Labor market flexibility and investment in human capital*

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Abstract

Employers use signals of productivity to hire from a pool of workers. Educational systems produce these signals mostly by testing. Because educational tests may change the incentives to acquire different types of human capital, the link between achievement and productivity may be ambiguous. The tests may adversely affect the accumulation of useful but hard to test skills. Certain types of skills, such as creativity and ability to collaborate with others, are more costly to test than others, such as subject knowledge. Given this asymmetry, signals from the educational system are likely to lead individuals to trade off acquisition of “creativity” for “knowledge”. Transparent labor markets that allow employers to signal the rewards to less testable skills induce an efficient allocation of investment in human capital. Less transparent markets encourage credentialism, testing, and rote memorization that characterize the educational system in many developing countries.

We build a simple model of testing and human capital accumulation to show how rational agents may distort their accumulation of human capital in response to rewards in the labor market for knowledge and creativity. We show that individuals in rigid labor markets will favor greater acquisition of knowledge at the expense of other types of human capital. We contrast two stylized educational systems that arise from each type of labor market. In one, corresponding to a rigid labor market, selection into higher levels of education is based on results of a national entrance exam, mainly the ‘big test’ for entering the university, as in Japan and the Middle East. In such a system private gains from investment in education can be high while its social productivity is low. In a more flexible labor market, such as in the United States, data from tests are complemented by information from a variety of other sources, resulting in a more balanced accumulation of human capital and higher social productivity.

We use the insights from the model to resolve an apparent anomaly between the crucial role of human capital in growth asserted in theory and the lack of firm support for it empirically. We explain this anomaly by noting that countries with the fastest growth in education happen to be those with the most distorted portfolio of human capital, that is, those with rigid labor markets where human capital accumulation has been least efficient, but where the market encourages production of knowledge and formal schooling. We present econometric evidence from a cross section of countries to show that, once we take the differences in the labor market transparency into account, the effect of human capital on the rate of growth is positive.

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1 Introduction

The recent economic growth literature has emphasized the importance of human capital without carefully delineating the characteristics of human capital or, importantly, how and why the accumulation of human capital may vary across countries. In this paper we consider the implications of recognizing that human capital is a productive input with several dimensions. In particular, we distinguish between observable characteristics which we call “knowledge” and unobservable characteristics which we denote “creativity.” We consider only cognitive traits as human capital and treat the rest as ability. We divide the cognitive traits into two dimensions, one measurable by testing and therefore observable and the other measurable only at considerable costs and so untestable (although eventually inferred by employers who observe productivity). Labor markets provide signals to individuals about the relative rewards of investments in these different dimensions of human capital. Parents, educators, and ultimately children respond to these rewards by choosing a mix of the two types of human capital. In non-transparent labor markets, individuals may over accumulate measurable human capital (i.e. formal schooling) while under-investing in unobservable human capital. This phenomenon is often observed in developing countries with rigid labor markets and a strong desire to ensure that rewards (e.g. access to higher education, eligibility for formal sector jobs, and wages) are allocated on the basis of objective criteria. At the margin, agents distort their allocations of investments between observable and unobservable human capital, that is, between knowledge and creativity.

The distortions are closely linked to the structure of the labor market. We show that imperfections in the labor market which block signals from employers about the importance of non-testable skills lead to too much emphasis on the easily testable aspects of human capital. In particular, non-transparent labor markets, in which laws discourage layoffs, or in which wage scales are set according to educational credentials, may induce educational systems to produce workers with inappropriate skill portfolios.

We believe that the link that our model establishes between labor market flexibility and the efficiency of human capital formation fills an important gap in the growth literature noted by Topel (1999). Flexible labor markets offer more transparency in returns to various types of human capital and thereby encourage the accumulation of a more efficient portfolio of human capital, which is good for economic growth. This provides an explanation for why in many empirical studies years of schooling does not appear to foster growth (Benhabib and Spiegel 1994; Berthelemy, Dessus, and Varoudakis ; and Pritchett 2001). The reason suggested by our model is that schooling is a good
proxy for human capital only where markets induce an efficient choice of human capital portfolios. Indeed, as we show in the empirical section of the paper, in the sample of countries with flexible labor markets education and growth are positively associated, whereas in the sample of countries with rigid labor markets, a group which has incidentally experienced faster increase in years of schooling, there is not relation between schooling and growth. Essentially, our argument is that the existing regressions of growth on years of schooling are misspecified. The proper specification should model the effect of schooling on growth conditional on the labor market regime, because it is only in the conditional distribution of growth and years of schooling that the latter is correlated with human capital.

The paper is organized as follows: we introduce a very stylized model of the allocation of endowments between observable and unobservable human capital in Section 2. In Section 3, we extend the basic model to incorporate altruistic parents and the production of human capital. Section 4 examines the implications of the model for the role of the labor market and the empirics of schooling and growth for a cross section of countries using the concept of labor market flexibility. We utilize widely available measures of labor market flexibility to show that, controlling for labor market flexibility, the effect of education on growth is positive and significant, as predicted by theory. This section also discusses the implication of the model for reform and educational systems and the labor market. Section 5 concludes.

2 Model

We first discuss a very simple version of the model to provide the basic intuition for our claim that non-transparent labor markets can induce inefficient tradeoffs between observable and unobservable human capital. Even this simple version illustrates how using schooling as the measure of human capital can overstate the productive effects of an economy’s investments in education.

Suppose that productivity is a function of human capital only, but that human capital has two components: knowledge \( k \) and creativity \( r \). Individual productivity is described by a standard neo-classical production function \( w(k, r) \):

\[
\begin{align*}
w_k, w_r & > 0 \\
w_{kk}, w_{rr} & < 0 \\
w_{kr} & > 0
\end{align*}
\]
Let \( f \) be symmetric and choose units such that \( w_k = w_r \) and \( w_{kk} = w_{rr} \).

### 2.1 Benchmark: full observability

Suppose knowledge and creativity are observable endowments. Then, with perfectly competitive labor and output markets, an individual’s wage \( w \) is equal to his output: \( w = w(k, r) \). Let individuals be born with a human capital endowment \( e \) which may be allocated to either knowledge \((k)\) or creativity \((r)\). The two are both “produced” from the endowment \( e \). For simplicity we assume that the marginal rate of transformation is -1:

\[
k + r = e \tag{1}
\]

We assume that endowments are fixed at birth at level \( e \) and that individuals have a one-time decision to make regarding their endowment allocation. One might imagine that education increases \( e \), so that both \( k \) and \( r \) can increase with expenditure of resources. But in our model the role of education is simply to allocate a fixed endowment to knowledge and creativity. One can think of the role of learning at home and school as the movement along the budget constraint imposed by \( e \). We believe that this simple construct captures well our idea that, at the margin, individuals who are acquiring human capital face a choice between those aspects of human capital which are observable and those which are not. It helps us focus on our main objective which is to study the impact of labor market behavior on the allocation of resources to different types of human capital.

Individuals allocate their human capital endowments to knowledge and creativity to maximize their income:

\[
\text{Maximize } \quad w(k, r) \\
\text{s.t. } \quad k + r = e
\]

The first order conditions imply that output is maximized when

\[
\frac{\partial k}{\partial w_k} = \frac{\partial r}{\partial w_r} \tag{2}
\]

Figure 1 depicts the equilibrium of the individual. Given the assumed symmetry and the strict concavity in \( k \) and \( r \), the optimal allocation of an endowment \( e \) splits it evenly across knowledge.
and creativity:
\[ k = r = \frac{e}{2} \]  

(3)

This is entirely standard; knowledge and creativity are complements, so agents will want to have some of each.

![Diagram](image)

Figure 1: Choice of knowledge and creativity in competitive equilibrium (transparent labor market) for an individual with endowment \( e \).

### 2.2 Case 1: Transparent labor market

We first examine the equilibrium of a transparent labor market. By a transparent labor market we mean one in which individuals have little incentive to hide their abilities. As noted earlier, we assume that the educational system signals each worker’s testable human capital accurately, but revelation of creativity is only possible after the individual has worked for an employer. So one reason why employers value experience is because it provides information for \( r \). In a transparent labor market individuals will develop their \( k \) and \( r \) efficiently because they gain little from distortions away from the optimal allocation represented by \( A \). This is because those who misrepresent their \( r \) can only do so for a limited time before their true \( r \) is revealed. With sufficient transparency and a low discount rate it is easy to show that \( A \) also represents the market equilibrium.

Since the testable component of human capital, knowledge, is the only signal available to employers, firms offer prospective employees (who we assume have no employment history) a wage equal to their expected productivity. Suppose firms expect that workers choose to allocate their endowment
of human capital optimally. Then they would be willing to offer:

$$w = w(k, k)$$  \hspace{1cm} (4)$$

To a prospective employee, the value of this wage, $V(w)$ is:

$$V(w) = w + \beta \left[ \pi V(w) + (1 - \pi)V_0 \right]$$

$$= \frac{1}{1 - \beta \pi} \left[ w + \frac{\beta}{1 - \beta}(1 - \pi)v_0 \right]$$  \hspace{1cm} (5)$$

where $\beta$ is the individual’s discount factor and $\pi$ is his tenure probability, the likelihood he remains in the job next period. The value of his alternative (to this job) is $V_0$; $v_0 \equiv (1 - \beta)V_0$, the per period flow which has value $V_0$ in perpetuity. The job is naturally more valuable the higher $w$ is:

$$\frac{dV}{dw} = \frac{1}{1 - \beta \pi}$$  \hspace{1cm} (6)$$

And the benefits of remaining in it increase as $w$ is relatively larger than $v_0$:

$$\frac{dV}{d\pi} = (w - v_0)\frac{\beta}{(1 - \beta \pi)^2}$$  \hspace{1cm} (7)$$

Staying in this job is also more valuable as the future is discounted less ($\beta$ approaches 1).

Consider a worker’s choice between allocating his endowment $e$ to knowledge ($k$) and creativity ($r$). His allocation, $(k, r)$, might be, in the extreme, either the most productive: $(0.5e, 0.5e)$ or the “most deceptive”: $(e, 0)$. Since firms can observe only $k$, the second allocation is the most deceptive since the worker masquerades as a worker with endowment $(e, e)$. The choice is illustrated in Figure 2; the most productive allocation of endowment $e$ allows the worker to reach the output level represented by Isoquant A. By showing knowledge level $k = e$, he purports to be able to produce at the level represented by Isoquant B, but actually (given his choice of $(k, r) = (e, 0)$) can only reach the output level represented by Isoquant C.

Is this masquerade an attractive option? The two important considerations from the point of view of the worker are the relative premium offered by the job (the difference $w - v_0$) and second, the likelihood of retaining the job in subsequent periods, $\pi$. Suppose for now that $\pi$ has a trivially
simple form:

\[ \pi = \begin{cases} 
1 & \text{If productivity is as expected.} \\
0 & \text{Otherwise.} 
\end{cases} \]  

(8)

In this case, the high wage \((w = w(e, e))\) is received for only one period by a worker with endowment \(e\) who masquerades as one with endowment \(2e\); the worker worries a great deal about the value of the alternative, \(V_0\). Presumably \(V_0\) is the value of eventually being identified as a low productivity worker; \(v_0 = w(k, 0)\), or

\[ V_0(k) = \frac{v_0}{1 - \beta} = \frac{w(k, 0)}{1 - \beta} \]  

(9)

The concavity of the production function suggests that the masquerade is unlikely to be attractive. And, as long as the masquerade is unattractive, the worker’s signaled level of knowledge will be an accurate signal of his (equivalent) level of creativity. The firms’ expectations will be confirmed in equilibrium.
2.3 Case 2: Rigid labor market

Suppose, however, that labor markets are not transparent. Lack of transparency can arise from excessive rigidity of employment contracts caused, for example, by government regulation that restricts the ability of firms to fire workers whose productivity is low. Many countries restrict firms’ freedom to fire at will. In some economies, the “firms” are actually governmental bodies and the restrictions may be an outgrowth of trying to ensure that employment decisions are made objectively. Providing employment protection to private sector workers is sometimes intended to provide social insurance that is otherwise not available. The net result is to raise the cost of layoffs and firing to employers.

In this case, firms (or government bureaucracies) make wage offers on the basis of knowledge only. If a worker later proves to be less productive than anticipated, but this “productivity deficit” is a reflection of limited creativity, which is unobservable, then firing the worker is subjective. Since knowledge is verifiable, while creativity is not, hiring and firing (and wage offer) decisions may be restricted to those conditioned only on knowledge.

Let hiring, then, be permanent (with no subsequent downward adjustment of wages). Now, $\pi = 1$ and the value of an offer of $w$ is:

$$V(w) = \frac{w}{1 - \beta}$$

(10)

Now, what is important to the worker is not his fall back payoff flow, $v_0$, which was quite low in the transparent labor market case, but getting the offer $w$. Once he gets the job paying $w$, he keeps it.

But this suggests that firms will not form the kind of expectations which their counterparts in a transparent labor market do. Since the relative gain from masquerading as a higher productivity worker is so much higher with an inflexible labor market, at the margin workers will always choose to tradeoff creativity for knowledge. Now, confronted with a worker of knowledge level $k$, a firm’s forecast of the worker’s productivity, $\hat{w}_R$ will have to reflect this incentive to deceive:

$$\hat{w}_R = w(k, 0)$$

(11)

But, if wage offers are $\hat{w}_R$, then workers have no incentive to allocate their endowments efficiently (that is, so that $k = r$).

So, what we have characterized as an inflexible labor market, which might arise from a desire to ensure that workers are evaluated objectively, leads to a large distortion in the allocation of human capital. All workers over-invest in knowledge at the expense of creativity. In aggregate, an economy characterized by transparent labor markets could reach full output $Y^*$. Let the distribution of
endowments be described by the continuous probability density function \( g(e) \) (with associated cdf \( G(e) \)); then full output would be:

\[
Y^* = \int_0^{\infty} y(\frac{e}{2}, \frac{e}{2})dG(e) \quad (12)
\]

In contrast, the inflexible labor market economy would only reach output level \( Y_0 \):

\[
Y_0 = \int_0^{\infty} y(e, 0)dG(e) \quad (13)
\]

Clearly, there are variations on the scheme described here which would mitigate this dire outcome. One alternative would be for firms in an inflexible labor market to offer a wage profile, rather than a wage. For instance, the first period’s wage would be \( w(k, 0) \), while the second period’s wage could be contingent on the first period’s output. Formally, this would solve the problem; here the firm is learning about workers’ productivity through signals over time (Jovanovic 1979). Our model in fact mimics a market with a wage scale based on \( k \) only. Such wage scales that tie wages and salaries to diplomas and certificates are prevalent in the public sector. Like employment protection, they prevent managers from using their discretion to engage in favoritism. Some countries, notably in MENA, extend wage scales to private sector employment (Said 2001).

### 3 Investment in human capital

Assume there is full observability and consider a parent interested in his own consumption and the wages of a child. Because productivity is fully observable, the child, as an adult will be paid \( w = f(k, r) \) and the parent’s problem is to maximize:

\[
U(c) + f(k, r)
\]

where \( c \) is the parent’s consumption and \( U(\cdot) \) is a function describing his utility from own consumption (with standard properties). His discount factor for now is one. Parents endow their children with human capital of the two kinds in the amounts \( k \) and \( r \).

Knowledge capital can be purchased at the price \( p_k \) per unit; creativity, the unmeasurable component of human capital, must be produced at home. It must be produced in the household because its unobservable nature presents agency problems for the educational system. Parents’ time can be invested in either producing creativity at the rate of \( \rho \) units of creativity capital per unit of parent’s
time or in working in the labor market. Parents’ time is normalized to one and can be spent on
either market work or investment in children. Parents earn the exogenous wage $W$. Parents face a
budget constraint which relates purchased goods (own consumption and knowledge capital) to labor
earnings:
\[
c + p_k k = W\left(1 - \frac{\partial r}{\partial \rho}\right)
\]  
(15)
The parent’s problem is:
\[
\text{Maximize } \quad U(c) + f(k, r)
\]  
(16)
s.t. \quad W\left(1 - \frac{r}{\rho}\right) - c - p_k k = 0

3.1 Equilibrium
With full observability, the child’s productivity will be a function of both $k$ and $r$, and so the parent’s
first order conditions imply that
\[
U'(c) = \frac{\partial f}{\partial k} \frac{p_k}{p_k} = \frac{\partial f}{\partial r} \frac{W}{\rho}
\]  
(17)
At the margin, consumption is weighed against the productive value of investments in children. The
marginal value per dollar of investments in the two types of human capital are equated.

In the simple model outlined earlier, we ignored parents’ consumption, had no production of
human capital, assumed the prices of $k$ and $r$ were equal, and assumed that $\partial f/\partial k = \partial f/\partial r$. Given
these differences, the first order condition in (17) is a slight generalization of (2).

3.2 Discussion
When labor markets are not transparent, the payoff from investing in children is no longer $f(k, r)$,
but is now $w(k)$ where $w(k)$ is the wage offered by an employer who observes not $k$ and $r$, but only
$k$. Furthermore, the employer is restricted to conditioning payoffs to workers on only observable
characteristics; i.e. on knowledge, or $k$. Just as in the simple endowment model above, if children’s
wages are increasing in $k$, but not in $r$ and if wages are never revised downward after initial employ-
ment, then parents will optimally choose $r = 0$. Since creativity is costly to acquire, but $\partial w/\partial r = 0$,
parents will not invest in it. Now, the parents’ first order condition is (instead of (17)):
\[
U'(c) = \frac{\partial f}{\partial k} \frac{p_k}{p_k} \bigg|_{(k, r) = (k, 0)}
\]  
(18)
4 Implications

4.1 The role of labor markets in growth

The labor market determines the rewards to individual skills and characteristics. Its efficiency and institutional features are therefore expected to affect human capital accumulation and economic growth. There is a large literature that emphasizes the role of the labor market in the allocation of individuals to jobs, but not in human capital accumulation and growth (Topel 1999). Barro (1998) notes that “long lasting differences in [basic political, legal, and economic institutions] across countries have proven empirically to be among the most important determinants of differences in rates of economic growth.” Labor markets would seem an obvious place to look for differences in growth rates because the most significant differences between the economic institutions of different countries are in their labor market institutions (Botero et al. 2003). Yet the empirical literature on growth has not accounted well for these differences. This is particularly surprising since findings of weak (sometimes negative) effect of human capital on growth have been regarded as odd in light of the great emphasis placed on human capital in the theoretical literature starting with Lucas, Jr. (1988) and Becker, Murphy, and Tamura (1990). While the initial level of schooling appears to influence the growth rate positively (Mankiw, Romer, and Weil 1992), evidence on the effect of increase in schooling on growth is mixed at best. Benhabib and Spiegel (1994), Borenstein et al. (1999), Levin and Raut (1997), and Pritchett (2001) for lack of such effect and Gemmell (1996) and Topel (1999) for evidence for it. Summarizing the result of the empirical literature, Topel (1999) concludes, the empirical growth literature does not lend much support to the idea that human capital, at least as represented by measured educational attainment, is a key element of economic growth (p. 2964).

A few studies have focused on the relationship between labor market flexibility and growth of output and employment. Higher European unemployment rates relative to United States and the UK have been linked to relatively less flexible labor markets, while more flexible labor markets have been associated with higher productivity and faster growth Nickell and Layard (1999).

Existing empirical results linking labor market flexibility to growth performance are tentative. The major reason is that labor market flexibility is difficult to pin down empirically has hampered more definitive studies of the effect of flexibility on growth (Schultz 2000). Barro (1998) and Forteza and Rama (2000) use indices of labor market flexibility to explain growth performance. Forteza and Rama (2000) find that countries with more flexible markets recovered faster from recessions, while Barro (1998) did not find any significant relationship between labor market flexibility and
growth. Poor quality of data on labor market flexibility makes it difficult to conclude much from either study.¹

There are complex reasons why flexibility should matter for economic performance. The literature on incentives argues that flexibility in paying individuals differentially and ability to demote or fired them provides incentives for managers and workers to perform better on their jobs (Shapiro and Stiglitz 1984). Yet, it is sometimes argued that some form of implicit insurance is needed to provide incentives for individuals to invest in firm specific human capital, which is also productive.

In our model flexibility matters for economic performance, and growth in particular, because it promotes efficient accumulation of human capital. It is the means to an end, to achieve transparency, by which we mean the ability of employers (or the labor market) to signal to future job seekers and their parents the true return from investment in different attributes. Wage flexibility is important in allowing employers to adjust compensation over time as they learn more about a worker’s true productivity. Because wages are generally inflexible downward, being able to layoff workers whose productivity is low is equally important. Our model offers an explanation why the empirical literature on growth finds small support for the positive effects of human capital on growth. Rigid labor markets may lead to a rapid increase in schooling but not productive human capital because these markets encourage the wrong mix of “knowledge” and “creativity”. We argue that lack of success in explaining cross country growth with years of education may, in part, be due to years of schooling being a reasonable measure of “knowledge”, but not for “creativity”, especially in countries with non-transparent labor markets. Several studies that have added quality of schooling to the list of explanatory variables in growth regressions have reported a significant positive effect (Hanushek and Dongwook 1995, Barro 1998). But their measures of quality provide more accurate estimates of the level of “knowledge” of the workforce but still fail to capture the non-testable types of human capital. Moreover, test scores from international sources, which are not administered to a random sample of countries, may suffer from selection bias. Countries with weaker educational systems may be less likely to participate in the test.

Indirect empirical evidence suggests that competitiveness of labor markets may enhance the role of education in growth. For example, Levin and Raut (1997) show that the interaction of exports and human capital affects growth but human capital by itself does not. Openness and labor market flexibility are likely to be related. Similarly, Borenstein, DeLong, and Lee (1999) show that

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¹Barro (1998) uses the number of ratifications with the International Labor Organizations (ILO) and concludes that while the results point to a reduction in growth and increase in human capital investment, the ILO variable fails to capture the effect of labor market restrictions. Forteza and Rama (2000) use a mixture of several labor market characteristics to study the effect of structural reform. Their index is not measuring the aspects of flexibility suited for our model. For example, China is ranked number 3, above the United States (23), in flexibility!
although the interaction of foreign direct investment and human capital is associated with growth, each variable used separately is not. Evidence presented by (Kim and Topel 1995) indicates that labor market flexibility in the fast growing countries of Taiwan and Korea helped growth.

4.2 Empirics of growth revisited

Lack of comparability of education data is recognized as a problem for cross country regressions (Behrman and Rosenzweig 1994). Several studies attempt to correct for this by including quality of education (Hanushek and Dongwook 1995). Our hypothesis is that an appropriate human capital series, one that corrects for an imbalance in favor of formal knowledge at the expense of creativity, would show greater correlation with growth of output. We use a very basic empirical relation to relate human capital to growth across countries:

\[
\frac{\dot{y}}{y} = \alpha + \beta \frac{I}{Y} + \gamma \frac{\dot{h}}{h} + \epsilon. \tag{19}
\]

Growth of per capita income \(y\) is related to the rate of physical capital accumulation, for which the investment-GDP ratio \(I/Y\) is a proxy, and growth of human capital, which is related to the growth rates of its components, “knowledge” \(k\) and “creativity” \(r\).

Consider first the limiting case in which the labor markets of all the countries in the sample are flexible. Invoking equation (3), which is the equilibrium of the model in the benchmark case with full flexibility, growth of human capital would be equal to growth of its components (this can be derived from the productivity function \(h = w = f(k, r)\) by assuming \(f(\cdot)\) to be linear homogeneous):

\[
\frac{\dot{h}}{h} = \frac{\dot{k}}{k} = \frac{\dot{r}}{r}.
\]

In this case the coefficient of years of schooling in a regression of growth on schooling would accurately reflect the effect of human capital (knowledge and creativity together), so that omitting \(r\) from the estimated equation would not matter. At the other extreme, consider a sample of countries with rigid labor markets. For these countries, \(k\), measured by years of schooling, would be a poor proxy for human capital, \(h\), resulting in misspecification and bias in the estimate of \(\gamma\). Finally, for a sample of countries which includes both types of countries, the reported estimated coefficient of schooling would be simply hard to interpret. With the exception of some studies done on more homogeneous groups such as the OECD countries or states of the United States, this is indeed the difficulty with most cross country regressions of growth.
Table 1: Wages and Prices Grading Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Rigidity</th>
<th>Determination of wages and prices</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very low</td>
<td>Market determines all wages and prices, no effective minimum wage</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Low</td>
<td>Market determines most prices, minimum wage may or may not be effective</td>
<td>63</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Mixture of market and government, minimum wage applied effectively</td>
<td>66</td>
</tr>
<tr>
<td>4</td>
<td>High</td>
<td>Market determines few wages and prices, government sets most wages.</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>Very high</td>
<td>Wages and prices almost completely controlled by the government</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Number of countries in the sample reported by Heritage Foundation.

A simple way to improve the estimation is to employ a dummy variable for labor market rigidity in (19) to obtain separate estimates of $\gamma$ for the flexible and rigid countries:

$$\frac{\dot{y}}{y} = \alpha + \beta \frac{I}{Y} + \gamma \frac{k}{k} + \theta D \frac{k}{k} + \epsilon', \quad (20)$$

where $D$ is equal to one if the labor market is rigid and zero otherwise. Thus, for a flexible labor market ($D = 0$) we have: $\gamma = \gamma'$, so $\gamma'$ can is now the estimated effect of human capital on growth. For rigid labor markets the effect of schooling on growth will equal $\gamma = \gamma' + \theta$. We would expect $\gamma$ to be positive, and larger than previously estimated, and $\theta$ to be negative, yielding a smaller coefficient for the estimated effect of education on growth in inflexible countries. Although this method does not use all the information available on the labor market, it provides a straightforward method for testing the main hypothesis of this section, that is, $\gamma > 0$ for flexible countries and closer to zero in rigid labor markets. It also has the advantage of requiring only a gross measure of labor market rigidity. Since this is difficult to measure, our approach avoids placing undue burden on a foundation of questionable data.

We test the specification in (20) by employing indices of labor market rigidity developed by the Heritage Foundation (Heritage Foundation 2003) and by the World Bank (2003). The former is an index of wage and price controls, from one to five, which classifies countries according to the degree to which wages and prices are set administratively rather than by the market (see Table 1). The recently made available data by the World Bank (2003) on regulatory environment around the world take a more direct approach to measuring labor market regulations by considering a variety of laws and regulations that impinge on the labor market.

The main index developed by World Bank (2003), the Employment Laws Index, is an average of the three indices which take values between 0 and 100, where higher values mean more regulation.
Table 2: Comparison of labor market flexibility indices

<table>
<thead>
<tr>
<th>Heritage index</th>
<th>Mean value of World Bank index for flexibility in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wage and price controls</td>
</tr>
<tr>
<td>1</td>
<td>45.5</td>
</tr>
<tr>
<td>2</td>
<td>45.2</td>
</tr>
<tr>
<td>3</td>
<td>47.3</td>
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<td>4</td>
<td>40.9</td>
</tr>
<tr>
<td>5</td>
<td>68.0</td>
</tr>
</tbody>
</table>

Notes: World Bank indices range from 0-100; the index of “employment laws” (last column) is an average of the other three indices.

We also use two of the components of this index that seem to relate more closely to the transparency of the labor market, flexibility of hiring and firing. A caveat for all these indices is that we are using their most recent value which may not necessarily reflect the conditions of the labor market for the entire period. Only a handful of countries, mainly the former socialist countries, have experienced dramatic changes in labor market flexibility in recent years, but these countries for the most part lack other data and are therefore excluded from the analysis. The score for the two measures of rigidity do not match well (Table 2). We think that the Heritage data is closer to what we have in mind. The World Bank rankings are based on laws and regulations, not necessarily their enforcement, which can vary greatly from one country to another (MacIssac and Rama 1997).

We define three dummy variables based on three World Bank indices of flexibility in hiring, firing, and the summary employment laws index. It is set equal to one for the values of the index greater than the median (low flexibility) and zero otherwise. We do the same for the index of wage and price controls of the Heritage Foundation, except that instead of taking the median the Heritage dummy takes the value of one if the index less than three and zero otherwise. As Table 1 shows, there are very few countries in the two extremes of 1 and 5, and the main distinction arises between scores 2 and 3. For the estimation sample, the reasons for summarizing the information contained in these indices by a dummy variable is that they are too crude and observations in individual cells too few to allow the estimation of the effect of degrees of labor market rigidity on human capital accumulation and growth. Since the purpose of our empirical exercise is not to obtain a precise estimate of the effect of rigidity, we believe that the dummy variable specification is sufficient to bring out the differences between the more and less rigid labor markets.

The differences in mean growth rates, capital accumulation, and increase in education between two groups of countries defined according to various indices of labor market rigidity are quite revealing (Table 3). According to the Heritage index countries with flexible labor markets grew more
than twice as fast during 1965-98, invested 25% more of their GDP in physical capital per year, while experiencing a rate of increase in average years of schooling for 1966-99 which was actually 42% lower. Other indices show the same pattern but the differences are less pronounced. Summary statistics for the regressions are provided in Table 4.

Results of estimation for equation 20 are reported in Table 5. But before examining these results, consider the baseline case (column 2) which is the estimation result for the pooled sample of countries with rigid and flexible labor markets. The effect of increase in years of schooling is shown to be small and insignificant, the sort of result that has prompted the search for the missing human capital effect on growth. Introducing the interaction term with the Heritage dummy allows for different effects on growth in rigid and flexible countries and changes the results considerably. As predicted by our model, the coefficient of schooling is much higher for countries with flexible labor markets: 0.42 compared to 0.06 for those with rigid labor markets (this is the sum of the coefficients of human capital and the interaction term). The coefficient of schooling for countries with flexible labor markets is positive and significant is estimated at 0.42 which is much more reasonable as an estimate of the elasticity of output with respect to human capital. For countries with more rigid labor markets education does not appear to influence growth at all, a finding that echoes that of Pritchett (2001). The results from the World Bank indices are not as conclusive, but generally support the Heritage result (columns 4-6). Among these, the results using the hiring dummy are very close to the Heritage results in significance and size of the estimates.

The coefficient of the dummy variable is not significant in any of the regressions and the point estimates are very small. If these estimates are to be taken seriously, one might conclude that the (negative) effect of labor market rigidity on growth is mainly through distortion in human capital accumulation. Once we take that into account, rigidity has little direct effect on growth.

4.3 Implications for policy

The most important policy implications of our paper are with respect to reform of the education system and the labor market. Chief among the objectives of education reform in developing countries is to shift the emphasis in instruction from rote memorization and credentialism to acquisition of productive skills. Perhaps the most important message of this paper for education reform is that rote memorization and credentialism are in large part driven by distorted incentives generated by the labor market and therefore education reform presupposes labor market reform that removes distortion of incentives. Students seek diplomas because they are rewarded. They resort to rote
Table 3: Average performance of countries with flexible and rigid labor markets

<table>
<thead>
<tr>
<th>Index of rigidity</th>
<th>Growth of GDP per capita, 1965-88</th>
<th>Investment ratio 1965-98</th>
<th>Growth of schooling 15+ old, 1966-99</th>
<th>Number of countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heritage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flexible</td>
<td>0.67</td>
<td>16.88</td>
<td>0.53</td>
<td>51</td>
</tr>
<tr>
<td>rigid</td>
<td>0.32</td>
<td>12.82</td>
<td>0.92</td>
<td>49</td>
</tr>
<tr>
<td>World Bank</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment laws</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flexible</td>
<td>0.67</td>
<td>16.58</td>
<td>0.64</td>
<td>54</td>
</tr>
<tr>
<td>rigid</td>
<td>0.49</td>
<td>15.01</td>
<td>0.71</td>
<td>53</td>
</tr>
<tr>
<td>Hiring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flexible</td>
<td>0.69</td>
<td>16.88</td>
<td>0.56</td>
<td>48</td>
</tr>
<tr>
<td>rigid</td>
<td>0.56</td>
<td>15.04</td>
<td>0.71</td>
<td>48</td>
</tr>
<tr>
<td>Firing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flexible</td>
<td>0.71</td>
<td>17.41</td>
<td>0.60</td>
<td>53</td>
</tr>
<tr>
<td>rigid</td>
<td>0.45</td>
<td>14.15</td>
<td>0.75</td>
<td>54</td>
</tr>
</tbody>
</table>

Note: Number of countries in the sample is that used for estimation.

Table 4: Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth of GDP per capita, 1965-98</td>
<td>103</td>
<td>0.52</td>
<td>0.61</td>
<td>-0.84</td>
<td>2.19</td>
</tr>
<tr>
<td>Growth of years of schooling, 1965-99</td>
<td>98</td>
<td>0.73</td>
<td>0.46</td>
<td>-0.13</td>
<td>2.65</td>
</tr>
<tr>
<td>Share of investment in GDP, average 1965-98</td>
<td>168</td>
<td>14.49</td>
<td>7.74</td>
<td>1.89</td>
<td>44.16</td>
</tr>
<tr>
<td>Wage and price controls (Heritage)</td>
<td>151</td>
<td>2.7</td>
<td>0.78</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>1 (%)</td>
<td>3</td>
<td>1.99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (%)</td>
<td>63</td>
<td>41.72</td>
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<tr>
<td>3 (%)</td>
<td>66</td>
<td>43.71</td>
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<td></td>
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<tr>
<td>4 (%)</td>
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<tr>
<td>5 (%)</td>
<td>4</td>
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<tr>
<td>Dummy variable for wage and price control</td>
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<td>0.56</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0 (%)</td>
<td>66</td>
<td>43.71</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1 (%)</td>
<td>85</td>
<td>56.29</td>
<td></td>
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</tr>
<tr>
<td>World Bank indices</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment laws index</td>
<td>107</td>
<td>49.72</td>
<td>13.75</td>
<td>19</td>
<td>78</td>
</tr>
<tr>
<td>Hiring laws</td>
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<td>45.6</td>
<td>15.69</td>
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<td>80</td>
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<tr>
<td>Firing laws</td>
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<td>36.21</td>
<td>18.43</td>
<td>0</td>
<td>73</td>
</tr>
<tr>
<td>Dummy variable for employment laws (riglaw)</td>
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<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0 (%)</td>
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<td>50.47</td>
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<td></td>
</tr>
<tr>
<td>1 (%)</td>
<td>53</td>
<td>49.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dummy variable for hiring laws (righire)</td>
<td>96</td>
<td>0.5</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0 (%)</td>
<td>48</td>
<td>50</td>
<td></td>
<td></td>
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<td>1 (%)</td>
<td>48</td>
<td>50</td>
<td></td>
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<td>Dummy variable for firing laws (rigfire)</td>
<td>107</td>
<td>0.5</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0 (%)</td>
<td>53</td>
<td>49.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (%)</td>
<td>54</td>
<td>50.47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public sector wages and salaries as % of GDP</td>
<td>53</td>
<td>5.32</td>
<td>3.35</td>
<td>0.03</td>
<td>14.94</td>
</tr>
<tr>
<td>Dummy variable for wages and salaries (rigidws)</td>
<td>53</td>
<td>0.51</td>
<td>0.50</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>0 (%)</td>
<td>26</td>
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<tr>
<td>1 (%)</td>
<td>27</td>
<td>50.94</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
memorization because passing tests and obtaining degrees depend more on what they can memorize than what they can do with their knowledge.

An example from Iran will help illustrate the difficulty with education reform where the labor market rewards performance on tests rather than productivity on the job. The official name of the ministry of education in Iran is the Ministry of Instruction and Nurture but its deputy minister for Nurture recently admitted that the ministry had failed to promote “nurture and character development” because teachers and parents want schools to focus on testing and grades rather than extra curricular activities such as sports (Hamshahri 2000). Memoranda to school officials prohibiting the extra mathematics drill during class periods meant for physical education and the arts were simply ignored. School officials complained that physical education and the arts were so unpopular with parents that they would take their kids out of school during those periods and send them to private preparatory classes or private tutors for more math drill. Indeed, in Iran parents prefer private schools because they believe that private schools improve their children’s chance of entering a university. Private schools promise this by more rather than less focus on knowledge acquisition and test preparation. Accordingly, they invest much less in space for sports and pay less attention to extra curricular activities than public schools. In Iran, privatization of schools has failed in promoting better teaching and learning because, as with other education reforms, they fail to address the root cause of the problem.

In other countries with similar education systems improvements in labor market flexibility has
encouraged education reform. In Japan, which has a much more transparent labor market than Iran, concern about creativity has led the government to instruct schools to expand extra curricular activities and universities to use non-test evaluations—such as teacher recommendation—in addition to test results in their admission process. In Turkey, where labor markets are becoming more transparent, elite private universities have petitioned the government to allow them to recruit students without strict adherence to rank in the nationwide entrance examinations. In these countries schools are beginning to respond more to signals emanating from the global market than their local labor markets.

The objective of labor market reform should be to increase its transparency and effectiveness in providing the signals that induce the right mix of investment in human capital. Labor markets provide these signals by letting families and individuals know who keeps a job and who does not, and how individuals with different characteristics are compensated. Public sector employment, which in many developing countries dominates the incentive system, is the most rigid of all, so the most obvious place to start is to reduce the role of public sector in employment and/or increase flexibility in their employment policies. Public employment guarantees of the type that used to exist in Egypt and Morocco, coupled with de facto lifetime job tenure in the public sector, have done more to promote credentialism than teaching methods in schools. Privatization of public enterprises helps in this regard because private firms are more likely to reward productive characteristics than public organizations that are less concerned with profit maximization. Policies that increase turnover can be useful to the extent that they can raise the transparency of signals about rewards to various types of investments in human capital. Allowing wages to reflect productivity as evaluated by the employer, instead of linking pay to diplomas, as the wage scale in Iran’s labor law does, is another important reform implied by this paper.

Reform of the labor market requires reform in yet another front. In most developing countries employment protection serves as social insurance. Increasing market flexibility reduces social protection, so other mechanisms for social insurance need to replace employment guarantees. Increasing labor market flexibility as a way to reduce unemployment has been correctly stressed in the economics literature. Our arguments in this paper add to the urgency for instituting social protection by drawing attention to the huge cost of distorting the signals for human capital accumulation that are incurred when labor markets take up the task of social protection. Perhaps once this additional cost is taken into account, the need to relieve the labor market from duties to provide social insurance becomes more compelling. Modern social insurance systems that are designed to decouple the employment relation from insurance provision should therefore be part and parcel of labor market
reform, and their benefits extend well beyond the labor market to improving the efficiency of the educational system.

5 Conclusions

In this paper we have used a simple model of human capital accumulation to show how labor market rigidities that distort the signals that helps individuals choose the optimal mix of human capital components. We posit two types of human capital: knowledge which is testable and therefore observable by educators, and creativity which is only observed by employers. To the extent that employers are free to reward the latter, labor markets become fully transparent and individuals will have the incentive to invest in the right mix of these skills. If, on the other hand, rigidities such as labor market regulation prevent employers from rewarding all skills, then individuals will invest in observable and testable skills and educational systems, public or private, will specialize in the delivery of knowledge as the expense of creativity.

We used the model to resolve an apparent empirical anomaly in the growth literature that fails to reveal the kind of affirmative role for education in growth that theory has predicted for human capital. We argue that the usual measure of human capital, years of schooling, fails to accurately reflect the level of creativity in countries with rigid labor markets. We therefore use dummies to separate countries with rigid and flexible labor markets and show that for the latter education is positively associated with growth, while the effect of education on growth is insignificant for the former group.

References


