I Z A Institute of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17590

Exchange Rates and Economic Growth During the Global Business Cycle: The Role of Labor Market Institutions

Vytautas Kuokštis
Muhammad Asali
Simonas Algirdas Spurga

DECEMBER 2024

I Z A Institute of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17590

Exchange Rates and Economic Growth During the Global Business Cycle: The Role of Labor Market Institutions

Vytautas Kuokštis
Vilnius University

Muhammad Asali
Vilnius University, College of Management Academic Studies, Israel and IZA

Simonas Algirdas Spurga
Vilnius University

DECEMBER 2024

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Exchange Rates and Economic Growth During the Global Business Cycle: The Role of Labor Market Institutions[1]

The effect of exchange rate regimes on economic performance is one of the key questions in international economics, both academically and policy-wise. Based on the theory of Optimum Currency Areas (OCA), we examine how labor market regulations affect the relationship between exchange rate regimes and economic growth during global recessions and recoveries. Using a global panel dataset, we show that the negative influence of fixed exchange rate regimes during global shocks identified in earlier literature only manifests itself in countries with high labor market regulation. Conversely, fixers with less labor market regulation recover faster from global recessions than floaters.

JEL Classification: G01, G18, J08, O24, P17

Keywords: exchange rate regimes, labor market regulation, growth, global recessions, recovery

Corresponding author:
Muhammad Asali
College of Management Academic Studies
Yitzhak Rabin Avenue 7
Rishon LiTsiyon 7549071
Israel

E-mail: muhammad.asali@gmail.com

1 This work was supported by the Lithuanian Research Council under grant number P-MIP-22-312.

1. Introduction

Exchange rate regimes can have important macroeconomic effects (Frieden 2016). Despite a large body of literature, however, there is still no consensus on whether fixed exchange rates are good for economic growth (Frankel 2012; Petreski 2009; Rose 2011). Some studies find that fixed rates boost growth (Ghosh, Gulde, and Wolf 2000; Cruz-Rodríguez 2022), others show a negative effect (Bleaney and Francisco 2007; Levy-Yeyati and Sturzenegger 2003), with some identifying no significant relationship (Klein and Shambaugh 2012; Miles 2008) or one that varies by income group (Sosvilla-Rivero and Ramos-Herrera 2014). Nevertheless, there is strong evidence that fixed exchange rates can have a negative effect on growth during crises, such as natural disasters and recessions because flexible regimes allow smoother and faster adjustment to shocks (Chia, Cheng, and Li 2012; Edwards and Levy Yeyati 2005; Elekdag and Tuuli 2023; Oeking 2015; Ramcharan 2007; Terrones 2020).

We provide the first empirical study that analyzes how the performance of exchange rate regimes during shocks (global recessions) depends on labor market institutions. Using a global panel dataset, we find strong evidence that fixers will not underperform floaters during global recessions if they have flexible (less regulated) labor markets.

We derive our hypothesis from the optimum currency area (OCA) theory (Mundell 1961), which argues that labor market flexibility can act as a substitute for nominal currency depreciation (De Grauwe 2016). Labor market flexibility encompasses wage flexibility and labor mobility, both of which can help in adjusting to shocks. This effect is particularly important under a peg and can strengthen its credibility (Castrén, Takalo, and Wood 2010). Our independent variable is the exchange rate regime and the dependent variable is economic growth. Our two key moderator (conditioning) variables are global economic recessions and labor market flexibility which we proxy by labor market regulation.

Our main finding is that the fixed exchange rate regime has a positive effect on growth during recoveries from crises in economies with highly flexible labor markets. We contribute to the literature by empirically supporting an important prediction of the OCA theory; challenging the earlier findings that fixed rates are in general inefficient during economic downturns; and demonstrating the importance of labor market policies under fixed exchange rate regimes in terms of performance during crises.

2. Data and methodology

The working sample in this study is based on panel data that we assembled for 117 countries, spanning the years 1970-2016. Data on the de facto exchange rate regime come from Ilzetzki, Reinhart, and Rogoff (2017), whose fine scale classification of exchange rate regimes is used to define a fixed exchange rate regime for categories 1-8 and non-fixed otherwise.

We measure labor market flexibility (LMF) using the CBR data by Adams et al. (2017) covering labor laws in 117 countries. We perform principal component analysis to produce a single index, LMF, normalized to the interval [0,10], with 10 being the least regulated, most flexible, labor market (Annex A describes the construction of the index in detail).

To understand the moderating impact of labor market flexibility on the relationship between the exchange rate fixity and growth during recessions and recoveries, we estimate a general model as follows:

$$g_{it} = \alpha_i + \beta_1 FER + \beta_2 LMF + \beta_3 RES + \beta_4 REC + \beta_5 FER \times LMF + \beta_6 FER \times RES + \beta_7 FER \times REC + \beta_8 LMF \times RES + \beta_9 LMF \times REC + \beta_{10} FER \times LMF \times RES + \beta_{11} FER \times LMF \times REC \ + \gamma \ ln \ ln \ (GDPPC_{i,t-1}) \ + X_{it}\delta + \phi t + \varepsilon_{it}$$

Where g_{it} is the growth rate of the real per-capita GDP of country i in year t. α_i represents country fixed effects. FER stands for exchange rate regime: $FER = 0$ if floating, and $FER = 1$ if fixed. LMF is the measure of labor market flexibility. RES stands for Recession, and REC for Recovery. As in Terrones (2020), recessions are defined as one of the years: 1975, 1982, 1991, 2009; and recoveries are defined as the 3-year period following a recession, that is 1976-78, 1983-85, 1992-94, and 2010-12. The control (omitted) group is of non-fixers in expansion years.

The vector X includes time-variant control variables: log of the population size and growth, polity index on the level of democracy, the Chinn-Ito index of capital account openness, rest-of-the-world growth rate, a variable to proxy for macroeconomic turbulence in the domestic economy (the "freely falling" exchange rate), the lagged GDP per capita, and, in the dynamic model, the lagged dependent variable. ϕt captures a linear time trend, or else time fixed effects in the full specification; and ε_{it} is the error term, a mean-zero growth innovation. Our choice of control variables is guided by theory and earlier literature, as we want to account for potential confounders (most importantly, the *level* of economic development but also global growth rate and political-institutional variables) and also retain comparability with other studies (Kuokštis, Asali, and Spurga 2022; Terrones 2020).

The total effect of exchange rate fixity on growth, from this general specification, is given by:

$$\text{Effect of Fixed ER on growth} = \beta_1 + \beta_5 LMF + \beta_6 RES + \beta_7 REC + \beta_{10} LMF \times RES + \beta_{11} LMF \times REC$$

We focus on the total effect of fixity on growth during recovery years, that is represented by: $\beta_1 + \beta_7 + (\beta_5 + \beta_{11}) \times LMF$, and also relate to the partial effect in recoveries (relative to non-fixers in expansion years, similar to the main measure in Terrones, 2020) which is given by

$\beta_7 + \beta_{11} \times LMF$. New to this literature, we postulate that both measures are affected by the level of labor market flexibility.

3. Results

Table 1 provides the static and dynamic estimation of the model featuring interactions with labor market flexibility. Dynamic models include lagged dependent variable, and given the presence of fixed effects, use the one-step Arellano-Bond instrumental variables' approach, limiting the number of instruments (reducing the dimensionality of the instrument matrix) to the number of endogenous variables and their lags.[2]

We find that the actual effect of exchange rate fixity during recoveries *is* affected by the level of labor market flexibility.

---

[2] The main variables in the analysis have been tested for stationarity and found to be stationary and trend stationary as used in our analyzed models. See appendix B for details.

Table 1. The effect of fixed exchange rate on growth during recessions and recoveries in the presence of labor market flexibility

	(1)	(2)	(3)	(4)	(5)	(6)
	Restricted sample			Full Sample		
	Static	Static	Static	Dynamic	Static	Dynamic
Fixed exchange rate	.5348	.1478	-1.0904	-.4951	-.4679	.242
(FER), lagged	(.3227)	(.9327)	(1.027)	(.5876)	(.8441)	(.5482)
Recession	.0146	-.2514	-3.4439	-3.5555*	-61.6428**	-53.7702***
	(.5124)	(1.6527)	(2.1149)	(2.0232)	(26.7015)	(19.2055)
Recovery	.5005**	.1973	.9467	.8256	3.472***	-.6892
	(.1947)	(.6191)	(.6686)	(.6414)	(.95)	(2.7578)
FER*Recession	-.2672	-1.9679	-1.2818	-1.3485	-.2712	-.7748
	(.5403)	(1.9309)	(2.4891)	(2.4696)	(2.2212)	(2.1526)
FER*Recovery	-.7625***	-2.3089***	-2.6122***	-1.8923**	-3.7569***	-3.0311***
	(.288)	(.8743)	(.9295)	(.872)	(.9032)	(.7968)
Log(Population)	-.416	-.996	-1.2448	.0091	-1.3306	-.092
	(1.0676)	(1.1295)	(1.1747)	(.0865)	(1.0356)	(.0753)
Population growth	-68.7262***	-91.0162***	-53.8001**	-56.4142***	-58.5988**	-52.6529***
	(18.7113)	(21.6244)	(26.3794)	(16.0484)	(25.8125)	(14.6602)
Polity	.0275	.0152	-.0219	-.0105	-.0214	.0036
	(.0303)	(.0326)	(.0357)	(.0233)	(.031)	(.0218)
Capital account	.0736	-.6513	.1417	.0929	-.4202	-.0082
openness	(.5068)	(.4622)	(.5696)	(.296)	(.5635)	(.3123)
Labor market flexibility		.1016	-.1665	-.051	.0374	.0906
(lag), LMF		(.1982)	(.2214)	(.0781)	(.1794)	(.0971)
FER*LMF		.0478	.3971*	.1767	.2026	-.0265
		(.2135)	(.2323)	(.1216)	(.1875)	(.1104)
LMF*Recession		.0361	.2373	.2573	.2212	.1688
		(.2769)	(.43)	(.4154)	(.3808)	(.359)
LMF*Recovery		.0476	-.1663	-.1255	-.3881***	-.2881**
		(.1198)	(.1357)	(.137)	(.1443)	(.1414)
FER*LMF*Recession		.3337	.0681	.077	-.121	-.0266
		(.3375)	(.5194)	(.5229)	(.4611)	(.4612)
FER*LMF*Recovery		.3792**	.4122**	.2957	.6562***	.5302***
		(.1844)	(.2012)	(.1874)	(.1886)	(.17)
Growth rate (lag)				.267***		.2599***
				(.0391)		(.0404)
Ln(GDP per capita (lag)	-2.6152***	-1.8202**	-3.1681***	-.3737***	-3.1059***	-.3764***
	(.6284)	(.6897)	(.613)	(.0998)	(.5511)	(.0911)
Free Falling exch. rate	-4.293***	-4.8621***			-4.3562***	-3.8663***
	(.6703)	(.7787)			(.9034)	(.8413)
Rest of the world growth	Yes	Yes	No	No	Yes	Yes
N. of cases	3509	2651	3564	3550	3564	3550
N. of countries	100	80	107	107	107	107
N. of instruments				22		70
AR(2)				-0.84		-0.27
p-value				0.403		0.785
Hansen-J statistic				6.27		6.32
p-value				0.100		0.503

Notes: the dependent variable is the growth rate of real GDP per capita. Dynamic models are estimated by IV-FE (the one-step Arellano-Bond estimator). Regressions include fixed effects. Short specification includes a linear time trend, and long specification includes time fixed effects. Columns (1) and (2) refer to the restricted sample that was used in Terrones (2020) for comparison. Columns 3-6 use the full samples. In the dynamic models (columns 4 and 6) the lagged dependent variable was treated as endogenous, the 2-4 lags of the dependent variable were used as instruments in the GMM style, as well as the 2-4 lags of the rest-of-world-growth in the longer specification (column 6). Remaining regressors were included as strictly exogenous. AR(2) refers to Arellano-Bond test for second order serial correlation. Hansen is the test for overidentifying restrictions. Robust standard errors clustered at the country level in static models, and one-step system-GMM robust standard errors in the dynamic models, in parentheses.
**** p<.01, ** p<.05, * p<.1*

Previous results in the literature, mainly Terrones (2020) as represented in column (1) of the table, refer to the coefficient of the interacted variable "FER*Recovery" being negative as a sign that fixers perform worse in recoveries. The general specification once labor market flexibility is controlled for, even for the very same sample that was used in Terrones (2020), which we call the "restricted sample," show that this result is rather a function of labor market flexibility. In highly flexible labor markets, the total and partial effect of exchange rate fixity on growth can be positive. These effects, based on the estimation results in Table 1, are reported in Table 2 below.

Table 2 first reports the naïve effect of exchange rate fixity on growth in recovery years as appears in column (1) of Table 2. This is based on estimation results of the analog column in Table 1. More importantly, Table 2 reports the total and partial effect of exchange rate fixity on growth in recovery years when accounting for labor market flexibility in the country.

Table 2. The total and marginal effects of exchange rate fixity on growth during recoveries, at different levels of labor market flexibility

		(1) Static	(2) Static	(3) Static	(4) Dynamic	(5) Static	(6) Dynamic
Total effect		-.2277					
		(0.3499)					
Partial effect		-0.7625***					
		(0.2880)					
Rigid labor market:	Total effect		-2.1611**	-3.7027***	-3.2570***	-4.2248***	-3.7688***
			(0.9174)	(1.0939)	(1.1637)	(0.9345)	(0.9398)
	Partial effect		-2.3089***	-2.6122***	-2.5815**	-3.7569***	-4.0957***
			(0.8743)	(0.9295)	(1.1891)	(0.9032)	(1.0753)
Flexible labor market:	Total effect		2.1090*	4.3911***	3.1871**	4.3631***	3.0364***
			(1.3033)	(1.5268)	(1.5947)	(1.2666)	(1.3556)
	Partial effect		1.4836	1.5101	1.4523	2.8055***	3.0679**
			(1.0698)	(1.1701)	(1.4992)	(1.0740)	(1.3524)
Sample		Restricted	Restricted	Full	Full	Full	Full

Notes: estimates are based on results from the respective columns in Table 1. Column (1) refers to the replication of Terrones (2020), there the focus is only on the partial effect and is correctly reported as negative. Column (2) adds the variable "Labor Market Flexibility" to the basic model of Terrones in (1) and applied to the very same restricted subsample. Columns 3-6 use the full sample available. The Total effect of fixed exchange rate regime on growth in recovery time is $\beta_1 + \beta_7 + (\beta_5 + \beta_{11}) \times LMF$, estimated for rigid labor markets (LMF=0) and for flexible labor markets (LMF=10).

The partial effect of fixed exchange rate regime on growth in recovery years (relative to expansion years) is given by $\beta_7 + \beta_{11} \times LMF$.

**** p<.01, ** p<.05, * p<.1*

As can be seen from Table 2, we find strong evidence to support our hypothesis. Following a crisis, fixers with highest labor market flexibility rates recover *faster* than non-fixers. Similarly, fixers with high labor market flexibility also perform better than non-fixers during recession years, although the results are not statistically significant.[3] The total effect of exchange rate fixity on economic growth is positive in recovery years, and is highly statistically and economically significant.

4. Conclusions

In this paper, we show that fixers do not underperform floaters during recession years, and perform better during global recoveries if they have flexible labor market institutions. The stronger effect for recoveries is theoretically expected: while labor market flexibility facilitates macroeconomic adjustment, the new wage and employment equilibrium is typically attained with a lag even in flexible labor markets (see, for instance, Gautier, Roux, and Suarez Castillo 2022).

Our study has important academic and policy implications. First, we provide novel empirical evidence that the effects of exchange rate regimes depend on labor market regulations, questioning the previously established finding that fixed rates are universally bad for growth during crises. Therefore, studies analyzing the macroeconomic effects of exchange rate regimes should take into account labor market institutions.

While higher labor market regulation might bring benefits, such as higher labor income share and employment (Adams et al. 2017), our research suggests that there might be a tradeoff in

[3] This result is not shown in the table, but is available upon request.

terms of counteracting shocks for fixers. In other words, we highlight the importance of labor market reform for countries that have fixed exchange rates.

The limitation of our study is that we only explored the relationship between labor market regulations and exchange rate regimes during global recessions. Future research should investigate whether the results hold for different types of economic shocks; whether labor market institutions help to better explain and predict currency crises; and whether there are important interactive effects between labor markets institutions, exchange rate regimes, and the real exchange rate level (Du and Liu 2015).

References

Adams, Zoe, Parisa Bastani, Louise Bishop, and Simon Deakin. 2017. 'The CBR-LRI Dataset: Methods, Properties and Potential of Leximetric Coding of Labour Laws'. *International Journal of Comparative Labour Law and Industrial Relations* 33 (1). https://kluwerlawonline.com/api/Product/CitationPDFURL?file=Journals\IJCL\IJCL2017004.pdf.

Bleaney, Michael, and Manuela Francisco. 2007. 'Exchange Rate Regimes, Inflation and Growth in Developing Countries -- An Assessment'. *The B.E. Journal of Macroeconomics* 7 (1). https://doi.org/10.2202/1935-1690.1546.

Castrén, Olli, Tuomas Takalo, and Geoffrey Wood. 2010. 'Unemployment Persistence and the Sustainability of Exchange Rate Pegs'. *Scottish Journal of Political Economy* 57 (1): 85–102. https://doi.org/10.1111/j.1467-9485.2009.00508.x.

Chia, Wai-Mun, Tianyin Cheng, and Mengling Li. 2012. 'Exogenous Shocks and Exchange Rate Regimes'. *The World Economy* 35 (4): 444–60. https://doi.org/10.1111/j.1467-9701.2012.01445.x.

Cruz-Rodríguez, Alexis. 2022. 'Exchange Arrangements and Economic Growth: What Relationship Is There?' *Journal of Economics and Political Economy* 9 (3): 238–56. https://doi.org/10.1453/jepe.v9i3.2358.

De Grauwe, Paul. 2016. 'European Monetary Unification: A Few Lessons for East Asia'. *Scottish Journal of Political Economy* 63 (1): 7–17. https://doi.org/10.1111/sjpe.12108.

Du, Qingyuan, and Qing Liu. 2015. 'Labor Market Flexibility and the Real Exchange Rate'. *Economics Letters* 136 (November):13–18. https://doi.org/10.1016/j.econlet.2015.08.012.

Edwards, Sebastian, and Eduardo Levy Yeyati. 2005. ‘Flexible Exchange Rates as Shock Absorbers’. *European Economic Review* 49 (8): 2079–2105. https://doi.org/10.1016/j.euroecorev.2004.07.002.

Elekdag, Selim, and Maxwell Tuuli. 2023. ‘Weather Shocks and Exchange Rate Flexibility’. *Review of International Economics* 31 (5): 1793–1832. https://doi.org/10.1111/roie.12692.

Frankel, Jeffrey A. 2012. ‘Choosing an Exchange Rate Regime’. In *Handbook of Exchange Rates*, edited by Jessica James, Ian W. Marsh, and Lucio Sarno, First Edition, 767–84. John Wiley & Sons, Inc.

Frieden, Jeffry A. 2016. *Currency Politics: The Political Economy of Exchange Rate Policy*. Princeton University Press.

Gautier, Erwan, Sébastien Roux, and Milena Suarez Castillo. 2022. ‘How Do Wage Setting Institutions Affect Wage Rigidity? Evidence from French Micro Data’. *Labour Economics* 78 (October):102232. https://doi.org/10.1016/j.labeco.2022.102232.

Ghosh, Atish R., Anne-Marie Gulde, and Holger C. Wolf. 2000. ‘Currency Boards: More than a Quick Fix?’ *Economic Policy* 15 (31): 270–335. https://doi.org/10.1111/1468-0327.00063.

Ilzetzki, Ethan, Carmen M. Reinhart, and Kenneth S. Rogoff. 2017. ‘Exchange Arrangements Entering the 21st Century: Which Anchor Will Hold?’ 23134. NBER Working Paper Series. Cambridge, MA: National Bureau of Economic Research.

Klein, Michael W., and Jay C. Shambaugh. 2012. *Exchange Rate Regimes in the Modern Era*. Cambridge, Massachusetts, London, England: MIT Press.

Kuokštis, Vytautas, Muhammad Asali, and Simonas Algirdas Spurga. 2022. ‘Labor Market Flexibility and Exchange Rate Regimes’. *European Journal of Political Economy* 75 (December):102205. https://doi.org/10.1016/j.ejpoleco.2022.102205.

Levy-Yeyati, Eduardo, and Federico Sturzenegger. 2003. 'To Float or to Fix: Evidence on the Impact of Exchange Rate Regimes on Growth'. *American Economic Review* 93 (4): 1173–93. https://doi.org/10.1257/000282803769206250.

Miles, William. 2008. 'Exchange Rates, Inflation and Growth in Small, Open Economies: A Difference-in-Differences Approach'. *Applied Economics* 40 (3): 341–48. https://doi.org/10.1080/00036840600639881.

Mundell, Robert A. 1961. 'A Theory of Optimum Currency Areas'. *The American Economic Review* 51 (4): 657–65.

Oeking, Anne. 2015. 'The European Periphery during the Crisis: Fix or Float?' *Applied Economics Letters* 22 (4): 285–90. https://doi.org/10.1080/13504851.2014.939368.

Petreski, Marjan. 2009. 'Exchange-Rate Regime and Economic Growth: A Review of the Theoretical and Empirical Literature'. SSRN Scholarly Paper. Rochester, NY. https://doi.org/10.2139/ssrn.1726732.

Ramcharan, Rodney. 2007. 'Does the Exchange Rate Regime Matter for Real Shocks? Evidence from Windstorms and Earthquakes'. *Journal of International Economics* 73 (1): 31–47. https://doi.org/10.1016/j.jinteco.2006.12.004.

Rose, Andrew K. 2011. 'Exchange Rate Regimes in the Modern Era: Fixed, Floating, and Flaky'. *Journal of Economic Literature* 49 (3): 652–72. https://doi.org/10.1257/jel.49.3.652.

Sosvilla-Rivero, Simón, and María del Carmen Ramos-Herrera. 2014. 'Exchange-Rate Regimes and Economic Growth: An Empirical Evaluation'. *Applied Economics Letters* 21 (12): 870–73. https://doi.org/10.1080/13504851.2014.894625.

Terrones, Marco E. 2020. 'Do Fixers Perform Worse than Non-Fixers during Global Recessions and Recoveries?' *Journal of International Money and Finance* 104 (June):102160. https://doi.org/10.1016/j.jimonfin.2020.102160.

Appendices

Annex A. The labor market flexibility index

The CBR labor regulations database is based on leximetric data coding techniques that aim to measure cross-national and inter-temporal variations in the content of legal rules. The CBR project was initially a response to the emergence of the World Bank's *Doing Business* indicators (Adams et al. 2017, 2–3), and is aimed at helping researchers address "the questions raised in labor economics and the economics of law concerning the impact of laws and regulations on labor market outcomes, and, more generally, on the economic performance of firms, sectors and nations" (Ibid, 67). As the authors describe it, the other indices compiled by the World Bank, the OECD, and others, are partial in their coverage of labor law systems in terms of the scope of the rules covered and the periods of time coded for. The CBR database, on the other hand, provides data on labor laws in 117 countries, captured by forty (40) different indices. Each index lies between 0 and 1, where "0" stands for no protection or the lowest protection offered to workers, and "1" expresses the highest protection offered. Although some of these subcomponents are cardinal variables, most of them are expressed on an ordinal scale.

The 40 indicators are grouped by five different domains of labor regulations, as shown in Table A 1 below.

Table A 1. CBR indices by type of regulation

Category	Type of regulations	Indexes
A	Different forms of employment	I1-I8
B	Regulation of working time	I9-I15
C	Regulation of dismissal	I16-I24
D	Employment representation	I25-I31
E	Industrial action	I32-I40

Source: Adams et al. (2017)

First, we redefine these indicators to associate higher values with less regulation, or labor market flexibility. If I stands for the protection index in CBR data, then F, the associated measure of labor market flexibility in that particular segment of regulation, is defined as: $F_i = 1 - I_i, i = 1,2, \dots ,40$.

We then group these indicators by subcategories of labor laws and regulations that are investigated, and within each category of indices we calculate the sum (or average) of the respective indices, yielding five major summary indices, one for each category. Thus the main five subcomponents of labor market flexibility are defined for each country and year as:

$$F_A = \sum_{i=1}^{8} F_i \, , F_B = \sum_{i=9}^{15} F_i \, , F_C = \sum_{i=16}^{24} F_i \, , F_D = \sum_{i=25}^{31} F_i \, , F_E = \sum_{i=32}^{40} F_i$$

On these aggregated indices we perform principal component analysis in order to build a single "Labor Market Flexibility" index, LMF, which is then normalized to the interval [0,10], 10 being the least regulated, most flexible, labor market. Below are the minimum, median, and maximum values of the labor market flexibility index thus calculated for all countries included in the analysis.

Table A2. Minimum, median, and maximum values of the labor market flexibility index

Country	Minimum	Median	Maximum	Country	Minimum	Median	Maximum
Afghanistan	5.2	6.3	6.5	Macedonia	3.7	4.4	4.5
Algeria	1.3	2.3	4.9	Malaysia	6.0	6.1	7.4
Angola	2.4	2.7	6.2	Mali	4.4	4.5	5.8
Argentina	2.9	3.3	5.4	Malta	3.8	6.3	7.1
Armenia	3.2	3.8	4.0	Mexico	3.0	3.6	3.6
Australia	5.6	7.5	8.1	Moldova	3.1	3.1	3.7
Austria	3.3	3.7	5.2	Mongolia	4.7	6.0	6.5
Azerbaijan	2.4	2.6	3.5	Montenegro	2.6	2.9	3.6
Bangladesh	4.9	6.0	6.1	Morocco	2.8	4.6	5.9
Belarus	2.5	3.7	4.1	Myanmar	6.5	6.8	7.0
Belgium	2.1	3.6	5.7	Namibia	4.6	4.9	7.5

Bolivia	2.9	4.1	4.2
Botswana	5.3	5.4	8.6
Brazil	3.2	3.5	5.3
Bulgaria	1.4	2.7	3.8
Cambodia	3.4	3.4	4.1
Cameroon	4.5	5.5	6.3
Canada	6.0	6.6	7.1
Chile	4.3	5.2	7.0
China	4.2	6.4	8.4
Colombia	4.3	4.5	5.0
Congo, Dem. Rep.	3.2	4.7	4.7
Costa Rica	5.3	5.4	5.4
Cote d'Ivoire	4.3	6.8	7.1
Croatia	1.4	2.2	4.6
Cyprus	3.5	5.5	5.5
Czech Republic	3.0	4.1	5.9
Denmark	4.6	5.6	7.2
Dominican Republic	5.1	5.5	6.0
Ecuador	1.9	3.3	4.4
Egypt	4.2	5.1	5.9
Estonia	3.3	3.9	4.2
Ethiopia	4.2	6.6	7.7
Finland	2.0	3.4	6.4
France	0.0	0.1	4.7
Gabon	3.6	4.8	5.4
Georgia	3.9	4.7	6.6
Germany	2.6	3.5	3.9
Ghana	4.8	5.9	6.4
Greece	3.1	4.8	7.2
Honduras	3.9	3.9	4.3
Hungary	2.8	3.6	5.1
Iceland	4.1	6.6	7.5
India	3.8	4.1	5.2
Indonesia	3.1	3.7	4.1
Iran	6.1	6.4	8.0
Ireland	4.6	7.0	7.9
Israel	4.6	5.2	5.3
Italy	1.8	2.0	2.3
Netherlands	1.2	3.4	4.7
New Zealand	5.2	7.3	8.5
Nicaragua	4.2	6.0	7.1
Nigeria	7.9	7.9	9.1
Norway	2.2	3.5	5.3
Pakistan	3.0	3.5	5.0
Panama	4.3	4.6	7.5
Paraguay	3.7	4.0	4.1
Peru	2.9	3.8	5.2
Philippines	4.4	5.0	10.0
Poland	1.9	3.9	6.2
Portugal	0.2	0.9	5.9
Qatar	6.2	6.2	6.6
Romania	2.2	5.6	6.0
Russia	2.8	3.1	3.6
Rwanda	3.6	5.3	5.5
Saint Lucia	4.2	8.1	8.6
Saudi Arabia	7.0	7.5	7.5
Senegal	2.9	3.3	4.4
Singapore	5.4	6.0	6.0
Slovak Republic	2.5	3.8	3.9
Slovenia	1.1	1.5	3.1
South Africa	3.5	6.1	6.2
South Korea	2.6	4.9	6.1
Spain	1.6	2.3	5.8
Sri Lanka	4.7	5.2	5.4
Sudan	6.8	8.2	8.8
Sweden	2.1	3.2	6.8
Switzerland	5.2	5.7	6.2
Syrian Arab Republic	5.1	5.7	5.7
Tanzania	6.2	6.3	6.6
Thailand	5.4	6.5	8.6
Tunisia	3.0	5.1	5.8
Turkey	3.6	5.1	5.5
Uganda	5.3	7.8	8.2
Ukraine	2.9	3.0	4.5
United Arab Emirates	6.0	6.8	6.9
United Kingdom	5.4	7.2	8.4

Japan	5.2	5.6	5.8	United States	9.3	9.3	9.8
Jordan	4.9	6.3	6.3	Uruguay	2.9	3.1	6.7
Kazakhstan	3.2	4.3	4.5	Venezuela	1.8	3.1	5.0
Kenya	5.5	7.2	8.1	Vietnam	4.3	4.7	8.0
Kyrgyz Republic	3.3	4.0	4.3	Yemen, Rep.	4.6	5.0	5.0
Latvia	2.3	3.0	4.7	Yugoslavia	2.5	2.6	4.3
Lesotho	5.8	6.3	6.9	Zambia	6.4	8.3	8.8
Lithuania	1.6	2.7	4.7	Zimbabwe	6.0	7.9	9.4
Luxembourg	2.2	3.2	6.1				

Annex B. Tests for the stationarity of the main variables

In Table B1 we check the stationarity of the main variables in this study. We use the Im-Pesaran-Shin test for panel unit roots, assuming no structural breaks in the data; as well as the Karavias-Tzavalis test which tests for unit roots under structural breaks (extension of Phillips-Perron test for the case of panel data). We reject the null hypothesis that all involved series are nonstationary. The resulting stationarity of all or most involved series renders the following analysis and their interpretation valid.

Table B1. Stationarity tests of the main variables (growth, labor market flexibility, and population)

	GDP-PC Growth	Labor market flexibility	Change in LM flexibility	Population growth
Panel Unit Root	-35.72 (0.0000)	-3.13 (0.0009)	-31.41 (0.0000)	-54.77 (0.0000)
Unit Root with Structural Break in				
1975	-110 (0.0000)	-3.57 (0.0002)	-91.28 (0.0000)	-35.25 (0.0000)
1982	-110 (0.0000)	-3.18 (0.0007)	-90.94 (0.0000)	-34.01 (0.0000)
1991	-101 (0.0000)	-3.86 (0.0001)	-84.62 (0.0000)	-33.59 (0.0000)

Notes: Upper panel is the Im-Pesaran-Shin test for panel unit roots with one lag and a trend. Lower panel is the Karavias-Tzavalis test for panel unit roots with one known structural break, at recession times, on the demeaned series of data. In parentheses is the p-value for the test of the respective panel unit root. The null hypothesis is rejected at all significance levels, for all variables in all cases (the null hypothesis assumes that all panel time series are nonstationary).