WP/18/64

IMF Working Paper

Structural Reforms and Labor Reallocation
A Cross-Country Analysis

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INTERNATIONAL MONETARY FUND

 WP/18/64

IMF Working Paper

Middle East and Central Asia Department

Structural Reforms and Labor Reallocation: A Cross-Country Analysis

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Authorized for distribution by Nicolas Blancher

March 2018

Abstract

Institutional and market frictions impose costs on the reallocation of labor from low to high productivity sectors, leading to suboptimal allocations and a loss in aggregate labor productivity. Using cross-country sector-level data, we use a dynamic panel error correction model to compute the speed of sectoral labor adjustment, as well as the contribution of structural reforms in governance, labor and product markets, trade and openness, and the financial sector to lowering the costs of labor reallocation. We find that, on average, sectoral employment shares converge towards equilibrium allocations, closing about 13.7 percent of labor productivity gaps each year; this speed of labor adjustment varies across sectors and income groups. On structural reforms, we find a significant association between more efficient labor reallocation and financial market liberalization, less bureaucracy, strong judicial and regulatory environment, trade liberalization, better education and more flexible labor and product markets.

JEL Classification Numbers: J24, L16, N10, O47

Keywords: Growth, labor productivity, structural change

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[1] The authors would like to thank Nicolas Blancher, Adnan Mazarei, Lorraine Ocampos, Noah Ndela Ntsama, Harald Finger, Romain Duval, John Bluedorn, and Jorge Alvarez for their useful comments.

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I. INTRODUCTION

Raising productivity has become a mounting challenge for economies seeking to boost growth. In a multi-sector economy, aggregate productivity is a weighted average of individual sectors' productivity; gains in aggregate productivity can therefore stem from (i) productivity gains within a sector, and (ii) a reallocation of resources, notably labor, from low to high productivity sectors (e.g. from agriculture to manufacturing and services). This latter reallocation, termed structural transformation, has been an important source of aggregate productivity growth for many developing economies (McMillan and Rodrik 2011). In addition, by directing job flows towards higher wage sectors, structural transformation can narrow labor productivity gaps between sectors within the economy, promoting inclusive growth.

Nevertheless, there can be constraints to efficient labor reallocation. For emerging and frontier economies in particular, institutional frictions—in labor, financial and product markets, trade, governance, as well as the regulatory environment— can inhibit the optimal flow of jobs across sectors. Rigidities in job flows result in inefficient allocations of employment shares, which in turn lead to lost opportunities for productivity growth. For example, low educational attainment or skills mismatches can deter agricultural workers from taking jobs in manufacturing, and excessive labor regulations can make hiring or firing costly for firms, discouraging job creation in higher productivity sectors.

This paper examines the role of such institutional frictions in sectoral labor reallocation within an economy. It documents a fresh set of stylized facts on the speed of structural transformation process, and assesses the role structural reforms can play facilitating this process. Further, through a distance-to-frontier analysis (DtF), the paper assesses the impact of structural reforms for a specific economy, Morocco.

To this end, we estimate a dynamic panel error correction model (P-ECM) of sectoral labor allocation using sector level data for a panel of 44 countries. The P-ECM model is used as the process of structural transformation is non-stationary, where value added and employment shares are cointegrated and are driven by the same underlying process of technical change (Herrendorf, Rogerson, and Valentinyi 2013, Ngai and Pissarides 2007). Such a model is able to capture these key empirical patterns while providing a measure of the level of policy distortions or institutional costs that can restrict the 'adjustment speed' of labor across sectors (Pagan 1985, Alogoskoufis and Smith 1991). These distortions cause short-term gaps in labor productivity across sectors by slowing down the efficient adjustment of employment shares in response to changes in sectoral labor productivity.

We find empirical evidence that labor allocation (measured by employment shares) across sectors follows an adjustment process, and converges towards equilibrium allocations, closing about 13.7 percent of the labor productivity gap each year. This speed of this

convergence varies across sectors as well as income groups. We also find a significant positive association between more efficient labor reallocation and structural reforms to increase financial liberalization, and decrease bureaucracy and regulatory restrictions as well as to allow for more independent judicial systems. Trade liberalization, better education, and more flexible labor and product market also facilitate faster labor reallocation. In the Morocco case study, the distance to frontier analysis reveals that the highest payoff to labor reallocation stems from reforms to reduce bureaucracy and regulations, and improve education, providing direction for reform prioritization.

The remainder of the paper proceeds as follows: Section II reviews the existing literature related to structural transformation and constraints to labor reallocation; Section III discusses data and the empirical strategy; Section IV discusses our results; Section V presents the distance to frontier analysis for Morocco; and Section VI concludes.

II. LITERATURE REVIEW

A. Labor Reallocation

Cross-country studies reveal a large gap in aggregate productivity levels between countries at the 10th and 90th income percentiles (Caselli 2005 and Erosa, Koreshkova, and Restuccia 2010), which is also observed across countries by sector. For example, the labor productivity of the US agricultural sector is five to ten times that of low-income countries, a pattern observed for services as well (Duarte and Restuccia 2010; Gollin, Lagakos, and Waugh 2014). Large gaps in labor productivity levels also persist across sectors within countries, particularly in low-income economies (McMillan and Rodrik 2011). For the most part, this is driven by the agriculture sector, which employs a large share of the population relative to its value-added.

While estimating cross-sector gaps in TFP is impractical for most economies, a second-best approach has been to rely on the marginal contribution of labor mobility across sectors (or to find TFP at the firm-level). In this vein, Temple and Wößmann (2006) find that the contribution of structural change to growth remains large when accounting for differentials in the marginal product of labor across sectors. This suggests that observed labor allocation is not always efficient. Thus, reallocating labor can help close gaps in sectoral labor productivity levels within a country and raise aggregate TFP. Recent studies have found the impact on growth can be large. For example, McMillan and Harttgen (2014) show that over the period 2000-2010, structural transformation accounted for roughly half of Africa's growth in output per worker. Krugman (1994) provides a less formal presentation of this intuition for China and the Soviet Union, arguing that significant increases in productivity levels stemmed from the large reallocation of factor inputs towards higher productivity sectors, without necessarily raising sectoral TFP and efficiency levels. Given the potential lift to growth efficient sectoral labor allocations can bring, this paper aims to estimate a measure of this allocative efficiency by estimating a 'speed' of structural transformation, in particular,

labor reallocation across sectors within an economy.

B. Frictions and Structural Reforms

Restuccia and Rogerson (2008) analyze the relationship between allocative efficiency among firms and aggregate TFP. Their theoretical framework shows how frictions lead markets to allocate a disproportionate share of resources to certain firms relative to their labor productivity—a misallocation of resources that lowers aggregate TFP. Hsieh and Klenow (2009) apply this intuition to Chinese and Indian industrial firms and find large hypothetical gains in productivity stemming from redistributing capital and labor resources such that marginal returns among firms are matched to levels observed in the US. The key contribution of these papers has been to analyze the role frictions play in misallocation of resources, and its impact on sectoral productivity.

Against this background, several papers have tried to identify the key frictions that drive labor and capital misallocations. Most of this work has focused on frictions at the firm-level. Using a large sample of Eastern European firms, Haltiwanger, Scarpetta, and Schweiger (2014) find a statistically significant role for distortionary labor market regulations in hindering efficient labor allocations. Bai, Carvalho, and Phillips (2017), assessing the role of credit frictions across the US, find a positive significant effect of banking deregulation on the efficiency of labor reallocation across firms. Trade restrictions have been shown to be another source of distortions which allow less productive firms to survive while high productivity firms suffer costly access to local markets.

In addition to capital and labor adjustment costs and financial and trade frictions, other type frictions exist that are more likely found in countries with less-developed institutions. For one, the presence of large state-owned enterprises (SOEs) can be a source of distortion. Subsidizing large and inefficient firms can drive resources away from more productive entities, as argued in Hsieh and Klenow (2009) for India. Giordano and al. (2015) study the effect of public sector efficiency on firm productivity and find that public sector inefficiency significantly reduces labor productivity in private sector firms. The spread of the informal sector can also give rise to distortions: in a study on Indian and Mexican firms, Hsieh and Klenow (2014) observe that manufacturing firms do not grow at the same speed observed in the US; Mexican and Indian firms tend to operate in the informal sector to avoid rigidities in the regulatory framework, but suffer lower productivity in return.

At the sectoral level, McMillan and Rodrik (2011) highlight several frictions: (i) customs on imported goods protect less efficient firms from international competition, preventing labor reallocation to more productive sectors of the economy; (ii) currency devaluation, which can serve as a subsidy to less productive firms; and (iii) revealed comparative advantage in natural resources or extractive sector. Ciccone and Papaioannou (2008) analyze the reallocation of labor between sectors subject to barriers to entry, documenting a significant role in manufacturing industries. Cheremukhin et al. (2017) find that barriers to entry and

monopoly powers in the non-agricultural sector largely explain the failure to industrialize the Russian economy over the Tsarist and Soviet periods. MacKinnon (1973) and Shaw (1973) argue that financial repression in low-income countries may prevent an efficient allocation of capital, and that financial liberalization, by unifying domestic capital markets, would boost financial development and economic growth. Mensah and al. (2016) shows that good governance and building institutions are key instruments in promoting structural transformation in Sub-Saharan Africa. This paper builds on the literature on sector-level frictions by developing an empirical model to quantify the impact of different types of frictions on the labor reallocation process. This exercise can help provide country authorities direction to prioritize among several available structural reform options.

III. EMPIRICAL STRATEGY

A. Model Specification and Estimation

Following Ngai and Pissarides (2007), labor allocation across sectors is governed by a long-run equilibrium relationship: (1) labor shares n are allocated to sectors according to their relative consumption expenditure $c \times p$ ($\equiv va \times p$ in equilibrium), which is in turn (2) a function of relative productivity levels and relative weights ω (i.e. preferences) of sector outputs in the aggregate consumption basket, and (3) equilibrium sectoral prices are proportional to sectoral total factor productivity (TFP),

$$\frac{n_i}{n_j} = \frac{p_i c_i}{p_j c_j} = \left(\frac{\omega_i}{\omega_j}\right)^{\varepsilon} \left(1 - \frac{a_j}{a_i}\right)^{1-\varepsilon} \tag{1}$$

$$\frac{p_i}{p_j} = \frac{a_j}{a_i} \tag{2}$$

for any two sectors i and j. Labor reallocation (i.e. structural transformation) takes place if TFP growth rates (γ_i) across sectors are not equal, and ε, the price elasticity of substitution between goods, is not equal to 1,

$$\frac{\dot{n}_i}{\dot{n}_j} = (1-\varepsilon)\frac{\gamma_j}{\gamma_i} = (1-\varepsilon)\frac{\dot{p}_i}{\dot{p}_j} \tag{3}$$

If $\varepsilon = 1$, prices adjust perfectly as output (va_i) responds to the change in TFP productivity growth rates, such that labor productivity $\eta_i \equiv \frac{p_i va_i}{\eta_j}$ does not change and no reallocation takes place.

For the case where $\varepsilon < 1$, i.e., demand is inelastic, an increase in a sector relative TFP growth rate γ leads its price level to fall significantly as demand does not rise enough in response to the increase in output. In such a case, the rise in γ results in a decline in labor productivity within the sector, prompting labor to move towards sectors with higher labor productivity (but lower γ) to restore the balance to the long run equilibrium relation in equation (2); this reallocation is a function of the gap between the sectoral TFP growth rates.

On the other hand, if $\varepsilon > 1$, demand rises in response to the fall in prices, which limits the extent of the price decline, leaving a positive net effect on labor productivity. Therefore, labor flows in the direction of the higher γ and η sectors.

Multi-sector growth models such as Ngai and Pissarides (2007) assume a frictionless world, where labor allocations and prices can fully adjust to restore optimality in response to changes in sectoral productivity. Nonetheless, as motivated earlier, frictions can slow this adjustment process, creating a wedge between the observed sectoral allocation of labor and the long-run optimal plan where labor productivity across sectors is equalized. While the long-run relationship is determined by technological change affecting relative TFP growth across sectors, in the short run, adjustment costs allow labor to reallocate only partially, creating deviations of varying magnitude and persistence from the optimal long-run allocation. Hence, the speed by which labor flows towards its optimal allocation is determined by the magnitude of the adjustment costs facing the economy through its transformation process, whether market, institutional or regulatory.

Accordingly, we model the dynamics of labor reallocation with a cointegrated Error Correction Model (ECM). The model captures the main empirical patterns of structural transformation and, therefore, allows for a direct estimation of its key structural parameters. *First*, the underlying process of structural transformation is non-stationary, meaning that sectoral labor shares and productivities maintain a secular trend over time, as observed in the data and documented in Herrendorf, Rogerson, and Valentinyi (2013) for instance. *Second*, since these trends are driven by the same underlying process of technical change, they are cointegrated. *Third*, in the short run, sector output and employment are subject to disturbances that move them away from their co-integration equilibrium values. *Fourth*, there are frictions in the adjustment process of labor, output and prices that prevent an instantaneous reversion to the trend. By preserving the cointegration relation between the variables, the ECM model allows the estimation of both long and short-term elasticities as well as the adjustment speed of labor in the economy. While the model has a long history in time series analysis, its application to panel dynamics is limited and only recent (Yasar, Nelson, and Rejesus 2006).

Let N, P, A, and Ω be the relative values to agriculture of the corresponding small letter variables (labor share, sector price level, sector TFP, and sector weight in consumption, respectively, for any sector i in country j at time t). Following Pagan (1985) and Alogoskoufis and Smith (1991), the ECM model can be interpreted as the optimal adjustment rule of an economy that faces a penalty for both deviations from equilibrium as well as rapid adjustments. In our case, $N_{i,j,t}$ tracks the equilibrium value $N^*_{i,j,t}$ through a costly correction for any deviations that occur in the short term. Taking the simple case of a minimization of a myopic quadratic cost function,

$$\Lambda_{i,j,t} = \frac{1}{2}\left(N_{i,j,t} - N^*_{i,j,t}\right)^2 + \frac{\kappa}{2}\Delta N^2_{i,j,t} \tag{4}$$

where κ is the ratio of the marginal cost of adjustment relative to the marginal cost of being away from equilibrium. The optimal allocation of labor at time *t* would have the following solution,

$$\Delta N_{i,j,t} = \lambda\left(N^*_{i,j,t} - N_{i,j,t-1}\right) = \Delta N^*_{i,j,t} - \lambda(N_{i,j,t-1} - N^*_{i,j,t-1}) \tag{5}$$

where $\lambda = \frac{1}{1+\kappa}$ is the speed of adjustment and lies between 0 and 1; the closer λ is to 1 the faster the speed of adjustment, and the lower the costs created by frictions.

From equation (1), we know that the long-run equilibrium relationship is,

$$N^*_{i,j,t} = f(P_i \times C_i) = f(P_i \times VA_i) \tag{6}$$

Baseline Model

Substituting equation (6) into (5), and taking logs yields an ECM of labor reallocation dynamics:

$$\Delta \log N_{i,j,t} = \underbrace{\beta_1 \Delta \log VA_{i,j,t} + \beta_2 \Delta \log P_{i,j,t}}_{\text{short-term dynamics}} - \lambda \underbrace{\left[\log N_{i,j,t-1} - \left(\delta_1 \log VA_{i,j,t-1} + \delta_2 P_{ijt-1} + \delta_3 X_{t-1}\right)\right]}_{\text{long-term dynamics}} + \beta_3 Z_{jt} + u_t \tag{7}$$

where β_1 and β_2 are short-term elasticities, λ is the adjustment speed, and δ_1, δ_2 and δ_3 correspond to the long-term elasticities. X_t and Z_t are vectors of control variables; X includes growth rate of GNP per capita, population growth rate, as well as constant and linear trend fixed effects (sector × country), while Z_t includes an index for the global business cycle, and a global linear trend. Equation (7) implies that labor moves every period in response to contemporaneous changes in the long run equilibrium values (short term dynamics), and to correct past deviations from the trend (long term dynamics). The latter is termed the Error term,

$$\text{Error}_{i,j,t} \equiv \log(N)_{i,j,t} - [\delta_1 \log(VA)_{i,j,t} + \delta_2 log(P)_{i,j,t-1} + \delta_2 X_t] \tag{8}$$

Role of Structural Reforms

We augment the baseline equation (7) to analyze the role of structural reforms in the labor reallocation process. We introduce an interaction term of a set of structural indicators on governance and financial reforms with the speed of adjustment. Additional control variables for reforms in trade and openness, education, product and labor regulations are also introduced, consistent with findings from the literature on sectoral productivity.

$$\Delta \log(N)_{i,j,t} = \beta_1 \Delta \log(VA)_{i,j,t} + \beta_2 \Delta \log(P)_{i,j,t} - \lambda_1 (\text{Error}_{i,j,t-1}) - \lambda_2 (\text{Error}^2_{i,j,t-1}) - \underbrace{\lambda_3 R_{j,t} \times (\text{Error}_{i,j,t-1})}_{\text{structural indicators interaction}} + \beta_3 Z_t + u_t \quad (9)$$

where Error^2 controls for the size of the productivity gap, $R_{j,t}$ is an aggregate structural indicator, and λ_3 is a measure of its contribution to the speed of adjustment. Within the setting of equation (9), adjustment speed is a function of the error size as well as the structural indicator we include,

$$\lambda = \lambda_1 + \lambda_2 \text{Error}_{i,j,t-1} + \lambda_3 R_{j,t} \quad (10)$$

Estimation

We estimate equations (7) and (9) in two stages. In the first stage, we estimate the stationary error term as well as the long run elasticities from the co-integration relationship in equation (8) using pooled OLS. In the second stage, we substitute for the error term and estimate the short-term elasticities as well as the adjustment speed parameter using fixed effect System GMM to address the endogeneity between labor shares and sectoral value added, and price levels. GMM also handles the endogeneity induced by the inclusion of the fixed effect in our dynamic setting (Nickell, 1981). In order to validate the assumptions of our estimation approach, we run several econometric tests, summarized in Appendix A.

B. Data

The dataset is compiled from several sources. Employment and value-added shares across sectors come from the Groningen Growth and Development Center 10 sectors (GGDC) database (see Table B.3). The reform and institutional measures comprise recent indices compiled by the IMF of de jure reforms and liberalization in the real and financial sectors. These measures are supplemented with variables on institutional quality and regulatory restrictiveness from the Economic Freedom indicators. Structural reform indices are compiled by the IMF (2008); these are annual indicators of implemented reforms in international trade, FDI, the financial sector (banking system and capital market). All reform indices are normalized to range between 0 and 1, with higher values indicating a greater degree of liberalization. Institutional variables include business regulations and governance as captured by the Fraser index, with higher values denoting less restrictive regulations.

IV. RESULTS

A. Baseline

The results of the baseline regression for the labor reallocation process, equation (7), are reported in Table (1). Our main interest is the estimated value of the adjustment speed λ, which is the coefficient on the deviation term. The estimated value of the coefficient multiplying the long run block is -0.137. The negative sign reflects a convergence pattern, i.e., the long run equilibrium between labor allocation and sectoral productivity, while the magnitude of the speed implies that the average economy in our sample reallocates its labor to close 13.7 percent of the distance between its current and desired long run allocation within one year. It is important to note that by adding control variables, (Country × Sector × Time Trend) fixed effects, we assume that the economy's desired labor allocation across sectors does not necessarily eliminate productivity gaps completely. While this assumption deviates to some extent from our theoretical motivation, it reflects possible nonlinearities in the real world.[2]

We control for the size of the productivity gap by including the second order effect of the error gap term; the results are reported in the last two columns of Table 1. We find that the effect of this second order term is 0.074. From equation (10), this result implies a value for λ_2 of -0.074, meaning that if the deviation of relative labor allocation from its long-term target rises by 1 percent,[3] the speed of adjustment declines by 7.4 percent, which is more than half the average speed. This result is important since it stresses the need for active policies to accelerate labor movement at earlier stages of development, where gaps are large and persistent.

Table 1. Labor Reallocation Baseline Results

Dependent Variable: $\Delta log(N_t)$

		without Gap Size		with Gap Size	
Explanatory Variables		**Est.**	***Pr*(> |z|)**	**Est.**	***Pr*(> |z|)**
Relative Value-Added Growth	$\Delta log(VA_{i,j,t})$	0.281	8.8e-38	0.278	1.014e-37
Relative Sectoral Prices Growth	$\Delta log(P_{i,j,t})$	0.0409	0.0004	0.039	0.0007
Deviation from Long Run Target	$Error_{i,j,t-1}$	-0.137	8.4e-07	-0.139	8.6e-07
(Deviation from Long Run Target)^2	$Error^2_{i,j,t-1}$	–	–	0.074	0.005
GDP Per Capita Growth Rate		0.0646	4.7E-15	0.0636	4.026e-15
Population Growth Rate	$\Delta log(Pop.)_{j,t}$	0.347	2.34e-24	0.282	4.43e-12
Global Business Cycle Index		5.69e-05	0.221	6.128e-05	0.189

[2] For instance, sectors that rely on natural resources like mining cannot expand enough to absorb the labor force.

[3] The gap error term is extracted from a log regression. An increase of 1 multiplies the gap by a factor of 2.7.

B. Baseline Across Sub-Groups

The regression analysis is performed over different sub-samples to explore differences in the role of alternative channels over groups of economies (e.g. across income levels), and economic sectors.4 Tables (2, 3) report the estimated adjustment speed in a descending order.

- **Income**. The persistence of productivity gaps appears to correlate with country income. High income countries enjoy the most dynamic labor force, allowing them to close productivity gaps across sectors with a faster speed (27.8 percent a year). However, the speed drops to almost 5.4 percent for low-income countries. It is also worth noting that this relationship between country income and its speed of adjustment is not necessarily linear. Consistent with the finding that wider productivity gaps are more persistent than smaller ones, we see that labor force mobility across sectors in high income countries are almost 5 times faster than that of low-income countries, but only 2.4 times faster than lower middle-income countries.

- **Sectors**. Looking at the reallocation speed across sectors, we see that mining and utilities are the fastest (lower speed of adjustment) in attracting labor out of agriculture. Indeed, these two sectors have higher labor productivity while requiring relatively lower skills and training compared to sectors such as manufacturing or high value-added services. They also face less structural frictions as their activities are typically carried out by state-owned enterprises or large scale private-public initiatives. While this could explain their desirability from the perspective of agricultural workers, the growth potential of these two sectors is limited, and their ability to create jobs on the long run diminishes significantly. On the other hand, economies appear to face more frictions when it comes to high value-added sectors such as manufacturing and trade and tourism where productivity gaps appear to be the most persistent.

Table 2. Labor Reallocation Speed Across Income Groups

Income Group	Estimate	Pr(>|z|)
High income	0.2784	0.0001
Upper middle income	0.2064	0.0000
Lower middle income	0.1153	0.0001
Low income	0.0545	0.0001

[4] We do not run the estimation per country since the number of observations per country is not enough to yield significant results; in addition, GMM becomes inconsistent as the cross-sectional dimension of the panel falls below the time dimension.

Table 3. Labor Reallocation Speed Across Economic Sectors

Sector	Adjustment Speed	Pr(>|z|)
Mining	0.178	0.001
Utilities	0.148	0.000
Construction	0.117	0.000
Government Services	0.115	0.000
Transport, Storage and Communication	0.108	0.000
Manufacturing	0.103	0.000
Trade, Restaurants and Hotels	0.102	0.002

C. The Role of Structural Reforms

This section assesses the extent to which structural reforms, in particular, governance and financial sector reforms, are associated with less persistent productivity gaps across sectors and facilitate labor reallocation. We use the full sample, two sub-samples based on income levels, as well as a sub-sample for the manufacturing sector.

Table (4) reports λ_3 values in equation (9), which represent the interaction coefficient of selected aggregate structural indicators with the lagged dependent variable, multiplied by -1. The estimated value of the coefficient is a measure of the extent to which variations in the structural indicator affect the adjustment speed. The indicators reported are the ones that are found to have significant effects out of our large set of structural indicators.

Financial Reforms

The IMF Structural Reform indices on financial reforms rank countries with respect to their degree of interest rate controls, privatization of the financial sector, banking supervision, size of security markets, and the degree of entry barriers within the sector. They also provide composite indices for overall banking performance, and domestic finance. Generally, we expect financial development to contribute to a more efficient movement of labor towards higher productive sectors. Economies that allow firms to smoothly access financing according to their growth potential and business opportunities ensure that financial resources are geared towards investments and therefore job creation in higher productivity sectors.

We find that productivity gaps are less persistent in countries that achieve higher levels of financial development by supporting financial depth and lending to the private sector, securities, and capital markets (Table 4). Easing interest rates controls financial repression also contributes to a more efficient allocation of labor. The effects of reforms in the financial sector appear to be more significant in high income countries (Table 6) compared to the samples of low-income countries (Table 5), and in the manufacturing sector (Table 7).

A financial development indicator can be insignificant due to either one of two factors: first,

it could be that other deeper institutional factors are more binding, making labor reallocation less responsive to financial development. Second, it may be the case that the variations within the subsample are limited, making the indicator irrelevant in explaining labor movement across sectors. For low-income countries, any of the two reasons could be valid; financial development could be of secondary importance given other more binding constraints in other sectors such as trade and openness, or it could be that a common characteristic between all low-income countries is a low level of financial development. These results do not therefore contradict studies that have argued that financial repression in developing countries may prevent an efficient allocation of capital, and that financial liberalization, by unifying domestic capital markets, would boost financial development and economic growth.

For the manufacturing sector subsample, the limited importance of financial development indicators in this case implies that other structural aspects are more relevant for boosting job creation and labor reallocation towards the manufacturing sector. While a high level of financial development is important for small and medium enterprises, job creation in the manufacturing sector could be more dependent on large capital investments that rely on external sources of financing.

Governance Reforms

Our analysis of the role of governance reforms relies on the Economic Freedom indices, which cover elements like the quality of the regulatory environment, ownership rights, the judicial system and the costs that bureaucracy imposes on businesses. These factors matter for attracting investment towards sectors such as manufacturing and services. Corruption and a weak business environment do not allow the expansion of higher productivity initiatives, which limits their ability to create jobs and draw labor out of agriculture or government jobs. In line with this, we find that improvements in areas such as ownership rights and bureaucracy costs are strongly associated with lower persistence in productivity gaps across sectors. This is consistent with other studies that find good institutions encourage productive activities rather than rent-seeking, corruption and other unproductive activities (IMF, 2003).

For low-income countries, governance indicators are insignificant because of the high correlation between economic development (and income levels) and quality of government especially at the lower tail of the distribution. Therefore, we do not expect to find enough variation in governance indicators within the group of low-income countries. However, for high income countries, we find that lower bureaucracy costs and higher central bank independence are associated with higher speed of job creation and therefore a less persistent productivity gaps across sectors. For the manufacturing sector, results suggest the importance of limiting the size of the government and public enterprises, lowering the level of credit extended to the public sector, and judicial independence.

Other Reforms

Trade and Openness

Trade and openness reforms appear to be the most effective in boosting reallocation of labor, where reforms to facilitate openness to capital flows and reduce restrictions on transactions are associated with the lowest persistence of productivity gaps. This result continues to hold across the different income groups over all sectors, as well as for the manufacturing sector (see Tables 5, 6 and 7).

Openness to international capital and goods markets could contribute through various channels to labor reallocation towards higher productivity sectors. These include knowledge sharing through FDI, the expansion of the tradable services sector, the rise of average labor productivity in the tradable sector, which gains more exposure to more profitable international markets, and technological diffusion towards the agricultural sector, which allows it to be less labor intensive. While market openness can also lead to job destruction if home industries are exposed prematurely to international competition, our empirical evidence supports a positive net effect of trade and current account liberalization on labor reallocation.

Education

We find a significant role for that education, especially for primary education. Higher dropout rates for both sexes lead to more persistent productivity gaps. The correlation between dropout rates and illiteracy could make it more difficult for labor to move out of agriculture to more sophisticated sectors.

Labor Regulations

We find that payroll taxes matter significantly for job creation and labor allocation across sectors, particularly for the lowest tax level. We also find that increasing severance payments has a negative effect on job creation and the flow of labor to higher productivity sectors.[5] High severance payments make jobs more attractive, provide a safety net for workers, and allow employees to maintain bargaining power. However, they also increase labor costs.

Product Markets

For the low-income countries sample, we find a strong and significant effect: higher rates of job flows towards higher productivity sectors is associated with low Lerner index (i.e. lower concentration of market power). This suggests that for low-income countries, allowing for a

[5] We report only the result for the OECD score for the 20-year horizon, but we also get significant results for the whole spectrum from the maximum period down to nine months.

more equalized market structure would allow larger flows of employment towards higher productivity sectors.

Table 4. The Role of Structural Indicators in Labor Reallocation Speed
(Full Sample)

Positive values of λ_3 imply that the higher the indicator value, the faster the labor reallocation speed.

Aggregate Indicator	λ_3	Pr(>|t|)	Data Source
Financial			
Interest rate controls	2.44	0.000	EF
Financial privatization	0.271	0.010	SR
Banking supervision	0.274	0.004	SR
Security markets	0.325	0.001	SR
Domestic finance (composite)	0.375	0.000	SR
Labor			
Employee payroll taxes, lowest level	-0.859	0.000	SR
Employer payroll taxes, lowest level	-0.413	0.041	SR
OECD score for severance pay after 20 years	-0.563	0.000	SR
Education			
Cumulative drop-out rate, primary	-0.4	0.002	SI
Governance and Regulations			
Restrictions on sale of real property	1.12	0.000	EF
Bureaucracy costs	1.89	0.000	EF
Inflation (most recent year)	2.02	0.029	EF
Trade and Openness			
Compliance costs	1.19	0.002	EF
Capital flows	0.228	0.025	SR
Financial restrictions on current account transactions	0.417	0.000	SR
Restrictions on capital account transactions	0.447	0.001	SR

Table 5. The Role of Structural Indicators in Labor Reallocation Speed (Low Income Countries)

Positive values of λ_3 imply that the higher the indicator value, the faster the labor reallocation speed.

Aggregate Indicator	λ_3	Pr(>|t|)	Data Source
Financial			
Bank deposits to GDP	0.326	0.038	SI
Interest rate controls	0.158	0.001	SR
Product Market			
Lerner index	-109.395	0.000	SI
Labor			
Employee payroll taxes, highest level	-0.577	0.020	SR
Employee payroll taxes, lowest level	-0.631	0.010	SR
Employer payroll taxes, highest level	-0.684	0.000	SR
Employer payroll taxes, lowest level	-0.317	0.047	SR
OECD score for severance pay after 20 years	-0.477	0.000	SR
Education			
Gross enrollment ratio, tertiary	1.326	0.000	SI
Trade and Openness			
Financial restrictions on current account transactions	0.343	0.000	SR
Restrictions on capital account transactions	0.486	0.000	SR

Table 6. The Role of Structural Indicators in Labor Reallocation Speed (High Income Countries)

Positive values of λ_3 imply that the higher the indicator value, the faster the labor reallocation speed.

Aggregate Indicator	λ_3	Pr(>|t|)	Data Source
Financial			
Bank credit to bank deposits	0.170	0.020	SI
Interest rate controls	0.276	0.003	SR
Banking supervision	0.294	0.034	SR
Security markets	0.309	0.030	SR
Financial privatization	0.350	0.030	SR
Domestic finance (composite)	0.424	0.006	SR
Labor			
Unemployment coverage	-1.650	0.038	SR
OECD score for severance pay after 20 years	-0.649	0.018	SR
Education			
Cumulative drop-out rate, primary	-0.512	0.035	SI
Governance and Regulations			
Bureaucracy costs	1.187	0.000	EF
Inflation (most recent year)			
Trade and Openness			
Financial restrictions on current account transactions	0.511	0.006	SR
Restrictions on capital account transactions	0.489	0.010	SR

Table 7. The Role of Structural Indicators in Labor Reallocation Speed (Manufacturing)

Positive values of λ_3 imply that the higher the indicator value, the faster the labor reallocation speed.

Aggregate Indicator	λ_3	Pr(>|t|)	Data Source
Financial			
Bank concentration	-0.431	0.043	SI
Labor			
Labor market regulations	1.438	0.027	EF
Governance and Regulations			
Credit to government and state-owned enterprises to GDP	-0.555	0.007	SI
Government enterprises and investment	0.780	0.032	EF
Judicial independence	0.824	0.043	EF
Trade and Openness			
Foreign ownership investment restrictions	1.763	0.016	EF
Financial restrictions on current account transactions	0.391	0.003	SR
Restrictions on capital account transactions	0.399	0.003	SR

V. Country Case Study: Morocco

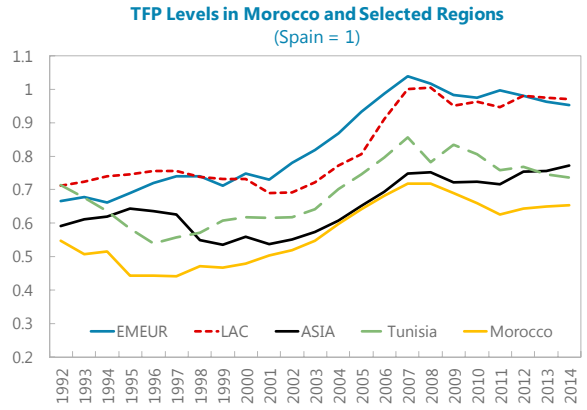
Morocco, a lower middle-income country, has registered an average 3.3 percent per capita GDP growth over the last fifteen years, and TFP levels are well below emerging market peers (Figure 1). Structural transformation has contributed only modestly to Morocco's overall productivity growth, mostly from the movement of labor away from agriculture into services (Figure 2).[6] Despite rapid urbanization, agriculture continues to employ the largest share of Morocco's workforce (Figure 2), around 37 percent in 2017, and the share of agriculture in total value added has decreased slowly.

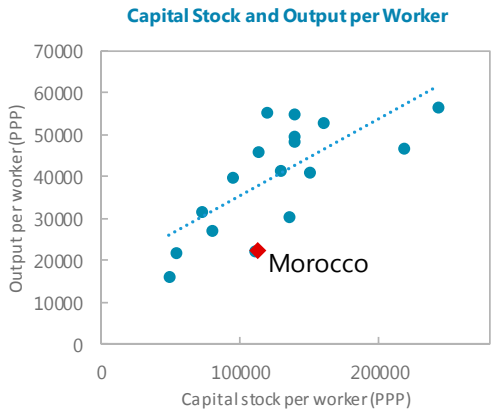
[6] To measure the contribution to labor productivity growth from the reallocation of labor across sectors of the economy, a variant of the canonical decomposition originating from Fabricant (1942) is used (also see Timmer and De Vries 2015):

$$\Delta P = \sum_i (P_i^T - P_i^0)S_i^0 + \sum_i (S_i^T - S_i^0)P_i^0 + \sum_i (P_i^T - P_i^0)(S_i^T - S_i^0)$$

where Si is the share of sector i in overall employment, Pi the labor productivity level of sector i, and superscripts 0 and T refer to initial and final period. In the equation, the change in aggregate productivity is decomposed into three terms. The first term on the right-hand side is the 'within-effect,' which is positive when the net change in labor productivity for all sectors (weighted by their employment shares) is positive. The second term measures the contribution of labor reallocation across sectors, being positive when labor moves from less to more productive sectors (structural change), our term of interest. The third term in the equation is known as the cross term or interaction term. It represents the interaction of changes in employment shares and sectoral productivity growth.

Figure 1. Morocco Growth Accounting



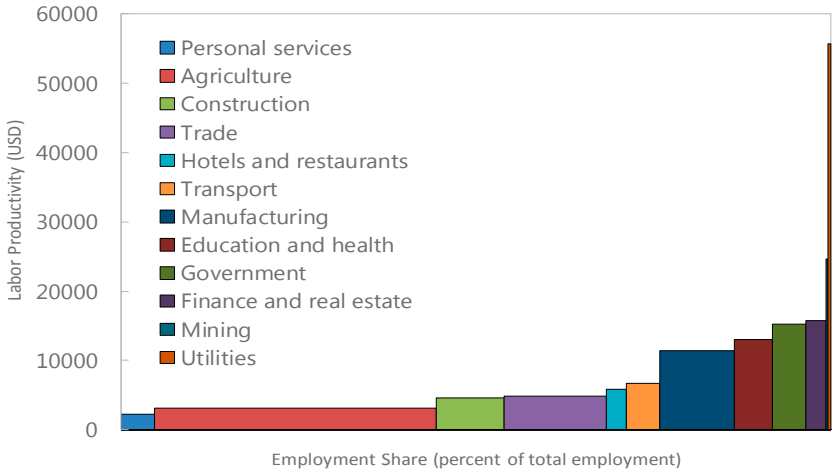


Sources: IMF WEO and Penn World Tables (9.1).
Comparator countries: Emerging Europe (EMEUR): Bulgaria, Croatia, Hungary, Poland, and Turkey; Latin America and Caribbean (LAC): Chile, Costa Rica, Dominican Republic, Panama, and Peru; Asia: Indonesia, Malaysia, and Philippines; Middle East and North Africa (right chart only): Egypt, Jordan, and Tunisia.

Several institutional frictions could prevent the efficient reallocation of labor across sectors in Morocco. Compared to many competitors, labor market regulations are particularly restrictive in Morocco, such as in the use of fixed-term contracts, firing, and working-hours flexibility. High social security contributions also help drive up labor costs and discourage formal employment, particularly for young people. Weak private sector (including SME) growth and a large degree of informality[7] have limited employment in higher productivity sectors (IMF, 2017). More than half of public investment in Morocco is channeled through state-owned enterprises (SOEs), of which 40 percent stems from only four SOEs (World Bank, 2017). Further, scores of Moroccan students at international tests are low, and dropout rates are high. Literacy rates in rural areas are particularly low, especially among women. The majority of Moroccan university students specialize in social sciences at the expense of technical fields, which leads to skills mismatches vis-à-vis higher productivity sectors.

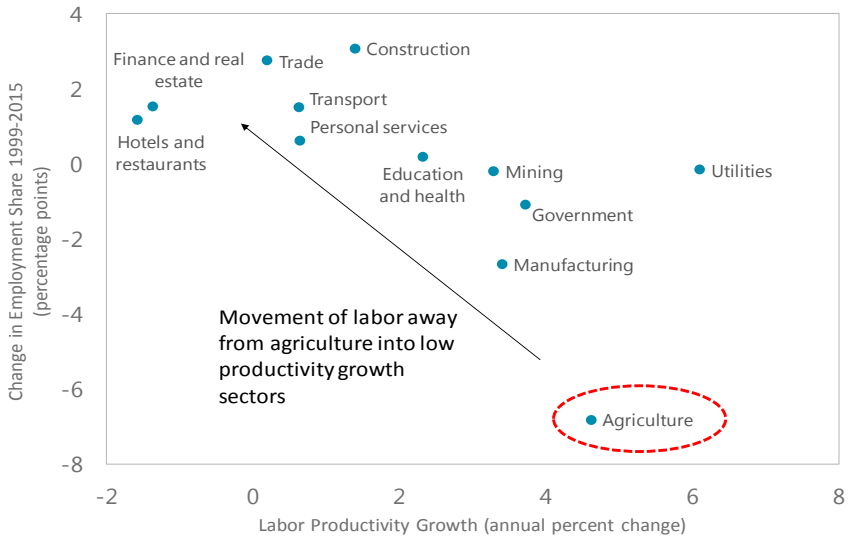
[7] The informal sector is estimated by National Statistics to be around 15 percent of total economic activity

Figure 2. Productivity Levels and Employment Shares by Sector in Morocco, 2015
(in USD)



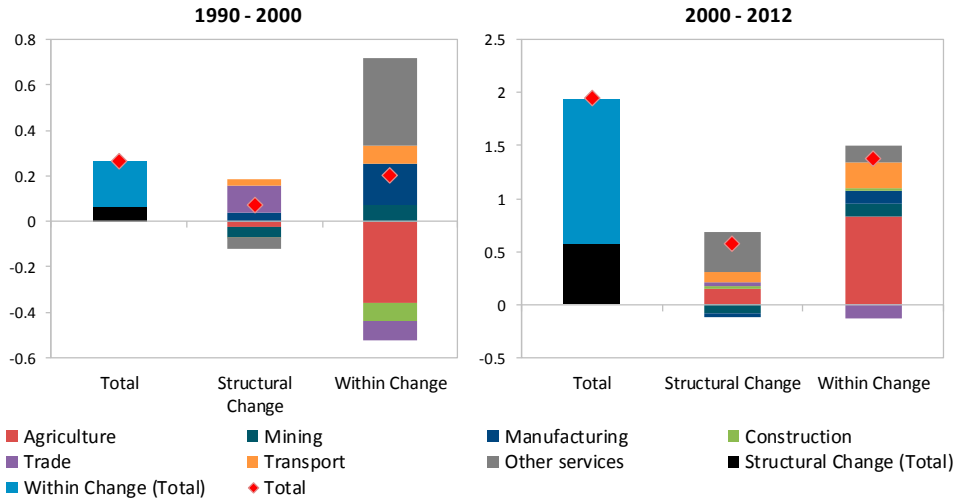
Source: Haut Commissariat au Plan.

Figure 3. Productivity Growth and Employment in Morocco, 1999–2015



Note: Value-added is nominal in the labor productivity calculation; Figure 4 presents real productivity growth.
Source: Haut Commissariat au Plan.

Figure 4. Decomposing Aggregate Productivity Growth in Morocco

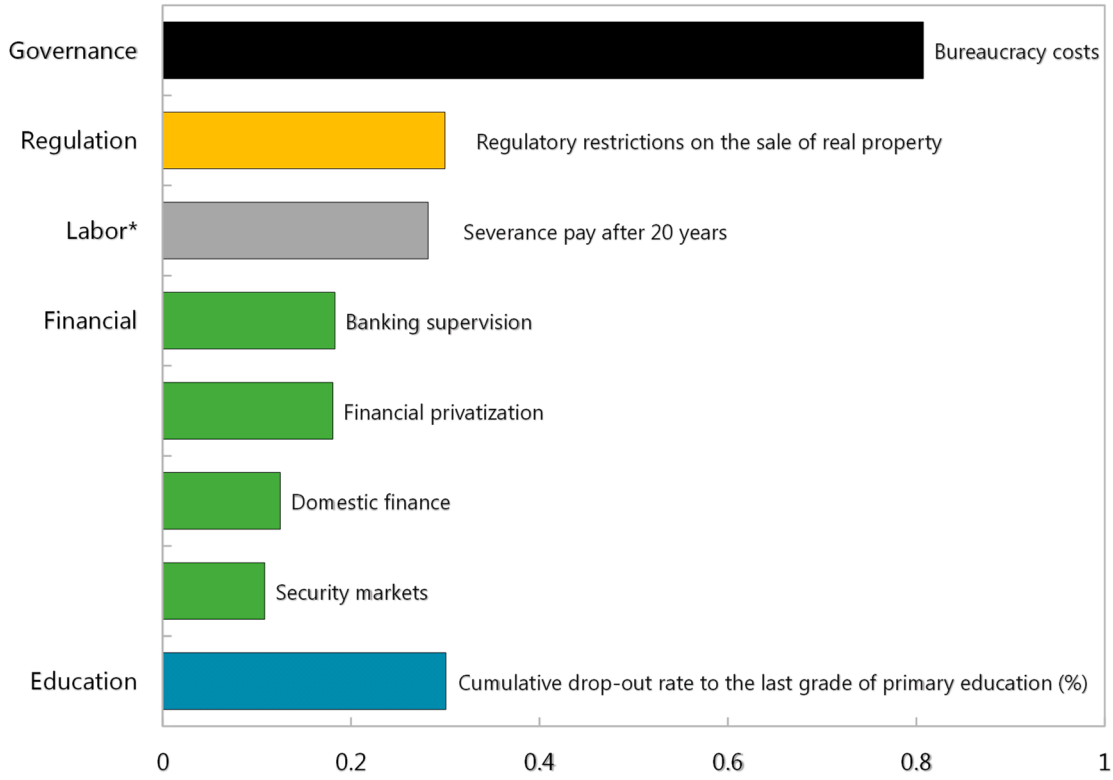


Source: GGDC Database.

Distance to Frontier Analysis

Figure 5 and Table (8) illustrates the distance between Morocco and the highest-achieving economies in the sample on several structural reform indicators, multiplied by the indicator's estimated coefficient in slowing the adjustment of labor to productivity shocks. Such an analysis helps signal potential priorities for policy reform that would support structural transformation in Morocco. These include reforms to reduce bureaucracy costs, financial market development, and reducing the primary education drop-out rate.

Figure 5. Morocco: Distance to Frontier



Frictions Estimate (higher = greater friction)
Last Reported Year: Cumulative drop-out rate, 2012; security markets, 2005; domestic finance: (composite), 2005; financial privatization, 2005; banking supervision, 2005; sale of real property, 2012; bureaucracy costs, 2012.
Note: Labor indicators are not widely available for Morocco. The results are based on Schindler and Aleksynska 2011. Source: Staff calculations

Table 8: Structural Indicators: Developments in Morocco and Best Observed

Indicator	Morocco		Best observed	Scale
	2000-12 Average	Latest		
Bureaucracy costs	5.3	5.3	10	0 to 10
Regulatory restrictions on the sale of real property	6.9	7.6	10	0 to 10
Cumulative drop-out rate to the last grade of primary education, both sexes (%)	20.4	11.2	0.8	100 to 0

VI. CONCLUSION

This paper has aimed to quantify structural transformation, measuring the speed of labor reallocation across sectors, and examined whether structural reforms can facilitate this process. To this end, we develop a panel error correction model to estimate the speed of job flows across sectors, and the contribution of governance quality and financial liberalization to the efficiency of this reallocation process. We run estimations over a full sample of all countries, two sub-samples for high income and low-income countries as well as a manufacturing subsample.

The paper's contribution to the literature is twofold. First, it documents a new set of stylized facts with regards to the structural transformation process; we find empirical evidence that labor allocation (i.e. employment shares) across sectors follow an adjustment process, converging towards equilibrium allocations, and closing around 13.7 percent of existing labor productivity gaps each year. The speed of employment share adjustment varies across sectors as well as country income groups. Second, with regards to the structural indicators and reform indices, our analysis confirms that good governance and financial development, along with trade and openness, education as well as more flexible labor and product market reforms matter for labor allocation toward higher productivity sectors. For all income levels as well as the manufacturing sector, the analysis shows that a more efficient bureaucracy, a more independent judicial system, and better regulations facilitate labor reallocation towards more productive sectors. Financial development, by expanding lending toward the private sector, and developing capital markets also allow for a more efficient allocation of labor. Other variables, such as education, trade and openness, labor and product market reforms are also found to be significant in explaining labor reallocation, consistent with previous studies in the literature.

Our results underscore the importance for policymakers of taking into account the impact of structural reforms on the sectoral allocation of labor, TFP, and growth. Further, a distance to frontier analysis can be used inform reform priorities for countries seeking to undertake structural reform. An interesting direction for future research could be to examine how the interaction and timing between various structural reforms affects labor movement across sectors, which would allow policymakers to be able to devise reform plans in a more comprehensive manner to support structural transformation in the economy.

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Appendices

A. Econometric Tests

To validate the assumptions of our estimation approach, the Error Correction Model, we run two sets of econometric tests. The first is with respect to the first non-stationary panel regression; while the pooled OLS estimator does not impose any assumptions, the GMM estimator in the second step requires that the residuals from the pooled OLS estimation are stationary. We choose to follow Pesaran (2007), who proposes a cross-sectionally augmented version of the Augmented Dickey-Fuller test (CADF). CADF augments the standard DF regressions with both cross-sectional averages of lagged levels and first differences of the individual series. Using the estimated test statistic for the individual series, a cross-sectional augmented IPS (CIPS) statistic is computed as a simple average of the individual CADF-tests. Among other candidate testing approaches (e.g. Levin, Lin, and Chu 2002, Im, Pesaran, and Shin 2003), the CIPS is more fitting to our application since it does not require a balanced panel condition, while parsimoniously controlling for possible cross-sectional dependencies. Using two lags to control for serial correlation, the CIPS test statistic is (-1.6496) which corresponds to a p-value of 0.02618; meaning, the test rejects the null hypothesis of non-stationarity.

Having extracted the stationary residuals from the cointegration relation in the first step, we run a series of GMM estimations: one for each structural reform indicator. For every estimation, we run four different tests: Sargan test, Arellano-Bond First Autocorrelation test, Arellano-Bond Second Autocorrelation test, and a Wald test.

The Sargan-Hansen test (Sargan 1958, Hansen 1982), developed for GMM estimation by Arellano and Bond 1991 uses over-identifying restrictions (OIR) to evaluate the validity of the instruments GMM uses, particularly the exogeneity assumption. It produces a chi-squared distributed test statistic and degrees of freedom equal to the number of over-identifying restrictions, under the null hypothesis that the instruments as a group are uncorrelated with the error term. For the baseline regression, the test statistic is 267.75 which corresponds to a near 1 p-value, such that we cannot reject the null hypothesis of exogenous instruments.

The First Autocorrelation test of Arellano-Bond (Arellano and Bond 1991) has the null hypothesis of no autocorrelation and is applied to first differenced residuals. Rejecting the null is important for the validity of the estimation process since it implies that the level residuals are not serially correlated, an assumption that GMM needs. We reject the null and report a test statistic of -7.738, which corresponds to a near zero p-value, given the statistic asymptotic normal distribution. On the other hand, serial correlation in the first-differenced errors at an order higher than 1 implies that the moment conditions used by System GMM are not valid. This is the hypothesis of the Second Arellano-Bond Autocorrelation test, where under the null, the second differenced residuals experience no serial correlation. We report a

statistic value of 0.7082 with a p-value of 0.478, implying that we cannot reject the null hypothesis. The last test we run is the classic Wald test for the null hypothesis that all model coefficients are zero. The null is rejected with a chi-squared statistic of 763.98 and a near zero p-value.

B. LEVEL EQUATION

In the main analysis, regression results were based on relative variables (labor shares, relative value added and relative prices). This approach allows us to normalize our observations across countries based on their relative magnitude to the agricultural sector in the respective country. The advantage is that we get more compact distributions and fewer outliers, allowing us to better compare countries and improve the regression robustness. However, the downside is that we abstract from the potential job destruction dynamics that could be taking place; that is, changes in labor shares across sectors could be driven not by job creation in high productivity sectors, but by job destruction in low productivity sectors. To account for this possibility and make sure that our main results are not sensitive to job destruction dynamics, we repeat our analysis using level data: employment level per sector, value added level per sector, and price level per sector.

The following equation mimics equation (9), but uses level data,

$$\Delta \log(EMP)_{i,j,t} = \overbrace{\beta_1 \Delta \log(VA)_{i,j,t} + \beta_2 \Delta \log(P)_{i,j,t}}^{\text{short-term dynamics}} - \overbrace{\lambda\left(\log(EMP)_{i,j,t-1}\right) - \left[\delta_1 \left(\log(VA)_{i,j,t-1} + \delta_2 X_t\right)\right]}^{\text{long-term dynamics}} + \underbrace{\beta_3 R_{j,t} \times log(EMP)_{i,j,t-1}}_{\text{structural indicators interaction}} + u_t \quad (12)$$

We report the results in table (A.1).

Table A.1: The Role of Structural Indicators in Job Creation Speed

Level Equation

Aggregate Indicator	λ_3	Pr(>|t|)	Data Source
Financial			
Bank deposits to GDP (%)	0.233	0.037	SI
Interest rate controls	0.172	0.005	SR
Banking Supervision	0.277	0.048	SR
Domestic Finance: (composite)	-0.289	0.025	SR
Labor			
Employee Payroll taxes, highest level	-0.760	0.000	SR
Employee Payroll taxes, lowest level	-0.709	0.001	SR
OECD Score for Severance Pay after 20 years	-0.518	0.003	SR
Governance and Regulations			
Regulatory quality	38.592	0.003	SI
Bureaucracy costs	1.064	0.013	EF
Inflation (most recent year)	2.177	0.019	EF
Government effectiveness	32.247	0.016	SI
Voice and accountability	34.773	0.015	SI
Trade and Openness			
Foreign banks among total banks (%)	0.955	0.001	SI
Freedom of foreigners to visit	0.775	0.048	EF
Compliance costs of importing and exporting	0.834	0.037	EF
Financial restrictions on current account transactions	0.397	0.000	SR
Restrictions on capital account transactions	0.453	0.001	SR

C. DATA APPENDIX

Table B.1: Baseline Regression Country and Time Coverage

Acronym	Country	Nominal Value Added	Sectoral Prices	Sectoral Employment
Sub-Saharan Africa				
BWA	Botswana	1964-2010	1964-2010	1964-2010
ETH	Ethiopia	1961-2010	1961-2010	1961-2010
GHA	Ghana	1960-2010	1960-2010	1960-2010
KEN	Kenya	1960-2010	1964-2010	1969-2010
MWI	Malawi	1960-2010	1966-2010	1966-2010
MUS	Mauritius	1960-2010	1970-2010	1970-2010
NGA	Nigeria	1960-2010	1960-2010	1960-2011
SEN	Senegal	1960-2010	1970-2010	1970-2010
ZAF	South Africa	1960-2010	1960-2010	1960-2010
TZA	Tanzania	1960-2010	1960-2010	1960-2010
ZMB	Zambia	1960-2010	1965-2010	1965-2010
North Africa				
EGY	Egypt	1960-2013	1960-2012	1960-2012
MOR	Morocco	1970-2012	1960-2012	1960-2012
Asia				
CHN	China	1952-2011	1952-2010	1952-2011
HKG	Hong Kong	1970-2011	1974-2011	1974-2011
IND	India	1950-2012	1950-2012	1960-2010
IDN	Indonesia	1966-2012	1960-2012	1961-2012
JPN	Japan	1953-2011	1953-2011	1953-2012
KOR	South Korea	1953-2011	1953-2011	1963-2011
MYS	Malaysia	1970-2011	1970-2011	1975-2011
PHL	Philippines	1971-2012	1971-2012	1971-2012
SGP	Singapore	1970-2012	1960-2012	1970-2011
TWN	Taiwan	1951-2012	1961-2012	1963-2012
THA	Thailand	1951-2011	1951-2011	1960-2011
Latin America				
ARG	Argentina	1950-2011	1950-2011	1950-2011
BOL	Bolivia	1958-2011	1950-2011	1950-2010
BRA	Brazil	1990-2011	1950-2011	1950-2011
CHL	Chile	1950-2011	1950-2011	1950-2012
COL	Colombia	1950-2011	1950-2011	1950-2010
CRI	Costa Rica	1950-2011	1950-2011	1950-2011
MEX	Mexico	1950-2011	1950-2011	1950-2012
PER	Peru	1950-2011	1950-2011	1960-2011
VEN	Venezuela	1960-2012	1950-2012	1950-2011
North America				
USA	United States	1947-2010	1947-2010	1950-2010
Europe				
DEW	West Germany	1968-1991	1950-1991	1950-1991
DNK	Denmark	1970-2011	1947-2009	1948-2011
ESP	Spain	1970-2011	1947-2009	1950-2011
FRA	France	1970-2011	1950-2009	1950-2011
GBR	United Kingdom	1960-2011	1949-2009	1948-2011
ITA	Italy	1970-2011	1951-2009	1951-2011
NLD	The Netherlands	1970-2011	1949-2009	1950-2011
SWE	Sweden	1970-2011	1950-2009	1950-2011

Table B.2: Sectoral Coverage

Sector name	ISIC Rev. 3.1 description
Agriculture	Agriculture, Hunting, Forestry, Fishing
Mining	Mining, Quarrying
Manufacturing	Manufacturing
Utilities	Electricity, Gas, and Water supply
Construction	Construction
Trade services	Wholesale, Retail, Hotels, Restaurants
Transport services	Transport, Storage, Communications
Business services	Financial Intermediation, Renting and Business Activities (excluding owner occupied rents)
Government services	Public Administration, Defense, Education, Health and Social work
Personal services	Other Community, Social and Personal service activities, Activities of Private Households

Table B.3: Indicators Description

Aggregate Indicator	Data Source	
Fraser Economic Freedom		
Interest rate controls	International Monetary Fund, International Financial Statistics (various issues)	Data on credit-market controls and regulations were used to construct rating intervals. Countries with interest rates determined by the market, stable monetary policy, and positive real deposit and lending rates received higher ratings. When interest rates were determined primarily by market forces and the real rates were positive, countries were given a rating of 10. When interest rates were primarily determined by the market but the real rates were sometimes slightly negative (less than 5%) or the differential between the deposit and lending rates was large (8% or more), countries received a rating of 8. When the real deposit or lending rate was persistently negative by a single-digit amount or the differential between them was regulated by the government, countries were rated at 6. When the deposit and lending rates were fixed by the government and the real rates were often negative by single-digit amounts, countries were assigned a rating of 4. When the real deposit or lending rate was persistently negative by a double-digit amount, countries received a rating of 2. A zero rating was assigned when the deposit and lending rates were fixed by the government and real rates were persistently negative by double-digit amounts or hyperinflation had virtually eliminated the credit market.
Judicial independence	World Economic Forum, *Global Competitiveness Report* (various issues)	This component is from the *Global Competitiveness Report*'s survey question: "Is the judiciary in your country independent from political influences of members of government, citizens, or firms? No—heavily influenced (= 1) or Yes—entirely independent (= 7)." The question's wording has varied slightly over the years. All variables from the *Global Competitiveness Report* were converted from the original 1-to-7 scale to a 0-to-10 scale using this formula: $EFW\text{i} = ((GCR\text{i} - 1) \ / \ 6) \times 10$.
Regulatory quality	International Monetary Fund, *International Financial Statistics* (various issues); International Institute for Management *Development, World Competitiveness Yearbook* (various issues)	Three quantitative sub-factors are equally weighted, with each counted as one-third of the component: • Credit market regulations - Ownership of banks (James R. Barth, Gerard Caprio, Jr. and Ross Levine, Bank Regulation and Supervision); Foreign bank competition (ibid.); Private sector credit (International Monetary Fund); Interest rate controls / negative real interest rates (ibid.) • Labor market regulations – (see entry) • Business Regulations - Price controls (International Institute for Management Development); Extra payments / bribes (ibid.); Administrative requirements (World Economic Forum); Bureaucracy costs (see entry); Starting a business (World Bank, Doing Business); Licensing restrictions (ibid.); Cost of tax compliance (ibid.)

Restrictions on sale of real property	World Bank, *Doing Business* (various issues)	This sub-component is based on the World Bank's *Doing Business* data on the time and monetary costs required to transfer ownership of property that includes land and a warehouse. Zero-to-10 ratings were constructed for (1) the time cost (measured in number of calendar days required to transfer ownership) and (2) the monetary cost of transferring ownership (measured as a percentage of the property value). These two ratings were then averaged to arrive at the final rating for this sub-component. The formula used to calculate the zero-to-10 ratings was: (Vmax − Vi) / (Vmax − Vmin) multiplied by 10. Vi represents the time or money cost value. The values for Vmax and Vmin were set at 265 days and 15% (1.5 standard deviations above average) and 0 days and 0%, respectively. Countries with values outside of the Vmax and Vmin range received ratings of either zero or ten accordingly.
Bureaucracy costs	World Economic Forum, *Global Competitiveness Report* (various issues)	This sub-component is based on the *Global Competitiveness Report*'s question: "Standards on product/service quality, energy and other regulations (outside environmental regulations) in your country are: (1 = Lax or nonexistent, 7 = among the world's most stringent.
Inflation (most recent year)	World Bank, *World Development Indicators* (various issues); International Monetary Fund, *International Financial Statistics* (various issues).	Generally, the Consumer Price Index was used as the measure of inflation for this component. When these data were unavailable, the GDP deflator inflation rate was used. The zero-to-10 country ratings were derived by the following formula: (Vmax − Vi) / (Vmax − Vmin) multiplied by 10. Vi represents the rate of inflation during the most recent year. The values for Vmin and Vmax were set at zero and 50%, respectively—the lower the rate of inflation, the higher the rating. Countries that achieve perfect price stability earn a rating of 10. As the inflation rate moves toward a 50% annual rate, the rating for this component moves toward zero. A zero rating is assigned to all countries with an inflation rate of 50% or more.
Compliance costs	World Bank, *Doing Business* (various issues)	This sub-component is based on the World Bank's *Doing Business* data on the time (i.e., non-money) cost of procedures required to export or import a full, 20-foot, container of dry goods that contains no hazardous or military items. Countries where it takes longer to export or import are given lower ratings. Zero-to-10 ratings were constructed for (1) the time cost to export a good (measured in number of calendar days required) and (2) the time cost to import a good (measured in number of calendar days required). These two ratings were then averaged to arrive at the final rating for this sub-component. The formula used to calculate the zero-to-10 ratings was: (Vmax − Vi) / (Vmax − Vmin) multiplied by 10. Vi represents the time cost value. The values for Vmax and Vmin were set at 62 and 80 days (1.5 standard deviations above average) and 2 days (1.5 standard deviations below average) and 0 days, respectively. Countries with values outside of the Vmax and Vmin range received ratings of either zero or ten, accordingly.

Labor market regulations	World Bank, *Doing Business* (various issues), *Global Competitiveness Report* (various issues); International Institute for Strategic Studies, *The Military Balance* (various issues)	Six quantitative sub-factors are equally weighted, with each counted as one-sixth of the component: • Ratio of minimum wage to the average value added per worker (World Bank) • Hindrance to hiring and firing workers (World Economic Forum) • Centralized collective bargaining, (World Economic Forum) • Mandated cost of hiring (World Bank) • Mandated cost of worker dismissal (World Bank) • Conscription International (Institute for Strategic Studies)
Hiring regulations and minimum wage	World Economic Forum *Global Competitiveness Report* (various issues)	This sub-component is based on the *Global Competitiveness Report*'s question: "The hiring and firing of workers is impeded by regulations (= 1) or flexibly determined by employers (= 7)." The question's wording has varied slightly over the years.
Government enterprises and investment	International Monetary Fund, *Government Finance Statistics Yearbook* (various issues); World Bank, *World Development Indicators* (various issues)	Data on the number, composition, and share of output supplied by State-Operated Enterprises (SOEs) and government investment as a share of total investment were used to construct the zero-to-10 ratings. Countries with more government enterprises and government investment received lower ratings. When there were few SOEs and government investment was generally less than 15% of total investment, countries were given a rating of 10. When there were few SOEs other than those involved in industries where economies of scale reduce the effectiveness of competition (e.g., power generation) and government investment was between 15% and 20% of the total, countries received a rating of 8. When there were, again, few SOEs other than those involved in energy and other such industries and government investment was between 20% and 25% of the total, countries were rated at 7. When SOEs were present in the energy, transportation, and communication sectors of the economy and government investment was between 25% and 30% of the total, countries were assigned a rating of 6. When a substantial number of SOEs operated in many sectors, including manufacturing, and government investment was generally between 30% and 40% of the total, countries received a rating of 4. When numerous SOEs operated in many sectors, including retail sales, and government investment was between 40% and 50% of the total, countries were rated at 2. A rating of zero was assigned when the economy was dominated by SOEs and government investment exceeded 50% of total investment.
Extra payments, bribes, favoritism	World Economic Forum *Global Competitiveness Report* (various issues)	This sub-component is based on the *Global Competitiveness Report*'s question: "In your industry, how commonly would you estimate that firms make undocumented extra payments or bribes connected with the following: A—Import and export permits; B—Connection to public utilities (e.g., telephone or electricity); C—Annual tax payments; D—Awarding of public contracts (investment projects); E—Getting favorable judicial decisions. Common (= 1) Never occur (= 7)." The question's wording has varied slightly over the years.

Size of government	International Monetary Fund, *Government Finance Statistics Yearbook (various years);* PricewaterhouseCoopers, *Worldwide Tax Summaries Online*	Four quantitative sub-factors are equally weighted, with each counted as one-fourth of the component: • General government consumption spending as a percentage of total consumption (International Monetary Fund) • Transfers and subsidies as a percentage of GDP (ibid.) • Government enterprises and investment (ibid.) • Top marginal tax rate (PricewaterhouseCoopers)
Foreign ownership investment restrictions	World Economic Forum, *Global Competitiveness Report* (various issues)	This sub-component is based on the following two questions in the *Global Competitiveness Report*: "Foreign ownership of companies in your country is rare, limited to minority stakes and often prohibited in key sectors (= 1) or prevalent and encouraged (= 7)"; and "In your country, rules governing foreign direct investment are damaging and discourage foreign direct investment (= 1) or beneficial and encourage foreign direct investment (= 7)."
World Bank Development Indicators		
Cumulative drop-out rate, primary	UNESCO Institute for Statistics	Proportion of pupils from a cohort enrolled in a given grade at a given school year who are no longer enrolled in the following school year. Dropout rate by grade is calculated by subtracting the sum of promotion rate and repetition rate from 100. For cumulative dropout rate in primary education, it is calculated by subtracting the survival rate from 100 at a given grade. Like other pupil-flow rates (promotion and repetition rates), the dropout rate is derived by analyzing data on enrolment and repeaters by grade for two consecutive years.
Gross enrollment ratio, tertiary	UNESCO Institute for Statistics	Gross enrollment ratio for tertiary school is calculated by dividing the number of students enrolled in tertiary education regardless of age by the population of the age group which officially corresponds to tertiary education, and multiplying by 100. All the data are mapped to the International Standard Classification of Education (ISCED) to ensure the comparability of education programs at the international level.
Lerner index	Bankscope	A measure of market power in the banking market. It is defined as the difference between output prices and marginal costs (relative to prices). Prices are calculated as total bank revenue over assets, whereas marginal costs are obtained from an estimated translog cost function with respect to output. Higher values of the Lerner index indicate less bank competition. Lerner Index estimations follow the methodology described in Demirgüç-Kunt and Martínez Pería (2010).
Bank concentration	Bankscope	Calculated as the sum of assets for three largest banks divided by the sum of assets for all banks in Bankscope for a given country. Only reported if number of banks is 3 or more. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations and other assets. Calculated from underlying bank-by-bank unconsolidated data.
Bank credit to bank deposits	International Monetary Fund, *International Financial Statistics*	The financial resources provided to the private sector by domestic money banks as a share of total deposits. Domestic money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. Total deposits include demand, time and saving deposits in deposit money banks.

Credit to government and state-owned enterprises to GDP (%)	International Monetary Fund, *International Financial Statistics*	Ratio between credit by domestic money banks to the government and state-owned enterprises and GDP.
Bank deposits to GDP (%)	International Monetary Fund, *International Financial Statistics*	The total value of demand, time and saving deposits at domestic deposit money banks as a share of GDP. Deposit money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. Calculated using the following deflation method: $\{(0.5)*[F_t/P\_e_t + F_{t-1}/P\_e_{t-1}]\}/[GDP_t/P\_a_t]$ where F is demand and time and saving deposits, P_e is end-of period CPI, and P_a is average annual CPI.
IMF Structural Reforms Database		
Capital flows		**Fully open = [2], Partially Restricted= [1], Fully Restricted= [0]** • Does a country set restrictions on capital inflow? (0/1) Coded as 0 when significant restrictions exist on capital inflows. Coded as 1 when banks are allowed to borrow from abroad freely without restrictions and there are no tight restrictions on other capital inflows. • Does a country set restrictions on capital outflow? (0/1) Coded as 0 when restrictions exist on capital outflows. Coded as 1 when capital outflows are allowed to flow freely or with minimal approval restrictions.
Financial privatization		Privatization of banks is coded as follows: **Fully Liberalized = [3]** if no state banks exist or state-owned banks do not consist of any significant portion of banks and/or the percentage of public bank assets is less than 10 percent. **Largely Liberalized = [2]** if most banks are privately owned and/or the percentage of public bank assets is from 10 percent to 25 percent. **Partially Repressed = [1]** if many banks are privately owned but major banks are still state-owned and/or the percentage of public bank assets is 25–50 percent. **Fully Repressed = [0]** if major banks are all-state owned banks and/or the percentage of public bank assets is from 50 percent to 100 percent.

Banking supervision	Enhancement of banking supervision over the banking sector is coded by summing up these four dimensions, which are assigned a degree of reform as follows. **Highly Regulated = [6], Largely Regulated = [4-5], Less Regulated = [2-3], Not Regulated = [0-1]** • Has a country adopted a capital adequacy ratio based on the Basle standard? (0/1) Coded as 0 if the Basle risk-weighted capital adequacy ratio is not implemented. Date of implementation is important, in terms of passing legislation to enforce the Basle requirement of 8 percent CAR. Coded as 1 when Basle CAR is in force. Prior to 1993, when the Basle regulations were not in place internationally, this measure takes the value of 0. • Is the banking supervisory agency independent from executives' influence? (0/1/2) Coded as 0 when the banking supervisory agency does not have an adequate legal framework to promptly intervene in banks' activities; and/or when there is the lack of legal framework for the independence of the supervisory agency such as the appointment and removal of the head of the banking supervisory agency; or the ultimate jurisdiction of the banking supervision is under the MOF; or when a frequent turnover of the head of the supervisory agency is experienced. Coded as 1 when the objective supervisory agency is clearly defined and an adequate legal framework to resolve banking problems is provided but potential problems remain concerning the independence of the banking supervisory agency; or although clear legal objectives and legal independence are observed, the adequate legal framework for resolving problems is not well articulated. Coded as 2 when a legal framework for the objectives and the resolution of troubled banks is set up and if the banking supervisory agency is legally independent from the executive branch and actually not interfered with by the executive branch. • Does a banking supervisory agency conduct effective supervisions through on-site and off-site examinations? (0/1/2) Coded as 0 when a country has no legal framework and practices of on-site and off-site examinations is not provided or when no on-site and off-site examinations are conducted. Coded as 1 when the legal framework of on-site and off-site examinations is set up and the banking supervision agency have conducted examinations but in an ineffective or insufficient manner. Coded as 2 when the banking supervisory agency conducts effective and sophisticated examinations. • Does a country's banking supervisory agency cover all financial institutions without exception? (0/1) Coded as 1 when all banks are under supervision by supervisory agencies without exception. Coded as 0 if some kinds of financial institutions are not exclusively supervised by the banking supervisory or are excluded from banking supervisory agency oversights.

Security markets	Different policies governments use to either restrict or encourage development of securities markets. These include the auctioning of government securities, establishment of debt and equity markets, and policies to encourage development of these markets, such as tax incentives or development of depository and settlement systems. Also included here are policies on the openness of securities markets to foreign investors. The index is calculated by adding the two following sub-dimensions: **Fully Liberalized = [4 or 5], Largely Liberalized = [3], Partially Repressed = [1, 2], and Fully Repressed = [0]** • Has a country taken measures to develop securities markets? (0/1/2/3) Coded as 0 if a securities market does not exist. Coded as 1 when a securities market is starting to form with the introduction of auctioning of T-bills or the establishment of a security commission. Coded as 2 when further measures have been taken to develop securities markets (tax exemptions, introduction of medium and long-term government bonds in order to build the benchmark of a yield curve, policies to develop corporate bond and equity markets, or the introduction of a primary dealer system to develop government security markets). Coded as 3 when further policy measures have been taken to develop derivative markets or to broaden the institutional investor base by deregulating portfolio investments and pension funds, or completing the full deregulation of stock exchanges. • Is a country's equity market open to foreign investors? (0/1/2) Coded as 0 if no foreign equity ownership is allowed. Coded as 1 when foreign equity ownership is allowed but there is less than 50 percent foreign ownership. Coded as 2 when a majority equity share of foreign ownership is allowed.
Domestic finance (composite)	Synthetic aggregate combining indicators for banking supervision, directed credit/reserve requirements, entry-barriers/pro-competition measures, privatization, security markets, and interest rate controls.
Restrictions on capital account transactions	These restrictions include multiple exchange rates for various transactions, as well as transactions taxes or outright restrictions on inflows and/or outflows specifically regarding financial credits. The composite indicator is constructed from three sub-components. By adding these three items: **Fully Liberalized = [3], Largely Liberalized = [2], Partially Repressed = [1], Fully Repressed= [0]** • Is the exchange rate system unified? (0/1) Coded as 0 when a special exchange rate regime for either capital or current account transactions exists. Coded as 1 when the exchange rate system is unified. • Does a country set restrictions on capital inflow? (0/1) Coded as 0 when significant restrictions exist on capital inflows. Coded as 1 when banks are allowed to borrow from abroad freely without restrictions and there are no tight restrictions on other capital inflows. • Does a country set restrictions on capital outflow? (0/1) Coded as 0 when restrictions exist on capital outflows. Coded as 1 when capital outflows are allowed to flow freely or with minimal approval restrictions.

<table>
<tr><td>Interest rate controls</td><td></td><td>In the most restrictive case the government specifies both lending and

deposit rates by fiat, or equivalently, sets ceilings or floors tight enough to be binding in most circumstances. An intermediate regime allows interest rates to fluctuate within a band. Interest rates are considered fully liberalized when all ceilings, floors or bands are eliminated.

Deposit rates and lending rates are separately considered, in coding this measure, in order to look at the type of regulations for each set of rates. They are coded as being government set or subject to a binding ceiling (code=0), fluctuating within a band (code=1) or freely floating (code=2). The coding is based on the following description:

FL=4 Fully Liberalized if both deposit interest rates and lending interest rates are determined at market rates.

LL = 3 Largely Liberalized when either deposit rates or lending rates are freed but the other rates are subject to band or only a part of interest rates are determined at market rates.

PR= 2/1 Partially Repressed when either deposit rates or lending rates are freed but the other interest rates are set by government or subject to ceiling/floor; or both deposit rates and lending rates are subject to band or partially liberalized; or either deposit rates or lending rates are subject to band or partially liberalized.

FR= 0 Fully Repressed when both deposit rates and lending rates are set by the government or subject to ceiling/floor.</td></tr>
<tr><td>Employee payroll taxes</td><td>OECD</td><td>Payroll taxes consist of taxes and social security contributions payable by workers assessed either as a proportion of the wages and salaries paid or as a fixed amount per person employed.</td></tr>
<tr><td>Employer payroll taxes</td><td>OECD</td><td>Payroll taxes consist of taxes and social security contributions payable by enterprises assessed either as a proportion of the wages and salaries paid or as a fixed amount per person employed.</td></tr>
<tr><td>OECD score for severance pay after 20 years</td><td>Labor Market Regulations in Low-, Middle- and High-Income Countries: A New Panel Database</td><td>Severance pay at 20 years tenure in months of pay:
<table><tr><td>OECD Score</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>Months of pay</td><td>0</td><td>≤ 3</td><td>≤ 6</td><td>≤ 10</td><td>≤ 12</td><td>≤ 18</td><td>> 18</td></tr></table></td></tr>
<tr><td>Unemployment coverage</td><td>Labor Market Regulations in Low-, Middle- and High-Income Countries: A New Panel Database</td><td>The number of UI benefit recipients is calculated as the number of individuals who, at a given point in time, receive UI benefits. Information on the number of UI benefit recipients come from the following sources: national statistics offices and national statistical yearbooks, ministries of labor, social protection, and employment, social security administrations, labor funds, other bodies who administer the programs, ministries of finance and economy, national central banks, local research institutes, and national libraries wherever available.</td></tr>
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