

IMF Working Paper

Labor Market Flexibility and Unemployment: New Empirical Evidence of Static and Dynamic Effects

*Lorenzo E. Bernal-Verdugo, Davide Furceri, and
Dominique Guillaume*

IMF Working Paper

Middle East and Central Asia Department

**Labor Market Flexibility and Unemployment:
New Empirical Evidence of Static and Dynamic Effects***

Prepared by Lorenzo E. Bernal-Verdugo,¹ Davide Furceri,² and Dominique Guillaume²

Authorized for distribution by Ron van Rooden

March 2012

This Working Paper should not be reported as representing the views of the IMF.

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

Abstract

The aim of this paper is to analyze the relationship between labor market flexibility and unemployment outcomes. Using a panel of 97 countries from 1985 to 2008, the results of the paper suggest that improvements in labor market flexibility have a statistically and significant negative impact on unemployment outcomes (over unemployment, youth unemployment and long-term unemployment). Among the different labor market flexibility indicators analyzed, hiring and firing regulations and hiring costs are found to have the strongest effect.

JEL Classification Numbers: E29, J60, E32, D7.

Keywords: Labor market; flexibility, unemployment; reforms; financial crises

Author's E-Mail Address: lebernal@uchicago.edu, dfurceri@imf.org, dguillaume@imf.org.

* The authors would like to thank Joël Toujas-Bernaté, Paul Estrin, and other participants in the Conference on *Crises, Institutions and Labor Market Performance: Comparing Evidence and Policies* (Perugia, November 10, 2011), the IMF-MCD Department Seminars, and the World Bank MNA Seminars for useful comments and discussions, and Kia Penso for excellent editorial assistance.

¹ University of Chicago, Department of Economics, and Bank of Mexico.

² International Monetary Fund.

I. Introduction	3
II. Data and Descriptive Statistics.....	4
III. Empirical Methodology and Results.....	5
A. Static Relationship Between Unemployment and Labor Market Institutions.....	6
B. Dynamic Relationship Between Unemployment and Labor Market Institutions ...	10
IV. Conclusions.....	12
References.....	24
Annex I: Data Description	26
Figure 1. Cumulative Effect of Labor Market Flexibility on Unemployment Over Time	13
Tables	
1. Summary Statistics for Labor Market Outcomes and Flexibility Indicators	14
2. Correlation Matrix of Labor Market Outcomes and Flexibility Indicators	14
3. The Static Effect of Labor Market Flexibility on Unemployment	15
4. The Static Effect of Labor Market Flexibility on Unemployment—OECD Countries ...	16
5. The Static Effect of Labor Market Flexibility on Unemployment— Non-OECD Countries.....	17
6. The Static Effect of Labor Market Flexibility Indicators on Unemployment	18
7. The Static Effect of Labor Market Flexibility Indicators on Youth Unemployment	19
8. The Static Effect of Labor Market Flexibility Indicators on Long-Term Unemployment	20
9. The Dynamic Effect of Labor Market Flexibility on Unemployment.....	21
10. The Dynamic Effect of Labor Market Flexibility on Different Unemployment Outcomes	22
11. The Dynamic Effect of Labor Market Flexibility on Different Unemployment Outcomes	23

I. INTRODUCTION

Economic theory and previous empirical studies have identified a number of policy and institutional determinants of unemployment, including unemployment benefits, tax wedges, the structure of collective bargaining, employment protection legislation, minimum wages and hiring costs. Overall, previous empirical evidence has in general concluded that more rigid labor market institutions may obstruct job creation and tend to be associated with higher levels of unemployment.³

However, almost of all these studies have focused on a subset of OECD industrial countries and, to the best of our knowledge, only two papers have analyzed the effect of labor market institutions for a broad sample of advanced and emerging economies: (i) Botero et al., (2004) analyze the effect of labor market regulations (employment laws, collective bargaining laws, and social security laws) on unemployment for a cross-country sample of 85 countries; (ii) Feldmann (2009) assesses the impact of labor market flexibility indicators (like those used in this paper) for a panel of 73 economies over the period 2000-03.

Our paper contributes to the empirical literature on the effects of labor market institutions on unemployment in three respects. First, it uses a broad sample of data for 97 countries over the period 1980-2008. This enables us to control for unobserved country-specific characteristics that may affect labor market performance and to assess how the effect of labor market institutions has evolved over time. Second, while most of the empirical research has focused on single indicators of labor market institutions, this paper mainly focuses on a composite indicator of labor market flexibility (see Feldman 2009 and Bernal-Verdugo et al., 2011 for a similar approach). This is important given the inherently complex nature of labor market regulation and the evidence that improvements in labor market efficiency are likely to require reforms in more than one area of the labor market (Bassanini and Duval, 2009). Third, the paper analyzes the dynamic effect of labor market institutions on unemployment outcomes, controlling also for possible endogeneity and reverse causality from unemployment to labor market institutions. Indeed, as shown by previous empirical evidence, labor market reforms aimed at improving labor market flexibility tend to occur in periods of weak economic performance and high level of unemployment (Duval, 2008; Bernal-Verdugo et al., 2011), which implies that OLS estimates of the effect of labor market institutions on unemployment may be biased downward.

³ For example, Nickel (1998), Elmeskov et al. (1998) and Nunziata (2002) find robust evidence that the level and the duration of unemployment benefits increase the level of unemployment. Belot and Van Ours (2004) and Nickell (1997) find that high labor taxes tend to increase unemployment rates. Botero et al., (2004) find that more rigid employment laws are associated with high unemployment, especially for the young. See Bassanini and Duval (2006) for a detailed review.

Overall, the results suggest that policies aimed at increasing labor market flexibility may have an important effect in reducing unemployment. These policies, however, have to be properly designed to also improve the quality of employment and to minimize possible negative short-term effects, not investigated here, on inequality and job destruction.

The rest of the paper is organized as follows: in Section II we discuss the data and the variables used in our estimations. Section III outlines the empirical methodology and describes the results. Finally, Section IV summarizes the main findings and discusses some potential policy implications.

II. DATA AND DESCRIPTIVE STATISTICS

For this paper we assemble a panel of data for 97 countries from 1985 to 2008.⁴ Data for labor market flexibility are taken from the Fraser Institute's Economic Freedom of the World (EFW) database. The database provides a composite measure of labor market flexibility and indicators of labor market flexibility in six policy areas: (i) minimum wage (*M*); (ii) hiring and firing regulation (*H*); (iii) centralized collective wage bargaining (*C*); (iv) mandated cost of hiring (*MCH*); (v) mandated cost of work dismissal (*MCW*); and (vi) conscription (*CO*).

In detail, (i) Minimum wages (*area5bi*) is based on the World Bank's Difficulty of Hiring and gives lower ratings to countries with a higher minimum wage; (ii) Hiring and firing regulations (*area5bii*) is based on the World Economic Forum's Global Competitiveness Report and gives a lower rating to countries in which the free hiring and firing of workers is impeded by regulation; (iii) Centralized collective bargaining (*area5biii*), based also on the WEF's Global Competitiveness Report, assigns ratings based on the centralization of the wage bargaining process, which are higher for countries with a more decentralized bargaining process; (iv) Mandated cost of hiring (*area5biv*) is based on the World Bank's Doing Business data on the cost of all social security and payroll taxes and the cost of other mandated benefits including those for retirement, sickness, health care, maternity leave, family allowance, and paid vacations and holidays associated with hiring an employee; (v) Mandated cost of worker dismissal (*area5bv*) is also based on the WB's Doing Business report, and rates countries according to the cost of the requirements for advance notice, severance payments, and penalties due when dismissing a redundant worker; (vi) Conscription (*area5bvi*), using data from the International Institute for Strategic Studies' "The Military Balance," and the War Resisters International's "World Survey of Conscription and Conscientious Objection to Military Service," rates countries based on the

⁴ Data for labor market flexibility are available for 140 countries over the period 1980–2008. In particular, data for labor market flexibility are available every five years from 1980 to 2000, and annually over the period 2001–08. Limited data availability for unemployment and our measure of output gap shortens the sample to 97 countries over the period 1985–2008. See the Annex for a list of countries and years included in the sample.

use and duration of military conscription, with the highest rating given to countries without military conscription.

All indicators are standardized on a 0–10 scale, with higher value of the indicator representing a more flexible labor market.

The sources of the data for the other variables used in the empirical analysis are the IMF's World Economic Outlook (WEO), the World Bank's World Development Indicators (WDI), the Penn World Table version 7.0 by Heston et al. (2011) and the database constructed by Laeven and Valencia (2010) on the occurrence of financial crises. The full list of variables, definitions and sources is provided in the Annex.

Table 1 presents descriptive statistics for the labor market flexibility indicators and the unemployment outcomes analyzed in the paper. For the composite labor market flexibility indicator we have a total of 1214 observations, ranging from a minimum of 1.8 to a maximum of 9.5. Among the unemployment outcomes, we can notice that unemployment is mostly concentrated among young people aged between 15 and 24.

Table 2 presents the correlation between unemployment outcomes and the labor market flexibility indicators. Not surprisingly, both unemployment outcomes and labor market flexibility indicators are positively correlated *within* each group. An exception is the statistically significant negative correlation between hiring and firing regulation and conscription. Among the unemployment outcomes the strongest correlation is between unemployment and long-term unemployment. Among the sub-components of the composite index of labor market flexibility, the strongest correlation is between hiring and firing regulation and the centralized wage bargaining. By construction, the composite indicator is strongly correlated with each of its sub-components. More interestingly, the correlation *between* unemployment outcomes and labor market flexibility indicators is in most of the cases negative and statistically significant. In particular, the composite labor market flexibility indicator is negatively correlated to all unemployment outcomes. Among the sub-indicators, those that tend to display a stronger negative correlation with the unemployment outcomes are, on average, the minimum wage and the hiring and firing regulation indicator. The strongest negative correlation is found between mandated hiring costs and youth unemployment.

III. EMPIRICAL METHODOLOGY AND RESULTS

In this section we discuss the empirical methodology used to analyze the relationship between labor market flexibility and unemployment outcomes, and we present the results of the econometric estimations under alternative model specifications.

We divide our empirical analysis in two parts. First, we estimate a static model specification to test for the hypothesis that the labor market regulations have a first order effect on unemployment outcomes. Second, we estimate a dynamic model specification to test whether labor market flexibility affects the change in unemployment over time. Our findings indicate that, after controlling for other macroeconomic and demographic variables, increases in labor market flexibility have a statistically significant negative impact both on the level and the change of unemployment outcomes for total, youth, and long-term unemployment. Static Relationship Between Unemployment and Labor Market Institutions

A. Static Relationship Between Unemployment and Labor Market Institutions

In order to assess the relationship between labor market flexibility and the level of unemployment we employ a standard static reduced-form specification in which unemployment is regressed against our measure of labor market flexibility and a set of macroeconomic and demographic variables as controls:

$$U_{it} = \alpha_i + \beta L_{it} + \gamma' X_{it} + \varepsilon_{it} \quad (1)$$

where U_{it} is the unemployment rate (total, youth, or long-term unemployment) for country i at time t , α_i represents country fixed effects that capture unobserved country-specific determinants of unemployment, $X_{i,t}$ is a vector of control variables including a measure of the output gap (*gap*) to control for business cycle fluctuations, the size of government (*incg*, proxied by the log of the ratio of government consumption to GDP), the degree of trade openness (*lnopen*, measured as the log of the ratio of total exports and imports to GDP), the rate of urbanization (*lnurbpop*), population density (*lnpopdens*), a crisis dummy (*crisis*) which takes value equal to 1 for the occurrence of a financial crisis and zero otherwise, and the lagged level of unemployment ($U_{i,t-1}$).

The main results regarding the relationship between unemployment and labor market institutions are shown in Table 3, which displays the estimates for the static specifications of the econometric model. First and foremost, it should be noted that, in all of the specifications, we find that improvements in the flexibility of labor market regulations have a statistically significant negative effect on the total unemployment rate. That is, increasing the rating of the composite labor market index by one standard deviation decreases, on average, the total unemployment rate by about 0.3–1.3 percentage points. In particular, the results for our baseline specification (first column), which includes only country fixed effects and our measure of the output gap as controls, suggest that a one standard deviation increase in the

labor market index is associated with a 0.9 percentage point decrease in the unemployment rate.⁵ The effect is stronger when we consider data averaged over 5-year periods, as a 1 standard deviation increase in the labor market index decreases the unemployment rate by 1.3 percentage points (column IX), which implicitly suggests that the effects tend to be larger over the medium term. These results are in line with those obtained by previous studies (such as Scarpetta 1996, Nickell 1997, Blanchard and Wolfers 2000, and Bassanini and Duval 2006), who conclude that labor market institutions are key determinants of unemployment outcomes.⁶

Among the control variables, apart from the output gap, we find that government size has a significant effect on unemployment outcomes (column II). This result is consistent with previous empirical evidence suggesting that countries characterized by a larger government size and a larger share of public employment tend to have higher unemployment rates (e.g., Feldman, 2006).

Also important to note is the high persistence of unemployment rates. According to our estimation results, a one percentage point increase in previous unemployment translates into a 0.83 percentage point higher unemployment in the current period (0.82 when government size is included), which can be dubbed as a “momentum” effect of pre-existing unemployment rate levels (columns VII and VIII).

In order to assess whether the results are robust across different country groups characterized by different levels of economic development and to compare our results with previous studies, which usually focus on OECD countries, we repeat the estimation exercise for two mutually exclusive groups of countries, namely for OECD and non-OECD countries, with the corresponding results shown in Tables 4 and 5, respectively. Adding to the robustness of our previous results, we find that the effect of labor market flexibility on the unemployment rate is again very strong and negative for both groups of countries, with non-OECD countries displaying larger effects. In particular, looking at the baseline specification (columns 1 of Tables 4 and 5) we can observe that while a one standard deviation increase in the labor market institutions index is associated with a 0.96 percentage point decrease in unemployment for non-OECD countries, the effect in OECD countries is about 0.86 percentage points. Also in line with the previous results is the high persistence of unemployment rates (columns VII and VIII of Tables 4 and 5). Noteworthy, the OECD

⁵ It is interesting to note that this specification is able to capture most of the time and cross-country variation of unemployment (the associated R^2 is about 0.8).

⁶ For example, Bassanini and Duval (2006) conclude that changes in labor market institutions seem to explain nearly two thirds of non-cyclical unemployment changes in OECD countries.

countries display a slightly higher degree of persistence than non-OECD countries. However, both the effect of the labor market flexibility on the unemployment rate and the persistence of unemployment are not statistically different between OECD and non-OECD countries. In fact, the 95 percent confidence band associated with the point estimates for OECD countries overlaps the 95 percent confidence band associated with the point estimates for non-OECD countries.

Successively, in order to assess whether the results are robust over time, equation (1) has been recursively re-estimated over the period 1980–2008⁷. The results obtained with this exercise are shown in Figure 1 and clearly suggest that the effect of labor market flexibility on the level of unemployment has increased over time. In particular, the effect of labor market flexibility on unemployment starts to become sizeable and statistically significant only after 2002. However, this finding has to be interpreted with caution because the number of panels over time is highly unbalanced, with a significantly higher number of observations after 2000.

In addition to total unemployment, we also consider the effect of labor market institutions on alternative types of unemployment. Tables 7 and 8 display the estimation results when youth and long-term unemployment, respectively, are used as dependent variables. In both cases, we obtain results that are consistent with those for overall unemployment, specifically that labor market flexibility has a strong and negative effect on both types of unemployment. Also, with the intention to obtain a more detailed assessment of the role of labor market institutions, we separately consider the six sub-components of the composite labor market index as explanatory variables in columns 2 through 7.

As for youth unemployment (see Table 7), we find that a one standard deviation increase in the composite labor markets index decreases unemployment by 1.41 percentage points, an effect significantly (at what level of significance) higher in magnitude than the figure obtained for total unemployment (Table 6). This may be taken as an indication of the potentially higher benefits obtained by young unemployed workers following an improvement in labor market institutions, when compared to those of the rest of the population, in terms of employment opportunities.

⁷ In detail, equation (1) has been re-estimated over the following time samples: (i) 1980-1990; (ii) 1980-95; 1980-2000; (iii) 1980-2001; (iv) 1980-2002;(v) 1980-2003; (vi) 1980-2004; (vii) 1980-2005; (viii)1980-2006; (ix) 1980-2007; (x) 1980-2008.

Among the sub-components of the general labor market institutions index, our results show that the hiring and firing regulations index (*area5bii*, in column 3) has a statistically significant negative effect on youth unemployment, as a one standard deviation increase in this sub-component index results in 0.78 percentage point decrease in youth unemployment. This result may be interpreted as an indication of the negative effect that hiring and firing rigidities have particularly on young workers, who may face stronger barriers to enter the labor market. Along these lines, Bassanini and Duval (2006) also find that, for OECD economies, strict employment protection legislation has negative effects on youth entry into labor markets.

The other sub-component that has a statistically significant negative effect on youth unemployment is the one related to military conscription (*area5bvi*, column 7): a one standard deviation improvement in the conscription index (that is, less conscription) yields a 1.58 percentage point reduction in youth unemployment. This may be interpreted as evidence that employers would rather not to hire young workers who have a higher probability of being recruited for the military service and thus reduce the fixed costs associated with hiring new personnel (e.g. recruiting, training, administrative, etc.).

With regards to long-term unemployment, the results shown in Table 8 indicate that a one standard deviation improvement in the composite labor market institutions index reduces long-term unemployment by 3.56 percentage points.⁸ As for the sub-components of the labor markets index, we notice that a one standard deviation improvement in the mandated cost of hiring index (*area5biv*, column 5) yields a 2.78 percentage point decrease in long-term unemployment, while a one standard deviation improvement in the conscription index (*area5bvi*, column 7) results in a 3.85 percentage point decrease, implying that military conscription may have long lasting effects.

For both youth and long-term unemployment, the degree of decentralization in the wage bargaining process (as measured by the *area5biii* index) does not seem to play an important role, as its coefficient is positive but not significantly different from zero in our estimations (columns 4 of Tables 7 and 8).⁹

⁸ Note that long-term unemployment is measured as the percentage of total unemployment that is of long-term. That is, if one half of total unemployment is of long-term, then the corresponding figure would be 50 percent.

⁹ In contrast, Bassanini and Duval (2006) find that high centralization in wage bargaining is associated with lower unemployment rates in OECD countries.

B. Dynamic Relationship Between Unemployment and Labor Market Institutions

In order to assess the relationship between labor market flexibility and changes in unemployment we use a dynamic reduced-form specification in which changes in unemployment are regressed against our measure of labor market flexibility and the set of macroeconomic and demographic variables described in the previous section:

$$\Delta U_{it} = \alpha_i + \rho U_{it-1} + \beta L_{it} + \gamma' X_{it} + \varepsilon_{it} \quad (2)$$

In order to address endogeneity due to the presence of the lagged level of unemployment among the regressors and to reverse causality from changes in unemployment to labor market flexibility, equation (2) has been estimated using the two-step GMM-system estimator.¹⁰

Table 9 displays the estimates for different specifications. Looking at the table, it is evident that improvements in labor market regulations that allow for a higher degree of flexibility have a statistically significant negative effect on changes in unemployment. That is, increasing the rating of the composite labor market index by one standard deviation decreases, on average, the change in the total unemployment rate by about 0.35–0.49 percentage points. In particular, the results for our baseline specification (first column), which include the lagged level of unemployment and our measure of output gap as controls, suggest that a one standard deviation increase in the labor market index is associated with a half percentage point decrease in the annual change in unemployment. Among the control variables, apart from lagged unemployment, we find that financial crises have a positive and statistically significant effect on changes in unemployment (column VII). This result is consistent with previous empirical evidence suggesting that financial crises lead to a significant and persistent increase in unemployment (e.g., Bernal-Verdugo et al., 2012).

Consistency of the two-step GMM estimates has been checked by using the Hansen and the Arellano-Bond tests. The Hansen J-test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process, cannot reject the null hypothesis that the full set of orthogonality conditions is valid (across the different specifications the p-value ranges from 0.2 to 0.4). The Arellano–Bond test for autocorrelation cannot reject the null hypothesis of no second-order serial correlation in the first-differenced error terms (across the different specifications the p-value ranges from 0.6 to 0.9).

¹⁰ The two-step GMM-system estimates (with Windmeijer standard errors) are computed using the `xtabond2` Stata command developed by Roodman (2009a). All explanatory variables are considered as endogenous (instrumented using up to 2 lags). The significance of the results is robust to different choices of instruments and predetermined variables.

In order to assess whether the results are robust across different country groups characterized by different levels of economic development we repeat the estimation exercise for OECD and non-OECD countries. As pointed out by Roodman (2009b) a problem with applying GMM-system estimator is that it may generate too many instruments which may reduce the efficiency of the two-step estimator and weaken the Hansen test of the instrument's joint validity. This could be an important issue when the number of countries is relatively small compared to the number of instruments, as in the case for the specification for OECD countries. To address this issue, and following Roodman's suggestion, for both group of countries we have applied the GMM-system estimator based on a collapsed number of instruments. The results obtained with this approach suggest that while the point estimate of the coefficient of labor market institutions is higher for non-OECD countries than for OECD countries, the estimated coefficients are not statistically different between the two groups (columns VII and VIII, Table 8).

As for the static specification, we also consider the effect of labor market institutions on changes in youth and long-term unemployment. The results displayed in Table 10 are consistent with those for overall unemployment, specifically that labor market flexibility has a strong and negative effect on the annual change of unemployment outcomes. In particular, the results suggest that an increase of one standard deviation in the composite labor market flexibility indicator decreases youth unemployment by about half percentage point, while long-term unemployment does so by nearly 2 percentage points.

In order to obtain a more detailed assessment of the role of labor market institutions on the changes in unemployment outcomes, we separately consider the six sub-components of the general labor markets index as explanatory variables. Starting with changes in the overall unemployment rate (column I, Table 11), we find that hiring and firing regulations and mandated costs of hiring have the strongest and most statistically significant effect. In addition, while hiring and firing regulations are found to have also a significant and negative impact on changes in youth unemployment, mandated costs of hiring are found to have a statistically significant effect on long-term unemployment (columns II and III, Table 11). Finally, military conscription is found to have a negative and statistically significant impact on change in both youth and long-term unemployment, but no significant effect on changes in the total unemployment rate.

IV. CONCLUSIONS

This paper contributes to the empirical literature on the effect of labor market institutions in three respects. First, while almost of all these studies have mostly focused on a subset of OECD industrial countries, our paper uses a broad sample of data of 97 countries over the period 1980-2008. Second, given the inherently complex nature of labor market regulation and the evidence that improvement in labor market efficiency are likely to require reforms in more than one area of the labor market, the paper mainly focuses on a composite indicator of labor market flexibility. Third, the paper analyzes the dynamic effect of labor market institutions on unemployment outcomes, controlling also for possible endogeneity and reverse causality from unemployment to labor market institutions.

The effect of labor market flexibility on unemployment outcomes is assessed in two steps. First, we estimate a static model specification to test for the hypothesis that labor market regulations have a first order effect on unemployment outcomes. Second, we estimate a dynamic model specification to test whether labor market flexibility affects the change in unemployment over time. Our findings indicate that, after controlling for other macroeconomic and demographic variables, increases in the flexibility of labor market regulations and institutions have a statistically significant negative impact both on the level and the change of unemployment outcomes (i.e., total, youth, and long-term unemployment). Among the different labor market flexibility indicators analyzed, hiring and firing regulations and hiring costs are found to have the strongest effect.

Overall the results of the paper suggest that policies that enhance labor market flexibility should reduce unemployment. At the same time, this raises the issue of the design and possible sequence of such reforms, and the adoption of policies aimed also to improve the quality of employment and to minimize possible negative short-term effects, not investigated in this paper, on inequality and job destruction. While data available for our large set of countries lack the necessary level of details to answer this question, micro- and macro-studies on OECD countries over the decade showed that it is important to protect workers, rather than jobs, by coupling of unemployment benefits with pressure on unemployed to take jobs and measures to help them (Blanchard, 2006). Moreover, employment protection should be designed in such a way to internalize social costs and not inhibit job creation and labor reallocation. Artificial restrictions on individual employment contracts should also be avoided.

Figure 1. Cumulative Effect of Labor Market Flexibility on Unemployment Over Time
(Percentage points)

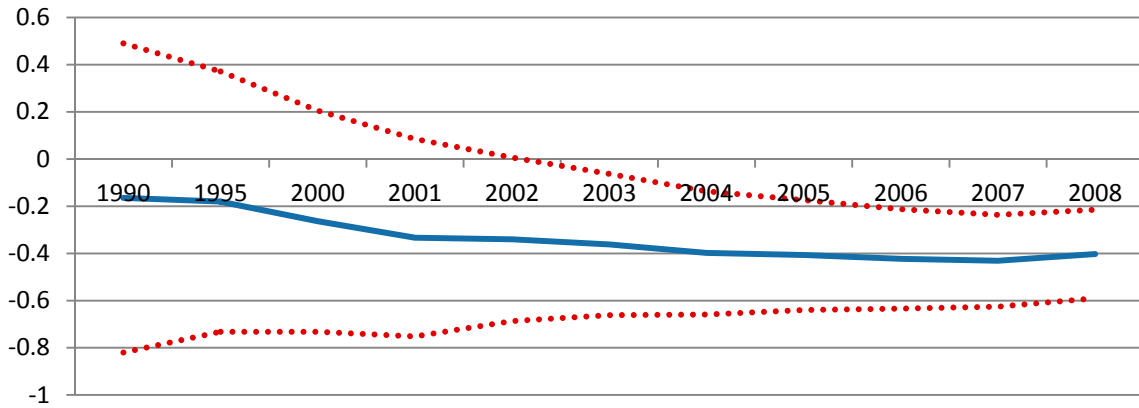


Table 1. Summary Statistics for Labor Market Outcomes and Flexibility Indicators

	Obs.	Mean	Std. Dev.	Min	Max
Labor market outcomes					
Unemployment	2826	8.9	5.9	0.0	37.3
Long-term unemployment	984	33.8	18.3	0.5	84.9
Youth Unemployment	1669	17.6	10.5	0.7	70.9
Labor market flexibility					
Composite index	1214	5.9	1.5	1.8	9.5
Minimum wage	1135	6.2	2.7	0.0	10.0
Hiring and firing regulations	1056	4.7	1.5	1.0	8.8
Centralized collective bargaining	1124	6.4	1.5	1.8	9.5
Mandated cost of hiring	1166	6.9	2.0	1.9	10.0
Mandated cost of worker dismissal	927	5.8	3.1	0.0	10.0
Conscription	1656	5.9	4.3	0.0	10.0

Source: Fraser Institute's Economic Freedom of the World (EFW) database.

Table 2. Correlation Matrix of Labor Market Outcomes and Flexibility Indicators

	U	YU	LU	L	M	H	C	MCH	MCW	CO
U	1									
YU	0.51***	1								
LU	0.90***	0.56***	1							
L	-0.11***	-0.22***	-0.13***	1						
M	-0.22***	-0.19***	-0.15***	0.64***	1					
H	-0.21***	-0.24***	-0.21***	0.44***	0.26***	1				
C	0.01	-0.03	0.00	0.46***	0.17***	0.54***	1			
MCH	-0.02	-0.31***	-0.02	0.63***	0.43***	0.28**	0.30***	1		
MCW	0.01	0.02	-0.04	0.47***	0.13***	0.19**	0.061	-0.02	1	
CO	0.01	-0.11**	-0.04	0.70***	0.20***	-0.09***	0.03	0.32***	0.06*	1

Note: U=unemployment; YU= youth unemployment; LU=long-term unemployment; L=composite labor market flexibility index; M= minimum wage; H=hiring and firing regulation; C=centralized collective bargaining; MCH=mandated cost of hiring; MCW=mandated cost of work dismissal; CO= conscription.

*, **, *** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 3. The *Static* Effect of Labor Market Flexibility on Unemployment

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
area5b	-0.569 (-2.99)***	-0.549 (-2.88)***	-0.472 (-2.34)**	-0.532 (-2.74)***	-0.569 (-2.86)***	-0.575 (-3.05)***	-0.193 (-2.20)**	-0.185 (-2.11)**	-0.835 (-2.56)**
gap_growth_3	-0.041 (-1.78)*	-0.013 (-0.58)	-0.038 (-1.60)	-0.043 (-1.80)*	-0.042 (-1.79)*	-0.044 (-1.88)**	-0.040 (-1.66)*	-0.024 (-1.02)	-0.394 (-3.86)***
lncg		2.754 (1.78)*						1.469 (1.55)	
lnopenk			-0.862 (-0.75)						
lnurbpop				-3.044 (-0.75)					
lnpopd					0.155 (0.06)				
crisis						0.630 (1.16)			
l.lur							0.829 (20.92)***	0.82 (19.5)***	
R ²	0.84	0.85	0.85	0.84	0.84	0.85	0.95	0.95	0.97
N	893	893	893	882	882	893	890	890	395

Note: T-statistics based on robust clustered standard errors in parenthesis. *,**,*** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 4. The *Static* Effect of Labor Market Flexibility on Unemployment—OECD Countries

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
area5b	-0.539 (-2.90)***	-0.457 (-2.08)**	-0.393 (-1.76)*	-0.517 (-2.63)**	-0.434 (-2.16)**	-0.54 (-2.91)***	-0.061 (-0.68)	-0.019 (-0.21)
gap_growth_3	0.006 (0.05)	0.056 (0.49)	0.021 (0.17)	0.003 (0.03)	0.006 (0.05)	0.001 (0.01)	-0.137 (-5.14)***	-0.106 (-3.83)***
lncg		5.460 (1.59)						2.903 (3.27)***
lnopenk			-1.108 (-0.66)					
lnurbpop				-1.799 (-0.24)				
lnpopd					-4.083 (-0.86)			
crisis						0.468 (0.95)		
l.lur							0.907 (70.93)***	0.901 (52.18)***
R ²	0.71	0.72	0.72	0.71	0.71	0.71	0.95	0.96
N	385	385	385	385	385	385	383	383

Note: T-statistics based on robust clustered standard errors in parenthesis. *, **, *** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 5. The *static* Effect of Labor Market Flexibility on Unemployment—Non-OECD Countries

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
area5b	-0.641 (-2.64)***	-0.66 (-2.71)***	-0.593 (-2.53)**	-0.600 (-2.45)**	-0.669 (-2.82)***	-0.661 (-2.71)***	-0.355 (-2.68)***	-0.368 (-2.77)***
gap_growth_3	-0.050 (-1.35)	-0.024 (-0.67)	-0.049 (-1.33)	-0.051 (-1.36)	-0.051 (-1.32)	-0.053 (-1.44)	-0.024 (-1.05)	-0.010 (-0.40)
lncg		2.458 (2.99)***						1.386 (2.51)**
lnopenk			-0.683 (-0.58)					
lnurbpop				-3.375 (-1.11)				
lnpopd					2.205 (0.85)			
crisis						0.826 (1.26)		
l.lur							0.786 (13.37)***	0.775 (12.97)***
R ²	0.87	0.87	0.87	0.87	0.87	0.87	0.95	0.95
N	508	508	508	497	497	508	507	507

Note: T-statistics based on robust clustered standard errors in parenthesis. *, **, *** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 6. The *Static* Effect of Labor Market Flexibility Indicators on Unemployment

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
area5b	-0.569 (-2.99)***						
area5bi		-0.182 (-2.41)**					
area5bii			-0.289 (-1.87)*				
area5biii				0.139 (0.51)			
area5biv					-0.272 (-2.65)***		
area5bv						0.002 (0.01)	
area5bvi							-0.053 (-0.55)
gap_growth_3	-0.041 (-1.78)*	-0.096 (-4.06)***	-0.063 (-2.29)**	-0.040 (-1.19)	-0.086 (-3.83)***	-0.112 (-3.56)***	0.003 (0.12)
R ²	0.85	0.87	0.85	0.84	0.86	0.91	0.80
N	893	824	847	876	838	632	1034

Note: T-statistics based on robust clustered standard errors in parenthesis. *,**,*** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 7. The *Static* Effect of Labor Market Flexibility Indicators on Youth Unemployment

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
area5b	-0.955 (-2.60)**						
area5bi		-0.232 (-1.34)					
area5bii			-0.494 (-2.20)**				
area5biii				0.369 (0.74)			
area5biv					-0.124 (-0.67)		
area5bv						-0.230 (-0.28)	
area5bvi							-0.385 (-2.03)**
gap_growth_3	-0.046 (-0.62)	-0.094 (-1.20)	-0.072 (-0.96)	-0.072 (-0.92)	-0.110 (-1.34)	-0.138 (-1.58)	-0.019 (-0.24)
R ²	0.86	0.88	0.87	0.85	0.87	0.91	0.84
N	707	650	682	705	666	492	790

Note: T-statistics based on robust clustered standard errors in parenthesis. *,**,*** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 8. The *Static* Effect of Labor Market Flexibility Indicators on Long-Term Unemployment

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
area5b	-2.355 (-2.71)***						
area5bi		-0.263 (-0.82)					
area5bii			0.888 (1.35)				
area5biii				1.169 (0.70)			
area5biv					-1.415 (-2.32)**		
area5bv						-2.328 (-1.61)	
area5bvi							-0.992 (-2.38)**
gap_growth_3	0.075 (0.32)	-0.200 (-1.06)	0.008 (0.03)	-0.087 (-0.38)	-0.131 (-0.56)	-0.214 (-0.72)	0.055 (0.25)
R ²	0.88	0.90	0.88	0.87	0.89	0.94	0.88
N	440	386	424	442	402	273	465

Note: T-statistics based on robust clustered standard errors in parenthesis. *,**,*** denote significance at 10 percent, 5 percent, and 1 percent, respectively.

Table 9. The *Dynamic* Effect of Labor Market Flexibility on Unemployment

	Full-sample						OECD	Non-OECD
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
area5b	-0.321 (-3.15)***	-0.303 (-3.23)***	-0.309 (-2.99)***	-0.231 (-2.43)**	-0.289 (-3.30)***	-0.289 (-3.14)***	-0.108 (2.32)**	-0.643 (-2.86)***
gap_growth_3	0.016 (0.52)	0.018 (0.5)	0.010 (0.31)	0.018 (0.5)	0.011 (0.35)	0.018 (0.5)	0.001 (0.00)	0.015 (0.58)
lncg		0.653 (1.25)						1.341 (1.55)
lnopenk			-0.687 (-1.41)					
lnurbpop				-0.201 (-0.56)				
lnpopd					0.117 (0.88)			
crisis						0.774 (2.23)**	0.586 (2.50)**	1.341 (1.75)*
l.lur	-0.047 (-1.63)*	-0.061 (-2.13)**	-0.089 (-1.95)**	-0.063 (-2.24)**	-0.061 (-1.97)**	-0.065 (-2.10)**	-0.056 (-1.07)	-0.056 (-0.82)
N	890	890	890	879	879	890	383	507
Hansen test (p-value)	0.20	0.31	0.32	0.35	0.43	0.32	0.31	0.25
Arellano-bond AR(2) test (p-value)	0.58	0.57	0.63	0.57	0.60	0.63	0.57	0.89

Note: z-statistics in parenthesis. *, **, *** denote significance at 10 percent, 5 percent, and 1 percent, respectively. GMM-system estimator. Two-step using Windmeijer robust standard errors. All explanatory variables considered as endogenous and instrumented using up to 2 lags.

Table 10. The *Dynamic* Effect of Labor Market Flexibility on Different Unemployment Outcomes

	Unemployment	Youth Unemployment	Long-term unemployment
	(I)	(II)	(III)
area5b	-0.321 (-3.15)***	-0.346 (-1.75)*	-1.296 (-2.02)**
gap_growth_3	0.016 (0.52)	0.202 (1.34)	0.190 (0.54)
l.lur	-0.047 (-1.63)*	-0.054 (-1.71)*	0.028 (0.29)
N	890	632	428
Hansen test (p-value)	0.20	0.48	0.18
Arellano-bond AR(2) test (p-value)	0.58	0.35	0.60

Note: z-statistics in parenthesis. *, **, *** denote significance at 10 percent, 5 percent, and 1 percent, respectively. GMM-system estimator. Two-step using Windmeijer robust standard errors. All explanatory variables considered as endogenous and instrumented using 2 lags.

Table 11. The *Dynamic* Effect of Labor Market Flexibility on Different Unemployment Outcomes

	Unemployment	Youth Unemployment	Long-term unemployment
	(I)	(II)	(III)
area5b	-0.321 (-3.15)***	-0.346 (-1.75)*	-1.296 (-2.02)**
area5bi	-0.026 (-0.76)	-0.044 (-0.50)	-0.084 (-0.41)
area5bii	-0.214 (-1.71)*	-0.490 (-2.11)**	0.155 (1.13)
area5biii	-0.068 (-0.61)	-0.025 (-0.15)	2.724 (1.21)
area5biv	-0.061 (-0.99)	0.151 (1.42)	0.141 (0.38)
area5bv	-0.136 (-2.02)**	0.005 (0.04)	-1.281 (-2.02)**
area5bvi	-0.057 (-1.07)	-0.278 (-2.74)***	-0.884 (-2.33)**

Note: The results reported for each indicator of labor market flexibility are based on separate regressions. z-statistics in parenthesis. *, **, *** denote significance at 10 percent, 5 percent, and 1 percent, respectively. GMM-system estimator. Two-step using Windmeijer robust standard errors. All explanatory variables considered as endogenous and instrumented using 2 lags.

References

- Bassanini, A. and Duval, R., 2006, ‘Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions,’ OECD Economics Department Working Papers No. 486.
- , 2009, ‘Unemployment, Institutions, and Reform Complementarities: Re-assessing the Aggregate Evidence for OECD Countries,’ *Oxford Review of Economic Policy* No. 25, pp. 40–59.
- Blanchard, O. and Wolfers, J., 2000, ‘The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence,’ *Economic Journal* No. 110, Vol. 462, pp. 1–33.
- Blanchard, O., 2006, ‘European Unemployment: The Evolution of Facts and Ideas,’ *Economic Policy* No. 21 Vol. 45, pp. 5–59.
- Belot, M. and van Ours, J.C., 2004, ‘Does the Recent Success of Some OECD Countries in Lowering Their Unemployment Rates Lie in the Clever Design of Their Labor Market Reforms?,’ *Oxford Economic Papers* No. 56, Vol. 4, pp. 621–42.
- Bernal-Verdugo, L.E., Furceri, D. and Guillaume, D., 2012, ‘Crises, Reforms, and Unemployment,’ IMF Working Papers (Forthcoming).
- Botero, J. C., Djankov, S., La Porta, R., et al., 2004, ‘The Regulation of Labor,’ *Quarterly Journal of Economics* No. 119 Vol. 4, pp. 1339–82.
- Elmeskov, J., Martin, J.P., and Scarpetta, S., 1998, ‘Key Lessons for Labour Market Reforms: Evidence from OECD Countries’ Experiences,’ *Swedish Economic Policy, Review* No. 5 Vol. 2, pp. 205–52.
- Feldmann, H., 2006, ‘Government Size and Unemployment: Evidence from Industrial Countries,’ *Public Choice*, No. 127 Vol. 3–4, pp. 451–67.
- Feldmann, H., 2009, ‘The Unemployment Effects of Labor Regulation around the World,’ *Journal of Comparative Economics* No. 37 Vol. 1, pp. 76–90.
- Heston, A., Summers, R. and Aten, B., 2011, Penn World Table Version 7.0, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.
- Laeven, L. and Valencia, F., 2010, ‘Resolution of Banking Crises: The Good, the Bad, and the Ugly,’ International Monetary Fund Working Paper No 146.
- Nickell, S., 1997, ‘Unemployment and Labor Market Rigidities: Europe versus North America,’ *Journal of Economic Perspectives* No. 11 Vol. 3, pp. 55–74.

- Nickell, S., 1998, "Unemployment: Questions and Some Answers," *Economic Journal* No. 108, pp. 802–16.
- Nunziata, L., 2002, "Unemployment, Labour Market Institutions and Shocks," Nuffield College Working Papers in Economics No. 16.
- Roodman, D., 2009a, "How to do xtabond2: An introduction to difference and system GMM in Stata," *Stata Journal*, No. 9 Vol. 1, pp. 86–136.
- Roodman, D., 2009b, "A Note on the Theme of Too Many Instruments," *Oxford Bulletin of Economics and Statistics*, No. 71, Vol. 1, pp. 135–58.
- Scarpetta, S., 1996, "Assessing the Role of Labour Market Policies and Institutional Settings on Unemployment: A Cross-country Study," *OECD Economic Studies*, No. 26, pp. 43–98.

Annex I: Data Description

The dependent and control variables included in the analysis belong to one of several categories, namely:

1) Unemployment

- Unemployment rate (*lur*, from WEO): Percentage of the total labor force that is currently unemployed.
- Youth unemployment rate (*unempyouth*, from WDI): Percentage of the total labor force of ages 15 to 24 that is currently unemployed.
- Long-term unemployment (*unemplong*, from WDI): Fraction (in percent) of the unemployment rate that is of long-term.

2) Macroeconomic variables

- GDP per capita (*rgdpl*, from WEO): Purchasing power parity (PPP) converted GDP per capita (with the Laspeyres methodology), derived from growth rates of private consumption, government expenditures, and investment at 2005 constant prices.
- Demand pressure (*gap_growth_n*): Gap in the current real GDP per capita growth with respect to a moving average of *n* years, centered at the current period.
- Government size (*lncg*, from PWT): (log) Government consumption share of PPP converted GDP per capita at current prices, in percent.
- Openness (*lnopenk*, from PWT): (log) Openness at 2005 constant prices, in percent.

3) Demographic variables

- Population size (*lnpop*, from PWT): (log) Total population (in thousands).
- Urbanization (*lnurbpop*, from WDI): (log) Urban population, as percent of total population.
- Density (*lnpopdens*, from WDI): (log) Population density, measured by the number of people per square kilometer of land area.

4) Financial crisis

- Financial crisis indicator (*crisis*): This dummy variable assigns a value of 1 to years in which a country was going through a financial crisis according to Laeven and Valencia (2010), and 0 otherwise.

Annex—Data Sample

Country	Time	Country	Time	Country	Time	Country	Time
Albania	2002-2008	El Salvador	2000-2008	Kyrgyz Rep.	2005-2008	Romania	2000-2008
Algeria	2002-2009	Estonia	2000-2008	Latvia	2000-2008	Russia	2000-2008
Argentina	1985,1990,1995,2000-2008	Fiji	2002-2008	Lithuania	2000-2008	Serbia	2006-2008
Armenia	2004-2008	Finland	1985,1990,1995,2000-2008	Luxembourg	1990,1995,2000-2008	Singapore	1990,1995,2000-2008
Australia	1990,1995,2000-2008	FYROM	2004-2008	Malaysia	1990,1995,2000-2008	Slovak Republic	1995,2000-2008
Austria	1985,1990,1995,2000-2008	France	1985,1990,1995,2000-2008	Malta	2002-2008	Slovenia	2000-2008
Azerbaijan	2004-2008	Georgia	1985,1990,1995,2000-2008	Mauritius	2000-2008	South Africa	1990,1995,2000-2008
Barbados	2005-2008	Germany	1985,1990,1995,2000-2008	Mexico	1990,1995,2000-2008	Spain	1985,1990,1995,2000-2008
Belgium	1985,1990,1995,2000-2008	Greece	1985,1990,1995,2000-2008	Moldova	2005-2008	Sri Lanka	2000-2008
Belize	2004-2008	Honduras	2000-2008	Mongolia	2000-2008	Sweden	1985,1990,1995,2000-2008
Bosnia & Herz.	2004-2008	Hong Kong	1990,1995,2000-2008	Montenegro	2005-2008	Switzerland	1985,1990,1995,2000-2008
Brazil	1990,1995,2000-2008	Hungary	1995,2000-2008	Morocco	2001-2008	Syria	2002-2008
Bulgaria	2000-2008	Iceland	1990,1995,2000-2008	Netherlands	1985,1990,1995,2000-2008	Taiwan	1990,1995,2000-2008
Canada	1985,1990,1995,2000-2008	Indonesia	1995,2000-2008	New Zealand	1985,1990,1995,2000-2008	Thailand	1990,1995,2000-2008
Chile	1995,2000-2008	Ireland	1985,1990,1995,2000-2008	Nicaragua	2000-2008	The Bahamas	2006-2008
Colombia	1995,2000-2008	Iran	2000-2008	Nigeria	2000-2008	Trinidad & Tobago	2000-2008
Costa Rica	2000-2008	Israel	2000-2008	Norway	1985,1990,1995,2000-2008	Tunisia	2001-2008
Croatia	2000-2008	Italy	1985,1990,1995,2000-2008	Pakistan	2002-2008	Turkey	1990,1995,2000-2008
Cyprus	2003-2008	Jamaica	2000-2008	Panama	2000-2008	Ukraine	2000-2008
Czech Rep.	2000-2008	Japan	1985,1990,1995,2000-2008	Paraguay	2000-2008	United Kingdom	1985,1990,1995,2000-2008
Denmark	1985,1990,1995,2000-2008	Jordan	1990,1995,2000-2008	Peru	1995,2000-2008	United States	1985,1990,1995,2000-2008
Dominican Rep.	1985,1990,1995,2000-2008	Kazakhstan	2005-2008	Philippines	1990,1995,2000-2008	Uruguay	2000-2008
Ecuador	2000-2008	Korea	1990-2008	Poland	1990,1995,2000-2008	Venezuela	1990,1995,2000-2008
Egypt	1990,1995,2000-2008	Kuwait	2002-2008	Portugal	1985,1990,1995,2000-2008	Vietnam	2003-2008