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JEL No: E20, E30, E32, E44, E60, G18, G28

Keywords: financial crisis, great recession, labour market performance, labour market regulation, short-time work agreements, flexicurity, Okun's law

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Why labour market response differed in the Great Recession: the impact of institutions and policy*

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1. Introduction and motivation

The recent crisis has been the deepest crisis industrialized economies have seen since the Great Depression in the nineteen thirties. While the crisis was rather synchronized across countries during its first months[1], the performance of individual countries now – more than four years after the start and more than three years after "Lehmann Brothers" – looks very heterogeneous. Output in some countries is higher than at the start of the crisis, in a few countries it never declined, in other countries it is far below its pre-crisis level.

The focus of this paper is to explain the reaction of labour markets *relative* to output markets. Labour market reaction was more heterogeneous than in past crises and the correlation between cross country variation of output and unemployment declined to -0.35 in this crisis as compared to -0.70 in the 1990-1993 recession[2]). The output market decline was deeper in Germany than in the USA in 2009. But the employment impact was much stronger in the US, with unemployment jumping up from 5% to 10%. In Germany unemployment dropped from 9% to 7%.

A specific innovation of this paper is that we do not use a single variable for output performance, but information about changes of GDP over different periods (years, quarters) as well as a trend change, and that we assess labour market performance by looking at changes in employment and unemployment as well as changes in the participation rate (plus three "trend changes"). We could label this view as an analysis in the spirit of a

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[1] This is indicated by the sharp and simultaneous fall in exports, industrial production and stock prices in the first three quarters see *Aiginger* (2010A, http://www.economics-ejournal.org/economics/journalarticles/2010-18).

[2] *OECD*, 2010, p. 29. See also IMF (2010, p. 69: "During the Great Recession output and unemployment responses differed markedly …"

"Generalized Okun's law", which relates one indicator on labour markets and one indicator on economic growth[3]).

As consensus for output markets we consider that three pre-crisis conditions explain the bulk of differences across countries. High output losses occurred in countries with high credit growth, with deficits in the current accounts and in countries with high pre-crisis growth of GDP (see *Aiginger*, 2011, *Rose - Spiegel*, 2009, *Berkman et al*., 2009, *Claessens et al*., 2010, *Lane et al.*, 2010, *Barell et al*., 2010). To carve out the impact of labour market reactions on top of output reaction, we include the output variable into the regressions explaining labour market performance.

The paper is structured as follows. Section 2 reviews hypotheses on the impact of labour market reactions to output decline. Section 3 describes the data set and variables we use and argues why we need comprehensive performance indicators (one for output markets, one for labour markets). Section 4 presents descriptive evidence on output and labour performance, the section 5 provides the main econometric results. Section 6 includes robustness tests and preliminary econometric evidence for the recovery period. Section 7 carves out common policy elements for best and worst performers not covered by econometrics and section 8 concludes.

2. Determinants of labour market reactions

In general labour demand is predicted to move in parallel with output. More specifically Okun's law suggests there is a statistical relationship between changes in unemployment and changes in real GDP. The reaction of unemployment on output is expected to lag by some months and labour market volatility is assumed to be smaller than output volatility since productivity is pro cyclical. [4]

There are few elaborated hypotheses about how exactly labour markets should perform relative to output markets in a deep crisis. The long-run labour markets response patterns have been addressed in the literature on the benefits and shortcomings of strict labour

[3] Okuns's law (*Okun*, 1962) describes a statistical relation between unemployment and economic growth. It is sometime used in a "difference form" (change in unemployment is related to change in real GDP), sometime in a "level form" (unemployment is related to the GDP-gap).

[4] Cyclical fluctuation in GDP growth translates into smaller fluctuation of the unemployment rate (or vice versa). The coefficient of the change in unemployment relative to GDP is shown empirically to be about 0.5 (*OECD*, 2010) and maybe rising over time (due to deregulation of the labour markets; *IMF*, 2010). The latter study (*IMF*, 2010) is the most explicit use of Okun's law to assess the changes in unemployment in the recent crisis. It concludes that unemployment in Spain and in the USA can be explained by Okun's law (plus financial stress and housing bubble), but in many other countries unemployment increased far less than predicted (Germany, Italy, Japan, the Netherlands).

market regulation, as shown in the OECD Jobs Study (1994). Other response patterns can be derived from the literature on the benefits of flexicurity regimes (see *European Commission*, 2007, but also later OECD Job Strategy Reviews). A third source is the literature on contractual agreements. Older versions stress the impact of the coverage of wage bargains and the role of trade unions (*Nickell*, 1999; *Traxler*, 2003); newer developments include contractual agreements which were introduced before the crisis (like individual working time accounts) or during the crisis (like negotiated part-time arrangements).

Regulation

According to *OECD* (1994) the persistence of high unemployment in many European countries can at least partly be traced back to Employment Protection Legislation (EPL). This would imply that regulation can have a negative impact on employment. Subsequent policy recommendations would be to remove regulatory obstacles, to decrease replacement ratios, job protection, and to increase external mobility (hire and fire). If we try to derive a testable hypothesis for the current crisis, it could be that at least in the medium run (from the start of the crisis up to normalization) there is a negative impact of strict employment protection on labour demand. Even if employment protection decelerates the decline in labour demand at the start of the crisis, eventually the disadvantages of protection outweigh the advantages, and the recovery of employment and probably also GDP growth is delayed[5]. The negative effect during a recovery could actually outweigh the dampening effect on unemployment at the start of the crisis. The whole pattern implied by this view is difficult to test, but at least the sign of the EPL variable as well as that of the replacement ratio would be expected to be negative. If this is not seen for "in-crisis performance" at least a separate analysis of the recovery phase should definitely reveal lower employment dynamics for countries with stronger employment protection.

Flexicurity

The hard-line view of a negative long-term effect of employment protection has been criticized e.g. by *Nickell* (1999) and *Howell* (2007), on both the theoretical and empirical level.[6] The "flexicurity model" (*European Commission*, 2007; *Maselli*, 2010; *Anderson*, 2011)[7]

[5] The NAIRU or any other concept of the "long-term" rate of unemployment will be increased by regulation.

[6] Howell et al. (2007) find "little evidence to suggest that 1990s reforms of core protective labour market institutions can explain much of either the success of "success stories" or the continued high unemployment of the large continental European countries. We conclude that the evidence is consistent with a more complex reality in which a variety of labour market models can be consistent with good employment performance."

[7] Flexicurity is a crucial element of the Employment Guidelines and the European Employment Strategy (*European Commission*, 2011), and specifically the flagship initiative: "An Agenda for new skills and jobs" of the Europe 2020

asserts that not all forms of protection are negative, and specifically that elements of flexibility for firms combined with elements of security for employees could be beneficial for employment as well as competitiveness. The model was derived mainly from the Danish example but it extends to other Nordic European countries and is partially copied by small countries in continental Europe. The flexicurity model combines elements of labour market flexibility, active labour market policy and generous unemployment benefits. This could lower costs for firms by enabling them to adjust labour cost specifically in periods of sluggish demand, while employees do not lose too much in their income, especially if they participate in learning, education, retraining and other active labour market programs. A set of common flexicurity principles contains (European COMMISSION, 2007): (i) flexible and reliable contractual arrangements, (ii) lifelong learning, (iii) active labour market policies, and (iv) modern social security systems.

New contractual agreements promoting internal flexibility

More recently flexible working arrangements have been used. In many countries individual "working time accounts" were introduced, in which overtime hours are accumulated. For firms this has the advantage that they can adjust labour input to output fluctuations in booms without paying the usual overtime surcharge and they can reduce labour costs without layoffs in troughs. Employees "use" (write down) the hours individually if they want a shorter working time for personal reasons (work life balance) or collectively by agreements on the firm level.

Reducing overtime and surpluses on employee time accounts were heavily used during the crisis. In some cases their use became mandatory as a result of contracts between trade unions and firm representatives either on the firm or industry level, if management and employees agreed on periods with shorter working weeks. These forms of internal flexibility were partially assisted by public subsidies conditional on short-term working arrangements. If employees accepted shorter working time, and firms avoided layoffs, the government compensated a substantial part of the income loss for the workers due to reduced working hours (*Crimmann et al*., 2010).

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strategy. The OECD has gradually changed its view on regulation, see e.g. *Barbier - Colomb - Madsen* (2009). *Martin and Scarpetta* (2011) conclude that "employment protection has a sizeable effect on labour market flows and these flows, in turn, have significant impacts on productivity growth". At the same time, the evidence also shows that while greater labour market reallocation benefits many workers through higher real wages and better careers, some displaced workers lose out via longer unemployment durations and/or lower real wages in post-displacement jobs." Consequently, some elements of protection may impact negatively on long-run growth, other elements will be beneficial at least in the short time. Empirical analyses is expected to show which impact dominated this crisis and finally during the recovery.

Such contracts do not easily fit into the argument of high regulation vs. low regulation, neither do they fit properly into the flexicurity model because they favour internal flexibility above external flexibility through social partner bargaining or tripartite contracts. They may reflect some elements of the literature on bargaining and corporate relations[8]. The new contracts definitely reflect the ability of social partners – be it on the industry or firm level – to negotiate flexible arrangements, as well as the willingness of governments to support bargaining through the use of temporary subsidies.

3. Data set and variables on labour and output markets

The Sample

Our sample covers European and non European industrialized countries including Turkey and Mexico. We define the "in-crisis period" as 2008 to 2010, and for the "recovery period" we use data for 2011 plus a forecast for 2012. Both choices reflect courageous and partly arbitrary decisions, since in some countries recovery was already rather strong in 2010, whereas in other countries the output did not even reach the pre-crisis level in 2011. Furthermore, the possibility of a second dip can still not be excluded (in fact forecasts for 2012 include the probability of a minor recession specifically in Europe).

Performance measurement

Output performances as well as labour market performance is not easy to measure, and different studies in the literature either use a single arbitrarily chosen GDP variable (e.g. annual decline in 2009), cumulate different annual or quarterly GDP changes or even run regressions for several variables[9]. We follow *Aiginger* (2011) to extract a single variable for output performance from four different GDP indicators and a single variable for labour performance out of employment, unemployment and participation data. Each composite indicator is derived by the Principal Component Technique[10], maximizing the informational content of the indicators while keeping the analysis simple.

[8] E.g. Driscoll's hypothesis that a medium degree of bargaining is worse than a high as well as a low one; see also *Traxler* (2003).

[9] See *Claessens et al*. (2010), *Barrel* (2010), *Aiginger* (2011).

[10] The weights of the inputs into the two composite "performance" indexes (one for output, one for labour) are based on factor loadings on the first component of the principal component analysis (PCA). The first component explains 90% of the common variance across the indicators. The resulting ordinal indicator (PC-value) is the main performance indicator we will use in the following analysis.

Output market performance (OPM) is derived from the following four GDP indicators:

- The rate of change of GDP in 2009;
- The cumulated annual change over the three years 2008, 2009, 2010;
- The decrease of quarterly GDP from the pre-crisis peak to its trough;
- The actual cumulated change in the three years 2008, 2009, 2010 relative to the "pre-crisis" trend growth from 2000 to 2007 ("trend change")

The choice of the four indicators is partly reflecting the literature which takes one of these indicators as dependent variable. 2009 is the dependent variable usually if one year is chosen. However GDP dropped in several countries already in 2008, and continued to decline in 2010. In some countries the drop was specifically sharp but concentrated in a few quarters, therefore some studies use quarterly data. Last but not least the drop looked small in some countries as measured by the relative fall of GDP, but was dramatically benchmarked against a high growth trend.

Labour market performance (LMP) is measured by combining seven indicators on unemployment, employment and labour force participation:

- the rate of change in employment in 2009;
- the change in unemployment rates in 2009;
- the change in unemployment rates in 2010;
- the change in labour market participation rates in 2009;
- the change in employment during the crisis (2007 to 2010) relative to the change in employment in the years before the crisis (2000 to 2007);
- the change in unemployment rates during the crisis (2008 and 2009) relative to the change before the crisis (2000 to 2007);
- the change in labour force participation rates during the crisis (2008 and 2009) relative to the change before the crisis (2000 to 2007).

Using more than one indicator to get a good assessment of performance is even more important for labour markets. Unemployment was in some countries dampened if labour supply decreased in the crisis, in other countries contractual agreements like unemployment insurance prevented exits from the labour force. Therefore to obtain a complete picture on labour market performance we need to look at the change in employment, labour participation and unemployment rates.

Labour market policy indicators

Given the complexity of the theoretical models, it is not possible to test which labour market policy proved to be superior, but we can hope to find some stylized facts.

Regulation is measured by the OECD Index on labour market regulation (EPL). The unemployment replacement ratio on the one hand is part of the regulatory indicators, on the other hand it constitutes an element of a flexicurity model. Active labour market policies (ALMP), formal or non-formal education (secondary education) and training constitutes other components of a flexicurity strategy and positive signs are to be expected. The share of employment in secondary education might also indicate the importance of human capital (which might induce firms specifically to prevent lay- offs due to the expected employee shortage in the recovery phase). Tenure reveals the importance of long-term employment relationships; part-time employment is an indicator of labour flexibility. The importance of collective agreements (bargaining) is measured by the coverage ratio (indicating how many employees are covered by collective agreements) and by the share of persons in short-term working agreements.

4. Descriptive results on the relationship between output and labour market performance

Table 1 shows the output market performance (OMP) of each country in our sample according to the four sub-indicators together with the composite indicator (PC-value) derived via principal component analysis. Additionally we show the ranking of the ordinal principal component in the last column of table 1 (PC-rank). Table 2 shows the same information (using seven sub-indicators) for labour market performance (LMP).

The best labour market performance is shown by three European countries, Poland, Germany and Switzerland. Out of these three countries Poland and Switzerland were among the best performers in output development too (rank 2 and rank 5 respectively), while Germany had an average or even slightly below average performance in output (rank 16). The low performers with regard to the labour market were Spain, Iceland, the USA, Hungary and Portugal. While Iceland and Hungary had rapidly decreasing output too, the USA and Portugal had a slightly above average output loss (rank 10 and 8) so that these countries had the worst "relative" performance of the labour market in the crisis. The best "relative" performance of labour markets are shown by Japan, Germany and Finland. The labour market reaction in these countries was much better than expected according to output indicators.

Table 1: Output market performance (OMP) and ranking according to PCA

Changes in GDP	2009	2010/2007	Trough 2009/ peak 2008	2010/2007 minus 2000/2007		
	Annual data, percentage change		Cumulated quarterly change	Trend change	PC-value Output	PC-rank Output
Australia	3.0	2.4	3.0	-1.1	100.0	1
Poland	1.7	3.4	1.7	-0.6	96.8	2
Korea	0.2	2.8	0.2	-1.8	85.2	3
Canada	-2.7	0.2	1.4	-2.4	73.1	4
Switzerland	-1.9	0.8	-2.4	-1.1	69.9	5
Norway	-1.4	0.4	-2.4	-1.9	68.3	6
New Zealand	-1.6	-0.1	-1.6	-3.5	65.1	7
Portugal	-2.6	-0.4	-4.0	-1.6	60.0	8
Belgium	-2.8	0.1	-4.1	-1.9	59.8	9
USA	-2.7	0.0	-3.8	-2.4	59.5	10
France	-2.6	-0.3	-3.9	-2.1	59.2	11
Austria	-3.9	0.1	-4.6	-2.1	55.0	12
Netherlands	-3.9	-0.1	-5.2	-2.1	53.0	13
Turkey	-4.7	1.0	-4.7	-3.9	50.9	14
Greece	-2.3	-1.8	-3.2	-5.9	49.7	15
Germany	-4.7	-0.1	-6.7	-1.4	49.1	16
Czech Republic	-4.1	0.2	-5.0	-4.3	48.7	17
Spain	-3.7	-1.1	-4.6	-4.5	47.4	18
Slovakia	-4.8	1.6	-7.3	-4.6	44.3	19
Sweden	-5.1	-0.3	-7.2	-3.3	41.8	20
United Kingdom	-5.0	-1.1	-6.2	-3.7	41.7	21
Mexico	-6.5	-0.2	-6.5	-2.7	41.7	22
Italy	-5.0	-1.8	-6.8	-2.9	40.4	23
Denmark	-5.2	-1.4	-7.0	-3.0	40.1	24
Japan	-5.2	-1.0	-8.4	-2.6	38.3	25
Hungary	-6.7	-1.7	-7.9	-5.1	28.6	26
Finland	-8.0	-1.5	-9.1	-4.8	23.2	27
Iceland	-6.8	-3.2	-6.3	-7.7	22.8	28

Source: Eurostat (AMECO).

Table 2: Labour market performance (LMP) and ranking according to PCA

	Employ-ment 2009	Unemploy-ment rates 2009	Unemploy-ment rates 2010	Participation Rates 2009	Employ-ment 2010/2007	Unemploy-ment rate 2008/09	Participatio n rates 2008/09	PC-value labor	Rank
	Changes to last year				Change to 2000/2007				
Poland	0,4	1,0	1,4	0,1	0,9	-9,1	5,5	100,0	1
Germany	-0,1	0,2	-0,6	0,3	0,3	-1,6	4,6	95,9	2
Switzerland	2,4	0,7	0,2	-0,2	1,2	0,2	1,5	94,3	3
Turkey	2,0	3,1	-2,0	-0,6	2,8	2,8	-1,5	89,4	4
Australia	0,3	1,3	-0,4	-1,0	-0,6	-0,7	2,6	84,8	5
Austria	-0,9	1,0	-0,4	-0,4	-0,4	-0,1	3,4	83,7	6
Korea	-0,3	0,5	0,1	-0,8	-0,9	-0,3	1,0	80,9	7
Norway	-0,5	0,6	0,4	-1,4	-0,5	-0,9	1,2	80,0	8
Belgium	-0,3	0,9	0,4	-0,8	-0,4	-0,3	1,5	79,6	9
Netherlands	-1,1	0,7	0,7	-0,1	-1,1	-0,3	3,4	78,2	10
Mexico	0,5	1,7	-0,1	-2,0	0,0	1,3	0,6	78,0	11
Japan	-1,6	1,1	0,0	-0,5	-0,7	-0,2	2,3	75,1	12
France	-1,2	1,8	0,3	-0,4	-1,0	-0,1	1,6	72,0	13
Canada	0,0	2,1	-0,3	-2,0	-1,5	0,3	1,1	70,8	14
Czech Republic	-0,7	2,3	0,6	-1,1	-1,1	-2,1	1,0	70,0	15
Italy	-1,6	1,1	0,6	-1,3	-2,1	-1,0	1,6	69,3	16
New Zealand	-1,1	2,0	0,3	-1,7	-2,0	0,5	1,8	68,0	17
Finland	-3,1	1,9	0,1	-2,8	-1,7	-1,3	1,6	62,2	18
Greece	-0,7	1,7	3,0	-0,6	-2,8	-1,6	2,8	61,3	19
United Kingdom	-1,6	2,4	0,3	-2,0	-1,2	1,5	-0,4	61,2	20
Sweden	-2,0	2,1	0,1	-3,4	-0,8	1,1	-0,2	60,4	21
Slovakia	-2,8	2,5	2,3	-2,1	-2,5	-5,8	3,4	59,8	22
Denmark	-2,9	2,7	1,3	-2,2	-1,5	-0,1	1,1	53,9	23
Portugal	-2,6	1,9	1,3	-2,0	-1,3	2,4	-0,9	53,2	24
Hungary	-2,8	2,2	1,1	-1,2	-1,4	2,4	-0,6	52,6	25
USA	-3,7	3,5	0,3	-3,2	-2,5	2,5	-2,3	39,3	26
Iceland	-6,0	4,3	0,3	-5,2	-3,8	2,4	-2,8	22,4	27
Spain	-6,7	6,7	2,1	-4,7	-6,5	4,2	1,1	0,0	28

Source: Eurostat (AMECO).

Figure 1 correlates the output performance index with the labour performance index (using ranks) across countries. The correlation between the performance measures is 0.55 if PC-ranks are used and 0.64 if PC-values are applied. Both coefficients indicate that output is important for explaining labour market developments, but there still remains a part of the variation which could be explained by labour market characteristics and structural determinants.

In figure 2 the OECD indicator for employment protection legislation is related to the residuals of a regression of labour market performance (LMP) on output performance (OMP). The residuals indicate that part of the variation in LMP which is not explained by output performance. The figure suggests a positive relation between the relative labour market performance and the degree of labour market regulation.

Figure 1: The relation between output and labour market performance (PC-ranks)

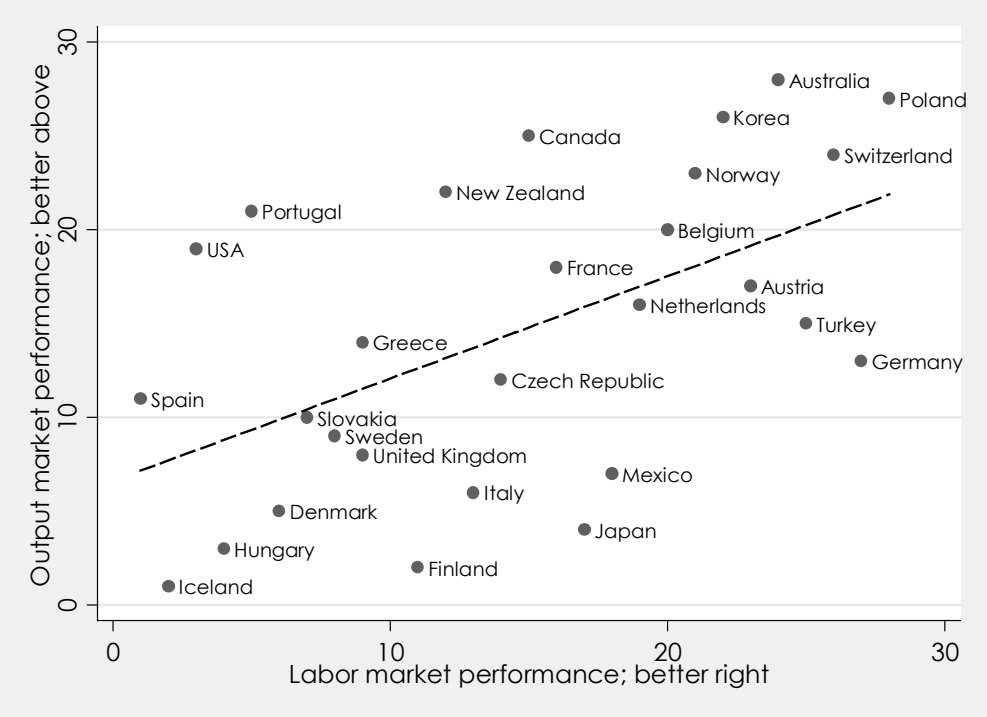
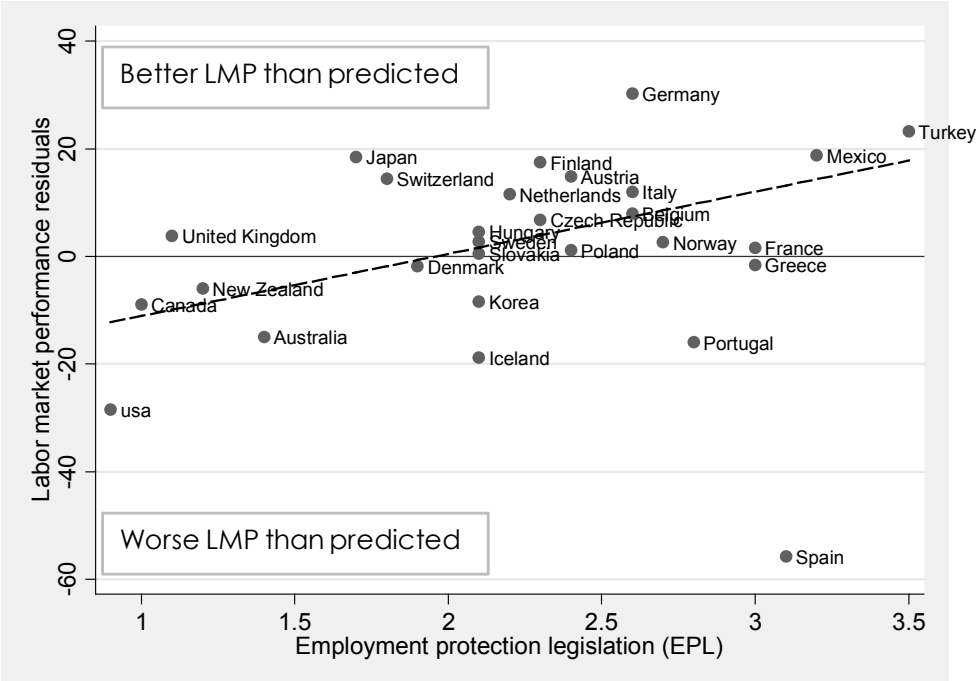


Figure 2: Employment protection vs. "relative" labour market performance



Remark: Predictions are derived from the equation LMP = f (OMP).

5. The main econometric results

Our econometric strategy will include three sets of variables. We regress labour market performance (LMP) to output market performance (OMP), secondly to labour market policy variables and thirdly to structural variables. Output market performance – using PC_value Output – will be included in all equations. For labour market variables we test different combinations (since there might be some multi-collinearity). The structural variables we include are per capita GDP and the share of manufacturing. In the robustness section we test further combinations of variables and additional structural variables. And in a final step, we then correlate economic performance (GDP as well as employment growth) after the crisis with labour market performance during the crisis. Since GDP-growth after the crisis is not fully discernable yet, we use the preliminary figures for 2011 and forecasts for 2012 for this part of the analysis. The endogeneity of employment protection is discussed in an annex.

Table 3: Explaining the labour market performance: main results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PC-Value Output	0.46***	0.62***	0.54***	0.59***	0.59***	0.57***	0.67***	0.59***	0.67***
	(3.605)	(4.282)	(3.493)	(4.554)	(4.199)	(3.996)	(7.664)	(4.249)	(4.540)
EPL		12.83**	16.40**	14.95**	14.64**	21.89***	15.41***	19.54***	11.74**
		(2.757)	(2.685)	(2.843)	(2.503)	(3.315)	(4.243)	(3.292)	(2.498)
ALMP		-1.19	-5.53	-1.96	-2.27	1.32	12.64*		-0.04
		(-0.131)	(-0.533)	(-0.222)	(-0.233)	(0.117)	(1.961)		(-0.005)
Training		0.19	0.21	0.38*	0.38	0.26		0.34	0.21
		(0.790)	(0.825)	(1.725)	(1.620)	(1.133)		(1.615)	(0.841)
Replacement Rate		0.12	0.10	0.20	0.22	0.02	-0.24	0.12	0.17
		(0.369)	(0.291)	(0.735)	(0.736)	(0.072)	(-1.408)	(0.470)	(0.529)
Secondary education		0.40	0.53	0.90**	0.89*	0.43	-0.16	0.31	
		(1.002)	(1.251)	(2.305)	(2.010)	(1.121)	(-1.196)	(1.442)	
Employment tenure			0.28	0.41**	0.41*	0.32	-4.87**	0.08	
			(1.226)	(2.103)	(1.976)	(1.584)	(-2.662)	(0.030)	
Part-time work					0.40	1.93	0.84***	0.88**	
					(0.129)	(0.644)	(3.411)	(2.207)	
Bargaining coverage						-0.35	-0.14	-0.25	
						(-1.653)	(-1.231)	(-1.590)	
Manufacturing share							2.66***	0.74	
							(6.026)	(1.019)	
GDP p.c. 2007				-1.01**	-1.00*		0.10	-0.65	
				(-2.187)	(-1.942)		(0.321)	(-1.244)	
Short-time arrangement									-1.53
									(-0.468)
Constant	48.60***	-9.09	-32.20	-36.35	-40.48	-44.07	25.75	-38.10	-6.67
	(6.797)	(-0.354)	(-0.890)	(-1.185)	(-0.972)	(-1.065)	(1.082)	(-1.186)	(-0.263)
R-squared adj.	0.300	0.452	0.392	0.609	0.571	0.557	0.817	0.640	0.554

Number of observations 28. Dependent variable: PC-value labour. – Source: Eurostat (AMECO).

Table 3 shows the multivariate regression explaining labour market performance by using robust regression models and applying a specific to general approach.

The most robust result is that the employment protection index is positive and highly significant in all tested specifications. Thus at least in the time period considered as the period primarily effected by the financial crisis (from 2008 to 2010), short term labour market performance was better in countries with more regulated labour markets.

The variables which could signal the main pillars of flexicurity show ambiguous results. The replacement rate always has a positive sign, the same holds for tenure and training but no single coefficient is significant. The share of part-time workers has positive coefficients (but they are significant only in two equations including per capita GDP).

The coefficient of ALMP is negative in most equations. This could indicate the impact of persistence of labour market problems; countries which had high unemployment rates in the period prior to the crisis might have tried to increase active labour market policy before.[11]

The coverage of bargaining is negative but nowhere significant, the share of workers in short-term agreements is far from significant.

The labour market performance has been significantly better in countries with high per capita GDP. The inclusion of this variable raises the coefficient of determination up to $R^2 = 0.61$, for output performance alone it is 0.30; if we include labour market characteristics the coefficient of determination ranges between 0.20 and 0.50.

6. Robustness and recovery phase

In this section we investigate whether the results change for different specifications of the equations. Then we look at the performance of the labour markets in the recovery phase, since better performance during the crisis could be coupled with a worse performance after the trough. We also present non-econometric evidence on countries with the best and the worst "relative" performing labour markets.

Robustness

There are at least two reasons why robustness has to be checked. Firstly, two of the determinants of LMP are dominant (OMP and EPL), and most other indicators are on the verge of being significant. And secondly, some of the determinants are correlated or overlapping (like tenure and employment protection). We therefore tested the impact if we omitted the dominant variables. Then we ran different combinations of the other variables, dropping candidates for multi-collinearity. In principle the results did not change; none of the less dominant variables changed sign, and seldom did one actually then become significant.

[11] The coefficient is positive if the training variable is deleted.

Adding more structural variables (like financial risk evaluation, or current account balance, pre-crisis credit or GDP growth – all these were found to impact on OMP in *Aiginger,* 2011) failed to change the coefficients and proved insignificant. In some cases the share of manufacturing got a positive and significant sign. This may hint that countries with a more competitive manufacturing base performed better in the crisis. This result is far from trivial since cyclical amplitudes are larger in manufacturing. All our tests indicate that the presented results seem to be very robust.

Since employment regulation itself is a composite indicator, we tested which component of it was responsible for mitigating the employment reaction. We find that the regulation of temporary contracts is the decisive element. It is this part of the regulatory framework which is highly significant in all equations. The protection of permanent workers against individual dismissal is insignificant and changes signs in different equations. The specific requirements for collective dismissals are positive but never significant.

Post crisis performance: early econometric evidence

If regulation lowers the employment reaction in the crisis, it could also retard the labour market reaction in the recovery phase or even the output recovery. As a first test of this "mirror image" of regulation, we regress economic performance in the recovery phase on labour market performance during the crisis and labour market regulation (and the other determinants in our main equations). As a measure of "recovery" we use the cumulated GDP growth for two years, first for real GDP, then for employment.

The effect of labour performance during the crisis on GDP growth in 2011/2012 is positive in all tested specifications and significant in one specification. Output performance during the crisis improves post-crisis performance, significantly in the output equations, insignificantly in the employment equation. The main result is that EPL is not significant and for GDP has a positive sign also in the recovery phase, while it is insignificantly negative for employment[12]. Additionally we correlated the post-crisis dynamics with the "residual" of the function explaining LMP by OMP. There is again no sign that the post-crisis recovery was negatively affected by measures to mitigate labour market reaction relative to output in the crisis.

Econometric evidence therefore tentatively indicates that better labour performance during the crisis does not trigger adverse effects in the economic performance in the early recovery phase. This is a preliminary result since the evidence available up to now is too short to

[12] We tested several specifications including EPL and different sets of control variables. EPL never turned significant.

completely reflect the long-run effect of labour market regulation on employment or trend GDP.

Table 4: The impact of labour market policy on recovery

	PC-value labor	PC-value output	EPL	ALMP	Short-time arrangements	Residual	Constant	R-squared
GDP growth 2011/2012	0.0154						0.7172	0.076
	(1.493)						(0.962)	
GDP growth 2011/2012		0.0181*					0.8195	0.099
		(1.719)					(1.385)	
GDP growth 2011/2012			0.1997				1.3612	0.011
			(0.544)				(1.618)	
GDP growth 2011/2012				-1.1247*			2.3884***	0.109
				(-1.822)			(6.229)	
GDP growth 2011/2012	0.0300*		0.2981	-1.1566*	-0.0400	-0.0207	0.3652	0.360
	(1.963)		(0.855)	(-1.888)	(-1.325)	(-1.068)	(0.266)	
Change in Employment 2011/2012	0.0075						-0.0747	0.020
	(0.733)						(-0.101)	
Change in Employment 2011/2012		0.0154					-0.3810	0.066
		(1.355)					(-0.588)	
Change in Employment 2011/2012			-0.1275				0.7166	0.005
			(-0.363)				(0.889)	
Change in Employment 2011/2012				0.2621			0.3090	0.006
				(0.396)			(0.765)	
Change in Employment 2011/2012	0.0232		-0.1147	0.3323	-0.0762	-0.0246	-0.9880	0.082
	(1.286)		(-0.300)	(0.478)	(-0.282)	(-1.023)	(-0.619)	

Number of observations 28. – Source: Eurostat (AMECO).

7. Best and worst performers: common elements

The relationship between output and labour performance – as suggested by Okun's law – has never been perfect, and there is evidence that it was even less perfect in the recent financial crisis than in other crises. We have tested which indicators can explain the "relative" labour market performance. We have also seen that many features of modern labour market policy, from flexicurity to bargaining and short-time agreements cannot be reflected by indicators. Therefore we now take a closer qualitative look at the countries with the relatively best and the relatively worst performance and try to identify what they have in common.

Country strategies: best performers

The relative best performing labour markets (in relation to the output decline) are Japan, Germany and Finland.

These countries have rather strict employment protection in common. There are less formal rules in Japan but high implicit seniority principles. Germany used to have rather strict regulation, but underwent a period of radical labour market reform in the years before the

crisis. Tenure is high and there are few part-time contracts in all three countries. All three countries also have a specific high share of workers with a secondary education (and good qualifications in general). Collective bargaining coverage is highest in Finland, and lowest in Japan. During the crisis all three countries made heavy use of short-time work schemes, they jumped from practically zero to 3.2% in Germany, 2.7% in Japan and to 1.7% in Finland. Japan saved about 400,000 jobs by reducing hours per worker (*OECD*, 2010, p. 18), one third of the reduction occurred through less overtime hours, and about half through the reduction of "standard hours" (*OECD*, 2010, p. 44). Two other common features of the three countries with the relatively best labour market performance are a strong trend of an ageing population and a large industrial base. Ageing populations lead to present or future labour shortages, specifically of qualified labour. In Germany and Japan the population is already declining, in Japan and in Finland there are also restrictive immigration policies.

Recovery has been strong in Germany in terms of GDP. Employed persons and employment rates have increased rather strongly after the crisis and the unemployment rate is definitely lower than at the start of the crisis. A strong recovery has started also in Finland. Germany and Finland both have relatively low budget deficits and debt positions and do not need a long period of heavy consolidation. Recovery in Japan had started, but was interrupted by the earthquake and the following problems in the supply chain; here public deficits and debt are high (albeit interest rates remain low since it is domestic debt).

The tentative finding that labour market protection, qualified workers plus working arrangements were key components for countries with better than predicted labour market performance is also underlined by Austria and the Netherlands which enjoy the lowest unemployment rates in Europe.

Country strategies: worst performers

The worst performing countries (again in relation to output decline) in the crisis were Portugal, the USA, and Canada. It is less easy to find common elements between these countries. Portugal is a country with strict employment regulation, high tenure and a high unemployment replacement rate. Expenditure on active labour market policy and training is low, as is the share of workers with a secondary education. The share of the industrial sector is declining, and the current account deficit is high. Despite a history of collective bargaining, there were nearly no agreements for short-time arrangements and work sharing in the crisis. Since budget deficits and debt are high, the government could not subsidize agreements, neither on the firm nor industry level. The USA and Canada had a strong labour market reaction in relation to moderate or average output decline. Regulation is low, the same holds

for tenure and active labour market expenditure. The share of the workforce with a secondary education is high and collective bargains much less common than in Europe. Short-time agreements remained very low (0.22% and 0.34%). Unemployment benefits and eligibility were raised a little bit, and output stimuli were relatively high. All in all both countries represent the Anglo-Saxon model of deregulated labour markets.

As far as the recovery is concerned, output in Portugal is still declining (due to the necessity of budget consolidation). In the USA recovery of output in 2012 looks stronger, but unemployment is still four percentage points higher than at the start of the crisis. Budget consolidation has not yet been tried, though the budget deficit is near 10% and debt is higher than GDP.

The countries next in line after these three countries, which also saw the labour market react relatively strongly during the crisis, underline the diversity of this group of low performers. On the one hand Australia and New Zealand are both countries with low bargaining and low regulation, and on the other hand Spain, France and Korea have more regulated labour markets with a tradition of bargaining.

Table 5: The effect of relative LMP on post-crisis GDP growth and employment

	Growth of GDP			Growth of employment			Unemployment rate			
	2011	2012	2011/2012	2011	2012	2011/2012	2011	2012	2011/2012	2011/2012 vs. 2009/2010
Germany	2.9	0.7	1.8	1.3	0.4	0.8	6.1	5.9	6.0	-1.5
Japan	-0.5	1.5	0.5	-0.2	0.1	0.0	4.9	4.8	4.9	-0.3
Finland	3.1	1.4	2.2	1.0	0.3	0.7	7.8	7.7	7.8	-0.6
Top 3 relative LMP	*1.8*	*1.2*	*1.5*	*0.7*	*0.3*	*0.5*	*6.3*	*6.1*	*6.2*	*-0.8*
Portugal	-1.9	-3.0	-2.5	-1.1	-1.4	-1.2	12.6	13.6	13.1	1.8
USA	1.8	1.0	1.4	0.4	0.4	0.4	9.0	8.9	9.0	-0.5
Canada	2.1	1.8	2.0	1.7	1.6	1.6	7.5	7.0	7.2	-0.9
Low 3 relative LMP	*0.7*	*-0.1*	*0.3*	*0.4*	*0.2*	*0.3*	*9.7*	*9.8*	*9.8*	*0.1*

Source: Eurostat (AMECO).

Post-crisis performance

Finally we look at the growth rates of GDP and employment and the change in the unemployment rate for the three countries with the best relative performance and those with the worst. The best performers in the crisis enjoyed higher growth of GDP in the recovery period 2011 and 2012 (1.5% vs. 0.3%). The same holds for growth of employment (0.5% vs. 0.3%); unemployment dropped by 0.8 percentage points for the top performers in the crisis, while it is marginally increasing for the low performers. This is again evidence that relative

labour performance did not aggregate problems immediately after the crisis, and if anything supports recovery.

Further research needed

Further evidence is needed to confirm our tentative findings, but the first results are more compatible with a positive effect on output of the stabilization of labour markets (via decreasing uncertainty or prevention of human capital losses), than with the assertion that employment protection in the crisis has been a drag in the first recovery phase.

Additional research is needed in several directions. Firstly, the variable "labour market regulation" should be further differentiated, to investigate which part of the regulation plays a positive role, which a negative one as well as how "the level of" and "changes in" regulation interacted to explain labour market performance. Secondly, indicators on flexicurity as well as on contractual agreements should be further developed: to reflect new developments (like work sharing, time accounts or tripartite agreements trading off short-term wage cuts against long-term job security). Thirdly we have made a cross-country investigation of a single, deep crisis. Panel research covering different crises could provide more general evidence (even if it will prove difficult to construct a panel for a period long enough to include several severe crises). Finally, the long-run effect of relative labour market performance can only be assessed if we have a longer time period after the climax of the crisis (than now i.e. in March 2012) and if we know about the possibility of a second dip or a longer period of slower growth. Nevertheless we think that the preliminary facts - more evidence-based stylized facts than actual proofs - are important for developing labour market policy in the meantime.

8. Conclusions

The goal of this paper has been to find out why labour market performance differed across countries in the recent crisis, and specifically why the changes in employment and unemployment were different across countries despite similar output changes. The question is of specific interest since firstly the correlation between changes in output and unemployment was lower in this crisis than in previous ones, and secondly labour market reactions in the crisis could impact on the current recovery period (with subdued and instable growth being usual after big crises).

We measure output performance in the crisis as well as labour market performance using a single composite indicator, condensing information from four and seven sub-indicators (output and labour market respectively). Since Okun's law correlates a specific indicator on

output performance (change in real GDP) with a specific indicator on labour market performance (change in unemployment) our approach could be labelled a test of a "Generalized Okun's law". Our sample contains 28 industrialized countries; the evidence covers primarily the period from 2008 to 2010. The econometric test therefore is cross section for a single crisis.

The main econometric finding is that countries with stricter employment regulation had less pronounced labour market responses for given output losses during the crisis. If we further subdivide labour market regulation into its sub-components, we find that the regulation of temporary contracts is the important component (not that of fixed contracts). Indicators for flexicurity strategies often have the expected sign. The same holds for benefit replacement ratios or expenditures in further education and training. But all the coefficients seldom reach significance. The available indicators on collective bargaining do not seem to be able to reflect the importance of social contracts or mutual trust, neither the role of new tripartite agreements on work-sharing in the crisis. The labour market reaction was softer pronounced in countries with higher per capita GDP and a larger share of manufacturing.

Looking qualitatively at the countries with the best performing labour markets relative to output changes (Germany, Japan, Finland) and those with the worst performance (Portugal, USA, Canada) we can see that the best performers heavily implemented short-time work arrangements (partly subsidized by governments), that they have a qualified and well trained workforce, and the population is ageing. The worst performers are heterogeneous and could be subdivided into two groups. Some of these countries represent the Anglo-Saxon model and show stronger labour market reactions as a result of quick hiring and firing and less regulation. Other countries in the low-performing group represent the southern European countries (Spain, Greece), where both budget and trade deficits led to weak or no recovery.

Mitigating the downward effect in the crisis via regulation or work-sharing agreements raises the question whether this does not retard recovery. No cross-country econometric evidence can be found up to now (using data for 2011 and forecasts for 2012 available in March 2012) that those countries in which the performance of labour markets was better during the crisis or in which labour markets were more regulated had a specifically retarded recovery. Casual evidence for the top and bottom countries indicates on the contrary that growth was marginally stronger in the countries which had mitigated the labour market effects of the downturn. While there are some signs that employment growth is weak in the recovery and unemployment is persistent in general, this holds for countries with both good as well as bad relative performance of labour markets during the crisis.

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Annex: Employment protection, labour hoarding, description of variables

Employment protection legislation may increase labour hoarding through dismissal protection. Differences in labour hoarding (measured as change in labour productivity) are (and should be by definition) highly correlated to differences in labour market performance during the crisis (the correlation between both variables is -0.4). If now employment protection legislation was correlated to labour hoarding, endogeneity would be a serious problem (they are weakly negatively correlated (-0.13)).

Table A1 shows multivariate estimates of the effects of our set of labour market variables on the change in labour productivity in the year 2009 (as a measure of the degree of labour hoarding). We find a slightly negative (but insignificant) effect of active labour market policy on the change in labour productivity. The most important result of this exercise is the insignificance of the employment protection legislation index. This leads us to conclude that there is no serious endogeneity problem.

Annex A1: The effect of labour market structure on labour productivity (labour hoarding)

	(1)	(2)	(3)	(4)	(5)
EPL	-0.06	-0.07	0.5	0.26	0.36
	(-0.084)	(-0.098)	-0.721	-0.395	-0.499
ALMP	-1.12	-1.11	-1.33	-1.05	-1.48
	(-0.763)	(-0.734)	(-0.956)	(-0.793)	(-0.811)
Training	-0.01	-0.01	-0.04*	-0.04	-0.04
	(-0.565)	(-0.533)	(-1.765)	(-1.717)	(-1.645)
Replacement ratio	-0.10**	-0.10*	0.01	-0.01	0
	(-2.167)	(-2.058)	-0.165	(-0.197)	(-0.075)
Secondary education			-0.04	-0.04	-0.04
			(-1.509)	(-1.715)	(-1.198)
Employment tenure			-0.25*	-0.23*	-0.25*
			(-1.998)	(-1.930)	(-1.882)
Part-time work		-0.07		-0.06	-0.07
		(-1.151)		(-1.447)	(-1.419)
Bargaining coverage					0.01
					-0.372
Constant	7.81**	8.87**	5.45	7.88*	6.99
	-2.54	-2.545	-1.395	-1.952	-1.479
R-squared	0.299	0.318	0.559	0.625	0.616

Number of observations 28. Dependent variable: Labour productivity (gross domestic product per hours worked) in 2009. – Source: OECD.

Annex A2: List of variables

Variable	Definition	Source	Year
PC-Value Output	Output market performance (OMP), Combined indicator of four GDP indicators (first component derived by principal component analysis); PC-Rank Output = Ranks of PC-Value output	own calculation	2008-2010
PC-Value Labor	Labor market performance (LMP), Combined indicator of seven employment/unemployment/paricipation indicators (first component derived by principal component analysis); PC-Rank Labor = Ranks of PC-Value Labor	own calculation	2008-2010
EPL	Employment Protection Legislation Index	OECD	2007
ALMP	Share of GDP spent on active labor market policies	OECD	2007
Training	Share of adults participating in education and learning at upper secondary and post-secondary non-tertiary level	OECD	2007
Replacement rate	Net income replacement rates for unemployment benefits (Percentage of earnings)	OECD	2007
Secondary education	Population aged 25 to 64 with at least upper secondary education	OECD	2007
Employment tenure	Average employment tenure in years	OECD	2007
Part-time work	Share of workers in part time employment	OECD	2007
Bargaining coverage	Share of workers covered by collective bargaining agreements	OECD	2003
Short-time arrangement	Annual average stock of employees participating in short-time work schemes as percentage of all employees	OECD	2009
Manufacturing share	Gross value added at current prices: manufacturing industry as a percentage of GDP	Eurostat (AMECO)	2007
GDP p.c. 2007	GDP per capita	OECD	2009