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Competition, Regulation and Institutional Quality

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Abstract

Regulation and competition policy are two alternative modalities by which the state intervenes in the market. In order for either to deliver welfare gains, there must first be a pre-existing market failure. We first present different varieties of market failures and identify those for which regulation is best address (cooperation failures such as The Fishing Game and the Public Goods Game, scale economies-based failures such as a Natural Monopoly and Meta-Market Failures) and those where competition policy works better (market power-based failures such as an artificial monopoly or cartel). We also discuss those market failures which cannot be remedied by an imperfect state. We show graphically the welfare outcomes of various industrial organizations (monopoly, duopoly, Walrasian limit) under the symmetric Cournot competition. We also deal with the welfare implications of imperfect substitutability. We then discuss some welfare implications of the Bertrand competition, its effect on innovation and on the formation of 'trusts'. We present reasons why competition policy is better than regulation in jurisdictions where institutions are weak. The reasons are: information intensity and asymmetry being greater with regulation, the greater ease of capture of the organs of regulation and, finally, the presence of private players who serve as allies of the competition agency and help monitor abuse of market power.

JEL Classification: K21, L51, L41, L44

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1. Introduction

Although most of the world since the 1990s has retreated from *dirigiste* or state allocation to market allocation of resources in view of the overall superior performance of market economies in the second half of the 20th century (see, e.g., Yergin and Stanislaw, 1998), markets left to their own devices many times fail to deliver the best social benefit that is feasible given taste, resources and technology. In the face of market failures, state intervention *could* improve the market's performance vis-à-vis inclusion and consumer welfare. Regulation and competition policy are alternative state interventions employed intendedly to heal market failures. The good intentions may however only litter the path to perdition (government failures) when interventions are combined with weak institutions.

Market failures represent foregone but attainable social welfare and as such are the object of state intervention in the market. Without a pre-existing market failure, no state intervention will deliver any improvement in welfare.

Market failures come in many flavors. Some market failures are better addressed through regulation; some others are better addressed through enhancing competition; still some others are better left well alone. The sphere of efficient use of one intervention or the other is determined first by the technical nature of the market failure itself and second by the capability of the institutions that implement the intervention. The latter consideration if ignored or unaccounted for can lead to intervention (alternatively, *government*) failures.

There are different responses to a market failure that the state may employ. The most common in many less developed countries is regulation. Typically, regulation employs rules of behavior and corresponding penalties that bind on a firm or on all firms in an industry (Shogren, 2002). Regulation itself comes in many forms: as legal statutes or enactments granting a franchise or vesting the oversight of an industry upon an agency or as a panoply of rules under the rubric of industrial policy. Thus, the Energy Regulatory Council (ERC) enforces rules of behavior for DUs (performance indices, approval of price charged captive consumers, rules on procurement of PSAs). Competition policy is a relative late comer in developing countries. Typically, competition policy seeks to enable competitive discipline by facilitating actual or potential entry of players in the market or preventing any action that whittles competition, i.e., by limiting the number of players in the market (through say, M & A) or to punish overt or covert abuse of market power by dominant players. The canons of competition policy are well known (Shogren, 2002; Lee, 2007; Cook, 2004). What is imperative for the outcomes to meet expectations is the indigenization of these canons to fit local conditions. Importation and adoption of these canons raw from developed economies can be counterproductive (De Leon, 2000). Finally, state ownership is another response to scale economies-based market failures which used to be center stage in the immediate post-World War II period but has now thankfully retreated to the sidelines.

The aim of this paper is elucidation of the role of local institutional quality and local context in the choice of intervention to fix a market failure. To provide a secure footing for the enquiry, we first give a flavor of the evidence associated with enhancing competition.

A Flavor of the Empirics on Competition Policy

Why should we be concerned with competition policy and competition law? The literature on the effects of competition and competition policy is very extensive and we here give only a flavor. There are three outcomes of interest: economic growth, innovation and total factor productivity.

Gutmann and Voigt (2014) have shown that the enactment of competition law as well as the duration of its operation partly explains growth, FDI and productivity growth. This is just the latest in a long line of corroborating results. Dutz and Hayri (1999) find a positive link between measures of competition law effectiveness and GDP growth using a cross-section of 52 countries. Clougherty (2010) finds a relationship between funding as a proxy of a country's commitment to competition policy and economic growth. Likewise it is now canonical that innovation effort among firms is quickened by competition and is summarized by the 'Inverted U Hypothesis' (Aghion, et al., 2004). Evidence of the positive response of total factor productivity to greater competition abound (Nickell, 1996; Disney, Haskell and Heden, 2003; Koke and Renneboog, 2005; Bloom and Van Reenen, 2007; OECD Factsheet, 2014).

We next provide the reasons why such empirical regularity makes intuitive sense. We begin with varieties of market failures.

2. Market Failures

A market failure exists when the pursuit of self-interest by the players in a *laissez faire* (alternatively, *Invisible Hand*) exchange situation results in an inferior social outcome given taste, technology and resources. By *laissez faire* exchange we mean exchange situation where the outcome is determined purely by the actions of the players un-fettered by the action of an *outside* (alternatively, *third*) party. A feasible social outcome superior to the status quo must exist which however is not attained consequent to the logic of player self-seeking acting on the payoffs. To illustrate these ideas, we employ an iconic social dilemma game called 'The Fishing Game' which is representative of a family of market failures called 'cooperation failures'.

The Fishing Game

The Fishing Game has two players, Ambo and Berto. Both earn their living by fishing in the same body of water. Each pursues his own self-interest, that is, prefer a large a payoff to a small one. Both can fish using either Nets (*N*) or Dynamites (*D*). The game is represented by **Table 1** below. In **Table 1**, there is no state that regulates fishing in the area (*Invisible Hand* regime). The payoffs given in the table are assumed present values of a lifetime stream of incomes (the presentation here follows Chapter 3 of Fabella, 2017b, *Deconstructing Mediocrity, Constructing Coherence*, a forthcoming volume).

Table 1. Payoff matrix of the Fishing Game: *Invisible Hand*

Actors / Actions		Berto	
		<i>N</i>	<i>D</i>
Ambo	<i>N</i>	10, 10	2, 12
	<i>D</i>	12, 2	3, 3

The pair of payoff numbers, say (2, 12), corresponds to Ambo choosing N and Berto choosing D ; first number '2' is Ambo's payoff and the second '12' is Berto's payoff under action pair (N, D). The use of dynamites by players degrades the fish stock and progressively reduces the fishing-related incomes. The game in **Table 1** has the structure of a Prisoner's Dilemma Game of the dominant strategy variety. The action pair (D, D) meaning Berto chooses D and Ambo chooses D , giving payoff (3, 3) is the Nash Equilibrium (indeed the Dominant Strategy Nash equilibrium) of this game because once in (D, D), the players have no incentive to budge—if Ambo stays put at D , Berto who shifts to N loses (gets 2 versus 4). (D, D) is autonomically stable and is unique because no other payoff profile has this property. But there is a payoff (10, 10) given by action pair (N, N) which is feasible for the players and better than the (3, 3) payoff of (N, N). Yet (N, N) will not be attained or if attained perchance does not persist, since (N, N) is not a stable outcome: if the players are at (N, N), one player, say Berto, will do better if he bolts to D (Berto gets 12 instead of 10). Ambo thinks the same way and so will also shift to D . Both will end at (D, D) giving (3, 3) the inferior outcome. Payoff (10, 10) is the socially superior outcome but the game will settle at inferior payoff (3, 3) given by (D, D). Thus, both players pursuing their own self-interest will attain and inferior outcome (3, 3). This makes the game a market failure. All market failures have the thermodynamic character: left to itself a close system moves from a state of order (N, N) to one of maximum disorder (D, D).

Fixing the Fishing Game by Regulation

This Fishing Game market failure will persist until acted upon by an outside force; a regulation in the form of a state-enacted statute that punishes the use of dynamite but also raises the wherewithal (say, a head tax) to finance the enforcement of the statute. We let the statute be $S = (p, c, f)$, that is, the statute S consists of a triple (p, c, f) where:

- (a) $p > 0$ is the penalty to any fisherman who chooses option D ;
- (b) $c > 0$ is the head tax imposed per fisherman to pay for the enforcement of S to be paid regardless of game outcome;
- (c) $f, 0 \leq f \leq 1$, is the probability of enforcement, i.e., of being caught and penalized. The average penalty for malfeasance is thus pf .

The S -modified payoff table is now given in **Table 2**:

Table 2. Payoff Matrix of the S -modified Fishing Game

Actors / Actions		Berto	
		N	D
Ambo	N	$10 - c, 10 - c$	$2 - c, 12 - c - pf$
	D	$12 - c - pf, 2 - c$	$3 - c - pf, 3 - c - pf$

Note that in any payoff profile where D is fielded, expected penalty pf is subtracted from payoff of the agent using D .

For vividness, suppose the state enacts $S = (5, 2, f)$, that is, the penalty for using D is 5, the enforcement probability is f , while 2 is the contribution (tax payment) of each fisherman to finance the enforcement regime. The sum $2 + 2 = 4$ is the transactions cost of statute S .

Institutions and Interventions

a. Strong Institutions

Let's assume initially that the statute S is enforced by a *strong institution* in that every violation (use of D) is detected and punished with probability $f = 1$. Furthermore, the over-arching institution is *benevolent*: it seeks to maximize the welfare of the community with Berto and Ambo as members. The modified payoff matrix is now given in **Table 3**.

Table 3. Payoff Matrix of the $S = (5, 2, 1)$ -modified Fishing Game

Actors / Actions		Berto	
		N	D
Ambo	N	8, 8	0, 5
	D	5, 0	-4, -4

Note that now (N, N) is the Nash (also the Dominant Strategy) equilibrium of the $S = (5, 2, 1)$ -modified game. The after-tax payoff delivered by (N, N) is now $(8, 8) > (3, 3)$, the payoff from (D, D) for the players in the original Fishing Game market failure. Thus, the statute S is now, as it were, a part of the new extended environment.

The statute $S = (5, 2, 1)$ has transformed the game from a Prisoner's Dilemma to a Prisoner's Delight because players' self-interest is served by using N ; from a game with a dominant strategy D for both players to one with a dominant strategy N for both. The crucial outcome is that S has effectively changed the behavior of the players from D to N ; in the process, S has caused the attainment of the social optimum, now $(8, 8)$, for society given S . $S = (5, 2, 1)$ is thus a government success (also a *Visible Hand* success). Each player realizes 8, whereas in the original game absent the state they each realize only 3. The state has transformed a collective action problem into a collective achievement! Such is the magic of strong institutions! The Three Gorges Dam in China is iconic of a massive public goods project that reduced the incidence of killer floods on the Yangtze River from one every ten to one every 100 years and delivered 25,000 megawatt of clean power to boot. In the process, 1.3-million people, 13 cities and 120 municipalities were moved from traditional locations to higher grounds. It would be inconceivable without a strong state behind it.

b. Weak Institutions

Suppose however that the enforcement is weak. In lieu of the original $f = 1$, let $f = 0.10$. That is, the statute is now $S' = (5, 2, 0.10)$. This means that enforcement is so porous due perhaps to the corruption among enforcers that only 10% of violators are ever punished. The payoff matrix is now given by **Table 4**.

Table 4. Payoff matrix of the $S' = (5, 2, 0.10)$ -modified Fishing Game

Actors / Actions		Berto	
		N	D
Ambo	N	8, 8	0, 9.5
	D	9.5, 0	0.5, 0.5

Note that the Nash Equilibrium of the game under original intervention $S = (5, 2, 1)$ was (N, N) giving (8, 8). The Nash equilibrium of the game under S' (**Table 4**) is (D, D) , same as in the original F ; player behavior has not changed. But now due to the transaction cost of the intervention of S' borne by players, (D, D) delivers only (0.5, 0.5) which is worse than (3, 3) delivered by *laissez faire*. For this reason $S = (5, 2, 0.1)$ is called a *state* or *government failure* (also a Visible Hand failure). (N, N) delivers (8, 8) > (0.5, 0.5) but is not a Nash equilibrium. Regulation of the Fishing Game using S' has failed to improve the situation for the players and community and indeed has worsened it. Weak institution is the root cause. We see therefore that the success or failure of regulation depends upon the quality of the implementing agency. Unfortunately in many low income countries, even well-meaning address of market failures can reap a harvest of government failures. Many times, if a task cannot be done well, it is better left undone.

By contrast, the Fishing Game market failure cannot be fixed by raising the number of fishermen in the area. As is well-known, this would just result in another market failure, what is popularly known as ‘the tragedy of the commons’. The tragedy of the commons is the many-player generalization of the two-player Prisoner’s Dilemma Game and is familiarly associated with the overexploitation and degradation of common properties such as forest cover, atmospheric carbon load and fish stock.

The government failure above illustrates the danger in regulatory address of a market failure. We have highlighted the weakness in enforcement ($f = 0.10$) but weakness can emerge in other ways: lobbying interest may lower the penalty from 5 to 2 or the revenue (2) collected from the fisher-folk may be set too high if not stolen or wasted elsewhere. These political economy considerations can transform a well-meaning intervention into a *government failure*: an intervention which results in a welfare outcome worse than the original *laissez faire* market failure!

c. Natural Monopoly

Another market failure where only state regulation can work to improve the market is a ‘natural monopoly’: substantial scale economies operate to make a single firm the most efficient industrial organization, i.e., many firms producing at smaller scale raises the average cost drastically so that consumer surplus decreases relative to monopoly status quo (more on this below).

The power distribution segment of the power sector (the distribution utilities or DUs) is considered by EPIRA as a 'regulated sector': they enjoy a franchise so that no other distribution utility can operate in their respective franchise area. The efficiency rationale is precisely because duplication of the wires delivery network will be costly and wasteful. They (DUs) however have to be regulated because they have 'captive consumers', consumers that cannot go elsewhere for their power needs. As observed above, the ERC is the government agency that approves the DU power rates to counter any abuse of market power. But the power generation segment of the power sector is considered by EPIRA as 'competitive', that is, the price and terms of their power supply agreement (PSA) is determined by negotiation among market players and not by a state agency. Lately, the ERC has required DUs to submit their PSAs to competitive bidding so as to address yet another possible market failure associated with transfer pricing or sweetheart deals (see Fabella, 2016). This, needless to say, is in keeping with the spirit of the PCA.

Meta-Market Failures

The third genre of market failures that cannot be fixed by competition policy is what we call elsewhere 'meta-market failure' (Fabella, 2017a). This is not the garden variety market failure such as 'The Fishing Game', 'natural monopoly', or the 'public goods market failure'. This was highlighted by Piketty (2014) who showed empirically that income inequality tends to rise without limit even in the most developed of economies. This means that the Pareto optimal distribution attained by a well-behaved (i.e., perfectly competitive) market is not the distribution favored by the constituent society, the latter giving a higher value to more equitable income distribution (see Fabella, 2017a). This is the reason why the 'Second Fundamental Theorem of Welfare' (SFTW) was deemed interesting. The SFTW says that for every Pareto efficient distribution, there is an underlying redistribution of initial assets such that the Pareto efficient distribution will be attained by the market. Only state intervention in the form of wealth or income tax can fix this market failure, or if SFTW is to be the guide, a prior redistribution of assets.

We do not aim to be exhaustive. Indeed, there may be other market failures where regulation can work but not competition policy.

Market Failures where Competition Policy has the Advantage

We now turn to the genre of market failures that competition policy provides a fix. They come under the rubric of market-power failures. Suppose the market is served by a single firm, a monopoly either mandated by a legal franchise or one enabled by collusion without the benefit of scale economies. We call this an artificial monopoly.

a. Artificial Monopoly as Market Failure: A Graphical Rendition

The next section is elementary but may be useful as tutoring material. We first show graphically how an artificial monopoly is a market failure and then how this can be re-oriented towards higher consumer welfare by competition policy.

Suppose there is a monopoly or a cartel in the market for good or service q . Think of commodity q as 'petrol' in a specific location. Let there be no close substitute for q . The price of q is p . Demand is linear and the average cost is constant at $c > 0$. We first show how this is a market failure. As we know from Economics 101, the monopolist will maximize profit at (q^m, p^m) given in **Figure 1** below.

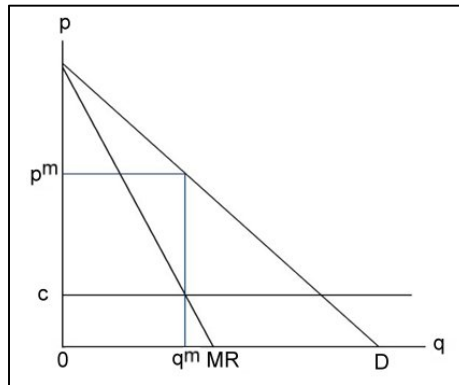


Figure 1. Monopoly equilibrium

Note: D in **Figure 1** is the demand curve which represents the buying side of the market, MR is the marginal revenue curve, $c > 0$ is the constant marginal cost, p is the price and q is the good/service. For the competition commission (CC), what is important is the size and the distribution of economic surplus (the welfare outcome) produced by the market structure, in this case a monopoly.

We turn to the welfare outcome. **Figure 2** gives the consumer's surplus (yellow), the firm profit (blue) and the deadweight loss (red).

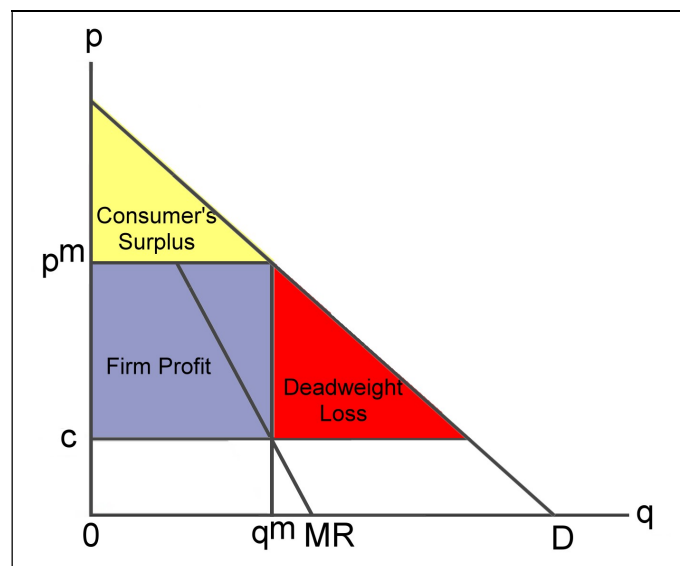


Figure 2. Monopoly welfare outcome

Consumer's surplus (color yellow) is the concept that economists use to represent what consumers actually realize from the market. It is the sum of all the individual surpluses (the difference between utility benefit derived less the price) of all buyers of q . Consumer's surplus is the principal concern of CC. Firm profit (blue) is what goes to the firm and its shareholders. The Deadweight loss (red) goes to nobody in society—is thus the measure of economic waste. This is a market failure because the deadweight loss (red) could very well be part of the consumer's surplus but is not. The mandate of CC is to raise the consumer's surplus (yellow) and reduce the deadweight loss (red) in a sustainable way such that the market does not go 'missing' or the service or commodity q does not disappear from the market. 'Sustainable' is extremely important for CC because the consumer's surplus of a missing market is zero! It is the worst kind of market failure where the commodity or service q is unavailable at any price. Now let us see how the artificial monopoly can be reoriented to do better at consumer's surplus.

b. Disrupting the Anti-Competitive Status Quo (Monopoly)

The competition agency can disrupt the anti-competitive status quo by sponsoring or supporting a legislation lifting the legal franchise, thus, doing away with the artificial barrier to entry; or if the monopoly is due to a cartel, the agency after due process can declare the cartel illegal and impose a heavy enough fine, thus, causing it to break up.

Suppose in the wake of the CC action, a second firm producing identical q enters the market. Now there is more competition in the market with two firms (a duopoly) instead of one firm (a monopoly). The market price of the duopoly is p^d . The welfare outcome of a duopoly is given in **Figure 3**.

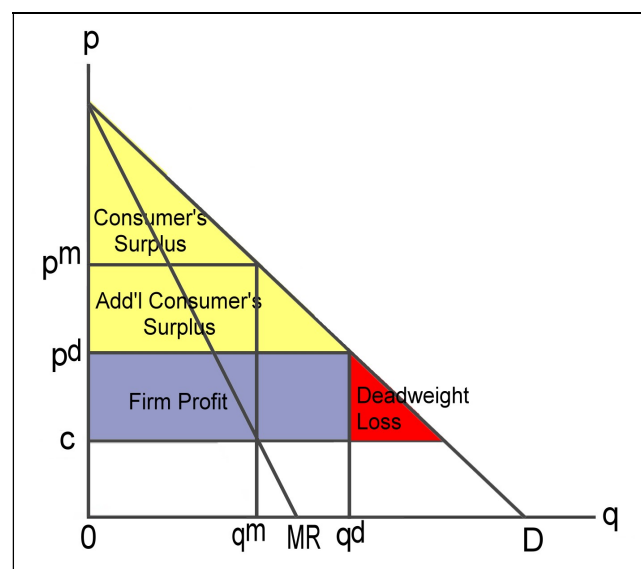


Figure 3. Welfare Impact of a Duopoly

Note that the consumer's surplus (in yellow) has increased in size compared to the consumer's surplus in **Figure 2**; by contrast, the deadweight loss (red) has shrunk in size and so has the firm profit (blue) compared to counterparts in **Figure 2**. The increase in consumer's surplus comes at the expense

of the profit of the firm (lower price effect) and of the deadweight loss (higher output effect). The CC action of facilitating entry of one other firm has reduced the price (from p^m to p^d), increased output (from q^m to q^d) and in the process raised the consumer welfare and consumer access! Thus, competition policy has made the market work better: it deepened the market and made it more inclusive.

But in the symmetric Cournot competitive market, while an improvement, the duopoly is not yet a complete solution to the monopoly market failure. It is just a less socially costly market structure than a monopoly. The welfare outcome of the duopoly itself can still be improved upon. Let us show this next.

c. Triopoly: Three Firms Compete

It is easy to glean from **Figure 3** that the more firms enter the market after the lifting of entry barriers, the better off are the consumers. Suppose two identical firms enter instead of just one. We then have a triopoly (three firms). The resulting market price will be p^t which is lower than p^d (the price slides down along the demand curve D). This means that the triopoly price is lower ($p^{d*} < p^d$) and the triopoly output higher ($q^{d*} > q^d$). This fact is reflected in **Figure 4**.

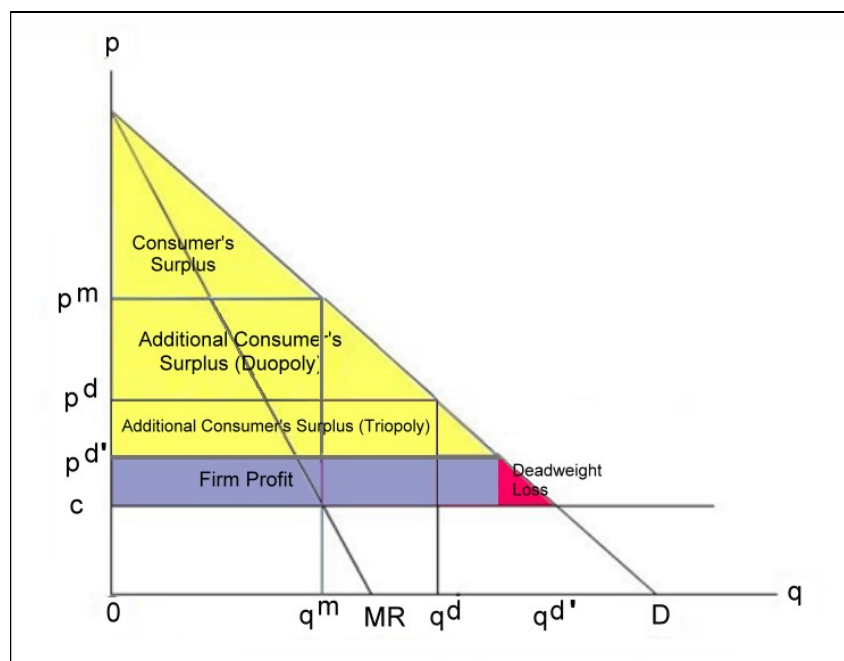


Figure 4: Welfare Outcome of a Triopoly

It is clear that consumer's surplus (yellow) has risen further! The aggregate firm profit is even smaller (blue) and the deadweight loss (red) has shrunk further. The price of q is $q^{d*} < q^d$ and output of q , q^{d*} has increased further. The market is now deeper and more inclusive than one under a duopoly. But because the space in red persists, it can still be further improved.

d. The Walrasian Limit of the Symmetric Cournot Competition

Suppose we extend the triopoly (**Figure 4**) above, to entry of a progressively larger number of identical firms. It is clear that the price will slide further down the demand curve. As the number of firms becomes very large, we approach the Walrasian limit of the symmetric Cournot competition. The welfare outcome at the Walrasian limit is given in **Figure 5**. The monopoly market failure is completely solved at the Walrasian limit.

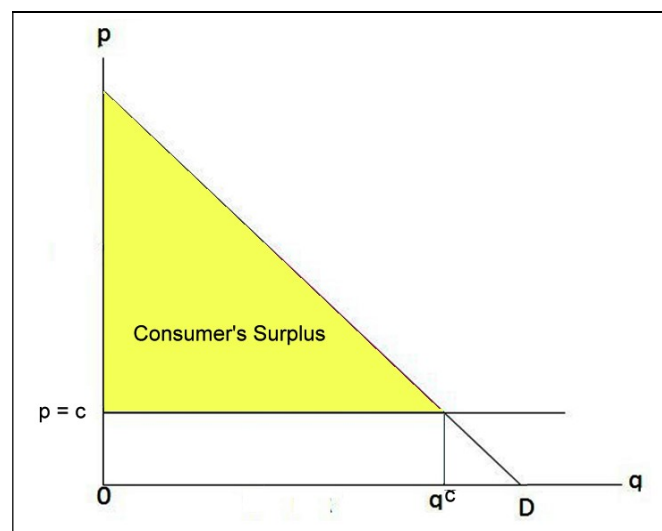


Figure 5. Welfare Outcome at the Walrasian Limit

At the Walrasian limit, all firms operate at $p = c$ or price = marginal cost. The quantity supplied q^c is at its largest. Note that only the consumer's surplus (yellow) appears; the aggregate firm profit has disappeared (no abnormal profit) and the deadweight loss (red) is gone. This situation is the *Nirvana* of the symmetric Cournot competitive market with consumer's surplus at maximum. Only then is artificial monopoly market failure in **Figure 2** completely solved. No further intervention or entry in the market can increase the Walrasian consumer's surplus.

Regulatory Address of an Artificial Monopoly

An artificial monopoly (enabled by a franchise or a cartel) can also be addressed by regulation. For example, the regulatory agency can subject the monopoly to a Rate of Return on Base (RORB) regulation. Suppose the RORB implies a price of p^{RB} . For convenience, we set $p^{RB} = p^d$. Then **Figure 4** still applies but with p^d substituted by p^{RB} . Consumer's surplus has expanded compared to **Figure 2**.

There are problems associated with administratively determining p^{RB} : the first is that the p^{RB} is set too high either due to ignorance of the regulator or mutually rewarding collusion between regulator and regulatee. In which case, the regulation is of no use at easing the social cost of market failure; no improvement in consumer's surplus ensues. The second is that p^{RB} is set too low ($p^{RB} < c$) due to the populist tendency of the regulator, in which case the firm goes bankrupt (missing market). These can happen because RORB regulation requires a lot of technical, financial and accounting information to properly determine; and in these the firm has information advantage over the regulatory agency. In a

weak institutions environment, the firm has a strong incentive to report misleading data and to influence the decision process either directly by capturing decision centers or the courts. The outcome is as if it were negotiated between two parties, the firm and the agency only. By contrast, if due to entry facilitated by CC there are more firms in the market, the price is determined by the market and out of the hands of the CC and the information asymmetry in favor of the firm is reduced as firms at the receiving end of abuse of market power will provide otherwise hard-to-come-by information. The presence of a second private water service provider in Metro-Manila providing parallel (non-direct) competition after the 1997 privatization was crucial in the decision making of the regulatory office during the rate rebasing exercise in 2002 (Fabella, 2011).

Likewise, in weak institutions environment, political considerations may dominate the regulatory agency's thinking and the administered price may be set lower than marginal cost; in which case the firm goes out of business (missing market) or becomes state-owned or set lower than stipulated in the original contract so a period of uncertainty ensues.

So the advantages of competition policy over regulation of an artificial monopoly are: (1) reduced information asymmetry, (2) third party witnesses to abuse of market power, (3) greater difficulty for capture, (4) the reduced likelihood of producing a missing market/increased likelihood of producing state-ownership, and (5) the smaller cost of mistakes—say, allowing entry where the monopoly is natural results in no entry.

Of course there remains the danger of overzealous private response to deregulation when too many firms enter only to realize that fewer firms are viable given the size of the market (when n firms enter where the market is $(n - 1)$ -viable given the fixed cost requirement). But most of the cost of subsequent consolidation will be borne by business not by consumers.

Market Failures Not Fixable by the State

Two genre market failures are better left well alone by the state confronted with limited capacity: *Constrained Pareto* market failures are market failures that the state cannot fix with social gain because the information required is not available to the state or government (Stiglitz, 1982); *RC-efficient* market failures are those that satisfy Williamson's (Williamson, 1996; 2007) 'remediableness criterion'—those that the relevant state cannot remedy with welfare gain because the transactions cost required for a fix it is just too prohibitive (see also Fabella, 2017b). Only a consumer loss can be expected from intervening in such markets. RC-efficient market failures are intimately associated with the limited capacity of extant governments. These need not remain RC-efficient all the time or everywhere. A market failure may be RC-efficient in Djibouti but not in Germany because the state capacity in Germany is considerably better. The PCC's role with respect to this genre of market failures is different. In so far as these are identified, PCC will prevent the loss of consumer's surplus by persuading the state to refrain from intervening or to postpone its intervention until its capacity has improved and the transactions cost has fallen.

We now turn our attention to another advantage of enhancing competition: enhancing innovation.

The Dynamic Welfare Impact of Competition: Innovation

Thus far, we have revealed the competition-induced static welfare gains. Even more telling for economic growth is the dynamic impact of more competition. Little or no incentive to innovate exists for the monopoly in **Figure 2** because competition is absent and profit is large. With the entry of another firm forming a duopoly, the profit of each firm will now depend on the comparative marginal cost. The lower Firm 2's marginal cost is relative to Firm 1's, the higher is Firm 2's profit relative to Firm 1's, and vice versa. Thus, there is an incentive for each firm to invest in innovation to lower its cost. If Firm 2 attains a lower marginal cost and increases its profit at the expense of Firm 1's, Firm 1 will respond by either imitating the innovation of Firm 2 or doing its own innovation effort. We analyze only the case where both firms attain the same identical lower marginal cost $c^* < c$. Then the welfare outcome of the original disruptive act of the competition agency which allows entry of one other firm is even larger: the price p^d is lower and the output q^d is higher. This is given in **Figure 6**.

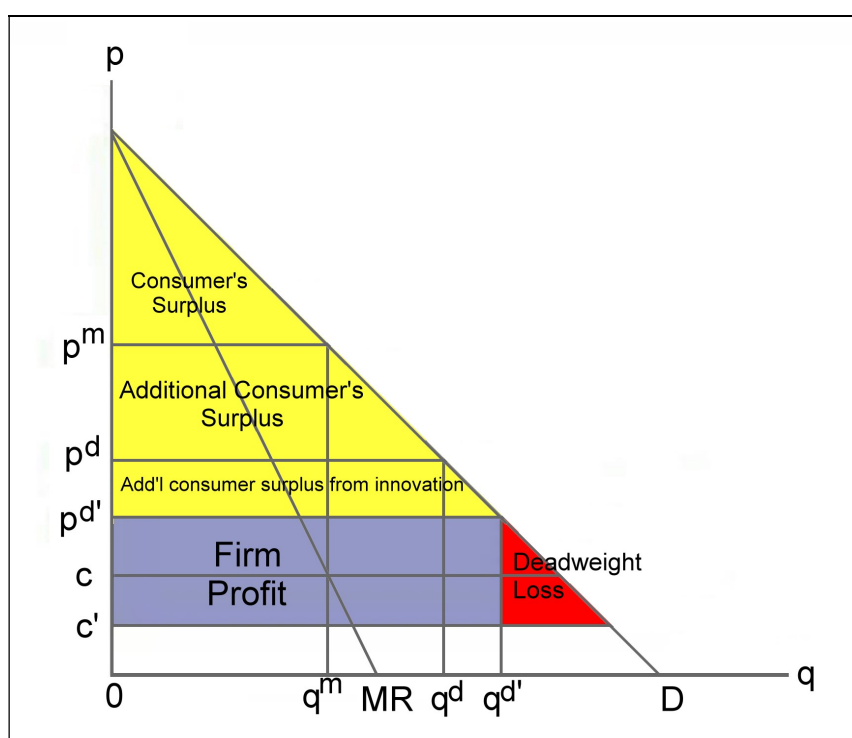


Figure 6. Welfare Outcome of a Duopoly with Innovation

Figure 6 is to be compared with **Figure 3**, a duopoly case without innovation. Innovation due to more competition results in lower marginal cost $c' < c$. This in turn lowers the equilibrium price to $p^d < p^d$ of the duopoly and higher output $q^d > q^d$. The consumer's surplus increases by 'additional consumer's surplus from innovation' (additional yellow). This again comes from lower price effect and higher output effect. This is not readily forthcoming when the intervention is regulatory!

Inverted U Hypothesis

The relationship between the amount of innovation and the number of competitors in the market (the competitiveness of the market) is non-linear. First broached out by Nickell (1996), it is now widely known as the ‘Inverted U Hypothesis’—the amount of innovation first rises with a few firms in a neck-and-neck race, reaches a peak and then starts to go down with too many firms (Aghion, 2002; Onori, 2014; Clarke, 2011). **Figure 7** is stylized representation of the relation.

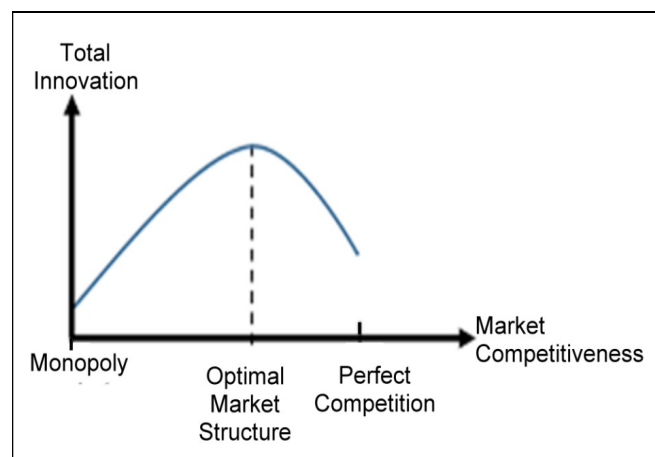


Figure 7. The Inverted U Hypothesis

Contrary to the static welfare gain that is monotonically increasing as progressively more firms enter the market, the welfare gain from innovation due to a rise in the number of firms first rises, reaches a peak and then falls (**Figure 7**). In terms of **Figure 6**, the drop in c to c' ($c - c'$) increases as one moves from a duopoly to a triopoly. Thus, while the innovation effect is a distinct advantage of enhancing competition over regulation, the welfare gain may be non-linear with respect to the number of firms. We now turn to a market competition that may enhance the benefit of enhancing competition.

Bertrand Competition

Nature

Our analysis so far was done under the symmetric Cournot competitive assumption where competition among firms is effected through the level of output supplied by firms in the market. Market players will aver that winning market share by offering lower prices is closer to their reality than manipulating output. This is evidenced by ‘price wars’, a phenomena where two or more firms offering competing products try to undermine each other by ever higher price discounts. These two competition assumptions (price versus quantity) are identical when the market structure is a monopoly but diverge radically with two or more firms.

In Bertrand competition, firms compete precisely through price offers instead of quantity offers. The welfare outcome is radically different. The Bertrand game of price competition with identical products is all-or-nothing, i.e., the firm that charges a lower price owns all of the market; all the others goes bankrupt! Given Bertrand competition, only two firms producing identical q will attain equilibrium

at $p = c$! This precisely is as in **Figure 5** above—consumer surplus is at maximum, there is no abnormal profit and deadweight loss is zero. Under Cournot competition by contrast, the Walrasian limit in **Figure 5** is attained by the entry of a very large number of firms. Only two firms suffice under Bertrand. As far as the CC is concerned, the monopoly market failure is completely solved by enabling only one more firm to enter the Bertrand competitive market!

Collusion and Trusts under Bertrand Competition

But the CC cannot rest on its laurels. The fact of the matter is that the temptation to collude or cartelize is so much stronger and indeed some collusion may be induced by the threat of a ‘price war’. It is well documented that John D. Rockefeller forced independent steelmakers to join a steel cartel by threatening a price war or ‘cutthroat competition’ against non-joiners. Only Carnegie Steel resisted the threat and forced a virtual Bertrand triopoly with Carnegie Steel on one side and the cartels on the other. Carnegie Steel became a prodigious innovator and price cutter, which threatened to push out the cartels. Eventually, the threatened John D. Rockefeller persuaded the feisty but aging Andrew Carnegie to sell his interest in Carnegie Steel and the ‘steel trust’ led by United States Steel Corporation assumed complete command of the US steel market.

The Gilded Age of the USA (1878-1900) was characterized by *laissez faire* economics where “the government governs best that governs least.” This looked kindly at businesses that cartelize so as to maximize firm profit at the expense of consumers (a move from **Figure 4**, say, to **Figure 2**). The ostensive reason for the benign attitude towards cartels then was the avoidance of disastrous and disruptive price wars that resulted in bankruptcies and unemployment. US businesses responded to *laissez faire* governance by sponsoring collusive organizations called *trusts* (sugar trust, oil trust, coir trust, etc.). To protect consumers against exploitation by trusts, the Sherman Anti-Trust Law was finally passed in 1890. However, the victories were few (the breakup of J.P. Morgan’s Standard Oil in 1910 was salient); it was only much later at the eve of World War I that anti-trust became earnestly pursued and only after a specialized agency the Fair Trade Commission (FTC) was enacted in 1914. Under Bertrand competition, the CC’s role tilts towards anti-trust.

Innovation under Bertrand Competition

The nature of Bertrand competition being cutthroat induces greater innovation effort by firms. The story of Carnegie Steel in its struggle against other producers and especially against the steel cartels is one of scorched-earth price competition driven by relentless cost-cutting innovations. Viewed from this perspective, the Bertrand duopoly attains higher consumer surplus than is reflected in **Figure 4**. This again is of interest to CC. We now turn to the presence of imperfect substitutes.

Imperfect Substitutes

The Bertrand Model

The symmetric Cournot and Bertrand competition that we employed thus far assumed that firm outputs are ‘perfect substitutes’ for each other. Many times, though a market for q_1 has just one firm, q_1

does have to contend with another product q_2 that is an imperfect substitute. The presence of an imperfect substitute reduces the market power of the sole supplier of q and does give consumers some relief. Let the demand functions for q_1 and q_2 be, respectively,

$$q_1 = a - bp_1 + dp_2 \text{ and}$$

$$q_2 = a - bp_2 + dp_1, b > d.$$

The symmetric Bertrand duopoly price at Nash equilibrium is (see **Appendix 1** for derivation):

$$p^* = (a + bc)/(2b - d)$$

The Bertrand duopoly equilibrium price p^* is thus higher than the monopoly price $(a + bc)/(2b)$ which holds when $d = 0$ or when the demand for q_1 is not responsive at all to p_2 . In other words, the market of q_1 is a monopoly. This is difficult to reconcile with consumer relief, which is usually associated with a lower price. We take another tack.

A Cournot Model with Imperfect Substitute

To facilitate welfare comparison, we model imperfect substitute instead as a Cournot duopoly where the output of one firm is imperfect substitute of one's own. The total supply in the market from the viewpoint of firm 1 is not $q = (q_1 + q_2)$ but $q^\wedge = (q_1 + \delta q_2)$, $0 \leq \delta \leq 1$, which is the degree of substitutability. From the viewpoint of firm 2, total supply is $q^\wedge = (\delta q_1 + q_2)$. The symmetric Cournot competitive equilibrium output of this game is (see **Appendix 2** for the derivation):

$$q^{di} = [(a - c)/b(2 + \delta)].$$

The superscript *di* of q represents 'duopoly with imperfect substitutes'.

Note that:

$$q^m \geq q^{di} \geq q^d.$$

That is, the firm output in this imperfect substitute Cournot game is intermediate between the monopoly output $q^m = [(a - c)/2b]$, $\delta = 0$ (zero substitution), and the duopoly output $q^d = [(a - c)/3b]$, $\delta = 1$ (perfect substitution). As intuition would have it, the degree of relief to consumers from monopoly power depends upon the degree of substitutability δ , $0 \leq \delta \leq 1$, between q_1 and q_2 . The closer δ is to 1, the closer is the price to the duopoly price and the farther removed from monopoly price. The situation is given by **Figure 8** below.

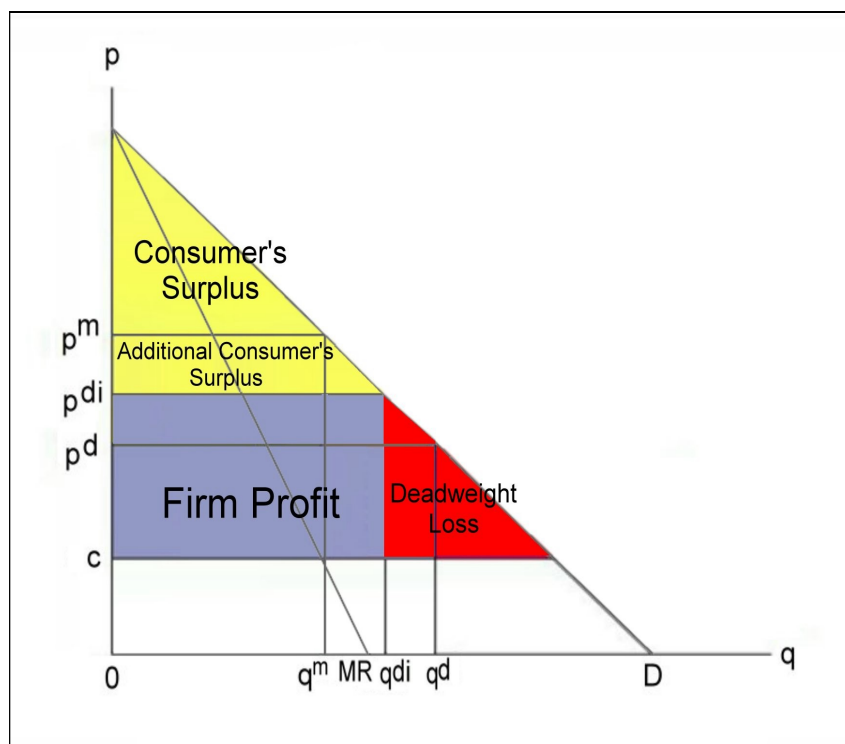


Figure 8. Welfare outcome of monopoly with imperfect substitute.

The presence of imperfect substitutes and the degree of substitution must be factored in by the CC in order to determine the social cost of an extant monopoly and the urgency of dealing with it.

3. Summary

In this paper, we start by giving a flavor of empirical evidence on the salutary effect of competition policy on growth, innovation and total factor productivity. We then discuss the relationship between competition policy and regulation, two alternative interventions into the market by the state. As such, they can only improve social welfare if they deal with a market failure. Not all market failures are fixable by state intervention; some market failures cannot be fixed with gain because the information requirement is too high (*Constrained Pareto*); some others cannot be fixed because the transactions, cost consequent of weak institutions, is too steep (*RC-efficient*).

Among those that can be fixed by state intervention, which intervention is best for which market failure was our next focus. To properly situate the role of each, we first discussed the variety of market failures that may confront the state authorities. We first dealt with market failures for which regulation seems to be the proper address: cooperation failures such as the Fishing Game and the Public Goods Game, the scale economies-based market failures such as the natural monopoly and, finally, the meta-market failures.

We then dealt with market failures for which competition policy seems the proper address, viz., artificial monopoly or any abuse of market power. Market dominance is not a crime in modern jurisprudence of competition law; abuse of market dominance is. A monopoly may be artificial—a single

firm rationalized only by a legal franchise or many firms coordinating behavior by a collusive agreement among themselves. We showed graphically how consumer welfare (consumer's surplus) rises monotonically as the number of players enter a symmetric Cournot competitive market, one where firms compete by quantity offers. Only at the Nirvana point (the Walrasian limit) with very large number of firms in the market is the market failure completely solved. Any intermediate number will serve as partial solution. We then turned to Bertrand competition where firms compete through price offers for perfectly substitutable q . This is made salient by the 'price wars' and 'cutthroat competition' that time and again hit the headlines. In this case, only two firms can already attain the Nirvana point of maximum consumer welfare, thus, completely solving the market failure. The CC's task is easier with Bertrand competition. Two features in Bertrand competition are of interest to CC: (a) Bertrand competition has stronger inducement for innovation due to its winner-takes-all tournament character, and (2) Bertrand competition has stronger inducement for collusive behavior and trusts, thus, threatening to transform the market to a virtual monopoly. This the CC must look out for.

In the presence of an imperfect substitute to q , the power of a monopolist is diminished. We show using the Cournot imperfect substitute model that the equilibrium price in the market is intermediate between the price of the monopoly and the price of a duopoly. Thus, the imperfect substitute delivers a welfare relief for consumers.

We also identified the advantages of competition policy over regulation of an artificial monopoly: (1) reduced information asymmetry, (2) third party witness to abuse of market power, (3) greater difficulty for capture, (4) the reduced likelihood of producing a missing market/increased likelihood of producing state-ownership, (5) the smaller cost of mistakes—say allowing entry where the monopoly is natural results in no entry, and (6) greater inducement for innovation. These advantages are more pronounced under weak than under strong institutions. It is thus important for the competition commission to be aware of imperfect substitutes to determine the social cost of a monopoly and the urgency of its address.

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Appendix 1

Derivation of the Bertrand Duopoly Price with imperfect Substitute

The demand functions of the two goods q_1 and q_2 are:

$$q_1 = a - bp_1 + dp_2 \text{ and}$$

$$q_2 = a - bp_2 + dp_1, \quad b > d.$$

The profit functions are:

$$\pi_1 = (p_1 - c)(a - bp_1 + dp_2)$$

$$\pi_2 = (p_2 - c)(a - bp_2 + dp_1)$$

The first order condition for firm 1 is:

$$\delta\pi_1/\delta p_1 = a - 2bp_1 + dp_2 + cb = 0,$$

The reaction functions are:

$$p_1 = (d/2b)p_2 - (a + bc)/2b$$

$$p_2 = (d/2b)p_1 + (a + bc)/2b.$$

At symmetric Nash equilibrium, the Bertrand duopoly price with imperfect substitute is:

$$p_1 = p_2 = p^* = (a + bc)/(2b - d),$$

as in the text.

Appendix 2

Derivation of q^{di}

The profit functions of firm 1 and firm 2 are, respectively:

$$\pi_1 = [a - b(q_1 + \delta q_2)]q_1 - cq_1$$

and

$$\pi_2 = [a - b(\delta q_1 + q_2)]q_2 - cq_2 .$$

The first order conditions under Cournot assumption are:

$$a - 2bq_1 - b\delta q_2 - c = 0$$

and

$$a - 2b\delta q_1 - bq_2 - c = 0.$$

Assuming symmetry, $q_1^* = q_2^* = q^{di}$ we have from either:

$$q^{di} = [a - c]/b(2 + \delta)$$

as claimed in the text.