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Institutional Enforcement, Labor-Market Rigidities, and Economic Performance

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Abstract[1]

This paper compares non-enforceable and enforceable measures of labor rigidities as a measure of the quality of labor institutions, and tests whether such labor rigidities are conducive to long-run growth. We find that non-enforceable labor regulations do not have a bearing on economic growth, but enforceable labor regulations do. In fact, when using a GMM-IV method for a panel data of countries during the period 1970-2000 that accounts for weak endogeneity, we find that such a link is negative and statistically significant. It appears that excessive labor rigidities are thus negatively linked with long-run economic growth.

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1. Introduction

In this paper we study the issue of institutional enforcement of regulations by focusing on labor-market policies and their potential link to economic performance. We test the different impacts of enforceable and non-enforceable labor regulations by proxying non-enforceable labor rigidity measures using data on conventions from the International Labor Organization (ILO). It has been argued that non-enforceable conventions—that is, those that exist on paper and are simply *de jure* regulations—appear to be more distortionary and tend to be the least enforced in practice (Squire and Suthiwart-Narueput, 1997). According to Freeman (1993), these conventions reflect the ideal regulatory framework from an institutionalist perspective and cover a variety of labor market issues, from child labor to placement agencies. Whereas in theory, a country's ratification of ILO conventions gives the country legal status and thus supersedes domestic regulations relating to those issues, in practice the degree of labor-market rigidity depends on how the conventions are enforced. It is the outcome of the regulations that matters, rather than their number. Different observers emphasize different outcomes: minimum wages, mandated benefits (such as old-age pension, health insurance, or maternity leave), mandated job security and high firing costs, large and powerful trade unions, and the government's share of the labor force. Note that distortions of this latter sort do not necessarily stem from a "thick" labor code, which re-emphasizes the distinction between non-enforceable and enforceable measures.

There are two broad views regarding the role of labor-market regulation in economic performance. The distortionists argue that government regulations in labor markets—such as minimum wages, social security contributions, job security, and collective bargaining—create distortions (World Bank, 1990). In this view, labor-market regulations are obstacles to growth for at least three reasons: they prevent wages from equaling their marginal product in equilibrium, leading to a misallocation of resources; they hinder the adjustment of the labor market to shocks, and finally, labor regulations that redistribute economic rents from capital to labor reduce the profitability of investment and lead to lower growth rates.

The institutionalists claim that market failures generate divergences from the ideal world and emphasize the benefits of government interventions in the labor markets (ILO, 1991). Labor regulations fulfill redistributive roles for low-wage workers or constitute

insurance against adverse market outcomes (Standing and Tokman, 1991). Labor standards force employers to focus on enhancing their labor force through either training or technical innovation (Freeman, 1993). Finally, standards on mandated benefits may help solve moral hazard or selectivity issues that prevent firms from offering socially desirable benefits or contracts (Summers, 1988).[2]

We use Rama and Artecona (2002), which contains panel data on labor regulations on paper and in practice for several countries, and focus on the period 1970-2000. The data are organized in five-year period averages. Regulation on paper, or non-enforceable regulation, is approximated by the number of International Labor Organization standards ratified by the national labor laws.[3] Regulation in practice, or enforceable regulation, is proxied by information on categories such as minimum wages, conditions of work and benefits, trade unions and collective bargaining, and public-sector employment.

We report the panel data regression results using three different types of estimators: least-squares-based estimators, including pooled ordinary least squares least squares with time effects, and least squares with country dummies (fixed-effects estimator); IV estimator using pooled IV and IV with time and country effects; and the generalized method of moments (GMM) estimators for dynamic panel data models developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). Here, we appropriately control for the presence of unobserved country effects in a dynamic panel data model, and we account for endogenous regressors with both external and internal instruments.

The rest of the paper is divided into three sections. Section 2 discusses the data and methodology applied, Section 3 discusses the findings, and Section 4 concludes.

[2] Forteza and Rama (2006) study the role of labor-market regulations in the success of economic reforms. They find that wage adjustment and labor reallocation in outward-oriented economies will be faster if labor markets are flexible. Potential losers from economic reforms, such as workers in the public sector or unionized labor, usually try to hinder the adjustment process (Alesina and Drazen, 1991; Fernandez and Rodrik, 1991). Besley and Burguess (2004) assess the role of labor-market regulations in explaining the performance of the Indian manufacturing industry between 1958 and 1992, and find that regulations designed to protect workers actually reduce growth and increase poverty.

[3] Among the conventions ratified and included in this index, we have universal legislation on issues such as child labor, compulsory labor, equal remuneration for male and female workers, equal opportunity, the right of collective bargaining, and organization in unions, among others.

2. Empirical Approach

Our regression framework is specified by the following system:

$$dy^*_{it,t-k} = \mu_i + \eta_t + X_{it}\beta$$
$$dy_{it,t-k} = dy^*_{it-k} + L_{it}\Gamma + \xi_{it} \quad (1)$$

According to the first equation, the equilibrium growth rate of the economy in country *i* during the [*t*,*t-k*] period, $dy^*_{it,t-k}$, is a function of the log of per capita output in the initial period *t-k*, y_{it-k}; a set of the growth determinants for country *i* at time *t* described by the matrix $\mathbf{X_{it}}$; and unobserved country- and period-specific effects, μ_i and η_t, respectively.

Our second equation states that any deviation in long-term equilibrium growth may be explained by a set of variables that proxy for the departures from competition in the labor markets, $\mathbf{L_{it}}$. This matrix, **L**, is our variable of interest; it may comprise different indicators that focus on specific policies or institutions in the labor markets. We denote by $\{l_{it}^k\}_{k=1}^K$ all the *K* indicators of labor market rigidities comprised in the matrix, $\mathbf{L_{it}}$. We do not assume that labor-market policies and institutions are time-invariant, but rather expect that labor institutions may change over longer horizons. If any of the l_{it}^k variables equal 0, labor markets are perfectly competitive. In contrast, larger values for any of these variables indicate greater deviation from perfect competition in the labor market. Negative values for the γ_k coefficients in the $\mathbf{\Gamma}$ matrix imply that the reduction of labor rigidities—that is, distortions that cause labor markets to depart from competitive equilibrium—may improve the growth rate in the long term.

Testing equation (1) may raise additional empirical problems. Some of the l_{it}^k variables are highly correlated with each other, thus leading to problems of multicolinearity.[4] This problem of colinearity impedes identification of the parameters of the variance-covariance matrix. We address the issue among labor-market regulation indicators by aggregating the variables in the $\mathbf{L_{it}}$ matrix, using a similar strategy as Forteza and Rama (2006). Before we aggregate them in a single index, we need to normalize them so as to express them in comparable units. We define our labor-market rigidity indicator above as l_{it}^k, for *k=1,…,K*. Next, we define l_{min}^k and l_{max}^k as the minimum and maximum deviations from perfect

[4] For example, the correlation between trade union membership and government employment is approximately 0.8, whereas mandated benefits and minimum wage have a correlation of 0.5.

competition that a country's labor market can achieve. We can thus specify our normalized labor-market rigidity indicator as follows: $\tilde{l}_{it}^{\,k} = \frac{l_{it}^{k} - l_{\min}^{k}}{l_{\max}^{k} - l_{\min}^{k}}$ By construction, $\tilde{l}_{it}^{k}$ fluctuates between 0 and 1. We then define our aggregate measure of labor-market rigidities as the average of *J* out of the *K* relevant labor-market rigidities (where $J \leq K$). In principle, this aggregate index also ranges from 0 to 1, but unless all of the labor-market rigidities are perfectly correlated with each other, the actual range of variation across countries should be significantly narrower for the aggregate measures than for any of the individual indicators. We use our aggregate index l_{it}^{A}, to test the effects of the overall labor-market rigidity on growth. We reformulate (1) as:

$$dy_{it,t-k} = dy^{*}_{it,t-k} + \gamma_A l_{it}^{A} + \xi_{it} \qquad (2)$$

The sign and order of γ_A can be used to check the nature and magnitude of the impact of labor-market rigidities on growth. However, different labor-market rigidities may have different signs that can cancel each other out to some extent. Even if the estimate of the parameter γ_A turned out to be significant, its mere sign might not help identify the specific policies and institutions that need to be reformulated. We still need more information on the sign and order of magnitude of the γ_j parameters. We are tempted to use equation (2) to test for the effects of particular labor-market rigidities. If l_{it}^{A} is replaced by $\tilde{l}_{it}^{k}$ in equation (2), the coefficient multiplying it captures not only the effects of the labor-market regulation, *k*, but also (partly) those of all of the other missing rigidities. Since they are likely to be correlated with each other, the value obtained for γ_k might be reflecting the effects of these other rigidities. For example, let us assume that unionized labor does not affect growth, but minimum wages do, and that minimum wages tend to be higher in countries with larger labor unions. If we include minimum wages in equation (2) instead of l_{it}^{A}, we obtain a significant estimate for this variable even though it should be statistically and economically insignificant. This problem can be partially corrected by defining the complementary labor regulation variable, $\tilde{l}_{it}^{-k}$, as the average of the indicators that are different from *k*. This variable can be used to control for all other labor-market features except $\tilde{l}_{it}^{k}$, by using:

$$dy_{it,t-k} = dy^*_{it,t-k} + \gamma_k \tilde{l}^{k}_{it} + \gamma_{-k} \tilde{l}^{-k}_{it} + \xi_{it} \quad (3)$$

with γ_k capturing the effect of labor-market regulation *k* on long-term growth.

2.1 Data

We use Rama and Artecona (2002), which contains panel data on labor regulations on paper and in practice for 121 countries and is organized in five-year observations from 1970 to 2000.[5] The data distinguishes between regulations on paper and regulations in practice. We follow Rama (1995) and Forteza and Rama (2006) in defining aggregate indices of the overall extent of labor regulations on the economy. Our non-enforceable labor rigidity measure is defined as the cumulative number of ILO conventions ratified by a country's labor code over time. This measure reflects not only the ideal regulatory framework from an institutionalist view, but also the so-called "thickness" of the labor code (Forteza and Rama, 2006). The index includes ratified ILO conventions regarding the minimum age of employment (Convention 138); forced or compulsory labor (Convention 29); the abolition of forced labor (Convention 105); equal remuneration for male and female workers (Convention 100); discrimination with regard to equality of opportunity or conditions of employment on the basis of race, religion, sex, political opinion, or social origin (Convention 111); the right of workers and employers to establish associations or organizations of their own (Convention 87); and the right to bargain collectively (Convention 98).

The extent of regulation in the labor market depends on the way these regulations and norms are implemented and enforced.[6] We use an indicator that captures the degree of

[5] The countries included are (i) Industrial: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States; (ii) Latin America: Argentina, Bahamas, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela; (iii) East and South Asia: China, Hong Kong, Indonesia, Korea, Malaysia, Mongolia, Papua New Guinea, Philippines, Singapore, Taiwan, Thailand, Vietnam, Bangladesh, India, Nepal, Pakistan, Sri Lanka (iv) Eastern Europe and Central Asia: Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Poland, Romania, Russia, Slovak Rep, Slovenia, Ukraine, Yugoslavia; (v) Middle East and North Africa: Algeria, Bahrain, Cyprus, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, Turkey, United Arab Emirates, Yemen; and (vi) Sub-Saharan Africa: Botswana, Burkina Faso, Cote d'Ivoire, Ethiopia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, Zimbabwe.

[6] Botero et al. (2004) have produced a recent labor regulation data set on, mostly, enforceable measures. The usefulness of these data is limited for our purposes as it is only available for a cross-section of countries for the 2000s.

enforcement as opposed to, simply, the number of regulations. Following the methodology described above, we construct an aggregate index of regulations in practice using information on the following four categories: minimum wages, mandated benefits, trade unions, and public-sector employment.[7] Following Forteza and Rama (2006), we construct an aggregate index of enforceable labor regulations as the simple average of the ratio of minimum wage to income per capita, the number of days of maternity leave for a first child born without complications, the ratification of ILO Convention 87 that allows workers to establish organizations, and the ratio of central government employment to total employment.[8] As described above, we normalize all the labor-market regulation indicators in such a way that their values fluctuate between 0 and 1. Countries with the highest (lowest) extent of labor regulation have a score of 1 (0).[9]

The dependent variable is the per-capita growth rate of gross domestic product from the Penn World Tables (Heston et al., 2002).[10] We follow the vast empirical literature on growth and include broadly accepted regressors. This is the case with the initial GDP per capita (in logs) to account for transitional convergence. Similarly, we include controls that reflect structural factors such as the level of secondary schooling (Barro and Lee, 2000), which proxies human capital; credit to the private sector as a ratio to GDP to account for financial depth (Beck et al., 2001); the ratio of real exports and imports to GDP as a measure of trade openness (Loayza et al., 2003); a measure of civil liberties to account for institutions and governance (Loayza et al., 2003); basic macro controls to account for economic stability, such as the consumer price index inflation rate, the real exchange-rate overvaluation, and terms of trade

[7] Heckman and Pagés (2000) constructed data on job separation costs for Latin America and found that these costs have a substantial impact on the level of employment in the region. Unfortunately, data on job separation costs are available for only a very limited sample of countries

[8] Forteza and Rama (2006) also test another index based on the simple average of the ratio of the minimum wage to unit labor costs in the manufacturing sector, social security contributions as a percentage of salaries, total trade union membership as a percentage of total labor force, and the share of general government employment in total employment. Whereas we also tested this index, we do not report the findings as the results were similar. They are available upon request.

[9] In addition, the aggregate index of regulation is computed for countries with at least two of the four dimensions involved in the analysis. Unfortunately, there are not enough data to construct an indicator of job separation costs covering a large number of countries. Heckman and Pagés (2000) find that job separation costs have a substantial impact on the level of employment in Latin America.

[10] In particular, we use the real gross domestic product per capita (chain index prices).

(Loayza et al., 2003). All these data come from the World Development Indicators (World Bank, 2005) [11]

Table 1 shows the basic summary statistics of both the non-enforceable index as well as of the enforceable index with its corresponding components. Notice that in the latter we have grouped the corresponding labor-market rigidities into two categories, "political" and "economic" rigidities. In the former we include the ratification of ILO Convention 87 on unionization, and the percentage of central government employment, while in the latter we include minimum wages and maternity leave.

3. Findings

We show results using a simple pooled approach with and without fixed effects as well as our preferred method, a GMM-IV system estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998). The GMM-IV system estimator is preferred for the following reasons: first, it accounts for (unobserved) country-specific effects that may bias our estimates. Specifically, we eliminate the control for the presence of time effects with time dummies and we eliminate the country-specific effects by expressing our equation in differences. Second, the GMM-IV system estimator controls for the possibility of endogenous regressors. We use both internal instruments (lagged levels as instruments for the differences, and lagged differences as instruments for the levels). We compute some specification tests: (a) the Sargan test of over-identifying restrictions, which tests the validity of the moment conditions that we set up to perform the IV regressions, and, (b) tests of higher-order serial correlation. In general, the specification tests validate our regressions for statistical inference. That is, our instruments are valid according to the Sargan test, and we reject the possibility of our errors displaying high-order serial correlation.[12]

In this section we show that when the labor-market rigidity index is based on enforceable regulations, it does have an impact on economic performance. On the other hand, when the rigidity index is based on non-enforceable regulations, the end result is statistically meaningless to economic growth. In short, institutional enforcement does matter for growth.

[11] We follow the tradition of empirical cross-country and panel growth regression models in focusing on the ultimate policy, structural, and external determinants of factor accumulation and productivity growth. Hence, we exclude capital and any other direct factor of production.

[12] Note that to implement this technique, we require countries for which there are at least three consecutive (five-year-period) observations during the 1970-2000 period.

Table 2 presents per-capita growth regressions that link economic growth and enforceable labor-market rigidity using pooled data. We find a negative and statistically significant relationship at 5 percent between our labor rigidity index and economic performance in the fixed effects case. Economically speaking, we find that a one standard deviation decline in the index of enforceable rigidities (0.17) is associated with a growth rate that is higher by 0.28 percentage points per year, and by 1.41 percentage points over a five-year period. In addition, we find that the significant coefficient for labor-market rigidities appears to be mainly driven by economic forces that generate such rigidities.[13] From the ordinary least squares regression with fixed effects, we find that a one standard deviation decline in the economic index of rigidities is associated with a surge in the growth rate of 0.39 percentage points per year (or 1.95 percentage points over a five-year period).

As in standard empirical growth specifications, we find that the initial GDP yields a negative and statistically significant sign in the corresponding coefficient which, as is well-known, indicates conditional convergence among countries. Similarly, consistent with a human capital effect, we obtain a positive and statistically significant coefficient in our educational variable. Furthermore, we find that the macroeconomic variables included yield the expected signs and are consistent with previous research (Loayza et al., 2003). This is the case with the inflation rate (negative and statistically significant), terms of trade shocks (positive and statistically significant), exchange-rate overvaluation (negative and statistically significant), and governance (positive and statistically significant).

Table 3 replicates the above specification, but uses our non-enforceable labor rigidity index instead of the enforceable one. Unsurprisingly, we find that this regressor yields a coefficient that, although negative, is statistically insignificant at conventional levels.[14] That is, rules just written "on paper" are not binding unless they are enforceable.

In Table 4 we present the results using our preferred estimating method, namely, the GMM-IV based on Arellano and Bover (1995) and Blundell and Bond (1998). As in the simple ordinary least squares case we find that non-enforceable labor market regulations do not have a

[13] In other words, when we separate our index by "political" and "economic" components, we find that the negative and statistically significant impact is maintained in the case of the former, although not in the case of the political component.

[14] For the sake of economy, we do not include the full specification but focus only on our variables of interest. Notice that we also test a ratio between our enforceable and non-enforceable labor rigidity measure and, as expected, find that it is statistically significant at conventional levels.

bearing on economic growth for the period under consideration. In fact, while we find that most regressors behave in a similar fashion as in the OLS case: the non-enforceable rigidity measure yields a coefficient that is not statistically significant albeit with the expected sign. On the other hand, enforceable labor regulations are binding in terms of their impact on economic growth. The related coefficient is, as expected, negative and statistically significant at 5 percent.[15]

Table 5 replicates the same reduced form as before but instead of using labor rigidity indices, we test the actual measures that compose our enforceable rigidity measure, namely, minimum wage, maternity leave, unionization, and employment in central government. In the GMM-IV case—our preferred method—we find that consistent with our previous findings using "political" and "economic" factors of influence on growth, the economic variables (minimum wage and maternity leave) tend to yield the expected sign as well as strong statistical significance. This is less so in the case of the so-called political variables (unionization and government employment). In fact, these findings provide additional support for our previous results.

3.1 Changes in Specification

In this section we test whether the above findings are robust to the inclusion of additional variables. Doing this provides some confidence that the findings are not capturing the effect of potential omitted variables. Following Sala-i-Martín (1997), we augment the benchmark empirical specifications used in Table 4 by using a pool of 10 ancillary variables that are introduced in the regressions in a methodical manner.[16] We choose up to three at a time and perform regressions including all possible combinations. The variable of interest is said to be strongly correlated or robust with the dependent variables if the weighted *cdf(0)* is greater than or equal to 0.95. Findings for this exercise are shown in Table 6. In the first column in this table we report the weighted mean. The second column shows the aggregate *cdf(0)* under the assumption of non-normality. Finally, the third column presents the standard error computed as the weighted variance estimate for all the regressions. According to these results, our previous findings are robust to changes in specification when using the benchmark specification of our

[15] When separating the economic and political effects, we find similar results to the ones presented when using OLS. These findings are available upon request.

[16] We use 10 ancillary variables: percentage married, percentage of immigrants, urbanization rate, rate of unemployment, percentage of firms whose headquarters are in the United States, percentage of multiethnic families, population, rate of participation, and city ethnolinguistic fractionalization (World Bank, 2005).

preferred method as shown in the second column in Table 4, which lends some additional credibility to the previous findings.

4. Conclusions

In this paper we compare non-enforceable and enforceable measures of labor rigidities as a measure of the quality of labor institutions and test whether such labor rigidities are conducive to long run growth. We find than non-enforceable labor regulations do not have a bearing on economic growth, but enforceable labor regulations do. In fact, when using a GMM-IV method for a panel data of countries during the period 1970-2000, which accounts for potential weak endogeneity, we find that such a link is negative and statistically significant at conventional levels. Thus, it appears that excessive labor rigidities are negatively linked with long-run economic growth. Our findings are robust to changes in specification.

From a policy perspective, the above findings seem to indicate that the "thickness" of labor regulations per-se is not necessarily a concern since it may not affect economic performance. However, enforceable and binding labor regulations do have the potential to dramatically affect growth rates in an economy. These findings are relevant not only for industrial countries where excessive labor regulations appear to be quite significant and thus appear to be a heavy burden on overall economic performance, but also for developing countries where, paradoxically, part of the excessive regulation enacted in these countries may actually be non-binding and thus, harmless in terms of economic growth.

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Appendix

Dynamic Panel Data Econometric Methodology[17]

Recently developed dynamic panel data techniques allow us to address potential endogeneity problems, as well as possible unobserved time and country-specific effects that may produce biased and inconsistent estimates.[18] This methodology formulates a set of moment conditions that can be estimated using GMM techniques in order to generate consistent and efficient estimates. Specifying the regression equation in differences allows for the elimination of the country-specific effect. First-differencing yields:

$$y_{i,t} - y_{i,t-1} = \beta_1\left(y_{i,t-1} - y_{i,t-2}\right) + \beta_2\left(X_{i,t} - X_{i,t-1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right). \qquad (1)$$

The use of instruments is required to deal with two issues: first, the likely endogeneity of the explanatory variables, *X*, which is reflected in the correlation between these variables and the error term; and, second, the correlation of the new error term, ($\varepsilon_{i,t}$ - $\varepsilon_{i,t-1}$), by construction with the differenced, lagged dependent variable, ($y_{i,t-1}$ - $y_{i,t-2}$). Instead of assuming strict exogeneity (that is, that the explanatory variables are uncorrelated with the error term at all leads and lags), we allow for the possibility of simultaneity and reverse causation. We adopt the more flexible assumption of weak exogeneity, according to which the current explanatory variables may be affected by past and current realizations of the dependent variable but not by its future innovations. Under the assumptions that (a) the error term, ε, is not serially correlated, and (b) the explanatory variables are weakly exogenous, the following moment conditions apply:

$$E\left[y_{i,t-s} \cdot \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \quad for\ s \geq 2; t = 3, \ldots, T \qquad (2)$$

$$E\left[X_{i,t-s} \cdot \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \quad for\ s \geq 2; t = 3, \ldots, T \qquad (3)$$

The GMM estimator simply based on the moment conditions in (2) and (3) is known as the differences estimator. Although asymptotically consistent, this estimator has low asymptotic precision and large biases in small samples, which leads to the need to complement

[17] We thank Norman Loayza, who generously contributed to this section.
[18] For instance, Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1997).

it with the regression equation in levels.[19] For the regression in levels, the country-specific effect is not directly eliminated, but must be controlled for by the use of instrumental variables. The appropriate instruments for the regression in levels are the lagged differences of the corresponding variables if the following assumption holds; although there may be correlation between the levels of the right-hand side variables and the country-specific effect, there is no correlation between the differences of these variables and the country-specific effect. This assumption results from the following stationarity property,

$$E\left[y_{i,t+p} \cdot \eta_i\right] = E\left[y_{i,t+q} \cdot \eta_i\right] \quad and \quad E\left[X_{i,t+p} \cdot \eta_i\right] = E\left[X_{i,t+q} \cdot \eta_i\right] \quad for\ all\ p\ and\ q \tag{4}$$

Therefore, the additional moment conditions for the second part of the system (the regression in levels) are given by the following equations:[20]

$$E\left[\left(y_{i,t-s} - y_{i,t-s-1}\right) \cdot \left(\eta_i + \varepsilon_{i,t}\right)\right] = 0 \quad for\ s = 1 \tag{5}$$

$$E\left[\left(X_{i,t-s} - X_{i,t-s-1}\right) \cdot \left(\eta_i + \varepsilon_{i,t}\right)\right] = 0 \quad for\ s = 1 \tag{6}$$

Using the moment conditions presented in equations (2), (3), (5), and (6), and following Arellano and Bond (1991) and Arellano and Bover (1995), we employ a generalized method of moments (GMM) procedure to generate consistent estimates of the parameters of interest. The weighting matrix for GMM estimation can be any symmetric, positive-definite matrix, and we obtain the most efficient GMM estimator if we use the weighting matrix corresponding to the variance-covariance of the moment conditions. Since this variance-covariance is unknown, Arellano and Bond (1991) and Arellano and Bover (1995) suggest the following two-step procedure. First, assume that the residuals, $\varepsilon_{i,t}$, are independent and homoskedastic both across countries and over time. This assumption corresponds to a specific weighting matrix that is used to produce first-step coefficient estimates. We construct a consistent estimate of the

19 Blundell and Bond (1997) show that when the lagged dependent and the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. This weakness has repercussions for both the asymptotic and small-sample performance of the differences estimator. As persistence increases, the asymptotic variance of the coefficients obtained with the differences estimator rises (i.e., deteriorating its asymptotic precision). Furthermore, Monte Carlo experiments show that the weakness of the instruments produces biased coefficients in small samples. This is exacerbated by the variables' over-time persistence, the importance of the specific effect, and the smallness of the time-series dimension.

20 Given that lagged levels are used as instruments in the differences specification, only the most recent difference is used as instrument in the levels specification. Other lagged differences would result in redundant moment conditions (Arellano and Bover, 1995).

variance-covariance matrix of the moment conditions with the residuals obtained in the first step, and we use this matrix to re-estimate our parameters of interest (i.e., second-step estimates). Asymptotically, the second-step estimates are superior to the first-step ones in so far as efficiency is concerned. The moment conditions are applied such that each of them corresponds to all available periods, as opposed to each moment condition corresponding to a particular time period. In the former case, the number of moment conditions is independent of the number of time periods, whereas in the latter case, it increases more than proportionally with the number of time periods. Most of the literature dealing with GMM estimators applied to dynamic models of panel data treats the moment conditions as applying to a particular time period. This approach is advocated on the grounds that it allows for a more flexible variance-covariance structure of the moment conditions. Such flexibility is achieved without placing a serious limitation on the degrees of freedom required for estimation of the variance-covariance matrix because the panels commonly used in the literature have both a large number of cross-sectional units and a small number of time-series periods (typically not more than five). We have, however, chosen to work with the more restricted application of the moment conditions (each of them corresponding to all available time periods) because of a special characteristic of our panel, namely, its large time-series dimension (for some countries in our sample, we work with as many as 20 time-series observations). This approach allows us to work with a manageable number of moment conditions, so that the second-step estimates, which rely on estimation of the variance-covariance matrix of the moment conditions, do not suffer from overfitting biases.

Table 1.
Summary Statistics: Rigidity in Labor Markets
Sample of 121 countries, five-year non-overlapping observations, 1970-2000

Variable	Mean	Std. Error	Correlation with growth	p-value
Non-Enforceable Index	0.2977	(0.201)	-0.0163	(0.704)
Enforceable Index	0.2876	(0.174)	-0.17902	(0.000)
(i) Economic Components	0.1474	(0.096)	-0.11081	(0.010)
Minimum Wage	0.1374	(0.160)	-0.12129	(0.011)
Maternity Leave (# days)	0.1559	(0.109)	-0.04387	(0.315)
(ii) Political Components	0.4284	(0.351)	-0.0943	(0.051)
Ratification of ILO Conv. 87	0.5872	(0.486)	-0.13156	(0.001)
Central Govt. Employment	0.1637	(0.139)	0.08150	(0.085)

Table 2.
Panel Regressions: Labor Rigidities and Growth with Enforceable Measures
Sample of 121 countries, five-year non-overlapping observations, 1970-2000

	Pooled with Fixed Effects		Pooled	Pooled with Fixed Effects	Pooled
Constant	0.139	**	0.156 **	0.17472 **	0.169. **
	(0.06)		(0.08)	(0.031)	(0.05)
Initial GDP (logs)	-0.008	*	-0.05826 **	-0.01079 **	-0.056 **
	(0.01)		(0.007)	(0.004)	(0.007)
Secondary Enrollment	0.021	**	-0.01282 **	0.01103 **	-0.01383 **
	(0.01)		(0.007)	(0.004)	(0.007)
Credit to GDP ratio	-0.008		0.00188	-0.00095	0.00185
	(0.01)		(0.004)	(0.002)	(0.004)
Inflation Rate	-0.021	**	-0.01104 **	-0.0169 **	-0.01142 **
	(0.01)		(0.003)	(0.003)	(0.003)
Openness	0.001		0.01207 **	-0.00528 *	0.00836
	(0.01)		(0.006)	(0.003)	(0.006)
Terms of Trade Shocks	0.066	**	0.04683 **	0.0908 **	0.05052 **
	(0.04)		(0.023)	(0.03)	(0.024)
RER Overvaluation	-0.006	**	-0.00449	-0.00602 *	-0.00277
	(0.01)		(0.004)	(0.003)	(0.004)
Governance Index	0.005	**	0.00248	0.00422 **	0.00248
	(0.00)		(0.002)	(0.002)	(0.002)
Enforceable	-0.032	**	-0.01568		
Labor Rigidity Index	(0.02)		(0.027)		
(i) Economic Component				-0.04056 **	0.00535
				(0.015)	(0.048)
(ii) Political Component				-0.00477	-0.00064
				(0.005)	(0.012)
Observations	369		369	369	369
R-Squared	0.18		0.6122	0.2127	0.6132

(*) Statistically significant at 10 percent; (**) statistically significant at 5 percent; (***) statistically significant at 1 percent.

Table 3.
Panel Regressions: Labor Rigidities and Growth with Non-Enforceable Measures
Sample of 121 countries, five-year non-overlapping observations, 1970-2000

	Coefficient		Std. Error	R-Squared	Observations
Pooled					
Non-Enforceable	-0.007		0.01	0.24	382
Enforceable relative to Non-Enforceable	-0.004	**	0.001	0.24	370
Fixed Effects					
Non-Enforceable	-0.007		0.03	0.54	382
Enforceable relative to Non-Enforceable	-0.005	**	0.002	0.55	370

The dependent variable is the growth rate in per capita GDP. Our control variables are output per capita (in logs), secondary schooling, domestic credit to the private sector, trade openness, governance, inflation, real exchange-rate overvaluation, terms-of-trade shocks, and the labor regulation indicator. Only the latter is reported here. Full regression results are not reported for reasons of space, although they are available upon request. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported. (*) Statistically significant at 10 percent; (**) statistically significant at 5 percent; (***) statistically significant at 1 percent.

Table 4.
Panel Regressions: Labor Rigidities and Growth with Enforceable Measures
Dependent Variable: Growth in GDP per capita, 1970-2000
Sample of 121 countries, five-year non-overlapping observations
Estimation Method: GMM-IV System Estimator

	Non-enforceable		Enforceable	
Constant	0.15271	**	0.15936	**
	(0.017)		(0.018)	
Initial GDP (logs)	-0.00504	*	-0.00197	
	(0.003)		(0.004)	
Secondary Enrollment	0.01352	**	0.00168	
	(0.003)		(0.004)	
Credit to GDP ratio	-0.00921	**	-0.00032	
	(0.002)		(0.002)	
Inflation Rate	-0.01797	**	-0.01382	**
	(0.002)		(0.001)	
Openness	-0.00474	**	-0.01389	**
	(0.002)		(0.003)	
Terms of Trade Shocks	0.07474	**	0.07132	**
	(0.011)		(0.009)	
RER Overvaluation	-0.01119	**	-0.01455	**
	(0.002)		(0.002)	
Governance Index	0.00690	**	0.00219	**
	(0.001)		(0.001)	
Labor Rigidity Index	-0.04724		-0.07454	**
	(0.07)		(0.014)	
Sargan Test (p-value)	(0.221)		(0.201)	
Serial Correlation Tests (p-value)				
First Order	(0.000)		(0.000)	
Second Order	(0.154)		(0.473)	
Observations	219		234	
R-Squared	0.1448		0.1385	

(*) Statistically significant at 10 percent; (**) statistically significant at 5 percent; (***) statistically significant at 1 percent.

Table 5.
Panel Growth Regressions with Individual Rigidity Measures
Dependent Variable: Growth in GDP per capita, 1970-2000
Sample of 121 countries, five-year non-overlapping observations
Estimation Method: GMM-IV System Estimator

	Pooled	Fixed Effects	GMM-IV
Minimum Wage	-0.01788 *	-0.02048	-0.042**
	(0.010)	(0.033)	(0.020)
Maternity Leave	-0.00085	0.04774	-0.032**
	(0.014)	(0.041)	(0.015)
Trade Union	-0.01099	0.00781	-0.014*
	(0.008)	(0.015)	(0.008)
Central Government Employment	0.01324	-0.03634	-0.023
	(0.012)	(0.025)	(0.014)

(*) Statistically significant at 10 percent; (**) statistically significant at 5 percent; (***) statistically significant at 1 percent. The four variables in this table are the components of the enforceable labor rigidity index employed in this paper: minimum wage as percentage of income per capita, maternity leave with full pay measured in number of days, trade union measured by ratification of ILO Convention 87, and central government employment as a percentage of labor force.

Table 6.
Sensitivity to Changes in Specification
Sensitivity Analysis for Benchmark Specification

	Mean	*cdf(0)*	Standard Error
Enforceable Labor Rigidity Measure	-0.0079	0.96	0.011
(i) Minimum Wage	-0.0433	0.93	0.019
(ii) Maternity Leave	-0.0351	0.93	0.016
(iii) Trade Union	-0.0145	0.90	0.007
(iv) Central Government Employment	-0.0296	0.88	0.014

The second column presents the standard error of the variable of interest, while the first column shows the cumulative distribution function (0). A variable whose weighted *cdf(0)* is larger than 0.95 is significantly correlated with the dependent variable (i.e. robust) at a 5 percent significance level. The *cdf* is computed assuming non-normality of the parameters estimated. Results are similar if we assume normality, instead. The benchmark regression employed is that of the second column in Table 4. Estimation Method: GMM-IV System