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EMPLOYMENT PROTECTION AND LABOUR MARKET DYNAMICS: NEW EMPIRICAL EVIDENCES USING EUROPEAN REGIONAL DATA

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Abstract

Unemployment is one of the main issues countries must manage to achieve economic growth. The different behaviour showed in Europe and US triggered academic research to investigate which are the motivations behind this phenomenon. Thus, labour market flexibility and the hysteretic behaviour of unemployment became major subjects of study in Economics literature.

The present paper first starts with a full description of these two variables through descriptive statistics and an empirical analysis of hysteresis, using both panel data and time-series methodologies. Once verified the presence of a Unit Root in European unemployment, the investigation moves further implementing a simple econometric model to examine whether labour market regulation influenced unemployment and employment rate in Europe between 2000 and 2013. The short period of time considered is balanced using regional data, which allow to build a large dataset and to take advantage of the asymmetry given by different (regional) labour markets functioning under the same set of (national) institutions.

Results show the efficacy of employment protection in reducing (increasing) unemployment (employment) in the period considered.

While restricting the sample to the years of sustained economic growth preceding the financial crisis the relationship between EPL and Employment Rate becomes not significant, for unemployment results hold. However, the effect is the opposite considering only core or peripheral countries of Europe, with the latter group experiencing higher unemployment rates the higher the strictness of employment protection. Moreover, peculiarities of the Germany Labour Market play an important role in determining the significance of the results. It is then probable the presence of heterogeneity across countries and the possible influence of some unobserved variables.

It seems then mandatory to consider the structural peculiarity of each area when implementing structural reforms on labour market regulation.

Agenda

Introduction and Review of the Literature

Unemployment has always been one of the key parameters to measure the health of the economy. Its social and economic costs are fundamental in measuring the efficacy of the political class and of its intervention in the economy.

The financial crisis of 2008, followed by the sovereign debt turmoil of 2011, strongly increased the unemployment rate of most of the European countries and depressed the overall economy of Europe; the recovery process that started in 2013 has been low and full of difficulties for the Union, and only in 2016-2017 it began to be strong and common across all States and regions[1].

This double negative shock strongly challenged the fundamentals of the European Union, introducing doubts on the appropriateness of the size of the Eurozone and its inability to properly use monetary policies. However, mainstream economics does not address much power to this economic tool to shape the economy in the long-run. Talking about unemployment, for example, the current rate U always tends to go back to its natural rate U^* [Friedman M., 1968]. Nevertheless, most economists think monetary policy can push U away from U^* at least for a short period of time (few years), as Paul Volker managed to do in 1980-1983 raising unemployment in the US [Ball L., 2009].

Since those years, indeed, after the stagflation phenomena hit Europe and US in the 70s, disinflationary economic policies started all across developed countries making unemployment rise, in particular in Europe. This long-run trade off can explain most of the behaviour of unemployment and inflation in the past, but it does not in the more recent years, where the hypothesis of a *hysteretic* labour market seems to be the most promising explanation [Gali, 2015].

The hysteresis hypothesis has first been proposed in a paper published by Blanchard and Summers in 1986, "*Hysteresis and the European Unemployment Problem*". The authors challenge conventional classic or Keynesian theories, and propose an explanation of the persistently high Unemployment Rate in Europe through the *insider-outsider* hypothesis, i.e. a wage-setting asymmetry between those who are employed (insiders) and those who are not (outsiders). Results are that the higher is the bargaining power of insiders, which basically derives from the level of their job protection, the stronger is the persistence in unemployment.

The article of Blanchard and Summers opened then a new field of study of unemployment behaviour and the influence of labour market institutions.

[1] https://www.weforum.org/agenda/2016/12/what-to-watch-in-europe-in-2017/

First, plenty of papers analysed whether the unemployment rate is truly hysteretic or not, through Unit Root tests with time-series or panel data methods, as for example Ledesma L. and Miguel (2000), Bornhorst E. and Commander S. (2004), Camarero M., Silvestre J., Tamarit C. (2004), Ball L. (2009), Khraeif N. et Al. (2015), Galì J. (2015); Results are mixed for OECD countries, and one of the few consolidated evidence is that United States unemployment does not show a Unit Root, i.e. it is stationary (Gordon R., 2015).

Second, many authors investigated the relationship between countries' labour market regulation and unemployment level and change over time. Scarpetta S. (1996), Nickell S. (1997 and 1999), Blanchard O. and Wolfers J. (2000), Belot M., Van Ours J. (2001), Nickell S., Nunziata L., Ochel W. (2005), Verdugo L. et Al, (2012), Andresson et Al. (2014) find evidences of the importance of labour market flexibility in determining both the structural level of unemployment of a country and its adjustment speed over time, even though distinctions must be provided among different sets of institutions.

The present work will follow both lines of research, to provide an overall analysis of the relationship between unemployment and employment protection legislation in Europe using regional data, from 2000 to 2013.

First, section 1 describes employment and unemployment in Europe both at regional and country level, also testing (and finding) the presence of a Unit Root both with panel and time-series approaches.

Second, section 2 focuses on the measure of the flexibility of the labour market, describing the situation in Europe both through the OECD EPL Index, widely used in the papers mentioned above, and the Fraser Index of labour market regulation, an alternative source of data to test whether there are differences or not across indicators.

Third, section 3 merges the previous analysis to study the impact of labour market institutions in the dynamics of the labour market proposing two different approaches:

1) A simple linear model between unemployment and labour market regulation;
2) A deeper analysis on the relationship between labour market regulation and different economic structures, using employment sectorial data;

Conclusions, then, summarizes the findings and try to discuss eventual economic policy implications.

Section 1: Unemployment Overview

1.A Review of the Theory

The amount of active population in the economy is defined as the total amount of people aged between 15 and 64 years old (*N*), i.e. in the working age, currently working or looking for a job. Those who are not employed but want to work are *unemployed* people. This measure is usually expressed as the ratio (*U*) between total unemployed people and the active population, and it should not be confused with the non-participation rate (*1-P*), the amount of people who can be part of the active population (i.e. people in the working age) but who are not working nor looking for a job. On the other hand, the employment rate (*L*) is defined as the ratio between the employed people and the total working age population.

Applying some algebra[2], the relationship between unemployment and employment levels becomes:

$$\Delta U \cong \frac{\Delta N_t}{N_{t-1}} + \frac{\Delta P_t}{P_{t-1}} - \frac{\Delta L_t}{L_{t-1}} \quad (1)$$

This equation shows that changes in the parameters might have different effects on unemployment. For example, if the labour force shrinks it is possible that U falls without L rising. Moreover, a determined level of U might reflect different situations: a dynamic market in which workers frequently change their job getting in and out of unemployment quickly, or it might be a sign of hysteric labour market, i.e. a market which is rigid and where unemployment is persistent.

Some argue that economic policies should not consider only the unemployment rate but also the non-participation rate. However, macroeconomic textbooks do not focus on this parameter and it is not usually considered in empirical research[3].

The next step, then, is to find the determinants of the levels of unemployment each economy experiences, beginning from prices of goods and salaries of workers.

The classical view starts from the basics; supply equals demand in the market of goods, i.e.:

$$y_t = m_t - p_t \quad (2)$$

Where *y* is the output in logs, *m* being money supply and *p* the price index in logs.

At the same time, firms produce with a linear technology such that:

$$y_t = \alpha_t + l_t \quad (3)$$

[2] Cahuc and Zylberberg (2004), pag 449

[3] Blanchard, Amighini, Giavazzi, "Macroeconomia, una prospettiva europea", 2010, page 176

Where α is the productivity parameter and l employment in logs. Moreover, it set prices according to the following mark-up rule:

$$p_t = w_t - \alpha_t + X \tag{4}$$

Where w is the nominal wage in logs and X is increasing in the market power of firms. Labour supply (in logs) is then an increasing function of real wages:

$$l_t^s = \bar{l} + n(w_t - p_t) \tag{5}$$

Using 4 and 5 and doing some algebra it is obtained the equation describing the equilibrium level of employment:

$$l_t^* = \bar{l} + \eta(\alpha_t - x) \tag{6}$$

Using (2) and (3) the equilibrium in the goods market determines p^* given l^*:

$$p_t^* = m_t - l_t^* - \alpha_t \tag{7}$$

This model has some implications:

1. A positive demand shock increases prices, while l^* is determined by the fundamentals of the economy. Money is neutral;
2. A positive productivity shock increases wages and employment by reducing prices;
3. Market power reduces output and prices;

… And some limits:

4. Unemployment can only be voluntary;
5. Compared to real data, the model predicts too much volatility in wages, in particular given productivity shocks;
6. Changes in aggregate demand have no real effects, and this is not consistent with the data;

Accounting for these limits, the model makes a step further. Nickell (1998) presents a simple unemployment macro model, starting from the fact that two equations are common to almost all macro models of unemployment: Aggregate demand and aggregate production

$$y = \sigma_1(x_n - p) + \sigma_2 x_r \tag{8}$$

$$u = -wy \tag{9}$$

Where y is Real GDP, x_n account for exogenous nominal demand factors and x_r exogenous real demand factors, p is the GDP deflator, u the unemployment rate. Government policy affects the x parameters.

It is then assumed that pricing is based on a mark-up model:

$$p - w = z_p - \beta_2(p - p^e) \tag{10}$$

Where *w* is the wage and *z* are exogenous factors influencing the mark-up. β_2 captures price stickiness. Here demand effects on price setting are not accounted for (conclusions will not be affected).

The wage setting is then described with:

$$w = \gamma_2 p^e + (1 - \gamma_2)p - \gamma_1 \ln u - \gamma_{11} \Delta \ln u + z_w \tag{11}$$

Where wages are assumed to be set as a mark-up on actual and expected prices, influenced by the state of the economy, represented with log of unemployment rate and log of its growth rate; z_w is the vector of all exogenous wage pressure factors.

γ_1 is the long run unemployment elasticity and it depends on labour market institutions and other peculiarities of the economy.

γ_2 measures how much wages are sticky, i.e. how much they depend on expected prices. With perfect indexation, $\gamma_2 = 0$.

Assuming unanticipated shocks on demand, prices and wages, i.e.:

$$x_n = x_{n-1} + \varepsilon_n \;\; x_r = \bar{x}_r + \varepsilon_r \;\; z_p = \bar{z}_P + \varepsilon_P \;\; z_w = \bar{z}_w + \varepsilon_w$$

The result is the reduced form of unemployment equation under rational expectations:

$$\ln u = \frac{\gamma_{11}}{\gamma} \ln u_{-1} + \frac{\bar{z}_p + \bar{z}_w}{\gamma} - \frac{w_1 \alpha_2}{\alpha_2 + w_1 \gamma} \left(\epsilon_n + \frac{\sigma_2}{\sigma_1} \epsilon_r \right) + \frac{w_1}{\alpha_2 + w_1 \gamma} (\epsilon_p + \epsilon_w) \tag{12}$$

Where $\gamma = \gamma_1 + \gamma_{11}$, $\alpha = \beta_2 + \gamma_2$, $w = \frac{w\sigma_1}{u}$ with *u* average unemployment.

Note that the model implies an unemployment-inflation trade off of the form:

$$\ln u = \frac{\gamma_{11}}{\gamma_1} \ln u_{-1} + \frac{\bar{z}_p + \bar{z}_w}{\gamma} - \frac{\alpha_2}{\gamma} \Delta^2 p \tag{13}$$

From this model, we learn that:

1. Unemployment is determined by demand factors;
2. Labour market institutions influences the parameters of the model. They might differ across time and countries;
3. If unemployment does not affect wages in the long run (γ_1=0), equation 12 is transformed in a Random Walk, i.e. external shocks have permanent effects on the level of unemployment and there is not return to the original equilibrium (*hysteresis hypothesis).* Empirical evidences differ across countries and show the possible presence of Unit Roots in many European nations, while there is no evidence in the United States (see section1, chapter 3);

4. If $\gamma_1>0$, on the other hands, shocks (positive or negative), will not have permanent effects, unless they permanently change some of the parameters in the equation;

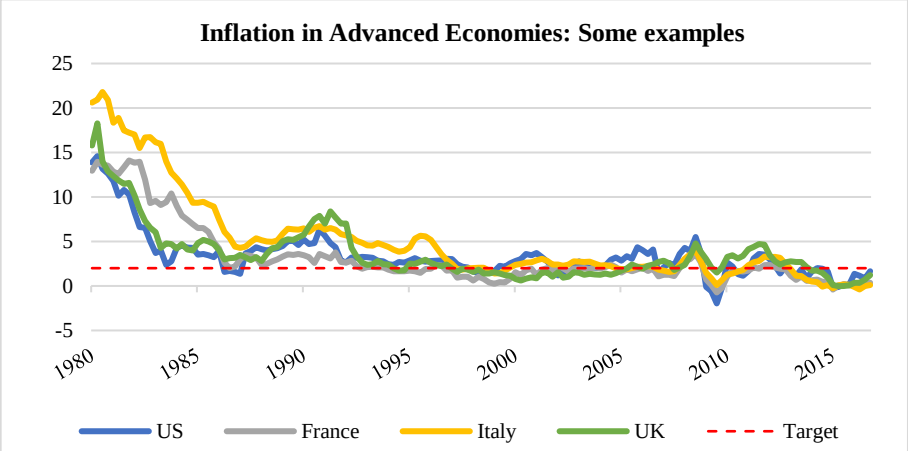
With respect to the inflation-unemployment trade-off, new evidences have been collected, analysed and presented in the ECB Forum of Central Banking in 2015.

In the middle of the XX century, it was consolidated a strong, negative, relationship between inflation and unemployment (the Philipp's Curve) that inspired the economic policies of developed countries for many years during the 50s and 60s. However, starting from the oil crisis in the 70s (and the stagflation phenomenon) this relation became weaker and weaker in the following years, stabilising from the mid-90s to today at a level close to zero, but statistically significant [Blanchard, Cerutti and Summers, 2015].

These authors confirm an earlier IMF study (IMF's April 2013 W.E.O.) which shows that since the mid-70s short-run inflation expectation have become more stable and that the Philipp's Curve flattened.

The main explanation of this phenomena proposed by Blanchard, Cerutti and Summers is that it changed the way people form expectation of inflation. The "inflation targeting" approach implemented by Central Banks led to less weight on past inflation levels and more on perceived target, making move the Philipp's Curve from an "accelerating" one to a "level" one.

Chart 1 (Data Source: OECD, 2017)



Does this mean that the monetary policy conducted by Central Banks, i.e. inflation targeting, is not necessary anymore or need to change its goals? No, it doesn't. According to the paper previously mentioned, the relationship between inflation and unemployment is still present and statistically significant, and Central Banks are doing their job managing it. What is really needed, then, are structural reforms working on the supply side of the economy.

During his speech at the ECB forum on Central Banking in Sintra, 2015, ECB President Mario Draghi clearly defines what are structural reforms in his view:

"Structural reforms are, in my view, best defined as policies that permanently and positively alter the supply-side of the economy. This means that they have two key effects.

First, they lift the path of potential output, either by raising the inputs to production – the supply and quality of labour and the amount of capital per worker – or by ensuring that those inputs are used more efficiently, i.e. by raising total factor productivity (TFP). Second, they make economies more resilient to economic shocks by facilitating price and wage flexibility and the swift reallocation of resources within and across sectors."

Indeed, structural reforms become particularly important in a Monetary Union, where the Central Bank cannot respond to single-country issues which have to be solved by government intervention first at Union level, through the implementation of reforms that will lead to convergence of the underlying economies, and second at country level, receiving the Union directives and facing the distinctive characteristics of the national economy.

1.B European Labour Market: Some Descriptive Statistics

General Overview

The labour market is the supply of people in a particular country or area who are able and willing to work[4]. Every economic area, from union to regional level, has its own characteristics: Different age of the population, different level (and quality) of education, different business specializations (services, manufacturing…) and so on. All these features shape social and economic conditions. Even while moving toward a process of unionization, differences will always be present and will always need to be managed to improve the economic and social environment in which a Union operates.

The European labour market makes no exception. Through this chapter it will be illustrated via tables and maps what is the current EU situation and how it evolved since the introduction of the Euro currency, focusing on some key parameters of the labour market (GDP, employment and unemployment rates, education…), both at Union, National and Regional Level. A deeper investigation of the labour market institutions is left instead to Section 2, where it will be analysed how international organizations measure the level of regulation of each State and how these measures can be used to assess institutions' role in the unemployment behaviour.

The period analysed goes mostly from 2000 to 2016. The study is split in four main years: 2000 as the starting point (introduction of the Euro and starting date of plenty of statistics on Eurostat, source of the data); 2008 as the peak level of the EU economy; 2013 as the bottom point and 2016 as the last available data to describe the current situation.

The first focus is on aggregate data at European level (EU-27/28), in particular on the employment structure (age and sectorial composition), with some insights on the current NUTS 2 distribution of these characteristics to emphasise the variability that would otherwise be lost analysing the data at Union and country level;

The chapter then continues with a deeper analysis on the unemployment level in Europe at Country and NUTS 2 level, comparing its key features with the ones of the United States of America and its Federal States. This focus will be the incipit to introduce the hysteresis hypothesis in the unemployment rate, i.e. the fundamental theoretical background behind the relationship between labour market institutions and unemployment level and growth in an economy.

[4] Cambridge Dictionary

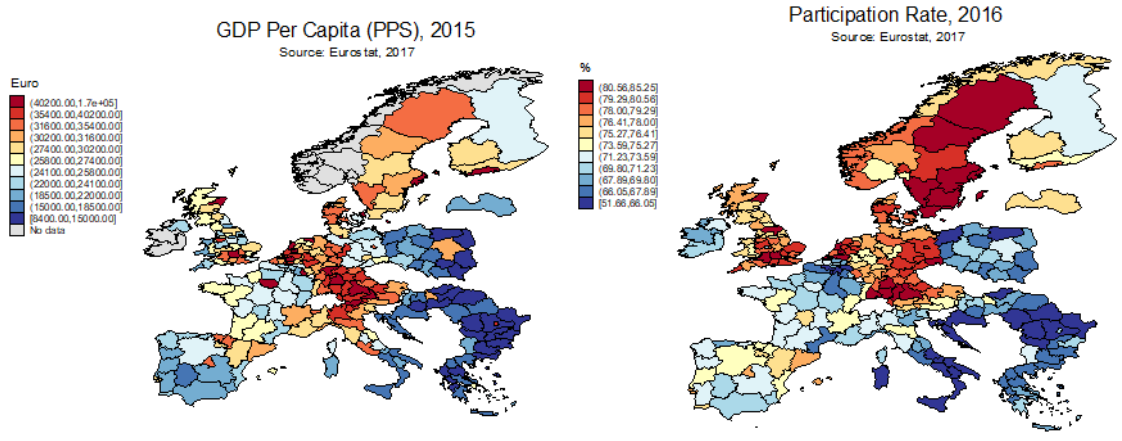
Table 1 reports some of the statistics anticipated above: it is tangible an improvement in all of them from 2000 to 2016, except for young unemployment, which is still higher than its starting level even though it is well below the top reached in 2013. However, looking at data from 2008 it is evident that the recovery process is still not complete since all the parameters are worst off their 2008 levels, except for secondary education and GDP per capita (at purchase power standards).

The bottom part of the table shows how the variability across countries and NUTS 2 regions of the variables changed in these 16 years. Even though parameters look better today than in 2000, variability (measured as standard deviation) increased for all of them. From this point of view, a lot of work is still needed to make the underlying economies of the Union to converge to an optimal level. The maps below show the current situation for some of the variables described.

Table 1 & Charts 2-3 (Data Source: Eurostat, 2017)

Stats EU -27*		**Part. Rate**	**15-24 Unmp Rate**	**Tot. Unmp Rate**	**Long Term Unmp**	**Tot. Emp Rate**	**Pop. With Sec. Edu**	**Temp. Contr.**	**GDP Per Capita PPS (€)**
2000		68.54%	18.30%	9.00%	4.28%	62.10%	64.40%	9.50%	19.800
2008		70.71%	15.70%	6.70%	2.63%	65.70%	71.40%	10.90%	26.100
2013		72.00%	23.60%	10.60%	5.20%	64.10%	75.10%	10.70%	26.700
2016		72.97%	18.60%	8.30%	4.05%	66.70%	76.90%	11.20%	28.900
Stdev 2000	Country Level	6.3%	9.3%	4.4%	2.7%	7.8%	16.57%	4.27%	n.a.
Stdev 2016		5.8%	9.0%	4.0%	2.9%	7.0%	12.99%	4.97%	n.a.
Stdev 2000	NUTS 2 Level	6.3%	12.4%	5.4%	3.5%	8.4%	16.83%	n.a.	n.a.
Stdev 2016		8.0%	13.1%	5.9%	4.3%	9.9%	17.59%	n.a.	n.a.

**Source: Eurostat. Data refers to EU-27 aggregate except for GDP that refers to EU-28. GDP of 2016 is not available, the one reported is referred to 2015*

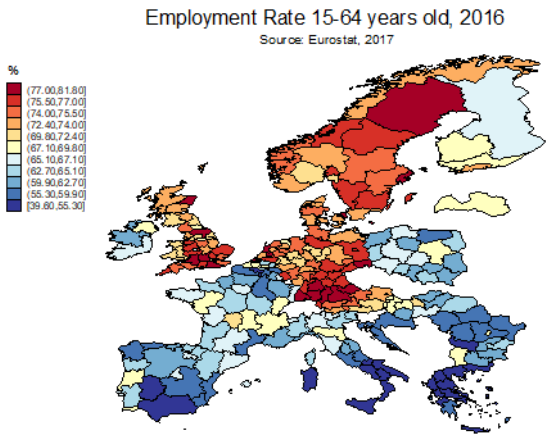


In table 2 are reported statistics related to the employment structure by age in Europe. Divergence is high at extreme age cohorts (15-24 and 55-64), where employment rate is lower and apparently "weaker", i.e. more sensible to crisis and shocks with respect to "core" ages. Differences move following a north-south axis as in the statistics presented above (see map charts).

Looking at the sectorial structure (table 3 and charts 6-7), on the other hand, it is possible to notice an east-west axis: eastern countries economy relies more on the industrial and manufacturing sectors while more advanced economies in the west have a solid tertiary sector (some of the results below might seem odds talking about tertiary sector, for example Sicilia and Lazio. This is because public administration and tourism is included in the computation of the tertiary sector quota, and in these regions they constitute an important part of the economy).

Table 2 & Charts 4-5 (Data Source: Eurostat, 2017)

Stats EU -27*		**Emp. 15-24**	**Emp. 25-34**	**Emp. 35_44**	**Emp. 45-54**	**Emp. 55-64**	**Emp. 15-64**
2000		37.10%	75.30%	79.00%	73.30%	36.80%	62.10%
2008		37.20%	77.90%	81.90%	78.30%	45.50%	65.70%
2013		32.20%	73.60%	79.20%	77.50%	50.20%	64.10%
2016		33.80%	75.70%	80.90%	79.40%	55.40%	66.70%
Stdev 2000	Country Level	14.82%	6.51%	6.54%	7.93%	15.48%	8.34%
Stdev 2016	Country Level	15.14%	6.96%	5.39%	7.84%	12.45%	7.66%
Stdev 2000	NUTS 2 Level	14.28%	8.43%	6.82%	8.17%	12.77%	8.37%
Stdev 2016	NUTS 2 Level	15.11%	10.39%	8.75%	10.74%	12.41%	9.85%
**Source: Eurostat. Data refers to EU-27 aggregate*							



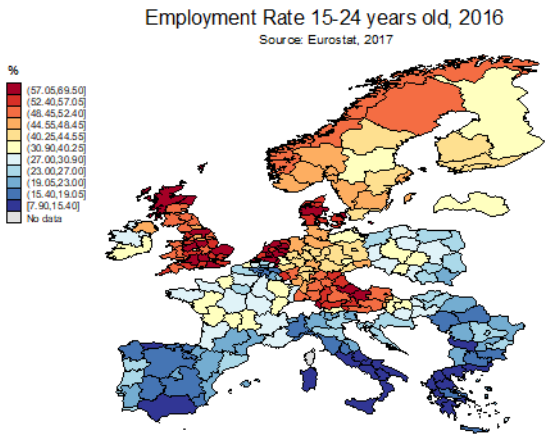
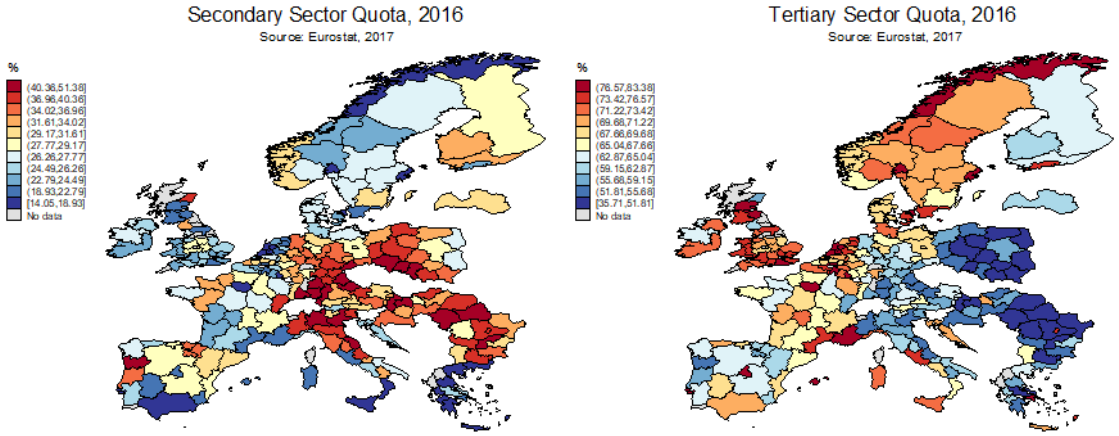


Table 3 & Charts 6-7 (Data Source: Eurostat, 2017)

Stats EU -27*		Agr. Quota	Ind. Quota	Serv. Quota
2000		7.11%	29.79%	63.10%
2008		5.62%	33.30%	61.08%
2013		5.44%	30.09%	64.46%
2016		4.93%	29.94%	65.13%
Stdev 2000	Country Level	7.37%	5.35%	9.09%
Stdev 2016	Country Level	4.53%	6.49%	5.32%
Stdev 2000	NUTS 2 Level	9.06%	7.55%	10.47%
Stdev 2016	NUTS 2 Level	8.87%	7.90%	7.51%
**Source: Eurostat. Data refers to EU-27 aggregate*				



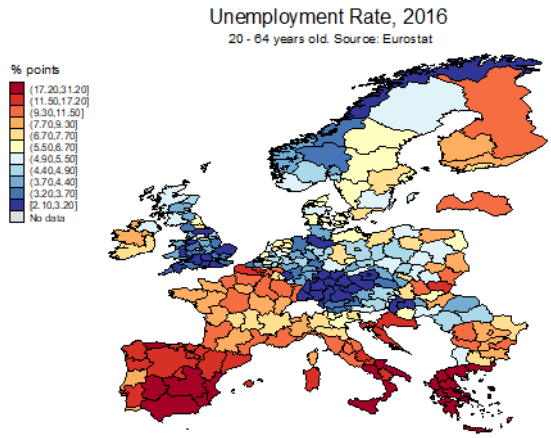
This might say that while economic recovery is helping the European Continent to better deal with its problems, there are still issues to face up at a regional level, issues that cannot be underestimated by European and country governments only because the recovery process is pushing the economy to pre-crisis levels.

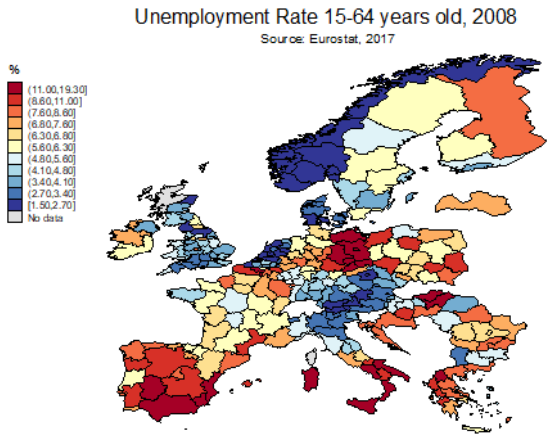
Indeed, convergence in economic fundamentals should be the main goal of policy makers in the Eurozone. The maps presented show that Europe is still far from this goal, even at a country level. Examples of Italy and Spain show high divergence within country, while Germany and Nordic countries show high divergence with respect the Southern ones. Unemployment makes no exception.

Unemployment Focus

Focusing on unemployment, Europe still assists to a huge variability across States and across Regions (at NUTS2 level), as clearly visible in charts 8 and 9.

Charts 8-9 (Data Source: Eurostat, 2017)





It is here evident a net difference between Southern (Portugal, Italy, Spain…) and Northern (Germany, Norway, Denmark…) Europe, with the first group of countries experiencing high and persistent levels of unemployment while the latter group shows low levels of people without a job. France seems to belong more to the group of Mediterranean countries rather than the Nordic ones.

The situation, conversely, looked to some extents quite different in 2008, right before the financial crisis hit the world.

Germany had a much higher unemployment level compared for example to Northern Italy, that had a level analogous to United Kingdom or Denmark. However, depressed regions were already experiencing high unemployment (Southern Italy and Spain, Portugal, Greece…), and, apparently, they "influenced" their neighbours during the financial crisis, showing that the problem was likely not only at a regional-level but also at a country-level.

Charts 10, 11 and 12 below and some descriptive statistics (table A1 and A2 in the appendix) show that a convergence process was likely happening during the positive business cycle experienced between 2000 and 2007, where unemployment was lowering and converging to a common level across all Europe, looking in this way more similar to the United States, which become the natural comparable of an economic union. However, with the spread of the crisis, the convergence process blew up and disparities across European countries increased to new maximums.

Charts 10 & 11 (Data Source: Eurostat and FRED, 2017)

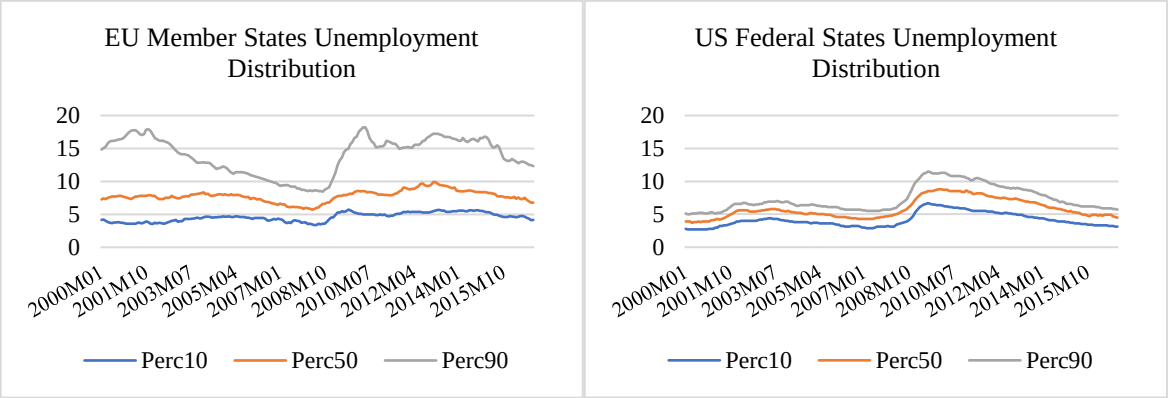


Chart 12 (Data Source: Eurostat and FRED, 2017)

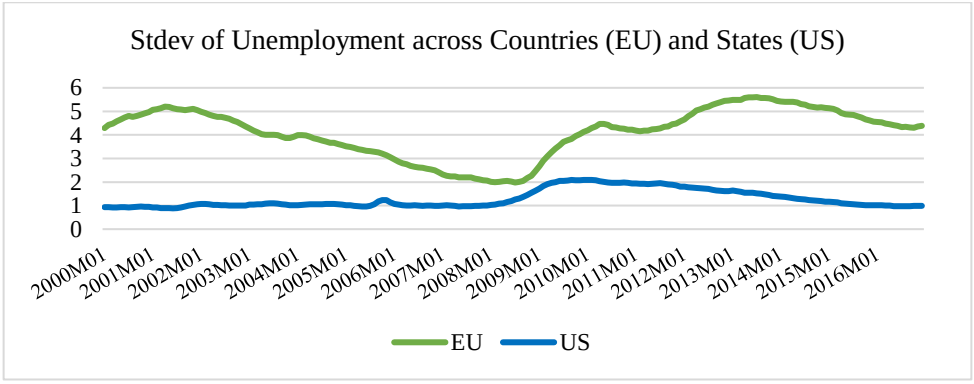
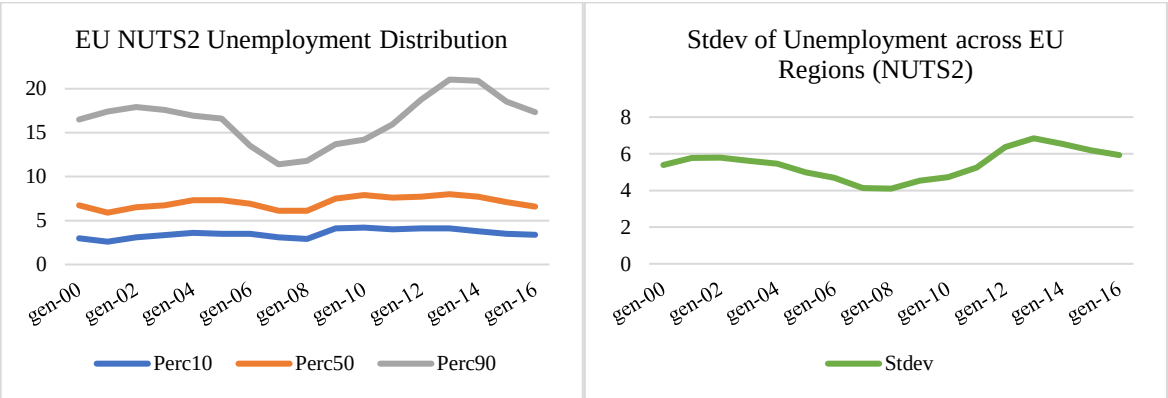


Chart 12 shows the standard deviation across the unemployment level of 30 States in Europe and 51 Federal States in US. The higher the standard deviation, the higher the disparities.

It is here clearly visible how the financial crisis in 2008 strongly increased unemployment gaps across European States and how the sovereign debt crisis in 2011 gave a fatal hit to the recovery attempts of the European Union. Moreover, the recovery process that seems to start in 2013 shows a much slower downward path than the one experienced in the pre-crisis period. This phenomenon is even more evident analysing NUTS2 data.

***Chart 13 and 14** (Data Source: Eurostat, 2017)*

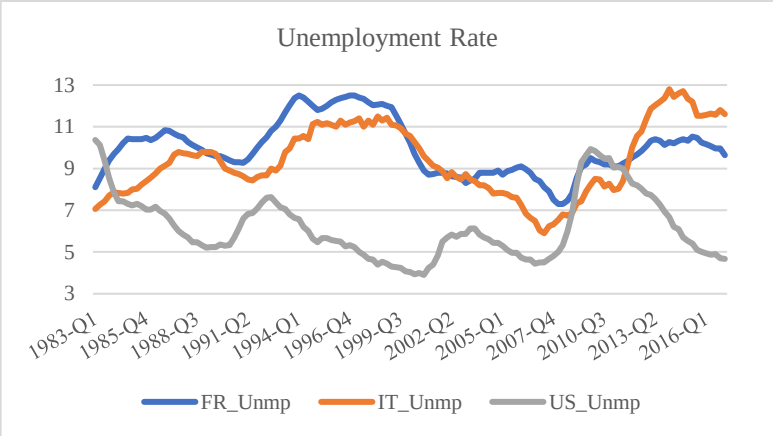


These evidences show how much work is still needed in Europe to create a better Union, at least talking about job creation.

The key point is to understand how advanced economies as the one of United States and Europe have such a big difference in the behaviour of their Unemployment rate.

This is a well-recognised issue that has been studied in the economic literature, as presented before, at least since the '80s with Blanchard and Summers as pioneers publishing the first paper about *hysteresis*. A simple chart immediately displays it: While European unemployment (Italy and France are taken as examples given the early start date chosen) shows a non-stationarity component, the US one seems to follow a mean reverting process.

Chart 15 (Source: OECD, 2017)



Indeed, oversea unemployment seems to react to shocks increasing sharply its level but moving back quickly to a "natural" level. On the other hand, European countries, here exemplified with Italy and France, have more difficulties and the recovery path appears much slower. This seems to corroborate the existence of a non-stationary component, i.e. the presence of a Unit Root.

Among many, in a paper published in 2015, Jordi Galì[5] analyses three possible causes of a Unit Root (i.e. non-stationarity) in European unemployment:

1. *The Natural Rate Hypothesis*: The Unemployment Natural Rate is the equilibrium rate that makes the salaries chosen in the "salaries determination" equation equal to the salaries derived from the "price fixation equation". The hypothesis is that the non-stationary component derives from an exogenous permanent effect in the Natural Rate;
2. *The long-run trade off Hypothesis*: The long run trade off refers to a consolidate relationship between inflation and unemployment levels. The non-stationary component derives from the presence of a Unit Root in wage inflation;
3. *The hysteresis Hypothesis*: Hysteresis means that shocks have permanent effects on the level of unemployment, i.e. there is not a natural rate to which the economy

[5] Director of the Center for Research in International Economics, Universitat Pompeu Fabra

converges. The non-stationary component derives from the institutional framework in which firms and workers operate (insider-outsider model);

Galì conclusions are that the first hypothesis provides little evidence to be behind the unit root in unemployment, and the second can account for it only when the data sample is the one of the disinflationary period of the ‘70s and ’80s, but not in the more recent past.

The hysteresis hypothesis, on the other hand, might have potential to explain the non-stationary behaviour of Unemployment in Europe.

In the next chapter it will be verified the effective presence of a Unit Root in 13 European Countries (the ones with more history available, at least from 1990) first with panel data techniques and then with time series single country tests. United States are again taken as benchmark, given the large amount of literature that shows their unemployment stationarity. Once this is verified, the framework will focus on labour market institutions of European Countries, to study the effects they have on unemployment by age (young unemployment, 15-24 years old, total unemployment, 20-64 years old, and long-term unemployment) using the EPL indicator developed by the OECD and regional data.

The analysis will then make a step further utilizing sectorial data on employment level to better understand how employment protection legislation impacts on different economic structures; This might be of help to better suit economic policies according to the economy peculiarities in which the legislator is operating.

1.C Unit Roots: Evidences in Europe

As pointed out earlier, charts show a structural difference of the unemployment behaviour in different countries. In particular, while the US unemployment level seems to revert quickly to a "natural" rate after a negative shock, the European countries show difficulties in returning to pre-shock levels, and when a recovery process starts it is usually slower that the one it is observed in North America.

These different paths are known in statistics as stationary and non-stationary processes.

A stationary time series is a series whose statistical properties such as mean, variance, autocorrelation… are all constant over time. It shows a mean reverting behaviour fluctuating around the mean as it always tends to go back to it. This is consistent with a "natural rate hypothesis", i.e. the idea of a permanent optimal rate to which unemployment always converges.

A process in which shocks have permanent effects is instead non-stationary, and it is also said a Unit Root process. This is consistent with the "hysteresis hypothesis" presented in the previous chapter.

Some argue that researchers must be careful not to confuse a Unit Root process with a stationary process that shows persistence: in this latter case, it is still possible to observe the process reverting to pre-shocks levels, but following a much slower path. It can be seen as a "near Unit Root" process [León-Ledesma, Miguel A., 2000].

While this might seem an issue, the difference between persistence and non-stationarity is subtle and it might lose of significance from an economic policy point of view. Even a persistent (but stationary) process might have the same "real" effects in the economy as a hysteric one, in particular from a political perspective.

Thus, it is reasonable to assume that both persistence and hysteresis are issues to consider at the same level when dealing with unemployment and labour market regulation.

In any case, the tests proposed in the next paragraph will substantially not reject the hypothesis of non-stationarity in many of the countries analysed, and in the time series approach the empirical framework will account for "close to unity" problem of the Dickey Fuller test.

The Unit Root testing proceeds then both with a panel data approach, using Levin-Lin-Chu Test and Pesaran Test, and a time series approach with a DickeyFuller-GLS test. Both approaches confirm the existence of non-stationarity in the sample analysed: thirteen European countries chosen according to the availability of long time-series and the importance of their economy in Europe.

Panel Data Unit Root Test

Unit Root testing using Panel techniques is an evolution from time series unit root tests.

Pioneers of this are Levin, Lin and Chu (2002). They start from the fact that in finite samples, unit root test procedures are known to have limited power against alternative hypotheses with highly persistent deviations from equilibrium. They then consider pooling cross-section time series data as a means of generating more powerful unit root tests.

A panel unit root test considers both the asymptotic behaviour of the T dimension and the cross-sectional dimension N of the panel. There are three possibilities to handle this, and the tests used will focus on the sequential limit theory, where N (the number of countries in the panel) is fixed and T is allowed to go to infinity [Kunst, Nell, Zimmermann, 2011].

It is first performed a Levin-Lin-Chu Test to both young unemployment (15 to 24 years old people) and total unemployment (20 to 64 years old people). The LLC test has the following hypothesis:

H_o: Panels contain unit roots

H_1: Panels are stationary

For thirteen European countries, using monthly data from January 1991 to December 2016, it is rejected the null of Unit Roots at the 5% level for total unemployment (p-value = 0.0238) but it cannot be rejected even at 10% for young unemployment (p-value = 0.2093).

The test allowed the subtraction of cross-sectional mean (as suggested by the test authors), it did not include a trend, and it used a number of lags equal to 6 for the ADF test after performing ADF tests to all the single series, and finding it as the best lag for many of them[6].

However, the LLC test suffers of some drawbacks [Kunst, Nell, Zimmermann, 2011]:

1. The null hypothesis is very restrictive, stating that all panels have a unit root;
2. The test strongly relies on cross-sectional independence. However, testing the panel for it, it cannot be accepted this assumption; It will then be performed a more appropriate test developed by Pesaran in 2007;
3. According to the authors, the test works well with panel with N between 10 and 250 and T between 5 and 250. The panel utilized has N=13 and T = 312. It might be too long in terms of T. With so extended time series, though, it should be possible to safely run time series test for Unit Roots. In this specific case, it will be applied a variant of the Dickey Fuller Test, the DF-GLS test.

Going on with the panel data procedure, the panel is first tested for cross-sectional independence using the Pesaran (2004) C-D test for cross-section independence in macro

[6] Following the methodology proposed by Schwert (1989)

panel data. As expected, the null hypothesis of cross-sectional independence is rejected at the 1% level both for young and total unemployment. Then, a test that allows for cross-sectional dependence is performed [Pesaran, 2007].

Results are now identifying a Unit Root: the null of non-stationarity cannot be rejected.

To check the robustness of these findings, the procedure is repeated for the (total) unemployment rate of 50 US States in the same period and with the same frequency of data (monthly). In the American case, LLC test rejects the null of non-stationarity as in the European case, and after controlling for cross-sectional independence, which exists also in this panel, also the Pesaran Test rejects the null of a Unit Root in the series.

It seems then evident a statistical difference in the behaviour of European and American unemployment.

Time series Unit Root test

The most common way to test for a Unit Root in time series analysis is through the Dickey-Fuller Test, or its augmented version (ADF test), which accounts for serially correlated errors. However, even this test suffers of some drawbacks: it has little power w.r.t. the alternative when there is a deterministic trend and Φ is near to 1, i.e. it has small probability to reject the null hypothesis of a unit root when the null hypothesis is false [Kirchgassner G., Wolters J., 2000].

Elliot, Rothenberg and Stock developed a variant of the ADF (Efficient tests for an autoregressive unit root, Econometrica, 1996), called DF-GLS test, to account for these issues.

The examination will directly rely on this methodology to better deal also with the hysteresis-persistence issue described above.

Again, the analysis is computed first on 13 European Countries, with US as comparable, and then it is checked the robustness using US States. The power of the test should be granted by the large T available (312 observations for each time series). Results for European Countries are presented in table 4 and 5, both for total and young unemployment.

Table 4 (Source: Eurostat, 2017 – own computations)

Total Unemployment (20 - 64 years old)

Country	Optimal Lag	T-Stat	1% Crit. Value	5% Crit. Value	10% Crit. Value
BE	9	-1.548	-2.580	-1.978	-1.663
FR	11	-1.209	-2.580	-1.971	-1.656
DK	12	-1.367	-2.580	-1.967	-1.653
DE	13	-1.184	-2.580	-1.963	-1.649
IE	14	-1.297	-2.580	-1.959	-1.645
ES	11	-2.368**	-2.580	-1.971	-1.656
IT	12	-1.254	-2.580	-1.967	-1.653
NL	9	-3.103***	-2.580	-1.978	-1.663
PT	4	-0.707	-2.580	-1.995	-1.679
FI	9	-1.826*	-2.580	-1.978	-1.663
SE	11	-0.978	-2.580	-1.971	-1.656
UK	12	-1.409	-2.580	-1.967	-1.653
NO	7	-0.835	-2.580	-1.985	-1.670
US	12	-2.310**	-2.580	-1.967	-1.653

Table 5 (Source: Eurostat, 2017 – own computations)

Young Unemployment (15 – 24 years old)

Country	Optimal Lag	T-Stat	1% Crit. Value	5% Crit. Value	10% Crit. Value
BE	3	-0.997	-2.580	-1.998	-1.682
FR	15	-0.534	-2.580	-1.955	-1.642
DK	14	-1.294	-2.580	-1.959	-1.645
DE	15	-1.049	-2.580	-1.955	-1.642
IE	10	-1.761*	-2.580	-1.974	-1.660
ES	9	-1.855*	-2.580	-1.978	-1.663
IT	11	-0.614	-2.580	-1.971	-1.656
NL	10	-2.413**	-2.580	-1.974	-1.660
PT	15	-0.918	-2.580	-1.955	-1.642
FI	11	-1.682*	-2.580	-1.971	-1.656
SE	11	-0.847	-2.58	-1.971	-1.656
UK	12	-1.280	-2.58	-1.967	-1.653
NO	13	-1.004	-2.58	-1.963	-1.649
US	11	-2.315**	-2.58	-1.971	-1.656

The null hypothesis of the test is the existence of a Unit Root. This hypothesis is rejected when the t-statistic is lower than the indicated critical value (critical values obtained by the test's authors using montecarlo simulations). The Optimal lag is chosen using the Ng-Perron seq t criteria [Ng S., Perron P., 2001].

According to these results, it cannot be rejected the null of a Unit Root at 5% level in 11 countries over 13 with respect to total unemployment (Netherlands, and surprisingly Spain, do

not show non-stationarity), and only in Netherlands for young unemployment. In US, on the other hand, in both cases the series is stationary.

Repeating the analysis for US Federal States, they show the opposite behaviour (table A3 in the appendix). More than a half of US States reject the hypothesis of a Unit Root at a 5% level or lower, and 35/50 (70%) considering a confidence level of 10%.

Analysis summary

So far, results seem to be striking. A Unit Root is common in European Countries while it is much more sporadic in US States, where more than 70% of the Federal States have unemployment showing a mean-reverting behaviour.

There could be many explanations of this significant difference in unemployment trend on the two Economic Areas, but one of the most debated is the institutional environment in which economic agents operate, in particular how the labour market is regulated.

In the next section is presented a summary framework about labour market institutions across Europe, at least the major countries, and the indexes developed by OECD and the Fraser Institute to track the development of labour market regulation in the World.

Section 2: Labour Market Regulation Overview

2.A Introduction: Labour Market Regulation Indexes

As previously mentioned, discussing hysteresis in the labour market implies discussing how institutions, through legislation, influence the interaction between firms and workers in the economic activity.

Regulation of the labour market might affect unemployment in many ways: generous insurance against unemployment might reduce the job search efforts, while employment protection might have mixed effects, reducing the increase in unemployment during economic turmoil but decreasing the flows of workers through the labour market during economic recovery periods [Blanchard and Wolfers, 2000].

It is not an easy task to measure the differences in labour market regulations in different countries and how reforms effectively change the status quo in favour of a more flexible or rigid Employment Protection Legislation (EPL).

The topic is a pillar of economic policy since the 80s, and for this reason employment protection indicators gained more and more attention during the years, since they are fundamental tools to use in empirical analysis to assess EPL role in shaping the labour market.

The most recognised provider of time series EPL indexes is the OECD with its indicators of regular and temporary contracts legislation and the rules governing collective dismissals. Other academic and international institutions produce their own indicators, even though there are some drawbacks in the way they are computed, as it will be pointed out later in this chapter. The purpose of this work is not to make a comparison across indicators' providers. However, it will be proposed the same model using both the OECD Index, the indicator the analysis relies on, and the Fraser Institute Labour Market Regulation Index (LMR), chosen among others given the extensiveness of data available and the possibility to use its sub-components to "customize" the broad index.

2.B OECD EPL Indexes in Europe

The OECD defines its indicators as a measure of the procedures and costs involved in dismissing individuals or groups of workers, or hiring individuals with regulars or temporary contracts. The indicators are computed using statutory laws. Collective bargaining agreements and case law, as well as advice and contributions from country-experts[7].

Employment Protection usually regards the laws regulating the dismissal of one or more employees: it states when it is possible to fire a person or a group of people and which is the correct procedure to adopt and the sanctions applied in case of breach of these provisions.

With respect to regular contracts (EPR), procedures included in the index concern the notification, the delay involved before notice can start, the length of the notice period and the severance pay. Application of the law and sanctions are measured through the definition of justified or unfair dismissal (every country has its own), length of trial period, compensation or possibility of reinstatement following unfair dismissal.

Collective dismissal (EPC) is instead measured looking through the definition of collective dismissal at State level, notification and delays involved in case of collective dismissal and other targeted regulation employers must respect in this particular case.

Fixed term contracts (EPT) strictness depends on how long and how many times a person can be employed with a temporary contract and which kind of jobs can legally employ people on a temporary basis[8].

In the OECD Outlook on Employment of 2004 the full computational methodology is reported. The Indexes can take values from 0 (most flexible) to 6 (strictest). The comprehensive index is computed following the procedure illustrated by Bassanini and Nunziata (2009):

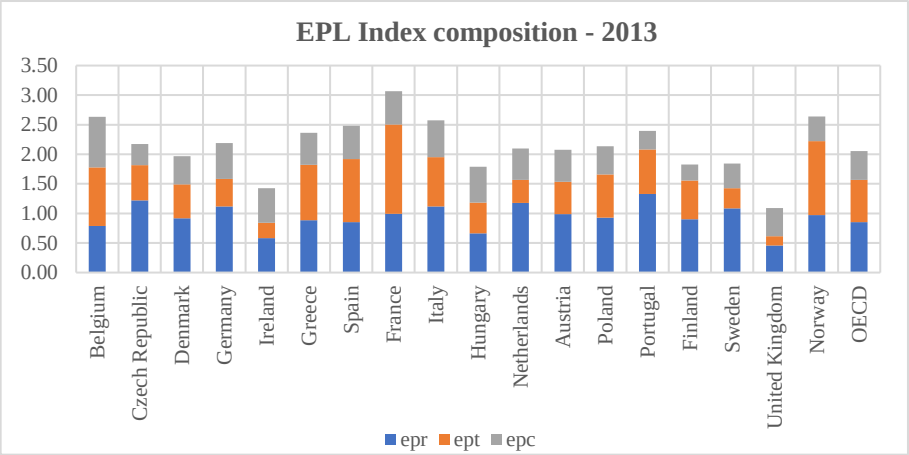
$$EPL = \left(\frac{5}{12}\right) * EPR + \left(\frac{5}{12}\right) * EPT + \left(\frac{2}{12}\right) * EPC \tag{14}$$

In Europe the role of institutions in the labour market is usually considered massive, lead by the importance the Welfare State acquired in the past decades in the European economy. The OECD Index confirms this thought assigning an overall value of 2.15 on the simple average of 18 European countries (the ones with data available in the overall period of the analysis) against the OECD average[9] of 2.05. For a further comparison, the US the index has a value of 0.69, the lowest level in the OECD sample.

[7] http://www.oecd.org/els/emp/oecdindicatorsofemploymentprotection.htm
[8] www.oecd.org/employment/protection
[9] Which comprises European countries

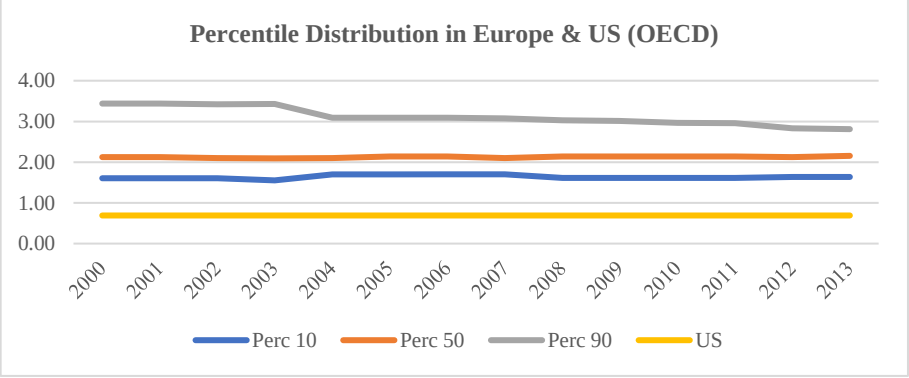
According to data from 2013 (the most recent available), Mediterranean countries are the ones with the highest level of EPL, together with Norway and Belgium. The component that mainly differs across legislations is the temporary contracts one, that mostly leads the differences across countries' levels.

Chart 16 (Source: OECD, 2017)



Providing a percentile distribution of the evolution of the EPL Index in Europe, it can be noticed that, over time, changes happened in countries with a high level of employment protection (90th percentile) while in median and low-level countries it stayed stable. This might seem a (small) convergence process delivering a uniform level of labour market regulation in the European Union.

Chart 17 (Source: OECD, 2017)

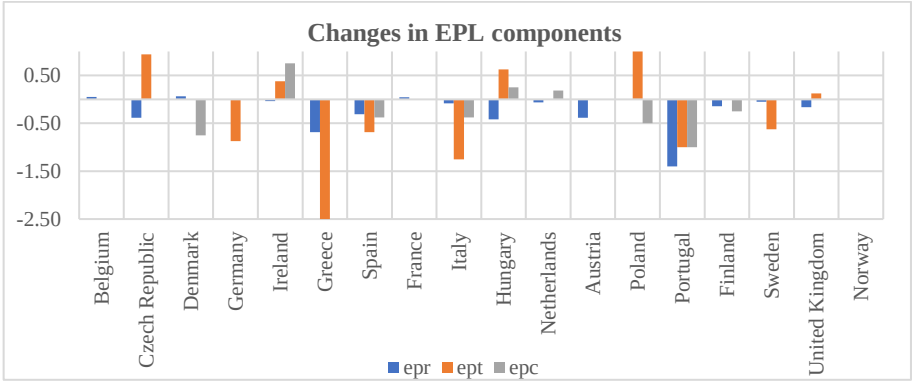


For the countries with data available from 2000 to 2013, the chart below shows how the three different components changed in the last decade.

Countries that experienced the strongest increase in flexibility are the Mediterranean ones, as Greece, Italy, Spain and Portugal, mostly through liberalization of the temporary work labour market. Portugal is quite an outlier since it strongly deregulated also regular contracts legislation, uncommon practice across the other countries (event though after 2015 also other States are changing fundamental rules of regular contracts, as it will be described ahead in this section).

Also, this chart evidences an overall trend of reduction of the strictness of employment protection, even though there are some exceptions (Poland, Ireland, Hungary…) while some countries did not make any change at all.

Chart 18 (Source: OECD, 2017)



In general, the situation in Europe seems going in the direction of a partial increase in the labour market flexibility, in particular in the segment of temporary contracts. However, the low regulative level of the United States is still far away.

2.C Fraser Institute Indexes in Europe

The Fraser Institute is a Canadian think tank founded in 1974 by Michael Walker[10]. Its motto is "if it matters, measure it", so its mission is to create a reliable measure (i.e. open data and transparent methodology) of different economic variables which are not easy to measure with traditional data provided by institutional databases (Eurostat, FRED, OECD…). Data are available complete and on an annual basis since 2002, and its indexes are largely cited in economic policy research[11].

These variables are summarized in 5 macro-groups:

1. Size of Government: Expenditures, taxes and enterprises;
2. Legal Structure and security of property rights;
3. Access to sound Money;
4. Freedom to trade internationally;
5. Regulation of credit, labour and business;

Each macro group is the arithmetic average of sub-indexes which represents more specific subjects of interest of the macro category. Focusing on labour market regulation, there are six indicators [Gwartney, Lawson, Hall, 2016]:

- Hiring Regulation and Minimum Wage: This sub-component is based on the "Employing Workers" section of the World Bank's *Doing Business* and is based on the following components: (1) whether fixed-term contracts are prohibited for permanent tasks; (2) the maximum cumulative duration of fixed-term contracts; and (3) the ratio of the minimum wage for a trainee or first-time employee to the average value added per worker. An economy is assigned a score of 1 if fixed-term contracts are prohibited for permanent tasks and a score of 0 if they can be used for any task. A score of 1 is assigned if the maximum cumulative duration of fixed-term contracts is less than 3 years; 0.5 if it is 3 years or more but less than 5 years; and 0 if fixed-term contracts can last 5 years or more. Finally, a score of 1 is assigned if the ratio of the minimum wage to the average value added per worker is 0.75 or more; 0.67 for a ratio of 0.50 or more but less than 0.75; 0.33 for a ratio of 0.25 or more but less than 0.50; and 0 for a ratio of less than 0.25.
- Hiring and Firing Regulation: This sub-component is based on the Global Competitiveness Report question (World Economic Forum): "The hiring and firing of workers is impeded by regulations (= 1) or flexibly determined by employers (= 7)".

[10] https://www.fraserinstitute.org/about
[11] https://www.fraserinstitute.org/sites/default/files/economic-freedom-research-professional-citations-2014.pdf

- Centralized Collective Bargaining: This sub-component is based on the Global Competitiveness Report (World Economic Forum) question: "Wages in your country are set by a centralized bargaining process (= 1) or up to each individual company (= 7)".
- Hours Regulations: This sub-component is based on the "Rigidity of Hours Index" in the World Bank's *Doing Business*, and is based on the following five components: (1) whether there are restrictions on night work; (2) whether there are restrictions on holiday work; (3) whether the length of the work week can be 5.5 days or longer; (4) whether there are restrictions on overtime work; and (5) whether the average paid annual leave is 21 working days or more. For each question, when the regulations apply, a score of 1 is given. If there are no restrictions, the economy receives a score of 0. The zero-to-10 rating is based on how many of these regulations are in place: 0 regulations results in a rating of 10; 1 regulation results in a rating of 8; and so on.
- Mandated cost of worker dismissal: This sub-component 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 with 10 years tenure. The formula used to calculate the zero-to-10 ratings was: $(Vmax - Vi) / (Vmax - Vmin)$ multiplied by 10. *Vi* represents the dismissal cost (measured in weeks of wages). The values for *Vmax* and *Vmin* were set at 58 weeks (1.5 standard deviations above average in 2005) and 0 weeks, respectively. Countries with values outside the Vmax and Vmin range received ratings of either zero or 10 accordingly.
- Conscription: Data on the use and duration of the military conscription.

The overall index is then built computing the simple average of the 6 components illustrated. However, there are limitations in the development of this indicator.

A research of the International Labour Office (ILO) points some criticisms of how the Fraser Institute (and other organizations) compute their labour market flexibility indicator [Aleksynska, Cazes, 2014]. In the next paragraphs are reported the main findings of the paper to better understand how to use and interpret this index in the empirical framework.

The first and main problem is the use of the Employing Workers Indicator (EWI), a sub-indicator of the Doing Business indicator developed by the World Bank which has been criticised from academia and other international organizations (see Berg and Cazes, 2008, Lee, McCann and Torm, 2008). Independent reviews had the effect of making the bank modifying and excluding this indicator from the computation of the broad Ease of Doing

Business indicator, since its valuation of the labour market was biased towards the problems of employment protection, not considering its benefits [World Bank, 2009].

Then, the authors present other issues:

- The use of some, but not all, of the sub-components of the Rigidity of Employment Index, without explaining why;
- The EWI edition changed over time because of methodological reviews, but Fraser does not indicate which one it uses;
- The World Bank does not use, and suggest not to use this data to rank countries, while Fraser still does;
- There is a repetitiveness of questions in creating the sub-indicators, generating redundancy and over-representation of similar concepts, for example in the hours regulation component. The simple average used to create the LMR Index does not help to limit the problem, but it emphasizes it.

The ILO research concludes that despite the problems outlined so far, the index could still be useful, in particular for cross-country comparison within the same year and based on disaggregated components. However, time-series analysis might be more problematic. For this reason, the empirical framework will rely on the OECD EPL Index and it will use a *custom form* of the Fraser Index to check whether there are effective differences in the analysis or not.

Accounting for these evidences, this work will perform some modifications on the main index:

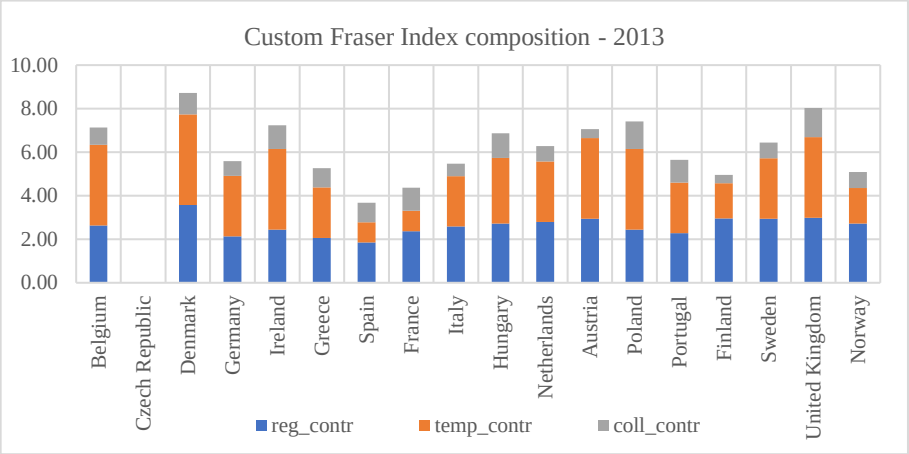
1. Conscription is eliminated. The *custom* index will not rely on this parameter in the analysis given that it is expected more to misallocate labour rather than increase unemployment [Å.E. Andersson, D.E Andersson, B. Hårsman, Z. Daghbashyan, 2014];
2. Hours regulation is excluded because considered redundant with the other components;
3. The simple average of the remaining components is replaced using a similar weighted average as the one used to build the OECD Index. The regular contract component (*epr*) is computed as the simple average of Hiring and Firing and Cost of Dismissal indicators; Hiring Regulation and Minimum Wage accounts for the temporary contracts regulation (*ept*), and Centralized Collective Bargaining for the collective dismissal one (*epc*);

The main index is then computed in the same way as in equation 14.

The higher the level of the index, the higher the flexibility of the market (Hint: opposite interpretation with respect the OECD Index).

This custom form of the Fraser Index shows some similarities with the OECD Index, for example the low variability across countries of regular contracts regulation and, on the opposite, the high differences on temporary contracts legislations.

Chart 19 ***(Source: Fraser Institute, 2017)***



From a country "ranking" perspective it can be noticed that, again, Mediterranean countries are the ones with the stricter labour market regulation, together with Norway, but there are some discrepancies with the OECD Index as reported in the table below, discrepancies regarding mainly Scandinavian and Eastern countries.

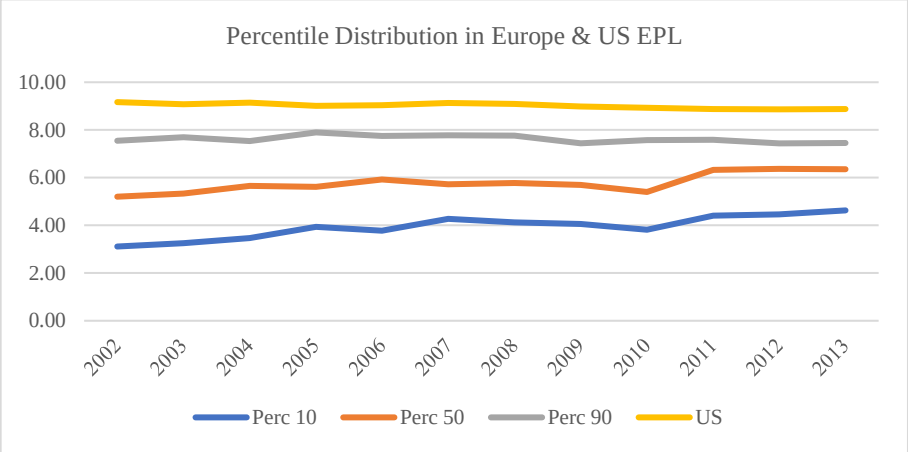
Table 6 (Source: OECD and Fraser, 2017. Highlighted the bigger discrepancies)

Country Ranking as of 2013 (1st most flexible)

Country	OECD Rank	Fraser Rank
Belgium	15	5
Denmark	6	1
Germany	10	11
Ireland	2	4
Greece	11	13
Spain	13	17
France	17	16
Italy	14	12
Hungary	3	7
Netherlands	8	9
Austria	7	6
Poland	9	3
Portugal	12	10
Finland	4	15
Sweden	5	8
United Kingdom	1	2
Norway	16	14

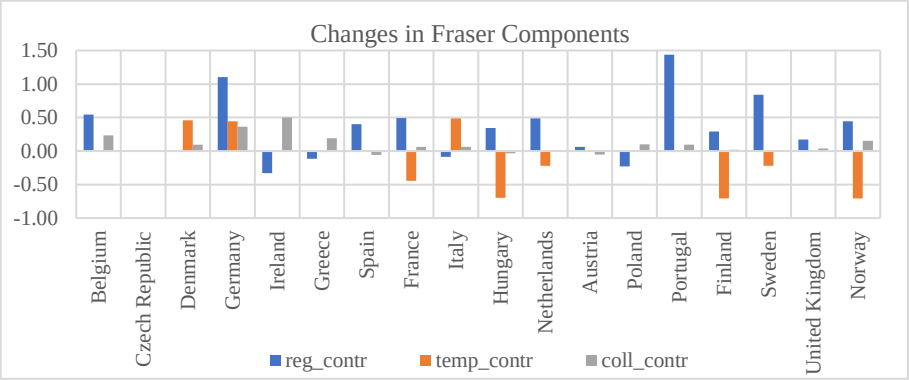
According to Fraser, changes in labour market flexibility have been quite significant for all the countries with high and median-level of labour market regulation in the panel. This differs from the OECD Index behaviour, which is much more stable over time.

Chart 20 ***(Source: Fraser Institute, 2017)***



Analysing the single components of Fraser, other similarities with the OECD Index can be find, for example the biggest regular contracts increase in flexibility in Portugal, while there are discrepancies in particular with respect Scandinavian countries, Germany and Belgium.

Chart 21 ***(Source: Fraser Institute, 2017)***



To conclude, some descriptive statistics might help to better see the differences across indexes (reference period: 2002 – 2013).

Table 7 (Source: OECD and Fraser, 2017)

Index	Mean	StDev	Min	Max
OECD (Epr)	2.31	0.62	1.09	4.58
OECD (Ept)	1.72	1.08	0.25	4.75
OECD (Epc)	3.28	0.66	1.63	5.13
OECD (Broad)	2.23	0.64	1.05	3.69
Fraser (min_wage)	6.42	2.37	2.2	10
Fraser (hir&fir)	3.69	1.29	1.33	8.51
Fraser (cost_dism)	7.68	2.06	1.01	10
Fraser (coll_barg)	5.31	1.86	1.83	8.37
Fraser (Official)	6.18	1.34	3.34	8.48
Fraser (Custom)	5.93	1.48	2.86	8.90

2.D Indexes and Economic Policies: Some examples

So far it has been described how these indexes try to measure reality. However, it might be difficult to interpret how these numbers change over time, i.e. how economic policy can effectively change their value. The question becomes: which reforms did contribute to significant changes in the index value and at the same time caused real changes in the labour market of a country?

A comprehensive study of the indexes computation over time is behind the scope of this work, but the next paragraphs will try to provide some examples focusing on three countries labour market reforms: Italy, Germany and France[12]. With respect to the first two countries the examples taken try to identify which has been the institutional innovation that brought a consistent change in the indexes in the first years of 2000s. Talking about France, on the other hand, it's investigated whether there have been reforms or not, since indexes levels stayed basically flat in all the period considered in the analysis.

Labour Market reforms in Italy

Looking at the Fraser Institute Index, it can be noticed that the main driver of the flexibility improvement in the first years of the century for Italy has been *Hiring Regulations and Minimum Wage*, i.e. the measure of temporary contracts regulation (from 4.4 in 2002 to 6.70 in 2004). Other indicators do not show big changes in the same period.

Looking at the OECD Index, the trend, compared to the Fraser one, is the same: the regular contracts index (*epr_v1*) stays stable for all the available period, with only a slightly decrease from 2.76 to 2.68 in 2013. The same happens also for collective dismissal regulation (*epc*). The other parameter that behaves as the Fraser comparable is the temporary contracts regulation (*ept_v1*), that became more flexible in the early 2000s moving from a level of 3.25 to 2.38 and 2.00 in 3 years. It then stays flat until the last observation.

The main labour market reform in Italy of those years has been the "Legge Biagi" (n.30/2003), which improved the flexibility of the Italian labour market through the introduction of new contracts and the loosening of restrictions at many levels [Ichino, 2004]. Some examples are the introduction of contracts inspired by Anglo-Saxon legislation, like *Staff Leasing* and *Job Sharing* and the loosening of restrictions on part-time jobs and jobs on call. However, this reform did not affect the regular contracts legislation but only the temporary contracts one, and this is fully reflected in the indexes behaviour.

[12] The choice, discretional, has been driven by the availability of information in English language and the relevance of the reforms implemented and the changes in the indexes

It will be interesting to see how the "Jobs Act" reform (2015) will impact on the indexes level for Italy (data are now updated only until 2013/14).

Labour Market reforms in Germany

Following the same procedure, the main drivers of the flexibility improvement in Germany using the Fraser index are identified in *Hiring Regulations and Minimum Wage* indicator (from 5.6 in 2002 to 6.70 in 2004) and *Mandate Cost of Work Dismissal* indicator (from 3.6 in 2008 to 6.26 in 2010).

The OECD Index, however, behaves in the same way as for Italy. Strictness of regular contracts regulation (level of 2.68) never changes in the period considered, in net contrast with the Fraser indicator comparable (cost of worker dismissal), and so it does regulation of collective dismissal (level of 3.63). However, temporary contracts regulation strongly increased its flexibility, moving from an already low level of 2.00 in 2002 to 1.50 and 1.00 in the following years.

The process of reforms of the labour market in Germany started in 2002 and continued in the subsequent years with the Hartz reforms, which introduced, among many things, a deregulation of temporary employment, a cut in unemployment assistance and benefits and a reorganization of the Federal Labour Agency. The success in 2008-2009 during the Great Recession, from a labour market perspective, has been the extensive use of *short time work* and *working time accounts* (flexible working times, exchange of salary and working time employee is released from work for long periods or early retires). The introduction of these formulas allowed Germany to not reduce the amount of employed population reducing only the number of hours worked [Rinne, Zimmermann, 2012].

The OECD Index, then, seems to better describe the German situation.

Labour Market reforms in France

While Germany moved in reforming labour market and social protection aiming to reduce rigidities, France did not follow the same scheme, focusing more on taxing qualified labour to maintain its high levels of social protection. [A. Fabre, 2012].

The OECD Index shows an initial, little increase in the strictness of EPL for regular contracts in 2003, from 2.34 to 2.47, and then a second little reduction in 2009, from 2.47 to 2.38. Collective dismissal regulation, such as in Germany and Italy, stays fixed, at a level of 3.38 for all the available period. So far, the behaviour of these two indicators is quite similar to the other two countries taken as example. However, talking about temporary contracts legislation, France diverges, since also this index stays stable at a level of 3.63 for all the available period, indicating not tangible reforms.

Fraser indicators behaves quite similarly. To notice, the collective bargaining power index moves with uncertainty around its mean (6.00) for all the pre-crisis period, and *Mandate Cost of Work Dismissal* increases in flexibility during the financial crisis period from a level of 7.03 in 2008 to a level of 8.50 in 2010. Thus, from this perspective the two index providers measure reforms in different ways.

The Sarkozy government started a series of reforms since 2007 to face the Great Recession [Askenazy, Erel, 2012], aiming to liberalize the labour market introducing new contracts and increasing the generosity of short time work, while extending at the same time forms of social protection (for example unemployment benefits).

With respect the increase in flexibility, there are not evidences in the index value of OECD but Mandated cost of worker dismissal of Fraser seems to account for that. The OECD measure seems more consistent, given the comparison between the amount of part-time (or short-time) workers in France in the pre-crisis period, 200.000 people, and the one of Germany, where there were 1.2 million people employed with temporary contracts. Moreover, its increase to respectively 250.000 people and 1.500.000 people during the financial turmoil (+50.000 for France, + 300.000 for Germany) is a sign of the net difference in the use of temporary contracts by the two countries, difference which lies in the costs and bureaucracy procedures existing in the French system (until January 2012 part-time working was subject to official authorisation). Furthermore, in Germany its cost is born by unemployment benefit, while in France the employer is partly reimbursed by the State [A. Fabre, 2012].

The new legislature started in 2017 with president Macron largely relied on reforms of the labour market during the election campaign. New laws are going to be introduced and, at least on paper, radical changes are going to take place[13]. As for the jobs act in Italy, it will be interesting to see how this will impact on the indexes computation.

Now that both unemployment and labour market institutions have been analysed, the next section will provide an empirical framework to study the relationship between these two variables in Europe between 2000 and 2013, using regional data of both unemployment and employment rates.

[13] http://www.ilsole24ore.com/art/mondo/2017-08-23/doppia-partita-macron-lavoro-063724.shtml?uuid=AErgHOGC & http://www.ilsole24ore.com/art/mondo/2017-08-30/loi-travail-macron-va-avanti-riforma-063602.shtml?uuid=AEvYggJC
Accessed September 2017

Section 3: Empirical Framework

3.A Dataset

The empirical analysis goes through two different steps.

First, it will be studied how institutions affect the unemployment rate at different levels: young and total short-term unemployment and total long-term unemployment.

The second step focuses on how legislation impacts on different economic structures, i.e. how sectorial employment (agriculture, industry…) changes with different EPL.

Both frameworks rely on a fixed effect model, to get rid of all the fixed specificities of each region. The usual test to decide between random and fixed effect has been computed and errors have been clustered since both heteroskedasticity and serial correlation have been spotted in the data.

Data mainly comes from Eurostat, the only database with regional statistics for the European Union. Other sources of data are the OECD for employment protection and other institutional measures (tax wedge, union density and unemployment benefits), and Fraser, limited to its labour market indexes.

This work differs from the papers presented in the introduction mainly for the use of regional data. The main intuitions behind it are two:

- First, there is a large amount of observations despite the short time period considered (2000-2013) and the sporadic frequency of data (annual);
- Second, and most important, it is possible to take advantage of a certain "asymmetry" of the data; indeed, while labour market regulation is implemented at national level, many regions operating inside the same institutional framework have substantially different unemployment rates (in particular in Mediterranean countries). Thus, the idea is that this variability within country and between countries might lead to more robust and interesting results;

In the spirit of Blanchard and Wolfers (2000), the model specification introduces a set of variables differentiated between "dynamic" controls and "static" controls, to account for changes in equilibrium and actual unemployment rate. The first are (nominal[14]) GDP growth and inflation, and they are a measure of shocks in the economy (positive or negative). Inflation is available only at national level and accounts for country-macroeconomic shocks, while GDP controls for regional ones. Both variables are associated with a negative (positive)

[14] GDP at regional level is available only nominal or at PPS. However, the latter is not suitable to be used as a growth rate according to Eurostat data description
http://ec.europa.eu/eurostat/cache/metadata/en/reg_eco10_esms.htm

relationship with unemployment (employment); their sign in the regressions, thus, is expected to be negative (positive).

The second set of controls comprises demographic and institutional characteristics of each region, all at NUTS-2 level, except for Union Density, Tax Wedge and Unemployment Benefits (other measures of institutions influence in the labour market) which are measured at country level. These controls should account for structural characteristics of the regional economy and their impact on the structural unemployment rate. In the Appendix is provided a description of each variable.

3.B A Simple Model of Unemployment and Employment Protection Legislation

The first model studies a simple linear relationship between the unemployment rate and the Employment Protection Legislation, measured through the OECD overall Index.

$$U_{crt} = \beta_0 + \beta_1 EPL_{ct} + \beta_2 U_{crt-1} + \gamma_1 X + \mu_r + \delta_t + \epsilon_{rt} \quad (15)$$

Where U_{crt} is the unemployment rate in region *r* of country *c* at time *t*, EPL_{ct} is the value of the index for a determined country at time *t* and β_2 is the coefficient of the lagged term of unemployment. *X* is a vector of controls which includes both economic performance and intrinsic characteristics of each region, while μ represents the regional fixed effects and δ the time fixed effects. ϵ is the error.

Table 8 below reports the preliminary results accounting for regional, country and time fixed effects. EPL coefficient is strongly significant and it indicates a negative relationship between Unemployment and Employment Protection (the higher the employment protection, the lower the unemployment rate). The persistence of unemployment is strong, as visible in the coefficient of its lagged term, and the other controls have the expected sign[15].

Table 8: Impact of EPL on total unemployment rate, 20-64 years old (2000-2013)

Dep_Var: Unmp_Tot	r1	r2	r3
oecd_epl	-7.31***	-1.49***	-1.20***
lagged_unmp		0.88***	0.93***
tax_wedge		0.11***	0.08**
union_dens		0.12***	0.14***
unmp_ben		0.02	0.02*
gdp_g		-0.08***	-0.09***
acc_cpi		-0.21***	-0.22***
sec_educ		0.02	0.00
urb_proxy		-0.15*	0.00
tech_quota		-0.04	-0.01*
age_median		-0.39***	-0.06***
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	3332	2632	2632
R^2	0.25	0.85	0.94

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

[15] See Appendix with controls description

Results are similar if we consider as dependent variable the long-term unemployment rate (the unemployment rate that represents the percentage of total unemployed people seeking a job for longer than one year[16]), while their magnitude is even stronger analysing young unemployment level (the unemployment rate of people aged between 15 and 24 years old). Regressions' outputs are reported in the Appendix (Table A4 and A5).

How do results change using the Fraser Index instead of the OECD Index? It should first be recalled that this index has the opposite interpretation of the OECD EPL Index, i.e. an increase in the value of the index corresponds to an increase in the *flexibility* of the labour market. Obtaining the same sign in the output, then, is equal to have the opposite result.

To start, the analysis tries to use the normal index developed by Fraser. Results are the opposite of above for all three unemployment measures, since the sign is negative and significant for all the specifications. Table A6-7-8 in the Appendix reports the regressions' coefficients for total, young and long-term unemployment.

The same happens using the custom form of the Index developed in Chapter 2.C: results are robust across the different specifications, but they show the opposite behaviour with respect the OECD Index, as reported below in Table 9[17].

Table 9: Fraser Index and total unemployment rate, 20-64 years old (2002-2013)

Dep_Var: Unmp_Tot	**r1**	**r2**	**r3**
fraser_epl	-0.93*	-0.62***	-0.73***
lagged_unmp		0.92***	0.94***
tax_wedge		0.12***	0.10**
union_dens		0.12**	0.14***
unmp_ben		0.03**	0.03**
gdp_g		-0.09***	-0.09***
acc_cpi		-0.21***	-0.21***
sec_educ		-0.02	-0.02**
urb_proxy		-0.20***	-0.02
tech_quota		-0.08**	-0.02***
age_median		-0.18*	-0.04***
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	2974	2357	2357
R^2	0.14	0.87	0.95

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

[16] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfst_r_lfu2ltu&lang=en

[17] the same sign of the Index coefficient in the regression for Fraser and OECD Indexes has opposite meaning. Full data are available only since 2002

The outcome is peculiar primarily because the panel is strongly unbalanced towards the double negative shocks which hit Europe after 2007 and it does not account for the subsequent recovery period; It is thus hard to believe that most flexible countries experienced lower levels of unemployment in this period and that the analysis is not influenced by that (this will be pointed out later also for the OECD Index, see the robustness checks paragraph). Testing for it, the sample is restricted to the crisis period, from 2008 to 2013 (when unemployment rose across all Europe): the result is that *higher flexibility* is still associated with *lower* unemployment, even though the statistical significance is weaker (5% - results not reported).

This outcome, summed with the criticisms of the ILO report (despite the attempt to customize the index through its sub-indexes in a more suitable and comparable form), might indicate a further evidence on the inappropriateness of the Index for an extensive econometric study, as claimed in Section 2.

Accounting for these criticisms, the analysis moves forward focusing exclusively on the OECD Index and its sub-components.

Robustness Checks

The first consideration is that the framework time-period, as already mentioned earlier, is strongly unbalanced towards the financial and sovereign debt crisis years which affected Europe (2009-2013). Thus, results might be driven by the strong increase in unemployment experienced in those turbulent years since the dataset does not account for the subsequent recovery process (recalling from section 1 that unemployment in Europe reached its peak level in 2013, and only then it started decreasing). This to say that, during a turmoil, countries with the strongest employment protection will experience a lower increase in unemployment, *ceteris paribus*, if their institutional infrastructure properly works (that's the point of having employment protection legislation). What is not clear, however, is how EPL influences *the recovery attempts* of an economy after a shock or in a scenario of positive and sustained growth. This is, in principle, the main goal of the analysis, as it should be recall from the hysteresis definition introduced in section 1.

To study the effects of labour market institutions in a growing economic environment, then, the time-period of the analysis is restricted to the pre-crisis period, i.e. from 2000 to 2008 (included), when the European economy was constantly growing and unemployment was lowering across regions and countries (see chapter 1.B).

Restricting the sample period, results change only in magnitude, which is lower, but the sign remains the same and it still indicates a negative relationship between strictness of the employment protection legislation and unemployment. However, using country fixed effect the coefficient becomes not significant at 5%, but its p-value is relatively low and equal to 0.078, i.e. within a 10% confidence interval (Table 10).

Table 10: Impact of EPL on total unemployment rate, 20-64 years old (2000-2008)

Dep_Var: Unmp_Tot	**r1**	**r2**	**r3**
oecd_epl	-2.36***	-0.80**	-0.38
lagged_unmp		0.67***	0.89***
tax_wedge		0.03	-0.06
union_dens		-0.02	0.03
unmp_ben		0.10***	0.09***
gdp_g		-0.09***	-0.07***
acc_cpi		-0.25***	-0.24***
sec_educ		-0.04	0.00
urb_proxy		0.00	0.01
tech_quota		-0.07	-0.01
age_median		-0.63***	-0.04***
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	2077	1567	1567
R^2	0.17	0.66	0.93

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Results hold also for long-term unemployment (even though with weaker significance) and young unemployment (outputs are reported in the Appendix, Tables A9 and A10). Thus, apparently, it does not matter what is the economic scenario, EPL and unemployment are negatively correlated.

To test these results, more extensive robustness checks are carried on the restricted sample of total unemployment, using the regression with regional and time fixed effects and all the controls. All the tables showing the numerical results are reported in the Appendix.

To start, the biggest countries of the Union – Germany, France, Italy, Spain, United Kingdom, Greece, Sweden, Denmark, Netherlands, Finland and Portugal - are dropped from the dataset to see whether one of them is driving the outcomes (Table A11 in the Appendix). Sign and magnitude of the coefficients do not change with respect the broad regression, but removing Germany the OECD Index coefficient is not significant anymore (while it still is checking the full sample). Explanations of Germany result might be its large weight in the dataset (it is one

of the countries with the highest number of regions), associated with the peculiarities of its recovery process after the reunification, when it managed to strongly reduce unemployment in the Est stabilizing the country economic and social equilibrium, in particular in the first decade of the 2000 [Rinne, Zimmermann, 2012].

Single country influence is not the only possible country-division for the robustness checks. Relying on the definition of Core, Peripheral, Inner and Outer Countries provided by Barlett and Prica (2016), countries are divided in four macro-regions based on their economic prosperity and geographical position:

Table 11: European Countries Aggregation

Inner Core	Belgium, Germany, France, Netherlands, Austria, Finland
Inner Peripheral	Ireland, Greece, Spain, Italy, Cyprus, Portugal
Outer Core	Czech Republic, Denmark, Estonia, Latvia, Lithuania, Poland, Slovakia, Sweden, United Kingdom, Norway
Outer Peripheral	Bulgaria, Croatia, Hungary, Romania, Macedonia, Slovenia

The model is then applied to the different aggregations described.

Results (Table A12 in the Appendix) confirm the initial estimates for core and outer clusters, but the peripheral one shows the opposite sign, i.e. a stricter employment protection regulation is associated with higher unemployment. The inner country cluster has, in the end, not significant results.

This result might indicate that labour market institutions have different outcomes according to the efficiency of the underlying economies. Peripheral countries[18] are usually considered to be more risky, fragile, and with weaker economic health than core countries[19]: in this kind of scenario, then, employment protection seems to have the opposite effect of the one described so far. Even the non-significance of the EPL coefficient of the "inner-only" regression moves in this direction, since aggregating Mediterranean countries and Core continental countries it is not possible to find an effect of labour market institutions on unemployment.

This outcome might indicate countries' heterogeneity and unobserved variables in the sample.

Another interesting control is on the component of the OECD Index, i.e. regular (EPR), temporary (EPT) and collective (EPC) contracts.

Regressing the single sub-indexes instead of the broad index, results are different: EPR coefficient loses significance in the pre-crisis period while it is still significant and negative in

[18] Observations in the sample are largely unbalanced towards inner peripheral

[19] Interest Rates of Government bonds are usually a good parameter to further define this kind of aggregation

the full sample; EPT sign, magnitude and significance are the same of the outline regression (both in the overall period and in the restricted one) and, in the end, a higher level of EPC is associated with a higher level of unemployment, indicating that legislation on collective dismissals increases unemployment in periods of economic prosperity. Results are reported in the Appendix (Tables A13-14-15) for the pre-crisis period.

By Country and time-period controls are not the only one available. Given the nature of the analysis, which emphasizes the regional approach, it makes sense to divide the regions in macro-groups according to common characteristics.

The panel is then divided in quantiles: once the variable of interest is selected, the average of each region is taken in the time-period of reference; the quantiles of this average are computed, and each region is assigned to its correspondent quantile. In this way, it is possible to build homogeneous groups of regions (focusing on one characteristic at a time), to study the effect of EPL without following a Country logic but a regional one. Each quantile, then, is sequentially removed from the regression to check whether any characteristic is driving the results of the analysis.

The control is computed on most of the variables used in the regression, and tables with results are presented in the Appendix (from A16 to A22). To summarize:

- Unemployment level aggregation: Removing 3rd and 5th quantiles (those with higher unemployment), the EPL coefficient becomes not-significant at a 5% level. Dropping the 3rd quantile, however, the output becomes significant considering a minimum increase in the confidence interval (p.value = 0.061), while dropping the 5th one it stays far from significance;
- Employment rate aggregation: Results are driven by the 1st quantile, i.e. regions with lowest levels of employment. Removing them from the sample, the output loses significance;
- GDP per capita (PPS) aggregation: Results are the same as for Employment rate aggregation;
- Secondary education aggregation: Results are robust across all the quantiles;
- Urban Proxy aggregation: Results are robust across all quantiles except for the 5th one, i.e. removing rural areas (the ones with highest level of agricultural employment) the coefficient loses significance;
- Technological level aggregation: Results are robust across all quantiles;
- Median Age aggregation: Results are robust across all quantiles except if we remove the “youngest” regions, which appear to drive the outcomes;

To summarize: carrying on the analysis from 2000 to 2013 seems not appropriate since the dataset is largely biased towards the crisis period started in 2008, when it is assumed that a higher EPL works to reduce unemployment. Since it is of much more interest to study the role of labour market institutions in a growing economic scenario, the sample is restricted to 2000-2008 and then various robustness checks are implemented.

While reducing the time-period does not change the outcomes of the analysis, some checks make the coefficient of the EPL Index not significant. Overall results are mainly driven by Germany, low GDP and employment rate regions and rural areas. Excluding them from the sample, EPL becomes not significant in influencing the unemployment rate.

Moreover, countries' economic efficiency seems to matter in the choice of strictness of employment protection, since in "problematic" countries a higher incidence of labour market institutions is associated with higher levels of unemployment. On the contrary, economically solid countries show the opposite behaviour.

In the end, results change also de-composing the OECD Index on its sub-components: strictness of EPC is associated with higher unemployment levels (in both sample periods). This confirms also some of the conclusions anticipated in the review of the literature, where it was stressed the importance to differentiate across effects of different labour market institutions.

3.C A step further: EPL and Economic Sectors

The large availability of regional data on Eurostat allows the analysis to move further and focus on more specific details about the economic outcomes of EPL. Indeed, regional employment rates are available for six macro sectors: agriculture, industry, construction, services, financials and public administration. This de-composition allows to study in a deeper way how labour market institutions impacts on different economic structures, and which sectors are more affected by the strictness of employment protection legislation.

The first step of the analysis follows the same procedure adopted in the previous chapter studying unemployment rate.

$$E_{crt} = \beta_0 + \beta_1 EPL_{ct} + \beta_2 E_{crt-1} + \gamma_1 X + \mu_r + \delta_t + \epsilon_{rt} \quad (16)$$

The same approach is then replicated to each sectorial employment rate alone, for a total of six regressions more.

$$E_{scrt} = \beta_0 + \beta_1 EPL_{ct} + \beta_2 E_{scrt-1} + \gamma_1 X + \mu_r + \delta_t + \epsilon_{rt} \quad (17)$$

The model then makes a step further modifying the dataset to introduce sectorial fixed effect (Equation 18) and the interaction between sector and region fixed effects (Equation 19). The expanded dataset allows to cluster the data at a more punctual and singular level in order to obtain a more efficient estimation which consider both regional and sectorial specificities, dealing in this way with explicit sectorial and regional&sectorial shocks which would gone missing using equation 17.

$$E_{scrt} = \beta_0 + \beta_1 EPL_{ct} + \beta_2 E_{scrt-1} + \gamma_1 X + \mu_r + \delta_t + \vartheta_s + \epsilon_{rt} \quad (18)$$

$$E_{scrt} = \beta_0 + \beta_1 EPL_{ct} + \beta_2 E_{scrt-1} + \gamma_1 X + + \delta_t + \mu\vartheta_{rs} + \epsilon_{rt} \quad (19)$$

Again, the analysis is first carried on the entire period and then in the pre-crisis years and with the sub-components of the OECD EPL Index to check for eventual differences.

First specification

Results of regression 16 (total employment rate) in the entire period are equal to the ones obtained in the unemployment model: A stricter Employment Protection Legislation is associated to a *higher* level of employment. However, restricting the sample period, on the other hand, results become not-significant (Table 12).

Table 12: Impact of EPL on total employment rate (full and pre-crisis period)

	2000-2013			**2000-2008**		
Dep_Var: Emp_Tot	**r1**	**r2**	**r3**	**r1**	**r2**	**r3**
oecd_epl	3.24***	1.50***	1.13***	-0.54	0.10	0.31
lagged_unmp		0.77***	0.94***		0.52***	0.92***
tax_wedge		-0.20***	-0.11***		-0.11*	0.06
union_dens		-0.14***	-0.16***		-0.11***	-0.11**
unmp_ben		-0.01	-0.01		-0.08***	-0.08***
gdp_g		0.06***	0.06***		0.07***	0.06***
acc_cpi		0.17***	0.19***		0.12***	0.20***
sec_educ		0.02	0.02***		0.12***	0.03***
tech_quota		0.07*	0.04***		0.24***	0.04***
age_median		0.49***	0.06***		0.84***	0.09***
Controls	-	Yes	Yes	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-	Yes	Yes	-
Country Fixed Effects	-	-	Yes	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N Obs.	3396	2657	2657	2134	1591	1591
R^2	0.19	0.76	0.97	0.35	0.66	0.97

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Decomposing at sectorial level the outcome becomes more interesting[20]: accounting for the financial and sovereign crisis in the sample, employment protection shows its efficacy in the construction and services sectors, while it does not result significant for the other four (Table 13).

[20]Controls are removed from tables for a clearer visualization. The outline regression is always the one with regional and time fixed effects

Table 13: Impact of EPL on sectorial employment rate (2000-2013)

Dep_Var: Sector Employment Rate	**agr**	**ind**	**constr**	**serv**	**fin**	**p.a.**
oecd_epl	0.14	0.14	0.70***	0.41***	0.05	0.31
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N Obs.	2585	2889	2892	2934	2810	2935
R^2	0.58	0.68	0.62	0.43	0.93	0.74

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Discharging the crisis years, results change. The EPL coefficient has a significant and *positive* impact on agriculture and construction and a significant and *negativ*e impact on the financial sector employment rate. It loses significance on the services sector (Table 14).

Table 14: Impact of EPL on sectorial employment rate (2000-2008)

Dep_Var: Sector Employment Rate	**agr**	**ind**	**constr**	**serv**	**fin**	**p.a.**
oecd_epl	0.41**	-0.21	0.41**	-0.13	-0.69**	-0.18
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N Obs.	1535	1733	1726	1761	1716	1762
R^2	0.45	0.42	0.35	0.21	0.81	0.68

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Accounting for these differences across time periods, it might become useful to study the years of the crisis. Here coefficients are all positive and significant, except for the agricultural sector (outcome not reported).

Considering the sub components of the EPL index, more insights are available (Results are reported in Tables A23-24-25 in the Appendix only for the pre-crisis sample):

- EPR→ In the full sample, regular contract regulation has a negative impact on the financial sector employment rate, it is not significant for the industry sector while it is positive for the other sectors employment rates. In the pre-crisis restricted sample, however, it is negatively associated with the employment level of industrial and financial sectors. It is still positive, however, for construction and public administration, and not significant for agriculture. In the on-going crisis restricted

sample (2009-2013), on the other hand, for all sectors the coefficient is positive and significant at least at 5%;

- EPT→ In the full sample, temporary contract legislation is associated with a *higher* level of employment only for the construction sector. All other sectors have EPL coefficient not significant. In the pre-crisis sample, EPT has a *negative* impact on the employment rate of the financial sector, while it's the opposite for agriculture and construction sectors. During the crisis period, temporary contract regulation is associated with higher employment rates for all the sectors with the exception of agriculture (again), which has a non-significant coefficient;
- EPC→ Collective dismissal regulation confirms the trend seen in the unemployment analysis, and even in the full sample is associated with lower employment rate for industrial and financial sectors, while it is not significant for the others. In the pre-crisis period, the only significant coefficients are the one of the industry sector, which is negative, and the one of the public administration, which is positive. During the crisis timeframe, on the other hand, a stricter regulation has a positive effect on construction and services employment rates, negative on agricultural sector, and not significant on the others;

To summarize, then, employment protection is considered effective in maintaining higher employment levels during economic turmoil, but it does not show statistical relevance in positive economic growth scenarios. Moreover, it becomes relevant to de-compose the analysis by sector employment rate and the index by its sub components, since the effects *differ* across economic segments for *different* legislation settings in d*ifferen*t economic scenarios. Thus, it might be of interest to differentiate employment protection on the type of sector in which firms operate.

However, this simple model might suffer idiosyncratic events at sectorial level which would likely influence the outcomes. It becomes then interesting to modify the dataset in order to cluster the observations to a further level, to account for specific sectorial shocks and or trends.

Second specification

Digging further in the dataset, it is possible to achieve a more robust result clustering by sector *and* by region.

As reported in table 15, results are the same whether it has been controlled for region and sector separately or both at the same time. EPL coefficient is positive and significant in the overall period.

Restricting the sample period, as in the first specification, coefficients of labour market regulation become not significant.

Table 15: Impact of EPL on total employment rate (full and pre-crisis period)

	2000-2013		**2000-2008**	
Dep_Var: Sector Employment Rates	**r1**	**r2**	**r1**	**r2**
oecd_epl	0.16**	0.25**	0.01	-0.02
lagged_unmp	0.94***	0.69***	0.94***	0.32***
tax_wedge	-0.02*	-0.05***	-0.03	-0.07**
union_dens	-0.02*	-0.02	0.00	0.01
unmp_ben	0.00	0.00	0.00	-0.01
gdp_g	0.02***	0.01***	0.02***	0.03***
acc_cpi	0.02*	0.02	0.02	0.00
sec_educ	0.01	0.02*	0.01	0.03**
tech_quota	0.01	0.01	0.03	0.06**
age_median	0.06***	0.16***	0.18**	0.23***
Regional Fixed Effect	Yes	-	Yes	-
Time Fixed Effect	Yes	Yes	Yes	Yes
Sectorial Fixed Effect	Yes	-	Yes	-
Reg*Sec Fixed Effect	-	Yes	-	Yes
N Obs.	12731	12731	7671	7671
R^2	0.98	0.98	0.97	0.98

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

However, the outcome in the full sample is driven by the *construction sector*: removing it from the regression, EPL coefficient becomes not significant also there (while it still is dropping the others). In the pre-crisis period, on the other hand, the non-significance of the result is robust across different sectors (tables not reported).

Studying the effects of the sub-components of the OECD Index, results do not change in the pre-crisis period, since coefficients remain not significant (results are not reported).

Conclusions

The view on Employment Protection Legislation effects on labour market will always be the playing field of political debates and of the subsequent economic policies.

Those in favour of higher flexibility argue that strictness of EPL is responsible for the structural increase in unemployment after a shock hits the economy, and of its consequent slower recovery process compared to the one of an ideal flexible market.

Those in favour of higher strictness, on the other hand, do not recognize this effect as true, and consider a stronger employment protection as a fundamental of the Welfare State and of the Rights of the workers, which cannot be sacrificed in the name of a higher growth (correlation in which they do not either believe).

According to OECD data and recent reforms implemented in major European countries, economies seem to move towards a generalized process of liberalization of the labour market, even though the overall level of protection in Europe is still far from the one of United States, considered the most flexible market in the world.

This process is probably mainly driven by the difficulties to recover from the shocks that hit Europe in 2008 and 2011, events that challenged the stability of the Monetary Union, and caused higher levels of unemployment in many countries, pushing politicians to implement important reforms in order to try to improve the situation.

Academic research is providing studies on this topic since the 80s, when the hysteresis hypothesis and the insider-outsider model was proposed by Blanchard and Summers, through the analysis of hysteresis in time-series data of unemployment and the study of the relationship between EPL, measured with indicators provided by sovra-national institutions like the OECD or the World Bank, and unemployment rates.

Talking about the hysteretic behaviour of unemployment rates, results from the literature are mixed for OECD countries, except for the United States, where a stationary path is widely accepted as a fact.

Adopting both panel-data and time-series approaches in Europe, and confronting them with the results obtained using USA and USA Federal States data, in this work it has been found a significant statistical difference in the behaviour of unemployment on the two sides of the Atlantic Ocean, providing evidences of the effective presence of hysteresis in most of the European Countries (even though with some exceptions) in the time-frame analysed.

Studying the causes of hysteresis, Employment Protection Legislation becomes then one of the major “suspects”. The literature results widely accept the hypothesis that stricter

protection has a bad influence on the level of unemployment in the various countries, but they also avoid generalizing on the overall effect making distinctions on different institutions.

This analysis adopts two different approaches in studying the impact of Employment Protection Legislation in the labour market, investigating the effect both on unemployment and sectorial employment, in order to match EPL and economic structures.

The panel regression indicates a negative relationship between strictness of EPL (measured by the OECD) and total unemployment, long-term unemployment and young unemployment, with different magnitudes, but all statistically significant.

The index developed by Fraser, on the other hand, shows opposite results. To explain this difference, and to choose between the two options, the model is tested on the crisis period, where unemployment should rise more on flexible labour markets, since crisis period are the ones where EPL should work the most avoiding excessive rise in unemployment. Here the labour market regulation index of Fraser still indicates that a higher flexibility is associated with lower unemployment (while the OECD Index shows the opposite), posing doubts on the reliability of this outcome. This, summed with criticisms pointed out by ILO, says that this index is probably not a good measure to use in an extensive econometric analysis.

The study then moves forward relying only to the OECD Index, to check the robustness of the results. The first consideration is the time-period used in the analysis, which is largely biased towards the financial and sovereign debts crisis. The sample period is then restricted to 2000-2008 to study the effect of EPL in a positive economic growth scenario.

For the broad regression, results hold at 1% confidence interval, indicating that the stricter the legislation, the lower the unemployment rate. However, the analysis is likely biased by countries' heterogeneity and possible unobserved variables. Further checks give some insights on what drives most the model's outcomes and which problems this kind of model might incur into, as countries' heterogeneity and unobserved variables:

- Dropping Germany from the dataset, EPL coefficient is not significant anymore, while it is dropping the other countries. An explanation might be the excellent management of the reunification process of the Country, which brought the unemployment to a persistent decrease, also during the 2008 financial crisis, and its size in the sample, which is one of the biggest;
- Aggregating countries by economic performance (core and peripheral), results are mixed based on their "economic efficiency". In problematic countries, like the Mediterranean ones, a higher EPL is associated with a higher unemployment, while in

core countries the opposite is true. The political and economic stability, then, seems to matter in the way employment protection legislation influences the labour market;

- Aggregating regions by common characteristics it is possible to see that results are mainly driven by high unemployment regions, low employment/GDP and rural areas. Dropping them from the sample, EPL coefficient becomes not significant;
- In the end, studying the sub-component of the Index makes other insights available; The regular contract legislation is not significant in the pre-crisis sample, while it is the temporary contract one, with negative sign. On the opposite, strictness of collective dismissal regulation is associated with higher unemployment (also in the full sample framework), showing the completely opposite behaviour;

Studying EPL impact on unemployment, then, it is not possible to derive a single conclusion. However, results are still indicating possible suited intervention in the labour market legislation of countries which determined characteristics. For example, countries whit a preponderant union density might consider increasing the flexibility of the collective dismissal regulation (where it might be supposed that it has a higher impact), or, for Mediterranean countries, it would likely help to reduce unemployment decreasing the overall strictness level of Employment Protection in the beginning of a recovery process after a shock. On the other hand, advanced countries with homogeneous and highly productive regions can focus on different kind of reforms instead of working on changing the status quo.

Moving to the employment framework, results are specular to the ones described so far for the full period, while the EPL coefficient is not significant in the pre-crisis years. It becomes then more interesting to study the effects on single sectors employment, where results are different, mostly between industry and financial sectors, which are negatively affected by EPL, and construction, agriculture and public administration, to which employment is enhanced by the strictness of the regulation. However, this specification misses possible idiosyncratic events and trends at sectorial level, which likely influence the output. Accounting for this, in the full-sample period results hold as above, but they are driven by the construction sector. Removing it, the EPL coefficient becomes not significant.

In the pre-crisis period, on the other hand, there is not statistical significance, and this outcome is robust across different sectors.

Results, then, are mainly driven by the financial and sovereign crisis years and the construction sector, in which a stricter EPL helps maintaining higher levels of employment during economic turmoil. It would be of interest, anyway, to study the possibility of implementing “customized” regulations based on the sector in which firms operate. This

might lead to an overall less rigid market in which economic sectors can express their potential without being subject to legislation thought for other economic realities which do not suit them correctly.

The same approach might be harder to implement through a “regional” employment protection legislation, since it would drive firms to simply move their productivity factors to more suitable areas. Nevertheless, the regional and sectorial approach adopted in the analysis hopefully helped to infer interesting insights on the relationship between unemployment and labour market institutions in Europe and possible solutions to implement through economic policies according to the characteristics of the economy in which the legislator operates.

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Appendix

Table A1: Descriptive statistics of unemployment in European Countries

(Source: Eurostat, 2017. Reference Period: 2000-2016)

Country	Average Unmp	Max Unmp	Min Unmp	Year Max Unmp	Year Min Unmp	Stdev
Austria	4.99	6.30	3.60	2016	2000	0.66
Belgium	7.83	8.90	6.10	2004	2001	0.70
Bulgaria	11.38	20.10	5.00	2001	2008	3.90
Croatia	13.68	17.70	8.30	2014	2008	2.65
Cyprus	7.65	16.80	3.00	2015	2002	4.59
Czech Republic	6.75	9.30	3.50	2000	2016	1.37
Denmark	5.58	7.90	3.10	2012	2008	1.36
Estonia	9.66	18.90	4.00	2010	2007	3.50
Finland	8.36	10.20	6.30	2000	2008	0.87
France	9.10	10.60	7.30	2015	2008	0.85
Germany	7.43	11.20	3.90	2005	2016	2.08
Greece	15.01	27.90	7.30	2013	2008	7.13
Hungary	7.77	11.40	4.30	2010	2016	2.07
Iceland	4.45	7.60	2.40	2010	2007	1.79
Ireland	8.17	15.20	3.70	2012	2000	4.13
Italy	9.12	13.00	5.70	2014	2007	1.99
Latvia	12.06	20.60	5.30	2010	2007	3.69
Lithuania	11.48	18.30	4.00	2010	2007	4.13
Luxembourg	4.59	6.60	1.80	2015	2001	1.31
Malta	6.54	8.50	4.10	2003	2016	0.79
Netherlands	5.14	7.90	3.10	2014	2001	1.29
Norway	3.61	5.00	2.30	2016	2008	0.64
Poland	12.49	20.50	5.40	2002	2016	4.84
Portugal	10.17	17.50	4.80	2013	2000	3.40
Romania	7.02	8.80	5.50	2002	2008	0.73
Slovakia	14.51	19.70	8.70	2000	2008	3.20
Slovenia	7.13	10.80	4.20	2013	2008	1.63
Spain	15.87	26.30	7.90	2013	2007	6.21
Sweden	7.13	9.30	4.90	2010	2000	0.97
United Kingdom	5.96	8.40	4.60	2011	2004	1.24

Table A2: Descriptive statistics of unemployment in US Federal States

(Source: FRED, 2017. Reference Period: 2000-2016)

Country	Average Unmp	Max Unmp	Min Unmp	Year Max Unmp	Year Min Unmp	Stdev
CA	7.44	12.20	4.70	2010	2000	2.42
WIU	5.67	10.40	2.80	2010	2000	1.62
IN	6.18	10.90	2.90	2010	2000	2.12
NY	6.18	8.90	4.20	2009	2000	1.50
FL	6.15	11.20	3.10	2009	2006	2.38
TX	5.76	8.40	4.00	2009	2000	1.26
MI	7.65	14.90	3.20	2009	2000	2.58
AL	6.53	11.90	3.80	2009	2007	2.13
MA	5.51	8.80	2.60	2009	2000	1.53
IL	6.93	11.20	4.20	2009	2000	1.93
GA	6.43	10.50	3.40	2009	2000	2.22
MO	6.07	9.80	3.10	2009	2000	1.63
TN	6.37	11.10	3.70	2009	2000	1.91
OH	6.45	11.00	3.80	2009	2000	1.83
NC	6.72	11.30	3.30	2010	2000	2.17
NJU	6.25	10.30	3.30	2010	2000	2.04
CO	5.44	8.90	2.70	2010	2000	1.82
WA	6.69	10.40	4.60	2009	2007	1.60
SC	7.12	11.70	3.70	2009	2000	2.14
AK	7.00	8.00	6.30	2009	2000	0.53
NV	7.21	13.70	3.90	2010	2000	3.22
PA	5.94	8.70	4.00	2010	2000	1.36
AZ	6.37	11.20	3.70	2009	2007	2.11
VA	4.53	7.40	2.10	2010	2000	1.39
KY	6.65	10.90	4.00	2009	2000	1.87
AR	5.98	8.40	3.90	2011	2016	1.31
LA	6.18	9.50	3.90	2005	2006	1.11
WV	6.16	8.80	4.10	2010	2008	1.23
MN	4.88	8.10	3.00	2009	2000	1.27
HI	4.46	7.30	2.40	2009	2006	1.45
OR	7.23	11.90	4.50	2009	2016	1.92
NM	5.96	8.30	3.70	2010	2007	1.28
MD	5.11	7.80	3.40	2010	2000	1.38
CT	5.82	9.20	2.20	2010	2000	1.94
KS	5.08	7.30	3.40	2009	2000	0.98
IA	4.37	6.60	2.40	2009	2000	0.94
ND	3.27	4.30	2.60	2009	2014	0.39
MT	5.01	7.40	2.90	2010	2007	1.14
UT	4.70	8.00	2.30	2009	2007	1.56
DC	7.30	10.50	5.40	2011	2000	1.47
DE	5.21	8.70	3.30	2009	2001	1.70
ID	5.51	9.70	2.90	2009	2007	1.83
NH	4.21	6.60	2.60	2009	2000	1.06
OK	4.78	7.10	2.90	2009	2000	0.99
WY	4.39	7.20	2.70	2009	2007	1.10
ME	5.46	8.30	3.20	2009	2000	1.56
NE	3.62	4.80	2.80	2009	2000	0.56
MS	7.30	10.80	5.00	2010	2000	1.60
RI	6.99	11.30	4.00	2009	2000	2.54
VT	4.25	7.00	2.60	2009	2000	1.01
SD	3.58	5.20	2.40	2010	2000	0.75

Table A3: DF-GLS test on unemployment in US Federal States

(Source: FRED, 2017. Reference Period: 1991-2016)

State	Optimal Lag	T-Stat	1% Crit. Value	5% Crit. Value	10% Crit. Value
US	12	-2.31**	-2.580	-1.967	-1.653
CA	15	-3.378***	-2.580	-1.955	-1.642
WIU	15	-1.721*	-2.580	-1.955	-1.642
IN	6	-1.756*	-2.580	-1.989	-1.673
NY	12	-2.499**	-2.580	-1.967	-1.653
FL	14	-2.446**	-2.580	-1.959	-1.645
TX	14	-2.29**	-2.580	-1.959	-1.645
MI	13	-1.469	-2.580	-1.963	-1.649
AL	15	-2.41**	-2.580	-1.955	-1.642
MA	7	-0.958	-2.580	-1.985	-1.670
IL	9	-2.191**	-2.580	-1.978	-1.663
GA	15	-2.065**	-2.580	-1.955	-1.642
MO	14	-1.841*	-2.580	-1.959	-1.645
TN	11	-1.741*	-2.580	-1.971	-1.656
OH	9	-2.165**	-2.580	-1.978	-1.663
NC	5	-1.891*	-2.580	-1.992	-1.676
NJU	14	-2.456**	-2.580	-1.959	-1.645
CO	8	-2.484**	-2.580	-1.982	-1.667
WA	5	-2.709***	-2.580	-1.992	-1.676
SC	12	-1.673*	-2.580	-1.967	-1.653
AK	2	-2.81***	-2.580	-2.001	-1.684
NV	9	-2.675***	-2.580	-1.978	-1.663
PA	8	-2.198**	-2.580	-1.982	-1.667
AZ	14	-2.152**	-2.580	-1.959	-1.645
VA	13	-1.528	-2.580	-1.963	-1.649
KY	14	-1.923*	-2.580	-1.959	-1.645
AR	5	-0.582	-2.580	-1.992	-1.676
LA	15	-1.889*	-2.580	-1.955	-1.642
WV	13	-0.901	-2.580	-1.963	-1.649
MN	8	-2.124**	-2.580	-1.982	-1.667
HI	14	-1.666*	-2.580	-1.959	-1.645
OR	14	-2.731***	-2.580	-1.959	-1.645
NM	11	-2.454**	-2.580	-1.971	-1.656
MD	7	-2.075**	-2.580	-1.985	-1.67
CT	14	-2.683***	-2.580	-1.959	-1.645
KS	15	-2.82***	-2.580	-1.955	-1.642
IA	10	-1.714*	-2.580	-1.974	-1.66
ND	15	-1.318	-2.580	-1.955	-1.642
MT	12	-1.335	-2.580	-1.967	-1.653
UT	15	-3.502***	-2.580	-1.955	-1.642
DC	5	-1.882*	-2.580	-1.992	-1.676
DE	12	-1.344	-2.580	-1.967	-1.653
ID	14	-3.199***	-2.580	-1.959	-1.645
NH	7	-0.541	-2.580	-1.985	-1.67
OK	14	-1.275	-2.580	-1.959	-1.645
WY	14	-1.884*	-2.580	-1.959	-1.645
ME	7	-0.852	-2.580	-1.985	-1.67
NE	13	-1.08	-2.580	-1.963	-1.649
MS	15	-1.329	-2.580	-1.955	-1.642
RI	5	-1.509	-2.580	-1.992	-1.676
VT	15	-0.83	-2.580	-1.955	-1.642
SD	15	-2.237**	-2.580	-1.955	-1.642

Optimal lag chosen with the Nq-Perron seq t criteria. Confidence level p< 0.10; ** p < 0.05; *** p <0.01*

Controls used in the regression:

- **Tax_wedge (State level):** Tax wedge is defined as the ratio between the amount of taxes paid by an average single worker (a single person at 100% of average earnings) without children and the corresponding total labour cost for the employer. The average tax wedge measures the extent to which tax on labour income discourages employment. This indicator is measured in percentage of labour cost. The sign of this indicator is expected to be negative, i.e. to increase unemployment; Source: OECD;
- **Union density (State Level):** Trade union density corresponds to the ratio of wage and salary earners that are trade union members, divided by the total number of wage and salary earners (OECD Labour Force Statistics). Density is calculated using survey data, wherever possible, and administrative data adjusted for non-active and self-employed members otherwise. Data are expressed in percentages and presented from 1980. The sign might change whether the time-period analysed comprises economic turmoil, when unions avoid larger dismissals, or not; Source: OECD;
- **Unemployment Benefits (State Level):** Benefit entitlement before tax as a percentage of previous earnings before tax. Data are averages over replacement rates at two earnings levels (average and two-thirds of average earnings). The sign is expected to be negative since they disincentive the research of a new job. Source: OECD;
- **GDP growth (NUTS2 level):** Computed as the annual growth of the nominal GDP per capita of each region. It accounts for regional macroeconomic shocks, and its sign is expected to be negative. Source: Eurostat;
- **Accelerating CPI (State Level):** Delta between current and lagged harmonised consumer price index. It's a second indicator of macroeconomic performance, but it accounts for country-level shocks, and its sign is expected to be negative, as for the GDP growth. Source: Eurostat;
- **Secondary Education (NUTS2 level):** Percentage of people with at least secondary education per region. It controls for the environmental infrastructure in which the economy of the region operates. Its sign is expected to be negative, i.e. higher educated areas should have an healthier economic environment. Source: Eurostat;
- **Urban Proxy (NUTS2 level):** Percentage of people employed in the agricultural sector. Rural areas are usually associated with higher unemployment and this variable control for this. The expected sign is thus positive. Source: Eurostat;

- **Technological Level (NUTS2 level):** Percentage of people employed Research and Development. This control measures how advanced are the single regions. The expected sign is negative, since higher technologically developed regions should be associated with lower unemployment. Source: Eurostat;
- **Median Age (NUTS2 level):** Median age of the population in each region. Since young people have more difficulties finding a job (see young unemployment rates), this control account for the structural presence of a younger and then harder to employ quota of the population. Its sign is expected to be negative. Source: Eurostat;

Table A4: Impact of EPL on Long-Term Unemployment (2000-2013)

Dep_Var: Long-Term Unemployment	**r1**	**r2**	**r3**
oecd_epl	-4.57***	-1.37***	-1.18***
lagged_unmp		0.89***	0.95***
tax_wedge		0.12***	0.11***
union_dens		0.05	0.07**
unmp_ben		0.02*	0.03**
gdp_g		-0.05***	-0.06***
acc_cpi		-0.16***	-0.17***
sec_educ		0.04*	0.00
urb_proxy		-0.05	0.01
tech_quota		-0.02	0.00
age_median		-0.20**	-0.03***
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	2936	2305	2305
R^2	0.23	0.84	0.93

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A5: Impact of EPL on Young Unemployment (2000-2013)

Dep_Var: Young Unemployment	**r1**	**r2**	**r3**
oecd_epl	-13.73***	-4.56***	-3.59***
lagged_unmp		0.77***	0.87***
tax_wedge		0.28***	0.16*
union_dens		0.32***	0.39***
unmp_ben		0.07*	0.08***
gdp_g		-0.17***	-0.18***
acc_cpi		-0.44***	-0.46***
sec_educ		0.10	-0.02
urb_proxy		-0.18	-0.01
tech_quota		-0.11	-0.06***
age_median		-0.87***	-0.07
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	3003	2338	2338
R^2	0.31	0.79	0.92

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A6: Fraser Index measure of EPL on total unemployment (2000-2013)

Dep_Var: Unmp_Tot	**r1**	**r2**	**r3**
fraser_epl	-2.38***	-0.79***	-0.70***
lagged_unmp		0.87***	0.92***
tax_wedge		0.02	-0.00
union_dens		0.08*	0.11**
unmp_ben		0.06***	0.06***
gdp_g		-0.09***	-0.09***
acc_cpi		-0.24***	-0.24***
sec_educ		-0.01	-0.01*
urb_proxy		-0.24***	-0.02
tech_quota		-0.10***	-0.02***
age_median		-0.15	-0.04***
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	3419	2534	2534
R^2	0.27	0.86	0.94

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A7: Fraser Index measure of EPL on long term unemployment (2000-2013)

Dep_Var: Long Term Unemployment	**r1**	**r2**	**r3**
fraser_epl	-1.60***	-0.51***	-0.42***
lagged_unmp		0.89***	0.94***
tax_wedge		0.09***	0.08***
union_dens		0.01	0.03
unmp_ben		0.05***	0.05***
gdp_g		-0.07***	-0.07***
acc_cpi		-0.21***	-0.21***
sec_educ		0.01	0.00
urb_proxy		-0.10*	0.00
tech_quota		-0.05*	-0.01
age_median		0.02	-0.01
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	3020	2207	2207
R^2	0.26	0.85	0.93

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A8: Fraser Index measure of EPL on young unemployment (2000-2013)

Dep_Var: Young Unemployment	**r1**	**r2**	**r3**
fraser_epl	-4.45***	-1.94***	-1.58***
lagged_unmp		0.76***	0.86***
tax_wedge		0.17*	0.06
union_dens		0.19*	0.30***
unmp_ben		0.15***	0.15***
gdp_g		-0.19***	-0.19***
acc_cpi		-0.52***	-0.51***
sec_educ		0.04	-0.04*
urb_proxy		-0.39*	-0.04
tech_quota		-0.25***	-0.08***
age_median		-0.18	-0.02
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	3090	2240	2240
R^2	0.32	0.8	0.93

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A9: Impact of EPL on Long Term Unemployment (2000-2008)

Dep_Var: Long-Term Unemployment	**r1**	**r2**	**r3**
oecd_epl	-1.02*	-0.50*	-0.32
lagged_unmp		0.69***	0.88***
tax_wedge		0.10**	0.03
union_dens		-0.09**	-0.07*
unmp_ben		0.06***	0.08***
gdp_g		-0.06***	-0.05***
acc_cpi		-0.20***	-0.22***
sec_educ		0.00	0.01
urb_proxy		0.09	0.01
tech_quota		-0.07*	0.00
age_median		-0.35***	-0.01
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	1731	1299	1299
R^2	0.12	0.69	0.93

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A10: Impact of EPL on Young Unemployment (2000-2008)

Dep_Var: Long-Term Unemployment	**r1**	**r2**	**r3**
oecd_epl	-3.29*	-2.23**	-2.11***
lagged_unmp		0.59***	0.84***
tax_wedge		-0.05	-0.21
union_dens		-0.08	0.08
unmp_ben		0.17***	0.16***
gdp_g		-0.22***	-0.16***
acc_cpi		-0.65***	-0.60***
sec_educ		-0.07	-0.03
urb_proxy		0.08	0.00
tech_quota		-0.26*	-0.06**
age_median		-1.15***	-0.06
Controls	-	Yes	Yes
Regional Fixed Effects	Yes	Yes	-
Country Fixed Effects	-	-	Yes
Time Fixed Effects	Yes	Yes	Yes
N Obs.	1808	1351	1351
R^2	0.08	0.56	0.91

*Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A11: Single Country Robustness Check, total unemployment (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**ex_GER**	**ex_FRA**	**ex_ITA**	**ex_SPA**	**ex_UK**	**ex_GR**	**ex_SW**	**ex_DK**	**ex_NH**	**ex_FI**	**ex_PT**
oecd_epl	-0.80**	-0.59	-0.83**	-1.43***	-0.64**	-0.66**	-1.94***	-0.72**	-0.80**	-0.88***	-0.79**	-0.79**
l_unmp_tot	0.67***	0.67***	0.68***	0.60***	0.73***	0.67***	0.66***	0.67***	0.67***	0.65***	0.67***	0.66***
tax_wedge	0.03	0.01	0.04	-0.10*	0.06	0.03	0.17**	0.05	0.03	-0.05	0.02	0.03
union_dens	-0.02	-0.03	-0.06	0.03	-0.14***	-0.02	-0.01	0.00	-0.02	-0.02	-0.02	-0.03
unmp_ben	0.10***	0.09***	0.11***	0.17***	0.11***	0.10***	0.08***	0.09***	0.10***	0.11***	0.10***	0.10***
gdp_g_pc	-0.09***	-0.09***	-0.09***	-0.09***	-0.08***	-0.10***	-0.08***	-0.09***	-0.09***	-0.09***	-0.09***	-0.09***
acc_cpi	-0.25***	-0.27***	-0.24***	-0.26***	-0.23***	-0.27***	-0.23***	-0.25***	-0.25***	-0.29***	-0.25***	-0.24***
sec_educ	-0.04	-0.02	-0.03	-0.04	-0.04	-0.05	-0.04	-0.02	-0.04	-0.03	-0.04	-0.04
urb_proxy	0.00	-0.01	-0.01	0.04	0.02	-0.01	-0.08	0.00	0.00	-0.05	-0.01	0.01
tech_quota	-0.07	-0.06	-0.06	-0.07	-0.06	-0.07	-0.09*	-0.06	-0.07	-0.10*	-0.07	-0.07
age_median	-0.63***	-0.49***	-0.62***	-0.55***	-0.62***	-0.58***	-0.93***	-0.54***	-0.63***	-0.70***	-0.63***	-0.65***
N	1567	1303	1418	1416	1431	1407	1463	1503	1562	1471	1550	1526
R^2	0.66	0.64	0.68	0.66	0.73	0.67	0.69	0.66	0.66	0.67	0.66	0.66

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A12: Core/Peripheral Countries Robustness Check, total unemployment (2000-2008)

Dep_Var: Unmp_Tot	r2	all_core	all_per	all_inner	all_outer
oecd_epl	-0.80**	-2.97***	1.86***	0.11	-3.44***
lagged_unmp	0.67***	0.66***	0.52***	0.55***	0.73***
tax_wedge	0.03	0.24***	0.13	-0.07	-0.35***
union_dens	-0.02	-0.07	0.17	0.18**	-0.13*
unmp_ben	0.10***	0.12***	-0.07**	0.00	0.24***
gdp_g	-0.09***	-0.07***	-0.13**	-0.06**	-0.07***
acc_cpi	-0.25***	-0.23***	0.01	0.13*	-0.26***
sec_educ	-0.04	-0.03	0.03	-0.12***	0.04
urb_proxy	0.00	-0.02	-0.18	-0.07	-0.18
tech_quota	-0.07	-0.05	-0.07	-0.05	-0.1
age_median	-0.63***	-1.12***	-0.53**	-0.56***	-0.72*
N Obs.	1567	1062	505	1089	477
R^2	0.66	0.78	0.5	0.52	0.86

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A13: Regular Contracts EPL, total unemployment (2000-2008)

Dep_Var: Unmp_Tot	r1	r2	r3
EPR	-2.81**	0.06	0.38
lagged_unmp		0.67***	0.89***
tax_wedge		0.06	-0.04
union_dens		-0.03	0.01
unmp_ben		0.09***	0.09***
gdp_g		-0.10***	-0.08***
acc_cpi		-0.26***	-0.24***
sec_educ		-0.04	-0.00
urb_proxy		-0.04	0.00
tech_quota		-0.08	-0.01
age_median		-0.58***	-0.04***
N Obs.	2077	1567	1567
R^2	0.14	0.65	0.93

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A14: Temporary Contracts EPL, total unemployment (2000-2008)

Dep_Var: Unmp_Tot	**r1**	**r2**	**r3**
EPT	-1.00***	-0.38***	-0.23*
lagged_unmp		0.67***	0.89***
tax_wedge		0.02	-0.07
union_dens		-0.02	0.03
unmp_ben		0.10***	0.09***
gdp_g		-0.08***	-0.07***
acc_cpi		-0.24***	-0.23***
sec_educ		-0.04	-0.00
urb_proxy		0.00	0.01
tech_quota		-0.07	-0.01
age_median		-0.63***	-0.04***
N Obs.	2077	1567	1567
R^2	0.17	0.66	0.93

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A15: Collective Dismissal Regulation, total unemployment (2000-2008)

Dep_Var: Unmp_Tot	**r1**	**r2**	**r3**
EPC	4.75***	2.78***	3.04***
lagged_unmp		0.68***	0.89***
tax_wedge		0.07	-0.03
union_dens		0.05	0.10*
unmp_ben		0.07***	0.06***
gdp_g		-0.07***	-0.05***
acc_cpi		-0.21***	-0.18***
sec_educ		-0.05*	0.00
urb_proxy		-0.05	0.00
tech_quota		-0.10*	-0.01
age_median		-0.55***	-0.04***
N Obs.	2077	1567	1567
R^2	0.18	0.67	0.94

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A16: Total Unemployment Regional Quantile Aggregation (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**q1**	**q2**	**q3**	**q4**	**q5**
oecd_epl	-0.80**	-0.94***	-0.71*	-0.49	-1.51***	-0.12
lagged_unmp	0.67***	0.66***	0.66***	0.66***	0.71***	0.44***
tax_wedge	0.03	-0.08	0.05	0.07	0.12	-0.03
union_dens	-0.02	-0.01	0.00	-0.06	-0.05	0.14***
unmp_ben	0.10***	0.11***	0.10***	0.11***	0.09***	0.05***
gdp_g	-0.09***	-0.09***	-0.10***	-0.10***	-0.07***	-0.05***
acc_cpi	-0.25***	-0.31***	-0.30***	-0.26***	-0.24***	-0.01
sec_educ	-0.04	-0.03	-0.05	-0.04	-0.03	-0.10***
urb_proxy	0.00	-0.05	0.01	-0.05	-0.00	-0.04
tech_quota	-0.07	-0.11*	-0.06	-0.07	-0.07	-0.11***
age_median	-0.63***	-0.72***	-0.63***	-0.57***	-0.86***	-0.28***
N Obs.	1567	1327	1218	1267	1223	1233
R^2	0.66	0.58	0.66	0.68	0.68	0.67

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A17: Total Employment Regional Quantile Aggregation (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**q1**	**q2**	**q3**	**q4**	**q5**
oecd_epl	-0.80**	-0.56	-1.15**	-0.73**	-0.60*	-0.75**
lagged_unmp	0.67***	0.53***	0.70***	0.67***	0.66***	0.66***
tax_wedge	0.03	-0.03	0.08	0.04	0.01	-0.02
union_dens	-0.02	0.18***	-0.08*	-0.06	-0.01	-0.02
unmp_ben	0.10***	0.05**	0.11***	0.10***	0.10***	0.10***
gdp_g	-0.09***	-0.05***	-0.07***	-0.09***	-0.10***	-0.10***
acc_cpi	-0.25***	-0.06	-0.23***	-0.27***	-0.29***	-0.30***
sec_educ	-0.04	-0.10***	-0.02	-0.04	-0.04	-0.03
urb_proxy	0.00	0.09	0.01	-0.04	-0.04	-0.03
tech_quota	-0.07	-0.11**	-0.04	-0.10	-0.05	-0.09
age_median	-0.63***	-0.55***	-0.79***	-0.52***	-0.68***	-0.62***
N Obs.	1567	1269	1256	1228	1207	1308
R^2	0.66	0.52	0.69	0.68	0.67	0.68

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A18: GDP PPS Quantile Aggregation (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**q1**	**q2**	**q3**	**q4**	**q5**
oecd_epl	-0.80**	-0.22	-1.08***	-0.76**	-0.75**	-0.76**
lagged_unmp	0.67***	0.54***	0.67***	0.68***	0.67***	0.67***
tax_wedge	0.03	0.01	0.01	0.03	0.02	-0.02
union_dens	-0.02	0.14**	-0.02	-0.09	-0.02	-0.01
unmp_ben	0.10***	0.02	0.11***	0.12***	0.10***	0.10***
gdp_g	-0.09***	-0.04**	-0.09***	-0.09***	-0.09***	-0.09***
acc_cpi	-0.25***	-0.01	-0.26***	-0.26***	-0.27***	-0.29***
sec_educ	-0.04	-0.09***	-0.05	-0.05	-0.01	-0.03
urb_proxy	0.00	0.07	-0.02	-0.07	0.01	-0.04
tech_quota	-0.07	-0.08	-0.08	-0.08	-0.06	-0.09
age_median	-0.63***	-0.64***	-0.42**	-0.72***	-0.63***	-0.64***
N Obs.	1567	1287	1281	1230	1210	1260
R^2	0.66	0.50	0.68	0.71	0.68	0.67

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A19: Secondary Education Quantile Aggregation (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**q1**	**q2**	**q3**	**q4**	**q5**
oecd_epl	-0.80**	-1.16**	-0.89**	-0.93***	-0.61*	0.56*
lagged_unmp	0.67***	0.71***	0.68***	0.66***	0.65***	0.54***
tax_wedge	0.03	0.10	-0.01	-0.04	0.09	0.00
union_dens	-0.02	-0.13***	-0.02	-0.04	0.02	0.12*
unmp_ben	0.10***	0.11***	0.12***	0.12***	0.08***	0.01
gdp_g	-0.09***	-0.08***	-0.09***	-0.10***	-0.09***	-0.03**
acc_cpi	-0.25***	-0.24***	-0.27***	-0.28***	-0.28***	0.01
sec_educ	-0.04	-0.04	-0.03	-0.03	-0.02	-0.08***
urb_proxy	0.00	0.01	-0.01	-0.05	0.00	-0.13
tech_quota	-0.07	-0.07	-0.07	-0.09	-0.04	-0.10*
age_median	-0.63***	-0.67***	-0.66***	-0.69***	-0.56***	-0.55***
N Obs.	1567	1217	1270	1275	1305	1201
R^2	0.66	0.76	0.68	0.69	0.66	0.45

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A20: Urban Proxy Quantile Aggregation (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**q1**	**q2**	**q3**	**q4**	**q5**
oecd_epl	-0.80**	-0.61*	-0.72**	-0.96***	-0.98***	-0.77
lagged_unmp	0.67***	0.67***	0.67***	0.65***	0.66***	0.66***
tax_wedge	0.03	0.03	0.03	-0.01	-0.00	0.11*
union_dens	-0.02	-0.04	-0.03	-0.03	-0.00	0.05
unmp_ben	0.10***	0.10***	0.10***	0.12***	0.10***	0.06**
gdp_g	-0.09***	-0.09***	-0.10***	-0.09***	-0.07***	-0.08***
acc_cpi	-0.25***	-0.27***	-0.26***	-0.28***	-0.27***	-0.12*
sec_educ	-0.04	-0.04	-0.02	-0.05	-0.03	-0.07**
urb_proxy	0.00	-0.04	0.00	-0.03	0.05	-0.12
tech_quota	-0.07	-0.08	-0.03	-0.06	-0.09	-0.11**
age_median	-0.63***	-0.63***	-0.53***	-0.64***	-0.60***	-0.76***
N Obs.	1567	1281	1238	1256	1209	1284
R^2	0.66	0.67	0.66	0.68	0.66	0.63

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A21: Technological Level Quantile Aggregation (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**q1**	**q2**	**q3**	**q4**	**q5**
oecd_epl	-0.80**	-2.15***	-0.73*	-0.70**	-0.55*	-0.68**
lagged_unmp	0.67***	0.54***	0.69***	0.70***	0.67***	0.66***
tax_wedge	0.03	0.17*	0.01	0.01	0.01	0.01
union_dens	-0.02	0.10*	-0.07	-0.04	-0.02	-0.03
unmp_ben	0.10***	0.07***	0.10***	0.10***	0.10***	0.10***
gdp_g	-0.09***	-0.08***	-0.06***	-0.09***	-0.10***	-0.10***
acc_cpi	-0.25***	-0.17**	-0.19***	-0.26***	-0.31***	-0.29***
sec_educ	-0.04	-0.08***	-0.03	-0.04	-0.03	-0.03
urb_proxy	0.00	0.07	0.06	-0.04	-0.06	-0.04
tech_quota	-0.07	-0.12**	0.00	-0.07	-0.09	-0.10
age_median	-0.63***	-0.74***	-0.72***	-0.65***	-0.60***	-0.53***
N Obs.	1567	1262	1238	1248	1241	1279
R^2	0.66	0.62	0.66	0.69	0.68	0.66

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A22: Age Median Quantile Aggregation (2000-2008)

Dep_Var: Unmp_Tot	**r2**	**q1**	**q2**	**q3**	**q4**	**q5**
oecd_epl	-0.80**	-0.38	-0.93**	-0.68*	-0.83**	-1.03**
lagged_unmp	0.67***	0.61***	0.66***	0.67***	0.67***	0.69***
tax_wedge	0.03	0.07	-0.01	0.04	0.03	-0.01
union_dens	-0.02	0.02	-0.02	-0.02	-0.02	-0.01
unmp_ben	0.10***	0.06***	0.11***	0.10***	0.09***	0.11***
gdp_g	-0.09***	-0.06***	-0.09***	-0.10***	-0.10***	-0.09***
acc_cpi	-0.25***	-0.09	-0.27***	-0.28***	-0.29***	-0.26***
sec_educ	-0.04	-0.06**	-0.05	-0.04	-0.02	-0.03
urb_proxy	0.00	0.00	0.05	-0.02	-0.06	-0.01
tech_quota	-0.07	-0.10*	-0.03	-0.07	-0.11*	-0.08
age_median	-0.63***	-0.64***	-0.63***	-0.59***	-0.67***	-0.59***
N Obs.	1567	1327	1218	1267	1223	1233
R^2	0.66	0.58	0.66	0.68	0.68	0.67

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A23: EPR and sectorial Employment Rates (2000-2008)

Dep_Var: Sector Employment Rate	**agr**	**ind**	**constr**	**serv**	**fin**	**p.a.**
EPR	0.30	-0.92*	0.64*	0.76	-2.04***	1.66***
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N Obs.	1535	1733	1726	1761	1716	1762
R^2	0.45	0.42	0.35	0.21	0.81	0.68

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A24: EPT and sectorial Employment Rates (2000-2008)

Dep_Var: Sector Employment Rate	**agr**	**ind**	**constr**	**serv**	**fin**	**p.a.**
EPT	0.16*	-0.05	0.15**	-0.07	-0.22*	-0.12
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N Obs.	1535	1733	1726	1761	1716	1762
R^2	0.45	0.42	0.35	0.21	0.81	0.68

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*

Table A25: EPC and sectorial Employment Rates (2000-2008)

Dep_Var: Sector Employment Rate	**agr**	**ind**	**constr**	**serv**	**fin**	**p.a.**
EPC	0.02	-0.69*	0.19	0.08	-0.68	0.71*
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N Obs.	1535	1733	1726	1761	1716	1762
R^2	0.45	0.42	0.34	0.2	0.81	0.68

*Regional and Time Fixed Effect included. Legend: * p-value < 0.05; ** p-value < 0.01; *** p-value <0.001*