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## Labor Market Flexibility and the Impact of the Financial Crisis

DNB WORKING PAPER

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\* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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# **Labor Market Flexibility and the Impact of the Financial Crisis**

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## **ABSTRACT**

The impact of the global financial crisis varies across countries. We examine whether cross-country differences in output loss and speed of recovery are affected by differences in labor market flexibility. By employing cross-country regressions and including control variables like trade and capital market integration, fiscal balance, financial vulnerability, and institutional differences, we find that lower hiring cost reduce the output loss, notably so in high-income countries. However, the duration of the crisis is longer in case of low dismissal cost, notably so in low-income countries.

**JEL codes:** E32, E65

**Key words:** labor market flexibility, output loss, financial crisis

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## I. INTRODUCTION

The recent financial crisis, which originated in the US, has also hit the rest of the world. However, the impact of the crisis on economic activity varies widely across countries, reflecting differences in exposure and vulnerability to financial crises, heterogeneity in macroeconomic structures, and differences in policy responses (Berkmen et al., 2009). A few recent studies have examined the impact of the global financial crisis on output identifying factors that may explain cross-country differences in the impact of the financial crisis. For instance, Berkmen et al. (2009) find that countries with more leveraged domestic financial systems and more rapid growth in lending to the private sector tended to suffer more from the crisis, while countries exporting advanced manufacturing goods were more affected than those exporting food. Also countries with pegged exchange-rate regimes fared significantly worse than countries with a more flexible exchange rate regime.<sup>1</sup>

Up to now, there is no study examining the relationship between labor market flexibility and the impact of the financial crisis on output.<sup>2</sup> This paper examines for 56 countries over the period of 2007 until the first quarter of 2010 whether cross-country differences in the impact of the financial crisis on the loss of output and the duration of the crisis are related to differences in labor market flexibility. We measure the output loss by the decrease of real GDP from peak to trough. Likewise, the duration of the crisis is the length of the period between the peak and the trough of real GDP. Employing a cross-country model that includes control variables such as trade and capital market integration, financial development, monetary and fiscal policy, institutional differences, and population growth, we find that lower hiring cost reduce the output loss, notably so in high-income countries. However, the duration of the crisis is longer in case of low dismissal cost, notably so in low-income countries. The latter finding is in line with the results of Bentolila and Bertola (1990) and Bertola (1990) who argue that a reduction of firing cost does not increase firms' marginal propensity to hire, but strongly affects their willingness to fire.

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1. Other relevant studies are Berglöf et al. (2009), Naudé (2009) and Rose and Spiegel (2009).

2. The paper that comes closest to ours is Forteza and Rama (2006), who report that countries with relatively rigid labor markets experienced deeper recessions and slower recoveries.

## II. DEFINING LABOR MARKET FLEXIBILITY AND OUTPUT LOSS

According to Solow (1997), a labor market is inflexible if the level of benefits is too high, if there are too many restrictions on the freedom of employers to fire and to hire, if the hours of work are too tightly regulated, if excessively generous compensation for overtime work is mandated, if trade unions have too much power to protect incumbent workers against competition, or if statutory health and safety regulations are too stringent. In our empirical work, we will apply factor analysis on the indicators of labor market flexibility provided by Gwartney et al. (2009).<sup>3</sup> These data come close to the concept of labor market flexibility as outlined by Solow (1997). Gwartney et al. (2009) measure labor market flexibility using six indicators: minimum wage (*MW*), mandated cost of hiring (*MHC*), mandated cost of worker dismissal (*MDC*), hiring and firing regulations (*HFR*), centralized collective bargaining (*CCB*), and conscription (*CNS*). The indicators range between 0 and 10, where a higher score indicates a more flexible labor market.<sup>4</sup> *Table 1* presents summary statistics for the labor market indicators and other variables used in the analysis (to be discussed below). *Table 1* shows that the average scores of all labor market indicators are much lower than the maximum score. High-income countries have higher scores for the minimum wage and dismissal cost indicators than the other countries. It implies that the minimum wage and dismissal cost of high-income countries are

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3. These data have been widely used as a proxy for market flexibility. See, for instance, Pitlik (2002; 2008) and Weede and Kämpf (2002).

4. The minimum wage is based on the World Bank's Doing Business data for the ratio of mandated minimum wage to the average value added per worker. The formula used to calculate the zero-to-10 rating was:  $(V_{\max} - V_i) / (V_{\max} - V_{\min})$  multiplied by 10, where  $V_i$  represents the actual data for country  $i$ ,  $V_{\max}$  is the maximum value, and  $V_{\min}$  is the minimum value in the sample. Mandated cost of hiring 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. The same formula is applied as for minimum wages to calculate the rating. Mandated cost of dismissal is based on the World Bank's Doing Business data on the cost of the advance notice requirements, severance payments, and penalties due when dismissing a redundant worker. Again the same formula is used to come up with the ratings. Hiring and firing regulations is based on the Global Competitiveness Report's (from the World Economic Forum) question: "The hiring and firing of workers is impeded by regulations (= 1) or flexibly determined by employers (= 7)." Centralized collective bargaining is based on the Global Competitiveness Report's question: "Wages in your country are set by a centralized bargaining process (= 1) or up to each individual company (= 7)." Data on the use and duration of military conscription were used to construct rating intervals for conscription. A rating of 10 was assigned to countries without military conscription. When conscription periods exceeded 18 months, countries were rated zero. Full details are available at: [http://www.freetheworld.com/2009/reports/world/EFW2009\\_app.pdf](http://www.freetheworld.com/2009/reports/world/EFW2009_app.pdf).

lower than those of other countries. Meanwhile, the costs of hiring in high-income countries exceed those in the other countries in our sample.

*Table 1*  
Summary Statistics for Labor Market Indicators and Other Variables Used

Variables	All Countries			High-income Countries			Others		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
<b>Crisis Variables</b>									
Output Loss	0.13	0.08	0.52	0.11	0.08	0.40	0.17	0.02	0.52
Duration	4.27	1.00	10.00	4.97	1.00	9.00	3.33	1.00	10.00
<b>Labor Market Indicators (10-point scale)</b>									
Minimum Wage	6.86	0.50	10.00	7.31	4.80	10.00	6.26	0.50	10.00
Hiring and Firing Regulations	4.59	1.80	8.30	4.42	1.80	8.30	4.82	2.20	7.30
Centralized Collective Bargaining	6.44	2.60	8.70	6.22	2.60	8.70	6.73	3.60	8.30
Mandated Cost of Hiring	4.16	0.00	10.00	3.74	0.00	9.70	4.72	0.60	10.00
Mandated Cost of Worker Dismissal	6.53	0.00	10.00	7.49	1.20	10.00	5.25	0.00	9.60
Conscription	6.75	0.00	10.00	6.22	2.60	8.70	6.50	0.00	10.00
<b>Trade</b>									
Trade Barriers (10-point scale)	7.25	2.40	9.20	7.91	6.60	9.20	6.38	2.40	7.80
Openness	0.99	0.26	4.29	1.08	0.26	4.29	0.89	0.38	2.00
<b>Financial Integration</b>									
Capital Market Restrictions (10-point Scale)	6.00	3.30	8.60	6.41	4.30	8.60	5.47	3.30	8.40
<b>Financial Development</b>									
Credit to GDP	0.90	0.10	3.10	1.15	0.22	3.10	0.58	0.10	1.74
Log GDP per Capita	4.23	3.30	4.60	4.48	4.20	4.60	3.90	3.30	4.25
<b>Financial Vulnerability</b>									
Credit Growth	0.06	-0.89	0.89	0.09	-0.89	0.89	0.02	-0.25	0.82
<b>Policy Framework</b>									
Stability of Inflation (10-point scale)	9.17	6.80	9.90	9.48	8.50	9.90	8.75	6.80	9.70
Change of Fiscal Deficits (% GDP)	0.03	-0.13	0.11	0.04	-0.04	0.09	0.02	-0.13	0.11
Exchange rate regime (1 = flexible)	0.57	0.00	1.00	0.47	0.00	1.00	0.71	0.00	1.00
<b>Institutions</b>									
Governance	-0.02	-1.90	1.44	0.66	-0.45	1.44	-0.92	-1.90	0.51
<b>Population Growth</b>									
	0.01	-0.01	0.03	0.01	-0.01	0.03	0.01	-0.01	0.02
<hr/>									
Number of Countries	56	56	56	32	32	32	24	24	24

Source: International Financial Statistics (IFS), Gwartney et al. (2009), World Development Indicators (WDI), Kaufmann et al. (2009).

*Table 2* shows the correlation among the various indicators of labor market flexibility. Hiring and firing regulations (*HFR*) are significantly associated with centralized collective bargaining (*CCB*) and conscription (*CNS*), although with a different sign. In addition, minimum

wages (*MW*) are closely related to the mandated cost of worker dismissal (*MDC*), while the correlation of the mandated cost of hiring (*MHC*) and the other labor market indicators is low.

*Table 2*  
Correlation Matrix of Indicators of Labor Market Flexibility

	<i>MW</i>	<i>HFR</i>	<i>CCB</i>	<i>MHC</i>	<i>MDC</i>	<i>CNS</i>
<i>MW</i>	1.0000					
<i>HFR</i>	0.1683	1.0000				
<i>CCB</i>	-0.0291	0.5190*	1.0000			
<i>MHC</i>	-0.1042	0.2557	0.1545	1.0000		
<i>MDC</i>	0.3165*	0.2244	0.0823	-0.1633	1.0000	
<i>CNS</i>	0.0041	-0.2880*	0.0154	0.0904	0.1343	1.0000

Notes: \* indicates that the variable is significant at 5% confidence level

In order to evaluate to which extent the labor market indicators capture the same information, we apply factor analysis (*FA*) to the indicators of labor market flexibility in 2007 for 56 countries (see the list of countries in *Table A1* in the appendix). Specifically, the *FA* analysis can be represented as follows:

$$x = B\xi + \varepsilon \quad (1)$$

where  $x$  denotes a vector of observed variables (i.e., the indicators);  $B$  is the matrix of factor loadings;  $\xi$  represents a vector of the latent variable labor market flexibility; and  $\varepsilon$  is a random error term, which is assumed to be uncorrelated with the latent variables. The covariance matrix of the model is:

$$\Sigma = B\Phi B' + \Theta \quad (2)$$

Where  $\Sigma$  is the covariance matrix of  $x$ ,  $\Phi$  is the covariance matrix of  $\xi$ , and  $\Theta$  is the covariance matrix of  $\varepsilon$ . This equation is estimated using the maximum likelihood (ML) function

$$L = \log|\Sigma| + tr(\Sigma^{-1}S) \quad (3)$$

where  $S$  is the sample covariance matrix. To obtain the appropriate number of factors we use Catell's scree test, which selects the number of factors based on eigenvalues higher than 1. As three factors have eigenvalues higher than 1, we use three factors.

Having optimized the likelihood function, the factor loadings matrix is rotated by the Oblimin rotation method, so that it will be easier to interpret the findings. The Oblimin rotation method allows for correlation among the factors and minimizes the correlation of the columns of the factor loadings matrix. *Table 3* shows the estimation results of the rotated factor solution.

*Table 3*  
Rotated factor loading matrix

	<b>Factor</b>		
	<b>1</b>	<b>2</b>	<b>3</b>
Hiring and Firing Regulation ( <i>HFR</i> )	.925	.228	.212
Centralized Collective Bargaining ( <i>CCB</i> )	.492	.070	.096
Conscription ( <i>CNS</i> )	-.387	.137	.156
Mandated Cost of Worker Dismissal ( <i>MDC</i> )	-.112	1.005	.000
Minimum Wages ( <i>MW</i> )	.083	.318	-.067
Mandated Cost of Hiring ( <i>MHC</i> )	.096	-.165	.984

Note: Rotation Method: Oblimin with Kaiser Normalization

Since the Oblimin rotation method minimizes the correlation between columns of the factor loadings matrix, each indicator has a high loading on one factor, while it has a low loading on the other factors. *Table 3* shows that the first factor has high loadings on hiring and firing regulations, centralized collective bargaining, and conscription. Those indicators are related to how the labor market is regulated; hence we label this factor “*labor market regulation*”. Meanwhile, the indicators of mandated cost of worker dismissal and minimum wage have high factor loadings for factor 2; this factor is therefore labeled as “*dismissal cost*”. The indicator of cost of hiring loads high on factor 3, which is therefore labeled as “*hiring cost*”.<sup>5</sup> Some studies

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5. The final scores of each factor are calculated using a regression-based approach, which is a linear combination of all of the labor market flexibility indicators, weighted by the corresponding factor loading matrix. The final scores of each factor will be used for the estimations in the next section.



argue that those labor market flexibility indicators have an impact on unemployment (see Bentolila and Bertola, 1990; Bertola, 1990; and Feldmann, 2003).

The impact of the global financial crisis on output is measured as the percentage decrease of real GDP from peak to through during the first quarter of 2007 until the first quarter of 2010 (see *Table A1* in the appendix for details). Our sample period is determined by data availability and the fact that the crisis in the US subprime mortgage sector started in August 2007 (see also Berglöf et al., 2009). The peak is defined as the point in time with the highest level of real GDP, while the through is the point in time with the lowest real GDP. Furthermore, we consider the duration of the crisis as the period from peak to through (see *Table A1* in the appendix for details). As not all countries were out of the recession at the end of this period, the impact of the crisis on output loss and the duration of the crisis are underestimated.<sup>6</sup>

### III. ESTIMATION METHOD

To examine the effect of labor market flexibility on the decline in output following the financial crisis, we estimate the following cross-section model:

$$Y_i = \alpha + \beta L_i + \gamma Z_i + \varepsilon_i \quad (4)$$

In our first model,  $Y$  is the percentage change of real GDP from peak to through,  $L$  is our index of labor market flexibility, and  $Z$  is a vector of control variables such as trade linkages, financial integration, financial development, monetary and fiscal policy, institutional factors, and population growth. In our second model,  $Y$  represents the duration of the crisis.

The trade linkages are represented by two variables: regulatory trade barriers and openness. The regulatory trade barriers consist of non-tariff barriers and compliance cost of importing and exporting. The data come from Gwartney et al. (2009) and range from 0 to 10, where a higher score indicates fewer trade barriers. Openness is measured by the ratio of exports and imports to GDP, taken from the World Bank's World Development Indicators (WDI). It is expected that countries depending on trade will be more affected by the global financial crisis. Moreover, we consider the composition of trade (food, industrial, and fuel commodities) data on

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6. Some countries, such as Bulgaria, Denmark, Estonia, Finland, Greece, Iceland, Latvia, Lithuania, Romania, and Slovenia, still had a negative growth at the end of the sample period.

which is provided by the United Nations. Berkmen et al. (2009) report that countries exporting manufacturing products have been hit harder by the crisis than those exporting food.

Financial integration is proxied by international capital market controls. This indicator includes restrictions on foreign ownership of companies and the degree of capital controls. The data is provided by Gwartney et al. (2009). Similar to regulatory trade barriers, this variable also ranges between 0 and 10. A higher score implies more integration. As the global financial crisis originated in the financial sector in developed countries, we hypothesize that countries with fewer financial restrictions will be hit harder by the global financial crisis.

Financial development is represented by the ratio of domestic credit to GDP. We expect that financially more advanced countries will be hit harder by the crisis (Rose and Spiegel, 2009). The data come from the World Development Indicators. In addition, we consider GDP per capita as indicator of economic development level.

Taylor (2009) argues that excessive credit growth contributed to the global financial crisis. We therefore include the cumulative growth of domestic credit during 2003-2005 as explanatory variable. We expect that countries that experienced high credit growth prior to the crisis suffer stronger output losses. The data come from the World Development Indicators.

We also include proxies for the heterogeneity of monetary and fiscal policy frameworks across countries before the crisis. The monetary policy framework is represented by the volatility of inflation and a dummy for the exchange rate regime, while the fiscal policy framework is proxied by the change of the government budget balance to GDP. The latter variable also captures that various governments followed expansionary fiscal policies to reduce the impact of the financial crisis. We expect that countries with more stable inflation and with flexible exchange rates can handle external shocks more easily (Berkmen et al., 2009). The data for inflation stability come from Gwartney et al. (2009) and run from 0 to 10. A higher value of this variable indicates more stable inflation. We use the IMF's the facto exchange rate classification. The exchange rate regime is represented by a dummy variable that is one in case of a flexible exchange rate regime.<sup>7</sup> Countries with more expansionary fiscal policies are expected to suffer

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7. We divide the exchange rate regimes into two types: fixed and flexible exchange rate regimes. A fixed exchange rate regime consists of exchange rate arrangements with separate legal tender; currency board arrangements, conventional fixed peg arrangements; pegged exchange rate within horizontal bands; crawling pegs; and exchange rate within crawling bands. Flexible exchange rate regimes include managed floating and independently floating.

less from the crisis. The fiscal stimulus is measured by the change of the fiscal balance per GDP from 2008 to 2009, which is provided by WDI.<sup>8</sup>

The final aspect that may affect the severity of the crisis is the quality of governance that can be defined as the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them. Kaufmann et al. (2009) provide data on six dimensions of governance: voice and accountability; political stability and absence of violence; government effectiveness; regulatory quality; rule of law; and control of corruption. We apply factor analysis to these indicators of governance to come up with an appropriate measure for the quality of governance. Catell's scree test suggests one factor for governance. All six indicators of governance have high loadings on this factor, which will therefore be used in the estimations. We expect that countries with good governance will be better able to manage the impact of the financial crisis. In addition, we also control for population growth.

All labor market indicators and control variables used in the estimations refer to years before the crisis, except for the fiscal variable. *Table A2* in the appendix lists all explanatory variables and provides their sources. *Table 1* shows that high-income countries are more open to international trade and have fewer financial restrictions. In addition, financial markets of high-income countries are more developed, while these countries also had higher credit growth before the crisis. With respect to the policy framework, high-income countries have more stable inflation and more expansionary fiscal policies than the other countries in our sample. Likewise, the quality of governance of high-income countries is much better than that of the other countries.

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8. There may be a reverse-causality problem using this indicator, but data on the cyclically adjusted budget balance were not available for all countries in our sample.

*Table 4*  
Correlation Matrix

	<i>LMR</i>	<i>DC</i>	<i>HC</i>	<i>RTB</i>	<i>OP</i>	<i>FI</i>	<i>CR</i>	<i>GCAP</i>	<i>CRG</i>	<i>INF</i>	<i>EXC</i>	<i>FB</i>	<i>GOV</i>	<i>POP</i>
<i>LMR</i>	1													
<i>DC</i>	0.11	1												
<i>HC</i>	0.01	0.00	1											
<i>RTB</i>	-0.14	0.15	0.03	1										
<i>OP</i>	0.13	0.18	-0.04	0.22	1									
<i>FI</i>	0.01	0.28*	0.22	0.44*	0.22	1								
<i>CR</i>	-0.12	0.15	0.39*	0.35*	-0.14	0.05	1							
<i>GCAP</i>	-0.23	0.34*	-0.02	0.71*	0.13	0.38*	0.51*	1						
<i>CRG</i>	0.05	0.22	-0.14	0.23	0.06	0.16	0.15	0.15	1					
<i>INF</i>	-0.31*	0.17	-0.02	0.37*	-0.06	0.13	0.43*	0.47*	0.01	1				
<i>EXC</i>	0.27*	0.07	0.33*	-0.19	-0.23	-0.15	0.04	-0.19	-0.32*	-0.27*	1			
<i>FB</i>	-0.18	0.11	-0.01	0.14	-0.05	0.18	0.14	0.40*	-0.24	0.08	-0.14	1		
<i>GOV</i>	-0.16	0.38*	0.21	0.74*	0.18	0.41*	0.59*	0.86*	0.18	0.47*	-0.14	0.19	1	
<i>POP</i>	0.14	-0.32*	0.35*	-0.14	0.16	-0.17	0.12	-0.11	-0.27*	-0.04	-0.29*	-0.29*	0.04	1

Notes: *LMR* is labor market regulations; *DC* is dismissal cost; *HC* is hiring cost; *RTB* is regulation on trade barriers; *OP* is openness; *FI* is financial integration; *CR* is credit to GDP; *GCAP* is log GDP per capita; *CRG* is credit growth; *INF* is inflation stability; *EXC* is exchange rate regime; *FB* is change of fiscal balance to GDP; *GOV* is governance indicator; *POP* is population growth. \* indicates that the correlation is significant at the 5% confidence level.

*Table 4* shows the correlation matrix of the labor market indicators and the control variables. It turns out that our labor market flexibility indicators have a low correlation with most control variables. However, our governance indicator is highly correlated with some other control variables such as regulatory trade barriers, credit to GDP, and GDP per capita.

#### IV. ESTIMATION RESULTS

*Table 5* shows the estimation results for the impact of the financial crisis on output loss. In column (1), we include our labor market flexibility indicators and all control variables. We find that the indicators of labor market flexibility do not have a significant effect on output loss. However, after highly insignificant variables are excluded from the model, the coefficient of hiring cost becomes statistically significant with a negative sign (see column 2). The results do not change when we include the composition of export into the estimations (see columns 3, 4, and 5). The negative sign implies that lower hiring cost (i.e. more flexibility) leads to a smaller

output loss. According to the magnitude of the coefficient, a one-point increase in the hiring cost score (lower hiring cost) reduces output loss by about 0.021 points. So if a country moved from the lowest (Spain) to the highest score of our indicator of hiring cost (New Zealand), its output loss would decline by 0.076 points.

As to the control variables, our results suggest that regulatory trade barriers are statistically significant with a negative sign. It implies that fewer restrictions on international trade will lead to a lower output loss. The magnitude of the coefficient is stable for all model specifications. A coefficient of -0.061 means that a one-point increase in trade barriers score (i.e. fewer trade restrictions) reduce output loss by 0.061 points. However, countries depending on trade are more vulnerable to external shocks. As the global financial crisis caused a sharp decline in international trade, countries in which the contribution of trade to GDP is high suffered more from the crisis. Our indicators of trade composition are not significant. This finding is in contrast with the results of Berkmen et al. (2009) who report that the share of food in total exports is associated with smaller output growth revisions, which they use as indicator of the output loss due to the financial crisis.

As expected, capital market integration has a positive and statistically significant effect on output loss due to the financial crisis (see column 2-5). The global financial crisis originated in the financial sector in high-income countries and subsequently hit countries having highly integrated financial markets with advanced economies. Moreover, countries that experienced rapid credit growth prior to the global crisis were hit hard. This result is in line with the findings of Berkmen et al. (2009) that high domestic credit growth caused a larger decline in output during the global financial crisis.

Stability of inflation has a negative and significant effect on output loss. It implies that the countries in which the monetary authorities could keep inflation stable were less affected by the financial crisis. Meanwhile, the coefficients of the other policy framework indicators, i.e. the exchange rate regime dummy and the change of fiscal balance, are not statistically significant. The latter finding is in line with the conclusions of Taylor (2009) and Spilimbergo et al. (2009). According to Taylor (2009), the government transfers to families in the United States did not increase personal consumption expenditures due to the unpredictability of government policies.

Finally, our results show that countries with higher population growth experienced lower output losses. The magnitude of population growth's coefficients is relatively high ranging from

-5.240 to -5.779 (see columns 1-5). However, including population growth does not change the effect of hiring cost on output loss.

We also examine the relationship between labor market flexibility and the duration of the crisis. *Table 6* column (1) shows that the indicators of labor market flexibility do not have a significant impact on the duration of the crisis. However, after excluding highly insignificant variables, the coefficient of dismissal cost becomes significant with a positive sign (see column 2). This means that low dismissal costs (i.e. more flexibility) slow the recovery from the crisis. This finding is in line with the results of Bentolila and Bertola (1990) and Bertola (1990) that a reduction of firing costs does not increase firms' marginal propensity to hire, but strongly affects their willingness to fire. The results are robust when we include the composition of export as additional control variables (columns 3-5). The magnitude of the coefficient of dismissal cost implies that a one-point increase in the score of this variable (i.e. lower dismissal cost) increases the duration of the crisis by 0.554 quarters. So if a country moved from the lowest (Bolivia) to the highest score of our indicator of dismissal cost (Denmark), its recovery period would increase by 2.060 quarters.

The control variables that are significant are trade barriers, openness, credit growth, stability of inflation, and the exchange rate regime. Countries with more restrictions on international trade tend to recover faster than those with fewer restrictions. As the crisis deepens, there is increasing pressure to raise trade barriers such as non-tariff protection to limit imports, or introduce various forms of export subsidies (see Spilimbergo et al., 2009). However, countries depending on trade will recover faster from the crisis. In addition, countries that had higher credit growth before the crisis take longer to recover. A more flexible exchange rate regime and more stable inflation help the countries to recover faster.

*Table 5*  
Estimation Results for Output Loss

<b>Dependent Variable: Percentage change of GDP from the peak to bottom</b>					
VARIABLES	(1)	(2)	(3)	(4)	(5)
Labor Market Regulation	0.004 (0.010)				
Dismissal Cost	0.002 (0.013)				
Hiring Cost	-0.017 (0.013)	-0.021** (0.010)	-0.020* (0.010)	-0.023** (0.011)	-0.021** (0.010)
Trade Barriers	-0.061*** (0.013)	-0.061*** (0.011)	-0.061*** (0.011)	-0.061*** (0.011)	-0.061*** (0.011)
Openness	0.037** (0.016)	0.041*** (0.014)	0.038*** (0.014)	0.042*** (0.014)	0.041*** (0.014)
Share of Food in Exports			-0.063 (0.101)		
Share of Industrial Goods in Exports				0.031 (0.054)	
Share of Fuel in Exports					0.011 (0.072)
Financial Integration	0.013 (0.008)	0.015** (0.007)	0.016** (0.007)	0.015** (0.007)	0.015** (0.007)
Financial Development	-0.026 (0.023)				
Log GDP per Capita	-0.007 (0.067)				
Credit Growth	0.079* (0.046)	0.077** (0.036)	0.084** (0.038)	0.075** (0.036)	0.080* (0.040)
Stability of Inflation	-0.062*** (0.018)	-0.070*** (0.015)	-0.070*** (0.015)	-0.068*** (0.015)	-0.070*** (0.015)
Exchange Rate Regime Dummy	0.007 (0.026)				
Change of Fiscal Deficit	-0.155 (0.375)				
Governance	0.036 (0.025)	0.024 (0.014)	0.022 (0.015)	0.025* (0.015)	0.024 (0.015)
Population Growth	-5.779*** (1.727)	-5.440*** (1.326)	-5.240*** (1.373)	-5.452*** (1.336)	-5.438*** (1.340)
Constant	1.123*** (0.298)	1.120*** (0.159)	1.117*** (0.160)	1.086*** (0.171)	1.112*** (0.167)
Observations	56	56	56	56	56
R-squared	0.740	0.724	0.727	0.726	0.725

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Table 6*  
**Estimation Results for Duration of the Crisis**

<b>Dependent Variable: Duration</b>					
<b>VARIABLES</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>
Labor Market Regulation	-0.027 (0.278)				
Dismissal Cost	0.283 (0.354)	0.554** (0.257)	0.554** (0.260)	0.604** (0.263)	0.554** (0.260)
Hiring Cost	-0.047 (0.359)				
Trade Barriers	0.643* (0.358)	0.894*** (0.220)	0.894*** (0.223)	0.921*** (0.223)	0.893*** (0.227)
Openness	-0.535 (0.445)	-0.857** (0.379)	-0.855** (0.388)	-0.820** (0.382)	-0.858** (0.385)
Share of Food in Exports			0.096 (2.626)		
Share of Industrial Goods in Exports				1.326 (1.416)	
Share of Fuel in Exports					-0.030 (1.926)
Financial Integration	0.145 (0.213)				
Financial Development	0.699 (0.629)				
Log GDP per Capita	-0.511 (1.838)				
Credit Growth	1.951 (1.256)	1.784* (1.033)	1.773 (1.082)	1.706 (1.038)	1.777 (1.148)
Stability of Inflation	-1.295** (0.486)	-1.237*** (0.409)	-1.237*** (0.413)	-1.141*** (0.422)	-1.238*** (0.419)
Exchange Rate Regime Dummy	-1.759** (0.703)	-2.106*** (0.558)	-2.110*** (0.570)	-2.123*** (0.559)	-2.107*** (0.565)
The Change of Fiscal Deficit	8.121 (10.223)				
Governance	0.177 (0.688)				
Population Growth	-41.753 (47.061)				
Constant	13.583 (8.125)	11.079*** (3.693)	11.072*** (3.736)	9.487** (4.070)	11.099*** (3.945)
Observations	56	56	56	56	56
R-squared	0.572	0.525	0.525	0.533	0.525

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



## V. ROBUSTNESS TESTS

In order to check the robustness of estimation results, we employ two methods. First, we exclude the outliers from the estimations. Based on the residuals, Costa Rica, Jamaica, and Latvia were dropped. Second, we separate the sample into high-income countries and other countries. The estimation results are shown in *Table 7*.

Dropping outliers does not affect our main results. The coefficient of hiring cost is still statistically significant with a negative sign (see column 1). It indicates that lower hiring cost (more flexibility) leads to lower output losses. In addition, the dismissal costs remain a significant determinant of the duration of the crisis (see column 2). The countries that have low dismissal cost take longer to recover from the crisis.

When the observations are separated into high-income countries and other countries, it turns out that the results slightly change. Hiring cost significantly affect the output losses only in high-income countries, but not in the other countries (see columns 3 and 5). Still, the magnitude of the coefficient of hiring costs is very similar for both sub-samples; for non-high-income countries the coefficient is, however, estimated less precisely. Meanwhile, the duration of the crisis is affected significantly by the dismissal costs only in the non-high-income countries. The speed of recovery in high-income countries is affected by the other variables such as trade barriers, openness, credit growth, stability of inflation, and the exchange rate regime.

*Table 7*  
Robustness Tests

VARIABLES	Without Outliers		High-Income Countries		Other Countries	
	Output Loss	Duration	Output Loss	Duration	Output Loss	Duration
	(1)	(2)	(3)	(4)	(5)	(6)
Labor Market Regulation						
Dismissal Cost		0.500** (0.240)		0.111 (0.351)		0.795** (0.352)
Hiring Cost	-0.021** (0.009)		-0.018** (0.008)		-0.017 (0.021)	
Trade Barriers	-0.047*** (0.008)	0.657*** (0.219)		1.386** (0.497)	-0.071*** (0.015)	0.827** (0.294)
Openness	0.034*** (0.011)	-0.593 (0.362)		-1.185** (0.441)	0.051 (0.043)	
Financial Integration	0.020*** (0.006)				0.020* (0.011)	
Credit Growth	0.055* (0.030)	2.284** (0.996)	0.077** (0.030)	3.080** (1.158)	0.094 (0.093)	
Stability of Inflation	-0.082*** (0.014)	-0.359 (0.466)	-0.113*** (0.020)	-1.703** (0.816)	-0.066*** (0.023)	-1.297** (0.498)
Exchange Rate Regime Dummy		-1.878*** (0.534)		-2.190*** (0.653)		-1.578* (0.808)
Population Growth	-4.377*** (1.141)		-4.843*** (1.256)		-4.825* (2.578)	
Constant	1.097*** (0.118)	4.197 (4.050)	1.202*** (0.191)	12.142 (8.103)	1.084*** (0.231)	10.854** (4.754)
Observations	53	53	32	32	24	24
R-squared	0.796	0.528	0.718	0.605	0.775	0.481

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## VI. CONCLUSIONS

This study examines the relationship between the impact of the global financial crisis and labor market flexibility. By employing cross-country regressions and including control variables such as trade integration, financial integration, financial development, financial vulnerability, policy framework, institutional differences, and population growth, we find that countries with low hiring cost suffered lower output loss due to the recent financial crisis. However, countries with lower dismissal cost recovered slower than countries with higher dismissal cost. The results are robust for exclusion of outliers. Also regulatory trade barriers, openness, credit growth, financial integration, inflation stability, and population growth are found to have a significant impact on output loss. With respect to the speed of recovery from the crisis, we find that apart from labor market flexibility, only trade barriers, credit growth, and exchange rate regimes are statistically significant. Our findings for the total sample suggest that there is a trade-off between the depth of the recession following the crisis and the duration of the recession. A more flexible labor market leads to a smaller output loss, but it also increases the time to recover from the crisis. The results vary somewhat across country groups. Our findings suggest that in high-income countries, more labor market flexibility decreases the output loss, but does not affect the duration of the crisis.

## APPENDIX

*Table A1*

Countries in our sample and data used

<b>No.</b>	<b>Countries</b>	<b>Peak</b>	<b>Through</b>	<b>Duration</b>	<b>Output loss</b>
1	Argentina	2008: II	2009:I	3	0.099
2	Australia	2008:III	2008:IV	1	0.008
3	Austria	2007:IV	2009:I	5	0.087
4	Belgium	2007:IV	2009:I	5	0.093
5	Bolivia	2008:II	2009:I	3	0.122
6	Botswana	2008:III	2009:I	2	0.281
7	Bulgaria	2008:III	2010:I	6	0.313
8	Canada	2007:IV	2009:II	6	0.034
9	Chile	2008:II	2009:III	5	0.072
10	Colombia	2008:III	2008:IV	1	0.015
11	Costa Rica	2008:I	2009:I	4	0.045
12	Czech Republic	2008:II	2009:I	3	0.098
13	Denmark	2007:IV	2010:I	9	0.104
14	Estonia	2007:IV	2010:I	9	0.256
15	Finland	2007:IV	2010:I	9	0.162
16	France	2008:I	2009:I	4	0.039
17	Georgia	2007:IV	2009:I	5	0.214
18	Germany	2008:I	2009:I	4	0.067
19	Greece	2008:III	2010:I	6	0.144
20	Hungary	2007:IV	2009:I	5	0.191
21	Iceland	2008:III	2010:I	6	0.149
22	India	2008:IV	2009:I	1	0.062
23	Indonesia	2008:III	2008:IV	1	0.036
24	Israel	2008:III	2008:IV	1	0.031
25	Italy	2008:I	2009:II	5	0.068
26	Jamaica	2007:II	2009:IV	10	0.051
27	Japan	2008:I	2009:I	4	0.086
28	Korea, Rep.	2007:IV	2009:I	5	0.125
29	Kyrgyz Republic	2008:III	2009:I	2	0.524
30	Latvia	2007:IV	2010:I	9	0.396
31	Lithuania	2008:III	2010:I	6	0.280
32	Luxembourg	2007:IV	2009:II	6	0.084
33	Malaysia	2008:III	2009:I	2	0.109
34	Mauritius	2008:IV	2009:I	1	0.116
35	Mexico	2007:IV	2009:I	5	0.118
36	Mongolia	2007:IV	2008:I	1	0.350
37	Morocco	2008:II	2008:IV	2	0.019
38	Netherlands	2008:I	2009:II	5	0.050
39	New Zealand	2007:IV	2009:I	5	0.024
40	Norway	2008:IV	2009:II	2	0.090
41	Peru	2008:II	2009:I	3	0.096

42	Poland	2008:IV	2009:I	1	0.127
43	Portugal	2007:IV	2009:I	5	0.091
44	Romania	2008:IV	2010:I	5	0.431
45	Russian Federation	2008:III	2009:I	2	0.256
46	Singapore	2008:III	2009:I	2	0.096
47	Slovak Republic	2008:III	2009:I	2	0.193
48	Slovenia	2008:II	2010:I	7	0.157
49	South Africa	2008:III	2009:II	3	0.028
50	Spain	2008:I	2009:IV	7	0.046
51	Sweden	2007:IV	2009:III	7	0.176
52	Switzerland	2008:II	2009:II	4	0.024
53	Thailand	2008:I	2009:II	5	0.099
54	Turkey	2008:III	2009:I	2	0.253
55	United Kingdom	2008:I	2009:III	6	0.062
56	United States	2008:II	2009:II	4	0.038

Source: Authors' calculations based on data provided by the IMF's International Financial Statistic (IFS)

Table A2

List of Explanatory Variables

<b>Variables</b>	<b>Definition</b>	<b>Sources</b>
<b>Labor Market Flexibility</b>		
Minimum wage	The ratio of mandated minimum wage to the average value added per worker (2007)	Gwartney et al. (2009)
Hiring and firing regulation	Whether the hiring and firing workers is impeded by regulations or flexibly determined by employers (2007)	Gwartney et al. (2009)
Centralized collective bargaining	Whether wages are set by a centralized bargaining process or up to each individual company (2007)	Gwartney et al. (2009)
Mandated cost of hiring	Includes 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 (2007)	Gwartney et al. (2009)
Mandated cost of worker dismissal	Includes the cost of the requirements for advance notice, severance payments, and penalties due when dismissing a redundant worker (2007)	Gwartney et al. (2009)
Conscription	Duration of military conscription (2007)	Gwartney et al. (2009)
<b>Trade Integration</b>		
Regulatory Trade Barriers	Consists of Non-tariff trade barriers and compliance cost of importing and exporting (2007)	Gwartney et al. (2009)
Exports and Imports relative to GDP	Total export plus imports of goods and services to GDP (2007)	WDI (2009)
Share of food commodities in total exports	Ratio between food exports and total exports (2007)	UN Comtrade
Share of industrial commodities in total exports	Ratio between industrial commodity exports and total exports (2007)	UN Comtrade
Share of fuel in total exports	Ratio between exports in fuel and total exports (2007)	UN Comtrade
<b>Financial Integration</b>		
International capital market controls	Includes foreign ownership/investment restriction and capital controls (2007).	Gwartney et al. (2009)

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<b>Domestic Financial Development</b>		
Credit/GDP	Domestic credit to GDP (2005)	WDI (2007)
<b>Vulnerability</b>		
The Growth of Domestic Credit	Cumulative growth of domestic credit (2003-2005)	WDI (2007)
<b>Quality of Institution</b>		
Governance indicators	There are six components of governance: voice and accountability; political stability and absence of violence; government effectiveness; regulatory quality; rule of law; and control of corruption (2007)	The Worldwide Governance Indicators (WGI)
<b>Policy Framework</b>		
Standard deviation of inflation	Standard deviation of the inflation rate over the last five years (2007).	Gwartney et al. (2009)
Flexible exchange rate regime dummy	The exchange rate regime on the basis of degree of flexibility and the existence of formal or informal commitments to exchange rate paths (2006)	IMF (2007)
Fiscal stimulus	The change of fiscal balance per GDP from 2008 to 2009	WDI (2009)
Population growth	The percentage change of population (2007)	IFS (2010)

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## REFERENCES

- Bentolila, Samuel and Giuseppe Bertola (1990). Firing Costs and Labour Demand: How Bad is Eurosclerosis?, *The Review of Economic Studies*. 57(3): 381-402.
- Berglöf, Erik, Yevgeniya Korniyenko, Alexander Plekhanov, and Jeromin Zettelmeyer (2009). Understanding the Crisis in Emerging Europe, European Bank for Reconstruction and Development, Working Paper No. 109.
- Berkmen, Pelin, Gaston Gelos, Robert Rennhack, and James P. Walsh (2009). The Global Financial Crisis: Explaining Cross-Country Differences in the Output Impact, International Monetary Fund (IMF), Working Paper No. 280.
- Bertola, Giuseppe (1990). Job Security, Employment and Wages, *European Economic Review*. 34: 851-886.
- Feldmann, Horst (2003). Labor Market Regulation and Labor Market Performance: Evidence Based on Surveys among Senior Business, *Kyklos*. 56: 509-540
- Forteza, Alvaro, and Martin Rama (2006). Labor Market 'Rigidity' and the Success of Economic Reforms Across More than 100 Countries, *The Journal of Economic Policy Reform*. 9: 75-105.
- Gwartney, James and Robert Lawson with Herbert Grubel, Jakob de Haan, Jan-Egbert Sturm, and Eelco Zandberg (2009). Economic Freedom of the World: 2009 Annual Report, Vancouver, BC: The Fraser Institute. Data retrieved from [www.freetheworld.com](http://www.freetheworld.com).
- Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi (2009). Governance Matters VIII: Aggregate and Individual Governance Indicators 1996-2008, World Bank Policy Research Working Paper No. 4978.
- Naudé, Wim (2009). The Financial Crisis of 2008 and the Developing Countries, World Institute for Development Economic Research, Discussion Paper No. 01.
- Pitlik, Hans (2002). The Path of Liberalization and Economic Growth, *Kyklos*. 55: 57-80.
- Pitlik, Hans (2008). The Impact of Growth Performance and Political Regime Type on Economic Policy Liberalization, *Kyklos*. 61: 258-278.
- Rose, Andrew K. and Mark M. Spiegel (2009). Cross-Country Causes and Consequences of the 2008 Crisis: International Linkages and American Exposure, NBER Working Paper No. 15358.



Spilimbergo, Antonia, Steven Symansky, Oliver J. Blanchard, and Carlo Cottarelli (2009). Fiscal Policy For the Crisis, CEPR Discussion Paper No. 7130.

Solow, Robert M. (1997). What is Labor Market Flexibility: What is it good for?, *Proceedings of the British Academy*, 97: 189-211.

Taylor, John B. (2009). The Financial Crisis and The Policy Responses: An Empirical Analysis of What Went Wrong, NBER Working Paper No. 14631.

Weede, Erich and Sebastian Kämpf (2002). The Impact of Intelligence and Institutional Improvements on Economic Growth, *Kyklos*. 55: 361–380.

#### SUMMARY

The impact of the global financial crisis varies across countries. We examine whether cross-country differences in output loss and speed of recovery are affected by differences in labor market flexibility. By employing cross-country regressions and including control variables like trade and capital market integration, fiscal balance, financial vulnerability, and institutional differences, we find that lower hiring costs reduce the output loss, notably so in high-income countries. However, the duration of the crisis is longer in case of low dismissal costs, notably so in low-income countries.

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