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Economic Growth through the Development Process.∗

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Abstract
In this paper, I discuss some recent research in the area of economic growth and development emphasizing the endogenous dynamics of policies and organizational forms in a world characterized by credit-market and labor-market imperfections. I present a simple model of technological convergence featuring an endogenous evolution of contractual arrangements. The key assumption is that economic growth is associated with investments as well as with the adoption and imitation of existing technologies in economies lying far from the technology frontier. In contrast, growth is increasingly driven by innovation as economies approach the technological frontier. The theory predicts that contractual arrangements evolve and adapt spontaneously to the changing needs of technological progress. However, this evolution is neither necessary nor serendipitous. Economies that fail to introduce economic reforms as they advance may become stuck in non-convergence traps. I discuss a number of empirical applications, including the wave of reforms of industrial policy in India in the 1980s and 1990s.

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In the second half of the XXth Century, the world economy experienced unprecedented progress in the material standards of living; the income per capita increased, on average, four-fold between 1950 and 2000. Moreover, especially in the last twenty years, the developing world as a whole has grown significantly faster than has the industrialized one, leading to an absolute reduction in income inequality and poverty. The global experience has its dark sides, however. The development boom is mainly an Asian phenomenon, initially localized in the Pacific region and more recently spreading to India and China. On the opposite extreme, the standards of living have been stagnating in sub-Saharan Africa, and actually fell during the 1980s and 1990s. As a result, large cross-country differences in the standards of living persist. The average GDP per capita of non-OECD countries in year 2000 remains under that of the United States a century earlier, while 32 sub-Saharan African countries still subsist on an annual per capita GDP of less than 2000 US dollars.

Why do standards of living remain persistently different? Why are some developing countries closing the gap, while others are stagnating and remain stuck in poverty traps? Which policies and institutional arrangements can help developing economies grow and make the transition from relative poverty to prosperity, and which hinder these objectives? To date, there is no consensus answer to such important questions. The modern theory of economic growth has focused on the determinants of capital accumulation and innovation in industrialized economies, extrapolating its message to developing economies. The ensuing policy recommendations tend to be of the "one-size-fits-all" type. The right road for development – the orthodox doctrine maintains – is to let markets do their job. Governments should step away of any direct involvement in the economic process, and limit their action to favor, in both developing and developed countries, legal enforcement, property right protection, product and labor market liberalization, and monetary and fiscal stability. Many development economists, however, question the usefulness of this approach. They believe that the process of economic development differs qualitatively from the growth process in industrialized economies and that its analysis requires a different focus and even different theories.

In this paper, I present a theory that attempts to unify these two different approaches.
to the process of development. The key observation is that economic growth in industries and economies far from the technology frontier takes the form of adoption and imitation of existing technologies and capital accumulation in already existing lines of business. In contrast, the potential for growth by simply adopting existing technologies in technologically more advanced industries and economies is limited; as a result, innovation drives much of growth here. Imitation and innovation require different organizational forms, different relations between entrepreneurs and credit markets, and different processes of selection of entrepreneurs and firms. Consequently, the theory predicts a close link between distance to frontier, on the one hand, and organizational forms, market relations, and institutions, on the other.

There are two building blocks to this approach. First, institutions, firms’ organizations, and more general contractual relationships between individual agents and social groups evolve and adapt spontaneously to the changing needs of the process of technological progress. Thus, the adoption of appropriate institutions, i.e., institutions that promote growth in a particular stage of development and under specific local conditions, is in part an equilibrium phenomenon. Even political institutions respond to the endogenous pressure for changes; the process of democratization in the last quarter of century was more often the result of the internal collapse of autocratic regimes which proved unable to deliver acceptable levels of economic efficiency than the outcome of international pressure or intervention. This transformation, however, is not serendipitous and by no means a historical necessity; it is, in contrast, subject to high uncertainty, perils, and path dependence. Developing countries often successfully adopt arrangements at an early stage of the process of economic development that differ from those industrialized economies countries implement. However, it is not uncommon for such arrangements to become barriers to growth at later stages of the process of development. The ability or failure to introduce economic reforms then becomes key: some countries manage to sustain or even accelerate their convergence by reforming their policies and institutions, while others fail to reform obsolete and inappropriate policies. Politico-institutional lock-in can lead the process of technological development to a halt. The theory attempts to identify determinants of success and failure.

A key distinction in my approach lies in the differentiation between rigid and flexible
policies and institutions. Rigid policies include long-term contracts, trade and entry barriers, licensing systems, selective investment subsidies, employment protection and regulations reducing labor mobility, selective credit markets, and direct intervention of governments in corporate governance. Such policies are often described as barriers to economic growth and technology adoption that rise and persist due to political failures, such as the capture of politicians by vested interests and powerful minorities of insiders. However, there are numerous historical examples in which rigid institutions have been successful in promoting growth. These include the late industrialization experiences of Germany, Italy, and Russia. More recently, the import-substitution strategy of many Latin American countries seemed capable of sustaining high growth during the 1950s and 60s, although these countries later entered a profound crisis.

Albeit altogether different, the growth strategies of the major East-Asian economies, such as Korea and Japan, during the postwar period, were also characterized by many rigid elements. For instance, these economies relied on large integrated (and politically protected) firms, as well as long-term relationships between firms, banks and firms, and firms and employees. Some aspects of the process of technological catch-up in some continental European economies until the 1970s also fit this picture. For instance, Italy grew successfully for several decades after World War II through the adoption of highly interventionistic industrial policies, characterized by strong links between large (often state-controlled) banks and firms, and a politically entrenched economic leadership. These models contrast in many respects with the more flexible, competition-oriented institutions that prevailed in the United States or other Anglo-Saxon economies. Our theory framework highlights the forces behind the emergence of different organizational forms and the complex transformation taking place throughout the process of economic development.

The rest of the paper is organized as follows. Section 2 describes the benchmark theory. Section 3 characterizes the equilibrium and discusses two applications. In Section 4 we discuss some empirical evidence, both at the individual-country and at the cross-country level. Section 5 discusses an extension of the theory and its empirical application to the liberalization reforms in India. Section 6 concludes.
In this section, I present a workhorse model based on Acemoglu, Aghion and Zilibotti (2002 and 2006), hereafter referred to as AAZ. The production side of the economy consists of a unique final good, assumed to be the *numéraire*. This good is produced competitively using a continuum of intermediate inputs according to:

\[ y_t = \int_0^1 (A_t(i))^{1-\alpha} x_t(i)^\alpha \, di, \quad (1) \]

where \( A_t(i) \) is the productivity of the intermediate good in intermediate sector \( i \) at time \( t \), \( x_t(i) \) is the amount of intermediate good \( i \) used in the production of the final good at time \( t \), and \( \alpha \in (0,1) \).

Each intermediate good is produced by a monopolist \( i \in [0,1] \) at a unit marginal cost. A competitive fringe of imitators can copy its technology and also produce an identical intermediate good with productivity \( A_t(i) \), but its production activity is less efficient. In particular, fringe firms can produce at a marginal cost \( \chi \in (1,1/\alpha) \) units of final good. This competitive fringe limits the monopoly power of the leading firm, forcing the latter to set a *limit price*:

\[ p_t(i) = \chi > 1. \quad (2) \]

The parameter \( \chi \) captures both technological factors and government regulations such as barriers to entry or other competition policies. A higher \( \chi \) corresponds to larger barriers, i.e., a less competitive market. Given the demand implied by the final goods technology in (1) and the limit price in (2), the profit of the leading monopolist in sector \( i \) is given by:

\[ \pi_t(i) = \delta A_t(i), \quad (3) \]

where \( \delta \equiv (\chi - 1) \chi^{-\frac{1}{1-\alpha}} \) is an increasing function of \( \chi \) measuring the extent of monopoly power.

The process of economic growth is driven by technological progress, which is captured in the model by increases in \( A_t(i) \). Technical progress can stem from two complementary processes: (i) imitation (adoption of existing technologies); and (ii) innovation (discovery or adaptation to local conditions of new technologies). To describe the innovation
process, I first define the average economy-wide productivity as $A_t \equiv \int_0^1 A_t(i) \, di$, while I denote the productivity at the world frontier as $\bar{A}_t$, which is assumed to grow at the constant rate $g$, $\bar{A}_t = (1 + g) \bar{A}_{t-1}$. Since I focus on the process of technological convergence, I will maintain throughout the paper that $A_t \leq \bar{A}_t$ for all $t$. The process of imitation and innovation leads to the following law of motion of each sector's productivity:

$$A_t(i) = \eta \bar{A}_{t-1} + \gamma A_{t-1} + \varepsilon_t(i),$$

(4)

where $\eta > 0$ and $\gamma > 0$, and $\varepsilon_t(i)$ is a mean-zero random variable, capturing the feature that there may be differences in innovation performance across sectors. Equation (4) captures the two dimensions of productivity growth: imitation and innovation. $\eta \bar{A}_{t-1}$ stands for advances in productivity coming from adoption of technologies from the frontier (and thus depends on the productivity level of the frontier, $\bar{A}_{t-1}$), and $\gamma A_{t-1}$ stands for the component of productivity growth stemming from innovation (building on the existing knowledge stock at time $t-1$, $A_{t-1}$).

Finally, I define $a_t \equiv A_t/\bar{A}_t$ to be the measure of the country’s average proximity (i.e., the inverse of the distance) to the technological frontier at date $t$. Integrating (4) over $i \in [0,1]$, using the fact that $\varepsilon_t(i)$ has mean zero, dividing both sides by $\bar{A}_t$ and use the law of motion $\bar{A}_t = (1 + g) \bar{A}_{t-1}$ leads to a simple linear relationship between a country’s proximity to frontier $a_t$ at date $t$ and that at $t - 1$:

$$a_t = \frac{1}{1 + g}(\eta + \gamma a_{t-1}).$$

(5)

This equation shows how the process of technological convergence depends on imitation and innovation activity. As $a$ increases (i.e., as the country approaches the frontier), innovation becomes relatively more important for growth. In contrast, when $a_{t-1}$ is small, imitation activity is the main driving force of the growth process. I will use this basic equation to describe a number of applications in which rigid arrangements and institutions lead to a high $\eta$, whereas flexible arrangements and institutions lead to a high $\gamma$.

The theory maintains the assumption that there is a trade-off between the innovation and imitation activities carried out within firms. Contractual arrangements and the internal organization of firms affect the resolution of this trade-off. Long-term contracts
between firms, between firms and banks or between firms and their managers foster, for example, the undertaking of "large" investment projects involving the adoption (imitation) of well established technologies. In contrast, higher turnover and generally more flexible arrangements, favor the selection of entrepreneurial skills and more efficient firm-worker matches, ultimately enhancing firms’ innovative capabilities.

Before discussing the theory in more detail, I report some evidence that innovative activity, proxied by R&D investments, indeed increases with the distance to the technology frontier. This evidence is based on a study of Griffith, Redding and Van Reenen (2004) using data from the OECD sectoral database for the years 1974-1990. I define the “proximity to frontier” (i.e., the inverse of distance to frontier) for an industry, $PTF_{ict}$, as the total factor productivity (TFP) in industry $i$ in country $c$ at time $t$ divided by the highest TFP in industry $i$ at time $t$ in the sample. Table 1 (borrowed from AAZ) shows the correlation between the “proximity to frontier” and the R&D intensity, (R&D divided by sales) with or without controlling for country and industry effects. The first three columns use a measure of $PTF_{ict}$ without correcting for differences in skills and hours, whereas the last three columns use a measure that corrects for these differences. As the table shows, country-industries closer to their respective frontier are more R&D intensive.\(^1\) Moreover, the more rapidly an industry in any country approaches the world technology frontier, the more it becomes relatively R&D intensive. This is consistent with the view that R&D is more important in industries or countries closer to the world technology frontier.

**TABLE 1**

### 3 Industrial Policy and Contractual Relationships

I assume that a manager runs each firm. The relationship between the firm and its manager is subject to informational imperfections raising a standard agency problem. I discuss two alternative applications characterized by different informational problems. Fol-

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\(^1\)As the comparison between the different column reveals, the inclusion of country, industry and country-industry dummies reduces the estimated effect, suggesting that part of the raw correlation between innovation and distance to frontier comes from between-industry and between-country (e.g., institutional) comparisons. However, the estimated coefficient is statistically significant even in the more demanding specification of columns 3 and 6 that only uses within variation.
lowing AAZ, I assume that the parameters $\eta$ and $\gamma$ in (5) are functions of the (physical- or human-capital) investments the agent undertakes and the contractual arrangement between the principal and the agent.

3.1 Physical-Capital Investments

In the first application, based on AAZ, there is imperfect information about the quality (skills) of managers. There are two types of manager: high- and low-skill managers. When a manager is first hired, her ability is unknown; it is revealed over time through her subsequent performance. There are two possible contractual regimes: “long-term contracts”, $R = 1$, meaning that managers are not fired even if they are revealed to be low skill, and “short-term contracts”, $R = 0$, implying that the process of “creative destruction” replaces low-skill managers with new managers of unknown ability.

Managers have human skills but they cannot borrow, due to credit market imperfections. In contrast, firms have deep pockets but no skills. Due to a standard moral hazard problem (they can “steal the output”) managers must earn ex-post rents to be induced to behave. Since firms pay the investment costs but must share the returns with their managers, investments tend to remain below their efficient level. Long-term contracts induce insider managers to use their retained earnings to finance the investments. Thus, long-term contracts mitigate the underinvestment problem. Many of the active managers in the economy will have low skills and will be less innovative, however, under long-term contracts.

3.2 Firm-Specific Human-Capital Investments

In the alternative scenario, the principal-agent relationship is subject to a two-side moral-hazard problem. Firm-manager matches are subject to idiosyncratic shocks that make some matches more productive than others. For simplicity, matches can either be good or bad. Neither party knows if a match is good or bad at the time of initiation of a relationship, but this information becomes public after the first period of production. The quality of the match affects the firm’s innovative capability.

Young managers can make a costly firm-specific human-capital investment that has no value outside of the existing employment relationship. The investment is also specific
to the technology in use, and does not affect the firm’s innovative capability. The investment is not contractible, raising a standard moral hazard problem. Young managers find it optimal to make the investment only if they anticipate certain reemployment with the same firm in the following period; if not, they do not find investment profitable. Firms would like, ex-ante, to sign a contract inducing their managers make the human capital investment. However, they have limited (or no) commitment power, and their ex-post incentive is to dissolve bad matches, irrespective of whether the manager has made the human-capital investment.

\[ R_t = 1 \] here indicates a lifetime employment regime, such that managers invest in firm-specific human capital and firms retain all managers, irrespective of the quality of the match. \( R_t = 0 \) is a short-term contract regime such that managers do not invest and firms only continue the employment relationship when the match turns out to be good. Employment legislation and firms’ managerial culture determine the cost of separation and the prevailing contractual regime.

### 3.3 Growth-Maximizing Dynamics

The crucial assumption is that managerial talent and/or match quality matter more for innovation than for imitation. The resulting law of motion of the distance the frontier, (5), takes the form

\[
a_t = \begin{cases} 
\frac{1}{1+g}(\bar{\eta} + \gamma a_{t-1}) & \text{if } R_t = 1 \\
\frac{1}{1+g}(\eta + \tilde{\gamma} a_{t-1}) & \text{if } R_t = 0
\end{cases}
\]

(6)

where \( \bar{\eta} > \eta \) and \( \tilde{\gamma} < \gamma < 1 + g \). The assumption that \( \tilde{\gamma} < \gamma \) reflects the notion that high-skill managers and well-matched firms are better at performing innovation. Short-term contracts imply that relationships with low-skill managers (respectively, bad matches) are severed, leading to a better pool of active managers (respectively, a better pool of matches). The assumption that \( \bar{\eta} > \eta \) follows from the fact that long-term contracts imply more investment in either physical or human capital. To the extent to which the amount of imitation activity increases the rate of investment in existing technologies, long-term contracts lead to more imitation, i.e., higher \( \eta \).

I assume that \( g = \eta + \tilde{\gamma} - 1 \), which ensures that an economy choosing short-term contracts grows exactly at the rate \( g \) when it reaches the frontier. Figure 1 represent
the dynamics under the two contractual regimes.

FIGURE 1

Figure 1 shows that the economy with long-term contracts \((R = 1)\) achieves greater growth (higher level of \(a_t\) for given \(a_{t-1}\)) through the investments/imitation channel, but lower growth through the innovation channel. In particular, the positive intercept captures imitation while the slope coefficient multiplied by \(a_{t-1}\) captures innovation. The figure shows that the positive intercept is larger under \(R=1\) whereas the slope coefficient is larger under \(R=0\). The figure also shows that which regime maximizes the growth rate of the economy depends on the level of \(a_{t-1}\). In particular, there exists a threshold distance-to-frontier level, \(\hat{a} \in (0, 1)\), such that when \(a_{t-1} < \hat{a}\), long-term contracts \((R = 1)\) lead to greater growth, and when \(a_{t-1} > \hat{a}\), short-term contracts \((R = 0)\) achieves higher growth.

The growth-maximizing sequence starts with long-term contracts maximizing investments and imitation, and then switches to short-term contracts maximizing selection and innovation. The result is very intuitive: investments and imitation are the main source of growth for a very poor economy; long-term contracts are then efficient. However, as the economy comes sufficiently close to the frontier, innovation becomes the main source of growth. Short-term contracts then become efficient as they induce greater selection and innovative capability.

3.4 Equilibrium.

Consider the environment of section 3.1. There is no guarantee that the equilibrium contractual arrangements attain efficiency. As shown more formally in AAZ, the equilibrium organization takes the following form:

\[
R^e_t = \begin{cases} 
1 & \text{if } a_{t-1} < a_r(\delta) \\
0 & \text{if } a_{t-1} \geq a_r(\delta),
\end{cases}
\]
where $a_r$ is an increasing function of $\delta$, and generically $a_r(\delta) \neq \hat{a}$. The more anti-competitive the policy, the larger the range of $a$ such that the economy chooses long-term contracts. The intuition is as follows: when managers earn high rents, there is more scope for them to invest large retained earnings into their businesses. They then become more attractive to financiers than in economies where firms earn lower profits and therefore have lower retained earnings to inject into the investment process.

Rather than analyzing the problem in general (as is done in AAZ), I will consider a simplified case in which the government can choose between two competitive regimes, high competition ($\delta$) and low competition ($\bar{\delta}$). Suppose, in addition that

$$a_r(\delta) < \hat{a} < a_r(\bar{\delta})$$

and $a_0 > a_r(\delta)$. Figure 2 describes this example. The red and the green lines yield the equilibrium sequences under the low competition (RIGID) and high competition (FLEX) industrial-policy regimes, respectively. Short-term contracts is the equilibrium arrangement for all $a \leq a_r(\delta) \equiv a_FLEX$ under the high-competition regime; the economy switches then to long-term contracts for $a \geq a_FLEX$. In contrast, long-term contracts is the equilibrium arrangement for $a \leq a_r(\bar{\delta}) \equiv a_RIG$ under the low-competition regime; the economy switches then to long-term contracts for $a \geq a_RIG$. If I consider two economies at different stages of the development process, such as $a_0 \in (a_FLEX, \hat{a})$ and $a'_0 \in (\hat{a}, a_RIG)$, respectively, high competition is the appropriate (i.e., growth maximizing) policy for the richer economy ($a'_0$), whereas low competition is the appropriate policy for the poorer economy ($a_0$). More precisely, the optimal policy for the poorer economy consists of a temporary government intervention to restrict competition followed by a liberalization reform (i.e., a switch from $\bar{\delta}$ to $\delta$) as $a \geq \hat{a}$.

\textbf{FIGURE 2}

In the case shown in Figure 2, the competition policy only affects the speed of transition to the frontier, but not the long-term result. More extreme outcomes are possible, however. In Figure 3, I show a cases where the high-competition regime lead to
no investment activity for a range of low $a$’s, thus neither to imitation nor to innovation.\textsuperscript{2} The economy stagnates in absolute terms, and diverges from the frontier rather than converging to it. Industrial policy aimed at limiting competition and strengthening the incentive of incumbent firms to invest becomes then necessary to prevent the economy from falling into this poverty trap.

FIGURE 3

Insisting on low-competition policy may be very hazardous, however. In both Figure 2 and Figure 3, a government insisting on the anti-competitive policy condemns the economy to a non-convergence trap. In this case, the state of technology converges to $a_{\text{trap}}$ but there is no further convergence. In contrast, technology would converge to the frontier if a pro-competitive reform were introduced. The condition for a non-convergence trap to exist is that $a_r(\bar{\delta}) \equiv a_{RIG} > a_{\text{trap}}$, where $a_{\text{trap}}$ is pinned down by the intersection of the dynamics when $R = 1$ and the 45-degree line (more formally, $a_{\text{trap}} \equiv \bar{\eta}/(1 + g - \gamma)\textsuperscript{3}$). Non-convergence traps are especially interesting. Encouraging investment-based growth, by supporting existing, incumbent firms, may appear to be “appropriate policy”, but in fact condemns the economy to non-convergence. The resulting economy is an underdeveloped one, unable to realize the structural transformation necessary for the process of economic development.

Similar results are obtained in the human-capital investment environment of section 3.2. In a pure laissez-faire environment where firms cannot commit to retain managers if the match turns out to be bad there are no firm-specific investments, resulting in a low $\eta$. Human-capital investments are then suboptimally low condemning poor economies to slow growth. Employment regulations (and/or cultural norms that force firms to internalize the cost of laying off their managers) enable firms to make credible promises that all managers will be retained, at least as long as $a$ is not too large. However, excessively strict norms or firing regulations backfire. Non-convergence traps such as those of Figure 2 emerge in economies where bad matches are not dissolved even if their continuation is

\textsuperscript{2}This is a standard result in Schumpeterian models of innovation: low monopoly rents imply a corner solution with zero innovative investments.

\textsuperscript{3}More formally, $a_{\text{trap}} \equiv \frac{\bar{\eta}}{1 + g - \gamma}$. 

11
very costly for innovation and growth. As in the previous case, encouraging firm-specific investments and managers’ loyalty to their employers may appear to be “appropriate policy” at an early stage, but in fact it condemns the economy to non-convergence.

3.5 Summary

The discussion above highlighted how the equilibrium pattern of economic arrangements may involve the organization of the economy in non-standard ways (long-term contracts, limited competition, firing regulations, etc.), and the process of economic growth brings the structural transformation of these arrangements. It also highlighted how certain policies, such as reducing product or labor market competition, may appear attractive as a way of increasing growth temporarily, but can quickly turn into inappropriate institutions, causing the economy to become trapped and stop converging to the world technology frontier.

In fact, the danger of appropriate institutions turning into inappropriate institutions increases significantly once the analysis is expanded to incorporate political economy features, where incumbent firms can lobby to influence equilibrium policies. For example, under the plausible assumption that economic power can buy political power, these policies become easily entrenched once the economy adopts less competitive markets or subsidies to investment. Existing policies and institutions thus enrich incumbent entrepreneurs, who can then successfully lobby to maintain them (and thus prevent a switch to the innovation-based equilibrium). Similarly, unions representing insider workers have an incentive to lobby against labor market reforms.

These political-economy considerations therefore reiterate the fact that societies may become trapped in a non-convergence pattern with inappropriate institutions and relatively backward technologies, because earlier they adopted appropriate institutions for their circumstances at the time, but in the process also created a powerful constituency against change.
4 Empirical Evidence

4.1 Selected Countries

The non-convergence trap and the associated political economy interactions may be a good description of the experiences of a number of Latin American countries such as Brazil, Mexico, and Peru, which grew relatively rapidly with import substitution and protectionist policies until the mid-1970s, but then stagnated and were ultimately surpassed by other economies with relatively more competitive policies.

Figure 4 shows the growth performance of Central and South American countries at different stages of their development processes. I plot the average growth rate over five-year periods on the vertical axis, and the GDP per capita relative to the US at the beginning of each five-year period on the horizontal axis. The continuous line is for comparison. It represents the average growth rate across all non-OECD countries in the world (not only in Central and South America), conditional on the distance to frontier. Figure 4a plots the growth performance of the four largest Central and South American countries: Brazil, Argentina, Mexico, and Colombia. All of these countries actively engaged in import-substitution policies. Clearly, when their relative GDP lay under 40%, these four countries outperformed the average non-OECD country at the same level of development. But their performance was below average when their relative GDP exceeded 40%.

Figure 4b plots all Central and South American countries, and shows the same broad pattern. One concern about Figures 4a and 4b is that the cross-sectional variation alone drives the evidence. To address this concern, Figure 4c plots the growth rates controlling for fixed effects. In this figure, each point represents the deviation of the growth rate from the "usual growth rate" of the country in question. The construction of this panel precludes any cross-sectional variation. The continuous line is now calculated as the regression line of a convergence equation for the entire world sample after controlling for fixed effects. As the figure shows, the performance of Latin American countries deteriorates at a faster rate than that of the average developing country. A likely explanation

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4 Note that the continuous line is positively sloped. This reflects the well-known fact: that there is no absolute convergence across countries in the world.

5 In contrast to the cross-sectional pattern, there is convergence in the fixed-effect regression as indicated by the downward sloping line.
for this pattern is the important-substitution and incumbent-protective policies many countries in Latin America adopted. As this paper suggests, these policies appear to have led to relatively rapid initial growth, followed by stagnation. Moreover, the political economy of these countries suggests that the economic stagnation was associated with a persistent inability to implement policy reforms.

FIGURE 4 (FOUR PANEL)

Our simple theory also sheds new light on the experiences of South Korea and Japan. For much of the post-war period, both Korea and Japan achieved rapid growth and convergence relying on high investment, large conglomerates, government subsidies, and relatively protected internal markets. In Japan, the Ministry of International Trade and Industry (MITI) played a crucial role by regulating foreign currency allocations, import licenses, and the extent of competition; by directing industrial activity; and by encouraging investment by the *keiretsu*, the large groupings of industrial firms and banks (e.g., Johnson, 1982, Evans, 1995, Hoshi and Kashyap, 2002). In Korea, the large family-run conglomerates, the *chaebol*, appear to have played an important role, especially in generating large investments and rapid technological development. The chaebol, similar to the keiretsu in Japan, received strong government support in the form of subsidized loans, anti-union legislation, and preferential treatment that sheltered them from both internal and external competition. An additional important feature of both the chaebol and the keiretsu was their low managerial turnover, emphasis on long-term relationships, and generally rigid structures (e.g., Wade, 1990, Vogel, 1991, Evans, 1995).

In both Korea and Japan, a long period of convergence and growth came to an end, in the mid-1980s in Japan, and during the Asian crisis in Korea. The Korean case illustrates the politico-economic problems discussed above. For instance, Kang (2002) argues that political more than economic considerations have been driving policy making in Korea and that corruption was very widespread. Nevertheless, the crisis appears to have eventually opened the way to reforms in Korea: a number of the chaebol
went bankrupt, while others were split, or like Daewoo, were forced to restructure. Political reforms seem to have weakened the highly entrenched politico-economic elite. Interestingly, the speed of reforms seems to have been much slower in Japan. This may explain why Korea has since rapidly managed to resume growth after the crisis, while Japan’s economic performance continues to be weak.

This debate is also relevant for the process of liberalization and economic reforms in continental European countries such as Italy, France, and Germany. Italy is an emblematic case, as it experienced a very strong growth performance until the 1980s, with productivity per worker growing at a 4.8% yearly rate in the period 1950-1980. Italy then underwent a drastic slowdown, with labor productivity growing at a modest annual rate of 1.4%. While other European countries have experienced weak economic performance since the 1980s, that of Italy has been especially weak. In the period 1990-2003, labor productivity growth fell further to just above 1%, the second lowest rate of productivity growth among the G7, after Japan.\(^6\) The same industrial and competition policies that fostered growth in the post-war era, characterized by a strong coordinating role of government and banks, and support to large insider firms, seem to have become inappropriate and to be among the causes of the weak performance in recent years. Similarly, Italy has very tight regulations about dismissal of employees. In a recent newspaper article, Francesco Giavazzi\(^7\) writes:

"The idea that the economy needs institutions in which the State and large banks cooperate under the government’s direction was innovative in the 1930s and in the post-war period, when Italy was a poor and backward country... Since then, more than half century has past... In the 1950s and 1960s Italy — as later Japan and South Korea — grew by adopting well-established technologies, most of them developed in the United States: steel, automobile, household appliance industries. In that stage, in which large investments yielding delayed returns were necessary, one needed stability, and hence long-term relationships between industry and banks, stable ownership structures, low managerial turnover, all characteristics of a financial system relying on large banks. A

\(^6\)Labor productivity in the other G7 grew at the following annual rates in the period 1990-2003: United Kingdom 2%, United States 1.8%, Canada 1.8%, Germany 1.5%, France 1.1%, Japan 0.6%. All data are from Penn World Table 6.2.

\(^7\)"Why to privatize networks", Corriere della Sera, February 1, 2007, my translation.
strong role of the State in the economy was no obstacle: much of the growth in the 1960s is due to IRI which controlled a good share of the Italian industry and several major banks, and which has produced a generation of outstanding managers. But when a country reaches the technology frontier, innovation becomes the key factor for growth. And since it is mainly new firms that innovate, one needs lot of "creative destruction", namely, an environment in which old firms close down and are replaced by new ones, whose ownership is contestable, even that of banks".  

Many recent attempts to reform industrial policy have met resistance in Italy (see, for example, the privatization of public utility networks and of Alitalia, Italy’s national airline), showing how policies that were appropriate at an earlier stage tend to become entrenched and to create a constituency opposing change when reform becomes necessary to promote innovation-led growth.

4.2 Evidence: Cross-country Regressions

In this section, I move from the discussion of individual countries to a more systematic cross-country analysis. An implication of the theory discussed above is that anti-competitive policies, such as barriers to entry or trade restrictions, become increasingly harmful as an economy approaches the technology frontier. To test this implication, I consider a sample of non-OECD, non-socialist countries. I measure the distance to the frontier by the GDP per capita relative to that of the U.S..

I first consider barriers to entry. These are measured by the number of procedures necessary for opening a new business (Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2002). The sample of countries includes all non-OECD (including, however, those that joined the OECD in the 1990s, such as Korea and Mexico) and all non-socialist countries for which I have data. Barriers are measured according to the “number of procedures to open a new business” variable from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002).

8IRI was a large state holding company founded in 1933 by Alberto Beneduce. IRI exercised some original form of control on a number of large firms in the post-war Italian history. IRI closed its doors in June 2000, being an example of the process of equilibrium institutional dynamics discussed in the previous chapter.
I estimate the following regression equation:

\[ g_{i,t} = \alpha_0 + \alpha_1 B_i + \alpha_2 \frac{y_{i,t-1}}{y_{US,t-1}} + \alpha_3 \left( \frac{y_{i,t-1}}{y_{US,t-1}} \cdot B_i \right) + d_i + f_t + \varepsilon_{it}. \]

\( g_{i,t} \) is the growth rate in country \( i \) between \( t - 1 \) and \( t \), \( B_i \) denotes the level of barriers in country \( i \), \( y_{i,t-1} \) is GDP per capita in country \( i \) at date \( t - 1 \), \( y_{US,t-1} \) is GDP per capita in the United States \( i \) at date \( t - 1 \), and the \( f_t \)'s denote a full set of time effects. I take the time intervals to be 5 years. \( \alpha_3 \) is the coefficient of interest, which the theory predicts to be negative.

The results are reported in Table 2. Columns 1 and 2 report, respectively, the results of OLS regressions without and with country fixed effects (FE). Interestingly, the interaction effects increase significantly the point estimates (though, standard errors are also larger) by controlling for unobservable (e.g., institutional) cross-country heterogeneity. A problem with the specification of column 2 is that models with fixed effects and lagged dependent variables produce inconsistent estimates. To partially address this problem, I report the results of IV regressions where proximity to frontier is instrumented by its one-period lags in column 3.\(^9\) I furthermore control in column 4 for the education of the labor force measured by years of schooling for males (from the Barro-Lee data set). The interaction coefficient, \( \alpha_3 \) (distance to frontier * barriers) is always negative and in most cases statistically significant. This implies that as they approach the frontier growth in high-barrier countries slows down more relative to low-barrier countries.

### Table 2

Next, I consider the degree of openness to international trade. Rather than using the ratio of actual trade to GDP, which is a highly endogenous variable, I use the degree of openness predicted by a standard "gravity" equation as in Frankel and Romer

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\(^9\)Lag dependent variables are, as usual, quite imperfect instruments. However, it is not easy – and outside the scope of this paper – to find variables that affect barriers to entry and have no independent effect on growth in cross-country regressions. In the second part of this paper, I achieve better identification by looking at the effect of industrial policy reforms within one country.
The gravity equation estimates degree of openness as a function of differences in population, land area, proximity, and common borders to other countries; it takes whether a country is landlocked into account. I run a regression which is analogous to that for entry barriers:

$$g_{i,t} = \beta_0 + \beta_1 \text{OPEN}_i + \beta_2 \frac{y_{i,t-1}}{y_{US,t-1}} + \beta_3 \left( \frac{y_{i,t-1}}{y_{US,t-1}} \cdot \text{OPEN}_i \right) + d_i + f_t + \varepsilon_{it}.$$ 

In this case, the theory predicts that the interaction coefficient $\beta_3$ should be positive (as openness has a more positive effect close to frontier). The results are reported in columns 5-8, corresponding to columns 1-4 for barriers. The results show, in line with the predictions of the theory, that openness becomes increasingly important for growth as a country comes closer to the technology frontier. The estimates of the interaction coefficient $\beta_3$ (distance to frontier times openness) are always positive, although only statistically significant in one case.

5 Distance to Frontier and Policy Reforms

5.1 Theory

In the previous sections, I have discussed the aggregate effects of industrial policy on growth. I will now shift the focus to a more disaggregated level to discuss heterogeneous effects of economic reforms. Within the same industrial sector, firms endowed with different technological capabilities or firms located in regions with different local conditions, may respond differentially to the competitive pressure the removal of barriers to entry impose. In other terms, the effects of liberalization may be unequal – some firms, regions, or sectors may benefit whilst others suffer. This can lead to growing inequality. In this section, I discuss some recent research that I conducted jointly with Philippe Aghion, Robin Burgess, and Steve Redding (2005 and 2008, henceforth ABRZ05 and ABRZ08) on a series of reforms that took place in India during the 1980s and 1990s.

I modify the benchmark model in two respects. First, I interpret the analysis at the industry rather than at the economy-wide level. In other words, I think of (1) as describing the production function at the level of a single industry consisting of a continuum of intermediate subsectors. Each subsector is populated by a monopolist and a competitive fringe. For simplicity, I shall ignore general equilibrium effects working
through industry prices (more formally, I assume that all industries produce perfect substitute consumption goods).

Second, I assume that intermediate firms use both unskilled labor and capital (final output) as inputs for the production of $x_t(\nu)$, subject to a constant-returns-to-scale technology. A firm now consists of a manager (or entrepreneur), who can decide about production and investments, and a set of workers. Each firm generates a surplus that managers and workers split according to the Nash rule, where the bargaining shares depend on institutional features (state-specific labor legislation). I define $\beta$ as the the surplus share appropriated by firms. The equilibrium profit appropriated by the monopolist is similar to that of AAZ:

$$\pi_t(\nu) = \delta (\beta) A_t(\nu),$$

where $\delta$ is increasing in $\beta$.

The nationwide economy is subdivided in a set of segregated markets (states) that only have technological interactions one with another – I ignore, for instance, labor and capital mobility –. There are productivity differences across states within each industry. In particular, state-industries lie at different distances from the industry-specific technology frontiers; these distances grow over time at the exogenous rate $g$ in each industry. Moreover, $\beta$ can be different across states depending on the local labor market institutions and regulations. Pro-worker regulations are captured by a low $\beta$ while pro-employer regulations are captured by a high $\beta$.

As before, I consider two industrial policy regimes: high and low competition. Industrial policy may differ across industries (e.g., competition may be low in the textile industry and high in the metal industry) but the same policy applies across all states in each industry. With an eye on the empirical application, I will focus on a pro-competitive reform (slashing entry barriers) that applies economy-wide to selected industries. I consider two differential effects of the pro-competitive reform:

1. How industry-states lying at different distances to the frontier respond to the reform;
2. How industry-states characterized by different labor market regulations respond
to the reform.

FIGURE 5, (TWO PANELS)

The predictions of the theory about differential effects across industry-states with different productivity (holding constant labor market regulations) are described in Figure 5. The two panels represent the technological state of a given industry in two (geographical) states, one more advanced ($a_{adv}$) and one less advanced ($a_{backw}$). I assume $a_{adv} > \hat{a} > a_{backw}$ in this example. Under the licensing regime (panel a), both states adopted long-term contracts, emphasizing imitation at the expenses of innovation. After the reform (panel b), both switch to short-term contracts. However, the growth effects differ across the two states. Short-term contracts are appropriate for the more advanced state experiencing an improvement in its industrial performance. In fact, this state-industry was about to be absorbed in a non-convergence trap under the licensing regime. In contrast, long-term contracts were appropriate for the state further from the technological frontier. This state experiences a worsening of its performance due to the reform. The pro-competitive reform fosters growth in the state closer to frontier while harming it in the state farther from frontier. Although other cases are possible, all share the basic feature of this example. The theory predicts that within each industry, slashing entry barriers encourages output growth in advanced industry-states and discourages it in backward industry-states.

Intuitively, the policy reform exacerbates capital market imperfections in the backward state, reducing the cash flow of incumbent firms and causing a reduction in investments. Although the change in the contractual regime improves the selection of entrepreneurial abilities and enhances innovation, the losses outweigh the gains in this case. The opposite occurs in the advanced state which was about to fall into a non-convergence trap before the reform; following reform, firms are rescued as they are now induced to undertake a more innovation-oriented strategy.

The second dimension is the firms’ bargaining power in labor markets. Consider two states across which there are no technological differences in industry $k$. Suppose, that the two states have different labor market regulations, say $\beta_{PE} > \beta_{PW}$, namely,
the former state has a pro-employee legislation (PE) whereas the latter state has a pro-worker legislation (PW). Both states have the technological level \( a_t \). The upper panels in Figure 6 show the PE state before (Figure 6a) and after the reform (Figure 6b). Under the licensing regime, long-term contracts are adopted inefficiently. The reform reduces the threshold from \( a_{PE, LIC} \) to \( a_{PE, REF} \) inducing a switch to efficient short-term contract. In contrast no change in the contractual arrangements is observed in the PW state (lower panels); short-term contracts prevail efficiently both before and after the reform. In this case, the PE state benefits from the reform, whereas the reform has no effect in the PW state.

**FIGURE 6 (FOUR PANELS)**

Next, consider a different example in Figure 7. In this case, the PE states adopt efficient long-term contracts both before and after the reform. Thus, the reform has no immediate effect (see Figures 7a and 7b). Note, though, that the reform has long run effects, even in the PE state: the state-industry would have converged to a non-convergence trap under the licensing regime, whereas the state-industry will converge to the frontier due to the reform. The situation is very different in the PW state. Prior to reform, the industry adopted efficient long-term contracts. However, the reform reduces the cash-flow accruing to insider firms, thus reducing investments. The resulting switch to short-term contracts is inefficient and slows down growth.

**FIGURE 7 (FOUR PANELS)**

The following prediction holds across different parameter configurations: within each industry, conditional on the distance to frontier, slashing entry barriers increases the productivity growth in pro-employers state-industry relative to pro-workers state-industries.

5.2 Empirical analysis: slashing barriers in India

The theory can guide the empirical investigation of the effects of the liberalization reform in India during the 1980s and the 1990s. India is a particularly interesting case for a variety of reasons. First, it is a very large economy that stagnated until the 1980s and started
growing at a high sustained rate thereafter. How India managed to shift the gears of its economic performance has been the subject of a heated debate. The mainstream view is that the Indian miracle is the ultimate evidence of the benefits of economic reforms. This interpretation is controversial, however. Rodrik and Subramaniam (2004), for example, note that the engine of Indian growth got started in the earlier 1980s, well before any major economic reform was introduced (the major wave of liberalization, such as the trade reform, dates from the early 1990s). Second, India is very interesting because it experienced a Copernican revolution in industrial policy. After obtaining independence in 1947, India had chosen to remain a relatively closed economy with an extensive role for central planning of industry. The key of centrally-planned industrialization in India was the Industries Act of 1951 which brought all key industries in the registered manufacturing sector under central government control via industrial licensing. The Act required an industrial license for establishing a new factory, significantly expanding capacity, starting a new product line or changing location. During the 1980s and the 1990s, India underwent two waves of reforms. The first occurred in 1985 after Rajiv Gandhi’s rise to power. The second was launched in 1991 under Narasimha Rao, who came to power following Rajiv Gandhi’s assassination. These reforms had a landmark character, representing a discrete break with the past. Third, India has a unique set of sources of internal institutional variation that enable researchers to evaluate reforms more credibly than elsewhere. In particular, Indian states have a considerable degree of political autonomy resulting, among other things, in different labor market regulations. One can specifically study the interaction between national industrial policy and state labor market institutions. Finally, the industrial policy reform did not occur simultaneously in all industries. Thus, one can exploit both the cross-state institutional variation and the time variation across industry of the industrial policy reforms.

The empirical analysis is based on ABRZ05 and ABRZ08, where we measure entry liberalization by constructing a delicensing measure which records when a given 3-digit industry was delicensed. Motivated by the theories discussed above, one can ask two sets of questions. First, what is the effect of entry liberalization on industrial performance (both level and inequality). Second, how does the effect of industrial policy reforms interact with the state of technology (close vs. far from frontier) and state-specific labor
market institutions?

As a first step, ABRZ05 run regressions of the form:

\[ y_{it} = d_{it} + \beta_t + \eta_i + u_{it} \]

where \( i \) denotes a 3-digit (registered) manufacturing industry and \( t \) year, \( y_{it} \) is an economic outcome of interest (see below), \( d_{it} \) is a 0/1 dummy which switches on when a 3-digit industry is delicensed, \( \beta_t \) is a year dummy that controls for common macroeconomic shocks and will capture the overall effects of the 1985 and 1991 liberalizations across all 3-digit industries, \( \eta_i \) is an industry fixed effect that controls for unobserved heterogeneity across 3-digit industries, and \( u_{it} \) is a stochastic error. This is a “differences-in-differences” specification, where the effect of delicensing is identified from the differential change over time in the economic outcome in industries which delicense relative to industries where compulsory industrial licensing is retained.

**TABLE 3**

Performance variables include the number of factories, output, productivity and the respective standard deviation. The results reported in Table 3 show a substantial increase in the number of factories and of the inequality in the industrial performance (as measured by the standard deviation of output, labor productivity and total factor productivity). The increase in the number of factories is not surprising, since the reform removed the licensing system and other barriers to entry. It is remarkable, however, that we did not find any significant average effects of the reforms on other measures of economic performance such as output, employment or productivity (see ABRZ08 for detailed results). The industrial policy reform do not appear to have had a significant impact on the industrial performance, on average, although they did increase the inequality of economic performance, measured by both output, labor productivity and total factor productivity.

This finding of rising inequality following entry liberalization is consistent with the theory which emphasizes how a common reform may have uneven effects on the performance of state-industries within a given industrial sector. In ABRZ08) I explore how a
state-industry’s distance to the Indian technological frontier and how state specific labor market institutions can help understand increased inequality within 3-digit industry from 1980-1997. There, we run the following regression:

\[ y_{ist} = \alpha_{is} + \beta_{st} + \eta_{it} + \kappa_H H_{ist} + \xi_H H_{ist}d_{it} + \kappa_L L_{ist} + \xi_L L_{ist}d_{it} \]

\[ + \mu r_{st} + \theta(r_{st})(d_{it}) + \varepsilon_{ist}, \]  

(7)

where \( y_{ist} \) is output at the three-digit state-industry level, \( H_{ist} (L_{ist}) \) is a high-productivity (low-productivity) dummy which takes the value one if a state-industry lies in the top (bottom) tercile of the cross-state within-industry productivity distribution each year and zero otherwise, \( d_{it} \) is as before a dummy variable which switches on in the year a three-digit industry is delicensed, \( \alpha_{is} \) are state-industry fixed effects which control for any unobserved time-invariant determinants of state-industry performance (e.g. natural endowments, location), \( \beta_{st} \) are state-year dummies which control for state-specific macroeconomic shocks, \( \eta_{it} \) are industry-year interactions and \( \varepsilon_{ist} \) is a stochastic error. \( r_{st} \) is the labor regulation measure measured in state \( s \) at time \( t \).\(^{10}\) State-specific labor market regulations are measured by extending the measure proposed by Besley and Burgess (2004). See ABRZ08 for more details.

Note that the specification in (7) precludes estimating the level effects of the reform (as well as the effect of labor regulations) since these effects are absorbed by the set of state-industry, state-time, and industry-time dummies. However, we also run a less demanding specification which only included industry-state and time trend and allowed us to identify the average effects of the reform and of labor regulation. In line with the discussion above, the average effect of the reform on economic performance turns out to be positive, but small and statistically insignificant.

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\(^{10}\)Here, I will only discuss the results when output is the dependent variable. We also looked at employment and fixed capital, and obtained similar results.
The main coefficient of interests are the interaction effects $\xi_H$, $\xi_L$ and $\theta$. $\xi_H$ and $\xi_L$ capture the relationship between post-reform economic performance and distance to frontier. Since the second tercile is the omitted group, the theory predicts $\xi_H$ to be positive and $\xi_L$ to be negative. The estimation conforms with the theoretical predictions (see Table 4). Slashing barriers improved the performance of high-productivity state-industries (relative to the medium-productivity reference group) and worsened the performance of high-productivity state-industries (again, relative to the medium-productivity reference group). This confirms that the reforms had unequal effects.

The coefficient $\theta$ captures the interaction between state-specific labor regulations and the impact of the liberalization. The estimated coefficient is negative and highly significant. This implies that when delicensing occurred, industries in states with pro-employer regulation experienced larger increases in output relative to those located in pro-worker states. The result is robust to controlling for a large number of sociopolitical and economic covariates (and their interaction with the reforms) and to taking the possible endogeneity of the labor market regulations into account. It is also robust to a variety of strategies for clustering standard errors and for addressing other econometric concerns.

6 Conclusion

In this paper, I presented a simple theory that offers a unified framework for the analysis of economic growth and economic development. The key assumption is that economic growth in relatively backward economies is associated with adoption and imitation of and investment in existing technologies, while innovation drives growth in advanced economies. In the theory, the nature of contractual relationships evolves with economic growth. Although this evolution tends to adapt to and promote economic development, there is no guarantee of success. The theory shows why the process of technological convergence can come to a halt, and which policies and reform are necessary for restoring growth. I applied the theory to the experience of a number of developed and developing countries and focused in particular on the analysis of the process of economic liberalization in India.

The notion of appropriate institutions can be extended beyond the applications con-
sidered in this paper. For instance, one can apply it to labor market relations and internal organization of firms in the developed world. For instance, Western European countries have traditionally adopted a rigid model characterized by long-term employment relations and low employment turnover. Policies making it costly for firms to dismiss workers are part of this model. Until the 1970s, Europe experienced high growth and low unemployment, but has since lagged behind the United States over the last two decades. Long-term employment relations seem to have strengthened incentives for firm-specific investments, initially with beneficial effects (for instance, we see more firm-level-training in Europe than in the US). However, as Europe approached the technology frontier, its model entered a crisis. Flexibility and good matches between workers and firms become more important when innovation is the main source of growth. Globalization and the IT revolution seem to have reinforced this tendency.

The same technological transformations shape the internal organization of firms. Globalization and the recent technological development seem to have favored more decentralized firms. In Acemoglu, Aghion, Lelarge, Van Reenen and Zilibotti (2007), we propose and test a theory where firms far from the frontier adopt more rigid and centralized organizational forms than those close to the frontier. Technologically backward firms increase their productivity by adopting well-established technologies, and can learn the most productive way to implement them from the experience of more advanced firms in similar lines of business. For such firms, rigid hierarchical organizations can work relatively well, as innovation is not yet a daunting challenge. As firms approach the technological frontier, however, they can no longer just learn from other firms’ experience. Instead, they must innovate and open new avenues. At that stage, it becomes crucial to delegate more authority to managers, who possess better knowledge and information, and who must be allowed to act quickly and effectively. However, this delegation comes at a cost: local managers and shareholders have often conflicting objectives, and the managers can use the authority which is delegated to them to make choices that are not in the best interest of the shareholders. Our empirical analysis supports this theory using three different datasets of French and British firms.

Another aspect of the internal organization of firms is the extent of vertical integration in relationship with the process of technological convergence. This is analyzed
theoretically in Acemoglu, Aghion and Zilibotti (2004) and empirically in Acemoglu, Aghion, Griffith and Zilibotti (2003), using a panel data set of UK firms during the period 1980-2000. We document a negative correlation between vertical integration and the interaction between closeness of a firm to the technological frontier of its four-digit industry and the R&D intensity of its suppliers. The evidence suggests that as innovation becomes more important, there may indeed be shift from vertical integration to outsourcing.\textsuperscript{11}

Other applications of the theory include financial development – see, e.g., Aghion, Howitt and Mayer-Foulkes (2005) and Acemoglu and Zilibotti (1997 and 1999) – and education (Vandenbussche, Aghion and Meghir (2006) and Aghion, Boustan, Hoxby and Vandenbussche (2005)). In Aghion, Howitt and Mayer-Foulkes (2005), countries with a sufficient level of financial development converge to the growth rate of the technology frontier, whereas financially underdeveloped countries grow at a lower rate, even in the long run. In Acemoglu and Zilibotti (1997) financial development is endogenous to the growth process. Lack of financial development restricts diversification opportunities and deter high-productivity risky investments.

In summary, the process of economic development and technological change transforms economic relationships in a complex fashion in many spheres, including the organization of production, institutions, and policies – and even culture and values (see, e.g., Doepke and Zilibotti 2008). Acknowledging such complexity should not make us agnostic: some sequences of policies and institutions have fared better than others in promoting growth and development. More rigid institutions and organizations seem successful at generating high investment and technology adoption at an early stage of development, but pro-competitive reforms favoring an environment conducive to innovation must follow at the appropriate time. Such a sequence neither matches the rhetoric of market-enthusiasts nor that of market-skeptics in the heated public debate on globalization and growth.

\textsuperscript{11} Other applications of the theory that I do not discussed in this paper include financial development – see, e.g., Aghion, Howitt and Mayer-Foulkes (2005) and Acemoglu and Zilibotti (1997 and 1999) for its forebears – and education (Vandenbussche, Aghion and Meghir (2006) and Aghion, Boustan, Hoxby and Vandenbussche (2005)).
REFERENCES


## Table 1
### Innovation and distance to frontier

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Notes: Standard errors are in parentheses. The dependent variable is the ratio of R&D over value added at the 2/3 digit level. The independent variable "Distance to frontier" is the inverse of TFP in each industry relative to frontier (see Griffith et al. 2004) and is defined as decreasing in the distance to frontier. The mean of the dependent variable is 0.033 and its standard deviation is 0.045. The mean of the independent variable is 0.729 (0.705 in columns 4,5,6) and its standard deviation is 0.196 (0.203 in column 4,5,6). See AAZ, p.41.
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Note: Standard errors are in parentheses. The dependent variable is the average growth for five-years intervals, 1960-65, 1965-70,..., 1990-95. The independent variable "Distance to frontier" is the ratio of the country's GDP per worker to the GDP per worker in the U.S., both calculated at the beginning of each period. The independent variable "Barriers" is the "procedure measure", from Djankov et al. (2002), which measures the number of procedures necessary to open a business (see AAZ, p.43). The independent variable "Openness" is the predicted openness from the gravity equation in Frenkel and Romer (1999). The control variable for education is the average years of schooling in the male population over 25 at the beginning of each period.
## Table 3

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Factories</td>
<td>87.581</td>
<td>0.131</td>
<td>0.066</td>
<td>0.051</td>
<td>0.052</td>
</tr>
<tr>
<td>Industry delicensed</td>
<td>[36.311]</td>
<td>[0.040]</td>
<td>[0.066]</td>
<td>[0.024]</td>
<td>[0.025]</td>
</tr>
<tr>
<td>Observations</td>
<td>1764</td>
<td>1764</td>
<td>1764</td>
<td>1764</td>
<td>1764</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.97</td>
<td>0.65</td>
<td>0.64</td>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td>Industry fixed effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
</table>

Note: Standard errors are in parentheses. The sample is an industry-time panel on three-digit manufacturing industries during 1980-1997 from the Indian Annual Survey of Industries. Industry delicensed is an industry-time measure of delicensing, which takes the value 1 if the industry is delecensed in a particular year and 0 otherwise. Number of factories is the number of factories active in industry and year. St. Dev. Denotes the standard deviation across states within an industry and year. Y is real gross output. Y/L is gross output per employee. TFP1 is Total Factor Productivity. TFP2 is Total Factor Productivity including nonproduction and production workers as separate factors of production. See Aghion, Burgess, Redding, and Zilibotti (2005), p.299.
### Table 4
Robustness to Interactions with State and State-Industry Characteristics

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Delicense × Labor Regulation</td>
<td>-0.051</td>
<td>-0.064</td>
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<tr>
<td></td>
<td>[0.024]</td>
<td>[0.028]</td>
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<tr>
<td>Delicense × Log Development Exp</td>
<td>0.188</td>
<td>-0.113</td>
</tr>
<tr>
<td></td>
<td>[0.105]</td>
<td>[0.101]</td>
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<tr>
<td>Delicense × Financial Development</td>
<td>0.030</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>[0.014]</td>
<td>[0.017]</td>
</tr>
<tr>
<td>Delicense × Top Tercile</td>
<td>0.472</td>
<td>0.472</td>
</tr>
<tr>
<td></td>
<td>[0.032]</td>
<td>[0.032]</td>
</tr>
<tr>
<td>Delicense × Bottom Tercile</td>
<td>-0.521</td>
<td>-0.521</td>
</tr>
<tr>
<td></td>
<td>[0.033]</td>
<td>[0.033]</td>
</tr>
<tr>
<td>Observations</td>
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<td>18324</td>
</tr>
<tr>
<td>R-squared</td>
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<td>State-year fixed effects</td>
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<td>YES</td>
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<tr>
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<td>YES</td>
</tr>
<tr>
<td>Standard errors</td>
<td>Cluster</td>
<td>Cluster</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors adjusted for clustering on state × year delicensed in parentheses. The data set is a balanced panel of three-digit state-industries in the 16 Indian states over the period 1980 to 1997. Delicense is as in Table 3. State amendments to the Industrial Disputes Act are coded 1=pro-worker, 0=neutral and -1=pro-employer and then cumulated over 1947-97 to generate the labor regulation measure. Development expenditure is real per capita state spending on social and economic services. Financial development is from Burgess and Pande (2005). The F-statistic for the significance of the excluded instruments in the first-stage state-year regression is 16.87. Top (bottom) industry productivity tercile is a dummy which is one if a state-industry lies in the top (bottom) third of the cross-state within-industry labor productivity distribution each year and zero otherwise.
FIGURE 1: Growth-Maximizing Dynamics

Optimal Threshold

R=1

R=0

45°
FIGURE 2:
Rigid vs. Flexible Policies
FIGURE 3: Rigid vs. Flexible Policies and Traps with No-investment Traps
FIGURE 4b

PERFORMANCE OF LATIN AMERICAN COUNTRIES

growth rate

GDP pw relative to the US
FIGURE 4c

PERFORMANCE OF LATIN AMERICAN COUNTRIES (WITHIN)
FIGURE 5a
Two Industry-States at difference DTF
Prior to Reform
FIGURE 5b
Two Industry-States at difference DTF
After the Reform
FIGURE 6a:
State with Pro Employee Legislation
Prior to Reform

\[ a_t \]
\[ a_{t-1} \]

\[ 45^\circ \]

LICENSE
FIGURE 6b: State with Pro Employee Legislation After the Reform
FIGURE 6c: 
State with Pro Worker Legislation 
Prior to Reform
FIGURE 6d:
State with Pro Worker Legislation
After the Reform

\[ a_t \]

\[ a_{PW,REF} \]

\[ a_{t-1} \]
FIGURE 7a:
State with Pro Employee Legislation
Prior to Reform
FIGURE 7b:
State with Pro Employee Legislation
After the Reform
FIGURE 7c:
State with Pro Worker Legislation
Prior to Reform
FIGURE 7d:
State with Pro Worker Legislation
(negative effect)