Are Labor Market Regulations an Obstacle for Long-term Growth?

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Labor markets across the world are usually characterized by a set of institutions that limit the ability of private agents to determine wages and the amount of labor required and by tax systems that transfer resources from the working to the nonworking population via unemployment benefits, employment protection laws, and active employment policies by the government (Saint-Paul, 1999).

One strand of the economic analysis claims that labor institutions reduce the rate of job creation and increases unemployment (Salvanes, 1997; Nickell, 1997; Blanchard and Wolfers, 2000). This process has an adverse impact on economic growth (Besley and Burgess, 2004; Forteza and Rama, 2002). Supporters of this approach usually suggest the reduction or elimination of labor market regulations in order to foster labor reallocation and increased competition, which in turn enhances growth (Burki and Perry, 1997). Labor market reforms, however, have proved to be politically unfeasible and have faced significant opposition from powerful sectors of the economy (Alesina and Drazen, 1991).

A second strand of the analysis holds that the behavior of labor markets is far from competitive (Freeman, 1993a; Blanchard, in this volume). Proponents suggest that in the presence of market failures, governments should set up regulations for the proper functioning of the labor markets. Labor market regulations are introduced to enhance the welfare of workers and insure them from unexpected shocks. For

We would like to thank Osvaldo Larrañaga and Norman Loayza for their comments and suggestions.

Labor Markets and Institutions, edited by Jorge E. Restrepo and Andrea Tokman R., Santiago, Chile.

example, legislation on social security and mandated benefits was designed to secure the workers' income in case of old age, sickness, disability, and work-related accidents. Job security provisions are similarly undertaken to insure an income for workers who lose their jobs during economic downturns (Heckman and Pagés, 2000).

This paper tests whether labor market regulations have been an obstacle to long-run growth. Using two recently developed databases on labor regulation by Rama and Artecona (2002) and Djankov and others (2003), we perform our regression analysis for a sample of seventy-six countries over the period 1970–2000 in the tradition of empirical growth literature (Barro, 1991, 1997). Our analysis is performed on both cross-sectional and panel data; in both cases we control for the likely endogenous regressors. Our set of instruments consists of both external instruments chosen from theories of selection of labor regulations (Djankov and others, 2003a) and internal instruments, which are lagged levels or differences in panel data models (Arellano and Bond, 1991; Arellano and Bover, 1995).

Our cross-sectional results indicate that growth in industrial countries is hampered by thicker labor codes. The effect of de facto labor regulations on growth is mixed, depending on the data, indicator, or sample used. Finally, regulations stipulated in labor laws regarding employment, industrial relations, and social security seem to have an impact on growth only for industrial economies.

Our panel data regression analysis yielded five main results. First, growth among developing countries could be fostered by reducing the regulations stipulated in the national labor codes. However, deregulation processes in labor markets commonly succeed at reducing the number of regulations in labor laws, but they cannot improve the strength of legal enforcement mechanisms.

Second, growth in industrial countries could be enhanced by lower de facto regulation. According to our estimates, a one-standard-deviation decline in the labor regulations index could generate a 2 percent increase in growth in advanced economies. Achieving these growth effects would require an enormous deregulation effort from this group countries—especially the European economies. Unfortunately, most European countries have only marginally changed their labor institutions (Siebert, 1997).

Third, a decline in the degree of de facto labor regulation may also improve the growth rate of developing countries. Our regression results suggest that growth in developing countries would increase by 0.6 percentage points in response to a one-standard-deviation decrease

in the de facto labor regulations. However, obtaining significant growth benefits in these nations would require substantial labor market reform (that is, a sharper decline in labor regulations than that seen in the data over the period of analysis).

Fourth, the transmission channels of the adverse growth effects of higher labor regulations within developing countries are minimum wages and trade unions. Again, we find that the growth effects obtained from one-standard-deviation reductions in both variables are not plausible unless the countries embark on serious efforts to deregulate labor markets.

Finally, we construct a scorecard that summarizes the different panel estimation results presented in this paper. Our most robust results are that thicker codes are negatively associated with growth for the full sample and for developing countries; de facto regulations seem to hinder growth among developing countries; and minimum wages have an adverse impact on growth.

The rest of the paper is divided into four sections. Section 1 presents a brief review of labor regulations and economic performance. Section 2 discusses the data used and the methodology applied. Section 3 empirically evaluates whether labor regulations have hindered long-term growth. Finally, section 4 concludes.

1. Literature Review

There is a vast empirical literature evaluating the effects of economic policy on growth for a cross-section of countries. Recent evidence indicates that government interventions may have an important effect on growth. Hall and Jones (1999) show that poor social infrastructure (which they approximate by poor contract enforcement, low bureaucratic quality, and government repudiation of contracts, among others) is negatively related to long-term growth. The degree and type of government intervention vary across countries. Djankov and others (2002) analyze the regulations on starting a business across countries; they find that countries with extensive regulations on entry may enlarge their informal sectors and, hence, have a poor economic performance.[1]

1. Djankov and associates argue that this empirical result is consistent with economic regulations legislated and imposed by government officials or insiders that extract rents (see Shleifer and Vishny, 1998).

In policy circles, the differing viewpoints on the role of labor market regulations in the economic process fall into two broad groups (Freeman, 1993a). On the one hand, the distortionist view argues that government regulations in labor markets (in the form of minimum wages, social security contributions, job security, and collective bargaining) create distortions in an optimal world (World Bank, 1990). According to this view, labor market regulations are major obstacles to growth and employment for three main reasons. First, labor market regulations prevent wages from equaling their marginal product in equilibrium and thus lead to the misallocation of resources. Second, regulations may hinder the adjustment of labor markets to economic shocks. Finally, labor regulations that redistribute economic rents from capital to labor may reduce the profitability of investment; examples include collective bargaining schemes and expansionary fiscal programs to fund public employment. This reduced profitability may discourage investment and lower growth.[2]

On the other hand, the institutionalist view claims that market failures generate divergences from the ideal world and emphasizes the benefits of government interventions in the labor markets (ILO, 1991). Labor regulations may fulfill redistributive roles to low-wage workers or constitute an 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 innovations (Freeman, 1993a, 1993b). 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).

Forteza and Rama (2002) evaluate 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. International competition in the goods markets will drive down wages in the import-competing sectors and labor costs in the economy, thus making the export sector more competitive. If labor markets are not flexible, the adjustment in the economy will be slower and the unemployment rate will

2. Freeman (1993a, 1993b) argues that the distortionist view is not consistent with macro- and microeconomic propositions derived from economic theory. For example, Ricardian equivalence is rejected by those who argue that social security contributions have a negative impact on investment and savings. Also, the Coase theorem is not taken into account when distortionists claim that employment laws have efficiency costs.

be higher (Rama, 1997). Furthermore, current labor laws have been an obstacle to absorbing workers displaced by economic reform (IDB, 1997). The usual recommendation, therefore, is to eliminate government interventions that make labor costly and risky (Burki and Perry, 1997).

Potential losers from economic reforms, such as workers in the public sector or unionized labor, usually try to hinder or delay the economic adjustment process (Alesina and Drazen, 1991; Fernandez and Rodrik, 1991). High resistance to economic reforms from well-organized groups may lead to generalized protests and strikes. In response, the government may delay the adoption of reforms or launch an insufficient package of reforms, which, in turn, would have an insignificant impact on economic performance. This leads to the argument that resistance to reforms will be weaker when the distribution of adjustment costs is relatively equal and that economic reforms should be complemented with compensation mechanisms for workers affected by the reforms, such as job separation packages, early retirement programs, and unemployment benefits (Rama, 1995; Forteza and Rama, 2002).

Forteza and Rama (2002) find that labor regulations that determine the success or failure of structural reforms work through more political channels –proxied by unionization and government– , which are correlated with deeper recessions before adjustment and slower recoveries in the aftermath. On the other hand, economic aspects –measured by minimum wages or mandated benefits– do not seem to hinder growth. Finally, Besley and Burgess (2004) assess the role of labor market regulations in explaining the performance of the Indian manufacturing industry between 1958 and 1992. They find that regulations to protect workers (in the areas of collective bargaining and labor disputes) actually reduced growth and increased poverty.

2. The Data and Methodology

In this section, we discuss the labor regulation data used in our regression analysis and the estimation strategy pursued. First, we describe two recently developed databases on labor regulations and outcomes: the aggregate and individual measures proposed by Rama (1995) and Rama and Artecona (2002); and the indicators of labor market regulations gathered from labor codes by Djankov and others (2003a). Second, we outline the estimation techniques used to test the impact of labor regulations on long-term growth. Our preferred estimation

technique is the generalized method of moments instrumental variables (GMM-IV) system estimator (Arellano and Bover, 1995; Blundell and Bond, 1998), which takes into account the unobserved country- and time-specific effects, as well as possible endogenous regressors, in a dynamic panel data model.

2.1 The Data

As mentioned above, we use two different databases on labor market regulation and outcomes. The Rama-Artecona database has information on a larger sample of countries (121), it has a panel dimension (five-year average observations spanning 1945 to 1999), and it allows us to distinguish between regulations on paper and in practice.[3] The database from Djankov and others (2003a), which we denote the Djankov-La Porta database, covers a smaller sample of countries (eighty-five) and contains only cross-sectional information. It specifically gathers information on three types of labor laws (employment, industrial relations, and social security) for the year 1997. Next, we further describe the main features of these databases.

The Rama-Artecona Database

Rama and Artecona (2002) have collected extensive information on labor market regulations and outcomes for 121 countries. They report the data in five-year-period averages from 1945–49 to 1995–99. In this database, we can distinguish between regulations on paper (or de jure regulations) and regulations in practice (or de facto regulations). De jure regulations are approximated by eight indicators of International Labor Organization (ILO) labor standards as ratified and stipulated by legal documents in several countries. These conventions contemplate 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. De facto regulations and labor market outcomes are approximated by thirty-six indicators classified into six categories: labor force; employment and unemployment; wages and productivity; work conditions and benefits; trade unions and collective bargaining; and public sector employment.

3. See appendix A for the list of countries.

Here Rama and Artecona provide information on labor market regulations such as minimum wages, mandated benefits, nonwage costs, collective bargaining, and public employment, as well as labor market outcomes such as labor force, unemployment, earnings, and productivity.

Distinguishing between de jure and de facto regulations is crucial given that the enforcement of regulations and norms stipulated in labor codes is quite limited in developing countries.[4] We thus follow Rama (1995) and Forteza and Rama (2002) in defining aggregate indices of the overall extent of labor regulations in the economy. Our index of de jure regulation, which we denote $\mathbf{L}_0$, is measured as the cumulative number of ILO conventions ratified by a country's labor code over time. This index reflects not only the ideal regulatory framework from an institutionalist point of view (Freeman, 1993a), but also the thickness of national labor codes (Rama and Forteza, 2002). The index includes the ratification of the ILO conventions on 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).

As mentioned, however, the extent of regulation in the labor market depends on the way these legal regulations are implemented and enforced. Therefore, we require an indicator that captures the degree of enforcement as opposed to the number of regulations. Rama and Artecona (2002) provide measures for regulations in the following four areas: minimum wages, mandated benefits, trade unions, and public sector employment. Unfortunately, no data are available on job separation costs for a large number of countries.[5] To evaluate the overall effect of labor reforms in these dimensions, we follow Rama (1995) and Forteza and Rama (2002) in constructing two aggregate indices of

4. Squire and Suthiwart-Narueput (1997) suggest that de jure regulations that appear to be more distortionary in developing countries could be the least enforced in practice.

5. Heckman and Pagés (2000) construct data on job separation costs for Latin America and find that these costs have a substantial impact on the level of employment in the region.

Table 1. Indicators of Labor Market Regulations

Category	*Aggregate index L1*	*Aggregate index L2*
Minimum wages	Ratio of minimum wages to labor costs per worker in the manufacturing sector	Ratio of minimum wages to income per capita
Mandated benefits	Social security contributions as a percentage of salaries	Number of days of maternity leave for a first child born without complications
Trade unions	Total trade union membership as a percentage of total labor force	Dummy: Ratification of ILO convention 87, which allows workers to organize
Government employment	Ratio of general government employment to total employment	Ratio of central government employment to total employment

de facto labor regulations. Both proposed indices include proxies for these four dimensions of labor regulations, as summarized in table 1.[6]

Both aggregate indices, $\mathbf{L}_1$ and $\mathbf{L}_2$, are the simple averages of the proxies in the four dimensions. We normalized all the labor regulation indicators so that these variables are comparable across countries. Specifically, their values fluctuate between 0 and 1, with higher values reflecting a higher degree of labor market regulation. Finally, the aggregate indices, $\mathbf{L}_1$ and $\mathbf{L}_2$, are computed for countries with information for at least two of the four dimensions of the analysis.

The Djankov-La Porta Database

Djankov and others (2003a) have collected data on labor regulation in eighty-five countries. They analyze three dimensions of the national labor codes: laws governing individual employment contracts (employment laws); laws regulating the adoption, bargaining, and enforcement of collective agreements, the organization of trade unions, and the industrial action by workers and employers (industrial and collective relations law); and laws governing the social response to needs and conditions that affect the quality of life, such as old age, disability, death, unemployment, and maternity (social security law).[7]

6. The higher degree of correlation between the different dimensions of the labor regulation index prevents us from including all the variables of the aggregate index in the same regression.

7. In contrast with the Rama-Artecona database, we only have cross-sectional information on these variables.

We first use the aggregate index of employment laws, which regulate aspects of the individual labor contract, terms of reference, and termination of the contract. This index covers the restrictions placed on alternative employment contracts, conditions of the employment contract, and job security. Next, we have the aggregate index of industrial relations laws, which protect workers from employers. These laws contemplate aspects of the worker-employer relationship such as collective bargaining, the participation of workers in management, and collective disputes (for example, strikes and lockouts). Finally, we have the aggregate index of social security laws covering the risk of old age, sickness, and unemployment. Since labor laws (rather than outcomes) are used to construct all these indices, they are closer in spirit to de jure labor rigidities than de facto implementation in Rama and Artecona (2002).

Growth and its Determinants

Our dependent variable is the growth rate of gross domestic product (GDP) per capita, and we obtain the data from the Penn World Table 6.1 gathered by Heston, Summers, and Aten (2002). Specifically, we use the real GDP per capita (chain index prices). We follow the vast existing empirical growth literature in choosing the determinants of long-run economic growth.[8] We include the initial GDP per capita (in logs) to test for transitional convergence. We also consider structural factors such as the level of secondary schooling from Barro and Lee (2000) as a proxy of human capital; credit to the private sector as a ratio to GDP to measure financial depth (Beck, Demirgüç-Kunt, and Levine, 2000); the ratio of real exports and imports to GDP as a measure of trade openness; and the Freedom House index of civil liberties as a proxy of governance. Data on the consumer price index (CPI) inflation rate and real exchange rate overvaluation are obtained from the World Bank's *World Development Indicators*, which proxy for stabilization policies. Finally, changes in the terms of trade (as a proxy for external shocks) are also taken from *World Development Indicators*.

8. The set of growth determinants follows the classification of Loayza, Fajnzylber and Calderón (2003).

2.2 The Empirical Framework

This subsection evaluates the role of labor market rigidities in long-term growth following the traditional empirical growth literature. Our regression framework is specified by the following system:

$$dy^*_{it,t-k} = \mu_i + \eta_t + \alpha y_{it-k} + X_{it}\beta \text{ and} \quad (1)$$

$$dy_{it,t-k} = dy^*_{it-k} + L_{it}\Gamma + \xi_{it} \ .$$

According to the first equation of system 1, 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 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 set of long-term growth determinants follows the work of Loayza, Fajnzylber, and Calderón (2003). The initial level of per capita output (in logs) is included to test for conditional convergence. We consider indicators of human capital, financial depth, trade openness, and governance as proxies for structural policies and institutions. The CPI inflation rate and the real exchange rate overvaluation are proxies for stabilization policies, and terms of trade shocks approximate external shocks.[9]

In the spirit of Rama (1995), our second equation in the system indicates that any deviation in long-term equilibrium growth may be explained by a set of variables that proxy for departures from competition in the labor markets, L_{it}. This matrix, $\mathbf{L}$, is our variable of interest; it may comprise different indicators that focus on specific policy or institutions in the labor markets, such as minimum wages, mandatory benefits, trade union membership, government employment, social security laws, and collective bargaining. We denote by

$$\left\{ \ell^k_{it} \right\}_{k=1}^{K}$$

all the K indicators of labor market rigidities comprised in the matrix, $\mathbf{L}_{it}$. Unlike Rama (1995) and Forteza and Rama (2002), we do not

9. 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.

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 equals zero, labor markets are perfectly competitive. In contrast, larger values for any of these variables indicates greater deviation from perfect competition in the labor market. Negative values for the γ_k coefficients in the Γ 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.

Performing a regression analysis of 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 multicollinearity. For example, the correlation between trade union membership and government employment is approximately 0.8, whereas mandated benefits and minimum wages have a correlation of 0.5. This problem of collinearity impedes the identification of the parameters of the Γ matrix.

We address the issues of collinearity among labor regulation indicators by aggregating the variables in the $\mathbf{L}_{it}$ matrix, using the same strategy as Rama (1995) and Forteza and Rama (2002). Before we aggregate them in a single index, we need to normalize them so as to express them in comparable units. We defined our labor market rigidity indicator above as ℓ_{it}^{k}, for $k = 1,\ldots, K$. Next, we define $\ell_{\min}^{k}$ and $\ell_{\max}^{k}$ as the minimum and maximum deviations from perfect competition that a country's labor market can achieve. We can thus specify our normalized labor market rigidity indicator as follows:

$$\tilde{\ell}_{it}^{k} = \frac{\ell_{it}^{k} - \ell_{\min}^{k}}{\ell_{\max}^{k} - \ell_{\min}^{k}} .$$

By construction, $\tilde{\ell}_{it}^{k}$ fluctuates between zero and one. 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 zero to one, 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 of labor market rigidities, ℓ_{it}^{A}, to test the effects of the overall labor market rigidity on growth. We reformulate our growth equation in system 1 as

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

The sign and order of γ_A can be used to check the nature and magnitude of the impact of labor rigidities on growth. However, different labor market rigidities may have consequences of a different sign that cancel each other 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 $\tilde{\ell}_{it}^{k}$ 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 (actually we find a correlation of 0.5 between these variables). 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 irrelevant. This problem can be partially corrected by defining the complementary labor regulation variable, $\tilde{\ell}_{it}^{-k}$, as the average of the indicators that are different from *k*. This complementary variable can be used to control for all other labor market features, apart from $\tilde{\ell}_{it}^{k}$, by using the following model:

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

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

2.3 Estimation Techniques

We first estimate the growth regression equation specified in equation (1) using pooled ordinary least squares (OLS). We then run regression again incorporating time dummies, given that we want to analyze differences in growth experiences across countries stemming from labor rigidities. Neither of these methods, however, controls for endogenous regressors. Forces that affect both labor rigidities and growth could be driving the correlation between the variables, and our estimates may be biased.

One way to tackle the problem of endogeneity is to instrument for labor rigidities. We follow Djankov and others (2003a) in choosing the appropriate instruments for our measures of labor institutions. According to these authors, three theories explain the choice of labor institutions: efficiency theory, political power theory, and legal theory. Of these, North (1981) considers that the choice of institutions is driven primarily by efficiency considerations. Different institutional arrangements (such as the reliance on market forces, contract and private litigation, and government regulation) may be appropriate in different circumstances. One version of efficiency theory focuses on the distinction between regulation and social insurance. Social insurance may be relatively more efficient than regulation in dealing with market failures in countries with a low social marginal cost of tax revenues, which presumably are the wealthy countries (Becker and Mulligan, 2000). Poor countries must regulate to protect workers from being fired or mistreated by employers, whereas rich countries provide unemployment insurance, sick leave, early retirement, and so on because they can raise taxes cheaply to finance such operations (Blanchard, 2002). A second version of efficiency theory argues the opposite. It holds that the principal cost of regulation, relative to other forms of social control of business, is its potential for abuse of regulated firms by the government and its officials. Labor regulations can be used to force firms to hire and keep excess labor, to empower unions friendly with the government, and so forth. Rich, well-governed countries thus have a comparative advantage at regulation relative to other forms of social control of business because their governments are less likely to abuse power.

Political power theories argue that institutions are designed to transfer resources from those out of political power to those in power and to entrench those in political power (Olson, 1993). Institutions are generally designed to be inefficient by political leaders aiming to help themselves and their favored groups. Regulations protecting workers are introduced by socialist, social-democratic, and generally leftist governments to benefit their political constituencies (Hicks, 1999). In addition, labor regulations are a response to pressure from trade unions, and they should thus be more extensive when unions are more powerful, regardless of which government is in charge. Dictatorships, which are less constrained than democratically elected governments, tend to have more redistributive laws and institutions. Constitutions, legislative constraints, and other forms of checks and balances are all conducive to fewer regulations (Djankov and others, 2002). Likewise, economies that are open to trade may be less likely than closed economies to introduce

expensive regulations, because competition makes it less lucrative for governments to raise firms' regulatory costs (Ades and Di Tella, 1999).

With regard to legal theory, Djankov and others (2003b) argue that countries with different legal traditions use different social controls of business. Common law countries tend to rely on markets and contracts, civil law countries on regulation, and socialist countries on state ownership.[10] This implies that civil law countries and socialist law countries should regulate labor markets more extensively than common law countries. Common law countries may also have a less generous social security system since they rely on markets to provide insurance.

Our set of instruments for labor rigidity indicators is as follows. We use the log of GDP per capita to control for efficiency purposes. To test the political power theories, we use the index of institutionalized autocracy from the Polity IV codebook (Marshall and Jaggers, 2003) the leftist political orientation of the government and congress (Beck and others, 2001), and measures of trade openness. Finally, we test the legal theory by including dummy variables for countries with British common law and German civil code (La Porta and others, 1999).

Another way to tackle the endogeneity of labor rigidities is to use the GMM estimators developed by Arellano and Bover (1995) and Blundell and Bond (1998). This technique takes account of unobserved time effects through the inclusion of period-specific dummy variables, while country-specific effects are dealt with via differencing, given the dynamic nature of the regression. We also control for biases resulting from simultaneous or reverse causation. A more detailed reference to the GMM-IV techniques is presented in appendix B.

10. Common law emerged in England and is mostly characterized by the importance of decisionmaking by juries, independent judges, and judicial discretion as opposed to codes. Common law was transmitted to the British colonies, including Australia, Canada, New Zealand, India, Pakistan, the United States, and a number of countries in the Caribbean, East Africa, and Southeast Asia. Civil law evolved from Roman law in Western Europe and was incorporated into civil codes in France and Germany in the nineteenth century. It is characterized by less independent judiciaries, the relative unimportance of juries, and a greater role of both substantive and procedural codes as opposed to judicial discretion. French civil law was transplanted throughout Western Europe, including Belgium, Holland, Italy, Portugal, and Spain, and subsequently to the colonies in North and West Africa, Latin America, and parts in Asia. German codes became accepted in Germanic Western Europe, but were also transplanted to Japan and from there to China, Korea, and Taiwan. Socialist law was adopted in countries that came under the influence of the Soviet Union, while an indigenous Scandinavian legal tradition developed in Denmark, Finland, Iceland, Norway, and Sweden (Djankov and others, 2003).

3. Empirical Assessment

In this section we empirically evaluate whether labor market regulations have hindered long-term growth. We perform our regression analysis, first, on a cross-section sample of seventy-six countries with average figures for the 1970–2000 period and, second, on panel data for the same sample of countries with five-year averages over the same period. We use both the Rama-Artecona and Djankov-La Porta databases for the cross-section and only the former for the panel analysis.

We begin by presenting some basic statistics on the extent of labor market regulations and economic growth. We then perform a cross-sectional and panel data correlation analysis between growth and labor regulations. Next, we discuss the basic results of the growth regression in the cross-section of countries, followed by the panel data evidence on growth and labor regulations using different estimation techniques. Finally, we present our scorecard on the growth costs of labor regulations.

3.1 Basic Statistics

Table 2 reports the simple average of the growth rate in per capita GDP and different indicators of labor market regulation for a cross-section of countries during the 1970–2000 period. It includes both the simple averages for the Rama Artecona indicators of labor rigidity and the averages of the labor regulation indicators from the Djankov-La Porta database.

Based on the Rama-Artecona de jure index, we find that industrial countries are more regulated than developing countries (0.49 versus 0.25, respectively). Labor markets in Latin America are more regulated than the world sample (0.34 versus 0.30), whereas East Asia is less regulated than the world sample (0.09). Within the Latin American region, Chile has a similar number of regulations to the regional average, while Uruguay (not shown in the table) has the largest number of regulations (0.67). Both the Rama-Artecona de facto indices ($\mathbf{L}_1$ and $\mathbf{L}_2$) indicate that industrial countries exhibit a larger degree of labor market regulations than developing countries. If we use the $\mathbf{L}_2$ index of de facto regulations, Latin American labor markets are as regulated as labor markets in industrial economies. Chilean labor markets are less regulated than the Latin American average regardless of the aggregate index used.

The table also lists the components of the two aggregate indices of de facto labor regulations. Minimum wages, for example, are higher

Table 2. Basic Statistics for Labor Market Regulations and Economic Growth, 1970–2000
Simple averages across groups of countries

Variable	Full sample	Industrial economies	Developing countries	East Asia	Latin America	Chile
GDP per capita growth (percent)	1.60	2.20	1.40	4.30	0.90	2.40
Labor market rigidity[a]						
De jure index $\mathbf{L}_0$	0.30	0.49	0.25	0.09	0.34	0.33
De facto index $\mathbf{L}_1$	0.28	0.36	0.25	0.18	0.25	0.17
Minimum wage[b]	0.23	0.24	0.22	0.22	0.21	0.14
Social security contribution	0.37	0.45	0.35	0.26	0.35	0.40
Trade union membership	0.24	0.39	0.20	0.15	0.18	0.11
General government employment	0.27	0.39	0.22	0.16	0.25	0.05
De facto index $\mathbf{L}_2$	0.29	0.32	0.28	0.14	0.32	0.08
Minimum wage[c]	0.14	0.09	0.16	0.10	0.10	0.06
Maternity leave (no. days)	0.16	0.19	0.15	0.13	0.13	0.18
Ratification of ILO convention 87	0.59	0.79	0.54	0.17	0.78	0.03
Central government employment	0.16	0.19	0.16	0.11	0.21	0.03
De jure versus de facto						
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	–0.04	–0.12	–0.01	0.08	–0.09	–0.16
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	–0.02	–0.17	0.03	0.06	–0.02	–0.26
Labor regulation[d]						
Employment laws	1.53	1.36	1.60	1.39	1.79	1.46
Alternative employment contracts	0.56	0.58	0.56	0.57	0.55	0.58
Conditions of employment	0.62	0.49	0.67	0.52	0.73	0.58
Job security	0.35	0.28	0.37	0.30	0.50	0.31
Industrial (collective) relations law	1.25	1.22	1.26	1.12	1.44	1.18
Collective bargaining	0.51	0.46	0.53	0.37	0.68	0.78
Worker participation in management	0.23	0.32	0.20	0.27	0.15	0.00
Collective disputes	0.51	0.44	0.53	0.49	0.60	0.40
Social security laws	1.70	2.21	1.53	1.58	1.69	1.98
Old age, disability, and death benefits	0.57	0.68	0.53	0.56	0.53	0.46
Sickness and health benefits	0.65	0.75	0.62	0.69	0.74	0.79
Unemployment benefits	0.48	0.78	0.38	0.33	0.42	0.73

Source: Authors' calculations, based on data from Rama and Artecona (2002) and Djankov and others (2003a).
a. Indicators of labor market rigidity are from Rama and Artecona (2002).
b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.
d. Indicators of labor regulations are from Djankov and others (2003a).

(lower) among industrial countries than among developing countries when they are normalized by industrial wages (per capita income). Minimum wages in East Asia are below those in Latin American markets, with Argentina, Chile, and Peru achieving the lowest minimum wages in the region (when normalized by per capita income; again, only the case of Chile is shown in the table).

In the case of mandated benefits, social security contributions (normalized by total wages) are larger among industrial countries than among developing countries (0.45 versus 0.35, respectively). Chile's social security contributions (0.40) are larger than the averages for both the region (0.35) and East Asia (0.26). Industrial countries also have longer maternity leave than developing countries, with Chile again displaying a larger figure than the average in East Asia and Latin America. Trade union membership in developed economies is almost twice that in developing countries (0.39 versus 0.20, respectively). Trade union membership is lower in Latin America and East Asia than the mean for developing areas. The share of workers affiliated with trade unions is lower in Chile than in the group of Latin American countries, with Argentina and Brazil having the largest share of unionized workers. Finally, the size of public sector employment is larger in advanced economies than in developing countries; the difference is significantly larger when we use the general government (0.39 versus 0.22, respectively). Public employment in Chile is lower than average employment in both Latin America and East Asia, with the largest public employment in Latin America displayed by Argentina and Uruguay.

Finally, the table presents the simple average of the Djankov-La Porta indicators of labor regulation, which complement the measures of de jure regulations in the Rama-Artecona database. Regarding employment laws, developing countries are more regulated than industrial countries (1.60 versus 1.36), especially in the areas of job security and conditions of employment. The Chilean labor market is less regulated than the regional average (1.46 versus 1.79), as well as in job security and employment conditions. Similarly, developing countries are slightly more regulated than industrial countries in the area of industrial (collective) relations law (1.26 versus 1.22). Specifically, they are more regulated in the areas of collective bargaining and disputes and less regulated in the participation of workers in management. Argentina, Mexico, and Peru (not shown) have the most highly regulated labor markets in Latin America in the area of collective bargaining, followed by Chile and Colombia. Finally, workers in industrial countries are more protected with regard to social security than are workers in developing countries (2.21 versus 1.53); the largest difference is seen in unemployment benefits (0.78 versus 0.38).

Table 3 presents the evolution of labor regulations over the decades spanning the 1970–2000 period for different subsamples of countries. The aggregate index of de jure rigidities, $\mathbf{L}_0$, increased over the decades for all subgroups of countries. This implies that countries

across the world ratified more ILO conventions over time. The extent of rigidities in practice decreased slightly among industrial countries in the 1990s relative to the 1980s, whereas it increased among developing countries. Chilean labor markets became more regulated in the 1990s, whether measured by the $\mathbf{L}_1$ or $\mathbf{L}_2$ index.

3.2 Correlation Analysis

Table 4 presents the correlation between economic growth and a wide array of labor regulation indicators for a cross-section of countries averaged over the 1970–2000 period. In the cross-correlation analysis between growth in per capita GDP and the indicators of labor market rigidity in the Rama-Artecona database, we find that growth and de facto rigidities ($\mathbf{L}_0$) are negatively correlated for the full sample (–0.12), with a stronger correlation among developing countries than industrial countries (–0.28 versus –0.12, respectively). The negative correlation between labor regulations and growth is strongest among East Asian countries (–0.54) and almost negligible in Latin America (–0.001).

The correlation between the $\mathbf{L}_1$ index of de facto labor regulations and economic growth is negative for the world sample (–0.06), as well as among industrial and developing countries (–0.24 and –0.12, respectively). The $\mathbf{L}_2$ index also yields a negative association between labor regulations and growth. In this case, the correlation is similar for both industrial and developing countries (fluctuating around 0.33). East Asia displays the strongest negative correlation (–0.83).

Economic growth is negatively associated with minimum wages among industrial countries (with a correlation above –0.30), and they are negatively associated among developing countries when normalized by per capita income (–0.20). The negative correlation between growth and mandated benefits is weak for the full sample of countries (–0.05 for social security contributions and –0.12 for maternity leave).[11] A larger share of trade union labor in the total labor force is associated with lower growth for developing and Latin American countries (–0.11 and –0.18, respectively). Finally, government employment has a positive correlation with growth among developing countries and a negative one among industrial economies and East Asia.

11. If we consider the contribution to social security, the correlation is positive and small for the group of industrial countries (0.06) and Latin America (0.09). Maternity leave has a negative correlation with growth for industrial and developing countries (–0.28 and –0.14, respectively), and a positive but negligible coefficient for Latin America.

Table 3. Basic Statistics for Labor Market Regulations and Economic Growth over the Decades[a]
Simple averages across groups of countries

	All countries			*Industrial countries*			*Developing countries*			*Chile*		
Variable	*1970s*	*1980s*	*1990s*	*1970s*	*1980s*	*1990s*	*1970s*	*1980s*	*1990s*	*1970s*	*1980s*	*1990s*
GDP per capita growth (percent)	2.36	1.23	1.42	2.49	2.19	2.12	2.32	0.94	1.20	1.20	1.27	4.78
De jure index $\mathbf{L}_0$	0.27	0.29	0.32	0.44	0.48	0.54	0.23	0.25	0.27	0.32	0.32	0.36
De facto index $\mathbf{L}_1$	0.27	0.27	0.28	0.36	0.37	0.36	0.24	0.25	0.26	0.15	0.17	0.20
Minimum wage[b]	0.23	0.22	0.23	0.25	0.23	0.22	0.22	0.21	0.23	0.12	0.12	0.19
Social security contribution	0.33	0.36	0.41	0.41	0.45	0.49	0.31	0.34	0.39	0.36	0.40	0.45
Trade union membership	0.24	0.25	0.23	0.39	0.41	0.37	0.19	0.21	0.19	0.09	0.09	0.13
General government employment	0.27	0.27	0.26	0.39	0.41	0.38	0.22	0.22	0.22	0.04	0.05	0.04
De facto index $\mathbf{L}_2$	0.28	0.29	0.30	0.31	0.32	0.31	0.27	0.27	0.29	0.06	0.06	0.11
Minimum wage[c]	0.14	0.14	0.13	0.10	0.09	0.09	0.17	0.16	0.15	0.05	0.06	0.08
Maternity leave (no. days)	0.14	0.15	0.17	0.18	0.19	0.20	0.13	0.14	0.16	0.15	0.15	0.23
Ratification of ILO convention 87	0.55	0.58	0.64	0.74	0.82	0.82	0.50	0.53	0.59	0.00	0.00	0.10
Central government employment	0.18	0.18	0.14	0.21	0.20	0.15	0.17	0.17	0.13	0.02	0.03	0.03
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.00	–0.02	–0.06	–0.06	–0.11	–0.18	0.01	0.00	–0.03	–0.16	–0.15	–0.16
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	0.01	–0.01	–0.04	–0.12	–0.16	–0.23	0.05	0.03	0.01	–0.26	–0.26	–0.26

Source: Authors' calculations, based on data from Rama and Artecona (2002) and Djankov and others (2003a).
a. Panel data of nonoverlapping five-year-average observations, 1970–2000. Indicators of labor market rigidity are from Rama and Artecona (2002).
b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.

Table 4. Cross-section Correlation Analysis between Labor Regulation and Economic Growth, 1970–2000

Variable	Full sample	Industrial economies	Developing countries	East Asia	Latin America
Labor market rigidity[a]					
De jure index $\mathbf{L}_0$	–0.12	–0.13	–0.28	0.00	–0.54
De facto index $\mathbf{L}_1$	–0.06	–0.24	–0.12	0.35	0.28
Minimum wage[b]	0.03	–0.32	0.11	0.51	–0.23
Social security contribution	–0.05	0.06	–0.11	0.09	0.18
Trade union membership	–0.04	0.01	–0.11	–0.18	0.50
General government employment	0.04	–0.31	0.00	0.15	0.08
De facto index $\mathbf{L}_2$	–0.31	–0.34	–0.33	0.11	–0.83
Minimum wage[c]	–0.23	–0.34	–0.20	0.56	–0.55
Maternity leave (no. days)	–0.12	–0.28	–0.14	0.02	0.22
Ratification of ILO convention 87	–0.31	–0.13	–0.37	–0.14	–0.52
Central government employment	0.23	–0.25	0.25	0.33	–0.15
De jure versus de facto					
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.07	–0.01	0.17	0.17	0.67
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	–0.11	–0.06	–0.05	0.08	–0.61
Labor regulation[d]					
Employment laws	–0.24	0.16	–0.28	–0.04	–0.14
Alternative employment contracts	–0.01	0.14	–0.04	0.13	0.21
Conditions of employment	–0.28	0.08	–0.30	–0.05	–0.07
Job security	–0.21	0.15	–0.23	–0.13	–0.42
Industrial (collective) relations law	–0.06	0.27	–0.11	–0.10	–0.28
Collective bargaining	–0.19	0.32	–0.25	–0.24	–0.35
Worker participation in management	0.14	0.20	0.13	0.05	0.04
Collective disputes	–0.09	0.07	–0.08	–0.09	–0.36
Social security laws	0.04	–0.20	–0.01	0.20	0.35
Old age, disability and death benefits	0.26	–0.23	0.28	0.24	0.06
Sickness and health benefits	0.05	–0.27	0.04	0.13	0.17
Unemployment benefits	–0.06	0.13	–0.14	0.10	0.45

Source: Authors' calculations, based on data from Rama and Artecona (2002) and Djankov and others (2003a).
a. Indicators of labor market rigidity are from Rama and Artecona (2002).
b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.
d. Indicators of labor regulations are from Djankov and others (2003a).

The table also shows the cross-section correlation analysis between economic growth and the indicators of labor market regulation from the Djankov-La Porta database. These variables describe the laws protecting workers in three main areas of the labor code: employment, industrial or collective relations, and social security. The aggregate index of employment laws is negatively associated with growth for the world sample (–0.24) and for developing countries (–0.28), although it is positive for industrial countries (0.16). Within

the group of employment laws, the negative correlation for the full sample and for developing countries is strongest for conditions of employment (–0.28) and job security (–0.21).

Industrial relations (collective) laws, in turn, have a small and negative correlation with growth for the samples of Latin American and East Asian countries, whereas the correlation is positive for industrial countries. Laws on collective bargaining and on collective disputes have a negative correlation among developing areas, with the strongest correlation displayed for laws on collective bargaining (–0.25 for developing countries and –0.35 for East Asia). We find a positive association between growth and the participation of workers in management.

Finally, social security laws display a positive association with growth for the samples of Latin American and East Asian countries and a negative correlation for industrial countries. For the group of industrial countries, growth is negatively associated with laws contemplating old age, disability, and death benefits and with sickness and health benefits (–0.23 and –0.27, respectively), whereas there is a positive association between growth and unemployment benefits for the same group of countries (0.13). Developing countries showed a completely different correlation pattern: positive for old age and sickness benefits and negative for unemployment benefits.

Table 5 reports the results of our panel correlation analysis between economic growth and the labor regulation indicators in the Rama-Artecona database (the only one with a panel dimension). We present not only the panel correlation for the 1970–2000 period, but also the evolution of these correlation coefficients over the decades. In general, we find that de jure rigidities, $\mathbf{L}_0$, are negatively correlated with growth for all the samples. The correlation between growth and de facto rigidities is negative for industrial countries under both $\mathbf{L}_1$ and $\mathbf{L}_2$ and negative for developing countries under $\mathbf{L}_2$.

We also find that the degree of negative correlation between growth and $\mathbf{L}_0$ (de jure rigidities) increased in the 1990s relative to the 1980s for industrial countries (from –0.07 to –0.17), whereas it declined for developing countries over the same time period (from –0.25 to –0.10). Regarding the aggregate indices of de facto regulation, the negative correlation between $\mathbf{L}_1$ and growth decreased from –0.17 to –0.13 for industrial countries, while it remained constant for $\mathbf{L}_2$ at around –0.28. For developing countries, the correlation between $\mathbf{L}_1$ and growth became negative in the 1990s (–0.10) after being slightly positive in the 1980s (0.08), and it remained unchanged for $\mathbf{L}_2$ over the same period (–0.27).

Table 5. Panel Data Correlation Analysis between Labor Market Regulation and Economic Growth, 1970–2000[a]

	All countries				*Industrial countries*				*Developing countries*			
Labor rigidity indicator	*Pooled*	*1970s*	*1980s*	*1990s*	*Pooled*	*1970s*	*1980s*	*1990s*	*Pooled*	*1970s*	*1980s*	*1990s*
De jure index $\mathbf{L}_0$	–0.06	–0.05	–0.08	–0.03	–0.11	0.07	–0.07	–0.17	–0.15	–0.08	–0.25	–0.10
De facto index $\mathbf{L}_1$	0.04	0.14	0.12	–0.07	–0.15	–0.14	–0.17	–0.13	0.03	0.18	0.08	–0.10
Minimum wage[b]	0.07	0.02	0.09	0.10	–0.16	–0.13	–0.24	–0.15	0.14	0.06	0.18	0.17
Social security contribution	–0.01	0.09	–0.06	–0.01	0.03	0.23	–0.03	0.01	–0.04	0.08	–0.13	–0.03
Trade union membership	0.07	0.15	0.19	–0.09	0.00	–0.11	0.05	0.01	0.04	0.19	0.16	–0.16
General government employment	0.04	0.15	0.06	–0.05	–0.22	–0.36	–0.15	–0.20	0.02	0.26	–0.04	–0.09
De facto index $\mathbf{L}_2$	–0.20	–0.09	–0.25	–0.26	–0.18	0.08	–0.28	–0.28	–0.22	–0.11	–0.27	–0.27
Minimum wage[c]	–0.15	–0.21	–0.16	–0.10	–0.17	–0.05	–0.40	–0.09	–0.13	–0.23	–0.09	–0.08
Maternity leave (no. days)	–0.04	0.02	–0.04	–0.08	–0.17	–0.24	–0.06	–0.20	–0.05	0.05	–0.14	–0.08
Ratification of ILO convention 87	–0.18	–0.08	–0.25	–0.20	–0.07	0.24	–0.16	–0.20	–0.22	–0.11	–0.32	–0.23
Central government employment	0.09	0.15	0.03	0.07	–0.14	–0.25	–0.12	–0.15	0.12	0.23	0.02	0.10
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.09	0.12	0.18	–0.03	0.02	–0.18	–0.03	0.09	0.16	0.19	0.33	0.00
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	–0.09	0.03	–0.10	–0.18	–0.01	–0.08	–0.09	0.03	–0.06	0.04	–0.02	–0.18

Source: Authors' calculations, based on data from Rama and Artecona (2002).

a. Panel data for the 1970–2000 period are in five-year nonoverlapping observations. Indicators of labor market rigidity are from Rama and Artecona (2002).

b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.

c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.

Correlation Among Indicators of Labor Market Regulation

Here we briefly present the correlations between the different indicators of labor market regulation used in our regression analysis. First, we correlate labor indicators within the Rama-Artecona and Djankov-La Porta databases. We then correlate different indicators between the two databases. We find that countries with a higher degree of regulation on paper also display a higher degree of regulations in practice. This is reflected in the positive association between the index $\mathbf{L}_0$ and the aggregate indices of de facto rigidities, $\mathbf{L}_1$ and $\mathbf{L}_2$ (with correlation coefficients of 0.53 and 0.44). On the other hand, both aggregate indices, $\mathbf{L}_1$ and $\mathbf{L}_2$, are positively correlated (0.44).

Next, we analyze the correlation between each aggregate index of de facto regulations and their components. For the L_1 index, the proxies of trade unions and government employment have the highest correlation with the aggregate index (approximately 0.78), while minimum wages has the weakest correlation (0.44). In the case of the L_2 index, the trade union indicator displays the highest correlation with the aggregate index (0.92), while the correlation of the remaining dimensions fluctuates between 0.30 and 0.34. The proxies used in each dimension of the aggregate indices, $\mathbf{L}_1$ and $\mathbf{L}_2$, are positively correlated, with employment in general and the central government having a degree of correlation of 0.55. The correlation between minimum wage indicators is 0.35; between measures of mandated benefits, 0.29; and between trade union variables, 0.30.

We also report correlations for the labor regulation measures in the Djankov-La Porta database. We find that countries with higher regulation in employment laws also display a larger degree of regulations in industrial relations and social security laws. The positive correlation is strongest between employment laws and industrial relation laws (0.52) and weakest between employment and social security laws (0.10). We also find that the components of each aggregate index proposed by the Djankov-La Porta database are highly correlated with the aggregate index. For example, the aggregate index of social security laws is highly correlated with laws on sickness and health benefits (0.84) and unemployment benefits (0.89), while the aggregate index of employment laws is highly correlated with laws on job security (0.81) and employment conditions (0.79).

Finally, we evaluate the correlation of labor regulation indicators between databases. First, we find that the index of de jure regulations, $\mathbf{L}_0$, in the Rama-Artecona database is positively associated with the aggregate indices in the Djankov-La Porta database. The highest

correlation is displayed between $\mathbf{L}_0$ and social security laws (0.46), while the lowest is between $\mathbf{L}_0$ and employment laws (0.16). Analogously, we find that either the $\mathbf{L}_1$ and $\mathbf{L}_2$ index of aggregate de facto regulations is positively correlated with the indices in the Djankov-La Porta data. The highest correlation is again displayed with social security laws (0.59 with the $\mathbf{L}_1$ index and 0.30 with the $\mathbf{L}_2$ index).

3.3 Cross-section Regression Analysis

This section discusses the results for the relation between labor market regulations and economic growth for a cross-section of countries. Our dependent variable is the annual average growth rate in GDP per capita over the 1970–2000 period. The explanatory variables are the log of per capita GDP in 1970, the average years of secondary schooling in 1970, the ratio of domestic credit to the private sector to GDP, the average annual inflation rate, the degree of openness, the average annual change in the terms of trade, the real exchange rate overvaluation, the index of civil liberties (as a proxy for governance), and our measures of labor regulations. For reasons of space we only report the coefficient of interest (namely, the labor regulation coefficient), its standard deviation, the coefficient of determination (R^2), and the number of observations.[12]

Results for the Rama-Artecona Labor Regulation Indicators

Table 6 reports the estimated coefficient of labor regulation measures in the Rama-Artecona database and its statistical significance for the sample of all countries and the samples of developing and industrial countries. We provide both OLS and IV estimations for these coefficients.[13] The OLS estimates indicate that aggregate measures of labor regulations—de jure and de facto—are negatively and significantly related to growth among industrial countries. The sample of developing countries, as well as the full sample of countries, yield a negative association (although statistically negligible) between both growth and de jure regulations and growth and the $\mathbf{L}_2$ index of de facto regulations. Also, while the R^2 coefficient fluctuates between 0.44 and 0.73 for the full sample of countries and for developing countries, it ranges from 0.82 to 0.91 for the sample of industrial countries.

12. The full regression results are available on request.

13. The coefficient estimates and standard errors of the OLS estimates are robust to autocorrelation and White heteroskedasticity (following White, 1980).

Turning to the components of these aggregate indices of de facto labor regulations, we find the following significant results. First, public employment (by either the central or the general government) as a share of total employment has a positive association with economic growth for the full sample and for developing countries. On the other hand, trade unions fully explain the negative and significant correlation between growth and the $\mathbf{L}_2$ index for these two samples. Second, the negative relation between growth and the index of de facto labor regulations—whether measured by $\mathbf{L}_1$ or $\mathbf{L}_2$—among industrial countries is mainly driven by minimum wages and mandated benefits, proxied by either social security contributions or days of maternity leave (that is, the economic dimension of labor market regulations, according to Forteza and Rama, 2002).

For the IV estimates presented in the table, we instrument for labor market regulations following Djankov and others (2003a), as mentioned earlier. We find that labor markets are more regulated on paper ($\mathbf{L}_0$) and in practice ($\mathbf{L}_1$ and $\mathbf{L}_2$) in richer countries and in countries with left-oriented governments. In contrast, the extent of regulation is lower in countries with common law tradition.[14]

We find, first, that de jure regulations have a negative impact on long-run growth for all samples, although it is statistically significant only for industrial countries. Hence, if regulations in the Spanish labor code (which was the most highly regulated in the OECD during the 1995–99 period) were reduced to the average levels (namely, those exhibited by Greece and Portugal), the country's growth rate would increase by 1 percentage point per year. Second, although the $\mathbf{L}_1$ and $\mathbf{L}_2$ indices of de facto regulations have a negative relation with growth in all samples, $\mathbf{L}_1$ exerts a negative and significant impact on growth among developing countries, whereas $\mathbf{L}_2$ has a negative impact on growth among industrial countries.[15] Finally, the minimum wage has a negative and robust relation in the IV estimations regarding the normalization factor and the samples of countries.

Economically speaking, our IV cross-sectional estimates suggest two key implications. First, if Sweden (the country with the highest degree of regulation in 1995–99 according to this index) reduced its labor rigidities to Switzerland's level (the representative country in

14. For the sake of brevity, we do not report the first-stage regression results; they are available on request.

15. The negative impact of $\mathbf{L}_1$ on growth is mainly attributed to minimum wages, mandated benefits, and public employment, while the negative impact of $\mathbf{L}_2$ on growth is explained by minimum wages and trade union membership.

Table 6. Cross-section Regression Analysis for Labor Market Regulations and Economic Growth[a]

Estimation method and labor indicator	All countries				Industrial countries				Developing countries			
	Coeff.	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
Least squares[b]												
De jure index $\mathbf{L}_0$	–0.005	0.01	0.49	76	–0.012**	0.00	0.88	22	–0.010	0.02	0.50	54
De facto index $\mathbf{L}_1$	0.019	0.01	0.47	75	–0.017**	0.01	0.86	22	0.055**	0.02	0.51	53
Minimum wage[c]	0.000	0.01	0.47	65	–0.007**	0.00	0.87	22	0.015	0.01	0.52	43
Social security contribution	0.003	0.01	0.55	53	–0.010**	0.00	0.91	18	–0.005	0.02	0.61	35
Trade union membership	0.004	0.01	0.55	53	0.006	0.00	0.92	18	–0.011	0.03	0.59	35
General government employment	0.018*	0.01	0.44	67	–0.006	0.01	0.86	22	0.038**	0.02	0.50	45
De facto index $\mathbf{L}_2$	–0.015	0.01	0.48	73	–0.022**	0.01	0.86	22	–0.013	0.01	0.50	51
Minimum wage[d]	–0.014	0.01	0.49	66	–0.016**	0.01	0.87	22	–0.027	0.02	0.53	44
Maternity leave (no. days)	–0.012	0.02	0.52	59	–0.016**	0.01	0.87	21	–0.070	0.07	0.56	38
Ratification of ILO convention 87	–0.009*	0.01	0.53	59	0.000	0.00	0.94	21	–0.018**	0.01	0.59	38
Central government employment	0.027*	0.01	0.55	66	–0.019**	0.01	0.88	21	0.051	0.02	0.58	45
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.013*	0.01	0.73	75	0.006*	0.00	0.82	22	0.032	0.01	0.51	53
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	–0.004	0.01	0.47	73	0.012**	0.00	0.85	22	–0.005	0.02	0.49	51
Instrumental variables[e]												
De jure index $\mathbf{L}_0$	–0.027	0.03	0.49	76	–0.026*	0.02	0.83	22	–0.042	0.04	0.51	54
De facto index $\mathbf{L}_1$	–0.042	0.03	0.48	75	–0.022	0.02	0.82	22	–0.077*	0.05	0.51	53
Minimum wage[c]	–0.081**	0.03	0.53	65	–0.043**	0.02	0.83	22	–0.102**	0.04	0.58	43
Social security contribution	–0.006	0.02	0.55	53	–0.041**	0.02	0.89	18	–0.013	0.03	0.61	35
Trade union membership	–0.049	0.04	0.57	53	0.018	0.02	0.91	18	–0.078*	0.04	0.62	35
General government employment	–0.037	0.04	0.43	67	0.086**	0.02	0.88	22	–0.120**	0.05	0.49	45
De facto index $\mathbf{L}_2$	0.013	0.04	0.47	73	–0.036*	0.02	0.83	22	–0.005	0.05	0.49	51
Minimum wage[d]	–0.165**	0.07	0.51	66	–0.071**	0.03	0.86	22	–0.096	0.10	0.53	44
Maternity leave (no. days)	–0.075	0.08	0.53	59	–0.044	0.03	0.84	21	–0.214	0.17	0.54	38
Ratification of ILO convention 87	0.026	0.03	0.52	59	–0.026**	0.01	0.87	21	–0.015	0.03	0.50	38
Central government employment	0.036	0.06	0.51	66	0.048**	0.02	0.87	21	0.007	0.08	0.52	45

Table 6. (continued)

Estimation method and labor indicator	All countries				Industrial countries				Developing countries			
	Coeff.	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.022	0.05	0.46	75	0.064**	0.03	0.85	22	0.002	0.06	0.47	53
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	0.106**	0.05	0.52	73	0.042*	0.03	0.82	22	0.177**	0.07	0.55	51

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
Source: Authors' calculations, based on data from Rama and Artecona (2002) and Djankov and others (2003a).
a. We report the regression coefficient for the indicator of labor rigidity according to equation (1) in the text, based on an effective sample of seventy-six countries averaged over the 1970–2000 period. 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. Labor regulation data are from Rama and Artecona (2002). Full regression results and standard errors of the coefficients of the labor regulation variables are not reported for reasons of space, although they are available from the authors on request.
b. Standard errors are robust to autocorrelation and heteroskedasticity (White, 1980).
c. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
d. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.
e. Our set of instruments for the labor indicators consists of the level of development, trade openness adjusted by geographic variables, leftist political orientation of the government, common law tradition, German civil code tradition, and institutionalized autocracy. The set of instruments was chosen from the existing literature, following Djankov and others (2003a).

the sample of advanced economies), then its growth rate would increase by 0.7 percentage points per year. Second, if Argentina (the country with the highest degree of labor regulations in Latin America in 1995–99) reduced its level of regulations to the regional average, its growth rate would increase by 1.2 percentage points. If Argentina reduced its degree of labor regulation to the East Asian average, its growth rate would increase by 1.6 percentage points.

Results for the Djankov-La Porta Labor Regulation Indicators

Table 7 provides the coefficient estimates for labor regulation indicators in the Djankov-La Porta database, for which we run the same experiments as in the previous table.[16] The least squares estimates of the labor regulation coefficients for different samples of countries show that the aggregate index of employment laws has a negative and significant relation with growth among industrial countries, which is explained by laws on employment conditions. The index of social security laws has a positive and significant relation with growth in the world sample and the sample of developing countries, although the quantitative relevance of this estimated relation seems to be non significant.

With regard to the estimated IV coefficients for the labor regulation indicators, all three aggregate types of labor laws (namely, employment, industrial relations, and social security) have a negligible impact on growth for the world sample and for developing countries. However, all three aggregate indices have a negative and significant impact on growth among industrial countries. In the case of employment laws, for example, we find that if Portugal (the country with the strictest regulations in 1997) were to reduce its regulations to the level of Austria (a country with the average level of regulations), its growth rate would increase by 0.6 percentage points. An analogous decline in job security (from the countries with the highest levels to the average) might improve growth by almost 3 percentage points. In the case of industrial relations laws, Portugal could improve its growth rate by 0.6 percentage points if it reduced its degree of regulation to the average levels in the region (for example, that of the Netherlands). Finally, if social security regulations were lessened in Denmark and Sweden (that is, the countries with the region's most extensive regulations) to a

16. The full specification is analogous to that used in the cross-section analysis for the Rama-Artecona database and is available on request.

level on par with the regional average (for example, Switzerland and Italy), their growth rate would increase by 0.6 percentage points.

3.4 Panel Data Regression Analysis

We now present the panel data estimates of the relation between labor market rigidities and economic growth. We use panel data on seventy-six countries with nonoverlapping five-year-average observations for the 1970–2000 period. Here, we report three types of estimators: least-squares-based estimators (pooled OLS, least squares with time effects, and the within-group estimator); instrumental variables estimators, in which we instrument for labor market regulations following the strategy outlined earlier, both with pooled and time / country effects IV estimators; and generalized method of moments estimators (Arellano and Bond, 1991; Arellano and Bover, 1995), in which we control for unobserved country and time effects and the possibility of endogenous regressors and in which we use both internal instruments (that is, lagged levels of the variables in our regression framework) and external instruments (that is, exogenous variables that determine the choice of labor institutions and regulations in the country). For reasons of space, we only briefly explain the OLS and IV results and then focus our discussion on the GMM result, which is our preferred estimation method.

Panel Results from Least-square-based Estimators

Table 8 contains the regression results for the estimated coefficients of the wide array of labor regulation indicators using different least-squares-based techniques (namely, pooled OLS, least squares with time effects, and least squares with country dummy variables) applied to the full sample, the industrial country sample, and the developing country sample. Two caveats apply: these estimation techniques do not address the possibility of endogenous regressors, and taking into account unobserved country effects through country dummy variables (as in the within-group estimator) in a dynamic panel data model leads to inconsistent estimates.

Our pooled OLS estimates indicate that both the $\mathbf{L}_0$ index of de jure rigidities and the L_2 index of de facto rigidities have a negative and significant relationship with economic growth. The impact of $\mathbf{L}_1$ on growth is negative and significant only for industrial countries. These results for the indices of de facto regulations hold for the time-effects

Table 7. Cross-section Regression Analysis for Labor Market Regulations and Economic Growth[a]

Estimation method and labor indicator	All countries				Industrial countries				Developing countries			
	Coeff.	Std. dev.	R^2	No. obs.	Coeff.	Std. dev.	R^2	No. obs.	Coeff.	Std. dev.	R^2	No. obs.
Least squares[b]												
Employment laws	0.001	0.00	0.50	58	–0.004*	0.00	0.84	21	–0.002	0.01	0.53	37
Alternative employment contracts	0.009	0.01	0.51	58	0.005	0.00	0.87	21	0.007	0.01	0.54	37
Conditions of employment	0.003	0.01	0.50	58	–0.009**	0.00	0.85	21	0.008	0.01	0.54	37
Job security	–0.010	0.01	0.52	58	–0.007	0.01	0.84	21	–0.017*	0.01	0.56	37
Industrial (collective) relations law	0.001	0.00	0.50	58	–0.003*	0.00	0.84	21	–0.003	0.01	0.53	37
Collective bargaining	0.000	0.01	0.50	58	0.001	0.00	0.85	21	–0.004	0.01	0.53	37
Worker participation in management	0.003	0.00	0.50	58	–0.004	0.00	0.84	21	0.001	0.01	0.54	37
Collective disputes	–0.003	0.01	0.50	58	–0.010	0.01	0.85	21	–0.007	0.01	0.54	37
Social security laws	0.008**	0.00	0.55	58	0.002	0.00	0.81	21	0.007**	0.00	0.56	37
Old age, disability, and death benefits	0.016	0.01	0.55	58	0.000	0.01	0.81	21	0.030*	0.02	0.58	37
Sickness and health benefits	0.003	0.01	0.56	58	0.004	0.00	0.81	21	0.002	0.01	0.57	37
Unemployment benefits	0.013**	0.01	0.56	58	–0.001	0.01	0.81	21	0.010	0.01	0.56	37
Instrumental variables[c]												
Employment laws	0.004	0.01	0.51	58	–0.007*	0.00	0.85	21	0.002	0.01	0.53	37
Alternative employment contracts	0.027	0.03	0.51	58	0.044**	0.02	0.87	21	–0.035	0.08	0.54	37
Conditions of employment	0.018	0.02	0.51	58	–0.029**	0.01	0.86	21	0.089	0.09	0.55	37
Job security	–0.040	0.06	0.51	58	–0.073**	0.02	0.88	21	–0.009	0.09	0.53	37
Industrial (collective) relations law	0.004	0.01	0.51	58	–0.006**	0.00	0.86	21	0.005	0.01	0.54	37
Collective bargaining	0.042**	0.02	0.54	58	–0.010	0.01	0.86	21	0.061**	0.02	0.59	37
Worker participation in management	–0.030	0.02	0.54	58	–0.018**	0.01	0.86	21	–0.032	0.02	0.57	37
Collective disputes	0.047	0.03	0.52	58	0.018*	0.01	0.87	21	0.025	0.03	0.55	37

Table 7. (continued)

Estimation method and labor indicator	All countries				Industrial countries				Developing countries			
	Coeff.	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
Social security laws												
Old age, disability, and death benefits	–0.034	0.07	0.54	58	–0.131**	0.04	0.88	21	–0.088	0.10	0.54	37
Sickness and health benefits	–0.040	0.04	0.52	58	–0.031**	0.01	0.88	21	–0.066	0.06	0.56	37
Unemployment benefits	0.033	0.03	0.51	58	–0.043**	0.01	0.90	21	0.056	0.04	0.56	37

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
Source: Authors' calculations, based on data from Rama and Artecona (2002) and Djankov and others (2003a).
a. We report the regression coefficient for the indicator of labor rigidity according to equation (1) in the text, based on an effective sample of seventy-six countries averaged over the 1970–2000 period. 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. Labor regulation data are from Djankov and others (2003a). Full regression results and standard errors of the coefficients of the labor regulation variables are not reported for reasons of space, although they are available from the authors on request.
b. Standard errors are robust to autocorrelation and heteroskedasticity (White, 1980).
c. Our set of instruments for the labor indicators consists of the level of development, trade openness adjusted by geographic variables, leftist political orientation of the government, common law tradition, German civil code tradition, and institutionalized autocracy. The set of instruments was chosen from the existing literature, following Djankov and others (2003a).

Table 8. Panel Data Regression Analysis for Labor Market Regulations and Economic Growth: Least Squares[a]

Estimation method and labor indicator	Full sample				Industrial countries				Developing countries			
	Coeff.	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
Pooled estimator												
De jure index $\mathbf{L}_0$	–0.010*	0.01	0.20	382	–0.014**	0.01	0.29	111	–0.021*	0.01	0.20	271
De facto index $\mathbf{L}_1$	0.003	0.01	0.19	399	–0.015*	0.01	0.29	120	0.020	0.02	0.19	279
Minimum wage[b]	0.006	0.01	0.22	349	–0.008*	0.00	0.30	120	0.022*	0.01	0.24	229
Social security contribution	0.001	0.01	0.21	355	–0.006	0.01	0.30	105	0.000	0.01	0.21	250
Trade union membership	–0.001	0.01	0.22	366	0.005	0.01	0.34	119	–0.016	0.02	0.23	247
General government employment	–0.006	0.01	0.19	333	–0.002	0.01	0.29	120	0.004	0.01	0.20	213
De facto index $\mathbf{L}_2$	–0.024**	0.01	0.21	393	–0.024*	0.01	0.30	120	–0.025**	0.01	0.21	273
Minimum wage[c]	–0.011	0.01	0.24	358	–0.021**	0.01	0.31	120	–0.005	0.01	0.25	238
Maternity leave (no. days)	0.000	0.01	0.21	364	0.009	0.01	0.32	117	–0.018	0.04	0.21	247
Ratification of ILO convention 87	–0.012*	0.01	0.22	387	0.019**	0.01	0.33	120	–0.024**	0.01	0.23	267
Central government employment	0.011	0.01	0.22	335	–0.016*	0.01	0.34	119	0.029*	0.02	0.24	216
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.012*	0.01	0.20	377	0.008	0.01	0.27	111	0.031**	0.01	0.21	266
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	–0.002	0.01	0.19	370	0.008	0.01	0.27	111	0.001	0.01	0.20	259
Time-effects estimator												
De jure index $\mathbf{L}_0$	–0.007	0.01	0.24	382	–0.011**	0.01	0.46	111	–0.015	0.01	0.24	271
De facto index $\mathbf{L}_1$	–0.001	0.01	0.24	399	–0.013*	0.01	0.46	120	0.012	0.02	0.23	279
Minimum wage[b]	0.005	0.01	0.29	349	–0.008*	0.01	0.47	120	0.019*	0.01	0.30	229
Social security contribution	0.003	0.01	0.27	355	–0.004	0.01	0.47	105	0.004	0.01	0.26	250
Trade union membership	–0.007	0.01	0.28	366	0.007	0.01	0.50	119	–0.028*	0.02	0.28	247
General government employment	–0.007	0.01	0.24	333	–0.003	0.01	0.46	120	0.001	0.01	0.24	213
De facto index $\mathbf{L}_2$	–0.021**	0.01	0.25	393	–0.024**	0.01	0.47	120	–0.022**	0.01	0.25	273
Minimum wage[c]	0.001	0.01	0.30	358	–0.021**	0.01	0.48	120	0.012	0.02	0.30	238
Maternity leave (no. days)	0.002	0.02	0.26	364	0.010	0.01	0.49	117	0.001	0.04	0.25	247
Ratification of ILO convention 87	–0.012*	0.01	0.27	387	0.019**	0.01	0.50	120	–0.024**	0.01	0.28	267
Central government employment	0.006	0.01	0.27	335	–0.017*	0.01	0.51	119	0.024	0.02	0.28	216

Table 8. (continued)

Estimation method and labor indicator	Full sample				Industrial countries				Developing countries			
	Coeff.	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.007	0.01	0.24	377	0.007	0.01	0.44	111	0.022*	0.01	0.25	266
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	–0.004	0.01	0.24	370	0.007	0.01	0.44	111	–0.002	0.01	0.25	259
Country-effects estimator												
De jure index $\mathbf{L}_0$	0.017	0.03	0.54	382	–0.033	0.03	0.57	111	0.017	0.04	0.55	271
De facto index $\mathbf{L}_1$	–0.013	0.03	0.54	399	–0.010	0.03	0.52	120	–0.014	0.04	0.55	279
Minimum wage[b]	0.014	0.02	0.57	349	–0.032*	0.02	0.53	120	0.024	0.02	0.58	229
Social security contribution	0.030	0.02	0.57	355	0.044*	0.03	0.54	105	0.025	0.03	0.57	250
Trade union membership	0.001	0.02	0.55	366	0.020	0.02	0.52	119	–0.003	0.03	0.56	247
General government employment	–0.040**	0.02	0.59	333	–0.034*	0.02	0.54	120	–0.053*	0.03	0.60	213
De facto index $\mathbf{L}_2$	–0.010	0.03	0.54	393	–0.025	0.03	0.52	120	0.003	0.04	0.55	273
Minimum wage[c]	–0.049	0.03	0.56	358	–0.074*	0.05	0.53	120	–0.057	0.05	0.57	238
Maternity leave (no. days)	0.051	0.04	0.57	364	0.012	0.04	0.53	117	0.099	0.08	0.58	247
Ratification of ILO convention 87	0.022*	0.01	0.56	387	0.019	0.02	0.53	120	0.024	0.02	0.57	267
Central government employment	–0.024	0.02	0.59	335	–0.011	0.02	0.51	119	–0.049	0.05	0.60	216
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	–0.019	0.02	0.54	377	0.016	0.03	0.57	111	–0.013	0.03	0.55	266
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	–0.005	0.02	0.55	370	0.000	0.03	0.57	111	0.003	0.03	0.56	259

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
Source: Authors' calculations, based on data from Rama and Artecona (2002) and Djankov and others (2003a).
a. We report the regression coefficient for the indicator of labor rigidity according to equation (1) in the text, based on an effective sample of seventy-six countries averaged over the 1970–2000 period. The estimation method is least squares. 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. Labor regulation data are from Rama and Artecona (2002). Full regression results and standard errors of the coefficients of the labor regulation variables are not reported for reasons of space, although they are available on request. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported.
b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.

estimation. In the case of $\mathbf{L}_2$ index, the negative association between growth and labor regulations among industrial countries is explained by minimum wages and public employment, whereas it is explained by trade union membership for developing countries. When we account for country effects, we find that the aggregate indices of labor regulations—whether on paper or in practice—have no significant relation with growth for all samples.[17] Here, only the minimum wage has a negative and significant association with growth among developing countries, while general government employment has a negative and significant link with growth regardless of the sample.

Panel Results from Instrumental Variables Estimators

In table 9, we present the coefficient estimates for a large set of labor market regulation indicators using IV techniques. We performed pooled IV regressions, IV with time effects, and IV with country effects on the full sample of countries, as well as on the samples of industrial and developing countries. Our set of instruments for labor regulation indicators includes per capita output (in logs), trade openness, the government's orientation to the left, common law tradition, German civil code tradition, and institutionalized autocracy. The main results for the first-stage panel regressions are that rich countries and countries with a left-leaning political orientation have a higher propensity to impose labor rigidities and regulations than poor or conservative countries. Also, fewer regulations would be imposed in more open countries, in countries with common law tradition, and in less autocratic governments.

Our pooled and time-effects IV estimates yield similar qualitative results. The $\mathbf{L}_0$ index of de jure regulations and the $\mathbf{L}_1$ index of de facto regulations have a negative and significant impact on growth for the full sample of countries and the sample of developing nations, and all the components of the $\mathbf{L}_1$ index have a negative and significant effect on growth.[18] The $\mathbf{L}_2$ index of regulations, however, has a negative

17. This estimation is consistent in a dynamic panel data setting model only if the time dimension is very large (Nickell, 1981). These results should thus be interpreted very cautiously.

18. Based on our IV estimates with time effects, we find that if regulations in Mexican labor markets (which have the highest adjusted degree of labor regulations using the $\mathbf{L}_1$ index) declined to average Latin American levels (such as those of Colombia and Paraguay), the country's growth rate would increase by 1.1 percentage points. If labor regulations in Mexico declined to average East Asian levels, the gains in economic growth would be even higher (approximately 1.8 percentage points). In this latter case, the growth effects of reducing the extent of regulations are larger for minimum wages (2.4 percentage points) and for public sector employment (approximately 3.0 percentage points).

(though insignificant) impact on growth in all samples. Finally, our country-effects estimates yield an insignificant statistical effect of both de jure and de facto labor regulations on economic growth, although the minimum wage remains negative and significant when we account for country-effects. As mentioned earlier, these results should be taken with caution since they do not properly account for the presence of unobserved country-specific effects.

The GMM-IV System Estimator

Having characterized the link between economic growth and labor regulations using some conventional panel data estimation techniques, we now use the GMM-IV system estimator for dynamic panel data proposed by Arellano and Bover (1995) and Blundell and Bond (1998). The reasons behind the application of this methodology are threefold: we need an estimator that deals properly with the dynamic nature of our model; we need to account for unobserved country-specific effects within the framework of a dynamic panel data model; and we need to control for the possibility of endogenous regressors. One of the advantages of this estimation technique is that we can compute some specification tests to confirm whether our growth regressions are valid for statistical inference. Further statistical details on the estimation technique are included in appendix B.

Table 10 presents the regression results of our growth equation using the GMM-IV system estimator. The main difference with respect to the IV estimator used above is that we use not only the economic, legal, and political determinants of labor regulations, but also internal instruments (that is, lagged levels or differences of the explanatory variables) to account for the endogenous explanatory variables. Our instruments are valid according to the Sargan test, and we reject the possibility that the error terms display high-order serial correlation.[19] Among the main results for our control variables we find evidence of convergence for the full sample of countries. We also find that growth is enhanced by larger stocks of human capital, better governance, lower inflation, and real exchange rate overvaluation, as well as positive terms-of-trade shocks. Coefficient estimates of credit to the private sector and openness either are not robust or display an unexpected sign (see table 10). In the following paragraphs, we evaluate the significance of the impact of our variable of interest, that is, the effect of labor market regulations.

19. By construction, the error process should always exhibit first-order linear correlation (Arellano and Bover, 1995).

Table 9. Panel Data Regression Analysis for Labor Market Regulations and Economic Growth: Instrumental Variables[a]

Estimation method and labor indicator	Full sample				Industrial countries				Developing countries			
	Coeff.	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
Pooled estimator												
De jure index $\mathbf{L}_0$	–0.034**	0.02	0.21	381	–0.005	0.02	0.26	111	–0.052**	0.03	0.21	270
De facto index $\mathbf{L}_1$	–0.064**	0.02	0.21	398	0.023	0.02	0.29	120	–0.136**	0.04	0.23	278
Minimum wage[b]	–0.078**	0.02	0.24	349	0.023	0.02	0.29	120	–0.178**	0.04	0.28	229
Social security contribution	–0.032**	0.01	0.22	355	–0.019	0.02	0.30	105	–0.048**	0.02	0.23	250
Trade union membership	–0.068**	0.03	0.23	366	0.088**	0.02	0.39	119	–0.139**	0.04	0.25	247
General government employment	–0.092**	0.03	0.21	333	0.068**	0.02	0.34	120	–0.274**	0.05	0.28	213
De facto index $\mathbf{L}_2$	–0.036	0.02	0.20	393	–0.011	0.03	0.28	120	–0.056*	0.03	0.20	273
Minimum wage[c]	–0.099**	0.05	0.25	358	–0.030	0.06	0.30	120	–0.146**	0.06	0.27	238
Maternity leave (no. days)	–0.093*	0.05	0.22	364	0.115**	0.05	0.35	117	–0.188**	0.07	0.23	247
Ratification of ILO convention 87	–0.008	0.01	0.21	387	–0.008	0.01	0.30	120	–0.011	0.01	0.22	267
Central government employment	–0.087	0.06	0.22	335	0.143**	0.05	0.37	119	–0.251**	0.10	0.26	216
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.052*	0.03	0.20	376	0.080*	0.05	0.30	111	0.051	0.04	0.21	265
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	0.106**	0.03	0.22	370	0.003	0.03	0.26	111	0.198**	0.05	0.24	259
Time-effects estimator												
De jure index $\mathbf{L}_0$	–0.030*	0.02	0.25	381	–0.007	0.02	0.44	111	–0.045*	0.03	0.25	270
De facto index $\mathbf{L}_1$	–0.064**	0.02	0.26	398	0.014	0.02	0.45	120	–0.131**	0.04	0.27	278
Minimum wage[b]	–0.075**	0.02	0.30	349	0.014	0.02	0.45	120	–0.166**	0.04	0.33	229
Social security contribution	–0.029*	0.02	0.27	355	0.004	0.02	0.47	105	–0.043**	0.02	0.27	250
Trade union membership	–0.074**	0.03	0.29	366	0.074**	0.03	0.53	119	–0.143**	0.05	0.30	247
General government employment	–0.096**	0.03	0.26	333	0.059**	0.02	0.49	120	–0.281**	0.06	0.32	213
De facto index $\mathbf{L}_2$	–0.028	0.03	0.24	393	–0.008	0.02	0.45	120	–0.040	0.04	0.24	273
Minimum wage[c]	–0.092**	0.05	0.31	358	–0.193**	0.09	0.47	120	–0.128*	0.07	0.31	238
Maternity leave (no. days)	–0.103*	0.05	0.27	364	0.093	0.05	0.51	117	–0.176**	0.08	0.27	247
Ratification of ILO convention 87	–0.005	0.01	0.27	387	–0.006	0.01	0.47	120	–0.005	0.02	0.26	267
Central government employment	–0.098*	0.06	0.28	335	–0.035*	0.02	0.53	119	–0.253**	0.09	0.30	216

Table 9. (continued)

Estimation method and labor indicator	Full sample				Industrial countries				Developing countries			
	Coeff.	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.041	0.03	0.24	376	0.065**	0.03	0.46	111	0.029	0.04	0.25	265
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	0.102**	0.03	0.26	370	0.013	0.03	0.44	111	0.189**	0.05	0.28	259
Country-effects estimator												
De jure index $\mathbf{L}_0$	–0.088	0.08	0.55	381	–0.069	0.08	0.57	111	–0.137	0.11	0.56	270
De facto index $\mathbf{L}_1$	–0.049	0.07	0.55	398	0.030	0.06	0.52	120	–0.146	0.11	0.56	278
Minimum wage[b]	–0.108*	0.07	0.57	349	–1.150**	0.19	0.66	120	–0.185*	012	0.58	229
Social security contribution	–0.082	0.07	0.57	355	–0.086	0.41	0.52	105	–0.158*	0.10	0.58	250
Trade union membership	–0.020	0.05	0.56	366	1.379**	0.27	0.62	119	–0.096	0.09	0.57	247
General government employment	0.000	0.08	0.58	333	0.706**	0.19	0.58	120	–0.117	0.14	0.60	213
De facto index $\mathbf{L}_2$	–0.093	0.14	0.54	393	–0.070	0.20	0.52	120	–0.057	0.18	0.55	273
Minimum wage[c]	–0.376**	0.16	0.57	358	–0.306**	0.15	0.54	120	–0.477**	0.24	0.58	238
Maternity leave (no. days)	–0.147	0.13	0.57	364	0.054	0.13	0.53	117	–0.342*	0.21	0.58	247
Ratification of ILO convention 87	–0.066*	0.04	0.56	387	–0.070	0.05	0.53	120	–0.055	0.05	0.57	267
Central government employment	0.252*	0.14	0.59	335	0.559**	0.13	0.59	119	0.057	0.22	0.59	216
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.250**	0.12	0.56	376	0.701**	0.14	0.67	111	0.137	0.15	0.56	265
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	0.199*	0.11	0.56	370	0.163*	0.11	0.58	111	0.299*	0.16	0.57	259

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
Source: Authors' calculations, based on data from Rama and Artecona (2002) and Djankov and others (2003a).
a. We report the regression coefficient for the indicator of labor rigidity according to equation (1) in the text, based on an effective sample of seventy-six countries averaged over the 1970–2000 period. The estimation method is instrumental variables. 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. Labor regulation data are from Rama and Artecona (2002). Full regression results and standard errors of the coefficients of the labor regulation variables are not reported for reasons of space, although they are available on request. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported.
b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.

Table 10. Panel Data Regression Analysis for Labor Market Regulation and Economic Growth: GMM-IV Estimations[a]

	Full sample			*Industrial countries*			*Developing countries*		
Explanatory variable	L_0 *index*	L_1 *index*	L_2 *index*	L_0 *index*	L_1 *index*	L_2 *index*	L_0 *index*	L_1 *index*	L_2 *index*
Constant	0.139**	0.185**	0.178**	2.572**	1.492*	1.678*	0.191**	0.173**	0.123**
	(0.06)	(0.02)	(0.02)	(0.60)	(0.96)	(1.07)	(0.04)	(0.04)	(0.04)
Output per capita (logs)	–0.008	–0.016**	–0.008**	–0.069**	–0.031**	–0.058**	–0.018**	–0.012**	–0.002
	(0.01)	(0.00)	(0.00)	(0.03)	(0.01)	(0.02)	(0.00)	(0.01)	(0.01)
Secondary schooling	0.021*	0.031**	0.018**	0.008	0.049*	0.103*	0.025**	0.024**	0.016**
	(0.01)	(0.00)	(0.00)	(0.04)	(0.03)	(0.06)	(0.01)	(0.01)	(0.01)
Credit to private sector	–0.008	–0.004*	–0.004*	–0.001	0.008	–0.012	–0.007**	–0.003	–0.003
	(0.01)	(0.00)	(0.00)	(0.01)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)
Inflation	–0.021**	–0.020**	–0.021**	–0.366**	–0.316**	–0.231**	–0.018**	–0.019**	–0.024**
	(0.01)	(0.00)	(0.00)	(0.10)	(0.10)	(0.11)	(0.00)	(0.00)	(0.00)
Openness	0.001	–0.008**	–0.009**	0.002	0.029	0.039	–0.004	–0.001	–0.001
	(0.01)	(0.00)	(0.00)	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)
Terms-of-trade shocks	0.066*	0.058**	0.062**	0.185**	0.141**	0.354**	0.052**	0.037	0.044*
	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.18)	(0.02)	(0.02)	(0.02)
Real exchange rate overvaluation	–0.006	–0.012**	–0.011**	–0.041*	0.034	–0.086*	–0.005	–0.011**	–0.003
	(0.01)	(0.00)	(0.00)	(0.03)	(0.04)	(0.05)	(0.00)	(0.00)	(0.00)
Governance	0.005**	0.004**	0.003**	0.003	–0.002	–0.003	0.008**	0.005**	0.003*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Labor regulation indicator	–0.032	–0.006	–0.036**	–0.026	–0.154*	–0.133*	–0.043*	0.009	–0.040*
	(0.02)	(0.01)	(0.01)	(0.03)	(0.09)	(0.08)	(0.02)	(0.04)	(0.02)
Summary statistic									
No. countries	71	70	69	20	19	20	51	50	49
No. observations	220	238	235	64	72	73	156	165	162
R^2	0.18	0.19	0.27	0.47	0.36	0.51	0.14	0.23	0.29
Specification test (*p* value)									
Sargan test	0.63	0.76	0.68	0.50	0.30	0.41	0.89	0.92	0.92
Second-order correlation	0.16	0.76	0.44	0.45	0.59	0.63	0.31	0.75	0.27

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
Source: Authors' calculations, based on data from Rama and Artecona (2002).
a. The dependent variable is the growth rate in per capita GDP. The estimation method is the GMM-IV system estimator (Arellano and Bond, 1995; Blundell and Bond, 1998). We use the full sample of countries averaged, with nonoverlapping five-year observations over the 1970–2000 period. Labor regulation data are from Rama and Artecona (2002). Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported.

First, the $\mathbf{L}_0$ index of de jure regulations has a negative and significant relation with economic growth for all samples of countries, but the impact of deregulation is statistically significant only for the sample of developing countries. This result implies that a simplification of national labor codes may promote growth in developing countries. For example, if the index of de jure labor regulations for a representative developing country declined by one standard deviation (0.16), then its growth rate would increase from the regression sample mean of 1.2 percent to 1.9 percent. Also, if labor market regulations in Argentina (the developing country with the highest value for $\mathbf{L}_0$ in 1995–99) were relaxed to levels exhibited by the average developing country (say, the Philippines or Honduras), its growth rate would increase by 0.8 percentage points. Even so, while labor market deregulation might be effective at reducing de jure regulations, it might not reduce regulations in practice (Forteza and Rama, 2002).

The coefficient estimate of the $\mathbf{L}_1$ index of de facto labor regulations is negative and significant in our regression analysis only for the sample of industrial countries. Economically speaking, if the representative industrial country reduced its degree of labor regulation by one standard deviation (0.14), its growth rate would increase from the regression sample mean of 2.0 percent to 4.0 percent. However, serious efforts to deregulate labor markets in industrial countries would be required to achieve growth effects of this magnitude.[20] For developed economies, we find that all the components of the $\mathbf{L}_1$ index have a negative coefficient estimate, although one (general government employment) is not statistically significant (see table 11). If the level of market regulations in Sweden, for example, were to decline to the average level exhibited by the industrial countries, the growth rate would increase by 0.1 percentage point if the reduction is in minimum wages and by 0.8 percentage points if the decline is in social security contributions or trade union membership.

Finally, we find a negative and significant coefficient estimate for the $\mathbf{L}_2$ index of de facto labor regulations regardless of the sample of countries evaluated. From our coefficient estimates, we find that a one standard deviation decrease in the index $\mathbf{L}_2$ for industrial countries (0.1) would increase their growth rate by 1.3 percentage points, whereas an analogous decline for developing countries (0.15) would raise their growth rate by 0.6 percentage points. The negative impact

20. The level of regulations displayed by the average industrial economy over the 1990s is similar to that exhibited in the 1970s (see the average of the aggregate $\mathbf{L}_1$ index over decades in table 4).

Table 11. Labor Market Regulations and Long-term Growth: Sensitivity Analysis for GMM-IV Estimates[a]

	Full sample				*Industrial countries*				*Developing countries*			
Labor indicator	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*	*Coeff.*	*Std. dev.*	R^2	*No. obs.*
De jure index $\mathbf{L}_0$	–0.032	0.02	0.18	220	–0.026	0.03	0.47	64	–0.043*	0.02	0.14	156
De facto index $\mathbf{L}_1$	–0.006	0.01	0.19	238	–0.154*	0.09	0.36	72	0.009	0.04	0.23	165
Minimum wage[b]	0.031**	0.01	0.19	210	–0.013*	0.01	0.50	73	0.018	0.04	0.22	137
Social security contribution	–0.007	0.01	0.19	212	–0.077**	0.03	0.50	65	–0.007	0.02	0.25	147
Trade union membership	–0.010	0.02	0.25	218	–0.116*	0.07	0.45	73	–0.049	0.04	0.27	145
General government employment	0.022*	0.01	0.20	193	–0.086	0.09	0.47	73	0.026	0.03	0.22	120
De facto index $\mathbf{L}_2$	–0.036**	0.01	0.27	235	–0.133*	0.08	0.51	73	–0.040*	0.02	0.29	162
Minimum wage[c]	–0.013*	0.01	0.31	217	–0.028*	0.02	0.53	73	–0.031*	0.02	0.32	144
Maternity leave (no. days)	0.008	0.02	0.24	215	0.021	0.05	0.48	70	0.023	0.05	0.26	145
Ratification of ILO convention 87	–0.028**	0.00	0.28	232	–0.080	0.08	0.53	73	–0.043*	0.02	0.13	159
Central government employment	–0.043**	0.02	0.28	195	–0.025*	0.01	0.55	73	–0.025	0.07	0.25	122
De jure versus de facto												
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.038**	0.01	0.16	217	0.013	0.01	0.45	64	0.073**	0.02	0.12	153
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	0.008	0.01	0.20	214	0.028	0.03	0.48	64	0.021*	0.01	0.16	150

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
Source: Authors' calculations, based on data from Rama and Artecona (2002).
a. The dependent variable is the growth rate in per capita GDP. The estimation method is the GMM-IV system estimator (Arellano and Bond, 1995; Blundell and Bond, 1998). We use the full panel data of countries, with nonoverlapping five-year observations over the 1970–2000 period. Labor regulation data are from Rama and Artecona (2002). Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported.
b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.

of a higher degree of labor regulation in industrial economies (as proxied by higher values of $\mathbf{L}_2$) is mainly driven by the negative and significant growth effects of higher minimum wages and higher general government employment (see table 11). The other dimensions (maternity leave and trade union membership) have no statistically significant impact. Here, an increase in the growth rate of industrial countries of 0.3 percentage points would be achieved by a one-standard-deviation reduction of either. In developing economies, the negative impact of increased labor market regulations minimum wages (0.12) or public employment (0.11). on the growth rate may be attributed to higher minimum wages and larger trade unions. A one-standard-deviation cut in minimum wages (0.17) may increase the growth rate of a developing country by 0.5 percentage point, whereas an analogous decline in the role of the trade unions may raise the growth rate of the economy by 2.0 percentage points (see table 11).

3.5 A Scorecard on the Growth Costs of Labor Regulations

To assess the growth costs of labor market regulations, we constructed a scorecard based on the seven panel estimation techniques applied to the data. Using our seven different sets of estimated coefficients, we input the value of –1 (+1) to a negative (positive) and significant coefficient estimate, and 0 to an insignificant coefficient. Table 12 reports the proportion of negative and positive significant coefficients.[21]

We obtain four main stylized facts from our scorecard. First, thicker labor codes (as proxied by the index of de jure regulations) seem to be negatively associated with economic growth for both the full sample of countries and the sample of developing countries. Second, the aggregate index of de facto labor regulations—whether the $\mathbf{L}_1$ or $\mathbf{L}_2$ index—has a weak negative relation with growth for the full sample of countries and the sample of industrial economies. The $\mathbf{L}_2$ index of de facto labor regulations has a negative relation with growth only for the sample of developing countries. Third, when the minimum wage is expressed as a ratio of the average labor cost in the manufacturing sector, it has a robust negative relation with economic growth among industrial countries.

21. A scorecard that assigns a higher value to estimation techniques that give higher points to econometric techniques that deal with unobserved country and time effects and endogeneity yields similar results.

Table 12. Scorecard of Labor Regulations and Economic Growth[a]

Labor regulation indicator	*All countries*	*Industrial countries*	*Developing countries*
De jure index $\mathbf{L}_0$	–0.6	–0.3	–0.6
De facto index $\mathbf{L}_1$	–0.3	–0.4	–0.3
Minimum wage[b]	–0.3	–1.0	–0.1
Social security contribution	–0.3	0.0	–0.4
Trade union membership	–0.3	0.3	–0.4
General government employment	–0.3	0.3	–0.4
De facto index $\mathbf{L}_2$	–0.4	–0.4	–0.6
Minimum wage[c]	–0.6	–0.9	–0.6
Maternity leave (no. days)	–0.3	0.3	–0.4
Ratification of ILO convention 87	–0.4	0.3	–0.4
Central government employment	–0.1	–0.3	–0.1
De jure versus de facto			
$\mathbf{L}_1$ relative to $\mathbf{L}_0$	0.6	0.4	0.4
$\mathbf{L}_2$ relative to $\mathbf{L}_0$	0.4	0.1	0.6

a. Based on seven different panel data estimations, we assigned a value of –1 (+1) to a negative (positive) and significant coefficient estimate, and 0 to an insignificant coefficient. Here, we report the proportion of negative and positive significant coefficients.
b. Minimum wages are normalized with the average labor cost in the manufacturing sectors.
c. Minimum wages are normalized with real income per capita. All labor indicators are normalized as specified in the text.

When expressed as a ratio of income per capita, it seems to have an adverse impact on growth regardless of the sample of countries used. Finally, the rest of the categories—namely, mandated benefits, trade union membership, and public employment—have a negative but weak relation with growth for both the world sample and the sample of developing countries.

Our measures of labor regulation enforcement—measured here as the difference between de facto and de jure regulations—have a positive relation with growth. This relation is more robust for the full sample of countries when we use the $\mathbf{L}_1$ index, and for developing countries when we use the $\mathbf{L}_2$ index.

4. Conclusions

This paper has assessed whether labor market regulations represent an obstacle for long-term growth. For this analysis, we used two recently developed databases on labor regulations and outcomes: Rama and Artecona (2002), which contains data on labor regulations on paper and in practice for 121 countries and is organized in five-year observations from 1945–49 to 1995–99; and Djankov and others (2003a), which analyzes the labor codes for a cross-section of eighty-five countries.

We followed the empirical literature on growth in performing our regression analysis on two levels. First, we reported the cross-sectional regression results using least squares and instrumental variables. To instrument for labor regulations, we followed Djankov and others (2003a) in the selection of our instruments (that is, the level of development, leftist political orientation of the government, trade openness, common law tradition, German civil code tradition, and institutionalized autocracy). Next, we reported the panel data regression results using three different types of estimators: least-squares-based estimators, including pooled OLS, least squares with time effects, and least squares with country dummies (fixed-effects estimator); IV estimators 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 controlled for the presence of unobserved country effects in a dynamic panel data model, and we accounted for endogenous regressors with both external and internal instruments.

Our main findings are as follows. First, our cross-sectional analysis finds that thicker labor codes (or de jure regulations) have an adverse impact on long-run growth only among industrial economies. The impact of de facto regulations—as proxied by $\mathbf{L}_1$ and $\mathbf{L}_2$—is mixed. While we find a negative and significant relationship between growth and the $\mathbf{L}_2$ index in industrial countries, we find a negative and significant relationship between growth and the $\mathbf{L}_1$ index in developing countries. In addition, we find that all three types of labor laws described by Djankov and others (2003a) (namely, employment, industrial relations, and social security) have a significant impact on growth only among industrial countries.

Second, our GMM-IV system panel data estimates suggest that less-regulated labor codes may foster growth among developing countries. Economically speaking, if the $\mathbf{L}_0$ index declines by one standard deviation, the growth rate of a developing country should increase by 0.7 percentage points. One should be very cautious about this result, however, since simplifying labor codes does not guarantee an improvement in the ability to enforce these laws.

Third, the $\mathbf{L}_1$ index of de facto rigidities has a negative and significant relationship only for industrial economies. Our estimates suggest that a one-standard-deviation decrease in the $\mathbf{L}_1$ index may increase the growth rate of advanced economies by 2 percent. These growth effects, however, entail a significant effort to deregulate labor markets

among industrial economies, especially considering that most European countries have made only marginal changes in their labor market institutions.

Fourth, a high degree of labor regulation (as proxied by high values in our $\mathbf{L}_2$ index) has an adverse and significant impact on growth in both industrial and developing countries. We find that a one-standard-deviation decline in the $\mathbf{L}_2$ index developing countries (industrial economies) would increase their growth rate by 0.6 (1.3) percentage points.

Fifth, the adverse growth effects of labor regulations among developing countries might be explained by the significant negative growth effects of minimum wages and trade unions. If minimum wages were to decline by one standard deviation, the growth rate in developing countries would increase by 0.5 percentage points; the growth rate would increase by 2.0 percentage points if an analogous decline were experienced by the role of trade unions. To achieve these growth effects, however, developing countries would have to undertake a very strong effort toward labor market deregulation.

Finally, a scorecard of our panel data estimates suggests that thicker codes are negatively related to growth for both the full sample of countries and developing countries. Also, the impact of the aggregate indices of de facto regulations is negative, but weak. The minimum wage is the only variable with a robust negative relation with growth.

Appendix A
Sample of Countries

— Industrial countries (twenty-two countries): Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.
— Latin America and the Caribbean (twenty-one countries): 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, and Venezuela.
— East Asia and the Pacific (twelve countries): China, Hong Kong, Indonesia, Korea, Malaysia, Mongolia, Papua New Guinea, Philippines, Singapore, Taiwan, Thailand, and Vietnam.
— Eastern Europe and Central Asia (seventeen countries): Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Ukraine, and Yugoslavia.
— Middle East and North Africa (twenty-one countries): Algeria, Bahrain, Cyprus, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, Turkey, United Arab Emirates, and Yemen.
— South Asia (five countries): Bangladesh, India, Nepal, Pakistan, and Sri Lanka.
— Sub-Saharan Africa (twenty-three countries): Botswana, Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.

APPENDIX B

Estimation Methodology: The GMM-IV System Estimator

The estimation of a growth regression using a panel data set of countries across the world poses some challenges.[22] First, there are some unobserved country- and time-specific effects. We can account for the presence of time effects by including time-specific dummy variables in our regression, but the common methods used to account for country effects (that is, within-group estimators) are inappropriate given the dynamic nature of the regression equation. Second, most explanatory variables are likely to be jointly endogenous with economic growth, and we therefore need to control for the biases resulting from simultaneous or reverse causation. The main objective of this appendix is to outline the econometric methodology we use to control for country-specific effects and joint endogeneity in a dynamic model of panel data.

We use the generalized method of moments (GMM) estimators developed by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), and Arellano and Bover (1995) for dynamic models of panel data. These estimators take advantage of the panel data set; they are based, first, on differencing regressions or instruments to control for unobserved effects and, second, on the use of previous observations of the explanatory variables as instruments (which are called internal instruments).

After accounting for time-specific effects, we can rewrite equation (1) as follows:

$$y_{it} = \alpha\, y_{i,t-1} + \beta' \mathbf{X}_{it} + \eta_i + \varepsilon_{it} \ . \tag{B.1}$$

To eliminate the country-specific effect, we take first-differences of equation (B.1):

$$y_{it} - y_{i,t-1} = \alpha\left(y_{i,t-1} - y_{i,t-2}\right) + \beta'\left(\mathbf{X}_{it} - \mathbf{X}_{i,t-1}\right) + \left(\varepsilon_{it} - \varepsilon_{i,t-1}\right). \tag{B.2}$$

The use of instruments is necessary to deal with the likely endogeneity of the explanatory variables and the problem that, by construction, the new error term, $\varepsilon_{it} - \varepsilon_{i,t-1}$, is correlated with the lagged dependent variable, $y_{i,t-1} - y_{i,t-2}$. The instruments consist of

22. This appendix draws heavily on Loayza, Fajnzylber, and Calderón (2003).

previous observations of the explanatory and lagged dependent variables. Given that it relies on past values as instruments, this method only allows current and future values of the explanatory variables to be affected by the error term. Therefore, while relaxing the common assumption of strict exogeneity, our instrumental variable method does not allow the **X** variables to be fully endogenous.

Under the assumptions that the error term, ε, is not serially correlated and that the explanatory variables, **X**, are weakly exogenous (that is, the explanatory variables are assumed to be uncorrelated with future realizations of the error term), the GMM dynamic panel estimator uses the following moment conditions:

$$E\left[y_{i,t-s} \left(\varepsilon_{it} - \varepsilon_{it-1} \right) \right] = 0 \text{ and} \tag{B.3}$$

$$E\left[\mathbf{X}_{i,t-s} \left(\varepsilon_{it} - \varepsilon_{it-1} \right) \right] = 0 \ , \tag{B.4}$$

for $s \geq 2$; $t = 3,\ldots, T$. The GMM estimator based on these conditions is known as the difference estimator. Notwithstanding its advantages with respect to simpler panel data estimators, the difference estimator has important statistical shortcomings. Alonso-Borrego and Arellano (1996) and Blundell and Bond (1998) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. Instrument weakness influences the asymptotic and small-sample performance of the difference estimator. Asymptotically, the variance of the coefficients rises. Monte Carlo experiments show that the weakness of the instruments can produce biased coefficients in small samples.[23]

To reduce the potential biases and imprecision associated with the usual difference estimator, we use a new estimator that combines in a system the regression in differences with the regression in levels (developed in Arellano and Bover, 1995; Blundell and Bond, 1998). The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumption: although there may be correlation

23 An additional problem with the simple difference estimator relates to measurement error: differencing may exacerbate the bias as a result of errors in variables by decreasing the signal-to-noise ratio (see Griliches and Hausman, 1986).

between the levels of the right-hand-side variables and the country-specific effect in equation (B.1), there is no correlation between the differences of these variables and the country-specific effect. This assumption results from the following stationarity property:

$$E\left(y_{i,t+p}\,\eta_i\right) = E\left(y_{i,t+q}\,\eta_i\right) \text{ and} \tag{B.5}$$

$$E\left(\mathbf{X}_{i,t+p}\,\eta_i\right) = E\left(\mathbf{X}_{i,t+q}\,\eta_i\right),$$

for all p and q. The additional moment conditions for the second part of the system (the regression in levels) are as follows:[24]

$$E\left[\left(y_{i,t-1} - y_{i,t-2}\right)\left(\eta_i + \varepsilon_{it}\right)\right] = 0 \text{ and} \tag{B.6}$$

$$E\left[\left(\mathbf{X}_{i,t-1} - \mathbf{X}_{i,t-2}\right)\left(\eta_i + \varepsilon_{it}\right)\right] = 0\,. \tag{B.7}$$

Using the moment conditions presented in equations (B.3), (B.4), (B.6), and (B.7), we employ a generalized method of moments (GMM) procedure to generate consistent estimates of the parameters of interest and their asymptotic variance-covariance (Arellano and Bond, 1991; Arellano and Bover, 1995). These are given by the following formulas:

$$\hat{\theta} = \left(\bar{\mathbf{X}}'\mathbf{Z}\hat{\Omega}^{-1}\mathbf{Z}'\bar{\mathbf{X}}\right)^{-1}\bar{\mathbf{X}}'\mathbf{Z}\hat{\Omega}^{-1}\mathbf{Z}'\bar{\mathbf{y}} \text{ and} \tag{B.8}$$

$$\text{AVAR}\left(\hat{\theta}\right) = \left(\bar{\mathbf{X}}'\mathbf{Z}\hat{\Omega}^{-1}\mathbf{Z}'\bar{\mathbf{X}}\right)^{-1}, \tag{B.9}$$

where θ is the vector of parameters of interest (α, β); $\bar{\mathbf{y}}$ is the dependent variable stacked first in differences and then in levels; $\bar{\mathbf{X}}$ is the explanatory-variable matrix, including the lagged dependent variable (y_{t-1}, $\mathbf{X}$) stacked first in differences and then in levels; $\mathbf{Z}$ is the matrix

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

of instruments derived from the moment conditions; and $\hat{\Omega}$ is a consistent estimate of the variance-covariance matrix of the moment conditions.[25]

The consistency of the GMM estimators depends on whether lagged values of the explanatory variables are valid instruments in the growth regression. We address this issue by considering two specification tests suggested by Arellano and Bond (1991) and Arellano and Bover (1995). The first is a Sargan test of overidentifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. Failure to reject the null hypothesis gives support to the model. The second test examines the null hypothesis that the error term, ε_{it}, is not serially correlated. As in the case of the Sargan test, the model specification is supported when the null hypothesis is not rejected. In the system specification, we test whether the differenced error term (that is, the residual of the regression in differences) is second-order serially correlated. First-order serial correlation of the differenced error term is expected even if the original error term (in levels) is uncorrelated, unless the latter follows a random walk. Second-order serial correlation of the differenced residual indicates that the original error term is serially correlated and follows a moving average process of at least order one. This would reject the appropriateness of the proposed instruments (and would call for higher-order lags to be used as instruments).

25. In practice, Arellano and Bond (1991) suggest the following two-step procedure to obtain consistent and efficient GMM estimates. First, assume that the residuals, e_{it}, 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. Then, construct a consistent estimate of the variance-covariance matrix of the moment conditions with the residuals obtained in the first step, and use this matrix to reestimate the parameters of interest (that is, second-step estimates). Asymptotically, the second-step estimates are superior to the first-step ones insofar as efficiency is concerned.

References

Ades, A. and R. Di Tella. 1999. "Rents, Competition, and Corruption." *American Economic Review* 89(4): 982–93.

Alesina, A. and A. Drazen. 1991. "Why Are Stabilizations Delayed?" *American Economic Review* 81(5): 1170–88.

Alonso-Borrego, C. and M. Arellano. 1996. "Symmetrically Normalised Instrumental Variable Estimation Using Panel Data." Working paper 9612. Madrid: Centro de Estudios Monetarios y Financieros.

Arellano, M. and S. Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies* 58(2): 277–97.

Arellano, M. and O. Bover. 1995. "Another Look at the Instrumental Variable Estimation of Error-Components Models." *Journal of Econometrics* 68(1): 29–51.

Barro, R.J. 1991. "Economic Growth in a Cross Section of Countries." *Quarterly Journal of Economics* 106 (May, *Papers and Proceedings, 1990*): 407–43.

————. 1997. *Determinants of Economic Growth: A Cross-Country Empirical Study*. MIT Press.

Barro, R.J. and J.-W. Lee. 2000. "International Data on Educational Attainment Updates and Implications." Working paper 7911. Cambridge, Mass.: National Bureau of Economic Research.

Beck, T., A. Demirgüç-Kunt, and R. Levine. 2000. "A New Database on Financial Development and Structure." *World Bank Economic Review* 14(3): 597–605.

Beck, T., G. Clarke, A. Groff, P. Keefer and P. Walsh. 2001. "New Tools in Comparative Political Economy: The Database of Political Institutions." *World Bank Economic Review* 15(1): 165–76.

Becker, G. and C. Mulligan. 2000. "Accounting for the Growth of Government." University of Chicago. Mimeographed.

Besley, T. and R. Burgess. 2004. "Can Labor Regulation Hinder Economic Performance? Evidence from India." The Quarterly Journal of Economics 119 (1): 91-134.

Blanchard, O.J. and J. Wolfers. 2000. "The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence." *Economic Journal* 110(462): C1-33.

Blundell, R. and S. Bond. 1998. "Initial Conditions and Moment Conditions in Dynamic Panel Data Models." *Journal of Econometrics* 87(1): 115–43.

Burki, S.J. and G.E. Perry. 1997. *The Long March: A Reform Agenda for Latin America and the Caribbean in the Next Decade*. Washington: World Bank.

Djankov, S., E. Glaeser, R. La Porta, F. Lopez-de-Silanes, and A. Shleifer. 2003a. "The New Comparative Economics." *Journal of Comparative Economics* 31(4): 595–619.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer. 2002. "The Regulation of Entry." *Quarterly Journal of Economics* 117(1): 1–37.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, A. Shleifer, and J. Botero. 2003b. "The Regulation of Labor." Working paper 9756. Cambridge, Mass.: National Bureau of Economic Research.

Fernandez, R. and D. Rodrik. 1991. "Resistance to Reform: Status-Quo Bias in the Presence of Individual-Specific Uncertainty." *American Economic Review* 81(5): 1146–55.

Forteza, A. and M. Rama. 2002. "Labor Market Rigidity and the Success of Economic Reforms across More Than One Hundred Countries." Washington: World Bank. Mimeographed.

Freeman, R.B. 1993a. "Labor Market Institutions and Policies: Help or Hindrance to Economic Development?" *Proceedings of the World Bank Annual Conference on Development Economics*, 117–44. Washington: World Bank.

————. 1993b. Labor Market Institutions in Economic Development. *American Economic Review* 83(2): 403–08.

Griliches, Z. and J. Hausman. 1986. "Errors in Variables in Panel Data." *Journal of Econometrics* 31(1): 93–118.

Hall, R.E. and C.I. Jones. 1999. "Why Do Some Countries Produce So Much More Output per Worker than Others?" *Quarterly Journal of Economics* 114(1): 83–116.

Heckman, J. and C. Pagés. 2000. "The Cost of Job Security Regulation: Evidence from Latin American Labor Markets." Working paper 7773. Cambridge, Mass.: National Bureau of Economic Research.

Heston, A., R. Summers, and B. Aten. 2002. *Penn World Table Version 6.1*. University of Pennsylvania, Center for International Comparisons.

Hicks, A. 1999. *Social Democracy and Welfare Capitalism*. Cornell University Press.

Holtz-Eakin, D., W. Newey, and H. S. Rosen. 1988. "Estimating Vector Autoregressions with Panel Data." *Econometrica* 56(6):1371–95.

IDB (Inter-American Development Bank). 1997. *Latin America after a Decade of Reforms: Economic and Social Progress Report*. Washington.

ILO (International Labor Organization). 1991. "Employment Policies in the Economic Restructuring of Latin America and the Caribbean." *Tripartite Symposium on Structural Adjustment and Employment in Latin America and the Caribbean*. Document WEP 1-4-07 (Doc. 2). Geneva.

La Porta, R., F. López-de-Silanes, A. Shleifer, and R. Vishny. 1999. "The Quality of Government." *Journal of Law, Economics and Organization* 15(1): 222–79.

Loayza, N., P. Fajnzylber, and C. Calderón. 2003. "Economic Growth in Latin America and the Caribbean: Stylized Facts, Explanations, and Forecasts." Washington: World Bank. Mimeographed.

Marshall, M.G. and K. Jaggers. 2003. "Polity IV Project: Political Regime Characteristics and Transitions, 1800–2001." University of Maryland, Center for International Development and Conflict Management. Mimeographed (see www.cidcm.umd.edu/inscr/polity/index.htm).

Nickell, S. 1981. "Biases in Dynamic Models with Fixed Effects." *Econometrica* 49(6): 1417–26.

————. 1997. "Unemployment and Labor Market Rigidities: Europe versus North America." *Journal of Economic Perspectives* 11(3): 55–74.

North, D. 1981. *Growth and Structural Change in Economic History*. New York: Norton.

Olson, M. 1993. "Dictatorship, Democracy, and Development." *American Political Science Review* 87(3): 567–76.

Rama, M. 1995. "Do Labor Market Policies and Institutions Matter? The Adjustment Experience in Latin America and the Caribbean." *Labour* (special issue): S243–68.

————. 1997. "Labor Market Institutions and the Second-Best Tariff." *Scandinavian Journal of Economics* 99(2): 299–314.

Rama, M. and R. Artecona. 2002. "A Database of Labor Market Indicators across Countries." Washington: World Bank, Development Research Group.

Saint-Paul, G. 1999. "Towards a Theory of Labor Market Institutions." Universitat Pompeu Fabra, Mimeographed.

Salvanes, K.G. 1997. "Market Rigidities and Labour Market Flexibility: An International Comparison." *Scandinavian Journal of Economics* 99(2): 315–33.

Shleifer, A. and R.W. Vishny. 1998. *The Grabbing Hand: Government Pathologies and Their Cures*. Harvard University Press.

Siebert, H. 1997. "Labor Market Rigidities: At the Root of Unemployment in Europe." *Journal of Economic Perspectives* 11(3): 37–54.
Squire, L. and S. Suthiwart-Narueput. 1997. "The Impact of Labor Market Regulations." *World Bank Economic Review* 11(1): 119–44.
Standing, G. and V. Tokman, eds. 1991. *Towards Social Adjustment.* Geneva: International Labour Office.
Summers, L.H. 1988. "Some Simple Economics of Mandated Benefits." *American Economic Review* 78(2): 177–83.
White, H.L. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica* 48(4): 817–38.
World Bank. 1990. *World Development Report 1990*. Oxford University Press.