Do Differences in Unemployment Benefits Explain Unemployment in Spain Relative to Portugal?

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This paper determines that unemployment benefits partially explain Spanish unemployment relative to Portugal from 1985 to 2009. The difference in the maximum duration of unemployment benefits between Spain and Portugal is highly statistically and economically significant. A one month increase in maximum benefit duration in Spain relative to Portugal correlates to an increase in unemployment in Spain (relative to Portugal) of approximately 1 percentage point. Unionization, and to a lesser extent wage bargaining coordination, also explain the Spanish-Portuguese unemployment differences. Analytical comparisons between Spain and Portugal's economies should continue to provide valuable policy insight; insight which at this time is crucial to help Spain and the euro zone return to a path of economic growth and resilience.

I. Introduction

Nearly one in four Spaniards is out of work and seeking employment.[1] Not only is Spain's current level of unemployment astonishingly high in comparison with its fellow Organization for Economic Cooperation and Development (OECD) members, but Spain has struggled with periods of exceptionally high unemployment for nearly three decades. High unemployment and related reductions in national income in Spain contribute to the anemic economic recovery in Europe since the 2008 financial crisis and need to be combatted.

In a long-run comparison with Germany, France, the United Kingdom, Italy, and Portugal, Spain has experienced much greater unemployment levels and greater volatility in unemployment in the last 25 years (World Development Indicators). Portugal, in stark contrast, experienced exceptionally low and stable unemployment over that period (see fig. 1). Some research has focused on understanding the difference between the two apparent unemployment "outliers" of Portugal and Spain (Bover, García-Perea, and Portugal, 2000). The two countries not only represent extremes in unemployment levels for members of the OECD, but merit comparison because of the many historical, cultural and institutional similarities between both countries.[2] Blanchard and Jimeno (1995) conclude the unemployment benefit system is the only major institutional difference between these two countries and hence the driving force behind their disparate unemployment experiences. In this paper, I seek to carry forward this analysis and determine if unemployment benefits explain differing unemployment levels in Spain and Portugal.

Specifically, I am interested in determining if unemployment benefits and other institutional factors explain the difference in the unemployment rates between Spain and Portugal between 1985 and 2009.[3] The difference between Spanish and Portuguese labor taxation, for example, does not appear to explain the difference in the two countries' unemployment; other institutional differences, however, are explanatory. In this paper I consider the labor market institutions of unemployment benefits, collective bargaining, and tax policy and their effects on unemployment outcomes in the two countries.

I perform three base regressions in my analysis: (i) a random effects regression on a panel of Spanish and Portuguese data with a dummy variable for Spain included as a covariate, (ii) an OLS regression of unemployment on the institutional covariates for each country individually, and (iii) a regression of the difference in unemployment between Spain and Portugal by the differences within the variables from my guiding equation between Spain and Portugal.[4] I find that within Portugal, changes in union density correlate positively with unemployment rates over time. Within Spain, wage bargaining coordination is negatively correlated with unemployment and payroll taxes are positively correlated with unemployment. Increases in the difference in maximum unemployment benefit duration positively correlate to the differences in Spanish and Portuguese unemployment, differences in union density negatively correlate to differences in unemployment, and high wage bargaining in Spain relative to Portugal negatively correlates to differences in unemployment. In

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[1] In October 2012, the unemployment rate (percent unemployed of labor force) was 25.2 percent (Unemployment rates by sex, age and nationality (%)).

[2] These include their transitions from dictatorships to democracy in 1974-1975, the ascent to the European Community in 1986, and the introduction of European Monetary Union and the conversion to the euro currency in (2002) The European Community (EC) was the predecessor of the European Union (EU); the creation of the latter was in 1993 ("European Union").

[3] By Institution I mean the laws and practices that characterize Iberian labor markets. These typically include tax policies affecting wages, unemployment benefits programs, employment protect legislation, and collective bargaining practices.

[4] For example, I regress the difference between Spanish and Portuguese unemployment (Spain's value minus Portugal's value) on the difference between Spanish and Portuguese net replacement ratios. See equation [6] for the complete guiding equation.

conclusion, unemployment benefits, in terms of the maximum duration of unemployment benefits, do explain unemployment differences between Spain and Portugal, and evidence suggests collective bargaining explains unemployment differences as well.

My paper is organized as follows: Section II reviews the appropriate literature on unemployment in Spain and Portugal. Section III outlines the theory developed by Layard, Nickell, and Jackman (1991) that I utilize and modify to explain unemployment as a function of institutional factors such as the maximum allowed duration of unemployment benefits. Section IV A presents the summary statistics of my data and Section IV B presents my results and robustness analyses. Section V reports my conclusion that the maximum duration of unemployment benefits explains unemployment in Spain vis-à-vis Portugal.

II. Literature Review

I categorize the literature by its level of focus on unemployment in Spain and Portugal and by chronological progression of research on the issue of unemployment. I then propose a gap in the literature that this paper fills.

Papers that principally and comprehensively address the discrepancy between Spanish and Portuguese unemployment are limited. Blanchard and Jimeno find four elements of labor markets that could reasonably cause the gap between Spanish and Portuguese unemployment: fiscal policy or the "tax wedge," collective bargaining, employment protection, and unemployment benefits. After deeper evaluation of these four factors, however, the authors argue that only unemployment benefits appear to be substantially different between Spain and Portugal. They noted eligibility requirements are significantly stricter in Portugal, which leads Spain to have more unemployed persons receiving benefits than Portugal.

A more recent study that focuses specifically on a comparison between the two countries is that of Bover, García-Perea, and Portugal (2000). They focus on labor market institutions instead of shocks, but unlike the previous authors, they estimate unemployment using micro-data from the late 1970s through the mid-1990s.[5] They find that two key institutional differences explain the Portuguese-Spanish unemployment differential: unemployment benefits and wage flexibility. The authors explain that before 1985, Portugal had "virtually no [unemployment benefit] system" while Spain's was generous (p. 410). By 1989, however, the Portuguese system of benefits was covering a significantly larger portion of the unemployed and the replacement ratio had risen.[6] Then Spain, in 1992, tightened unemployment eligibility criteria and reduced the replacement ratio. Despite this convergence in policy by the 1990s, Spain's benefit system was still more generous than Portugal's.

The second finding of Bover, García-Perea, and Portugal's paper is that wages are considerably less flexible in Spain and play a major role in accounting for unemployment there. Specifically, wage floors established through collective bargaining are higher in Spain and more homogenous across industry sectors than in Portugal. The authors attribute these outcomes and the greater relative power of Spanish unions to exclusive jurisdiction rules, greater union coordination, and the public financing of unions. Theory suggests that greater union power alone results in higher unemployment, but that high wage bargaining coordination results in lower unemployment; this will be discussed in section three.

Bentolila and Jimeno (2006) bridge the gap from a focus on Spain and Portugal to a focus on Spain in comparison to the OECD. They discuss unemployment in Spain primarily in the context of the unemployment experience of OECD members, but also direct attention to the puzzling

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[5] By 'shocks' I mean any macroeconomic shock such as a drastic supply shift or rapid inflation.

[6] The replacement ratio is a key measure of unemployment benefits. It is defined as the cash unemployment insurance benefit received by an unemployed worker as a fraction of the worker's wage when they were employed.

difference in that experience between Spain and Portugal. Bentolila and Jimeno find that institutions as opposed to shocks were primarily responsible for the trend in Spanish unemployment from 1975 to 1995. They caution, however, that Spanish institutions "amplified the effects of aggregate shocks, which seem to have been similar in the rest of the OECD" (p. 331). This suggests that although Portugal and Spain in particular faced very similar shocks, Spanish and Portuguese institutions must be effectively different. In contrast to previous studies, however, the authors claim "unemployment benefits get too much blame for the rise in unemployment" and that collective bargaining deserves more blame.[7] "Unions have an undisputed grip on collective bargaining [in Spain], whose regulation remains unchanged since the early 1980s", according to Bentolila and Jimeno (p. 332). Bentolila and Jimeno's conclusion remains the same when specifically comparing Portugal and Spain: unemployment benefit replacement rates and their durations are much lower in Portugal than Spain, but it is primarily the high wages achieved by Spanish collective bargaining which explains the unemployment differential between the two countries.

Two papers discuss broad economic and unemployment differences across OECD countries. The work of Layard, Nickell, and Jackman (1991; hereafter referred to as LNJ) takes a macroeconomic approach to analyze the effects of institutions and economic shocks on unemployment rates in 19 OECD countries. They find the economies studied perform well in response to exogenous shocks under two general conditions; first, if the countries have an unemployment benefits system that discourages long-term unemployment, and second, if the system of wage determination is "satisfactory" (p. 449). In practice, benefits may still be generous, but the duration must be short so as not to encourage long-term unemployment. A "satisfactory" system of wage determination, can take two forms: a competitive non-unionized labor market or a labor market in which bargaining is centrally coordinated on the employer side. The levels of union coverage and coordination in Spain and Portugal are high relative to other OECD countries, but in Portugal more bargaining power and coordination lie within employer unions, while in Spain employers have less power and its two unions tend not to coordinate (Layard, Nickell, and Jackman 1991). In summary, LNJ suggest that unemployment benefits and collective bargaining together are driving the difference between unemployment levels in the two nations.

Jaumotte (2011) specifically compares Spain with the EU15, or the 15 European countries within the OECD, and is able to analyze much more recent data than previous studies.[8] Jaumotte implicitly argues the majority of Spanish unemployment derives from wage inflexibility caused by the level of centralization of its collective bargaining. Spain has an intermediate degree of coordination which takes place not at the firm level, but at the provincial and industry level. This is similar to Portugal, but the system is worse in Spain for four reasons: (i) national wage guidelines act as minimums and are bid up over many levels—the compounded effect is a substantial wage increase; (ii) bargains apply to all workers in the sector; (iii) firms' wage agreement "opt-out" clauses are restrictive and not readily used; (iv) wages are highly indexed to inflation but not corrected when inflation is lower than expected. She also concludes unemployment benefits and the tax wedge are material sources of unemployment for the Spanish labor market, but these claims were weakly addressed in her analysis.

This paper seeks to carry forward the work of studies which take a close look at institutional differences between Spain and Portugal. This paper considers the recent unemployment trends in the late 1990s and 2000s to discover what occurred during that time to harmonize Spanish and Portuguese unemployment levels, an area not adequately researched. It contributes to resolving the

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[7] Bentolila and Jimeno follow a shocks and institutions model developed by Blanchard and Wolfers (2000) which measures union power by using measures of union coverage, union density, and wage bargaining coordination.
[8] The EU15 is comprised of: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

disagreement between studies on the Spanish-Portuguese unemployment puzzle regarding the importance of unemployment benefits and collective bargaining (Blanchard and Jimeno (1995), Bover, García, and Portugal (2000), and Bentolila and Jimeno (2006). Moreover, my analysis of recent data on benefits and collective bargaining in both countries corroborates the relationship between those institutions and the unemployment rate found in broader cross-country studies involving the OECD (Layard, Nickell, and Jackman, 1991; Jaumotte 2011).

III. Theory
A. Theoretical Framework

I follow the approach of LNJ (1991) to relate unemployment with union power and unemployment benefits and outline their model below.[9] The model begins with an economy of many identical firms that are all unionized. The union's role in the economy is to maximize worker utility by maximizing the wage of its median voter while the firm's goal is to maximize profits. For simplification, unions only bargain for wages. When unions bargain for higher wages, firms must reduce employment to maximize profits. Thus, there is a bargaining period and an outcome period, where some workers may be laid off. In this model, workers are laid off at random, and therefore the expected utility of the median voter is the same as the utility for all workers. The authors build the model based on game theory; firms and unions will settle on a wage bargain because if there were a strike or lockout, both parties would lose revenue and wage income, respectively. Firms and unions are therefore going to maximize the total value of the outcome of the wage bargain, or the Nash-bargaining maximand, given by

$$[1] \quad \Omega = (W_i - A)^\beta [S(W_i)]^\beta \Pi_i^e (W_i)$$

W_i is the real wage at firm i, A is the expected alternative income for a worker who randomly has lost their job, β is a measure of union power, S is the probability of being employed by the same firm in the next period (relative to the current period in which the bargain is being negotiated) as a function of the wage, and Π_i^e is the expected operating profit—the excess of revenue when there is no strike. [10] S is decreasing in increasing wage and Π_i^e decreases in increasing wage. The expected alternative income is given by

$$[2] \quad A = (1 - \varphi u)W^e + \varphi u B \qquad W^e > B$$

where u is the level of unemployment in the economy, W^e is the expected real wage outside the firm, and B is the real unemployment benefit payment. φ is a constant which depends negatively on the turnover rate and positively on the discount rate as is confined to a domain of $0 < \varphi < 1$. The expression $(1 - \varphi u)$ reflects that the chances of getting a job are lower the greater the level of unemployment. The authors also assume unions have perfect foresight regarding u and B, so that their bargain is made with perfect information.

By calculating the first-order condition of the Nash-bargaining maximand and substituting the terms of that expression for relationships derived from the Cobb-Douglas production function and a constant elasticity demand function, the authors arrive at their final relationship between

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[9] This model was also used by Bover, García-Perea, and Portugal (2000) in their comparison study. I give a more complete description of the model in Appendix I.
[10] Game Theory is a theory of competition stated in terms of gains and losses among opposing players (here firms and workers). John F. Nash first proposed the general formulation of the maximand (Layard, Nickell, and Jackman 1991).

unemployment and the replacement ratio and union power. The relationship is expressed by equation [3].

$$[3] \quad u^* = \frac{1 - \alpha\kappa}{\left(\varepsilon_{SN} + \frac{\alpha\kappa}{\beta}\right)\left(1 - \frac{B}{W}\right)\varphi}$$

The final assumption required to make equation [3] a direct expression for unemployment is that the replacement ratio $\frac{B}{W}$ must be exogenous.[11] ε_{SN} is the elasticity of employment survival of workers at a firm with respect to the firms' expected employment, $\kappa = 1 - 1/\sigma$ is the measure of product market competiveness, and α is the labor intensity of production at the firm.

The union and unemployment theory developed by LNJ suits this paper's purposes well. It relates not only union bargaining power with unemployment, but it also includes a role for unemployment benefits. From equation (9) unemployment is positively related to union power, β. In LNJ's hypothesized economy, when unions have a great deal of power and only bargain for wages, unions bargain successfully for high wages but have to accept larger unemployment at their firm. Unemployment is negatively related to the labor intensity of the firm, α, and the firm's market power in the product market, κ. The higher the labor intensity of production, the more difficult it is for firms substitute capital for workers, and thus the lower the unemployment rate. The greater the firm's market competitiveness the more output they produce and sell at a given price and the more workers they will employ; hence, a negative relationship with unemployment. Unemployment is positively related to the replacement ratio, $\frac{B}{W}$, because the higher the ratio, the larger the alternative income, leading unions bargain for even higher wages which leads to greater unemployment. Lastly, the model clearly has roles for the firms' product market competitiveness and the intensity of labor in the firm's production process, but this paper will not consider these. In accordance with Bover, García-Perea, and Portugal (2000), labor intensity, product competitiveness, and turnover and discount rates are unlikely to differ greatly across Spain and Portugal and would therefore not explain the differences in each country's unemployment rates.

What the union theory of LNJ does not include are roles for maximum benefit duration or tax wedge. In both Spain and Portugal there are payroll and income taxes which could contribute to form such a tax wedge. A tax wedge is any tax policy or set of policies which create or expand a gap between what workers take home as pay and employers end up paying for labor. Such policies typically include taxes for social security and national healthcare programs. Maximum benefit duration is the longest continuous period of time an unemployed worker may receive unemployment benefit payments. For this paper and for interpretive purposes, longer benefit durations have the effect of raising the replacement ratio value and therefore increasing unemployment.[12]

To descriptively illustrate the effect of a payroll tax in the most general framework, consider the following: a payroll tax assessed on firms or employees increases the cost of labor for firms and lowers the wage received by workers. Initially, there is a labor market equilibrium with wage w_0 and employment E_0. Suppose the tax of t is then imposed on workers (assessing the tax on firms or workers makes no difference in the employment outcome). All workers end up only taking w-t euros home. One may envision this as a leftward shift of the labor supply curve, where the new

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[11] LNJ claim that the replacement ratio is "likely" to be exogenously set, but this is a strong assumption that could be relaxed in further research (Layard, Nickel, and Jackman, 1991, p. 106).

[12] Consider the benefit B, to be the present-discounted value of unemployment benefits accumulated monthly over the maximum benefit duration. As maximum benefit duration increases, B and unemployment increase.

equilibrium consists of w_t such that $w_t < w_0$, and E_t such that $E_0 < E_t$. The greater the tax t, the greater the leftward shift in supply, and the lower the employment outcome (or the higher the unemployment).

I incorporate the tax wedge into the equation for unemployment developed by LNJ as follows

$$[4] \quad u^* = \frac{1 - \alpha\kappa}{\left(\varepsilon_{SN} + \frac{\alpha\kappa}{\beta}\right)\left(1 - \frac{B}{W(1-\tau)}\right)\varphi}$$

The after-tax wage is some fraction of the bargained wage, where τ is the rate of taxation. As the tax wedge increases, the after-tax wage decreases, the observed benefit ratio increases and unemployment increases.

B. Union Power and Guiding Equation

What is union power? When taking the theoretical model to data, this variable must be reasonably defined. In the literature, studies typically measure union power as union coverage, union density, and the level of wage bargaining coordination (e.g. Bentolila and Jimeno, 2006; Blanchard and Wolfers, 2000). Union Coverage measures the number of workers in an industry for whom collective bargaining agreements determine wages, and these workers need not be official union members. Union density refers to the proportion of the labor force in union membership ("trade union"). Neither is a perfect measure of the number of workers bargaining in the economy, but in previous cross country comparisons, models typically use data on union coverage as opposed to density. This is also more in line with the model outlined above, which is concerned with wages and alternative incomes.

Union power is also a matter of the bargaining structure of collective bargaining. If unions bargain on a firm-by-firm basis, there are alternative jobs if a worker is laid off at one firm, and there may be a substantial value for A from the model. If, by contrast, there were one union bargaining with a single federation of employers on behalf of a country's entire workforce, then there would be no other firms or industries in the economy providing a work alternative. A would only represent the value of unemployment benefits and therefore the one union would have little bargaining power. They have little power because they are less willing to press for high wages and risk a lower post-bargain employment survival probability. High coordination implies that firms and unions are bargaining on a broad level, typically nationally. Low coordination implies small scale firm-level bargaining. Without a high degree of union coordination, a unionized economy results in higher unemployment. An economy with little unionization has an outcome close to full employment, ceteris paribus. An economy with high unionization but high coordination among employers and unions in wage bargains also results in low unemployment. These outcomes support a quadratic relationship between union coverage and unemployment; when union density is high, unemployment may be high or low depending on the level of wage bargaining coordination. This relationship is supported in my data (fig. 2). These outcomes suggest an interaction between union coverage and coordination, but, in line with the literature, I do not include an interaction in this paper.[13]

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[13] LNJ (1991) argue that union coverage has a positive relationship with unemployment, but Blanchard and Wolfers (2000) find different model specifications produce negative coefficients for coverage. They also estimate a negative coefficient for union density in one of their regressions.

From theory outlined above, LNJ (with my own modifications) have developed a framework for how workers and unemployment respond to benefits and expressed an interaction between unionization and coordination. From this framework, I build a regression model for unemployment and express the expected signs for the coefficients. The guiding equation of the regression model is

$$[5] \quad Unemployment_{it} = \\ \alpha + \beta_1 \ Replacement \ Ratio_{it} + \beta_2 \ Duration_{it} + \beta_3 \ Union \ Coverage_{it}^2 \\ + \beta_4 \ Coordination_{it} + \beta_5 \ TaxWedge_{it} + \varepsilon$$

where unemployment in country i at time t is a function of the replacement ratio, the maximum duration of benefits, the tax wedge, the union coverage, and the degree of union coordination.

IV. Empirical Evidence
A. Summary Statistics

To estimate the guiding equation, I need data for each variable in the equation for both Spain and Portugal at the same frequency. I use annual observations of these variables from 1985 to 2009. Table 1 presents the theoretical variables and their expected signs as well as the data I used for those variables (which were seldom ideal) and their definitions and sources. Table 2 details the different levels of wage coordination, measured by an index developed by Jelle Visser (2009). Due to the similarity between levels 2 and 3, I create a binomial variable 'CoordinationHigh' that is 1 if the wage bargaining index level is 4 and 0 if otherwise. If otherwise, coordination is assumed to be low, theoretically resulting in higher unemployment. As a proxy for the tax wedge, I use the employer social security payroll marginal tax rate (employer marginal rate or EMR, see Table 1 for details). Using the data I gathered, the guiding equation can be explicitly written as

$$[6] \quad Unemployment_{it} = \alpha + \beta_1 \ NetReplacementRatio_{it} \\ + \beta_2 \ Duration_{it} + \beta_4 \ Union \ Density_{it}^2 + \beta_5 \ CoordinationHigh_{it} + \beta_6 \ EMR_{it} + \varepsilon$$

Table 3 presents the summary statistics. From Table 3, Spain's average unemployment rate is 10 percentage points greater than Portugal's, and Spain's standard deviation on the unemployment rate is 5 percentage points, while that of Portugal is only 1.6 percentage points. Spain's standard deviation reflects the "wild ride" of Spain's unemployment experience over the period (Bentolila and Jimeno 2006). On average, Portugal has had a slightly higher net replacement ratio than Spain, yet Portugal has had low unemployment, which runs counter to theory and suggests benefits in terms of replacement ratios do not explain unemployment differences between the two countries. Maximum benefit duration is higher on average in Spain, and this variable therefore might explain higher unemployment in Spain than Portugal. Portugal's squared union density is, on average, clearly higher than Spain's and Portugal's wage bargaining coordination is lower. Theoretically, this combination should lead to higher unemployment for Portugal. Future research ought to consider Portugal in detail to better understand the nature of collective bargaining in that country and explain their counter-theoretical unemployment experience. Lastly, the mean of the employer marginal tax rate (EMR), is higher in Spain and theoretically matches Spain's higher unemployment compared to Portugal.

B. Main Results

Accounting for estimation issues, I perform a preliminary regression following equation [6] above using a robust random effects estimation technique.[14] Table 4 column (1) presents the results of this regression. This regression does not reveal what uniquely explains unemployment differences in Spain and Portugal, but explains overall unemployment in the Iberian Peninsula. It assumes the effect of the covariates is the same in each country. The only statistically significant explanatory variable for unemployment in this regression is the marginal social security contribution rate levied on employers or the employer marginal rate (EMR). I compare the main results to the results when a dummy variable for Spain is added as a covariate (column 2). One can observe that the statistical significance of the EMR and coefficient values in the regressions change when Spain is added to the regression. Columns (3) through (7) present alternative specifications of the equation from column (2) as sensitivity analyses. Only in the absence of the EMR does the Spain dummy variable become significant (column 7). In a preliminary response to the question of whether unemployment benefits explain unemployment in Spain vis-à-vis Portugal, these results indicate that benefits variables seem unable to explain any of the unemployment variation in the data when controlling for the other theoretical covariates. These results also motivate specific analysis of the difference between Spain and Portugal's unemployment.

In order to analyze possible country specific effects of unemployment covariates, I repeat the random effects estimation above but interact the Spanish dummy variable with the variables of the guiding equation. The incorporation of interacting covariates creates several new issues of severe collinearity involving several of the interaction terms in the model.[15] Nevertheless, I do not make any changes to the model that will be regressed, but my robustness checks exclude multicollinear variables. I find that specifications of interaction models produce no meaningful results and do not include them in a table. The main regression includes all covariates but none are statistically significant.[16] In the absence of the EMR, squared union density has a different effect in Spain than in Portugal (at the 10 percent significance level); in Spain, a 10 percentage point increase in union density would raise unemployment by 2.5 percentage points more than in Portugal. This provides a weak indication that union power may be playing a role in explaining Spanish unemployment vis-à-vis Portugal, and not unemployment benefits.

My next regression explores the possibility of different variables having different effects on unemployment in Spain and Portugal by examining the model on subsets of data for each country. I use a robust OLS regression of Spain and Portugal's individual unemployment series on the variables of the guiding equation. As maximum benefit duration in Spain remains constant throughout the period of study, I exclude it from Spain-specific regression. Table 5 presents the results of these regressions, where column (1) repeats regression (1) from Table 4. The dissimilarities between regressions (2) and (3) emphasize the differences in significant explanatory variables for the two countries and the different effects they have.

Replacement rates have no significant effect on unemployment in either country, and in Portugal the maximum benefit duration is insignificant. Unemployment benefits, therefore, may not explain Spanish unemployment vis-à-vis Portugal. For Portugal, squared union density is a significant factor positively related to unemployment; for Spain this variable has a negative sign and is insignificant.[17] In Spain, high wage bargaining coordination has a significant negative correlation

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[14] See Appendix II for an explanation of the estimation issues.

[15] For example, the correlation between the net replacement ratio and Spain is almost 99 percent and the average VIF for each covariate regressed on all others is 4536.

[16] This result is likely due to scarce degrees of freedom left after the inclusion of so many variables and to multicollinearity. In one robustness analysis I exclude the EMR and EMR-Spain interaction.

[17] A 10 percentage point increase in Portuguese union density (100 percentage point increase in squared union density) would correlate to an increase in the unemployment rate of 3 percentage points.

with the unemployment rate.[18] The EMR also has a significant positive relationship with unemployment in Spain.[19] Overall, these results indicate that the level of wage bargaining coordination and the EMR may explain Spanish unemployment relative to that of Portugal. In Portugal, these variables have no effect, but in Spain high coordination correlates with lower unemployment and a higher EMR correlates to higher unemployment.[20]

Regressions with a Spanish dummy variable covariate and regressions with Spanish interactions suggest the unemployment benefits have no relationship with unemployment in either Spain or Portugal. Individual country data only indicates what relationships exist within each country. To ultimately determine if unemployment benefits explain unemployment in Spain vis-à-vis Portugal, I regress the difference in Spanish and Portuguese unemployment on the difference within the variables from the guiding equation.[21]

Table 6 presents the results of the Spanish-Portuguese differences regression. Column (1) records the main regression results while the subsequent columns present sensitivity analyses using different model specifications. The primary findings of the main regression are (i) that the difference in maximum benefit duration is highly significant and positively correlated with the difference in unemployment rates and (ii) that the difference in union density is highly significant and negatively correlated with the difference in unemployment rates. Both relationships are also highly robust to different model specifications. The main model estimates that a 1 month increase in the difference between Spanish and Portuguese benefit durations increases the difference between Spanish and Portuguese unemployment rates by approximately 1 percentage point. Spain's maximum unemployment benefit duration did not change over the time period of study, but from the mid-1980s to the late 1990s, Portugal's maximum benefit duration was substantially lower than Spain's. It was over these years that the difference between Spanish and Portuguese unemployment was also highest. In 2000, Portugal matched their maximum benefit duration with Spain and in the early 2000s the gap in unemployment between the two groups converged mainly due to sizeable declines in Spain's unemployment but also to some increases in Portuguese unemployment. This finding strongly supports the hypothesis that unemployment benefits, at least in terms of their maximum duration, explain the difference in unemployment between Spain and Portugal.

The effect of a ten percentage point increase in the difference in union density would correlate with a 0.35 percentage point decrease in the difference in unemployment between Spain and Portugal. It is important to note that over the period of study, Spain's union density always lies below Portugal's union density and Spain's unemployment rates always lie above those of Portugal. An increase in Spain's union density would shrink the union gap with Portugal and also shrink the unemployment gap with Portugal by lowering unemployment.[22] Theory is ambiguous about the effect of union density alone—its effect depends on the level of coordination in wage bargaining—and so this result is in line with theory. If squared union density is negatively related with unemployment rates in Spain (which would agree with the sign from Table 5 column 3), theory

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[18] A transition from a low level of wage bargaining coordination to a high level would decrease Spanish unemployment by 4.6 percentage points.

[19] A 1 percentage point increase in the EMR would increase unemployment in Spain by 5.8 percentage points.

[20] I additionally utilize the estimated coefficients from the Portuguese model with the subset of Spanish data to predict unemployment in Spain. The residuals were unreasonably high and the mean standard error on the predicted unemployment was greater than ten, which clearly indicates that the coefficients are having a different effect on unemployment in Spain than in Portugal.

[21] For example, I regress the difference between Spanish and Portuguese unemployment on the difference between Spanish and Portuguese net replacement rates.

[22] If all other differences and the constant were zero and Spain minus Portugal's union density were negative 10 percentage points, the difference between Spain and Portugal's unemployment rates would be positive 0.3 percentage points (Spain would have higher unemployment). Conversely, if the difference in union density were positive ten, the difference between Spain and Portugal's unemployment rates would be negative 0.3 percentage points (Portugal would have higher unemployment).

suggests it must be the case that Spain has higher degrees of wage bargaining coordination for the Nash bargain to result in low unemployment. This condition of high wage bargaining is reasonably met given the average level of wage coordination in Spain is higher than Portugal (from the summary statistics) and from 2002 to 2008 (a period when the unemployment gap was small and Spanish unemployment was historically low), Spanish wage bargaining was consistently high relative to Portugal.

The level of wage bargaining is marginally statistically significant, but its sign fits well with the findings of the within-country regressions and agrees with theory. Effectively, this dummy variable indicates whether or not Spain has a high level of wage coordination relative to Portugal. If Spain's level of coordination is high while Portugal's is low, the difference will be 1, and its effect reduces the difference between Spanish and Portuguese unemployment by 1.59 percentage points specifically by lowering unemployment in Spain by that amount.[23] This variable is sensitive to different model specifications, but maintains its significance in the absence of the EMR and increases in significance in the absence of benefit duration.

V. Conclusion

In summary, my paper reports evidence that unemployment benefits explain Spanish unemployment relative to Portugal from 1985 to 2009, as presented in the results of the Spanish-Portuguese difference regression (Table 6 column (1)). The net replacement ratio appears to have no effect on the difference between Spanish and Portuguese unemployment and this finding is generally robust. The difference in the maximum duration of unemployment benefits, however, is highly statistically and economically significant. A one month increase in maximum benefit duration in Spain relative to Portugal would, by my estimation, increase unemployment in Spain (relative to Portugal) by approximately one percentage point. This result agrees with my theory and the literature relevant to understanding unemployment differences in Portugal and Spain.

Maximum benefit duration alone does not paint a complete picture; unionization, and to a lesser extent wage bargaining coordination also explain the Spanish-Portuguese unemployment differences. An increase in the difference in squared union density between the two countries decreases the difference in unemployment. The theoretical prediction for the effect of union density is ambiguous and depends on the level of wage bargaining coordination in labor markets. In future research, an interaction term between union density and coordination should be examined to better understand these variables' relationships with unemployment. The presence of high wage coordination in Spain relative to Portugal also negatively relates to the unemployment difference. Within Spain high wage bargaining coordination leads to a substantial reduction in unemployment. Decreases in the EMR within Spain would also have a large and significant mitigating effect on unemployment there.

The literature suggests that collective bargaining and unemployment benefits explain the difference between Spain and Portugal's unemployment experiences; Bentolila and Jimeno (2006) in particular claim that collective bargaining is more to blame than unemployment benefits. My analysis suggests that the latter claim is inaccurate for my period of study (1985 to 2009). My results suggest that collective bargaining may have some effect on unemployment, but the supporting evidence is weak and requires further research, whereas unemployment benefits in terms of the maximum benefit duration have a strong positive relationship with unemployment.

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[23] This conclusion is supported by the fact Spanish unemployment is always higher than Portugal's and that there is a strong negative effect of high coordination on unemployment within Spain (Table 4 column (3)). Portugal's unemployment might remain unaffected (as suggested by the lack of statistical significance for the coordination covariate in Table 4 column (2)).

The primary caveats of my paper relate to the quality of the variables I use. The net replacement ratio may not be a better measurement of benefits than the gross replacement ratio, and in future research it is imperative to find a better measure of benefits for both Spain and Portugal than the data I use. I concoct maximum benefit duration from various sources. Although confident the measurement is consistent, I cannot guarantee it is an accurate portrayal of the population of workers in both countries. In addition to union density, the inclusion and investigation of union coverage as a measure of union power would improve this paper; union density may underestimate the impact of collective bargaining in the two countries' labor markets. The EMR is not a perfect proxy for the tax wedge variable and may underestimate the impact of taxation in labor markets. Future research should attempt to use more reliable data, which may be available from the statistics institutes and central banks of Spain and Portugal.

Future research ought to consider Portugal in detail to better understand the nature of collective bargaining in that country, as it appears Portugal is able to maintain low employment despite high unionization and low wage bargaining coordination. Analytical comparisons between Spain and Portugal's economies should continue to provide valuable policy insight; insight which at this time is crucial to help Spain and the Eurozone return to a path of economic growth and resilience.
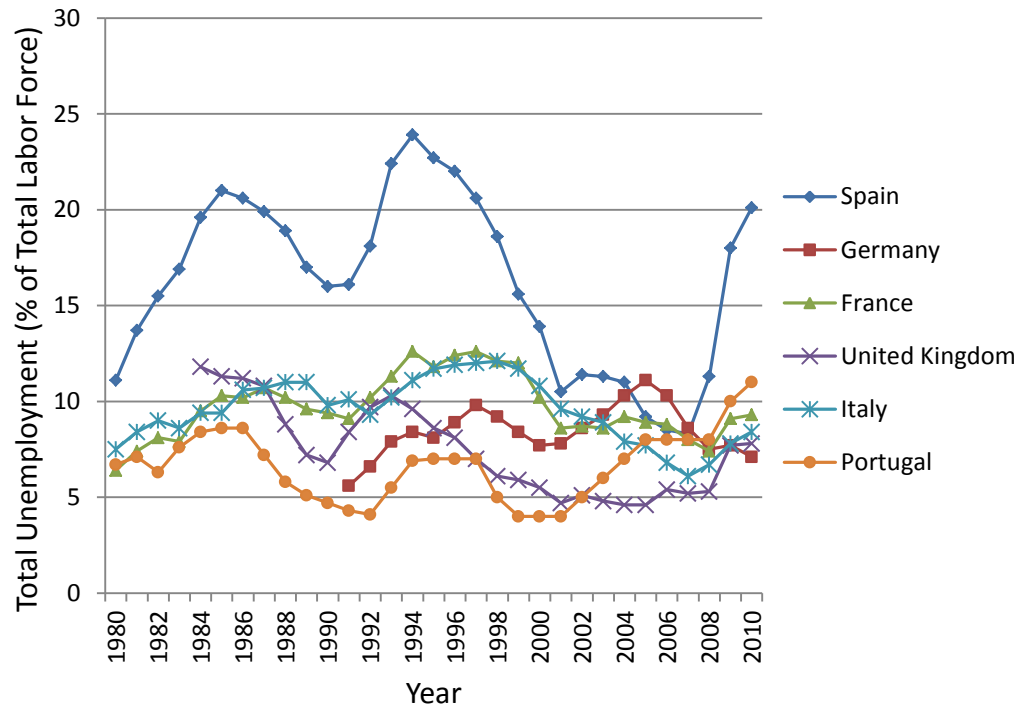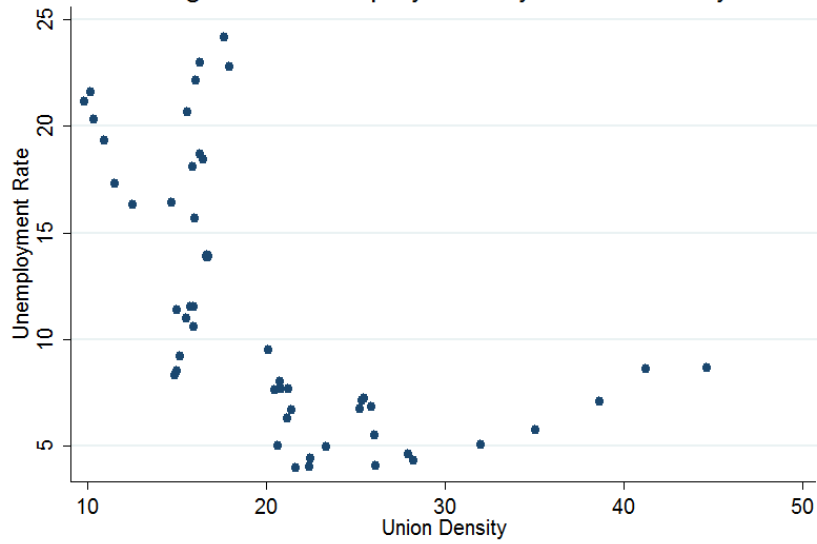
Figure 1: Unemployment

Figure 2: Unemployment by Union Density

Table 1: Summary of Variables

Theoretical Variable	Sign	Empirical Variable	Definition	Source
Unemployment Rate	NA	Unemployment Rate	Percentage of the civilian labor force unemployed	OECD Stat.Extracts
Replacement Ratio	(+)	Net replacement Ratio	The cash value of unemployment benefits, less taxes, received by an unemployed one-earner household with two children, divided by the wage less taxes when the household worker was employed. Taxes consist of mandatory contributions to social insurance programs, less cash transfers (ii).	Unemployment Replacement Rates Dataset (van Kliet and Caminada, 2012)
Maximum Benefit Duration	(+)	Maximum Benefit Duration	The longest continuous period of time, measured in months, during which a prime-aged worker (age 40-45) with over 6 years tenure in their previous job and dependents may receive benefits (iii).	Bover, García-Perea, Portugal (2000), Pereira (2006), OECD "Benefits and Wages: Policies" Dataset
Union Coverage	(Amb)	Union Density	The ratio of wage and salary earners that are trade union members, out of the total number of wage and salary earners.	OECD Stat.Extracts
Wage Bargaining Coordination	(-)	Wage Bargaining Coordination Index Level	An index from one to five, where increasing values imply greater coordination between firm and union wage bargainers (see Table 2).	ICTWSS
Tax Wedge	(+)	Employer Social Security Payroll Tax (Marginal Rate)	The marginal social security contribution rate levied on employers, or employer marginal rate (EMR) (iv).	OECD Tax Database, Table III.2 "Employer Social Security Contributions."

Notes: (i) The expected sign for union coverage is theoretically ambiguous, and is usually, but not always, found to be positive in the literature (Blanchard and Wolfers, 2000; Layard, Nickell, and Jackman (1991). (ii) Workers were assumed to earn the average production worker wage (from 1985 to 2000) or the average wage (from 2000 to 2009) when employed. (iii) The maximum duration measure does not include the duration of any supplemental unemployment assistance that may be available in special circumstances. I assume that the replacement ratio for 40 year old workers used in this paper corresponds to the maximum duration of benefits for which they would be eligible; primarily, I assume that the average 40 year old worker has 6 or more years of tenure with their employer. For Portugal, between 1985 and 1989, the maximum duration is calculated as 12 months plus one month for each year of tenure, given an individual is less than 45 years old and has at least six years tenure with his or her latest employer. I assume the minimum tenure length of six years and record the maximum duration as 18 months would be representative of the average Portuguese worker. To complement the data from Bover, García-Perea, and Portugal (2000), I use the maximum benefit duration from the OECD's "Benefits and Wages: Policies" dataset on unemployment benefit programs for both Spain and Portugal. This dataset records the maximum benefit duration for 40 year old workers, which still coincides with the information gleaned from Bover, García-Perea, and Portugal. Maximum durations are given for the years from 2010, 2007, and 2005 and I assume that there are no changes in policy in the intervening years. I also ensure the policy on maximum duration was accurate between 1999 and 2005. In particular, Portugal had undergone two reforms by 1999 and 2000, such that benefits in those years were limited to 21 and 24 month maximums, respectively (Pereira, 2006). (iv) The EMR is the best proxy for the tax wedge available to me. It underrepresents the tax wedge, but when combined with the net replacement ratio, which is adjusted for individuals' tax burdens, the overall representation of the tax wedge in this analysis is fairly accurate.

Table 2: Coordination in Wage Bargaining

Index Value	Definition
5	Economy-wide bargaining based on a) enforceable agreements between the central organizations of unions and employers affecting the entire economy or entire private sector, or on b) government imposition of a wage schedule, freeze, or ceiling.
4	Mixed industry and economy-wide bargaining: a) central organizations negotiate non-enforceable central agreements (guidelines) and/or b) key unions and employers associations set pattern for the entire economy.
3	Industry bargaining with no or irregular pattern setting, limited involvement of central organizations and limited freedoms for company bargaining.
2	Mixed industry and firm level bargaining, with weak enforceability of industry agreements
1	None of the above, fragmented bargaining, mostly at company level

Source: ICTWSS Codebook and Variable Description, Jelle Visser, 2009.

Table 3: Summary Statistics

Variable	Obs.	Mean-Portugal	Mean-Spain	Std. Dev.-Portugal	Std. Dev.-Spain	Minimum-Portugal	Maximum-Portugal	Minimum-Spain	Maximum-Spain
Unemployment	25	6.303	16.482	1.637	5.016	3.957	9.518	8.293	24.171
Net Replacement Ratio	25	77.168	74.495	1.375	7.819	75.072	79.703	68.489	89.362
Maximum Benefit Duration	25	19.720	24.000	3.736	0	16	24	24	24
Squared Union Density	25	738.758	222.903	427.160	64.550	406.002	1990.079	96.870	323.007
Wage Coordination Level	25	3.000	3.360	0.707	0.490	2	4	3	4
High Coordination	25	0.240	0.360	0.436	0.490	0	1	0	1
EMR	25	24.100	30.642	0.415	0.405	23.750	25.000	29.950	31.600

Sources: OECD StatExtracts, ICTWSS Database, Unemployment Replacement Rates Dataset, Bover, García-Perea, and Portugal (2000), Pereira (2006).

Table 4: RE Regression Results with Spain as Covariate

Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Net Replacement Ratio	-0.0316	-0.0560	-	-0.0561	-0.0413	-0.0568	-0.0878
	(0.110)	(0.114)	-	(0.112)	(0.112)	(0.112)	(0.107)
Maximum Benefit Duration	0.0316	0.00801	0.00844	-	-0.00845	0.00283	0.00625
	(0.276)	(0.278)	(0.275)	-	(0.276)	(0.275)	(0.277)
Squared Union Density	0.00157	0.00250	0.00230	0.00250	-	0.00260	0.00308
	(0.00237)	(0.00262)	(0.00255)	(0.00258)	-	(0.00258)	(0.00255)
High Coordination	-0.0699	-0.128	-0.134	-0.127	-0.190	-	-0.198
	(0.513)	(0.519)	(0.516)	(0.512)	(0.518)	-	(0.506)
EMR	1.570***	0.815	0.982	0.814	1.084	0.858	-
	(0.552)	(1.039)	(0.979)	(1.027)	(1.006)	(1.009)	-
Spain	-	7.099	5.899	7.132	3.617	6.892	12.68***
	-	(8.256)	(7.823)	(8.126)	(7.370)	(8.120)	(4.565)
Constant	-29.39	-10.39	-18.61	-10.21	-15.43	-11.38	11.32
	(19.15)	(29.28)	(24.17)	(28.49)	(28.94)	(28.57)	(10.55)
Observations	50	50	50	50	50	50	50
Number of Countries	2	2	2	2	2	2	2
Within-R-Squared	0.039	0.006	0.042	0.005	0.035	0.003	0.003
Between-R-Squared	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Overall-R-Squared	0.671	0.651	0.674	0.650	0.671	0.645	0.627

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Regression Results for Country Subsets

Independent Variable	(1) Overall	(2) Portugal	(3) Spain
Net Replacement Ratio	-0.0316	-0.449	0.170
	(0.110)	(0.276)	(0.159)
Maximum Benefit Duration	0.0316	0.0323	-
	(0.276)	(0.110)	-
Squared Union Density	0.00157	0.00346**	-0.0129
	(0.00237)	(0.00127)	(0.0175)
High Coordination	-0.0699	-0.301	-4.550**
	(0.513)	(0.673)	(1.807)
EMR	1.570***	-2.648	5.838**
	(0.552)	(1.591)	(2.126)
Constant	-29.39	101.7*	-170.6**
	(19.15)	(53.92)	(65.05)
Observations	50	25	25
Number of Countries	2	-	-
R-squared	-	0.305	0.598
Within-R-Squared	0.039	-	-
Between-R-Squared	1.000	-	-
Overall-R-Squared	0.671	-	-

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Estimation using a simple robust OLS regression. Because of the small sample size, these regressions have little power to determine significance, but they provide some idea of the importance of certain factors on unemployment in Portugal and Spain. For the Spain regression, maximum duration was omitted because it does not vary over the entire time range of the data.

Table 6: Regression Results for Spanish-Portuguese Differences

Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Net Replacement Ratio Difference	-0.169	-	-0.0219	0.0125	-0.163	-0.233**
	(0.143)	-	(0.278)	(0.107)	(0.124)	(0.0853)
Maximum Duration Difference	0.996***	0.952***	-	1.071***	1.233***	1.018***
	(0.196)	(0.214)	-	(0.210)	(0.144)	(0.208)
Squared Union Density Difference	-0.00353***	-0.00227**	-0.00525**	-	-0.00299***	-0.00363***
	(0.00122)	(0.00103)	(0.00248)	-	(0.000880)	(0.00120)
High Coordination Difference	-1.585*	-1.558	-4.713***	-1.274	-	-1.589*
	(0.916)	(0.932)	(0.845)	(1.039)	-	(0.881)
EMR Difference	1.046	2.406*	2.604	1.333	1.069	-
	(1.898)	(1.217)	(3.361)	(1.857)	(1.880)	-
Constant	-3.013	-10.62	-9.058	-2.939	-4.069	3.518**
	(12.33)	(8.769)	(20.83)	(12.15)	(12.20)	(1.255)
Observations	25	25	25	25	25	25
R-squared	0.838	0.828	0.633	0.807	0.814	0.835

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Estimation using simple OLS robust regression.

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Appendix I: Detail of Layard, Nickell, and Jackman (1991) Nash Bargaining Theory

Recall that combining the purposes of unions and firms results in the following Nash-bargaining maximand:

$$[1] \quad \Omega = (W_i - A)^\beta S(W_i)^\beta \Pi_i^e(W_i)$$

W_i is the real wage at firm i, A is the expected alternative income for a worker who randomly has lost their job, β is a measure of union power, S is the probability of being employed by the same firm in the next period (relative to the current period in which the bargain is being negotiated) as a function of the wage, and Π_i^e is the expected operating profit—the excess of income when there is no strike.[24] S increases in increasing wage and Π_i^e decreases in increasing wage.[25] The expected alternative income is given by

$$[2] \quad A = (1 - \varphi u)W^e + \varphi u B \qquad W^e > B$$

where u is the level of unemployment in the economy, W^e is the expected real wage outside the firm, and B is the real unemployment benefit payment. φ is a constant which depends negatively on the turnover rate and positively on the discount rate.[26] The expression $(1 - \varphi u)$ reflects that the chances of getting a job are lower the greater the level of unemployment.[27] The authors also assume unions have perfect foresight regarding u and B, so that their bargain is made with perfect information. The optimal outcome for the bargained wage is found by differentiating the log of the objective function with respect to W_i and setting the result equal to zero; equation [3] expresses the outcome of this procedure.[28]

$$[3] \quad \frac{\beta}{W_i - A} + \frac{\beta}{Si} \frac{\partial S_i}{\partial W_i} - \frac{N_i}{\Pi_i} = 0$$

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[24] For further explanation of β and the Nash Maximand, see Layard, Nickell, and Jackman (1991) pages 99-101 and Annex 2.2.

[25] The probability of employment and expected profit are decreasing in wage because as wage increases, firms hire fewer employees or realize lower profits or both.

[26] For an explanation of the turnover and discount rates, see Layard, Nickell, and Jackman (1991) page 145.

[27] Layard Jackman and Nickell (1991) page 103.

[28] In other words, the bargained wage is that wage which maximizes $\beta \log(W_i - A) S_i + log\Pi_i$. The authors invoke the envelope theorem such that $\partial \Pi_i / \partial W_i = -N_i$.

Then LNJ rearrange the expression to give the mark-up of the firm wage over outside opportunities.[29]

$$\frac{W_i - A}{W_i} = \left(\frac{W_i}{S_i}\frac{\partial S_i}{\partial W_i} + \frac{W_i N_i}{\beta \Pi_i}\right)^{-1}$$

$$= \left(\frac{N_i^e}{S_i}\frac{\partial S_i}{\partial N_i^e}\frac{\partial N_i^e}{\partial W_i}\frac{W_i}{N_i^e} + \frac{W_i N_i}{\beta \Pi_i}\right)^{-1}$$

$$[4] \qquad = \frac{1}{\varepsilon_{SN}\varepsilon_{NW} + W_i N_i/\beta \Pi_i}$$

In equation [4], and ε_{NW} is the absolute elasticity of expected employment with respect to the wage. LNJ assume ε_{SN} can be at most 1 as S_i is a probability.

Firms' profits in this economy depend on their production function and any product market power they may have. The authors again reasonably assume a Cobb-Douglas production function $Y_i = N_i^\alpha K_i^{1-\alpha}$ and a demand curve $Y_i = P_i^{-\sigma}Y_{di}$, where Y_{di} is a demand index.[30] Sparing detail, it follows that ε_{NW} can be expressed as

$$[5] \quad \varepsilon_{NW} = \frac{1}{1 - \alpha\kappa}$$

and that

$$[6] \quad \frac{W_i N_i}{\Pi_i} = \frac{\alpha\kappa}{1 - \alpha\kappa}$$

where $\kappa = 1 - 1/\sigma$ is the measure of product market competiveness.[31] Combining equations (5) and (6) with equation (4), the authors express the wage mark-up as κ

$$[7] \quad \frac{W_i - A}{W_i} = \frac{1 - \alpha\kappa}{\varepsilon_{SN} + \alpha\kappa/\beta}$$

The final steps are to substitute the expression for A and subsequently solve for u. In order to do this, the authors claim that $W_i = W^e$. This follows from the fact that all firms in the economy are identical; hence, $W_i = W$, where W is the aggregate wage. Workers' expectation of the wage, however, is still influenced by perceptions of inflation. In order for $W_i = W^e$ to be true, LNJ assume stable inflation over the bargaining period and subsequent work period; i.e. that the value of the wage bargained will be the same once payment for labor resumes. Incorporating equation [2] into the expression for the wage market by $W_i = W^e = W$, LNJ express the wage markup alternatively as

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[29] For an explanation of the Envelope Theorem, see "Envelope Theorem." *The Penguin Dictionary of Economics*. London: Penguin, 2003. *Credo Reference*. 28 Nov. 2007. Web. 26 Oct. 2012. <http://www.credoreference.com/entry/penguinecon/envelope_theorem>.

[30] A demand index is simply a measure which helps scale a demand curve for a product. The higher the demand index, the more output demanded at any price, where output demanded increases multiplicatively with price.

[31] For further detail, see Layard, Nickell, and Jackman (1991) page 102.

$$[8] \quad \frac{W_i - A}{W_i} = \varphi u \left(1 - \frac{B}{W}\right)$$

and substituting (8) into equation (7) and allows LNJ to solve for equilibrium unemployment:

$$[9] \quad u^* = \frac{1 - \alpha\kappa}{\left(\varepsilon_{SN} + \frac{\alpha\kappa}{\beta}\right)\left(1 - \frac{B}{W}\right)\varphi}$$

The final assumption required to make equation (8) a direct expression for unemployment is that the replacement ration $\frac{B}{W}$ must be exogenous, but this is a reasonable assumption for most countries that legislate labor market policies.

Appendix II: Estimation Issues

Four estimation issues challenge my statistical inference; heteroskedasticity, serial correlation, non-stationarity, and multicollinearity. I produce a likelihood ratio statistic for the group of variables and from the insignificant p-value, I conclude there is heteroskedasticity.[32] Using the Wooldridge Test for autocorrelation to determine the existence of serial correlation, the F-statistic was sufficiently improbable that I conclude there is serial correlation in the data.[33] Conveniently, with panel data both of these errors are reparable by using robust standard errors in my main estimations and robustness checks. Using a version of the Dickey-Fuller Test, I conclude that the net replacement ratio, maximum duration, the marginal social security contribution rate of employers (EMR), and coordination index level two (at the seven percent level) are non-stationary.[34] I choose to ignore potential non-stationarity as my random effects regression primarily picks up variance between Portugal and Spain, and not within each country over time; that is, the time series component of the panel data contributes much less to explaining unemployment relative to the cross country differences. Lastly, there was moderate collinearity between squared union density and maximum benefit duration, and squared union density and EMR.[35] I leave squared union density in the model because it is clearly necessary to answering my central question and the collinearity is mild.[36]

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[32] The likelihood ratio statistic (p-value) was 20.35 (0.0000).
[33] The Wooldridge F-statistic (p-value) was 255.472 (0.0398)
[34] The Fisher statistics (p-values) for the net replacement ratio, maximum duration, EMR, and coordination level 2 are 5.27 (0.26), 0.21 (1.00), 5.21 (0.27), 8.77 (0.07), respectively.
[35] The correlation coefficients between squared union density and maximum benefit duration, squared union density and EMR, are -0.68, -0.59, respectively.
[36] The VIF estimate for maximum benefit duration regressed on all other covariates is 2.51.