepneys, and UVs, the high road occupancy rate of private vehicles, the insufficient and ineffective urban transport planning and traffic management, and the inadequacy of urban road networks cause the unnecessary traffic congestions in the capital (ADB [2012]; JICA [2014]). With this, proposals to rationalize their respective routes, and develop and improve their infrastructure emerged. Table 1 shows the national and local road densities in Metro Manila and the adjacent Regions III and IV-A. Table 2 presents the traffic demand, public transport share in the transport demand, and private vehicle road occupancy rate in the Metro. Finally, Table 3 shows some major roads and road-based public transport improvement projects of the government [JICA 2014].

TABLE 1. National and local road densities in GCR, 2010

Region/ Road Classification	National Road Vehicle Density (Vehicle/km)	Local Road Vehicle Density (Vehicle/km)
Metro Manila	1,952	541
Region III	476	67
Region IV-A	415	108
Total, GCR	728	145

Source: JICA, 2014.

TABLE 2. Traffic demand, public transport share in traffic demand, road occupancy rate of private vehicles, 2012

	Traffic Demand (mil. trips/day)	Public Transport Share in Traffic Demand (%)	Private Vehicles Road Occupancy Rate (%)
Metro Manila	12.8	69%	78%

Source: JICA, 2014.

TABLE 3. Some major roads and road-based public transport improvement projects

C3 Missing Link (San Juan - Makati)
C5 Missing Link Southern Section
Global City to Ortigas Center Link Road
Skyway-FTI-C5 Connector
Other Interchanges/Flyovers
Other Urban Roads
Mega Manila (Secondary Roads Package)
Region III (Sec Roads - Approx.)
Region IV-A (Sec Roads – Approx.)
Integrated Provincial Bus Terminal System
Jeepney Fleet Modernization
Urban Bus Fleet Modernization
Modernization of traffic signaling system

Source: JICA, 2014.

In 2020, congestion levels dropped by 18 percentage points to 53 percent congestion level [TomTom 2020]. The reduced congestion in Metro Manila is the result of travel restrictions imposed during the pandemic. At the onset, the Philippine government imposed an enhanced community quarantine (ECQ) in Luzon from March 16, 2020 to May 15, 2020. The ECQ is a lockdown that restricted peoples' movement by implementing strict home quarantine measures and prohibiting all forms of public transportation. Government employees and the private sector were forced/advised to work from home. Schools were shut down.

Metro Manila and some parts of Luzon remained under modified ECQ (MECQ) from May 16, 2020 to May 31, 2020, as stipulated in IATF Resolution No. 37 s. 2020. This allowed some industries to operate at full operational capacity. Peoples' movement is still severely restricted, but mass gatherings limited to five individuals were allowed. Eventually, on June 1, Metro Manila and some regions shifted to general community quarantine (GCQ), while the rest of the country to modified GCQ (MGCQ), in accordance with IATF Resolution No. 41 s.2020.

In June, during the GCQ, only a handful of public utility buses (PUBs) and minibuses were allowed back on the road. It was only on July 3, or four months after jeepneys were told to cease operations, that they could operate again in the Metro. The jeepneys, however, ceased operations again from August 19 to September 3, when Metro Manila reverted to a stricter community quarantine. Eight months after the lockdown, only 70 percent of jeepneys in Manila were operating in a limited capacity as of end-November [Alegado and Calonzo 2020]. At present, the country remains under varying levels of community quarantine, imposing varying restrictions on public mobility and business operations.

When the pandemic hit Metro Manila, the government was in the middle of building new infrastructures and implementing new transportation policies to address the worsening traffic problems in the Metro. The government, with the support of various international agencies, devised two important public transportation plans before the pandemic, that aim to improve transport conditions. One study supported by the Japan International Cooperation Agency (JICA) focused on developing the transport infrastructure in the Greater Central Region (GCR)[1] to facilitate urban growth and expansion of Metro Manila [JICA 2014]. The other study, published by the Department of Transportation (DOTr), presented a plan to modernize the jeepney fleet [Mettke et al. 2016].

With the pandemic, new transportation issues emerged. The government must ensure that the public transportation sector operates at least at the minimum to meet the basic societal needs. It is necessary to bring essential workers who do not have private transportation to their workplace. Moreover, it is utilized by the public to access essential services and medical facilities. However, public transportation is a high-risk environment for spreading the disease during a pandemic. This is due to the high volume of people confined in a space with limited ventilation, no mechanism to identify potentially sick people and a variety of common surfaces to touch [UITP 2020]. Hence, there is a need to limit movement to essentials and to impose public health protocols that will reduce the spread of the disease in various modes of public transportation. In doing so, a significant number of individuals who are employed in the sector may be adversely affected. There are about 55,000 jeepney drivers in Metro Manila alone in 2016 [Mettke et al. 2016] and about 40,000 individuals[2] employed in the public bus sector.

As we can see, public transportation plays an important role even in the context of a pandemic. Government priorities must be realigned to address the emerging concerns. Particularly, the government must ensure that the public transportation system continuously transports goods and people while simultaneously ensuring that the disease does not spread, and families that rely on the sector for a living are sufficiently supported. In this paper, we examine the appropriateness of the road-based public transportation policy responses of the government implemented in Metro Manila during the COVID-19 pandemic using a multi-dimensional framework that will look at the economic, social, environmental, and health dimensions of the public transportation system.

2. Public transportation and the pandemic

A sustainable public transportation system is multi-dimensional. The economic, social, environmental, and health dimensions of the society must be carefully taken into account when planning for a public transportation system especially during the pandemic [Ibold, Medimorec, Wagner, and Peruzzo 2020]. The economic aspect deals with the productivity, operational activities, and efficiency of the sector and the society. The social aspect is concerned with

[1] National Capital Region (NCR), Regions III and IV-A

[2] If we assume that there are 3 employees hired for a single public bus - the driver, conductor, and a support staff - with around 13,000 buses plying in the capital, the public bus sector already employs around 40,000 people in Metro Manila alone.

the promotion of equality, accessibility, cultural and historical values of the society, inclusive mobility, and connectivity, among others. The environmental aspect deals with the management of emissions, climate change, biodiversity, ecosystems, and even noise pollution. Lastly, the health aspect deals with the promotion of public health such as the management of a pandemic, prevention of its future occurrence, and the management of air quality due to particulate matter emissions [Pitsiava-Latinopoulou and Iordanopoulos 2012].

To achieve a socially desirable mix and degree of economic, social, environmental, and health dimensions in public transportation, the sector's demand and supply factors are accordingly managed. During this pandemic, ways to control the sector's demand and supply became more prominent. Demand factors include the imposition of lockdowns and travel restrictions, adoption of social distancing measures, promotion of work-from-home arrangements and distance learning, promotion of active modes of transportation, adoption of appointment systems, and shift to online shopping, among others (ADB [2020]; Ibold et al. [2020]; Muley, Shahin, Dias, and Abdullah [2020]; Tirachini and Cats [2020]). Supply factor includes the management, creation, abolition of transport terminals and routes, determination of service frequencies and capacities of public transport, scheduling of transport services, allocation of bike lanes, and imposition of measures to prevent the spread of diseases in public transportation. This may include the use of queuing strategy, proper layout, and spacing in terminals to manage crowds, disinfection, physical distancing, contact tracing, testing of passengers, disinfection, health check-ups of employees, among others (Cani [2020]; Gkiotsalitis and Cats [2020]; Ibold et al. [2020]; Rubiano and Darido [2020]; Tirachini and Cats [2020]).

Government response during a pandemic can usually be divided into three phases: response, recovery, and rejuvenation [ADB 2020]. The response phase will largely consider the health and social dimensions in public transportation. Government wants to contain the spread of the virus while making sure that essential services are still provided, and public transport providers are supported. During this phase, government must ensure that essential services are accessible and essential workers are able to access public transportation while, at the same time, protects passengers and public transport service providers alike by imposing public health protocols such as the mandatory wearing of protective equipment, implementation of social distancing, disinfection, contact tracing, and constant health monitoring [ADB 2020]. Governments may also include provisions of alternative modes of transportation to move people and goods effectively [Rubiano and Darido 2020]. Some countries encouraged active transport/non-motorized transport, increasing access to bikes through financing and bike-sharing programs [Pardo 2020]. And just like other sectors that are badly hit by the pandemic, policies to support the financial recovery of public transport operators may be adopted. This may include liquidity support (supply-side subsidies or adjustment of fares), low interest loans to support short-term financial needs, assistance to informal transport service providers including formalization or exit strategies, restructuring of fare structure and booting of complementary/non-fare sources of funding like real estate, advertising or parking charges, review/renegotiation of contracts according to new financial reality of companies (including policy on upgrading fleets), among others [Rubiano and Darido 2020].

In the recovery phase, when health conditions have improved, the health and social dimensions are complemented with some economic and environmental aspects. Aside from the continued monitoring, evaluation, and improvement of response measures, government may already start to relax several mobility restrictions and further promote active modes of transportation to cater to the increasing transportation needs of people. In the rejuvenation phase, all dimensions are now more equally considered. This phase includes the further improvement of the quality of operations and services of public transport, redesigning the public transport system, mainstreaming of effective measures in standard operating procedures, among others [ADB 2020].

3. Transportation policies before COVID-19

The current transportation modernization plan of the government is guided by two important documents which were crafted before the onset of the COVID-19 pandemic. One is the report from JICA and the National Economic Development Authority (NEDA), discussing the comprehensive plan for transport development in Metro Manila and the adjourning regions of Central Luzon and CALABARZON. It was intended to guide the short-term and medium-term transport investment priorities to properly manage urban growth in Metro Manila [JICA 2014]. The other report was published by the DOTr, discussing the modernization plan for the jeepney industry [Mettke et al. 2016].

The JICA-NEDA paper assumed the continuous expansion of Metro Manila to become the Greater Capital Region (GCR), which will include Regions III and IV-A. The plan is guided by both regional-level and Metro-level sustainable development strategies. Regional-level development strategies include the promotion of a balanced development of agriculture, manufacturing, and services in the regions, prevention of urban sprawl, development of regional growth centers, and the improvement of connectivity and public transport services within and between regions, among others. Metro-level development strategies on the other hand, include the guided expansion of the Metro, improved access to affordable housing and improved living environment especially for low-income groups, development of a multi-modal public transport system, and the implementation of better traffic and demand management, among others. Since the transport sector plays an important role in these development strategies, the JICA-NEDA study crafted a transport development plan which includes the decongestion of Manila seaports, development of new gateway airports, and the reorientation of Mega Manila's road network structure through the construction of connector expressways and suburban railways and the rehabilitation of existing radial-circumferential road systems. Moreover, it proposes the improvement of road-based public transport and traffic management, which will include the need to rationalize terminals and interchange facilities "to improve the accessibility and mobility of road-based public transport modes and lessen the traffic congestions" [JICA 2014]. The report noted the huge number of bus companies, and their individual bus terminals, and jeepneys in Metro Manila and recommended a comprehensive approach in modernizing the bus and jeepney systems and their services [JICA 2014]. Some components of the JICA plan are currently implemented, such as the LRT 2 East Extension Project, MRT 3 Capacity Expansion, MRT 7 Transit Line (North Ave. to San Jose Del Monte), South Integrated Transport Terminal, Southwest Integrated Transport Terminal, Skyway Stage 3, among others [JICA 2019].

The jeepney modernization plan of the DOTr, on the other hand, aims to establish a modern, sustainable, and climate-friendly road-based public transport fleet to realize short- and medium-term mitigation effects, complement the existing improvements in the mass public transportation system, and limit the motorization trend of the country [Mettke et al. 2016]. This plan will be realized by implementing structural changes in the public transportation sector and renewing the existing jeepney fleet to higher capacity vehicles. Structural changes in the sector includes the introduction of joint fleet management, franchise consolidation and reform, re-organization of public transport planning and regulation, and utilization of technology to manage public transport operation. Renewal of existing fleet to higher capacity vehicles include the imposition of age limit and vehicle standards for jeepneys and the introduction of financial incentives to modernize and consolidate fleets. The implementation of the modernization plan consists of four components, namely: 1) creation of a National Transport Policy, 2) reorganization of transport institutions, 3) development of a consolidated public transport network and service plan for Metro Manila, and 4) consolidation and modernization of the jeepney fleet [Mettke et al. 2016]. Some components of the plan were already completed, such as the formulation of the National Transport Policy (NTP), which was approved in 2017 [NEDA 2018], and the development of a consolidated public transportation plan for Metro Manila (e.g. JICA-NEDA study). On the other hand, there are components that are still ongoing, such as the consolidation and modernization of jeepney fleet, as ordered in the Department Order (D.O.) No. 2017-011 of the DOTr, which is also known as the Public Utility Vehicle Modernization Program (PUVMP) [DOTr 2017a; 2017b].

The 7,700 provincial buses entering Metro Manila motivated the government to fast track the establishment of common provincial bus terminals to replace the individually-owned terminals within the metropolis [JICA 2014]. This undertaking started during the Aquino Administration with the issuance of Executive Order

(E.O.) No. 67, s.2012 and Administrative Order (A.O.) No. 40, s.2013, which both stipulate the establishment of integrated terminals in the north and south of Metro Manila. Currently, Public-Private Partnerships (PPP) have already commenced for the Southwest Integrated Transport System (Paranaque Integrated Terminal Exchange), South Integrated Transport System (Taguig Integrated Terminal Exchange), and North Integrated Transport System (North Luzon Express Terminal) [Public-Private Partnership Center 2019a; 2019b]. With D.O. No. 2017-011 of the DOTr, all provincial buses bound for Metro Manila should end their routes at these integrated transport terminals when already available.

D.O. No. 2017-011 of the DOTr also laid out a transportation policy geared towards "environmentally-sound mobility solutions." The Department wanted to promote high quality public transportation systems, including non-motorized transport,[3] and prioritize the movement of goods and people, instead of vehicles, guided by the principles of reliability, safety, accessibility, environmental soundness, and comfort. To realize this feat effectively and efficiently, the Department taps the local government units' (LGUs) local knowledge. Under the D.O., LGUs are mandated to craft their respective local public transport route plan (LPTRP), which shall contain lists and maps of existing and proposed public transportation routes and available transport facilities. These LPTRPs shall focus on the movement of people, not vehicles, and shall be the minimum requirement for the issuance of franchises.

In the same year, 2017, the government also approved the National Transport Policy (NTP), which will serve as a comprehensive guide to all elements of the transport system in developing, managing, operating, and utilizing the national transportation system. With a vision of safe, secure, reliable, efficient, integrated, intermodal, affordable, cost-effective, environmentally sustainable, and people-oriented national transport system, the NTP provides guidance on the following policy focus areas of transportation: a) resource generation, allocation and cost sharing, b) program and project selection, c) cost recovery and subsidies, d) regulation of passenger transport services, e) transportation management in urban and regional areas, f) support to other economic services, and g) governance and institutions. The NTP ensures the effective and efficient inter-government and local government coordination in providing or promoting intermodal connectivity among transport infrastructures, good governance in the transport sector, green and people-oriented transport systems, and new economic growth centers and transport infrastructure investments [NEDA 2018].

In realizing these plans, international development partners, such as the Asian Development Bank (ADB), Australian Agency for International Aid (AusAID), JICA, and World Bank, among others, provide support in developing the country's

[3] The policies for the use of non-motorized vehicles are embodied in a Joint Circular issued by the Departments of Health (DOH), Transportation (DOTr), Local Government (DILG), and Public Works and Highways (DPWH). See Joint Administrative Order 2020-001 (August 19, 2020).

transport sector. The support of these institutions aims to address the problems brought by insufficient financing, weak institutional capacity of transport institutions, low productivity in road administration, weak governance, and low private sector participation in the sector. For one, ADB's strategy for the Philippine transport sector makes sure to support inclusive and sustainable growth and the government's priority investment program. ADB does this by undertaking four key areas of intervention: 1) improving the national highways, 2) developing urban transport, 3) strengthening sector governance, and 4) facilitating private sector infrastructure development [ADB 2012].

4. Pandemic response

The pandemic altered the national government's transport policies through the IATF Resolution No. 101, s.2021. The national government, through the Inter-Agency Task Force for the Management of Emerging Infectious Diseases (IATF), approved the "minimum travel protocols for land, air, and sea" and adopted public health standards, which include social distancing and some basic hygienic practices (e.g. wearing of masks and face shields, proper hand hygiene, etc.), and the guidelines on testing for travelling. The IATF resolution also reiterated the mandatory utilization of the Integrated Terminal Exchange to all buses bound for the provinces from NCR, and vice-versa, instead of their respective private terminals, to serve as the central hub of transportation.

The Land Transportation Franchising and Regulatory Board (LTFRB) also issued the specific Guidelines for Public Transportation for Areas Under General Community Quarantine (GCQ), through LTFRB Memorandum Circular (M.C.) No. 2020-017, effective May 1, 2020. With the M.C., capacities of different modes of public transport are reduced to observe social distancing. PUBs and public utility jeepneys (PUJs) are allowed to load only half of the vehicle's capacity, while UV express services can load only up to 2 passengers per row. Safety and sanitary measures, for both passengers and drivers before and after using the public transport system, are also implemented such as the wearing of face masks, safe fare collection protocols, mandatory temperature monitoring, disinfection, installation of non-permeable transparent barriers between seats, and contact tracing protocols, among others. Moreover, the M.C. stipulates that the operation of a public transport must first be approved by the DOTr, where PUBs will be the most preferred mode, followed by tourist buses, OFG-compliant PUJs,[4] UV express, traditional PUJs, and lastly, tourist vans. The guidelines also indicate the minimum fare for PUBs and PUJs.

With respect to PUBs, the LTFRB issued Memorandum Circular No. 2020-019. The order was issued in preparation for the shift of the National Capital Region (NCR) from ECQ to GCQ. The policy rationalized routes that need to be served

[4] The Omnibus Franchising Guidelines (OFG) specify the requirement for modern jeepneys.

under GCQ and identified the technical requirements necessary to meet the health and safety requirements under the existing public health emergency [LTFRB 2020]. The order also indicated the preference towards an area-based fleet-managed single operator who can provide all the required number of compliant units. If there is no single operator that qualifies, the area-based operators must consolidate, as only one operationally consolidated group shall be allowed per route. The qualified operator must have a fleet management system and must meet the specifications for the bus units. The buses must be registered and have a valid Personal Passenger Insurance Policy. They must be equipped with global navigation satellite system (GNSS) to ensure monitoring of movement of units. Automatic Fare Collection System (AFCS) is encouraged for cashless transaction. The units must not be more than fifteen (15) years old. Also, units that are given special permits for EDSA Loop Service must also be low floor, low entry airconditioned bus with two doors. LTFRB also issued Memorandum Circular Nos. 2020-023 and 2020-026 to prepare the operations in the Metro of OFG-compliant jeepneys and traditional jeepneys, respectively. Under these two Circulars, preference has been granted as well to consolidated operators to ply the identified routes.

In supporting public transport providers adversely affected with the new guidelines due to the pandemic, IATF Resolution No. 69 s.2020 and Republic Act No. 11494, also known as Bayanihan to Recover as One Act, contain policies to support public transport operations. The policies stipulate the implementation of a service contracting scheme for PUVs to partially subsidize public transport operations, incentivize PUV operators to return to service, and restore the livelihoods of the transport workers. In the contracting scheme, in exchange for providing transport services during the pandemic, the government will be paying operators and drivers of PUVs based on vehicle-kilometers travelled [DOTr 2020]. The total amount allotted for the support is nearly ₱5.6 billion.[5]

Government also issued guidelines promoting the use of some active modes of transportation. DOTr Department Order No. 2020-14 and DOH, DOTr, DILG, and DPWH Joint Administrative Order No. 2020-001 identify policies that govern how vehicles should share the road with cyclists, provide safety protocols for active transport users, direct the construction of bicycle lanes, walking paths, and other

[5] Under Section 10 of the Bayanihan to Recover as One Act (Republic Act No. 11494 [2020]), the funds raised shall be used for the response and recovery interventions for the COVID-19 pandemic authorized in this Act and the following…

(g) Nine billion five hundred million pesos (₱9,500,000,000.00) to finance the following programs of the DOTr:

(1) Two billion six hundred four million pesos (₱2,604,000,000.00) to assist the critically impacted businesses in the transportation industry;

(2) Five billion five hundred eighty million pesos (₱5,580,000,000.00) to provide temporary livelihood to displaced workers in the industry through service contracting, regardless of quarantine levels, of public utility vehicles, as provided in this Act, as follows:

(i) Three billion pesos (₱3,000,000,000.00) for public utility jeepney drivers; and

(ii) Two billion five hundred eighty million pesos (₱2,580,000,000.00) for drivers of other public utility vehicles.

(3) One billion three hundred sixteen million pesos (₱1,316,000,000.00) to develop accessible sidewalks and protected bicycle lanes, procurement of bicycles and related safety equipment for bicycle distribution, sharing and lending programs, and procurement of bicycle racks.

support infrastructure, among others. In the Bayanihan to Recover as One Act, around ₱1.3 billion is allocated to develop accessible sidewalks, protected bicycle lanes, and other active mode transport support infrastructure.

Even with the pandemic, the government continued to pursue its 'Build Build Build' (BBB) program notwithstanding the lower budget for the projects. This is to help boost the still feeble economy by creating jobs and attracting investments, while at the same time, improving connectivity and mobility, assisting in containing the pandemic, and facilitating balanced development across the country. In doing so, the government reprioritized the infrastructure investment program and added projects that are adapted to the 'new normal', which include the enhancement of internet connectivity, digital economy, health care systems, and non-motorized transport infrastructure in the country [Malindog-Uy 2020]. Some BBB projects that are ongoing, or even completed, this pandemic, include the construction or renovation of several bike lane networks (in Metro Manila, Metro Cebu, and Metro Davao), expressways and roads (e.g. Tarlac-Pangasinan-La Union Expressway Rosario Exit, Laguna Lake Highway, Skyway Stage 3, BGC-Ortigas Center Link Roads, Alabang-Sucat Extension, Urdaneta City Bypass Road), bridges (e.g. Binondo-Intramuros Bridge, Estrella-Pantaleon Bridge), railways (e.g. LRT2 East Extension, LRT1 Cavite Extension), and airports (Malindog-Uy [2020]; Patinio [2021a; 2021b]; Rey [2021]). The government reiterated that existing health protocols must strictly be observed to prevent the spread of the disease, to seamlessly continue the infrastructure program [de Vera 2021].

5. Policy analysis/discussion

The government-issued transport policies during this pandemic, in general and in principle, are consistent with the recommended transport policies, based on the literature, that must be implemented during such crisis. Health and social aspects were given top priority, especially during the onset of the pandemic. Health protocols which are consistent with WHO's standards in public transportation were implemented. Assistance was given to public transport providers to support them and ensure their continuous services. Moreover, alternative modes of transportation have been promoted (i.e. walking and cycling) to accommodate additional transportation demand and promote environment-friendly solutions. The actual implementation of these policies, however, may be ineffective. For instance, a progress report submitted by the DOTr to Congress indicated that only 0.72 percent of the 5.58-billion-peso budget allotted to assist the transport sector has been utilized as of April 15, 2021 [Office of Senator Francis Pangilinan 2021]. The budget is for the Service Contracting Program which was intended to aid PUV drivers during the pandemic.

The government's decision to reprioritize and push through with its BBB program, particularly for transportation infrastructure, is also a welcome development since it helps alleviate the social and economic problems of the country by providing employment and by attracting investments. The success of this program, however, is conditional on the strict implementation of the health protocols, improved capacities of implementing agencies, and the enhanced safeguard against corruption for these projects (de Vera [2021]; Laforga [2021]; Rivas [2020]).

Aside from trying to meet the huge health, economic, and social demand of the pandemic for safe and sustainable public transportation services, the government took the pandemic as an opportunity to implement other transportation modernization policies which are better implemented after the pandemic or in the recovery or rejuvenation phase. The implementation of these is a bit ill-timed, considering the operational limitations, and the health and economic challenges everyone is experiencing, even though these projects and policies are consistent with the government pre-pandemic transportation plans. These modernization policies include the mandatory utilization of the integrated terminals, the consolidation of public transport operators, and the modernization of jeepneys.

5.1. Mandatory utilization of integrated transport terminals

Integrated terminals are envisioned to provide effective and efficient interconnections between different modes of transportation to improve travel time and travel experience of road users, and reduce overall network transport costs (MMDA [2014]; Pitsiava-Latinopoulou and Iordanopoulos [2012]). Currently, only the Southwest Integrated Transport System (Paranaque Integrated Terminal Exchange) and North Integrated Transport System (North Luzon Express Terminal) are operational, where the latter was just recently completed. It must be noted that these projects are consistent with the aforementioned JICA-NEDA study, NTP, and other government policy issuances (e.g. D.O. No. 2017-011 of the DOTr) that aim to improve the transport system. However, the rush to implement the utilization of these terminals during the pandemic, especially the North Luzon Express Terminal (NLET), nullified their supposed benefits. The haste to utilize NLET defeated the intermodality aspect of an integrated terminal since the only option of passengers to enter Metro Manila from NLET is via P2P buses [Provincial Bus Operators Association of the Philippines (PBOAP) 2021]. This translates to various additional costs incurred by the commuting public and transport providers. The case is different for the Paranaque Integrated Terminal Exchange (PITX), where buses and jeepneys connect the Terminal to the Metro.

The mandatory use of the integrated terminal has cost implications for passengers who require multiple transfers towards their destinations. Table 4 illustrates the increase in fare to passengers coming from the north if PUBs are required to use the NLET. From this table, we see an increase in transportation cost ranging from 22 percent to 96 percent due to the mandatory use of NLET and subsequent multiple modes of transportation to reach their destination. Aside from the cost of transportation, the travel time of passengers will be greatly altered. This arrangement will approximately increase the travel time of a passenger by four hours [Provincial Bus Operators Association of the Philippines (PBOAP) 2021].

The inconvenience brought about by the mandatory utilization of the integrated terminals by the provincial buses has pushed passengers to switch to unregulated "colorum" vans or private vehicles that charge three to seven times the fare of a regular bus trip, as shown in Table 5. Colorum vehicles do not require the usual health protocols. They also need not use the integrated terminals. Hence, they can transport passengers directly to Metro Manila, which reduces the number of transfers to reach their destinations. This translates to a more convenient and shorter travel time. However, colorum vehicles put passengers and the community at greater risk by increasing the possibility of spreading the disease and forcing passengers to use vehicles that are inefficient and less safe on the road [Kennedy 2002].

TABLE 4. Estimated additional fares (in pesos) of a passenger bound for Cubao due to mandatory utilization of NLET

Route	Original Fare to Cubao (1)	Add: Fare from ITX to Trinoma (North EDSA) (2)	Add: Fare from North EDSA to Cubao (3)	Subtotal of Additional Fares (4 = 2 + 3)	% Increase in Fare (5 = 4/1)
San Fernando	111	90	16	106	96%
Angeles	148	90	16	106	72%
Dau	152	90	16	106	70%
Tarlac	218	90	16	106	49%
Cabanatuan	202	90	16	106	52%
Gapan	163	90	16	106	65%
Olongapo	226	90	16	106	47%
Guagua, Pampanga	128	90	16	106	83%
San Miguel, Bulacan	144	90	16	106	74%
Dagupan	381	90	16	106	28%
San Carlos	361	90	16	106	29%
Baguio	485	90	16	106	22%

Source: Provincial Bus Operators Association of the Philippines (PBOAP), 2021.

TABLE 5. Comparison of bus fares and colorum private vehicles fares (in pesos)

Route	Bus Fare	Colorum Fare
Manila - San Fernando, Pampanga	150	500-1000
Manila - Dau, Mabalacat, Pampanga	163	500-1000
Manila – Dagupan, Pangasinan	392	1200
Manila - SM Rosales, Pangasinan	316	1500
Manila - Alaminos, Pangasinan	438	1,800
Manila – Cabanatuan, Nueva Ecija	213	1000
Manila - Gapan, Nueva Ecija	174	800
Manila - Santiago City, Isabela	437	2000
Manila – Tabaco, Albay	900	2500
Manila - Legazpi, Albay	950	2500
Manila - Sorsogon	1050	3500
Manila - Masbate	1300	3500

Source: Data gathered by researchers through queries to various carpool service providers

Another detrimental health implication of imposing the mandatory utilization of the integrated terminals during this pandemic is the higher degree of congregation and interaction between passengers during travel, increasing the risk of spreading COVID-19. For example, passengers from the north, who will congregate at NLET will be from Ilocos Norte, Ilocos Sur, La Union, Benguet, Pangasinan, Zambales, Bataan, Pampanga, Bulacan, Nueva Ecija, Nueva Vizcaya, Aurora, Benguet, Ifugao, Mountain Province, Kalinga, Abra, and Apayao. These passengers will then take multiple ride transfers using the Metro Manila buses, or worse, the more confined and less regulated public utility vehicles or vans to travel in and out of the Metro. These pose greater risk of rapid and more widespread transmission of the COVID-19 virus within Metro Manila and to the provinces with significantly lower and more contained infection rates. This contrasts with the safety and convenience by instead allowing provincial buses to temporarily use their terminals within Metro Manila during the COVID-19 pandemic.

Finally, requiring the bus companies to use the NLET also has cost implications for the transport providers. These must set up maintenance bays and offices in or near the new terminal. Furthermore, bus companies will pay a terminal fee for utilizing the facility. This transport policy is ill-timed considering the imposition of routes rationalization and the required reduction in passenger capacity by 50 percent due to the pandemic. Moreover, the number of provincial buses plying the Metro as of January 2021 is reduced to 1,803 buses, which is significantly lower than the pre-pandemic level of around 7,000 buses [Esmael 2021]. The bus industry is already suffering from income losses and the imposition of the mandatory utilization of integrated terminals makes it worse. As a result of the policy separating buses from their existing maintenance bays, road accidents may be more likely because pre-departure inspections will be done less frequently and less intensely.

5.2. Forced consolidation of public transport operators to qualify for special permits

The requirement of consolidating public transport operators before providing them with permits this pandemic is also consistent with the pre-pandemic transport plans and policies of the government, such as the DOTr jeepney modernization plan [Mettke et al. 2016] and D.O. No. 2017-011. NTP subtly supports this policy by promoting the implementation of a suitable business model for public transport that ensures passenger welfare and safety [NEDA 2018]. This forced consolidation policy, however, may go against the economic and social dimensions of public transportation, especially when implemented this pandemic. This requirement essentially replaces existing franchises with new ones. Moreover, the policy requires acquisition of new PUVs with new features.[6] This consolidation will create additional costs to transport providers, who are already severely affected by the pandemic. While the intent of this policy is good because it will streamline the management of public transportation, these are unnecessary policies during this pandemic that will only result in further loss of livelihood for the transport providers and their workers.

Forced consolidation of bus companies to qualify for special permits to ply transportation routes also raises legal questions. A State directive to compel private corporations to consolidate may violate their rights to liberty and due process. Article X, Section 16 of the Constitution also prohibits Congress to pass specific laws that “provide for the formation, organization, or regulation of private corporations.” Private corporations are created only by general law and in relation to this, the Revised Corporation Code does not grant the State the power to compel the consolidation of private corporations. The Revised Corporation Code grants the power to merge and consolidate to the private corporation themselves [Revised Corporation Code 2018].

5.3. Modernization of the jeepney fleet

LTFRB M.C. No. 2020-017 stipulates that DOTr will prefer buses, modern jeepneys, and UVs more than traditional jeepneys in granting approval to public transport providers to operate in a certain route. This modernization plan is again consistent with the pre-pandemic transportation plans and policies of the government that aims to improve the transport system (i.e. JICA-NEDA study, DOTr jeepney modernization plan, D.O. No. 2017-011, NTP). However, implementing this modernization policy now is ill-timed, considering the economic, social, and health challenges that transport providers, and even commuters, experience.

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[6] For EDSA Loop Service must also be low floor, low entry airconditioned bus with two doors.

Jeepney drivers have expressed their concerns on this government's preference for the so-called modern jeepneys over the traditional jeepneys, even during this pandemic [Pazzibugan 2020]. This policy can be understood as a subtle way of the government to eventually phase out traditional jeepneys amidst this crisis. Prior to the pandemic, the jeepney modernization plan of the government has already been criticized because jeepney drivers and operators cannot afford the modern jeepneys. Since this sector is mostly operated by small-scale operators, government subsidy is necessary to implement the modernization scheme [JICA 2014]. Legislators already questioned the readiness of the government to implement such plan [ABS-CBN News 2017]. Moreover, a recent study by UP Center for Integrative and Development Studies (UP CIDS) identifies the high price of modern jeepneys as the 'blind side' of the government jeepney modernization plan. This high price per unit of the said vehicles translates to a higher yearly payment for the drivers and operators, which might have a domino effect of higher jeepney fares that are detrimental to society. It is then suggested that traditional jeepneys and modern jeepneys must instead co-exist in the short-term, where the former is subjected to rigid quality standards [Mendoza 2021]. However, the government chose to push through with this jeepney modernization plan and gave preference to modern jeepneys to operate during this pandemic. It is already unlikely for small operators to afford the modern jeepneys and to force this now is even more unbearable.

6. Conclusion

Overall, the imposition of public transportation health protocols, provision of assistance to transport providers, and the promotion of non-motorized transport shall continue. This will enable the industry to effectively carry out its function during this pandemic. Moreover, the construction of transportation infrastructure should continue as this will help create employment and livelihood during this health crisis. However, aspects of the modernization and rationalization plan should be put on hold. While the intent of the three transportation policies mentioned in the preceding section were good and noble, the government forcing the implementation of these during the pandemic makes the industry and the public worse off in many ways. What the government should prioritize instead is the effective implementation of health protocols to stop the spread of disease, ensure public transport for essential goods and services, and minimize the losses of the sector by providing support. Forcing them to transfer their terminals, upgrade their vehicles, and consolidate into one legal entity now, will only incur the industry additional costs which they cannot absorb having been operating at a loss during the pandemic. The riding public, consequently, will have less transport services available, further restricting their mobility, and will bear greater transportation and health costs as well. The use of central terminals now may also go against the health protocols imposed to reduce the spread of the disease. Again, these modernization and rationalization policies have good intentions and are consistent with various medium and long term government transport plans. However, it will be better to implement these when the country has seen through the pandemic and the sector has recovered from economic losses brought about by the health crisis.

To prevent and effectively manage the future occurrence of such health crisis, it is now vital to include the public health criterion in the planning of the transport system. In the NTP, land use and urban transport planning are mandated to be integrated to effectively manage growth in urban areas while, at the same time, ensuring adequate capacity of transport services and facilities [NEDA 2018]. With the COVID-19 pandemic, it is now imperative to incorporate the public health dimension in these integrated plans to prepare us for these health crises, if not prevent them from happening at all. The same public health criterion must be added to the project selection guidance of the NTP. With this in mind, the cost implications of a possible future pandemic must now be considered in the cost-benefit analyses of every transport project and policy.

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