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The Middle Income Trap from a Schumpeterian Perspective

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This paper provides an outline for viewing the middle income trap through the lens of the Schumpeterian growth paradigm, which places the notion of creative destruction at the centre of economic growth. We argue that economic growth and development come from the complex interplay between changes in economic structure and supporting institutions at different stages of development – i.e. *structural transformation*. In this outline, we present a view of the process of economic development that takes the micro-level growth of firms and their competitive interaction as its building blocks. We discuss how institutional factors affect the evolution of these building blocks in understanding growth outcomes at different stages of development. In the last section, we set out an empirical framework for testing what microeconomic and institutional factors lead to growth slowdowns within this paradigm.

Viewing the middle income trap through the Schumpeterian perspective helps researchers and policy makers in two main ways. First, the Schumpeterian perspective bridges the gap between microeconomic drivers of firm dynamics and market competition and economy-wide growth. At a conceptual level, it brings in insights from the industrial organisation literature to macroeconomics and development economics. At a practical level, it allows the use of rich firm- and industry-level datasets to speak to sources of growth at different stages of development. These insights may prove invaluable to policymakers who are often confronted with the question of what "structural reforms" they need to carry out to boost growth. Second, the Schumpeterian perspective helps reconcile growth and development strategies with local institutional constraints. On the one hand, it delivers sharp predictions on how firm dynamics and market structure affect overall economic growth. On the other hand, it emphasises the idea that these predictions can be switched depending on an economy's institutional context and position in relation to other economies. Hence, one can accommodate political economy concerns in a micro-founded growth framework and avoid making "one size fits all" judgments even in the context of a single country.

1. Growth through creative destruction

The Schumpeterian growth paradigm is based on three main ideas (Aghion et al, 2013).

First idea: long-run growth is primarily generated by innovations. This is the natural counterpart of Solow's conclusion that no long-run growth can be expected without sustained technological progress.

Second idea: innovations result from entrepreneurial investments (R&D, training, computer purchase, etc.) and entrepreneurs respond to the economic incentives (positive or negative) that result from economic policies and economic institutions. Thus typically innovation-based growth will be discouraged in environments with poor property right protection or with hyperinflation as these will damage the profitability from innovation. In other words, innovation-based growth is a social process and we can talk about policies of growth and institutions of growth.

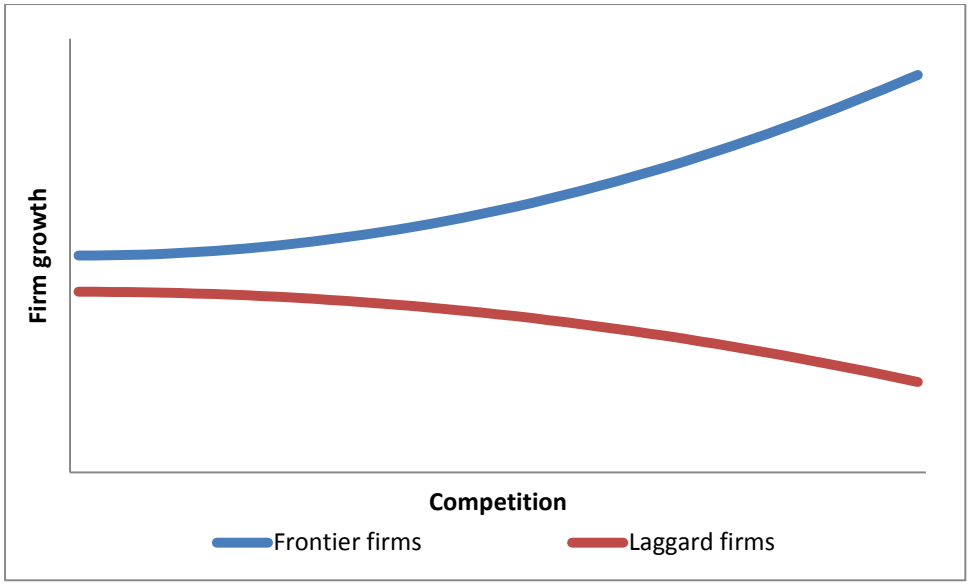
Third idea: creative destruction. New innovations replace old technologies, Schumpeterian growth is a competitive process between the old and the new: it tells the story of all these incumbents firms and interests which permanently try to prevent or delay the entry of new competitors in their sector. Hence there is something called "the political economy of growth".

A distinct prediction of the Schumpeterian growth model is that firm or job turnover should be positively correlated with innovation-led productivity growth. Another distinctive implication of the model is that innovation-led growth may be excessive under laissez-faire. Growth is excessive (resp. insufficient) under laissez-faire when the business-stealing effect associated with creative destruction dominates (resp. is dominated by) the inter-temporal knowledge spillovers from current to future innovators.

2. Productivity growth and product market competition

In most sectors of an economy there are two types of firms which do not react in the same way to increased product market competition. First, we have what we call "frontier firms", i.e. firms that are close to the current technological frontier in their sector. These firms are currently active and they make substantial profits even before innovating (again) this period. Second, we have what we call the "laggard firms", i.e. firms far below the current technological frontier. These firms make low profits and try to catch up with the current technology frontier. Faced with a higher degree of competition in their sector, firms that are close to the technology frontier will innovate more in order to *escape competition*, whereas firms that are far from the technological frontier and try to catch up will be *discouraged* by the higher degree of competition, and as a result innovate less: these latter firms behave like in the basic Schumpeterian model. Figure 1 summarises the relationship between competition and enterprise growth for these two groups of firms.

[Figure 1]



Overall, the effect of competition on innovation and productivity growth is an inverted-U, which synthetizes the positive *escape competition effect* and the negative *discouragement effect*. The prediction of opposite reactions of frontier versus non-frontier firms to competition, and of an inverted-U overall, were tested and confirmed in joint work with Richard Blundell, Nick Bloom and Rachel Griffith using the same kind of firm-level data as in the empirical studies I mentioned above.

To reconcile theory with this evidence we extend the basic Schumpeterian model by allowing for step-by-step innovation in the Schumpeterian growth model.[1] Namely, a firm that is currently behind the technological leader in the same sector or industry must catch up with the leader before becoming a leader itself. This step-by-step assumption implies that firms in some sectors will be neck-and-neck. In turn in such sectors, increased product market competition, by making life more difficult for neck-and-neck firms, will encourage them to innovate in order to acquire a lead over their rival in the sector. This we refer to as the escape competition effect. On the other hand, in unlevelled sectors where firms are not neck-and-neck, increased product market competition will tend to discourage innovation by laggard firms as it decreases the short-run extra profit from catching up with the leader. This we call the Schumpeterian effect. Finally, the steady-state fraction of neck-and-neck sectors will itself depend upon the innovation intensities in neck-and-neck versus unlevelled sectors. This we refer to as the composition effect.

This extended model predicts that in the aggregate the relationship between competition and innovation should follow an inverted-U pattern. Intuitively, when competition is low, innovation intensity is low in neck and neck sectors, therefore most sectors in the economy are neck and neck (the composition effect); but precisely it is in those sectors that the escape competition effect dominates. Thus overall aggregate innovation increases with competition at low levels of competition. When competition is high, innovation intensity is high in neck and neck sectors, therefore most sectors in the economy are unlevelled sectors, so that the Schumpeterian effect

[1] See Aghion, Harris and Vickers (1997) and Aghion, Harris, Howitt and Vickers (2001).

dominates overall. This inverted-U prediction is confirmed by Aghion, Bloom, Blundell, Griffith and Howitt (2005), using panel data on UK firms.

The prediction that more intense competition enhances innovation in "frontier" firms but may discourage it in "non-frontier" firms, was tested by Aghion, Blundell, Griffith, Howitt and Prantl (2009) using again panel data of UK firms.

This extended Schumpeterian model suggests complementary roles for patent protection and for competition policy in encouraging R&D investments and innovation: patent protection increases post innovation rents, whereas competition reduces pre-innovation rents for neck-and-neck firms. This prediction of a complementarity between competition and patent protection, was tested by Aghion, Howitt and Prantl (2013) using OECD country-industry panel data.

3. Trade liberalization and growth

The existing literature on trade and growth has pointed to several reasons for why trade should increase world income and enhance productivity growth.
First, trade openness increases the size of markets that can be appropriated by successful innovators or it increases the scale of production and therefore the scope for learning by doing externalities. This market size effect should be more important for smaller countries that increase market size by a higher proportion when opening up to trade. Thus, when regressing growth over "openness" and its interaction the size of the domestic economy (for example as measured by the log of population) one should find that the interaction coefficient between country size and openness is negative. And indeed this is what Alesina, Spolaore and Wacziarg (2005) find when they regress growth over country openness and size, using cross-country panel data.

Second, trade induces knowledge spillovers from more advanced to less advanced countries and sectors. Thus, one should expect the interaction between openness and initial income in the growth regressions to be negative: that is, growth is less enhanced by openness in more advanced countries. To the extent that knowledge tend to flow from richer to poorer countries, it is not surprising that the more advanced a country already is, the less it should benefit from knowledge spillovers inducing trade. This knowledge spillover effect has been analyzed at length by Keller (2004). It also underlies the work of Sachs and Warner (1995).[2]

Our discussion in the previous section suggests an important new channel whereby trade liberalization can affect productivity growth: namely, the induced increase in product market competition, by allowing foreign producers to compete with domestic producers. This in turn should

[2] Additional evidence on trade and research spillovers is provided in an important paper by Coe and Helpman (1995). For each country, they construct measures of domestic and foreign R&D capital stocks, where the latter are weighted averages of the domestic stocks of trade partners. They find that foreign R&D appears to have a beneficial effect on domestic productivity, and that the effect increases in strength with the degree of openness. Hence, not only are there important spillovers, but there is also some evidence that these are mediated by trade. However, one may argue that even if a correlation is observed between domestic productivity and foreign research, this may simply represent the outcome of common demand or input price shocks. Weighting the contribution of foreign research using data on bilateral trade flows, as in Coe and Helpman, is likely to mitigate this problem but will not overcome it altogether.

enhance domestic productivity for at least two reasons. First, by forcing the most unproductive firms out of the domestic market. Thus, Trefler (2004) shows that trade liberalization in Canada resulted in a 6% increase in average productivity. Second, by forcing domestic firms to innovate in order to escape competition with their new foreign counterparts (see Bloom et al, 2016).

4. The middle income trap in the Schumpeterian growth paradigm

In 1890, Argentina enjoyed a GDP per capita approximately 40% that of the United States, which made it a middle-income country. This level was three times the GDP per capita of Brazil and Colombia and equivalent to that of Japan at the time. Argentina sustained this level of 40% of the GDP per capita of the United States through the 1930's. To be precise, Chow's test (a statistical test) shows a break around 1938 (Figure 5), after which Argentina's productivity declines relative to American productivity by approximately 21% per year. What explains this drop-off?

Schumpeterian growth theory offers the following explanation. Countries like Argentina either had institutions or had implemented policies (in particular import-substitution) that fostered growth by accumulation of capital and economic catch-up. They did not, however, adapt their institutions to enable them to become innovating economies. As demonstrated in joint work with Daron Acemoglu and Fabrizio Zilibotti,[3] the greater the level of development in a country—*i.e.,* the closer it gets to the technology frontier— the greater the role of cutting edge innovation as the motor of growth, replacing accumulation and technological catch-up.

This phenomenon also exists in Asia. Japan, where the State has always tightly controlled competition, is another example: Japan's Ministry of Economy, Trade and Industry (MITI) caps the number of import permits, and the State subsidizes investment by the big industrial-financial consortia known a *keiretsu*. It is thus not surprising that from an extremely high level between 1945 and 1985—the envy of other developed countries— Japan's growth has fallen to a very low level since 1985.

In our previous discussion we mentioned some recent evidence for the prediction that competition and free-entry should be more growth-enhancing in more frontier firms, which implies that they should be more growth-enhancing in more advanced countries since those have a larger proportion of frontier firms. Similarly, Acemoglu, Aghion and Zilibotti (2006) show, using a cross-country panel of more than 100 countries over the 1960-2000 period, that:

1. Average growth should decrease more rapidly as a country approaches the world frontier when openness is low.
2. High entry barriers become increasingly detrimental to growth as the country approaches the frontier.

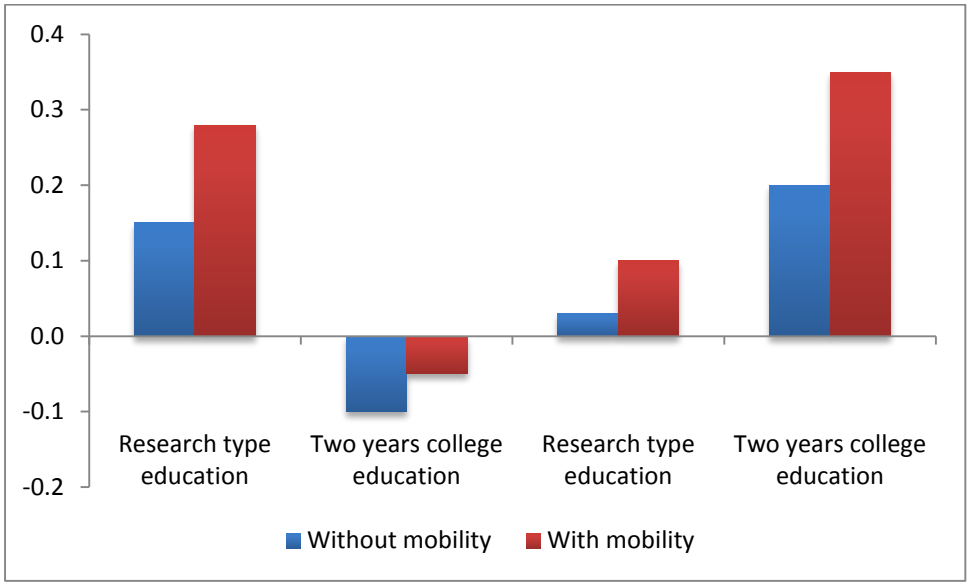
These two empirical exercises point to the importance of interacting institutions or policies with technological variables in growth regressions: openness is particularly growth-enhancing in countries

[3] Daron Acemoglu, Philippe Aghion, and Fabrizio Zilibotti, "Distance to Frontier, Selection, and Economic Growth," *Journal of the European Economic Association*, vol. 4, n° 1, 2006, pp. 37-74.

that are closer to the technological frontier; entry is more growth-enhancing in countries or sectors that are closer to the technological frontier.

Similarly, to the extent that frontier innovation makes greater use of research education than imitation, the prediction is that the more frontier an economy is, the more growth in this economy relies on research education. Aghion, Boustan, Hoxby and Vandenbussche (2009) showed that research-type education is always more growth-enhancing in US states that are more frontier, whereas a bigger emphasis on two-year colleges is more growth-enhancing in US states that are farther below the productivity frontier (see Figure 2).

[Figure 2]



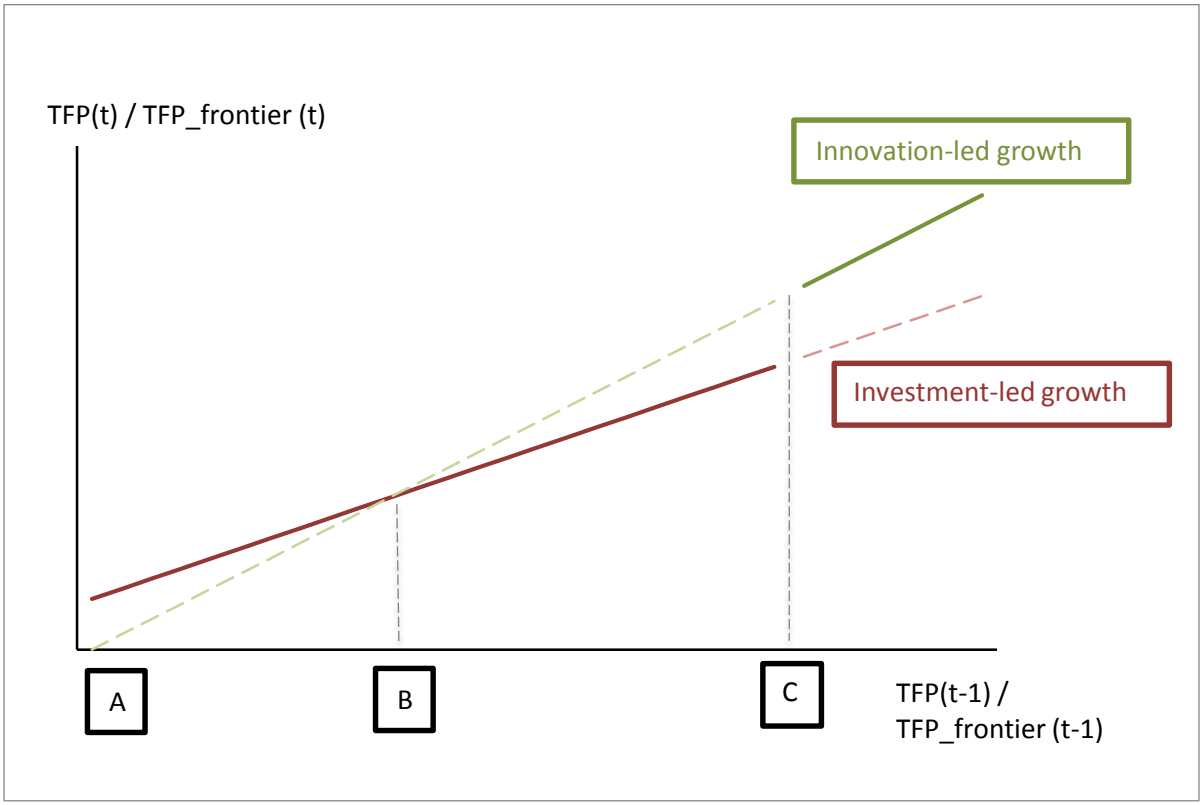
Also, in a frontier economy where growth relies on innovation, it is the funding of young and small-scale entrepreneurs that should take centre stage rather than large (state-owned) enterprises that try to protect their market shares. As a result, equity finance becomes more growth-enhancing than debt finance in more frontier economies. In practice this is because firms engaging in risky innovation are less likely to be funded by conservative banks, while in theory equity finance serves as a superior source of funding in aligning the incentives between entrepreneurs and creditors.

Catching-up growth on the other hand relies mainly on: (i) capital accumulation; (ii) knowledge transfers from more developed economies (e.g see Keller, 2004); (iii) factor reallocation (e.g see Hsieh and Klenow, 2009); (iv) the improvement of management practices (e.g. see Bloom, Van Reenen, and co-authors). Capital accumulation (through physical investments in machinery, buildings, infrastructure, is funded via the state and/or imported through foreign direct investment). The reallocation of labour happens from the agricultural sector to manufacturing (i.e. urbanisation). convergence occurs through imitation and adoption of existing technologies imported from abroad, which in turn benefits from having a good basic education system as well as openness to trade. For these mechanisms to generate growth, countries often pursue an investment-based strategy, which

relies on existing firms and managers to maximise investment but sacrifices the entry of new entrepreneurial firms and managers (Acemoglu et al, 2006). [4]

The idea of the middle income trap is best captured within the neo-Schumpeterian paradigm by what is called the "non-convergence trap." This refers to the level of development (distance to technology frontier) such that if an economy does not switch out of the investment-based strategy before this threshold is reached, then it stops converging to the frontier (Acemoglu et al, 2006). Figure 3 shows this idea in a simple diagram. Countries can often grow at fast rates and converge to the technology frontier through investment-based strategies when they are between points A and B. However, between points B and C they need to switch to an innovation-based strategy to continue their productivity convergence.

[Figure 3]



What happens is that the growing firms, which played an important role in the growth process during the catching up stage, are precisely those who have vested interests in maintaining trade and entry barriers so as to preserve their incumbency position. This is the case of the so-called

[4] Growth strategies far away from the technology frontier tend to relieve problems of coordination to achieve economies of scale, which often benefits incumbents and first movers. An investment-based strategy helps firms adopt existing technologies by overcoming frictions in the credit market and to a certain extent contractual frictions. Economic production is often based on long-term relationships between large (state-owned) firms and banks and non-competitive market structures. One need not worry much about the competitive landscape or quality of institutions to achieve growth at this stage, as the returns from agglomeration economies tend to outweigh other considerations.

"Chaebols" in Korea and "Keiretsus" in China. When incumbents firms become too powerful, then the country finds itself stuck in a non-convergence trap. This is called the "rent-shield effect."

China is perhaps the best example of how an economy that has been growing at a very high rate for a long period of time is slowing down and fears to get "stuck" as it approaches the technological frontier. For many decades, the Chinese growth model has been based on high rates of investment and net exports mostly funded (and enabled) by the state apparatus. This helped Chinese GDP per capita to go from 5% of U.S. GDP per capita in 1980 to almost 25% in 2015. However, the Chinese convergence slowed down in the past 5 years. The next stage of development will have to come from innovation-led growth, which will require policies and institutional reforms that are quite different to the ones that were so successful in helping China move out of the group of low-income countries.

In his presidential address at the 2016 Congress of the European Economic Association, Fabrizio Zilibotti provide evidence that China is not yet allocating its R&D effort optimally across firms and sectors. In particular he argues that the annual TFP growth of an R&D firm in China falls as that firm approaches the technology frontier in its sector exactly as the TFP growth of a non-R&D firm; by contrast, in Taiwan, the TFP growth of an R&D firms falls much less than the TFP growth of a non-R&D firm (and it even increases for more frontier R&D firms). This reflects a better allocation of R&D investments in Taiwan than in China.

One can also look at the relationship between technological development, democracy and growth. An important channel is Schumpeterian: namely, democracy reduces the scope for expropriating successful innovators or for incumbents to prevent new entry by using political pressure or bribes: in other words, democracy facilitates creative destruction and thereby encourages innovation. Acemoglu and Robinson (2006) formalize another reason, also Schumpeterian, as to why democracy matters for innovation: namely, new innovations do not only destroy the economic rents of incumbent producers, they also threaten the power of incumbent political leaders.

To the extent that innovation matters more for growth in more frontier economies, the prediction is that the correlation between democracy and innovation/growth is more positive and significant in more frontier economies. This prediction is confirmed by Aghion, Alesina and Trebbi (2007), who use employment and productivity data at the industry level across countries and over time.

5. Growth and firm dynamics

The empirical literature has documented various stylized facts on firm size distribution and firm dynamics using micro firm-level data. In particular: (i) the firm size distribution is highly skewed; (ii) firm size and firm age are highly correlated; (iii) small firms exit more frequently, but the ones that survive tend to grow faster than the average growth rate.

These are all facts that non-Schumpeterian growth models cannot account for. In particular, the first four facts listed require a new firm to enter, expand, then shrink over time, and eventually be replaced by new entrants: these and the last fact on the importance of reallocation are all embodied in the Schumpeterian idea of creative destruction.

Instead the Schumpeterian model as extended by Klette and Kortum (2004) can account for these facts. This model adds two elements to the baseline model: first, innovations come from both entrants and incumbents; second, firms are defined as a collection of production units where successful innovations by incumbents will allow them to expand in product space.
Various versions of this framework have been estimated using micro-level data by Lentz and Mortensen (2008), Acemoglu, Akcigit, Bloom and Kerr (2013), Akcigit and Kerr (2010) and Garcia-Macia, Hsieh and Klenow (2016).

This extended model allows us to explain the above-stylized facts:

Prediction 1: The size distribution of firms is highly skewed.

Recall that in this model, firm size is summarized by the number of product lines of a firm. Hence, a firm needs to have succeeded many attempts to innovate in new lines and at the same survived many attempts by potential entrants and other incumbents at taking over its existing lines, in order to become a large firm. This is turn explains why there are so few very large firms in steady-state equilibrium, i.e. why firm size distribution is highly skewed as shown in a vast empirical literature.

Prediction 2: Firm size and firm age are positively correlated.

In the model, firms are born with a size of 1. Subsequent successes are required for firms to grow in size, which naturally produces a positive correlation between size and age. This regularity has been documented extensively in the literature.

Prediction 3: Small firms exit more frequently. The ones that survive tend to grow faster than average.

In the above model, it takes only one successful entry to make a one-product firm to exit, whereas it takes two successful innovations by potential entrants to make a two-product firm exit. The facts that small firms exit more frequently and grow faster conditional on survival have been widely documented in the literature. [5]

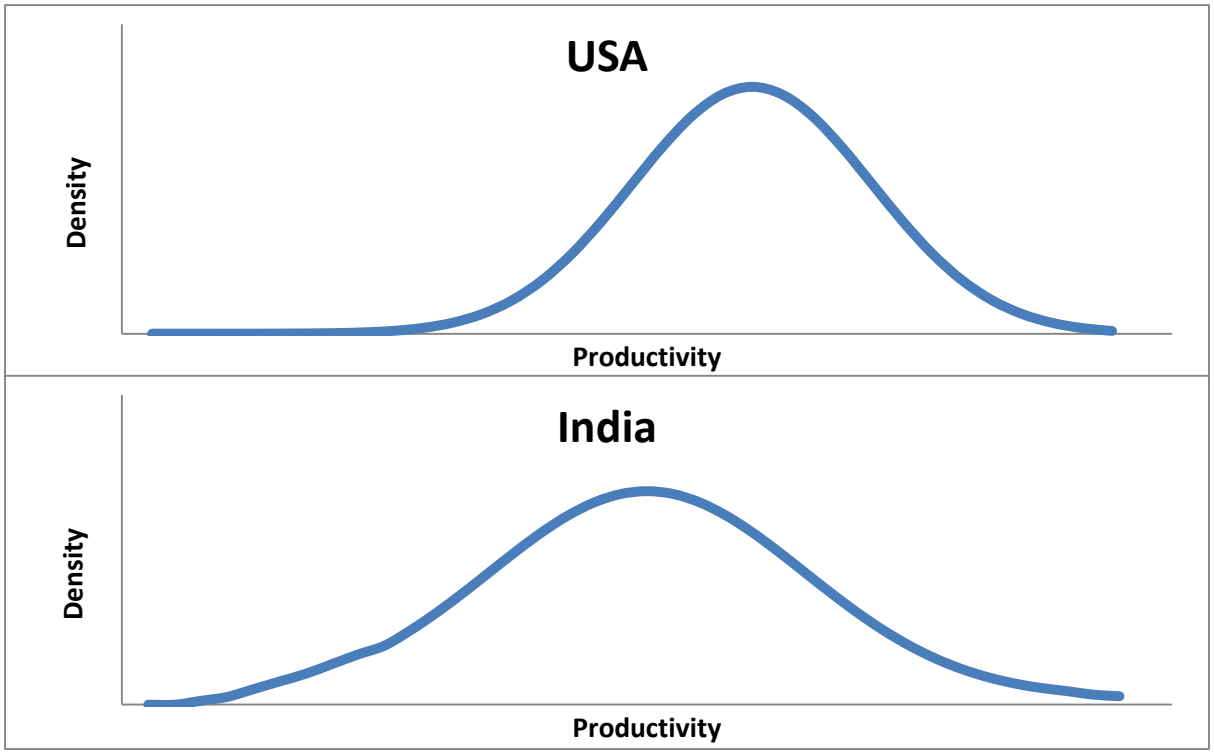
These models of Schumpeterian growth and firm dynamics also shed light on the analysis of the development process and what may stall or prevent innovation in developing countries. As it turns out, firm dynamics show massive differences across countries.

[5] See Aghion, Akcigit and Howitt (2013) and Akcigit and Kerr (2010) for references. In a recent work, Acemoglu, Akcigit, Bloom and Kerr (2013) analyze the effects of various industrial policies on equilibrium productivity growth, including entry subsidy and incumbent R&D subsidy, in an enriched version of the above framework.

In recent work, Hsieh and Klenow (2014) show that while establishments grow 5 times relative to their entry size by the age of 30, Indian counterparts barely show any growth. Why do establishments do not grow as much in India?

A second fact established by these authors, is that when comparing the distribution of Indian firms by productivity with the distribution of American firms, we observe that there are many more firms with low productivity in India than in the United States. Figure 4 displays this discrepancy in a diagram.

[Figure 4]



That firm size distribution is much more skewed to the right in developed economies when compared with emerging economies, means that there are quite a number of very large and highly productive firms that operate in the developed world, while the emerging world seems unable to create (or host) highly efficient firms and is instead dominated by a pool of small and relatively unproductive firms. EBRD's Transition Report 2014 documents that each of the 30+ countries in the transition region has a much higher percentage of firms with low productivity and a lower percentage of highly productive firms when compared with Israel, which is taken as a benchmark innovation-based economy. The Report also finds that Israel has a more compressed distribution of firm productivity than any of the transition economies.

Now let us consider the fact that, conditional on survival firms grow faster in developed economies versus emerging economies: imagine a simple chart that shows firm size on the vertical axis against firm age on the horizontal axis. In the United States, the line that depicts the relationship between firm size and age is significantly upward sloping; while in India, one sees almost a flat relationship. In other words, firm size and firm age are more highly correlated in developed economies than in

emerging economies. This is related to the fact that small firms exit more frequently, but the ones that survive tend to grow faster than the average growth rate in the developed world (Aghion et al, 2013). Hsieh and Klenow (2014) suggest that in emerging markets plants have low investments in process efficiency, quality, and in accessing markets at home and abroad. They estimate that the difference in life cycle dynamics of firms could lower aggregate productivity in manufacturing on the order of 25% in India and Mexico relative to the Unites States.

Placed side by side, these two facts tell a story that has consequences on the Indian economy as a whole: the inability of Indian firms, even the most innovative and productive ones, to grow beyond a certain size, enables firms with low productivity to survive. But, in the aggregate, innovation and thereby the growth of the Indian economy overall, suffers.

Now, to account for these two facts, we must consider the systemic characteristics of the Indian economy. As explained by Ufuk Akcigit and co-authors,[6] the limited growth of Indian firms over time appears to be tied to the fact that the majority of them remain family companies, which can be explained by the low average level of education and the resulting inadequate management skills, by defective infrastructure, and by the imperfections in the credit market in India.

To analyse the aggregate implications of the lack of delegation and weakness of rule of law on productivity and firm dynamics, Akcigit, Alp, and Peters (2016) extend the firm dynamics model introduced in the previous section, by adding two major ingredients: (i) production requires managers and unless firm owners delegate some of the tasks, firms run into span of control problem as owners' time endowment is limited; (ii) firm owners can be of two types, high or low. High-type firms are more creative and have the potential of expanding much faster than low type firms. Whether this fast expansion is materialized or not depends on the return to expansion which itself depends on the possibility of delegation.

The authors develop a model of growth and firm dynamics with delegation, which generates two main predictions:

Prediction 1: Everything else equal, the probability of hiring an outside manager and, conditional on hiring, the number of outside managers is increasing in firm size, decreasing in the owner's time, and increasing in the rule of law.
Larger firms operate with more product lines and hence they have less time from the owner directly. Hence, the marginal contribution of an outside manager is much higher in larger firms. The second part relates the family size to delegation. If the owner has more time (due to larger family size, for instance), then the owner has already more time to invest in his business and this lowers the demand for outside managers. Finally stronger rule of law implies higher net return to delegation. Akcigit, Alp, and Peters (2016) provide empirical support for these statements using Indian manufacturing establishments.

[6] Ufuk Akcigit, Harun Alp, and Michael Peters (2016), "Lack of Selection and Limits to Delegation: Firm Dynamics in Developing Countries," (No. w21905), National Bureau of Economic Research.

Prediction 2: Average firm size increases in the owner's time, increases in the rule of law, and the positive relationship between firm size and the owner's time becomes weaker as the rule of law improves.
Firm value is increasing in owner time and therefore the firms are willing to innovate and expand more when firm value is higher. The empirical support for the first part is provided by Bloom et al (2013). The positive link between firm size and the rule of law has been extensively documented in the literature (See for instance Bloom, Sadun, and Van Reenen (2012) for a detailed discussion). Finally, Akcigit, Alp, and Peters (2016) show that the link between firm size and family size is weaker in high trust regions in India.

Prediction 3: Firm growth decreases in firm size, more so when the rule of law is weaker.
This prediction follows from the fact that in larger firms, the owner has less time to allocate in each product line and hence the frictions to delegation become much more important for large firms. Hence, when the rule of law is weak, larger firms have less of an incentive to grow which means that the difference in growth incentives between large and small firms will be much more pronounced in weak rule of law countries or regions. Akcigit, Alp, and Peters (2016) show that growth decreases faster in firm size in low trust regions in India.

Prediction 4: Everything else equal, creative destruction and reallocation among firms will be much higher in economies where the rule of law is stronger, thanks to the delegation possibilities.
Clearly this latter prediction is in line with the main findings of Hsieh and Klenow's work which showed the missing growth and reallocation in developing countries. Understanding the reasons behind the lack of reallocation and creative destruction is essential in designing the right development policies.

The above two facts have important implications about the evolution of aggregate productivity and growth. Aggregate productivity increases when i) firms upgrade their efficiency over time, and/or ii) factors of production are re-allocated towards more efficient firms.

The first channel is typically found to be relatively more important in explaining growth (Foster et al (2008) find that 26% of productivity growth in the United States is accounted for by new entry, while the remaining is accounted for by within-plant improvements at incumbent plants), and it has a central role in the neo-Schumpeterian paradigm. Within this paradigm, firms have a choice between either carrying out R&D investments to push the technological frontier or imitating existing technologies to catch up to the frontier. However, there is a large variation across firms in terms of R&D investments (and skills and capability to expand a business, linked closely with human capital and unobserved entrepreneurial ability) and the returns to innovation. Moreover, the returns to in-house R&D versus returns to imitation of existing technologies differ across sectors and firms (depending on firm size, age, competition) and over time as countries approach the technology frontier. For instance, EBRD's Transition Report 2014 finds that introducing a new product increases labour productivity the most in low-tech sectors, while the returns to introducing new management practices or processes are lower in transition countries closer to the technological frontier. Therefore, understanding how the firm size distribution evolves and how R&D investments (and capabilities) are distributed across firms at different stages of development is of first-order importance.

As for the second channel: young and innovative firms grow by attracting (skilled) labour from older and less innovative firms and securing (higher quality) capital to fund their expansion. In a framework of monopolistic competition (that both Schumpeterian and new trade theory models embrace as their workhorse), aggregate productivity is driven by such reallocation of the factors of production to the larger and more efficient firms. This latter group includes not only new entrants who innovate with radical new products and technologies, but also large incumbents who carry out a large share of an economy's R&D expenditures to improve existing technologies. However, if there is a lack of such large and efficient firms in an industry to begin with, and young and successful firms find it difficult to grow at a high rate (due, for instance, to financial frictions), then policies aimed at increasing competition and openness to trade need not lead to reallocation and increase growth. Indeed, what we see in the emerging world is exactly a lack of reallocation of factors of production. This lack of reallocation is closely related to the problem of why young entrepreneurial firms and innovative incumbents do not grow at a high rate.

Empirical evidence to date on the second channel suggests that there could be huge gains from a more appropriate allocation of factors of production. Hsieh and Klenow (2009) find that if capital and labour were reallocated to equalise marginal products across plants within narrowly defined industries to the extent observed in the United States, then total factor productivity (TFP) would increase by 30%-50% in China and 40%-60% in India. Moreover, output gains would be roughly twice as large if capital accumulated in response to aggregate TFP gains. Hsieh and Klenow (2009) suggest that both India and China could have increased their manufacturing output substantially if the relatively large firms in each country were able to expand at the cost of smaller firms in their industries. Understanding why such reallocation does not happen in emerging economies is one of the key factors to explaining how countries get stuck in the convergence trap.

6. Implications for Emerging Asia

What can emerging economies in Asia do to innovate their way out of a middle income trap? The Schumpeterian paradigm points at a few priorities going forward. First, the process of technological diffusion – or spillovers – is an important factor behind cross-country convergence. While imitation of existing technologies drives technological diffusion at lower levels of development, countries need more cutting-edge technologies and frontier innovation as their income levels rise to sustain knowledge diffusion. Hence, greater investment in human capital and R&D become essential for middle-income countries such as China, India, or Indonesia. The rising stock of patents and other innovative activity in Asia – particularly in China – is a promising sign in this regard.

The second priority is therefore to ensure that the relatively more productive enterprises in an economy are able to engage in and reap the benefits of the latest innovations. A first step in this regard is better protection of intellectual property rights (IPR), which should extend to reducing the scope of expropriating successful entrepreneurs. A second step is to level the playing field in access to finance. In particular, if innovations can only be funded by retained earnings of producers or cheap credit through the state, then R&D and patenting are unlikely to be allocated to the most efficient enterprises. Many middle-income countries in Asia still have a long way to go both in terms of IPR protection and the efficient allocation of R&D.

The third priority goes to ensure that innovative enterprises can grow to an efficient scale: new entry and growth by entrepreneurs should be encouraged and the survival of less productive entrepreneurs discouraged. This ultimately relates to the political economy dimension of the Schumpeterian paradigm: creative destruction is only possible with enabling institutions, which play a more important role as a country approaches the technology frontier. In practical terms, this means that middle-income countries in Asia should encourage the creation of new businesses by lowering barriers to entry and strengthen the rule of law. The latter is particularly important in light of findings in the Indian context: business can grow only when managers can delegate more to non-family members. This is more likely to be the case in regions with stronger rule of law. Increasing inter-regional competition in doing business and strengthening the rule of law is therefore essential for middle-income Asia.

7. Conclusions and future work

A **first** step in our future research will be to merge the "appropriate institution" and "firm dynamics" models as a basis for a more comprehensive treatment of the middle income trap issue. In particular we want to look at the effect of various reforms (trade liberalization, removal of entry barriers, etc.) and look at the extent to which these reforms spur innovation-led growth by fostering firm dynamics and the selection of the most efficient firms in each sector. In short, we would revisit the same kind of analysis as in Aghion et al (2006) but through the lenses of Klette and Kortum (2004) and the subsequent firm dynamics literature.

The **second** step would be to bring this integrated framework to the data. We would take advantage of the observation that there are large and persistent productivity differences across firms within industries. [7]

A **third** avenue will be to use the Schumpeterian paradigm to analyse the switch from investment-led to innovation-led growth. Are there institutional or economic factors that enable this switch?

Fourth, what does the paradigm say about labor market policy? Are there cases when labor market reform may hurt innovation? A related issue is that of education, which is linked to the manufacturing base of countries. Tertiary education goes hand-in-hand with manufacturing but higher education is more important for innovation. How should countries balance the two?

These and related policy questions will motivate our future research on the middle income trap.

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[7] This heterogeneity is well approximated by power laws (Konig et al, 2016). In models of monopolistic competition, including Schumpeterian models, this heterogeneity in productivity is isomorphic to the observed firm size distribution. Hence, even in the absence of appropriately measured productivity data, one can use information on firm size to characterise an industry's heterogeneity. These differences are fairly constant over time; Syverson (2011) reports that regressing a producer's current TFP on its one-year-lagged TFP yields autoregressive coefficients on the order of 0.6 to 0.8.

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