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# Development progeria: the role of institutions and the exchange rate

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Convergence is more the exception than the rule in the development landscape. As a possible explanation, we posit development progeria: the phenomenon where a low-income country exhibits the industrial share dynamics of high-income mature economies where the Non-traded Goods Sector outgrows the Traded Goods Sector and the share of the non-traded goods sector outstrips the share of the traded goods sector. We argue that this seems to be the case of the Philippines in the last 25 years.

We then inquire into the drivers of this phenomenon. One possibility is the Rodrik hypothesis: that market and institutional distortions hamstring the Tradable goods sector more than they do the Non-tradable goods sector. The other possibility is the exchange rate policy being favorable or unfavorable to the Tradable goods sector. Using cross-country data for countries with per capita income of US$10,000 or less, we show that these two factors cannot be rejected as drivers of development progeria.

**JEL classification**: 014, 043, F31
**Keywords**: Development progeria, institutions, real exchange rate, low-income economies

## 1. Introduction

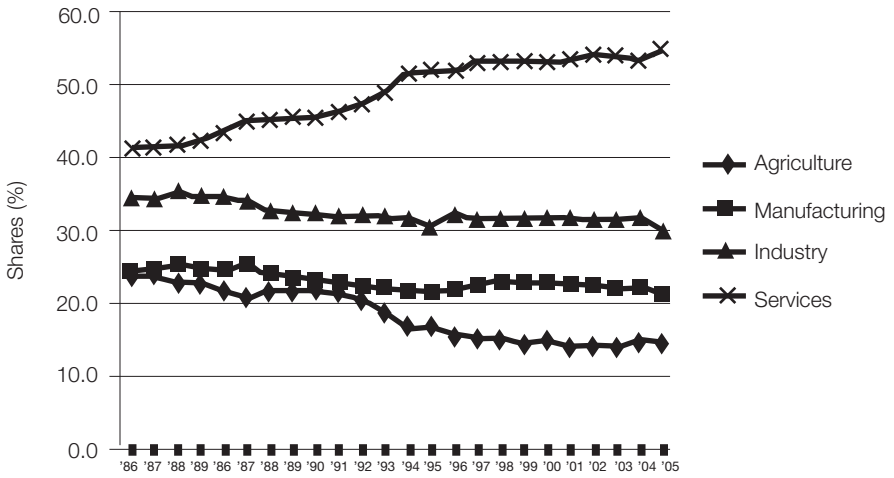
### *1.1. What is development progeria?*

Development progeria is the phenomenon where a low-income economy exhibits the industry share dynamics considered normal in advanced high-income economies: that is, where the share of the modern Tradable goods sector falls while that of the Non-tradable goods rises in the course of development. In medicine, progeria is a genetic malfunction where afflicted six-year olds exhibit

the physical characteristics of sixty-year-olds. Like advanced mature economies that are characterized by slow growth, economies afflicted by development progeria also grow slowly and thus have poor prospects for catching up with mature economies. In contrast, economies on the non-progeriac or convergent trajectory experience an extended period of growing industrial share of Tradables coincident with the retreat of Non-Tradables share in total output before they finally graduate to mature economy status.

### *1.2. The Philippines in the past 25 years*

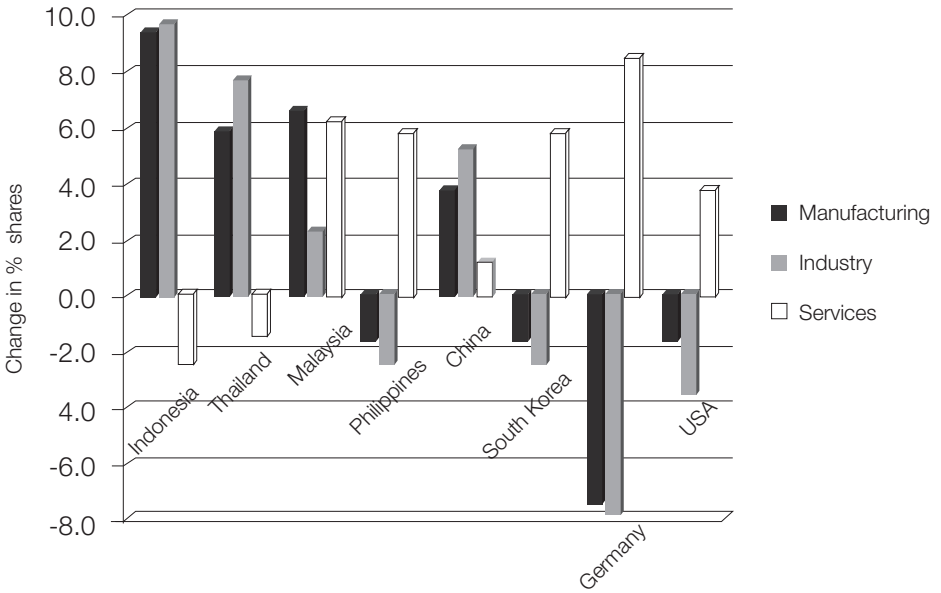
For the most part of the quarter-century following the 1986 overthrow of the authoritarian regime of Ferdinand Marcos, the Philippines has chafed under the moniker "sick man of Asia." It sank to the bottom of the ASEAN 5 in per capita growth, rate of poverty reduction, and investment rate [Usui 2011]. Figure 1 shows the share trajectories of Agriculture, Manufacturing, Industry, and Services.




Source of basic idea: World Bank Development Index

**FIGURE 1. Trajectory of industry sector shares in GDP: Philippines, 1986-2009**

It is clear that over the 25-year period from 1986-2009 the share of the Services sector gained continually while the shares of Industry and Manufacturing stagnated or lost out. To compare the experience with those of select neighbors and mature economies in the same period, Figure 2 below, which is taken from Fabella and Fabella [2010], presents the change in the percentage share of the Manufacturing, Industry, and Services sectors in the period 1986-1996 by countries.



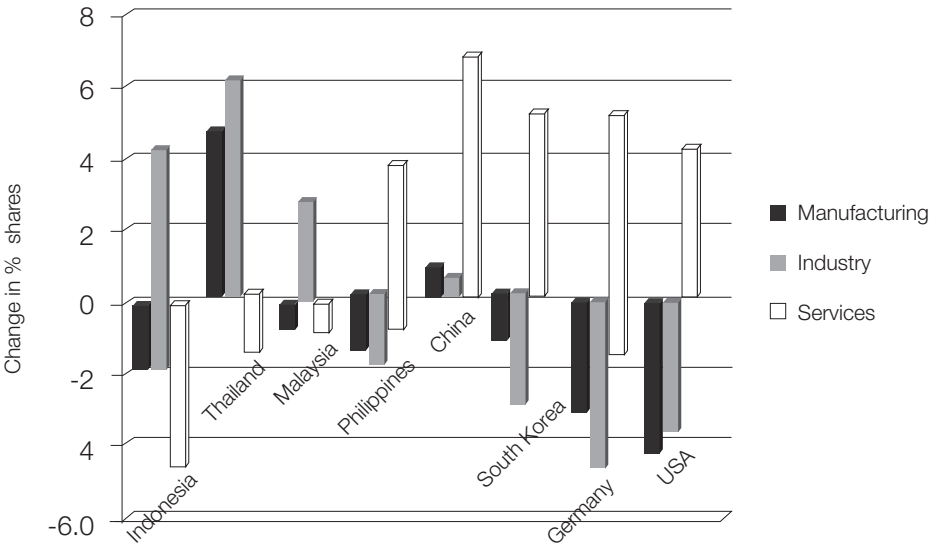

Source of basic idea: World Bank Development Index

**FIGURE 2. Change in percentage shares, 1986-1996**

Starting with the mature economies of Germany and the United States, the Services sector share rose while the shares of both Industry and Manufacturing for both periods fell. These are archetypes of late mature economy trajectory. South Korea, a new Organisation for Economic Co-operation and Development economy, saw its Services sector and Manufacturing shares rise but still with a slight increase in Industry share. Indonesia and Thailand saw their Service sector shares falling in the face of rapidly rising Industry and Manufacturing shares in both periods. This is the archetypal catch-up trajectory. Malaysia exhibited a rising Service sector share in this period but with rising Industry and Manufacturing shares. China exhibited the same pattern.

Figure 3 is taken from Fabella and Fabella [2010] and Fabella [2013]. It shows the trajectories for the second period (1996-2009).

Malaysia reverts somewhat to the archetypal catch-up trajectory with a falling Service sector share to go with a rising Industry but falling Manufactures share. China continues the pattern where both the Industry and Manufacturing sectors gain to go with a rising Service sector share. It is an economy firing on all cylinders.




Sources: Fabella and Fabella [2010] and Fabella [2013] (Transactions of the NAST)

**FIGURE 3. Change in percentage industry shares, 1996-2009**

Finally, we turn our attention to the Philippines. The trajectory exhibited by the Philippine industrial structure in the last quarter-century mimics that of late mature economies: in both periods, Industry and Manufacturing shares declined while Services share rose. By the end of the second period, the Services sector share stood at the 55.4 percent, a feature common to Organisation for Economic Co-operation and Development and mature economies. Premature economic ageing accompanied its journey throughout the 25-year period. This also means that its prospect for convergence with mature economies is poor.

The question we confront is this: How does development progeria get engendered? We explore how the growth of the Tradable goods and the Non-tradable goods sectors are differentially affected by the exchange rate and the quality of governance. In the next section, we formally generate the relationship.

## 2. The model

### *2.1. A small open economy*

We consider a model of the small open economy with two sectors, the tradable sector $T$ and the non-tradable sector $N$, each using two factors, labor $L$ and capital $K$, where $K$ is a specific factor of production and thus is not mobile across sectors. We assume full employment of labor, $L = L_T + L_N$, where $L_T$ is the labor used in $T$ and $L_N$ is used in $N$. Suppressing $K$, we can write the production technology of $T$ and $N$ respectively as:

$$T = Af(L_T), f' > 0 \text{ and } f'' < 0,$$

$$N = Bg(L_N), g' > 0 \text{ and } g'' < 0,$$

where $A > 0$ and $B > 0$ are positive Hicks-neutral technical parameters. The equilibrium allocation of $L$ (we assume an undistorted labor market) is given by the first order conditions:

$$Af'(L_T) = w,$$

$$Bg'(L - L_T) = w,$$

which combines to give $Af'(L_T) = Bg'(L - L_T)$. The latter can be solved for the equilibrium $L_T^*$ (and thus $L_N^*$). Since progeria is at its core about differential growth rates, we are interested initially in how $T$ and $N$ will grow as $L$ grows. Totally differentiating and solving for $(dL_T^*/dL)$, we get:

$$(dL_T^*/dL) = [Bg'']/[Af'' + Bg''] > 0.$$

The algebraic structure of $(dL_T^*/dL)$ is identical to that of the "power of the contract" in contract theory, where the efficient allocation of risk dictates that more risk is shouldered by the agent who suffers least from risk. If $g'' = 0$, or the marginal productivity of labor in $N$ is constant, but $f'' \neq 0$, all of the additional labor will be efficiently absorbed in $N$. Thus, the sector which suffers the least fall in marginal productivity from additional hiring should employ most of the additional labor at equilibrium.

### *2.2. The power of T*

The "power of $T$" is the power of the tradable goods sector $T$ to efficiently employ the increase in labor endowment. It is given by $(dL_T^*/dL)$.

Note that the power of $T$ is the inverse of the capacity of $N$ to efficiently absorb the additional labor. Thus, additional labor will be efficiently absorbed by that sector where the wage rate falls less with additional supply.

### *2.3. Market or institutional distortions and development progeria*

It is a known fact that least-developed countries (LDCs) are generally beset by a myriad of institutional and market distortions. Rodrik [2008] argued and showed evidence that these market and institutional failures on the supply side adversely affect $T$ and $N$ differentially, $T$ worse than $N$. We assume here that $T$ and $N$ are affected through the technical parameters $A$ and $B$, respectively.

Let the universe of supply side market and institutional failures (but excluding the labor market) be summarized by a single parameter $D > 0$ and let $A(D)$ and $B(D)$ represent the relationship between the Hicks-neutral parameters and $D$. The higher is $D$ the smaller are both $A$ and $B$ so that $A' < 0$ and $B' < 0$. It is understood that $D$ is lowest in mature developed economies.

While $D$ adversely affects both $T$ and $N$, $T$ is more adversely affected by $D$ than is $N$. We define this differential response: The Rodrik Differential Response Condition: Suppose $D^*$ and $D^{**}$ are two levels of $D$, $D^* < D^{**}$, then

$$A(D^*)/B(D^*) > A(D^{**})/B(D^{**})$$

or in continuous terms,

$$-[A'(D)/A(D)] > -[B'(D)/B(D].$$

In other words, the Hicks-neutral productivity of $T$ is pulled down more than that of $N$ by a rise in $D$. In terms of the production frontier, a higher $D$ shifts the production frontier inwards throughout, but a drop in the intercept in the $T$ axis is more than the drop in the $N$ axis.

We are interested in how a rise in $D$ *ceteris paribus* affects the composition of output at equilibrium. The following is shown in another paper [Fabella 2015].

Lemma 1: At equilibrium output basket, a rise in $D$ *ceteris paribus* will reduce the labor used in $T$,

that is, $(dL_T^*/dD) < 0$, if the Rodrik Differential Response Condition holds.

Therefore, the share of $T$ in total output will fall and that of $N$ will rise as $D$ rises. We now turn our attention to the response of relative growth rates of sectoral outputs when $D$ rises *ceteris paribus*. In the same paper by Fabella [2015], the following is further shown.

Lemma 2: $(dT/T) - (dN/N) < 0$ as $D$ rises *ceteris paribus,* if the Rodrik Differential Response Condition holds.

The growth rate of $T$ decreases more than that of $N$ when $D$ rises. When local market and institutional distortions are large ($D$ high), the share of Tradables will, over time, be lower and the share of Non-tradables higher. The more distorted are the market and institutional environments, the more likely is development progeria.

When local market and institutional distortions are large ($D$ high), the share of tradables will over time be lower and the share of Non-tradables higher than otherwise similar countries but with lower $D$. The more distorted is the local market and institutional environment, the more likely is development progeria relative to another country otherwise identical. The hypothesis corresponding to the above follows:

Hypothesis 1: The better is the governance quality in the economy, the higher the share of the Tradable goods sector in total GDP.

### 3. The exchange rate and development progeria

Yet another factor that possibly contributes to development progeria is the value of the domestic currency. Rodrik [2008] has shown that overvaluation is bad for the growth of low-income countries. Though we will not directly tackle overvaluation in this paper, we are interested in the impact of the value of the domestic currency on the industry shares. The production frontier of this simple open economy given $D^*$ is

$$T(N; D^*) = A(D^*)fL - g^{-1}[N/B(D^*)]$$

where $g^{-1}(.)$ is the inverse function of $g(.)$ assumed to exist and is convex and increasing (that is, concave and increasing $g(.)$ is assumed to be a one-to-one map). The first derivative of $T(N; D^*)$ with respect to $N$ is

$$T_N(N; D^*) = A(D^*)f'[-g^{-1}'/B(D^*)] < 0.$$

The production frontier is well-behaved, i.e., downward sloping and strictly concave to the origin. Being small and open, the economy is best off producing at the point in the frontier characterized by

$$-T_N(N; D^*) = EP_T/P_N$$

where $P_T$ is the price of a unit of tradables in foreign currency determined in the world, and $P_N$ is the price of a unit of non-tradables in domestic currency (say, the Philippine peso) determined in the domestic market, and $E$ is the amount of domestic currency that exchanges for a unit of foreign currency. $EP_T/P_N$ is known as the real exchange rate and is effectively the price of tradables in terms of non-tradables in domestic currency units. The higher is $(EP_T/P_N)$, the lower is the non-tradable sector output in the output mix of the economy or the larger is $T$'s share in total gross domestic product. The opposite result happens when $(EP_T/P_N)$ is lowered ( a real appreciation of the domestic currency).

Hypothesis 2: The higher is $(EP_T/P_N)$, the higher is the share of $T$ in GDP.

## 4. Estimation results

We employ Blundell and Bond's [1998] and Windmeijer's [2005] two-step system-generalized- method-of-moments (system-GMM) procedure to estimate the equation below:

$$y_{it} = \beta_{\chi}\chi_{it} + \beta_{Z}Z_{it} + \mu_{it}, \quad (1)$$

where $y_{it}$ is the ratio of the value-added of the tradable sector to GDP in country $i$ in period $t$. $\chi_{it}$ is a vector containing predetermined and endogenous regressors, which may include the lagged values of the dependent variable; $Z_{it}$ is a vector of strictly exogenous regressors; and $\mu_{it}$ is the error term containing the fixed-individual effects.

The main advantage of the two-step system-GMM procedure is that it enables one to account for the endogeneity of the regressors by allowing one to use the lagged values of both the dependent and independent variables as instruments. It also treats the Nickell bias, which is ubiquitous in macro-panel datasets with large $n$ (cross-section length) and small $t$ (number of periods). Moreover, Windmeijer's two-step correction procedure generates more precise and more efficient estimates, mitigating the finite-sample bias. Furthermore, we favor the two-step system-GMM procedure over Arellano and Bond's [1991] difference-GMM model, as the former is more appropriate for dealing with variables that are or close to "random walk," which most, if not all macroeconomic variables are purported to be. Lastly, information loss due to differencing in unbalanced panel datasets is less severe under the two-step system-GMM model than under the difference-GMM model.

To estimate Equation 1, we employ the ratio of annual manufacturing value added to GDP as a proxy for the ratio to GDP of the tradable goods sector, considering the fact that most manufactured goods are tradable and that manufacturing value added is more readily available in cross-country datasets.

The *XX* vector comprises the following: lags of manufacturing growth; the annual growth of the services sector value-added, which proxies for the non-tradable sector; the International Country Risk Guide (ICRG) index, which is a measure of the quality of institutions; the ratio of purchasing power parity conversion factor to the market exchange rate, which substitutes for the real exchange rate, with a higher ratio implying a decline in the competitiveness of locally produced goods, thereby hurting the tradable goods sector[1]; the average

[1] The ratio of purchasing power parity conversion factor to market exchange rate measures the amount of US dollars required in the local economy to purchase the same basket of goods and services that a dollar can purchase in the United States. Thus, a higher ratio signifies that the same basket of goods and services becomes relatively more expensive in the domestic economy. We prefer this series over the real effective exchange rate, as the latter has considerably less observations.

tariff rate on manufactured goods, which is a measure of distortion in the tradable goods sector; and fixed capital formation as a percentage of GDP, which is purported in theory as the main driver of output growth. We also include the "power of *N*," which is analogous to the power of *T* and is computed as follows:

$$\Delta L_N / \Delta L = [(\Delta L_N / L_N) / (\Delta L / L)] (L_N / L), \quad (2)$$

which is the ratio of the growth rate of employment in the services sector (the non-tradable sector) to the growth rate of total employment multiplied by the ratio of employment in services to total employment. As with the power of *T*, the power of *N* is a measure of the absorptive capacity of the services sector or of its ability to effectively employ the increase in labor supply. As this is negatively related to the power of *T*, we then expect it to negatively affect the manufacturing to GDP ratio.

The *Z* vector consists of a measure of tropical land area to account for country-specific characteristics and of period dummies. This is in line with the "Tropical Paradox," which is based on the observation that tropical countries closer to the tropical zone have lower per capita incomes than countries in more temperate climates. The period dummies are included to control for time-related shocks.

Except for the ICRG index, the rest of the data are downloaded from the World Development Indicators website. The dataset is an unbalanced panel of 51 developing countries[2] with real GNIs per capita of at most US$10,000, spanning six periods from 1984 to 2013.[3] Each period is an average of five years, as is typical in cross-country growth regressions, to minimize the impact of short-run fluctuations on the estimated parameters.[4]

Table 1 below presents the regression results and the instrumentation details.[5] With 51 instruments created using the second to fifth lags of the dependent and the appropriate independent variables, the estimated model passes the requisite diagnostic tests, i.e., the Arellano-Bond test of AR(2) in first differences and the Hansen J-tests of over-identifying restrictions. As a further test of the model's validity, we also checked that the estimated coefficient of the lagged value of manufacturing growth lies between the Ordinary Least Squares regression and fixed-effects estimates. Indeed, the Ordinary Least Squares estimate is 1.19, which is greater than the two-step system-GMM estimate of 1.18, which is, in turn, greater than the fixed-effects estimate of 0.60 (see Table A2 in the appendix).

[2] See the appendix for a list of countries included.
[3] We begin with 1984 due to data limitations.
[4] Due to the unbalanced nature of the panel, the effective number of periods is only 2.47 on average.
[5] The summary statistics of the regression variables are in Table A1 in the appendix.

**TABLE 1. Two-step system GMM results**

| **Dependent variable: Manufacturing-to-GDP ratio** | | | | | | |
|---|---|---|---|---|---|---|
| **Variable** | **Coefficient** | **Standard error** | **t-statistic** | **p-value** | **95% confidence interval** | |
| Manufacturing-to-GDP ratio (-1) | 1.18 | 0.03 | 35.47 | 0.00 | 1.11 | 1.25 |
| Manufacturing-to-GDP ratio (-2) | -0.33 | 0.03 | -10.15 | 0.00 | -0.39 | -0.26 |
| Power of *N* (-1) | -0.06 | 0.01 | -4.71 | 0.00 | -0.09 | -0.04 |
| Services growth rate | -0.13 | 0.04 | -3.34 | 0.00 | -0.20 | -0.05 |
| Fixed capital formation as percentage of GDP | 0.09 | 0.03 | 3.18 | 0.00 | 0.03 | 0.14 |
| ICRG index | 0.05 | 0.02 | 2.74 | 0.01 | 0.01 | 0.08 |
| Exchange rate (purchasing power parity-adjusted) | -0.08 | 0.01 | -7.49 | 0.00 | -0.10 | -0.06 |
| Tropical area | -0.51 | 0.33 | -1.58 | 0.12 | -1.17 | 0.14 |
| Period 3 | 1.31 | 1.03 | 1.27 | 0.21 | -0.76 | 3.39 |
| Period 4 | 1.52 | 0.91 | 1.67 | 0.10 | -0.31 | 3.35 |
| Period 5 | 0.92 | 0.92 | 1.01 | 0.32 | -0.92 | 2.77 |
| Period 6 | 1.04 | 0.85 | 1.22 | 0.23 | -0.68 | 2.76 |
| Number of observations: 119 | | | | | | |
| Number of groups: 51 | | | | | | |
| Number of instruments: 51 | | | | | | |
| **Diagnostic tests** | | | | | | |
| Arellano-Bond test for AR(1) in first differences: Prob > z = 0.006 | | | | | | |
| Arellano-Bond test for AR(2) in first differences: Prob > z = 0.185 | | | | | | |
| Hansen J-test of over-identifying restrictions: Prob > chi2 = 0.766 | | | | | | |
| *Difference-in-Hansen tests of exogeneity of instrument subsets:* | | | | | | |
| *GMM instruments for levels* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.527 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.824 | | | | | | |
| *GMM instruments: lagged manufacturing-GDP ratio, $2^{nd}$-$5^{th}$ lags* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.698 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.677 | | | | | | |
| *GMM instruments: lagged power of N, lagged services growth, exchange rate, 2nd lag* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.559 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.789 | | | | | | |
| *GMM instruments: fixed capital formation (percentage of GDP), lagged ICRG, 2nd-5th lags* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.565 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.767 | | | | | | |
| *IV instruments: Period 1, Period 2, Period 3, Period 4, Period 5, Period 6, eq(level)* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.816 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.296 | | | | | | |

The results in Table 1 provide evidence for the genesis of development progeria: the tradable sector, i.e., manufacturing, is adversely affected by an expansion of the non-tradable sector, i.e., services. The power of *N* is statistically significant and has the expected negative effect on manufacturing growth. Moreover, a higher growth rate of the services sector stunts the manufacturing sector, as is observed in development progeriacs.

In line with the theoretical results, ICRG, the real exchange rate proxy and the average tariff rate on manufactured goods have the expected effects on manufacturing growth. ICRG has a positive significant coefficient, which is consistent with the theoretical result that good institutional quality has a strong impact of spurring the tradable sector. The coefficient of the real exchange rate proxy also has a negative significant effect: A higher ratio of the purchasing power parity conversion factor to market exchange rate implies that a given basket of goods and services becomes more expensive in the domestic economy than in the United States, undermining the competitiveness of the tradable sector.

However, the coefficient of "tropical area" is not significant, although it has the requisite negative sign. This is in line with Rodrik et al. [2002], who find that the effect of geography on incomes per capita in a sample of 140 countries tends to vanish once the quality of institutions is controlled for.

As a robustness check, we employ an alternative measure of the power of *N*: the ratio of employment in services to total employment in the services and manufacturing sectors. The expected sign is still negative, as relative employment expansion in the services sector, which stands in for the non-tradable sector, would be to the detriment of manufacturing's own expansion prospects.

Indeed, Table 2 below shows that all the regressors are still significant and have the expected signs, as in the previous model.[6] In particular, the coefficient of the alternative definition of the power of *N* is still negative and significant, albeit much higher in magnitude than that of the previous definition. Moreover, the model passes all the diagnostic checks even with 56 instruments generated using the 2nd to 4th lagged values of the pertinent dependent variables.[7]

**TABLE 2. Two-step system GMM results with alternative definition of the power of *N***

| Dependent variable: Manufacturing-to-GDP ratio | | | | | | |
|---|---|---|---|---|---|---|
| **Variable** | **Coefficient** | **Standard error** | **t-statistic** | **p-value** | **95% confidence** | **interval** |
| Manufacturing-to-GDP ratio (-1) | 0.84 | 0.03 | 30.20 | 0.00 | 0.79 | 0.90 |
| Alternative power of *N* | -0.13 | 0.03 | -3.78 | 0.00 | -0.20 | -0.06 |
| Alternative power of *N* (-1) | -0.17 | 0.03 | -5.53 | 0.00 | -0.23 | -0.11 |
| Alternative power of *N* (-2) | 0.20 | 0.03 | 5.79 | 0.00 | 0.13 | 0.26 |
| Services growth rate | -0.06 | 0.02 | -2.46 | 0.02 | -0.11 | -0.01 |
| Fixed capital formation as percentage of GDP | 0.08 | 0.01 | 6.25 | 0.00 | 0.06 | 0.11 |
| ICRG index | 0.03 | 0.01 | 2.87 | 0.01 | 0.01 | 0.04 |

[6] The summary statistics of the regression variables are in Table A3 in the appendix.

[7] A caveat, however, is that the coefficient of lagged manufacturing-to-GDP ratio does not fall within the interval bounded by the Ordinary Least Squares regression and fixed estimates. The Ordinary Least Squares estimate is 0.78, while the fixed effects estimate is 0.38.

| Dependent variable: Manufacturing-to-GDP ratio | | | | | | |
|---|---|---|---|---|---|---|
| **Variable** | **Coefficient** | **Standard error** | **t-statistic** | **p-value** | **95% confidence** | **interval** |
| Exchange rate (purchasing power parity-adjusted) | -0.04 | 0.01 | -2.97 | 0.01 | -0.06 | -0.01 |
| Average manufacturing tariff | -0.03 | 0.01 | -2.55 | 0.01 | -0.05 | -0.01 |
| Period 3 | 7.70 | 2.78 | 2.77 | 0.01 | 2.11 | 13.28 |
| Period 4 | 9.15 | 2.71 | 3.37 | 0.00 | 3.69 | 14.60 |
| Period 5 | 7.75 | 2.88 | 2.69 | 0.01 | 1.97 | 13.54 |
| Period 6 | 7.20 | 2.90 | 2.49 | 0.02 | 1.37 | 13.02 |
| Number of observations: 127 | | | | | | |
| Number of groups: 48 | | | | | | |
| Number of instruments: 56 | | | | | | |
| **Diagnostic tests** | | | | | | |
| Arellano-Bond test for AR(1) in first differences: Prob > z = 0.021 | | | | | | |
| Arellano-Bond test for AR(2) in first differences: Prob > z = 0.132 | | | | | | |
| Hansen J-test of overid. restrictions: Prob > chi2 = 0.774 | | | | | | |
| *Difference-in-Hansen tests of exogeneity of instrument subsets:* | | | | | | |
| *GMM instruments for levels* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.319 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.943 | | | | | | |
| *GMM instruments: manuf'g-GDP ratio, alternative power of N, 3rd-4th lags* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.548 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.909 | | | | | | |
| *GMM instruments: services growth rate, 3rd-4th lags* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.573 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.896 | | | | | | |
| *GMM instruments: lagged ICRG, fixed capital formation (percentage of GDP), average manufacturing tariff, 2nd-3rd lags* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.573 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.896 | | | | | | |
| *IV instruments: Period 1, Period 2, Period 3, Period 4, Period 5, Period 6, eq(level)* | | | | | | |
| Hansen test excluding group: Prob > chi2 = 0.663 | | | | | | |
| Difference (null H = exogenous): Prob > chi2 = 0.906 | | | | | | |

## 5. Summary

In this paper, we first define development progeria as a phenomenon where the industrial share dynamics in low-income countries mimic the industrial share dynamics in mature high-income economies. This means that the Non-traded goods sector share is growing faster than the Traded Sector share in poor countries. By contrast, the industrial share dynamics of economies in the catch-up or convergent trajectory has the Traded goods sector share first outstripping the Non-traded sector share before shifting to the share dynamics of the mature high-income economies once a high income level is attained.

Development progeria entails slow overall growth for these economies and a thin chance of a catching up. We argue that the Philippines seems to be so

afflicted in the 25 years after the fall of the Marcos regime. We then inquire into the possible contributors to development progeria. We focus on two factors: the market and institutional distortions in developing countries which, according to Rodrik [2008] pull down the Traded goods sector more than they do the Non-traded goods sector growth and shares; and the impact of the value of the local currency which, when weak, tend to favor the Tradable goods sector and, when strong, the Non-traded goods sector. We use ICRG as proxy for the first and the purchasing power parity conversion factor to market exchange rate as proxy of the second.

We show, using the cross-country data from the World Bank Development Index for countries with per capita income US$10,000 or less and using Manufacturing as proxy for the Tradable sector and Services for the Non-traded goods sector, that those two factors after controlling for other factors cannot be rejected as contributors to development progeria. The better the governance environment and the more favorable the exchange rate to market rate, the higher is the share of tradable goods sector share. The variable "power of *N*" which is the capacity of the Non-tradable sector to absorb labor and the growth of the Non-tradable Sector have each a negative and significant effect on the share of the tradable sector. Likewise, the higher is the investment rate (proxied by the ratio of Gross Fixed Capital Formation to GDP), the higher is the share of *T* in GDP. That the variable "tropical area" is not significant is consistent with the Rodrik et al. (2002) result that when institutions and policies are introduced, the equatorial paradox loses its bite.

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## APPENDIX: List of countries included in the regressions

51 countries in Table 1: Albania, Armenia, Azerbaijan, Burkina-Faso, Bangladesh, Belarus, Bolivia, Brazil, Botswana, Chile, China, Cameroon, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Guyana, Honduras, Indonesia, India, Jamaica, Kazakhstan, Latvia, Madagascar, Malaysia, Mexico, Mongolia, Morocco, Namibia, Nicaragua, Pakistan, Panama, Peru, Senegal, Sierra Leone, South Africa, Sri Lanka, Suriname, Thailand, Trinidad and Tobago, Turkey, Uganda, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe

48 countries in Table 2: Albania, Armenia, Azerbaijan, Burkina-Faso, Bangladesh, Belarus, Bolivia, Brazil, Botswana, Chile, China, Cameroon, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Honduras, Indonesia, India, Jamaica, Jordan, Kazakhstan, Latvia, Madagascar, Malaysia, Mexico, Mongolia, Morocco, Namibia, Nicaragua, Pakistan, Panama, Peru, Paraguay, South Africa, Sri Lanka, Suriname, Thailand, Trinidad and Tobago, Turkey, Uganda, Uruguay, Venezuela, Vietnam

**TABLE A1. Summary statistics of regression variables in Table 1**

| Variable | Number of observations | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Manufacturing-to-GDP ratio | 119 | 16.81 | 6.32 | 4.85 | 34.93 |
| Manufacturing-to-GDP ratio (-1) | 119 | 17.69 | 6.28 | 6.20 | 34.93 |
| Manufacturing-to-GDP ratio (-2) | 119 | 18.64 | 6.28 | 5.95 | 37.97 |
| Power of *N* (-1) | 119 | -0.28 | 3.79 | -38.46 | 9.73 |
| Services growth rate | 119 | 5.20 | 3.12 | -2.03 | 18.86 |
| Fixed capital formation as percentage of GDP | 119 | 23.00 | 5.56 | 10.81 | 39.37 |
| ICRG index | 119 | 64.99 | 14.92 | -2.83 | 82.97 |
| Exchange rate (purchasing power parity-adjusted) | 119 | 42.32 | 14.12 | 17.17 | 81.47 |
| Tropical area | 119 | 0.66 | 0.44 | 0.00 | 1.00 |
| Period 1 | 119 | 0.00 | 0.00 | 0.00 | 0.00 |
| Period 2 | 119 | 0.00 | 0.00 | 0.00 | 0.00 |
| Period 3 | 119 | 0.17 | 0.38 | 0.00 | 1.00 |
| Period 4 | 119 | 0.23 | 0.42 | 0.00 | 1.00 |
| Period 5 | 119 | 0.29 | 0.45 | 0.00 | 1.00 |
| Period 6 | 119 | 0.32 | 0.47 | 0.00 | 1.00 |

**TABLE A2. Ordinary Least Squares and fixed effects estimation results**

| | Ordinary Least Squares | | Fixed effects | |
|---|---|---|---|---|
| | Coefficient | p-value | Coefficient | p-value |
| Manufacturing-to-GDP ratio (-1) | 1.19 | 0.00 | 0.60 | 0.00 |
| Manufacturing-to-GDP ratio (-2) | -0.34 | 0.00 | -0.33 | 0.00 |
| Alternative power of N (-1) | -0.02 | 0.70 | -0.01 | 0.80 |
| Services growth rate | -0.17 | 0.01 | 0.11 | 0.18 |
| Fixed capital formation as percentage of GDP (-1) | 0.08 | 0.03 | -0.08 | 0.17 |
| ICRG index (-1) | 0.02 | 0.18 | -0.10 | 0.19 |
| Exchange rate (purchasing power parity-adjusted) | -0.05 | 0.00 | -0.09 | 0.03 |
| Tropical area | 0.03 | 0.95 | | |
| Average manufacturing tariff | | | | |
| Period 1 | 0.00 | | 0.00 | |
| Period 2 | 0.00 | | 0.00 | |
| Period 3 | 0.23 | 0.67 | 0.33 | 0.45 |
| Period 4 | 0.86 | 0.10 | 0.00 | |
| Period 5 | 0.30 | 0.50 | -0.73 | 0.16 |
| Period 6 | 0.00 | | -0.62 | 0.33 |
| Constant | 1.66 | 0.29 | 24.09 | 0.00 |
| R-squared: | | | | |
| Within | 0.41 | | 0.62 | |
| Between | 0.97 | | 0.43 | |
| Overall | 0.93 | | 0.43 | |
| N | 119 | | 119 | |

**TABLE A3. Summary statistics of regression variables in Table 2**

| Variable | Number of observations | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Manufacturing-to-GDP ratio | 127 | 17.41 | 6.38 | 4.85 | 34.93 |
| Manufacturing-to-GDP ratio (-1) | 127 | 18.40 | 6.56 | 6.24 | 37.97 |
| Alternative power of *N* | 127 | 70.28 | 6.61 | 52.16 | 82.56 |
| Alternative power of *N* (-1) | 127 | 69.06 | 6.99 | 47.12 | 83.87 |
| Alternative power of *N* (-2) | 127 | 67.91 | 6.80 | 44.57 | 82.14 |
| Services growth rate | 127 | 5.09 | 3.01 | -2.03 | 18.86 |
| Fixed capital formation as percentage of GDP (-1) | 127 | 22.76 | 6.19 | 9.67 | 45.16 |
| ICRG (-1) | 127 | 65.43 | 14.51 | -2.83 | 82.97 |
| Exchange rate (purchasing power parity-adjusted) | 127 | 41.74 | 14.14 | 17.17 | 81.47 |
| Average manufacturing tariff | 127 | 9.02 | 9.33 | 0.56 | 86.87 |
| Period 1 | 127 | 0.00 | 0.00 | 0.00 | 0.00 |
| Period 2 | 127 | 0.00 | 0.00 | 0.00 | 0.00 |
| Period 3 | 127 | 0.18 | 0.39 | 0.00 | 1.00 |
| Period 4 | 127 | 0.23 | 0.42 | 0.00 | 1.00 |
| Period 5 | 127 | 0.31 | 0.46 | 0.00 | 1.00 |
| Period 6 | 127 | 0.28 | 0.45 | 0.00 | 1.00 |