Growth, Development, and Appropriate Versus Inappropriate Institutions*

Daron Acemoglu  Philippe Aghion
MIT  Harvard University

Fabrizio Zilibotti
IIES Stockholm University.

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Abstract

In this paper, we present a simple model that offers a unified framework for the analysis of economic growth and economic development. In our model, the transformation of production relationships, a key feature of the process of economic development, goes hand-in-hand with economic growth. The main driving force of this pattern is that economic growth in relatively backward economies is associated with adoption and imitation of existing technologies and investment in existing lines of business, while growth in advanced (frontier) economies is driven by innovation. Consequently, the process of economic development takes the form of a transformation of economic relationships in many spheres. The framework we present, though simple, enables us to offer a number of new ideas about the relationship between institutions/organizations, economic growth and economic development. Most important is that there will be a process of organizational and institutional change associated with the process of economic development. This process of change is also associated with the notion of “appropriate institutions/organizations”. Equilibrium organization of production and the broader institutions of the society may differ with the stage of development (and with the distance of an economy’s technology to the frontier technology in the world). Nevertheless, the model also shows how attempts to impose such “appropriate institutions” from the outside can turn them into “inappropriate institutions,” i.e., into barriers to further convergence of a developing economy.

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The literatures on economic growth and economic development have exactly the same focus: how does an economy grow and develop from relative poverty to prosperity? Despite their obvious unity of purpose, the two literatures have often diverged in their interpretations and approaches. Growth theory, building on the growth experience of more advanced nations, strives to capture the orderly process of economic growth, most famously captured by the Kaldor facts, and models a relatively constant and sustained process of economic growth. Development economics, on the other hand, in many ways starts from the important observations of Kuznets (1957, 1966, 1973), which highlighted the process of structural transformation taking place simultaneously with economic development. Kuznets emphasized how development went hand in hand with changes in the sectoral composition of output, transformation of production relationships, urbanization, growing importance of skills and perhaps even changes in social relationships. These powerful, and largely accurate, observations have led many development economists to focus on what is different—and thus what needs to be changed—in less-developed economies. It is in fact possible to see this Kuznetsian unified theme as the foundation of both the development economics of the 1950s and 1960s and the new empirical development economics of the last decade or so.

In this paper, we offer a simple framework that unifies these two disparate approaches to the process of development. The basic idea of our approach, which builds on our earlier work (Acemoglu, Aghion and Zilibotti, 2006, from now on AAZ), is that economic growth in relatively backward economies takes the form of adoption and imitation of existing technologies and capital accumulation in already existing lines of business. In contrast, in more advanced economies, there is limited potential for growth by simply adopting existing technologies, so much of growth is driven by innovation. Imitation and innovation require different organizational forms, different relations between entrepreneurs and credit markets, different processes of selection of entrepreneurs and firms. In our model, we capture the stage of development by the distance of an econ-

1Kaldor facts refer to the relative constancy of the growth rate, the capital-output ratio, the share of capital income in GDP and the real interest rate in the process of economic growth of many nations over the past hundred years (see Kaldor, 1963, Denison, 1974, Barro and Sala-i-Martin, 2004).
omy to the world technological frontier. Consequently, the model predicts a close link between distance to frontier and equilibrium organizational forms, equilibrium market relations and consequently, equilibrium institutions.²

For example, in our baseline model, which builds on AAZ, the equilibrium could take an investment-based or innovation-based form. Farther from the world technology frontier, economies choose the investment-based regime, which enables them to grow faster. The investment-based regime is associated with less selection, longer-term relationships and in many ways less competition. As they approach the frontier, many economies will change their organizational forms and market relations to transition to an innovation-based regime, with more competitive relationships, ensuring better selection of entrepreneurs and firms. Interestingly, however, the Kuznetsian transformation is not inevitable. Economies may get stuck in an investment-based regime, thus stop converging to the world frontier, even though a switch to the innovation-based regime would have generated convergence.

The ideas captured by this framework build not only on Kuznets, but also on Gerschenkron’s famous essay Economic Backwardness in Historical Perspective (1962). Gerschenkron (1962, p. 7) argued:

“... in a number of important historical instances industrialization processes, when launched at length in a backward country, showed considerable differences with more advanced countries, not only with regard to the speed of development (the rate of industrial growth) but also with regards to the productive and organizational structures of industry... these differences in the speed and character of industrial development were to a considerable extent the result of application of institutional instruments for which there was little or no counterpart in an established industrial country.”

Examples of rapid growth with a different set of economic and contractual arrangements (and perhaps "institutions"), than the frontier economies include the late indust-

²Here “institutions” are used to cover a variety of different economic, social and legal arrangements and modes of organizations, partly emerging from the interaction of agents and party resulting from the political process. Thus the notion of institutions is similar to that of North (1990), and broader than that used in Acemoglu, Johnson and Robinson (2005).
trialization experiences of Germany, Italy and Russia. They also include the import-substitution growth strategies of many Latin American countries during the 1950s and 60s, and the growth strategies of many Asian economies, such as Korea and Japan, during the postwar period, which relied on large firms, and long-term bank-firm and employee-firm relationships. These organizations contrast in many ways with the equilibrium organizations observed in the United States or other advanced economies. The framework highlights that there are natural reasons for these types of different organizations to emerge and then to become transformed in the process of economic development. It also suggests how these different organizations may become a barrier to growth if they persist, rather than change in the process of economic development as envisioned by Kuznets’ structural transformation.

There are two important points to note in this context:

1. The alternative economic arrangements, organizations and perhaps institutions, were not necessarily imposed from the outside, but emerged as equilibria in these late-industrializing countries. In the same way, the differences in sectoral composition, urbanization, credit relations that we observe in less-developed countries today are equilibrium phenomena. They may or may not be efficient. What is important is that the logic of the process of economic growth leads to the emergence of different equilibrium organizations at different stages of development.

2. As economies grow, these arrangements have a tendency to change, thus echoing Kuznets’ insights that the process of economic development corresponds to a process of structural transformation of the economy. However, if they fail to change, they would condemn the economy to a non-convergence trap.3

These two points also suggest a new perspective on the issue of appropriate institutions. Countries far from the frontier may develop organizational forms (or more broadly, “institutions”) that are appropriate for their own conditions, and the fact that these arrangements are different from those in frontier counties does not necessarily

3We refer to “non-convergence traps” because an economy in such a trap does not stop growing, but stops converging to the world technology frontier at an income level below those of advanced/frontier economies.
mean that they are inefficient or a barrier to economic growth. In fact, in some situations, as emphasized by Gerschenkron, such appropriate and non-standard institutions might encourage growth at the early stages of development. However, these appropriate institutions always come with the risk of quickly turning into inappropriate institutions, and preventing further economic progress and convergence in relatively less-developed economies. It is therefore dangerous to encourage non-standard, non-competitive practices in the name of appropriate institutions, since these do contain the seeds of their own destruction and the capacity to become the inappropriate institutions of the future, blocking economic development.

The current paper illustrates these issues using a minimalist model, which can be used for a variety of different applications. Before doing so, in Section 2, we provide some cross-country evidence consistent with the notion that various economic arrangements have different impacts on economic growth at different stages of economic development.

Finally, it is useful to note that ours is not the only approach that attempts to unify the processes of economic growth and economic development. Two alternatives are particularly noteworthy. The first approach comes from models that reconcile aggregate balanced growth with sectoral non-balanced growth (i.e., changes in the sectoral composition of output). This approach is taken by, among others, Laitner (2000), Kongsamut, Rebelo and Xie (2001), Acemoglu and Guerrieri (2005) and Ngai and Pissarides (2005)—see also Baumol (1967). The second approach comes from models of transition from a Malthusian growth regime with high population growth and low or no growth in income per capita to a high productivity growth regime associated with a demographic transition (see, for example, Galor and Weil, 2000, Hansen and Prescott, 2002, or Galor, 2005). Both of these differ from the approach in this paper because they either focus on the sectoral composition of output and the reconciliation of balanced and non-balanced growth at different levels of aggregation, or on the changes in the population dynamics and the associated changes in growth. In contrast, our purpose is to build a simple model that can be used to understand changes in various different facets of economic relationships in the process of economic development in line with Kuznets’ insights about structural transformation associated with economic development. In doing this, we also want to emphasize how equilibrium appropriate institutions emerge at different stages of
development and then become transformed, and how their failure to become transformed may lead to non-convergence traps.

The rest of the paper is organized as follows. Section 2 provides some motivating cross-country evidence. Section 3 provides a simple framework for modeling the process of growth based on imitation and innovation. In Section 4, we use this basic model to show how the process of selection of entrepreneurs and the relationship between entrepreneurs and society change in the process of economic development, and how the failure of some of these arrangements to change may lead to a non-convergence trap for the economy (where “inappropriate institutions” act as a barrier for further convergence). Section 5 shows how similar ideas can be applied to show the process of economic development affects the internal organization of the firm. Section 6 applies the same ideas to the role of skills and education in the process of economic development. Section 7 concludes.

2 Motivating Empirical Evidence

We now present some cross-country empirical evidence to motivate our analysis. The purpose of this empirical evidence is not to establish causal effects, but to give a sense that various important economic arrangements appear to have differential relationships with growth at different stages of development. In particular we focus on (i) barriers to entry, (ii) trade openness and (iii) education.

Figures 1a and 1b plot the relationship between growth and initial distance to frontier (GDP per capita relative to the U.S.) in a sample of non-OECD, non-socialist countries separately for those with high and low degree of “non-competitive” policies/barriers to entry. Barriers 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 those that joined the OECD in the 1990s, such as Korea and Mexico) and all non-socialist countries for which we have data. We split the sample into low-barrier and high-barrier countries according to the “number of procedures to open a new business” variable from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002). Countries are classified into the “low-barrier” group if the number of procedures is smaller or equal to 10 and into the “high-barriers” group otherwise. This
implies that 20 countries are classified as high barrier and 23 countries as low barrier.\textsuperscript{4}

The figures show growth in per capita income between 1965 and 1995 plotted against distance to frontier in 1965, where we also control for a dummy for sub-Saharan African countries which have much lower growth rates. While there is a strong negative relationship between growth and distance to frontier for countries with high barriers, the relationship is much weaker for countries with low barriers. In other words, high-barrier countries do relatively well when they are far from the frontier, but much worse near the frontier, while low-barrier countries grow almost equally successfully near or far from the frontier.

To see this more clearly, consider two separate regressions of country growth rates between 1965 and 1995 on the sub-Saharan Africa dummy and distance to frontier in 1965 in the samples of low-barrier and high-barrier countries. For low-barrier countries, the coefficient on distance to frontier is -0.028 (s.e.=0.029), thus highly insignificant (shown in Figure 1b). The same coefficient is -0.078 (s.e.=0.028) in the sample of high-barrier countries, which is significant at the 5 percent (shown in Figure 1a). The vertical axes in the figures show country growth rates after the constant and the effect of the sub-Saharan Africa dummy, estimated in the corresponding multivariate regression, are taken out.

This pattern is highly suggestive that the impact of non-competitive practices associated with entry barriers is very different depending on the stage of development. The evidence does not necessarily imply that entry barriers are conducive to fast growth, but suggests that they may have less harmful effects on economic growth for countries farther from the frontier.

\textbf{FIGURE 1}

Figures 1d and 1e show the same pattern when we look at growth in 5-year intervals and control for time effects and country fixed effects. These figures show that near the frontier a country with high barriers grows less than its “usual” growth rate. Therefore, as implied by our model, countries with high barriers slow down more significantly as they approach the frontier. With country fixed effects and time effects, the coefficient

\textsuperscript{4}Further details are provided in AAZ.
on the distance to frontier in the low-barrier sample is -0.039 (s.e. = 0.037), while in the high-barrier sample it is -0.109 (s.e. = 0.047). We also obtain similar results in fixed effect regressions when distance to frontier is instrumented by its past values in order to avoid biases resulting from the fact that distance to frontier is correlated with lags of the dependent variable.

A potential problem with the results in Figures 1a-1d is that entry barriers are both endogenous and measured towards the end of our sample. As an alternative, Figures 2a-2d show similar results exploiting “exogenous” differences in openness to international trade (another measure of competition policy). Here we split the sample according to the openness measure constructed by Frankel and Romer (1999), which predicts openness from a standard “gravity equation,” as a function of differences in population, land area, proximity and common borders to other countries, and whether or not a country is landlocked. In the cross-sectional regressions, the coefficient on the distance to frontier for the “closed” economies is -0.049 (s.e. = 0.021), while for the “open” economies, it is -0.041 (s.e. = 0.029). In the fixed effect regressions, the coefficient for closed economies is -0.197 (s.e. = 0.051), while for open economies, it is -0.087 (s.e. = 0.032).

FIGURE 2

The contrast between “open” and “closed” economies is somewhat weaker in the cross-section than was the case in Figures 1a and 1b, but the fixed effect specifications show a significantly stronger relationship between distance to frontier and growth for closed economies than for open economies. In conclusion, there is some evidence that openness (or at least its exogenous component) has a positive effect on growth, but this effect becomes particularly important for economies that are relatively close to the technology frontier.

Another dimension that will be explored in our analysis is the relationship between human capital accumulation and distance to frontier. For this reason, Figures 3a-d perform the same exercise, splitting the sample by human capital (total years of schooling in 1965). Here, the analysis intends to detect non-linear effects of education and educational policies. The results show that skills and human capital matter more nearer the frontier: there is a more negative relationship between growth and distance to frontier.
for low-human capital than for high-human capital countries. In the cross-sectional regressions, the coefficient on the distance to frontier for low-education countries is -0.122 (s.e. = 0.049), while for high-education countries, it is -0.063 (s.e. = 0.025). In the fixed effect regressions, the coefficient for the low-education countries is -0.228 (s.e. = 0.066) and for the high-education countries, it is -0.051 (s.e. = 0.031).

FIGURE 3

3 Baseline Model of Imitation and Innovation

Throughout, our purpose is to provide a simple framework that can be used in a variety of applications. This basic model is a simplified version of the model used in AAZ, but we make a number of stronger assumptions to simplify the exposition and refer the reader to that paper for some of the details that are not essential for the exposition.

Here we describe the production side of the economy, which consists of a unique final good, always taken as the numéraire. This good is produced competitively using a continuum of intermediate inputs according to:

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

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 in terms of the unique final good. The monopolist faces a competitive fringe of imitators that can copy its technology and also produce an identical intermediate good with productivity \( A_t(i) \), but will do so more expensively. In particular, the competitive fringe can produce each intermediate good at the cost of \( \chi > 1 \) units of final good. The existence of this competitive fringe forces the monopolist to charge a limit price:

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

Naturally, this limit price configuration will be an equilibrium when \( \chi \) is not so high that the monopolist prefers to set a lower unconstrained monopoly price. The condition
for this is simply

\[ \chi \leq 1/\alpha, \]

which we assume throughout.

We think of the parameter \( \chi \) as capturing both technological factors and government regulation regarding competitive policy. A higher \( \chi \) corresponds to a less competitive market.

Given the demand implied by the final goods technology in (1) and the equilibrium limit price in (2), equilibrium monopoly profits are simply:

\[ \pi_t(i) = \delta A_t(i), \] where \( \delta \equiv (\chi - 1)\chi^{-1/\alpha}. \]

(3)

In this expression, \( \delta \) is a measure of the extent of monopoly power. In particular it can be verified that \( \delta \) is increasing in \( \chi \) for all \( \chi \leq 1/\alpha \).

Our focus is with the processes of economic growth and economic development, which, in this model, will be driven by technological progress, that is, by increases in \( A_t(i) \). We will assume that each monopolist \( i \in [0,1] \) can increase its \( A_t(i) \) by two complementary processes: (i) imitation (adoption of existing technologies); and (ii) innovation (discovery of new technologies). All the key results of the framework will rely on the feature that different economic arrangements will lead to different amounts of imitation and innovation.

To prepare for this point, let us define the average productivity of the economy in question at date \( t \) as:

\[ A_t \equiv \int_0^1 A_t(i) \, di. \]

Let \( \bar{A}_t \), on the other hand, denote the the productivity at the world frontier. Naturally, \( A_t \leq \bar{A}_t \) for all \( t \). Throughout the paper with simplified the analysis by assuming that the world technology frontier, \( \bar{A}_t \), grows at the constant rate \( g \) (see AAZ), i.e.,

\[ \bar{A}_t = (1 + g) \bar{A}_{t-1}. \]

(4)

We assume that the process of imitation and innovation leads to the following law of motion of each sector’s productivity:

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

(5)
where $\eta > 0$ and $\gamma > 0$, and $\epsilon_t(i)$ is a mean-zero random variable, capturing the feature that there may be differences in innovation performance across sectors.

In equation (5), $\eta A_{t-1}$ 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 coming from innovation (building on the existing knowledge stock at time $t-1$, $A_{t-1}$).

Finally let us define

$$a_t \equiv \frac{A_t}{\bar{A}_t}$$

the (inverse) measure of the country’s distance to the technological frontier at date $t$.

Now, we can integrate (5) over $i \in [0, 1]$, use the fact that $\epsilon_t(i)$ has mean zero, divide both sides by $\bar{A}_t$ and use (4) to obtain a simple linear relationship between a country’s distance to frontier $a_t$ at date $t$ and the distance to frontier $a_{t-1}$ at date $t-1$:

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

Though simple, this equation encapsulates a number of important points. First, it shows how the dual process of imitation and innovation may lead to a process of convergence. In particular, as long as $\gamma > 1 + g$, equation (6) implies that $a_t$ will eventually converge to 1. Second, the equation also shows that the relative importances of imitation and innovation will depend on the distance to the frontier of the economy in question. In particular when $a_t$ is large (meaning the country is close to the frontier), $\gamma$—thus innovation—matters more for growth. In contrast when $a_t$ is small (meaning the country is farther from the frontier), $\eta$—thus imitation—is relatively more important.

To obtain further insights from this framework, we need to endogenize $\eta$ and $\gamma$, which is what we turn to next.

4 Distance to Frontier and Selection

4.1 Investment-Based and Innovation-Based Growth

In AAZ, the parameters $\eta$ and $\gamma$ are modeled as functions of the investments undertaken by the entrepreneurs and the contractual arrangement between firms and entrepreneurs. There are two types of entrepreneurs: high- and low-skill entrepreneurs. When an entrepreneur starts a business, her ability is unknown, and is revealed over time through
her subsequent performance. The economy may involve long-term relationships with the entrepreneurs ("long-term contracts", $R = 1$), meaning that entrepreneurs keep their job even if they are revealed to be low skill. Alternatively, the process of "creative destruction" may replace low-skill entrepreneurs by new entrepreneurs ("short-term contracts", $R = 0$). Long-term contracts are valuable for investments since the entrepreneurs have incentives to use retained earnings to finance greater investments. If the underlying economy features credit market imperfections, long-term contracts might be useful in mitigating the underinvestment resulting from these credit market imperfections. However, with long-term contracts, many of the active entrepreneurs of the society will have low skills and will be less innovative.

The crucial assumption in AAZ is that high skills matter more for innovation than imitation. This is a natural assumption, and in AAZ, we provided some regression evidence consistent with the notion that ability and skills are more important for innovation (and nearer the technology frontier).

Here, rather than repeat the derivation and the details of the analysis in AAZ, we present a simple reduced-form analysis. In particular, let us assume that the equation for the law of motion of the distance the frontier, (6), takes the form

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

(7)
as a function of the contractual/organizational decision at time $t$, $R_t \in \{0, 1\}$. In this equation we assume that

$$\bar{\eta} > \eta \text{ and } \bar{\gamma} < \gamma < 1 + g.$$  

(8)
The first part of this assumption follows immediately from the notion that high-skill entrepreneurs are better at innovation.

The second part requires more explanation. We naturally expect high-skill entrepreneurs to be better at imitation as well. In that case, there would be no trade-off and low-skill entrepreneurs would always be replaced by market forces (unless they had some other, political or economic advantage). However, the use of retained earnings to finance investments, mentioned above, means that incumbent entrepreneurs have an advantage relative to young entrepreneurs. If the importance of skills in imitation is
limited, then we can have a situation where the overall effect of retaining an incumbent low-skill entrepreneur is to increase the rate of imitation (the rate of investment in existing technologies), and thus $\tilde{\gamma} < \gamma$. This is what equation (8) introduces.

Finally, the last part of Assumption (8), $\gamma < 1 + g$, ensures that there are always “convergence” dynamics (i.e., no instability in the dynamical behavior of $a_t$).

Assumption (8) also explains why we refer to $R_t = 0$ as the innovation-based regime (since it encourages innovation by replacing low-skill entrepreneurs), and to $R_t = 1$ as the investment-based regime (since it makes use of the retained earnings of incumbent entrepreneurs to increase investment in existing technologies and make use of imitation rather than emphasizing innovation).

Figure 4 draws equation (7), under the further assumption that $g = \tilde{\eta} + \tilde{\gamma} - 1$, which ensures that an economy in the innovation-based regime, $R = 1$, at the frontier grows exactly at the rate $g$. In other words, this assumption implicitly endogenizes the world frontier growth rate as coming from innovation-based growth.

**FIGURE 4**

Figure 4 visually 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. 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 some level $\hat{a} \in (0, 1)$ of the distance the frontier, such that when $a_{t-1} < \hat{a}$, the investment-based strategy, $R = 1$ leads to greater growth, and when $a_{t-1} > \hat{a}$, the innovation-based strategy, $R = 0$, achieves higher growth.

It is straightforward to verify from (7) that $\hat{a}$ is given by the intersection of the $R = 0$ and $R = 1$ lines, thus by:

$$\hat{a} \equiv \tilde{\eta} - \eta \over \tilde{\gamma} - \gamma$$

(9)

The growth-maximizing sequence starts with the investment-based strategy and then switches to an innovation-based strategy. In the investment-based regime, incumbent entrepreneurs are sheltered from the competition of younger ones and this may enable
the economy to finance greater investments out of the retained earnings of incumbent entrepreneurs. In contrast, in the innovation-based regime, there is greater selection of entrepreneurs (and more generally of firms) and the emphasis is on maximizing innovation at the expense of investment.

Figure 4 describes the law of motion of technology in an economy as a function of the organization of firms (markets), captured by $R$. It does not specify what the equilibrium sequence of $\{R_t\}_{t=0}^\infty$ is. To determine this equilibrium sequence, we need to specify the organization of the credit market, incentives of entrepreneurs, the amount of retained earnings and the behavior of the consumers in the economy. Here our purpose is not to provide an exhaustive analysis, but to communicate the main ideas. For this reason, we will refer the reader to the analysis in AAZ, and simply explain a number of possibilities.

4.2 Equilibrium Patterns

There are four interesting configurations to consider (see AAZ for the conditions under which each of these configurations will emerge as the equilibrium):

1. Growth-maximizing equilibrium: the first and the most obvious possibility is an equilibrium that is growth maximizing. In particular, if markets and entrepreneurs are able to solve the agency problems, have the right decision-making horizon and are able to internalize the pecuniary and non-pecuniary externalities, we would obtain an efficient equilibrium. This equilibrium will take a simple form:

\[
R_t = \begin{cases} 
1 & \text{if } a_{t-1} < \hat{a} \\
0 & \text{if } a_{t-1} \geq \hat{a}
\end{cases}
\]

so that the economy achieves the upper envelope of the two lines in Figure 4. In this case, there is no possibility of outside intervention to increase the growth rate of the economy.\(^5\) Moreover, an economy starting with $a_0 < 1$ always achieves a growth rate greater than $g$, and will ultimately converge to the world technology frontier, i.e., $a_t = 1$. In this growth-maximizing equilibrium, the economy

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\(^5\)As discussed in AAZ, growth maximization may not coincide with welfare maximization. Here we ignore this issue and refer the reader once again to AAZ for the characterization of the welfare-maximizing equilibrium.
first starts with a particular set of organizations/institutions, corresponding to $R = 1$. Then, in line with Kuznets’ vision of a structural transformation as the economy grows, the economy switches from $R = 1$ to $R = 0$. In our simple economy, this structural transformation takes the form of long-term relationships disappearing and being replaced by shorter-term relationships, by greater competition among entrepreneurs and firms, and by better selection of entrepreneurs. Therefore, even in this growth-maximizing equilibrium there is a notion of “appropriate organizations/institutions”—the economy with $a_{t-1} < \hat{a}$ chooses the appropriate organization of firms for growth maximization. However, importantly, this is not the outcome of some outside intervention; the “appropriate organizations/institutions” emerge as the decentralized equilibrium of the economy.

2. **Underinvestment equilibrium**: the second potential equilibrium configuration involves the following equilibrium organizational form:

$$R_t = \begin{cases} 1 & \text{if } a_{t-1} < a_r(\delta) \\ 0 & \text{if } a_{t-1} \geq a_r(\delta) \end{cases}$$

where $a_r(\delta) < \hat{a}$. Figure 5 depicts this visually, with the thick black lines corresponding to the equilibrium law of motion of the distance the frontier, $a$. This equilibrium is referred to as the “underinvestment equilibrium” because for $a \in (a_r(\delta), \hat{a})$, the economy can reach a higher growth rate (as shown in the figure) by choosing $R_t = 0$, and this would correspond to a higher investment level by incumbent entrepreneurs that have more retained earnings to undertake greater investments. AAZ show why this particular configuration can arise as equilibrium. The main reason is that technological progress, i.e., an increase in $a_t$, creates a positive externality on consumers, which is not internalized by the monopolist—this is the usual *appropriability* effect present in all monopolistic competition models. As a result, there is a tendency for underinvestment in equilibrium. Since $R_t = 0$ involves greater investments out of retained earnings, there is a natural bias against $R_t = 0$ and the investment-based regime.

The most notable feature is that though equilibrium is different from the previous case, it again follows the sequence of $R = 1$ followed by a structural transformation
and a switch to greater competition among and selection of entrepreneurs with the innovation-based regime. Therefore, this equilibrium also exhibits the feature that the process of growth and economic development is associated with structural transformation. Moreover, the economy still ultimately converges to the world technology frontier, i.e., \( a_t = 1 \) is reached as \( t \to \infty \). The only difference is that the structural transformation from \( R = 1 \) to \( R = 0 \) happens too soon at \( a_{t-1} = a_r(\delta) \) rather than at \( \hat{a} \).

Consequently, in this case, a temporary government intervention may increase the growth rate of the economy. The temporary aspect is important here, since the best that the government can do is to increase the growth rate while \( a \in (a_r(\delta), \hat{a}) \). How can the government achieve this? Subsidies to investment would be one possibility. AAZ show that the degree of competition in the product market also has an indirect effect on the equilibrium, as emphasized by the notation \( a_r(\delta) \). In particular, a higher level of \( \delta \), which corresponds to lower competition in the product market (i.e., higher \( \chi \)), will increase \( a_r(\delta) \), and thus may close the gap between \( a_r(\delta) \) and \( \hat{a} \). This may be related to why some less developed economies support monopolies and the effect of entry barriers is different at different stages of development as shown in Section 2. Nevertheless, it has to be noted that reducing competition will create other, static distortions (because of higher markups). Moreover and more importantly, we will see in the next two configurations that reducing competition can have much more disastrous effects for economic growth.

FIGURE 5

3. **Sclerotic equilibrium:** the third possibility a sclerotic in which \( a_r(\delta) > \hat{a} \), so that incumbent low-skill, low-productivity firms survive even when they are damaging to growth. In AAZ, we show why this can happen: the retained earnings of incumbent entrepreneurs, which was useful in relaxing credit constraints, also creates a shield protecting them against the competition of more productive young entrepreneurs. Which effect dominates and whether we are in the underinvestment or the sclerotic equilibrium depends on parameter values. In particular, as the above discussion suggests, \( a_r(\delta) \) is increasing in \( \delta \), so there exists a level of \( \delta \),
\( \hat{\delta} \), such that if \( \delta > \hat{\delta} \), incumbent entrepreneurs have so much monopoly power and retained earnings that they can protect themselves against young entrepreneurs. The resulting pattern is drawn in Figure 6a. Now the economy fails to achieve the maximum growth rate for a range of values of \( a \) such that \( a \in (\hat{a}, a_r(\delta)) \). In this range, the innovation-based regime would be growth-maximizing, but the economy is stuck with the investment-based regime because of the retained earnings and the power of the incumbents.

Nevertheless, as shown in Figure 6a, this economy also follows the pattern of starting with a different set organizations, represented by \( R = 1 \), and then, as envisaged by Kuznets, switching to a different set of arrangements, \( R = 0 \). Like the previous two equilibria, this equilibrium also features convergence to the world technology frontier, i.e., to \( a = 1 \). Therefore, this economy also starts with different “appropriate” institutions and then these institutions and arrangements become transformed in the process of economic growth, making way to the innovation-based regime, which ensures that the economy converges to the world technology frontier. Nevertheless, this equilibrium configuration also shows that there will be a range, precisely \( a \in (\hat{a}, a_r(\delta)) \), where these alternative arrangements, though they may appear “appropriate,” are in fact detrimental to economic growth.

4. Non-convergence trap equilibrium: the fourth possibility is related to the third one and also involves \( a_r(\delta) > \hat{a} \). However, now the gap between \( a_r(\delta) \) and \( \hat{a} \) is even larger as depicted in Figure 6b, and includes the level of \( a = a_{trap} \), such that

\[
a_{trap} \equiv \frac{\bar{\eta}}{1 + g - \gamma}.
\]

Inspection of (7) will immediately reveal that if \( a_{t-1} = a_{trap} \) and \( R_t = 1 \), the economy will remain at \( a_{trap} \). Therefore, in this case the protection of incumbent firms (with their stock of retained earnings) not only retards growth for a temporary interval, but pushes the economy into a non-convergence trap. In particular, this is the only equilibrium pattern in which the economy fails to converge to the frontier; with the investment-based regime, \( R = 1 \), the economy does not grow beyond \( a_{trap} \), and at this distance to frontier, the equilibrium keeps choosing \( R = 1 \).
This equilibrium therefore illustrates the most dangerous scenario, that of non-convergence. Encouraging investment-based growth, by supporting existing, incumbent firms, may appear as “appropriate policy,” but in fact it condemns the economy to non-convergence. This is also the only case in which the Kuznetsian structural transformation does not occur because the economy remains trapped. In many ways, this is in line with Kuznets’ vision; the resulting economy is an underdeveloped one, unable to realize the structural transformation necessary for the process of economic development.

**FIGURE 6**

4.3 Policy, Political Economy and Inappropriate Institutions

The above discussion highlighted how the equilibrium pattern of economic arrangements may involve the organization of the economy in non-standard ways (long-term contracts, limited competition etc.), and the process of economic growth brings the structural transformation of these arrangements. It also highlighted how certain policies, such as reducing product 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, once the analysis is expanded to incorporate political economy features, where incumbent firms can lobby to influence equilibrium policies, the danger of appropriate institutions turning into inappropriate institutions increases significantly. For example, under the plausible assumption that economic power can buy political power, once the economy adopts less competitive markets or subsidies to investment, encouraging investment-based growth, these policies become easily entrenched; incumbent entrepreneurs become enriched by existing policies and institutions, and can successfully lobby to maintain them (and thus preventing a switch to the innovation-based equilibrium).

These political-economy considerations therefore reiterate that societies may get 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.

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, stagnated and were taken over by other economies with relatively more competitive policies, such as Hong Kong.

Figure 7 shows the growth performance of Central and South American countries at different stages of their development process. On the vertical axis we plot the average growth rate over five-year periods, while on the horizontal axis we plot the GDP per capita relative to the US at the beginning of each five-year period. 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 7a 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 is below 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 was larger than 40%.6

Figure 7b plots all Central and South American countries, showing the same broad pattern. One concern about Figures 7a and 7b is that the evidence can be largely driven by the cross-sectional variation. For instance, Brazil and Colombia account for most of the positive deviations in Figure 7a. To address this concern, Figure 7c plots the growth rates controlling for fixed effects. In this figure, each points represents the deviation of the growth rate from the “usual growth rate” of that country. In this panel, the cross-sectional variation is by construction removed. The continuous line is now calculated as the regression line of a convergence equation for the entire world sample after controlling for fixed effects.7 As the figure shows, the performance of Latin American countries deteriorates at a faster rate than that of the average developing country. A likely expla-

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

7 In contrast to the cross-sectional pattern, in the fixed-effect regression, there is convergence as indicated by the downward sloping line.
nation for this pattern is the important-substitution and incumbent-protective policies adopted by many countries in Latin America. As suggested by our approach, 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 7

Our simple theory also sheds new light on the experiences of Korea and Japan. Though in many ways more market friendly than Latin American countries, 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 the Korean case, 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. Kong (2002, p. 3) writes

“...political—not economic—considerations dominated policymaking... [in Korea].... and ...corruption was far greater than the conventional wisdom allows”.

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 into restructuring. Political reforms seem to have weakened the highly entrenched politico-economic elite: the patriarchs of Samsung, Daewoo and Jinro, the three major chaebol, were convicted in the late 1990s of major bribing of two former presidents (although their jail sentences were pardoned in 1997, see Asiaweek, October 10, 1997). Interestingly, the speed of reforms seems to have been much slower in Japan. This may explain why Korea has by now managed to resume growth rapidly after the crisis, while the economic performance of Japan continues to be weak.

5 Distance to Frontier and Internal Organization of Firms

The framework introduced above can also be used to study how the internal organization of firms changes with the process of economic growth and economic development. Here we illustrate these ideas looking at two facets of the internal organization of firms; (i) vertical integration; (ii) delegation of decision-making authority to managers.

5.1 Vertical Integration

Here we outline a model of how vertical integration decisions of firms change as an economy develops, which builds on Acemoglu, Aghion and Zilibotti (2004). In particular, let us consider a slight modification of equation (5) whereby

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

(10)

where

$$\gamma_t(i) = \gamma + \theta_t(i)$$

(11)
captures the rate of innovation of the firm an intermediate goods sector $i$. For example, we can think of the term $\theta_t(i)$ as the probability that an innovation in sector $i$ at time $t$ is successful. If so, there is innovation in the amount $1 + \gamma$. Otherwise, there is a smaller innovation, of size $\gamma$. As before, these innovations build on the knowledge stock of the country, thus they multiply $A_{t-1}$. The first term in (10), on the other hand, reflects imitation from the world technology frontier, hence the term $\bar{A}_{t-1}$.

The key assumption of the model of this subsection will be that the probability of innovation, $\theta_t(i)$, is affected by the internal organization of the firm, in particular, by whether the firm is vertically integrated or not. In particular, imagine that innovations
result from effort and initiatives by the owner/manager of the firm. Greater effort leads to greater $\theta_t(i)$. However, the owner/manager of the firm also engages in other tasks, such as production, marketing, distribution. The key decision is how to allocate his or her scarce time between these different activities. The internal organization of the firm affects these decisions. For example, with vertical integration, the owner/manager will perform all of these tasks himself or herself, whereas with outsourcing some of these tasks will be allocated to other agents. The key from the viewpoint of this paper is how this trade-off changes over the process of development, and whether there is also a structural transformation associated with the internal organization of the firm showing a tendency to change as an economy develops.

To investigate this issue in the simplest possible way, consider a symmetric equilibrium in which $\theta_t(i) = \theta$ for all $i \in [0,1]$. Then, dividing both sides of the above equation by $\bar{A}_{t-1}$, and integrating over $i \in [0,1]$, we once again obtain a simple linear equation describing how the state variable $a_t = A_t/\bar{A}_t$ evolves over time:

$$a_t = \frac{1}{1 + g} \left( \eta + \gamma \theta a_{t-1} \right),$$

where $g$ is again the growth rate of world technology frontier.

Now returning to the trade-off between vertical integration and outsourcing, we introduce the basic idea of *managerial overload*, that is, the inability of the manager/owner of the firm to exert effort to deal with all possible problems that arise in production, marketing, distribution as well as innovation. Outsourcing mitigates this problem by having another agent performs some of these tasks. But at the same time, it creates a holdup problem as in the incomplete contracts literature pioneered by Grossman and Hart (1986); the agent will receive a fraction of the revenue of the firm. In particular, we follow Grossman and Hart and the incomplete contracts literature, in modeling this holdup problem in the simplest possible way and assume that no ex ante contract can induce an enforceable division of surplus; sharing of profits must rely entirely upon ex post bargaining. In particular, with outsourcing, the agent brought into the production process will share some of the rents with the owner, thereby reducing the owner’s income. This dissipation of income makes outsourcing an attractive to the owner, and also if outsourcing is adopted, reduces the owner’s incentives to innovate.
The analysis in Acemoglu, Aghion and Zilibotti (2004) establishes that there exists a critical threshold of the distance to frontier \(a^v\) such that for all \(a < a^v\), equilibrium organizational form is vertical integration, and for \(a > a^v\), there will be outsourcing. The threshold \(a^v\) is typically less than 1, so that there will be a switch to outsourcing before reaching the technology frontier.

The reason for this pattern is that the value of innovation, and thus the value of higher \(\theta\), increases with \(a_{t-1}\). When \(a_{t-1}\) is close to zero, that is, in a relatively backward economy, imitation is much more important than innovation. Outsourcing may increase innovation, but it is not worth for the owner, since it will involve sharing the surplus with the agent. As \(a_{t-1}\) increases, the value of innovation and thus the value of high levels of \(\theta\) increase. Now it may become worthwhile for the owner to bring in another agent—outsource some of the activities—in order to take advantage of greater innovation possibilities.

Therefore, this simple model also predicts a structural transformation, this time with the internal organization of the firm shifting from vertical integration to outsourcing, as an economy develops.

Using a panel data set of UK firms during the period 1980-2000, in Acemoglu, Aghion, Griffith and Zilibotti (2003), we provide some evidence consistent with the pattern discussed here. Table 1, replicated from that paper, shows a negative and significant correlation between vertical integration and the interaction term between closeness of the firm to the technological frontier of its four-digit industry and 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.

### 5.2 Delegation of Authority

Another important aspect of firms’ organization is the extent to which decision making is centralized or decentralized within each firm, for example as captured by delegation of authority to lower-layer managers. Recent evidence based on French firm-level panel data by Acemoglu et al. (2006) shows a robust positive correlation between decentralization and distance of a firm to the technological frontier of its industry; firms that are relatively
closer to the frontier are more likely to delegate authority to lower-later managers. Acemoglu et al. (2006) provide an explanation for this based on learning, whereby firms farther from the frontier can learn from the experiences of more advanced firms about implementation of new technologies and does not need to delegate as much authority to specialized agents.

Here, we present a complementary explanation more closely related to the framework developed in this paper.

As in the previous section, consider a firm engaged in production and innovation. The firm (the owner) decides how much authority to delegate to a manager about production decisions. There is a conflict of interest between the owner and the manager, however. The manager may prefer to take actions that do not maximize the profits of the firm, instead choosing actions that provides him with private benefits (see Aghion and Tirole, 1997). We measure the degree of conflict of interest between the firm and the manager with the “congruence” parameter, $\beta$. In particular, $\beta$ is the probability that the interests of the manager are aligned with those of the firm. If the manager is delegated authority, he will choose the action that he prefers most. With probability $\beta$, this will be the action that leads to positive revenues for the firm, and with probability $1 - \beta$, it will lead to zero revenues. Clearly, the case with $\beta = 1$ corresponds to no conflict of interest, while $\beta = 0$ implies that the manager will always choose an action that leads to zero profits for the firm.

Let $p$ be our (inverse) measure of delegation of authority to the manager. In particular, $p$ is the probability that the firm monitors the manager. When the manager is monitored, he must take the decision maximizing the firm’s profit. If $p = 1$, there is no delegation of authority, and the firm monitors the manager and enforces the profit-maximizing action with probability 1. On the other hand, if $p = 0$, there is no monitoring of the manager, thus full delegation. In this case, the manager decides the best action unilaterally. In intermediate cases, the firm/owner decides with probability $p$ and the manager decides with probability $1 - p$.

Finally, the productivity of firm $i \in [0, 1]$ is again

$$A_t(i) = \eta \bar{A}_{t-1} + \xi \theta_t(i) A_{t-1}$$

with $\theta_t(i)$ denoting the amount of effort invested by the firm’s owner for innovation.
Using the same expressions for pricing, the expected profits of the firm is a function of its decentralization decision, \( p \), and the level of productivity, \( A_t(i) \), is given by:

\[
\pi_t(p_t(i), A_t(i)) = \delta L (p_t(i) + (1 - p_t(i)) \beta) A_t(i).
\]

The “overload” faced by the owner is modeled with the following simple quadratic cost:

\[
C(p_t(i), \theta_t(i)) = \frac{1}{2} (p_t(i) + \theta_t(i)) \delta A_{t-1},
\]

where the presence of the term \( A_{t-1} \) implies that these costs increase with the level of productivity in the economy. This cost function captures, in a simple way, the issue of overload; the marginal cost of either activity that the owner performance (monitoring and innovation) is increasing in the amount of the other activity.

Using these expressions, the maximization problem of the owner of the firm becomes:

\[
\max_{\{p_t(i) \in [0,1], \theta_t(i) \geq 0\}} \delta L (p_t(i) + (1 - p_t(i)) \beta) \left( \eta \tilde{A}_{t-1} + \xi \theta_t(i) A_{t-1} \right) - \frac{1}{2} (p_t(i) + \theta_t(i)) \delta A_{t-1}.
\]

Now dividing by \( A_{t-1} \) and noting that nothing depends on \( i \), this maximization problem can be written as

\[
\max_{\{p_t \in [0,1], \theta_t \geq 0\}} \delta L (p_t + (1 - p_t) \beta) (\eta + \xi \theta_t A_{t-1}) - \frac{1}{2} (p_t + \theta_t)^2.
\]

Assuming that \( \delta L \xi \leq 1 \), the solution takes the following simple form. There exists three thresholds (which are functions of the parameters)

\[
a_{p=1} \leq a_{\theta=0} < a_{p=0}
\]

such that:

1. If \( a_{t-1} \in [0, a_{p=1}] \), then the optimal (equilibrium) organization involves:

\[
p = 1, \quad \theta = 0
\]

2. If \( a_{t-1} \in [a_{p=1}, a_{\theta=0}] \), the optimal solution involves:

\[
p = \frac{\delta L \eta (1 - \beta)}{a_{t-1}}, \quad \theta = 0
\]

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3. If $a_{t-1} \in [a_{\theta=0}, a_{p=0}]$, the optimal solution has

\[
p = \frac{\eta (1 - \beta) - \beta \xi a_{t-1} (1 - \delta L \xi (1 - \beta))}{(1 - \beta) \xi a_{t-1} (2 - \delta L \xi (1 - \beta))}
\]

\[
\theta = \frac{\beta \xi a_{t-1} - \eta (1 - \beta) (1 - \delta L \xi (1 - \beta))}{(1 - \beta) \xi a_{t-1} (2 - \delta L \xi (1 - \beta))}
\]

where $p$ decreases and $\theta$ increases with $a$.

4. If $a_{t-1} \in [a_{p=0}, 1]$, the optimal solution has

\[
p = 0
\]

\[
\theta = \delta L \xi \beta.
\]

The most important implication of this characterization is that it leads to a pattern of structural transformation in the internal organization of the firm as a function of the stage of development (distance to frontier) in the economy. When $a$ is low, the owner delegates no authority to the manager ($p = 1$, which can also be interpreted as not hiring a manager). She also chooses zero innovation effort, $\theta = 0$. As $a$ increases to an intermediate range, there is some delegation (thus some change in the internal organization of the firm), but still no innovation effort. As $a$ increases further, a more interesting configuration emerges, where there is substantial delegation of authority to the manager, and the owner specializes in innovation. Finally, as the economy approaches the world technology frontier (i.e., a high level of economic development), there is full delegation to the manager, i.e., $p = 0$, and the amount of innovative effort by the owner is maximized.

This model therefore also illustrates how the process of development will lead to a structural transformation, along the lines of Kuznets’ emphasis, affecting not only the organization of markets, but also the internal organization of firms.

6 Distance to Frontier and Human Capital

The final application of our framework concerns the changing role of human capital (and its composition) over the process of development. The role of human capital in the process of technology adoption and economic convergence was first emphasized by Nelson and Phelps (1966). Figure 3 above suggests that the role of (formal) education could
be quite different for economies close to the frontier as compared to those farther away from the frontier. This idea is explored in greater detail in Vandenbussche, Aghion and Meghir (2003), who provide a model where in the importance of secondary versus higher education changes depending on the economy’s distance to the frontier. Vandenbussche, Aghion and Meghir (2003) and Aghion et al. (2006) provide evidence consistent with this notion.

Here, we illustrate related ideas using the framework develop above. Let us suppose that there are two different kinds of human capital in the economy, general-purpose and specific, and denote the average specific human capital of workers in the economy at time \( t \) by \( s_t \). This type of specific human capital may be acquired in schools, but it also includes skills acquired on the job or through non-formal education (for example, in the household). The average general-purpose human capital of the workforce, on the other hand, is denoted by \( e_t \). This type of human capital can only be acquired through formal schooling.

Let us go back to equation (5) and modify such that for all \( i \in [0,1] \), we have

\[
A_t(i) = \eta(s_t, e_t) \tilde{A}_{t-1} + \gamma(e_t) A_{t-1} + \varepsilon_t(i),
\]

(13)

where \( \varepsilon_t(i) \) is again a mean-zero term and \( \eta \) is increasing and continuously differentiable in both of its arguments, and \( \gamma \) is increasing and continuously differentiable in \( e_t \).

Equation (13) implies that while specific human capital is useful for adoption and use of existing technologies, only general-purpose human capital, acquired through formal schooling, is useful for innovation. This is clearly extreme, but captures the notion that formal schooling becomes more important at later stages of development. Moreover, let us assume that

\[
\frac{\partial \eta(s,e)}{\partial s} \geq \frac{\partial \eta(s,e)}{\partial e} \text{ for all } e, s \geq 0.
\]

(14)

and that

\[
\frac{\partial \gamma(0)}{\partial e} > \frac{\partial \eta(s=1,e=0)}{\partial s}.
\]

(15)

The first condition states that specific skills are more important for imitation than general-purpose skills, whereas the second condition states that general-purpose skills are sufficiently important for innovation.
Let us also assume that the representative worker has a limited amount of time, so that

\[ s_t + e_t \leq 1, \]

and naturally, \( e_t, s_t \geq 0 \). Condition (14) implies that when \( a_{t-1} \) is low in the economy is far from the frontier, the growth-maximizing strategy is to invest only in the specific skills of workers. In contrast, as the economy approaches the world technology frontier, (15) ensures that it becomes beneficial for the economy to invest in the general-purpose human capital of the workers.

If workers make their human capital decisions facing prices that reflect their contributions to growth, this will also be the equilibrium pattern of investment; formal education in general-purpose human capital will increase as the economy develops and approaches the world technology frontier. Therefore, this simple model provides another instance of a possible structural transformation, this time in the composition of skills of the workforce, going hand-in-hand with the process of economic development.

7 Conclusion

The literatures on economic growth and economic development emphasize different aspects of the process of development. While models of economic growth focus on technological change, capital accumulation and the relatively steady process of economic growth, much of development economics, building on the seminal work by Kuznets (1966), emphasizes the structural transformations taking place in the process of economic development.

In this paper, we presented a simple model that offers a unified framework for the analysis of economic growth and economic development. In our model, the transformation of production relationships goes hand-in-hand with economic growth. The main driving force of this pattern is that economic growth in relatively backward economies is associated with adoption and imitation of and investment in existing technologies, while growth in advanced (frontier) economies is driven by innovation. Consequently, the process of economic development takes the form of a transformation of economic relationships in many spheres. The framework we present, though simple, enables us to offer a number of new ideas about the relationship between the organization of production,
institutions, economic growth and economic development.

Using this basic framework, we illustrated how the organization of production, the extent of creative distraction and entry, the extent of vertical integration, the extent of delegation of authority to managers and the composition of human capital become transformed over the process of economic development.

We also used this framework to critically discuss the concept of “appropriate institutions/organizations.” The notion of appropriate institutions implies that the equilibrium organization of production relationships and broader institutions may differ with this stage of development. Our framework shows how the equilibrium process of economic development might take the form of the economy shifting from “institutions/organizations” appropriate for the early stages of development (which may be non-standard in many ways) to different (perhaps more standard) institutions and organizations as the economy develops.

Our framework, however, also highlights that attempts to impose such “appropriate institutions” from the outside can turn them into “inappropriate institutions,” which may have quite detrimental effect on the growth performance of less-developed countries. In particular, attempts to encourage “appropriate institutions” and policies at early stages of development might at best lead to temporary gains in growth, but will create the risk of the economy becoming stuck in a non-convergence trap because of the powerful constituencies that these institutions and policies create.

The framework presented in this paper is purposefully simple, so that it emphasizes the main trade-offs and can be applied in a variety of different settings. This framework can be develop in many ways both theoretically and also to bring it closer to data area. In current work, we are investigating some of the empirical implications of this framework for changes in the internal organization of the firm, but much else needs to be done. We believe that further study of models combining insights from economic growth and economic development and testing their implications with micro data our exciting in important areas for future work.
References


1 Introduction

The literatures on economic growth and economic development have exactly the same focus: how does an economy grow and develop from relative poverty to prosperity? Despite their obvious unity of purpose, the two literatures have often diverged in their interpretations and approaches. Growth theory, building on the growth experience of more advanced nations, strives to capture the orderly process of economic growth, most famously captured by the Kaldor facts,¹ and models a relatively constant and sustained process of economic growth. Development economics, on the other hand, in many ways starts from the important observations of Kuznets (1957, 1966, 1973), which highlighted the process of structural transformation taking place simultaneously with economic development. Kuznets emphasized how development went hand in hand with changes in the sectoral composition of output, transformation of production relationships, urbanization, growing importance of skills and perhaps even changes in social relationships. These powerful, and largely accurate, observations have led many development economists to focus on what is different—and thus what needs to be changed—in less-developed economies. It is in fact possible to see this Kuznetsian unified theme as the foundation of both the development economics of the 1950s and 1960s and the new empirical development economics of the last decade or so.

In this paper, we offer a simple framework that unifies these two disparate approaches to the process of development. The basic idea of our approach, which builds on our earlier work (Acemoglu, Aghion and Zilibotti, 2006, from now on AAZ), is that economic growth in relatively backward economies takes the form of adoption and imitation of existing technologies and capital accumulation in already existing lines of business. In contrast, in more advanced economies, there is limited potential for growth by simply adopting existing technologies, so much of growth is driven by innovation. Imitation and innovation require different organizational forms, different relations between entrepreneurs and credit markets, different processes of selection of entrepreneurs and firms. In our model, we capture the stage of development by the distance of an economy to

¹Kaldor facts refer to the relative constancy of the growth rate, the capital-output ratio, the share of capital income in GDP and the real interest rate in the process of economic growth of many nations over the past hundred years (see Kaldor, 1963, Denison, 1974, Barro and Sala-i-Martin, 2004).
the world technological frontier. Consequently, the model predicts a close link between distance to frontier and *equilibrium* organizational forms, *equilibrium* market relations and consequently, *equilibrium* institutions.\(^2\)

For example, in our baseline model, which builds on AAZ, the equilibrium could take an *investment-based* or *innovation-based* form. Farther from the world technology frontier, economies choose the investment-based regime, which enables them to grow faster. The investment-based regime is associated with less selection, longer-term relationships and in many ways less competition. As they approach the frontier, many economies will change their organizational forms and market relations to transition to an innovation-based regime, with more competitive relationships, ensuring better selection of entrepreneurs and firms. Interestingly, however, the Kuznetsian transformation is not inevitable. Economies may get stuck in an investment-based regime, thus stop converging to the world frontier, even though a switch to the innovation-based regime would have generated convergence.

The ideas captured by this framework build not only on Kuznets, but also on Gerschenkron’s famous essay *Economic Backwardness in Historical Perspective* (1962). Gerschenkron (1962, p. 7) argued:

“... in a number of important historical instances industrialization processes, when launched at length in a backward country, showed considerable differences with more advanced countries, not only with regard to the speed of development (the rate of industrial growth) but also with regards to the productive and organizational structures of industry... these differences in the speed and character of industrial development were to a considerable extent the result of application of institutional instruments for which there was little or no counterpart in an established industrial country.”

Examples of rapid growth with a different set of economic and contractual arrangements (and perhaps “institutions”), than the frontier economies include the late indus-

\(^2\)Here “institutions” are used to cover a variety of different economic, social and legal arrangements and modes of organizations, partly emerging from the interaction of agents and party resulting from the political process. Thus the notion of institutions is similar to that of North (1990), and broader than that used in Acemoglu, Johnson and Robinson (2005).
rialization experiences of Germany, Italy and Russia. They also include the import-substitution growth strategies of many Latin American countries during the 1950s and 60s, and the growth strategies of many Asian economies, such as Korea and Japan, during the postwar period, which relied on large firms, and long-term bank-firm and employee-firm relationships. These organizations contrast in many ways with the equilibrium organizations observed in the United States or other advanced economies. The framework highlights that there are natural reasons for these types of different organizations to emerge and then to become transformed in the process of economic development. It also suggests how these different organizations may become a barrier to growth if they persist, rather than change in the process of economic development as envisioned by Kuznets’ structural transformation.

There are two important points to note in this context:

1. The alternative economic arrangements, organizations and perhaps institutions, were not necessarily imposed from the outside, but emerged as equilibria in these late-industrializing countries. In the same way, the differences in sectoral composition, urbanization, credit relations that we observe in less-developed countries today are equilibrium phenomena. They may or may not be efficient. What is important is that the logic of the process of economic growth leads to the emergence of different equilibrium organizations at different stages of development.

2. As economies grow, these arrangements have a tendency to change, thus echoing Kuznets’ insights that the process of economic development corresponds to a process of structural transformation of the economy. However, if they fail to change, they would condemn the economy to a non-convergence trap.\(^3\)

These two points also suggest a new perspective on the issue of appropriate institutions. Countries far from the frontier may develop organizational forms (or more broadly, “institutions”) that are appropriate for their own conditions, and the fact that these arrangements are different from those in frontier counties does not necessarily

\(^3\) We refer to “non-convergence traps” because an economy in such a trap does not stop growing, but stops converging to the world technology frontier at an income level below those of advanced/frontier economies.
mean that they are inefficient or a barrier to economic growth. In fact, in some situations, as emphasized by Gerschenkron, such appropriate and non-standard institutions might encourage growth at the early stages of development. However, these appropriate institutions always come with the risk of quickly turning into inappropriate institutions, and preventing further economic progress and convergence in relatively less-developed economies. It is therefore dangerous to encourage non-standard, non-competitive practices in the name of appropriate institutions, since these do contain the seeds of their own destruction and the capacity to become the inappropriate institutions of the future, blocking economic development.

The current paper illustrates these issues using a minimalist model, which can be used for a variety of different applications. Before doing so, in Section 2, we provide some cross-country evidence consistent with the notion that various economic arrangements have different impacts on economic growth at different stages of economic development.

Finally, it is useful to note that ours is not the only approach that attempts to unify the processes of economic growth and economic development. Two alternatives are particularly noteworthy. The first approach comes from models that reconcile aggregate balanced growth with sectoral non-balanced growth (i.e., changes in the sectoral composition of output). This approach is taken by, among others, Laitner (2000), Kongsamut, Rebelo and Xie (2001), Acemoglu and Guerrieri (2005) and Ngai and Pissarides (2005)—see also Baumol (1967). The second approach comes from models of transition from a Malthusian growth regime with high population growth and low or no growth in income per capita to a high productivity growth regime associated with a demographic transition (see, for example, Galor and Weil, 2000, Hansen and Prescott, 2002, or Galor, 2005). Both of these differ from the approach in this paper because they either focus on the sectoral composition of output and the reconciliation of balanced and non-balanced growth at different levels of aggregation, or on the changes in the population dynamics and the associated changes in growth. In contrast, our purpose is to build a simple model that can be used to understand changes in various different facets of economic relationships in the process of economic development in line with Kuznets’ insights about structural transformation associated with economic development. In doing this, we also want to emphasize how equilibrium appropriate institutions emerge at different stages of
development and then become transformed, and how their failure to become transformed may lead to non-convergence traps.

The rest of the paper is organized as follows. Section 2 provides some motivating cross-country evidence. Section 3 provides a simple framework for modeling the process of growth based on imitation and innovation. In Section 4, we use this basic model to show how the process of selection of entrepreneurs and the relationship between entrepreneurs and society change in the process of economic development, and how the failure of some of these arrangements to change may lead to a non-convergence trap for the economy (where “inappropriate institutions” act as a barrier for further convergence). Section 5 shows how similar ideas can be applied to show the process of economic development affects the internal organization of the firm. Section 6 applies the same ideas to the role of skills and education in the process of economic development. Section 7 concludes.

2 Motivating Empirical Evidence

We now present some cross-country empirical evidence to motivate our analysis. The purpose of this empirical evidence is not to establish causal effects, but to give a sense that various important economic arrangements appear to have differential relationships with growth at different stages of development. In particular we focus on (i) barriers to entry, (ii) trade openness and (iii) education.

Figures 1a and 1b plot the relationship between growth and initial distance to frontier (GDP per capita relative to the U.S.) in a sample of non-OECD, non-socialist countries separately for those with high and low degree of “non-competitive” policies/barriers to entry. Barriers 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 those that joined the OECD in the 1990s, such as Korea and Mexico) and all non-socialist countries for which we have data. We split the sample into low-barrier and high-barrier countries according to the “number of procedures to open a new business” variable from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002). Countries are classified into the “low-barrier” group if the number of procedures is smaller or equal to 10 and into the “high-barriers” group otherwise. This
implies that 20 countries are classified as high barrier and 23 countries as low barrier.\footnote{Further details are provided in AAZ.}

The figures show growth in per capita income between 1965 and 1995 plotted against distance to frontier in 1965, where we also control for a dummy for sub-Saharan African countries which have much lower growth rates. While there is a strong negative relationship between growth and distance to frontier for countries with high barriers, the relationship is much weaker for countries with low barriers. In other words, high-barrier countries do relatively well when they are far from the frontier, but much worse near the frontier, while low-barrier countries grow almost equally successfully near or far from the frontier.

To see this more clearly, consider two separate regressions of country growth rates between 1965 and 1995 on the sub-Saharan Africa dummy and distance to frontier in 1965 in the samples of low-barrier and high-barrier countries. For low-barrier countries, the coefficient on distance to frontier is -0.028 (s.e.=0.029), thus highly insignificant (shown in Figure 1b). The same coefficient is -0.078 (s.e.=0.028) in the sample of high-barrier countries, which is significant at the 5 percent (shown in Figure 1a). The vertical axes in the figures show country growth rates after the constant and the effect of the sub-Saharan Africa dummy, estimated in the corresponding multivariate regression, are taken out.

This pattern is highly suggestive that the impact of non-competitive practices associated with entry barriers is very different depending on the stage of development. The evidence does not necessarily imply that entry barriers are conducive to fast growth, but suggests that they may have less harmful effects on economic growth for countries farther from the frontier.

FIGURE 1

Figures 1d and 1e show the same pattern when we look at growth in 5-year intervals and control for time effects and country fixed effects. These figures show that near the frontier a country with high barriers grows less than its “usual” growth rate. Therefore, as implied by our model, countries with high barriers slow down more significantly as they approach the frontier. With country fixed effects and time effects, the coefficient
on the distance to frontier in the low-barrier sample is -0.039 (s.e. = 0.037), while in the high-barrier sample it is -0.109 (s.e. = 0.047). We also obtain similar results in fixed effect regressions when distance to frontier is instrumented by its past values in order to avoid biases resulting from the fact that distance to frontier is correlated with lags of the dependent variable.

A potential problem with the results in Figures 1a-1d is that entry barriers are both endogenous and measured towards the end of our sample. As an alternative, Figures 2a-2d show similar results exploiting “exogenous” differences in openness to international trade (another measure of competition policy). Here we split the sample according to the openness measure constructed by Frankel and Romer (1999), which predicts openness from a standard “gravity equation,” as a function of differences in population, land area, proximity and common borders to other countries, and whether or not a country is landlocked. In the cross-sectional regressions, the coefficient on the distance to frontier for the “closed” economies is -0.049 (s.e. = 0.021), while for the “open” economies, it is -0.041 (s.e. = 0.029). In the fixed effect regressions, the coefficient for closed economies is -0.197 (s.e. = 0.051), while for open economies, it is -0.087 (s.e. = 0.032).

FIGURE 2

The contrast between “open” and “closed” economies is somewhat weaker in the cross-section than was the case in Figures 1a and 1b, but the fixed effect specifications show a significantly stronger relationship between distance to frontier and growth for closed economies than for open economies. In conclusion, there is some evidence that openness (or at least its exogenous component) has a positive effect on growth, but this effect becomes particularly important for economies that are relatively close to the technology frontier.

Another dimension that will be explored in our analysis is the relationship between human capital accumulation and distance to frontier. For this reason, Figures 3a-d perform the same exercise, splitting the sample by human capital (total years of schooling in 1965). Here, the analysis intends to detect non-linear effects of education and educational policies. The results show that skills and human capital matter more nearer the frontier: there is a more negative relationship between growth and distance to frontier.
for low-human capital than for high-human capital countries. In the cross-sectional regressions, the coefficient on the distance to frontier for low-education countries is -0.122 (s.e. = 0.049), while for high-education countries, it is -0.063 (s.e. = 0.025). In the fixed effect regressions, the coefficient for the low-education countries is -0.228 (s.e. = 0.066) and for the high-education countries, it is -0.051 (s.e. = 0.031).

FIGURE 3

3 Baseline Model of Imitation and Innovation

Throughout, our purpose is to provide a simple framework that can be used in a variety of applications. This basic model is a simplified version of the model used in AAZ, but we make a number of stronger assumptions to simplify the exposition and refer the reader to that paper for some of the details that are not essential for the exposition.

Here we describe the production side of the economy, which consists of a unique final good, always taken as the numéraire. This good is produced competitively using a continuum of intermediate inputs according to:

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

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 in terms of the unique final good. The monopolist faces a competitive fringe of imitators that can copy its technology and also produce an identical intermediate good with productivity $A_t(i)$, but will do so more expensively. In particular, the competitive fringe can produce each intermediate good at the cost of $\chi > 1$ units of final good. The existence of this competitive fringe forces the monopolist to charge a limit price:

$$p_t(i) = \chi > 1.$$ 

Naturally, this limit price configuration will be an equilibrium when $\chi$ is not so high that the monopolist prefers to set a lower unconstrained monopoly price. The condition
for this is simply
\[ \chi \leq 1/\alpha, \]
which we assume throughout.

We think of the parameter \( \chi \) as capturing both technological factors and government regulation regarding competitive policy. A higher \( \chi \) corresponds to a less competitive market.

Given the demand implied by the final goods technology in (1) and the equilibrium limit price in (2), equilibrium monopoly profits are simply:
\[ \pi_t(i) = \delta A_t(i), \quad \text{where} \quad \delta \equiv (\chi - 1) \chi^{-1/\alpha}. \]
(3)

In this expression, \( \delta \) is a measure of the extent of monopoly power. In particular it can be verified that \( \delta \) is increasing in \( \chi \) for all \( \chi \leq 1/\alpha \).

Our focus is with the processes of economic growth and economic development, which, in this model, will be driven by technological progress, that is, by increases in \( A_t(i) \). We will assume that each monopolist \( i \in [0,1] \) can increase its \( A_t(i) \) by two complementary processes: (i) imitation (adoption of existing technologies); and (ii) innovation (discovery of new technologies). All the key results of the framework will rely on the feature that different economic arrangements will lead to different amounts of imitation and innovation.

To prepare for this point, let us define the average productivity of the economy in question at date \( t \) as:
\[ \bar{A}_t \equiv \int_0^1 A_t(i) \, di. \]
Let \( \bar{A}_t \), on the other hand, denote the the productivity at the world frontier. Naturally, \( A_t \leq \bar{A}_t \) for all \( t \). Throughout the paper with simplified the analysis by assuming that the world technology frontier, \( \bar{A}_t \), grows at the constant rate \( g \) (see AAZ), i.e.,
\[ \bar{A}_t = (1 + g) \bar{A}_{t-1}. \]
(4)

We assume that the process of imitation and innovation leads to the following law of motion of each sector’s productivity:
\[ A_t(i) = \eta \bar{A}_{t-1} + \gamma A_{t-1} + \varepsilon_t(i), \]
(5)
where \( \eta > 0 \) and \( \gamma > 0 \), and \( \varepsilon_t(i) \) is a mean-zero run than variable, capturing the feature that there may be differences in innovation performance across sectors.

In equation (5), \( \eta \bar{A}_{t-1} \) 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 coming from innovation (building on the existing knowledge stock at time \( t - 1, A_{t-1} \)).

Finally let us define
\[
a_t \equiv \frac{A_t}{\bar{A}_{t-1}}
\]
the (inverse) measure of the country’s distance to the technological frontier at date \( t \).

Now, we can integrate (5) over \( i \in [0, 1] \), use the fact that \( \varepsilon_t(i) \) has mean zero, divide both sides by \( \bar{A}_{t} \) and use (4) to obtain a simple linear relationship between a country’s distance to frontier \( a_t \) at date \( t \) and the distance to frontier \( a_{t-1} \) at date \( t - 1 \):
\[
a_t = \frac{1}{1+g}(\eta + \gamma a_{t-1}).
\]

(6)

Though simple, this equation encapsulates a number of important points. First, it shows how the dual process of imitation and innovation may lead to a process of convergence. In particular, as long as \( \gamma > 1 + g \), equation (6) implies that \( a_t \) will eventually converge to 1. Second, the equation also shows that the relative importances of imitation and innovation will depend on the distance to the frontier of the economy in question. In particular when \( a_t \) is large (meaning the country is close to the frontier), \( \gamma \)—thus innovation—matters more for growth. In contrast when \( a_t \) is small (meaning the country is farther from the frontier), \( \eta \)—thus imitation—is relatively more important.

To obtain further insights from this framework, we need to endogenize \( \eta \) and \( \gamma \), which is what we turn to next.

4 Distance to Frontier and Selection

4.1 Investment-Based and Innovation-Based Growth

In AAZ, the parameters \( \eta \) and \( \gamma \) are modeled as functions of the investments undertaken by the entrepreneurs and the contractual arrangement between firms and entrepreneurs. There are two types of entrepreneurs: high- and low-skill entrepreneurs. When an entrepreneur starts a business, her ability is unknown, and is revealed over time through
her subsequent performance. The economy may involve long-term relationships with the entrepreneurs (“long-term contracts”, $R = 1$), meaning that entrepreneurs keep their job even if they are revealed to be low skill. Alternatively, the process of “creative destruction” may replace low-skill entrepreneurs by new entrepreneurs (“short-term contracts”, $R = 0$). Long-term contracts are valuable for investments since the entrepreneurs have incentives to use retained earnings to finance greater investments. If the underlying economy features credit market imperfections, long-term contracts might be useful in mitigating the underinvestment resulting from these credit market imperfections. However, with long-term contracts, many of the active entrepreneurs of the society will have low skills and will be less innovative.

The crucial assumption in AAZ is that high skills matter more for innovation than imitation. This is a natural assumption, and in AAZ, we provided some regression evidence consistent with the notion that ability and skills are more important for innovation (and nearer the technology frontier).

Here, rather than repeat the derivation and the details of the analysis in AAZ, we present a simple reduced-form analysis. In particular, let us assume that the equation for the law of motion of the distance the frontier, (6), takes the form

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

as a function of the contractual/organizational decision at time $t$, $R_t \in \{0, 1\}$. In this equation we assume that

$$\bar{\eta} > \eta \text{ and } \bar{\gamma} < \gamma < 1 + g.$$ 

The first part of this assumption follows immediately from the notion that high-skill entrepreneurs are better at innovation.

The second part requires more explanation. We naturally expect high-skill entrepreneurs to be better at imitation as well. In that case, there would be no trade-off and low-skill entrepreneurs would always be replaced by market forces (unless they had some other, political or economic advantage). However, the use of retained earnings to finance investments, mentioned above, means that incumbent entrepreneurs have an advantage relative to young entrepreneurs. If the importance of skills in imitation is
limited, then we can have a situation where the overall effect of retaining an incumbent low-skill entrepreneur is to increase the rate of imitation (the rate of investment in existing technologies), and thus \( \bar{\gamma} < \gamma \). This is what equation (8) introduces.

Finally, the last part of Assumption (8), \( \gamma < 1 + g \), ensures that there are always “convergence” dynamics (i.e., no instability in the dynamical behavior of \( a_t \)).

Assumption (8) also explains why we refer to \( R_t = 0 \) as the innovation-based regime (since it encourages innovation by replacing low-skill entrepreneurs), and to \( R_t = 1 \) as the investment-based regime (since it makes use of the retained earnings of incumbent entrepreneurs to increase investment in existing technologies and make use of imitation rather than emphasizing innovation).

Figure 4 draws equation (7), under the further assumption that \( g = \eta + \bar{\gamma} - 1 \), which ensures that an economy in the innovation-based regime, \( R = 1 \), at the frontier grows exactly at the rate \( g \). In other words, this assumption implicitly endogenizes the world frontier growth rate as coming from innovation-based growth.

**FIGURE 4**

Figure 4 visually 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. 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 some level \( \hat{a} \in (0, 1) \) of the distance the frontier, such that when \( a_{t-1} < \hat{a} \), the investment-based strategy, \( R = 1 \) leads to greater growth, and when \( a_{t-1} > \hat{a} \), the innovation-based strategy, \( R = 0 \), achieves higher growth.

It is straightforward to verify from (7) that \( \hat{a} \) is given by the intersection of the \( R = 0 \) and \( R = 1 \) lines, thus by:

\[
\hat{a} \equiv \frac{\bar{\eta} - \eta}{\bar{\gamma} - \gamma}.
\]

The growth-maximizing sequence starts with the investment-based strategy and then switches to an innovation-based strategy. In the investment-based regime, incumbent entrepreneurs are sheltered from the competition of younger ones and this may enable
the economy to finance greater investments out of the retained earnings of incumbent entrepreneurs. In contrast, in the innovation-based regime, there is greater selection of entrepreneurs (and more generally of firms) and the emphasis is on maximizing innovation at the expense of investment.

Figure 4 describes the law of motion of technology in an economy as a function of the organization of firms (markets), captured by $R$. It does not specify what the equilibrium sequence of $\{R_t\}_{t=0}^{\infty}$ is. To determine this equilibrium sequence, we need to specify the organization of the credit market, incentives of entrepreneurs, the amount of retained earnings and the behavior of the consumers in the economy. Here our purpose is not to provide an exhaustive analysis, but to communicate the main ideas. For this reason, we will refer the reader to the analysis in AAZ, and simply explain a number of possibilities.

4.2 Equilibrium Patterns

There are four interesting configurations to consider (see AAZ for the conditions under which each of these configurations will emerge as the equilibrium):

1. Growth-maximizing equilibrium: the first and the most obvious possibility is an equilibrium that is growth maximizing. In particular, if markets and entrepreneurs are able to solve the agency problems, have the right decision-making horizon and are able to internalize the pecuniary and non-pecuniary externalities, we would obtain an efficient equilibrium. This equilibrium will take a simple form:

$$R_t = \begin{cases} 1 & \text{if } a_{t-1} < \hat{a} \\ 0 & \text{if } a_{t-1} \geq \hat{a} \end{cases}$$

so that the economy achieves the upper envelope of the two lines in Figure 4. In this case, there is no possibility of outside intervention to increase the growth rate of the economy. Moreover, an economy starting with $a_0 < 1$ always achieves a growth rate greater than $g$, and will ultimately converge to the world technology frontier, i.e., $a_t = 1$. In this growth-maximizing equilibrium, the economy

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\(^5\)As discussed in AAZ, growth maximization may not coincide with welfare maximization. Here we ignore this issue and refer the reader once again to AAZ for the characterization of the welfare-maximizing equilibrium.
first starts with a particular set of organizations/institutions, corresponding to $R = 1$. Then, in line with Kuznets’ vision of a structural transformation as the economy grows, the economy switches from $R = 1$ to $R = 0$. In our simple economy, this structural transformation takes the form of long-term relationships disappearing and being replaced by shorter-term relationships, by greater competition among entrepreneurs and firms, and by better selection of entrepreneurs. Therefore, even in this growth-maximizing equilibrium there is a notion of “appropriate organizations/institutions”—the economy with $a_{t-1} < \hat{a}$ chooses the appropriate organization of firms for growth maximization. However, importantly, this is not the outcome of some outside intervention; the “appropriate organizations/institutions” emerge as the decentralized equilibrium of the economy.

2. Underinvestment equilibrium: the second potential equilibrium configuration involves the following equilibrium organizational form:

$$R_t = \begin{cases} 1 & \text{if } a_{t-1} < a_r (\delta) \\ 0 & \text{if } a_{t-1} \geq a_r (\delta) \end{cases}$$

where $a_r (\delta) < \hat{a}$. Figure 5 depicts this visually, with the thick black lines corresponding to the equilibrium law of motion of the distance the frontier, $a$. This equilibrium is referred to as the “underinvestment equilibrium” because for $a \in (a_r (\delta), \hat{a})$, the economy can reach a higher growth rate (as shown in the figure) by choosing $R_t = 0$, and this would correspond to a higher investment level by incumbent entrepreneurs that have more retained earnings to undertake greater investments. AAZ show why this particular configuration can arise as equilibrium. The main reason is that technological progress, i.e., an increase in $a_t$, creates a positive externality on consumers, which is not internalized by the monopolist—this is the usual appropriability effect present in all monopolistic competition models. As a result, there is a tendency for underinvestment in equilibrium. Since $R_t = 0$ involves greater investments out of retained earnings, there is a natural bias against $R_t = 0$ and the investment-based regime.

The most notable feature is that though equilibrium is different from the previous case, it again follows the sequence of $R = 1$ followed by a structural transformation.
and a switch to greater competition among and selection of entrepreneurs with the innovation-based regime. Therefore, this equilibrium also exhibits the feature that the process of growth and economic development is associated with structural transformation. Moreover, the economy still ultimately converges to the world technology frontier, i.e., \( a_t = 1 \) is reached as \( t \to \infty \). The only difference is that the structural transformation from \( R = 1 \) to \( R = 0 \) happens too soon at \( a_{t-1} = a_r(\delta) \) rather than at \( \hat{a} \).

Consequently, in this case, a temporary government intervention may increase the growth rate of the economy. The temporary aspect is important here, since the best that the government can do is to increase the growth rate while \( a \in (a_r(\delta), \hat{a}) \). How can the government achieve this? Subsidies to investment would be one possibility. AAZ show that the degree of competition in the product market also has an indirect effect on the equilibrium, as emphasized by the notation \( a_r(\delta) \). In particular, a higher level of \( \delta \), which corresponds to lower competition in the product market (i.e., higher \( \chi \)), will increase \( a_r(\delta) \), and thus may close the gap between \( a_r(\delta) \) and \( \hat{a} \). This may be related to why some less developed economies support monopolies and the effect of entry barriers is different at different stages of development as shown in Section 2. Nevertheless, it has to be noted that reducing competition will create other, static distortions (because of higher markups). Moreover and more importantly, we will see in the next two configurations that reducing competition can have much more disastrous effects for economic growth.

**FIGURE 5**

3. **Sclerotic equilibrium:** the third possibility a sclerotic in which \( a_r(\delta) > \hat{a} \), so that incumbent low-skill, low-productivity firms survive even when they are damaging to growth. In AAZ, we show why this can happen: the retained earnings of incumbent entrepreneurs, which was useful in relaxing credit constraints, also creates a shield protecting them against the competition of more productive young entrepreneurs. Which effect dominates and whether we are in the underinvestment or the sclerotic equilibrium depends on parameter values. In particular, as the above discussion suggests, \( a_r(\delta) \) is increasing in \( \delta \), so there exists a level of \( \delta, \hat{\delta} \),
such that if $\delta > \hat{\delta}$, incumbent entrepreneurs have so much monopoly power and retained earnings that they can protect themselves against young entrepreneurs. The resulting pattern is drawn in Figure 6a. Now the economy fails to achieve the maximum growth rate for a range of values of $a$ such that $a \in (\hat{a}, a_r(\delta))$. In this range, the innovation-based regime would be growth-maximizing, but the economy is stuck with the investment-based regime because of the retained earnings and the power of the incumbents.

Nevertheless, as shown in Figure 6a, this economy also follows the pattern of starting with a different set organizations, represented by $R = 1$, and then, as envisaged by Kuznets, switching to a different set of arrangements, $R = 0$. Like the previous two equilibria, this equilibrium also features convergence to the world technology frontier, i.e., to $a = 1$. Therefore, this economy also starts with different “appropriate” institutions and then these institutions and arrangements become transformed in the process of economic growth, making way to the innovation-based regime, which ensures that the economy converges to the world technology frontier. Nevertheless, this equilibrium configuration also shows that there will be a range, precisely $a \in (\hat{a}, a_r(\delta))$, where these alternative arrangements, though they may appear “appropriate,” are in fact detrimental to economic growth.

4. Non-convergence trap equilibrium: the fourth possibility is related to the third one and also involves $a_r(\delta) > \hat{a}$. However, now the gap between $a_r(\delta)$ and $\hat{a}$ is even larger as depicted in Figure 6b, and includes the level of $a$, $a_{\text{trap}}$, such that

$$a_{\text{trap}} = \frac{\bar{\eta}}{1 + g - \gamma}.$$ 

Inspection of (7) will immediately reveal that if $a_{t-1} = a_{\text{trap}}$ and $R_t = 1$, the economy will remain at $a_{\text{trap}}$. Therefore, in this case the protection of incumbent firms (with their stock of retained earnings) not only retards growth for a temporary interval, but pushes the economy into a non-convergence trap. In particular, this is the only equilibrium pattern in which the economy fails to converge to the frontier; with the investment-based regime, $R = 1$, the economy does not grow beyond $a_{\text{trap}}$, and at this distance to frontier, the equilibrium keeps choosing $R = 1$. 

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This equilibrium therefore illustrates the most dangerous scenario, that of non-convergence. Encouraging investment-based growth, by supporting existing, incumbent firms, may appear as “appropriate policy”, but in fact it condemns the economy to non-convergence. This is also the only case in which the Kuznetsian structural transformation does not occur because the economy remains trapped. In many ways, this is in line with Kuznets’ vision; the resulting economy is an underdeveloped one, unable to realize the structural transformation necessary for the process of economic development.

FIGURE 6

4.3 POLICY, POLITICAL ECONOMY AND INAPPROPRIATE INSTITUTIONS

The above discussion highlighted how the equilibrium pattern of economic arrangements may involve the organization of the economy in non-standard ways (long-term contracts, limited competition etc.), and the process of economic growth brings the structural transformation of these arrangements. It also highlighted how certain policies, such as reducing product 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, once the analysis is expanded to incorporate political economy features, where incumbent firms can lobby to influence equilibrium policies, the danger of appropriate institutions turning into inappropriate institutions increases significantly. For example, under the plausible assumption that economic power can buy political power, once the economy adopts less competitive markets or subsidies to investment, encouraging investment-based growth, these policies become easily entrenched; incumbent entrepreneurs become enriched by existing policies and institutions, and can successfully lobby to maintain them (and thus preventing a switch to the innovation-based equilibrium).

These political-economy considerations therefore reiterate that societies may get 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.
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, stagnated and were taken over by other economies with relatively more competitive policies, such as Hong Kong.

Figure 7 shows the growth performance of Central and South American countries at different stages of their development process. On the vertical axis we plot the average growth rate over five-year periods, while on the horizontal axis we plot the GDP per capita relative to the US at the beginning of each five-year period. 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 7a 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 is below 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 was larger than 40%.

Figure 7b plots all Central and South American countries, showing the same broad pattern. One concern about Figures 7a and 7b is that the evidence can be largely driven by the cross-sectional variation. For instance, Brazil and Colombia account for most of the positive deviations in Figure 7a. To address this concern, Figure 7c 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 that country. In this panel, the cross-sectional variation is by construction removed. 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 for this pattern is the important-substitution and incumbent-protective policies

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

7 In contrast to the cross-sectional pattern, in the fixed-effect regression, there is convergence as indicated by the downward sloping line.
adopted by many countries in Latin America. As suggested by our approach, 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 7

Our simple theory also sheds new light on the experiences of Korea and Japan. Though in many ways more market friendly than Latin American countries, 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 the Korean case, 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. Kong (2002, p. 3) writes

“...political—not economic—considerations dominated policymaking... [in Korea].... and ...corruption was far greater than the conventional wisdom allows”.

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 into restructuring. Political reforms seem to have weakened the highly entrenched politico-economic elite: the patriarchs of Samsung, Daewoo and Jinro, the three major chaebol, were convicted in the late 1990s of major bribing of two former presidents (although their jail sentences were pardoned in 1997, see Asiaweek, October 10, 1997). Interestingly, the speed of reforms seems to have been much slower in Japan. This may explain why Korea has by now managed to resume growth rapidly after the crisis, while the economic performance of Japan continues to be weak.

5 Distance to Frontier and Internal Organization of Firms

The framework introduced above can also be used to study how the internal organization of firms changes with the process of economic growth and economic development. Here we illustrate these ideas looking at two facets of the internal organization of firms: (i) vertical integration; (ii) delegation of decision-making authority to managers.

5.1 Vertical Integration

Here we outline a model of how vertical integration decisions of firms change as an economy develops, which builds on Acemoglu, Aghion and Zilibotti (2004). In particular, let us consider a slight modification of equation (5) whereby

\[ A_t(i) = \eta \bar{A}_{t-1} + \gamma_t(i) A_{t-1}, \]  

(10)

where

\[ \gamma_t(i) = \gamma + \theta_t(i) \]  

(11)

captures the rate of innovation of the firm an intermediate goods sector \( i \). For example, we can think of the term \( \theta_t(i) \) as the probability that an innovation in sector \( i \) at time \( t \) is successful. If so, there is innovation in the amount \( 1 + \gamma \). Otherwise, there is a smaller innovation, of size \( \gamma \). As before, these innovations build on the knowledge stock of the country, thus they multiply \( A_{t-1} \). The first term in (10), on the other hand, reflects imitation from the world technology frontier, hence the term \( \bar{A}_{t-1} \).

The key assumption of the model of this subsection will be that the probability of innovation, \( \theta_t(i) \), is affected by the internal organization of the firm, in particular, by whether the firm is vertically integrated or not. In particular, imagine that innovations
result from effort and initiatives by the owner/manager of the firm. Greater effort leads to greater $\theta_t(i)$. However, the owner/manager of the firm also engages in other tasks, such as production, marketing, distribution. The key decision is how to allocate his or her scarce time between these different activities. The internal organization of the firm affects these decisions. For example, with vertical integration, the owner/manager will perform all of these tasks himself or herself, whereas with outsourcing some of these tasks will be allocated to other agents. The key from the viewpoint of this paper is how this trade-off changes over the process of development, and whether there is also a structural transformation associated with the internal organization of the firm showing a tendency to change as an economy develops.

To investigate this issue in the simplest possible way, consider a symmetric equilibrium in which $\theta_t(i) = \theta$ for all $i \in [0, 1]$. Then, dividing both sides of the above equation by $\bar{A}_{t-1}$, and integrating over $i \in [0, 1]$, we once again obtain a simple linear equation describing how the state variable $a_t = A_t/\bar{A}_t$ evolves over time:

$$a_t = \frac{1}{1 + g} \left( \eta + (\gamma + \theta) a_{t-1} \right),$$

(12)

where $g$ is again the growth rate of world technology frontier.

Now returning to the trade-off between vertical integration and outsourcing, we introduce the basic idea of managerial overload, that is, the inability of the manager/owner of the firm to exert effort to deal with all possible problems that arise in production, marketing, distribution as well as innovation. Outsourcing mitigates this problem by having another agent performs some of these tasks. But at the same time, it creates a holdup problem as in the incomplete contracts literature pioneered by Grossman and Hart (1986); the agent will receive a fraction of the revenue of the firm. In particular, we follow Grossman and Hart and the incomplete contracts literature, in modeling this holdup problem in the simplest possible way and assume that no ex ante contract can induce an enforceable division of surplus; sharing of profits must rely entirely upon ex post bargaining. In particular, with outsourcing, the agent brought into the production process will share some of the rents with the owner, thereby reducing the owner’s income. This dissipation of income makes outsourcing an attractive to the owner, and also if outsourcing is adopted, reduces the owner’s incentives to innovate.
The analysis in Acemoglu, Aghion and Zilibotti (2004) establishes that there exists a critical threshold of the distance to frontier $a^v$ such that for all $a < a^v$, equilibrium organizational form is vertical integration, and for $a > a^v$, there will be outsourcing. The threshold $a^v$ is typically less than 1, so that there will be a switch to outsourcing before reaching the technology frontier.

The reason for this pattern is that the value of innovation, and thus the value of higher $\theta$, increases with $a_{t-1}$. When $a_{t-1}$ is close to zero, that is, in a relatively backward economy, imitation is much more important than innovation. Outsourcing may increase innovation, but it is not worth for the owner, since it will involve sharing the surplus with the agent. As $a_{t-1}$ increases, the value of innovation and thus the value of high levels of $\theta$ increase. Now it may become worthwhile for the owner to bring in another agent—outsource some of the activities—in order to take advantage of greater innovation possibilities.

Therefore, this simple model also predicts a structural transformation, this time with the internal organization of the firm shifting from vertical integration to outsourcing, as an economy develops.

Using a panel data set of UK firms during the period 1980-2000, in Acemoglu, Aghion, Griffith and Zilibotti (2003), we provide some evidence consistent with the pattern discussed here. Table 1, replicated from that paper, shows a negative and significant correlation between vertical integration and the interaction term between closeness of the firm to the technological frontier of its four-digit industry and 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.

TABLE 1

5.2 Delegation of Authority

Another important aspect of firms’ organization is the extent to which decision making is centralized or decentralized within each firm, for example as captured by delegation of authority to lower-layer managers. Recent evidence based on French firm-level panel data by Acemoglu et al. (2006) shows a robust positive correlation between decentralization and distance of a firm to the technological frontier of its industry; firms that are relatively
closer to the frontier are more likely to delegate authority to lower-later managers. Acemoglu et al. (2006) provide an explanation for this based on learning, whereby firms farther from the frontier can learn from the experiences of more advanced firms about implementation of new technologies and does not need to delegate as much authority to specialized agents.

Here, we present a complementary explanation more closely related to the framework developed in this paper.

As in the previous section, consider a firm engaged in production and innovation. The firm (the owner) decides how much authority to delegate to a manager about production decisions. There is a conflict of interest between the owner and the manager, however. The manager may prefer to take actions that do not maximize the profits of the firm, instead choosing actions that provides him with private benefits (see Aghion and Tirole, 1997). We measure the degree of conflict of interest between the firm and the manager with the “congruence” parameter, $\beta$. In particular, $\beta$ is the probability that the interests of the manager are aligned with those of the firm. If the manager is delegated authority, he will choose the action that he prefers most. With probability $\beta$, this will be the action that leads to positive revenues for the firm, and with probability $1 - \beta$, it will lead to zero revenues. Clearly, the case with $\beta = 1$ corresponds to no conflict of interest, while $\beta = 0$ implies that the manager will always choose an action that leads to zero profits for the firm.

Let $p$ be our (inverse) measure of delegation of authority to the manager. In particular, $p$ is the probability that the firm monitors the manager. When the manager is monitored, he must take the decision maximizing the firm’s profit. If $p = 1$, there is no delegation of authority, and the firm monitors the manager and enforces the profit-maximizing action with probability 1. On the other hand, if $p = 0$, there is no monitoring of the manager, thus full delegation. In this case, the manager decides the best action unilaterally. In intermediate cases, the firm/owner decides with probability $p$ and the manager decides with probability $1 - p$.

Finally, the productivity of firm $i \in [0, 1]$ is again

$$A_t (i) = \eta \bar{A}_{t-1} + \xi \theta_t (i) A_{t-1}$$

with $\theta_t (i)$ denoting the amount of effort invested by the firm’s owner for innovation.
Using the same expressions for pricing, the expected profits of the firm is a function of its decentralization decision, \( p \), and the level of productivity, \( A_t(i) \), is given by:

\[
\pi_t(p_t(i), A_t(i)) = \delta L (p_t(i) + (1 - p_t(i)) \beta) A_t(i).
\]

The “overload” faced by the owner is modeled with the following simple quadratic cost:

\[
C(p_t(i), \theta_t(i)) = \frac{1}{2} (p_t(i) + \theta_t(i))^2 A_{t-1},
\]

where the presence of the term \( A_{t-1} \) implies that these costs increase with the level of productivity in the economy. This cost function captures, in a simple way, the issue of overload; the marginal cost of either activity that the owner performance (monitoring and innovation) is increasing in the amount of the other activity.

Using these expressions, the maximization problem of the owner of the firm becomes:

\[
\max_{\{p_t(i) \in [0, 1], \theta_t(i) \geq 0\}} \delta L (p_t(i) + (1 - p_t(i)) \beta) (\eta A_{t-1} + \xi \theta_t(i) A_{t-1}) - \frac{1}{2} (p_t(i) + \theta_t(i))^2 A_{t-1}.
\]

Now dividing by \( A_{t-1} \) and noting that nothing depends on \( i \), this maximization problem can be written as

\[
\max_{\{p_t \in [0, 1], \theta_t \geq 0\}} \delta L (p_t + 1 - p_t \beta) (\eta + \xi \theta_t a_{t-1}) - \frac{1}{2} (p_t + \theta_t)^2.
\]

Assuming that \( \delta L \xi \leq 1 \), the solution takes the following simple form. There exists three thresholds (which are functions of the parameters)

\[
a_{p=1} \leq a_{\theta=0} < a_{p=0}
\]

such that:

1. If \( a_{t-1} \in [0, a_{p=1}] \), then the optimal (equilibrium) organization involves:
   \[
   p = 1 \\
   \theta = 0
   \]

2. If \( a_{t-1} \in [a_{p=1}, a_{\theta=0}] \), the optimal solution involves:
   \[
   p = \frac{\delta L \eta (1 - \beta)}{a_{t-1}} \\
   \theta = 0
   \]
3. If \( a_{t-1} \in [a_\theta=0, a_p=0] \), the optimal solution has

\[
\begin{align*}
p &= \frac{\eta (1 - \beta) - \beta \xi a_{t-1} (1 - \delta L \xi (1 - \beta))}{(1 - \beta) \xi a_{t-1} (2 - \delta L \xi (1 - \beta))} \\
\theta &= \frac{\beta \xi a_{t-1} - \eta (1 - \beta) (1 - \delta L \xi (1 - \beta))}{(1 - \beta) \xi a_{t-1} (2 - \delta L \xi (1 - \beta))}
\end{align*}
\]

where \( p \) decreases and \( \theta \) increases with \( a \).

4. If \( a_{t-1} \in [a_p=0, 1] \), the optimal solution has

\[
\begin{align*}
p &= 0 \\
\theta &= \delta L \xi \beta.
\end{align*}
\]

The most important implication of this characterization is that it leads to a pattern of structural transformation in the internal organization of the firm as a function of the stage of development (distance to frontier) in the economy. When \( a \) is low, the owner delegates no authority to the manager \( (p = 1, \text{ which can also be interpreted as not hiring a manager}) \). She also chooses zero innovation effort, \( \theta = 0 \). As \( a \) increases to an intermediate range, there is some delegation (thus some change in the internal organization of the firm), but still no innovation effort. As \( a \) increases further, a more interesting configuration emerges, where there is substantial delegation of authority to the manager, and the owner specializes in innovation. Finally, as the economy approaches the world technology frontier (i.e., a high level of economic development), there is full delegation to the manager, i.e., \( p = 0 \), and the amount of innovative effort by the owner is maximized.

This model therefore also illustrates how the process of development will lead to a structural transformation, along the lines of Kuznets’ emphasis, affecting not only the organization of markets, but also the internal organization of firms.

6 Distance to Frontier and Human Capital

The final application of our framework concerns the changing role of human capital (and its composition) over the process of development. The role of human capital in the process of technology adoption and economic convergence was first emphasized by Nelson and Phelps (1966). Figure 3 above suggests that the role of (formal) education could
be quite different for economies close to the frontier as compared to those farther away from the frontier. This idea is explored in greater detail in Vandenbussche, Aghion and Meghir (2003), who provide a model where in the importance of secondary versus higher education changes depending on the economy’s distance to the frontier. Vandenbussche, Aghion and Meghir (2003) and Aghion et al. (2006) provide evidence consistent with this notion.

Here, we illustrate related ideas using the framework develop above. Let us suppose that there are two different kinds of human capital in the economy, general-purpose and specific, and denote the average specific human capital of workers in the economy at time $t$ by $s_t$. This type of specific human capital may be acquired in schools, but it also includes skills acquired on the job or through non-formal education (for example, in the household). The average general-purpose human capital of the workforce, on the other hand, is denoted by $e_t$. This type of human capital can only be acquired through formal schooling.

Let us go back to equation (5) and modify such that for all $i \in [0, 1]$, we have

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

(13)

where $\varepsilon_t (i)$ is again a mean-zero term and $\eta$ is increasing and continuously differentiable in both of its arguments, and $\gamma$ is increasing and continuously differentiable in $e_t$.

Equation (13) implies that while specific human capital is useful for adoption and use of existing technologies, only general-purpose human capital, acquired through formal schooling, is useful for innovation. This is clearly extreme, but captures the notion that formal schooling becomes more important at later stages of development. Moreover, let us assume that

$$\frac{\partial \eta (s, e)}{\partial s} \geq \frac{\partial \eta (s, e)}{\partial e}$$

for all $e, s \geq 0$. (14)

and that

$$\frac{\partial \gamma (0)}{\partial e} > \frac{\partial \eta (s = 1, e = 0)}{\partial s}.$$ (15)

The first condition states that specific skills are more important for imitation than general-purpose skills, whereas the second condition states that general-purpose skills are sufficiently important for innovation.
Let us also assume that the representative worker has a limited amount of time, so that

\[ s_t + e_t \leq 1, \]

and naturally, \( e_t, s_t \geq 0 \). Condition (14) implies that when \( a_{t-1} \) is low in the economy is far from the frontier, the growth-maximizing strategy is to invest only in the specific skills of workers. In contrast, as the economy approaches the world technology frontier, (15) ensures that it becomes beneficial for the economy to invest in the general-purpose human capital of the workers.

If workers make their human capital decisions facing prices that reflect their contributions to growth, this will also be the equilibrium pattern of investment; formal education in general-purpose human capital will increase as the economy develops and approaches the world technology frontier. Therefore, this simple model provides another instance of a possible structural transformation, this time in the composition of skills of the workforce, going hand-in-hand with the process of economic development.

7 Conclusion

The literatures on economic growth and economic development emphasize different aspects of the process of development. While models of economic growth focus on technological change, capital accumulation and the relatively steady process of economic growth, much of development economics, building on the seminal work by Kuznets (1966), emphasizes the structural transformations taking place in the process of economic development.

In this paper, we presented a simple model that offers a unified framework for the analysis of economic growth and economic development. In our model, the transformation of production relationships goes hand-in-hand with economic growth. The main driving force of this pattern is that economic growth in relatively backward economies is associated with adoption and imitation of and investment in existing technologies, while growth in advanced (frontier) economies is driven by innovation. Consequently, the process of economic development takes the form of a transformation of economic relationships in many spheres. The framework we present, though simple, enables us to offer a number of new ideas about the relationship between the organization of production,
institutions, economic growth and economic development.

Using this basic framework, we illustrated how the organization of production, the extent of creative distraction and entry, the extent of vertical integration, the extent of delegation of authority to managers and the composition of human capital become transformed over the process of economic development.

We also used this framework to critically discuss the concept of “appropriate institutions/organizations.” The notion of appropriate institutions implies that the equilibrium organization of production relationships and broader institutions may differ with this stage of development. Our framework shows how the equilibrium process of economic development might take the form of the economy shifting from “institutions/organizations” appropriate for the early stages of development (which may be non-standard in many ways) to different (perhaps more standard) institutions and organizations as the economy develops.

Our framework, however, also highlights that attempts to impose such “appropriate institutions” from the outside can turn them into “inappropriate institutions,” which may have quite detrimental effect on the growth performance of less-developed countries. In particular, attempts to encourage “appropriate institutions” and policies at early stages of development might at best lead to temporary gains in growth, but will create the risk of the economy becoming stuck in a non-convergence trap because of the powerful constituencies that these institutions and policies create.

The framework presented in this paper is purposefully simple, so that it emphasizes the main trade-offs and can be applied in a variety of different settings. This framework can be develop in many ways both theoretically and also to bring it closer to data area. In current work, we are investigating some of the empirical implications of this framework for changes in the internal organization of the firm, but much else needs to be done. We believe that further study of models combining insights from economic growth and economic development and testing their implications with micro data our exciting in important areas for future work.
References


FIGURE 1.

Fig. 1a: HIGH BARRIERS

Fig. 1b: LOW BARRIERS

Fig. 1c: HIGH BARRIERS (FE)

Fig. 1d: LOW BARRIERS (FE)
FIGURE 5

The diagram illustrates the relationship between $a_t$ and $a_{t-1}$ for two cases: $R=1$ and $R=0$. The diagram shows horizontal and vertical lines indicating points $a_0$, $a_r(\delta)$, and $\hat{a}$. The graph is used to demonstrate the behavior of the system under different conditions.
FIGURE 6a
FIGURE 6b
FIGURE 7

LATINA AMERICA AND DISTANCE TO FRONTIER.

PERFORMANCE OF 4 largest LATIN AMERICAN COUNTRIES

PERFORMANCE OF LATIN AMERICAN COUNTRIES (WITHIN)