Does labour regulation matter for bank performance in the Eurozone Periphery?

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Abstract

Cost inefficiency scores for banks in the five countries of the Eurozone periphery (Greece, Ireland, Italy, Portugal, Spain) are estimated using stochastic frontier analysis (SFA) for the period 2000-2010. These are then employed in fixed-effects and dynamic panel models to estimate the impact of labour regulation on bank specific inefficiency in these countries that have initiated ambitious labour market reforms in light of the Eurozone public debt crisis. We opt for the Fraser Index of Economic Freedom (Gwartney et. al, 2012) and for the OECD Employment Protection Index for the first time in the banking literature to examine the impact of labour regulation on the performance of the banking sector. Results indicate that stringent labour regulation exerts a negative impact on bank performance. However, not all types of labour regulation are relevant for the performance of the banking sector. Dismissal costs, particularly the ones related to employees in regular contracts, is the main channel through which labour regulation affects negatively bank performance. Furthermore the use of interaction terms between labour regulation and the rule of law indicates that the negative impact of labour regulation on performance becomes more subdued at higher levels of law observance. Finally, we find that the negative impact of rigid labour regulation on bank performance is magnified during the crisis.

Keywords: *Labour Regulation; bank cost efficiency; Eurozone Periphery*

1. Introduction and Literature Review

The ever increasing importance of the banking industry in the global economy has led to numerous studies related to bank performance, as measured by efficiency, and its determinants. A large part of this research is focusing on the efficiency of the European banking systems (e.g. Allen and Rai, 1996; Altunbas et al., 2001; Lozano-Vivas et al., 2001, 2002; Maudos et al., 2002; Casu and Molyneux, 2003; Pasiouras et al., 2009; Brissimis et al., 2010). A major common ground between most of the studies on bank efficiency in the European Union (EU) is the persistence of cross-country heterogeneity in efficiency scores. This is so despite the evidence that some convergence of bank efficiency is taking place across the EU (Weil, 2009; Casu and Girardone ,2010; Brissimis et al., 2010; Koutsomanoli-Filippaki and Mamatzakis, 2010). Another common characteristic of most studies is that, in most cases, banks located in the European periphery (i.e. Greece, Italy, Ireland, Portugal and Spain) are less efficient than banks located in the countries of the European core (Allen and Rai, 1996; Dietsch and Lozano-Vivas, 2000; Bikker, 2001; Bikker, 2002; Brissimis et al., 2010). Environmental (country-level) variables have been found to be important determinants in explaining such cross-country heterogeneity in bank cost efficiency across the EU (Dietsch and Lozano-Vivas, 2000; Cavallo and Rossi, 2002; Guevara and Maudos, 2002; Maudos et. al., 2002; Hollo and Nagy, 2006). The first contribution of this study then is it focuses on country-level factors to explain differences of bank performance, as measured by cost efficiency, in the countries of the Eurozone periphery. This is important in the light of the recent financial and sovereign debt crisis that has hit particularly hard these economies.

An important source of the cross-country heterogeneity of the business environment in which firms are operating is regulation. The literature that examines the impact of regulations on bank performance is mainly focused on bank-specific supervisory and prudential regulation (Barth et al., 2004; Beck et al., 2006; Pasiouras, 2008; Pasiouras et al.,2009; Barth et al. 2010; Delis et al., 2011). Banks that are located in a country though are obliged not only to operate under the domestic financial regulations but also under the spectrum of the non-financial regulatory and institutional framework. So far, very few studies have explored the impact of the non-financial regulation and institutional quality on bank performance (Demirgüç-Kunt and Detragiache, 1998, 2002; Demirgüç-Kunt et al., 2004; Lensink et al. 2008; Hasan et al. 2009). Furthermore, there is no study, to the best of our knowledge, that

examines if labour regulation can affect bank performance. This is the second contribution of this study.

Labour regulation can have an impact on bank-performance directly by influencing the cost structure of banks. Personnel expenses form an important part of bank costs, and the ability of managers to control costs is an important success factor in the financial industry (Spong et al., 2005). Input prices in the banking sector, such as labour costs, can differ significantly in a cross-country framework because of labor regulation differences (Dietsch and Lozano-Vivas, 2000). Casu and Girardone (2010) also argue that the impact of EU financial integration on bank performance implies increased integration of the production prices, such as labour costs, and these could be affected by country-specific structural differences such as labour regulation. Furthermore, labour regulation can affect bank performance indirectly, via spill-over effects, if it affects the performance of firms in the non-financial sectors of an economy and so the fulfillment of their obligations to the banks.

Most of the literature that links labour regulation to economic performance finds that stringent regulation of labour reduces employment and production levels (Botero et al., 2004, Nickel and Layard, 1999; Heckman and Pagés, 2004, Lazear, 1990, Blanchard and Wolfers, 2000; Blanchard and Portugal, 2001). On the other hand, the evidence from the literature that links labour regulation to productivity growth is more mixed. Some studies find that stringent regulation of labour decreases productivity growth and investment levels (Besley and Burgess 2004; Bassanini et al. 2009; Autor et al. 2007). This could attributed to various channels such as the direct rise in the employment costs that regulation implies (Nickel, 1997; Bassanini and Ernst 2002; Scarpetta and Tressel 2004), reduced innovation effort of firms (Koeniger, 2005; Barbosa and Faria, 2011) and reduced employee effort because of higher job-security ((Ichino and Riphahn, 2005; Riphahn 2004). However, there are studies that find a positive link between the strigency of labour regulation and productivity (Deakin and Sarkar, 2008; Storm and Naastepad, 2009). This could be explained by increased willingness of employees to enhance their skills that are directly relevant to the firm they are working for (Wasmer 2006; Auer 2007).

Our results, in line with the stream of studies that find an negative effect of labour regulation rigidities on economic outcomes, show that stringent labour regulation exert a negative and statistically significant on the performance of banks located in the Eurozone periphery mainly via the regulation of dismissal costs. The rest of the paper is organised as follows; section 2 provides a description of the data and variables used, section 3 presents the results and discusses them and section 4 concludes.

2. Data and Variables

2.1 Measuring Bank Performance (Cost Inefficiency)

We use data from IBCA-Bankscope for the 2000-2010 periods. The sample includes 425 commercial and savings banks and, after removing errors and inconsistencies, 2,906 bank/year observations remain in an unbalanced panel. The sample includes the majority of such financial institutions in the Eurozone periphery.

In this study we follow Aigner et al. (1977) and Meeusen and Van den Broeck (1977) and opt for the stochastic frontier analysis (SFA) methodology in order to estimate bank cost inefficiency. A major advantage of this methodology is that both random error and inefficiency are incorporated in a composite error term.

More specifically, we assume the following specification for the cost frontier:

$$TC_{it} = f(P_{it}, Y_{it,,} N_{it,} Z_{it}) + v_{it} + u_{it} \quad (1)$$

Where TC_{it} the total cost for firm (bank) i at year t, P is a vector of input prices Y is a vector of outputs of the firm, N a vector of fixed netputs while Z is a vector of control variables. SFA, separates the error term into two components; The term u_i, stands for bank inefficiency that is in the control of management and follows the half-normal distribution. Such inefficiency has the potential to increase the costs of a bank above the best-practice level. The term v_i on the other hand, represents fluctuations that are beyond the firm's management (are random).

For the empirical implementation of the cost frontier, the following translog specification is used[1]:

$$\ln TC_i = \alpha_0 + \sum_i a_i \ln P_i + \sum_i \beta_i \ln Y_i + \tfrac{1}{2} \sum_i \sum_j a_{ij} \ln P_i \ln Pj + \tfrac{1}{2} \sum_i \sum_j \beta_{ij} \ln Y_i \ln Y_j +$$

$$\sum_i \sum_j \delta_{ij} \ln P_i \ln Y_j + \sum_i \varphi_i \ln N_i + \tfrac{1}{2} \sum_i \sum_j \xi_{ij} \ln P_i \ln N_j + \sum_i \sum_j \zeta_{ij} \ln Y_i \ln N_j + \sum_i \xi_i Z_i + u_i + v_i \quad (2)$$

In the quadratic terms of the stochastic frontier model (2) we impose standard linear homogeneity and symmetry restrictions. Additionally, we include time and country effects. The model then is estimated via a maximum likelihood procedure parameterized in terms of the variance parameters $\sigma_\varepsilon^2 = \sigma_u^2 + \sigma_v^2$ and $\gamma = \sigma_u^2 / \sigma_\varepsilon^2$.

In order to define bank inputs and outputs we follow Sealey and Lindley (1977) and opt for the intermediation approach. This approach assumes that the main function of banks is to use labour and capital in order to collect funds with the scope of transforming them into loans and other income generating assets. More specifically, two inputs and two outputs are specified. Inputs include labour (as measured by personnel expenses) and financial capital while loans (net of provisions) and other earning assets (government securities, bonds, equity investments, CDs and T-bills) are the outputs.

In terms of the input prices, we calculate the price of the financial capital as the ratio of total interest expenses to total interest bearing borrowed funds while the price of labour is represented with the ratio of personnel expenses to total assets. The sum of overheads, such as personnel and administrative expenses, interest, fee, and commission expenses, represent the total cost of each bank in the sample.

Furthermore, we include the total level of equity of each bank in the model as a quasi-fixed netput. The reason for this is twofold: Firstly, equity represents an alternative source of funding for a bank. In this way, the level of equity of each bank has the potential to affect directly its cost structure (Berger and Mester, 1997). In addition to this, ignoring financial capital may lead to a biased estimation of efficiency as firms with higher equity capital, which denotes that the shareholders have more capital at stake, may behave in a more risk averse manner than firms with lower level of equity but still optimally (efficiently) given the

[1] For simplification, we omit the subscripts for time (t).

risk preferences of their shareholders. Additionally we include also each bank's level of fixed assets, as a proxy for physical capital, which is also a standard in the literature related to inefficiency estimation (Berger and Mester, 1997).

Finally, in estimating the efficiency frontier in a cross-country context is important to use variables that could capture country-level heterogeneity both in terms of the general macroeconomic environment but also in terms of the banking industry of each country as both of these kind of country-level variables have an influence on the technology of banks located within specific national boundaries. Thus, we also include real GDP growth per capita as an indicator of the dynamism of each economy. To control for macroeconomic stability we include the inflation rate. Finally, to account for the level of competition on the banking industry in each country, we use the sum of the assets of the three largest banks as a share of assets of all commercial banks (the C3 ratio).

2.2 Determinants of Bank Performance (Cost inefficiency)

The next part of the analysis uses the cost inefficiency scores in 3.1 to estimate the impact of the labour regulatory environment in the EU periphery economies, using as control variables bank-specific and country specific control variables.

2.2.1 Labour Regulations

The major focus of the paper is to examine the impact of Labour regulations on the performance of the banking sector of the periphery countries and therefore the Fraser Index of Economic Freedom (Gwartney et. al, 2012) is included in the model[2]. The use of this index is common in the economics literature[3] and consists of five factors: size of government; legal structure and security of property rights; access to sound money; freedom to exchange with foreigners; and regulation of credit, labour, and business. These are weighted and form a composite index, with 0 indicating the lowest and 10 the highest level of economic freedom. It is the last component that is of most interest as the emphasis in this paper is primarily on labour regulations and their impact on the banking industry.

To this end, the labour regulations component is decomposed to account for the following: i) Hiring regulations and minimum wage (MW-FR), ii) Hiring and firing regulations (HF-FR), iii) Centralized collective bargaining (CCB-FR), iv) Hours regulations (HR-FR), v)

[2] See table A2 for more details related to this index.
[3] See for example Carlsson and Lundstrom (2002).

Mandated cost of worker dismissal (DISS-FR) and vi) Obligatory conscription to military service (CON-FR). The overall Fraser labour regulation index is the average of these six subcomponents.

In order to enrich the results of the analysis we add an alternative index of labour regulation; the Strictness of Employment Protection index, which is published by the OECD. The OECD Strictness of Employment Protection index[4] (EMP-OECD) has a more narrow focus than the Fraser index described above as it is mostly focused on the dismissal costs. It is composed of three sub-indices:

- An indicator which accounts for strictness of regulation in relation to regular contract employees (EMPREG-OECD),
- An indicator which accounts for strictness of regulation in relation to fixed-term and temporary work agency contracts (EMPTEMP-OECD), and
- An indicator accounting for the additional costs for collective dismissals (EMPCOLL-OECD).

Each indicator takes a score from 0-6 with higher values indicating more stringent regulation. Scores for the labour regulation variables are shown in a cross-country context in Table 1.

(Insert Table 1 about here)

In terms of the Fraser Index of Labour Regulations, the overall performance (LR-FR) of Ireland is significantly better with a 7.55 score than the rest of the GIIPs reflecting the strong adaption of liberal economic policies in these country in recent years. On the other hand the Mediterranean GIIPs countries show relatively low levels of labour market flexibility as the scores for all of them are centred around 5. Similarly, according to the overall OECD index of employment protection (EMP-OECD), which focuses mostly on dismissal costs, Ireland again represents the least regulated economy in terms of labour. Ireland's overall employment protection index stands at 1.04 while none of the rest of the GIIPs economies score is lower than 1.9.

With respect to the components of the Fraser index a relatively similar picture emerges with Ireland being the best performer in terms of minimum wage restrictions (MW-FR) and hours regulations (HR-FR) while it also scores highly in terms of dismissal costs (DISS-FR). The rest of the countries score low in most of the Fraser index components although there are cases that a country might be performing well in a specific component. For example Italy is the best performer in terms of dismissal costs (DISS-FR) scoring 9.67 when the overall

[4] See table A3 of the appendix for more details related to this index

average for this component is 7.37. Another important characteristic of the individual component scores in the Fraser Index is than on average some types of labour regulation are less flexible than others in the overall sample. For example, although the overall figure for dismissal costs (DISS-FR) is 7.37, denoting a liberal behaviour of the GIIPs economies (with the exception of Portugal) towards labour redundancy, the figure for centralised collective bargaining (CCB-LR) stands only at the 4.37 level reflecting the importance of trade union in all the GIIPs economies.

Similar initials conclusion can also be derived by having a cursory look in the individual components of the OECD index of employment protection. The index for the cost for collective dismissal (EMPCOLL-OECD), a proxy for trade union bargaining power, is much higher than the average for the other two components. This verifies the importance of trade unions in all the countries of our sample as it was also found by looking at the qualitatively similar indicator of the Fraser Index (CCB-LR). In terms of country specific scores, Ireland is the best performer (lowest scores) in all the components of the OECD employment protection index while the worst performers differ in each component. Portugal is the most strictly regulated GIIPs market when it comes to dismissal of employees on regular contracts (EMPREG-OECD), while in terms of temporary contracts (EMPTEMP-OECD) is Spain. Finally, Italy exhibits the highest collective dismissal costs (EMPCOLL-OECD) denoting the high bargaining power that trade unions exhibit in this country.

(Insert Table 2 about here)

The time series data on the regulation indices in Table 2 suggest that some GIIPs economies have significantly improved their scores in terms of labour regulations over the 2000-2010 period. In particular Italy has increased its overall Fraser index labour regulation (LR-FR) scores from 4.87 in 2002 to 6.48 in 2010. This improvement is also reflected in the overall OECD index of employment protection (OECD-EMP), which has decreased from 2.51 in 2000 to 1.89 in 2008. Portugal and Greece have also improved significantly in terms of the OECD index of employment protection (OECD-EMP). The OECD-EMP score for Greece has declined from 3.50 in 2000 to 2.73 in 2008, while the corresponding scores for Portugal are 3.67 in 2000 and 2.88 in 2009.

2.2.2 Control Variables

A number of control variables are used to account for individual bank characteristics. We include a bank size measure, total assets (TA), as it may indicate higher diversification of a bank's loan portfolio (Mester, 1993). The ratio of equity to total assets (EA) is employed as a measure of the incentives of shareholders to monitor management performance (Aysan and Ceyhan, 2008; Tanna et al., 2011). The ratio of loans to assets (LA) is also included at it represents the level of focus on traditional banking activities (Fries and Taci, 2005). As a proxy for default risk we use the loan loss provisions as a share to total loans (LLPL) as it represents the quality of the credit portfolio. The ratio of liquid assets to total assets (LIQAS) is used as a proxy for liquidity risk (Demirguc-Kunt and Huizinga, 2004) From the one side, a high liquidity ratio (LIQAS) can serve as a defence mechanism in case of urgent liquidity issue, but on the other hand relatively high availability of liquid assets could increase bank expenditures because of additional expenses required in terms of storage costs. We also use the return on assets ratio (ROA) as a measure of profitability and the net interest margin (NIM). With regards to country level variables, in order to control for financial development we use domestic credit to the private sector as a share of GDP (PSC/GDP) while to control for the general level of economic development and capture the sophistication of the domestic market, the real GDP per capita in purchasing power parity (PPP) terms is employed. These measures of development are used regularly in the bank efficiency literature (Grigorian and Manole, 2002; Kasman and Yildirim, 2006; Pasiouras, 2008). Finally, we use the ratio of inhabitants per square kilometre (DENS), a measure of population density, as a proxy for bank accessibility to potential customers.

3. Results and Discussion

3.1 *Cost Inefficiency Estimates*

Cross-country and cross-time cost inefficiency scores for the periphery economies over the 2000-2010 period are reported in Table 3.

(Insert Table 3 about here)

One cannot fail to notice that that the average bank cost inefficiency for the sample stands at around 0.17 implying that these banks need to improve by 17%, to reach the cost efficiency

frontier. Such inefficiency scores are compatible with the extant literature on bank efficiency in the EU (Brissimis et al., 2010; Chortareas et al. 2011). Bank inefficiency scores are higher in Ireland (0.189), a country that experienced tremendous difficulties in its banking system. On the other hand, the banking systems of the periphery economies of southern Europe, with the exception of Portugal, are found to performing better than the GIIPs average. In terms of the time series, it is noticeable an acute increase of the inefficiency of the banks in our sample in 2008, a year that represents the European onset of the global financial crisis. This inefficiency increase in 2008 is followed by two years (2009 and 2010) of improved bank performance before the commencement of the severe phase of the sovereign debt crisis from 2011 onwards.

3.2 *The Determinants of Bank Performance (Cost Inefficiency)*

3.2.1 The Impact of the Control Variables

As a first part of the analysis of the second stage results we provide an overview of the impact of the bank-specific and country-level control variables on bank inefficiency (see Tables 4 to 11). Bank size, as measured by the natural logarithm of total assets (lnTA), exerts a negative and statistically significant impact on inefficiency. This results provides supporting evidence to the view that larger banks are able to perform better than smaller ones duo to better diversified asset portfolio (Mester, 1993). The coefficient of the equity to assets (EA) ratio is also negative and significant in most models in line with Tanna et al. (2011). In terms of the risk measures we find that the loan loss provisions to total loans ratio (LLPL) has a positive and statistically significant on bank inefficiency, while the effect of the liquidity ratio (LIQAS) is significant and negative in most models. The positive association between the loan loss provision to total loans ratio (LLPL) and bank inefficiency lends support to the "bad management" and the "bad luck" hypothesis (Berger and De Young, 1997). According to the "bad management" hypothesis the capabilities of the bank managers determine the quality of a bank's loan portfolio. This suggests a negative association between bank performance and the LLPL ratio. On the other hand, the "bad luck" hypothesis posits that increases of impaired loans due to exogenous events forces banks to increase their cost in order to administer such situation. The negative impact of liquidity (LIQAS) on inefficiency is in line with previous studies who find that liquidity has a positive effect on bank performance (Demirguc-Kunt and Huizinga, 1999; Kosmidou, 2008). Furthermore, the net

interest margin (NIM) exerts a positive effect on inefficiency. In terms of the development control variables, we find that GDP per capita (lnGDPcap) and the level of financial development (PSC/GDP) have a positive impact on bank inefficiency in line with (Dietsch and Lozano-Vivas, 2000; Grigorian and Manole, 2002; Kasman and Yildirm, 2006).

3.2.2 The Impact of Labour Regulation using the Fraser Index

Tables 4 and 5 report the fixed effects and dynamic panel[5] results respectively for the subcomponents and the overall score of the Fraser index of labour regulation.

(Insert Table 4 and 5 about here)

In the fixed effects models the overall index of labour regulation (LR-FR) has a negative impact on inefficiency but this is not statistically significant (see model 8 of Table 4). The results for the subcomponents of the index reveal that most of them have a negative impact on inefficiency, while only the dismissal cost (DISS-FR) variable is statistically significant at the 1% level (see model 4 of Table 4). When all the subcomponents of the Fraser labour regulation index are included in the same regression (see model 7 of Table 4) dismissal cost regulation (DISS-FR) retain its negative sign and significance. The dynamic panel results in Table 5 further confirm the negative impact at the 1% level of dismissal cost (DISS-FR) on bank inefficiency (see models 4 and 7 of Table 5). Furthermore, in the dynamic panel models, the hiring-firing variable (HF-FR) is also significant at the 5% level (see model 2 of Table 5). The hiring-firing variable (HF-FR) though loses its significance in model 8 of Table 5 when we control for the rest of the labour regulation variables, while the minimum wage and hiring regulation (MW-FR) variable becomes significant at the 5% level exerting a negative effect on inefficiency. Finally, in the dynamic panel results the overall Fraser index of labour regulation (LR-FR) has a negative and statistically significant at the 5% level. The above results provide evidence that stringent regulation of labour has a negative impact on bank performance. However, not all types of labour regulation matter equally. The negative effect of labour regulation on bank performance is found to be channelled mainly through the regulation of dismissal costs and less through rigidities in the hiring process. These results are

[5] In all of our dynamic panel models we use the two-step system GGM (Arellano and Bover, 1995) specification with Windmeijer-corrected (robust) standard errors. Diagnostics tests such as the AR2 and the Hansen-J test have verified the validity of the dynamic panel models.

in accordance with the previous literature that finds a negative relationship between the stringency of labour regulation and performance, which stems from increased dismissal costs (Bassanini et al. 2009; Autor et al. 2007). Less stringent dismissal cost regulation can liberate firms from unproductive workers, that otherwise would be retained as employees, resulting in performance gains (Eslava et al., 2004). Additionally , less rigid labour regulation can have a positive impact on the productivity of employees as it stimulates their motivation (Ichino and Riphahn, 2005; Riphahn 2004), and thus can have a positive impact on bank performance. Furthermore, a decrease in the labour regulation rigidities can increase firm profitability (Almeida and Carneiro, 2009; Draca et al., 2011) which can lead to further efficiency gains.

3.2.3 The Impact of Labour Regulation using the OECD index of Employment Protection

In order to enrich the analysis and add more validity to the results obtained with the use of the Fraser index of labour regulation we also present results from fixed effects and dynamic panel models that use the OECD index of employment protection as a measure of labour regulation rigidities. These results are available in Tables 6 and 7.

(Insert Table 6 and 7 about here)

The overall OECD index of employment protection is found to have a positive and statistically significant at the 1% level impact on bank inefficiency in the dynamic panel analysis (see model 5 of Table 7). This result confirms the findings of the models in section 3.2.2 with regards to the impact of dismissal costs on bank inefficiency using the Fraser index. Moving to the three subcomponents of the OECD index of employment protection, the employment protection of regular contracts (EMPREG-OECD) asserts a positive and significant at the 1% level impact on bank inefficiency in both the fixed effects and the dynamic panel estimations (see model 1 of Table 6 and Table 7). These findings remain robust when the rest of the subcomponents of the OECD index of employment are included in the models (see models 4 of Table 6 and Table 7). The two other subcomponents of the OECD index, employment protection of temporary contracts (EMPTEMP-OECD) and protection from collective dismissals (EMPCOLL-OECD) are generally not found to have a significant impact on bank inefficiency. Only the protection from collective dismissal variable (EMPCOLL-OECD) exerts a positive and significant at the 1% level impact on inefficiency (see model 3 of Table 7), however its coefficient becomes insignificant when we control for the rest of the subcomponents of the OECD index. The use of the OECD index

employment protection adds further validity to the results obtained with the use of Fraser index that the main channel through which labour regulation can harm bank performance is through dismissal costs. Labour regulation rigidities can also have a negative effect on bank performance because they can act as barriers to entry for new firms (Scarpetta et al. 2002; Klapper et al. 2006), decreasing in such way competition. Decreased competition may have a negative effect on the performance of the non-banking sectors, hampering in that way the fulfilment of their obligations, such as loans, to banks. In addition to this, stringent labour regulation may increase firm informality (Loyaza, 1996; Schneider and Enste, 2000; Botero et al., 2004), making it in that way harder and more costly for banks to evaluate the creditworthiness of potential borrowers (Hoff and Stiglitz, 1993; Besley, 1995). Furthermore, the regulation of labour can also decrease performance because it disincentives firms to innovate (Saint Paul, 2002; Michie and Sheehan, 2003; Koeniger, 2005; Barbosa and Faria, 2011).

3.2.4 Is the impact of Labour Regulation on Bank Performance Dependent on the Rule of Law?

An interesting issue to explore further is whether the impact of labour regulation on bank performance differs according to the level of law enforcement capabilities of each country. This is because in the presence of weak rule of law and low bureaucratic quality, a regulation might exist formally but is not implemented. Previous literature on the impact of labour regulation on economic outcomes find that being able to enforce the regulation is of importance (Almeida and Carneiro, 2009; Caballero et al. 2013). In this study we follow Caballero et al. (2013) and interact the labour regulation variables with the rule of law variable (RL-WB) from the World Governance Indicators of the World Bank. This indicator captures the level to which regulations are enforced in a country as well as judicial efficiency. The results for the dynamic panel models that include the interaction terms of the rule of law (RL-WB) with the labour regulation components of the Fraser index and of the OECD index of employment protection are presented in Tables 8 and 9 respectively.

(Insert Table 8 and 9 about here)

In model 1 of Table 8 we can see that the individual effect of hiring and minimum wage regulation (MW-FR) on bank inefficiency is negative and statistically significant at the 5% level while its interaction with the rule of law (RL-WB) has a positive and statistically significant at the 10% coefficient. Similarly, the interaction between hours regulation (HR-

FR) and the rule of law (RL-WB) is positive and statistically significant at the 1% level when the individual effect of the hours regulation (HR-FR) variable on bank performance is negative and significant at the 5% level (see model 5 of table 8). Furthermore, the interaction between dismissal costs (DISS-FR) and the rule of law (RL-WB) is positively and significantly at the 5% level related with inefficiency (see model 4 of Table 8). In this case though, the negative coefficient of the individual effect of the dismissal cost (DISS-FR) variable is not statistically different from zero. These results are confirmed in the models that use the alternative labour regulation measure; the OECD index of employment protection. More particularly, in model 1 of Table 9 the employment protection of regular contracts (EMPREG-OECD) has a positive and statistically significant at the 1% level impact on bank inefficiency while the coefficient of its interaction with the rule of law (RL-WB) is also positive and significant at the 10% level. Interestingly, the interaction terms between both labour regulation measures, the Fraser index and OECD index of employment protection, and the rule of law (RL-WB) show that the negative impact of rigid labour regulation on bank performance becomes more subdued in the presence of higher levels of law enforcement. This is in contrast with Almeida and Carneiro (2009) who find that it is the actual enforcement of labour regulation that can affect negatively firm performance because of increased compliance costs. A possible channel through which higher levels of rule could moderate the negative effect of labour regulation on bank performance is by limiting the increase of firm informality that stems from stringent labour regulation (Loyaza, 1996; Schneider and Enste, 2000; Botero et al., 2004), which could increase the costs of financial intermediation for banks as it becomes harder for banks to screen borrowers (Hoff and Stiglitz, 1993; Besley, 1995). This is because rule of law and judicial efficiency is found to decrease the level of the unofficial economy (Loyaza, 1996; Johnson et al., 1998; Friedman et al., 2000). Another possible explanation could be that the enforcement of labour regulation might bring some marginal benefits to firm performance such as human capital accumulation towards firm-specific skills (Agell, 1999; Wasmer, 2006) and reduction in excessive labour turnover (Auer, 2007) which could have a negative impact on costs.

3.2.5 Does the Impact of Labour Regulation on Bank Performance Differs in the Crisis Period?

In this section we explore whether the impact of labour on bank performance becomes more subdued or is magnified during the crisis. For this reason we create a crisis dummy (CRISIS-

DUM) for the last three years of our sample, that is from 2008 to 2010. Then we estimate dynamic panel models that include the crisis dummy variable (CRISIS-DUM) and its interaction with the labour regulation variables of the Fraser index and the OECD index of employment protection. These estimations are available in tables 10 and11.

(Insert Table 10 and 11 about here)

In model 7 of Table 10 the overall Fraser labour regulation (LR-FR) variable exerts a negative and significant at the 1% level impact on bank inefficiency while the coefficient of its interaction with the crisis dummy (CRISIS-DUM) is also negative and significant at the 1% level. The models 1 to 6 of Table 10 include the interactions of the crisis dummy (CRISIS-DUM) with the subcomponents of the Fraser labour regulation index. In model 2 of Table 10 the interaction of the hiring and firing regulation (HF-FR) with the crisis dummy (CRISIS-DUM) is negative and statistically significant at the 1% level while the main effect of the hiring and firing regulation (HF-FR) is also negative and significant at the 5% level. These result provide evidence that the negative effect of stringent labour regulation in general, and in particular of regulation rigidities in the hiring and firing process, on bank performance becomes more magnified during the crisis years. This outcome is further validated in the dynamic panel models that include the OECD index of employment protection. In model 4 of table 11 the individual effect of the overall employment protection (EMP-OECD) on bank inefficiency is positive at the 5% level while the coefficient of its interaction term with the crisis dummy (CRISIS-DUM) is also positive and significant at the 10% level. In terms of the subcomponents of the OECD employment protection index, the interaction term between the costs of collective dismissals (EMPCOLL-OECD) and the crisis dummy (CRISIS-DUM) as well as the individual effect of the cost of collective dismissals (EMPCOLL-OECD) assert a positive impact on bank inefficiency at the 10% and 1% levels of significance respectively. A possible explanation of these results could be that countries with higher labour market rigidities experience deeper recessions (Forteza and Rama, 2006; Artha and de Haan, 2011). This is because stringent labour regulation can impede the creative-destruction process (Caballero et al. 2013) that facilitates the reallocation of resources from declining firms and sectors to expanding ones and so increase productivity (Foster et al., 2001; Bartelsman et al., 2009). This deterioration of the performance of firms located in countries with stringent labour regulation during the crisis could be channelled in the banking sector through increased levels of non-performing loans.

4. Conclusion

In this study we explore if labour regulation is a statistically significant determinants of bank performance for the banks located in the Eurozone periphery. To this end, we use SFA to estimate bank specific inefficiencies for the 2000-2010 period. Then we regress these inefficiency scores over several labour regulation variables along with several bank-specific and country-specific control variables. We use two different data sources for the labour regulation variables in order to increase the validity of our results. These are the Fraser Index of Economic Freedom (Gwartney et. al, 2012) and the OECD Employment Protection Index. Our empirical findings reveal that stringent labour regulation has a statistically negative impact on bank performance, that is it increases bank cost inefficiency. By decomposing the labour regulation components of the Fraser Index of Economic Freedom (Gwartney et. al, 2012) we identify that the type of regulation that is most harmful for bank performance are dismissal costs. The results of the models that employ the OECD Employment Protection Index confirm the negative effect of dismissal cost regulation on bank performance and further identify that it is the dismissal cost regulation of employees in regular contracts that matters the most for bank performance. The use of interaction terms between a dummy for the crisis years (2008-2010) and the labour regulation variables exposes that the negative impact of rigid regulation of labour becomes magnified during economic shocks. Thus a decrease in the stringency of labour regulation in the countries of the Eurozone periphery may prove to be beneficial for the performance of their bank sectors and make it more resilient at periods of economic downturn. In further analysis by using interaction terms between labour regulation and the rule of law we find that the negative individual effect of labour regulation on bank performance becomes more subdued at higher levels of law observance. This could be attributed to some positive effects of enforcing labour regulation on firm performance because of increased firm-specific knowledge of the employees. Another explanation could be that higher levels of rule of law could act as a deterrent for firms to enter the unofficial economy in order to avoid stringent labour regulation. This could increase bank costs because it would be harder for them to evaluate the creditworthiness of borrowers.

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Table 1: Labour Regulation in the GIIPs Economies (2000-2010)

Country	MW-FR	HF-FR	CCB-FR	HR-FR	DISS-FR	CON-FR	LR-FR	EMPREG-OECD	EMPTEMP-OECD	EMPCOLL-OECD	EMP-OECD
GREECE	5.44	3.04	3.85	3.93	7.66	1.82	**4.30**	2.30	3.64	3.25	**2.97**
IRELAND	8.00	4.15	3.69	9.00	8.33	10.00	**7.55**	1.60	0.48	2.38	**1.04**
ITALY	5.41	2.52	3.69	6.07	9.67	6.52	**5.92**	1.77	2.14	4.88	**1.95**
PORTUGAL	5.47	2.61	5.63	5.48	1.36	8.18	**4.97**	4.17	2.71	2.58	**3.44**
SPAIN	2.39	2.85	5.33	5.66	4.88	9.25	**5.20**	2.52	3.47	3.13	**2.99**
GIIPs Average	4.52	2.71	4.37	5.85	7.37	7.34	**5.57**	2.22	2.65	3.97	**2.43**

Note: For the Fraser Index Components figures are in means and in a 0-10 scale. Higher values denote a more liberal regulatory environment. LR-FR: overall regulations index, MW-FR: hiring and minimum wage regulation, HF-FR: hiring and firing regulation, CCB-FR: centralised collective bargaining, DISS-FR: dismissal cost, CON-FR: conscription regulation. For the OECD index figures are in means and in a 0-6 scale. Higher values denote a less liberal regulatory environment. EMP-OECD: overall index of strictness of employment protection, EMPREG-OECD: strictness of employment protection for regular contract, EMPTEMP-OECD: strictness of employment protection for temporary contracts, EMPCOLL-OECD: additional costs for collective dismissal
Source: The 2012 version of the Fraser Index of Economic Freedom for LR-FR, MW-FR, CCB-FR, HR-FR, CON-FR and the OECD Employment Protection Index for EMP-OECD, EMPREG-OECD, EMPTEMP-OECD and EMPCOLL-OECD.

Table 2 : Cross-Country Labour Regulation Over Time in the GIIPs Economies (2000-2010)

	Greece		Ireland		Italy		Portugal		Spain	
year	LR-FR	OECD-EMP	LR-FR	OECD-EMP	LR-FR	OECD-EMP	LR-FR	OECD-EMP	LR-FR	OECD-EMP
2000	.	3.50	.	0.93	.	2.51	.	3.67	.	2.93
2001	.	3.50	.	0.93	.	2.01	.	3.67	.	3.05
2002	4.08	3.50	7.62	0.93	4.87	2.01	4.27	3.67	5.14	3.05
2003	4.14	2.73	7.28	1.11	4.92	1.82	4.35	3.67	5.20	2.98
2004	4.15	2.73	7.40	1.11	5.35	1.82	5.33	3.46	5.43	2.98
2005	4.01	2.73	7.48	1.11	6.49	1.82	5.26	3.46	5.33	2.98
2006	4.39	2.73	7.48	1.11	6.40	1.82	5.27	3.46	5.36	2.98
2007	4.66	2.73	7.54	1.11	6.17	1.82	5.29	3.46	5.30	2.98
2008	4.43	2.73	7.58	1.11	6.30	1.89	5.18	3.15	5.14	2.98
2009	4.50	.	7.77	.	6.76	.	5.16	2.88	5.05	.
2010	4.36	.	7.93	.	6.48	.	4.67	.	4.72	.

Note: For the Fraser Index Components figures are in means and in a 0-10 scale. Higher values denote a more liberal regulatory environment. LR-FR: overall regulations index. Note that LR-FR is not available for 2001 and 2002 as one of the overall labour regulation components, dismissal costs (DISS-FR) is not available for these years. For the OECD index figures are in means and in a 0-6 scale. Higher values denote a less liberal regulatory environment. EMP-OECD: overall index of strictness of employment protection.
Source: The 2012 version of the Fraser Index of Economic Freedom for LR-FR, MW-FR, CCB-FR, HR-FR, CON-FR and the OECD Employment Protection Index for EMP-OECD, EMPREG-OECD, EMPTEMP-OECD and EMPCOLL-OECD.

Table 3: Cross-Country and Cross-Time Bank Cost Inefficiency in the GIIPs Economies (2000-2010)

Cross-Country Inefficiency Scores			
	Mean	**Std. Dev.**	**Obs**
Greece	0.162	0.065	179
Ireland	0.189	0.100	84
Italy	0.169	0.090	1633
Portugal	0.175	0.088	234
Spain	0.167	0.093	1000
GIIPs	0.169	0.090	3130
Cross-Time Inefficiency Scores			
	Mean	**Std. Dev.**	**Obs**
2000	0.166	0.094	314
2001	0.177	0.095	327
2002	0.171	0.093	313
2003	0.170	0.097	308
2004	0.174	0.112	296
2005	0.152	0.069	285
2006	0.163	0.085	275
2007	0.176	0.079	260
2008	0.191	0.089	265
2009	0.157	0.084	265
2010	0.155	0.066	222

Note: The table reports the mean cost inefficiency scores by country and by year over the 2000-2010 periods. The cost inefficiencies were estimated using stochastic frontier analysis and assuming a common cross-country frontier.

Table 4: The Impact of Labour Regulation on Bank Performance using the Fraser Index: Fixed Effects Models

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF	(5) INEF	(6) INEF	(7) INEF	(8) INEF
lnTA	-0.00309	-0.00193	-0.00235	0.00305	-0.00121	-0.00272	0.00586	0.00626
	(0.0114)	(0.0115)	(0.0112)	(0.0155)	(0.0115)	(0.0113)	(0.0171)	(0.0168)
LA	0.0186	0.0201	0.0233	0.0453	0.0248	0.0197	0.0486	0.0485
	(0.0379)	(0.0374)	(0.0375)	(0.0347)	(0.0370)	(0.0384)	(0.0367)	(0.0344)
EA	-0.164**	-0.163**	-0.159**	-0.113	-0.160**	-0.165**	-0.109	-0.114
	(0.0783)	(0.0797)	(0.0799)	(0.125)	(0.0783)	(0.0783)	(0.129)	(0.126)
LLPL	-0.0183	-0.0175	-0.0179	0.184**	-0.0168	-0.0183	0.181**	0.184**
	(0.0645)	(0.0648)	(0.0650)	(0.0904)	(0.0651)	(0.0646)	(0.0904)	(0.0876)
NIM	0.0164***	0.0164***	0.0160***	0.0179***	0.0160***	0.0163***	0.0179***	0.0188***
	(0.00545)	(0.00543)	(0.00572)	(0.00447)	(0.00561)	(0.00547)	(0.00476)	(0.00432)
ROA	-0.00317	-0.00326	-0.00321	-0.00718***	-0.00319	-0.00319	-0.00738***	-0.00757***
	(0.00234)	(0.00234)	(0.00235)	(0.00271)	(0.00235)	(0.00234)	(0.00265)	(0.00266)
LIQAS	-0.00867	-0.0103	-0.00574	0.0480	-0.00720	-0.00862	0.0436	0.0423
	(0.0435)	(0.0443)	(0.0432)	(0.0371)	(0.0431)	(0.0438)	(0.0394)	(0.0375)
lnGDPcap	-0.0511	-0.0701	-0.0486	0.0632	-0.0965	-0.0594	-0.0251	0.0447
	(0.0744)	(0.0656)	(0.0704)	(0.0831)	(0.0931)	(0.0766)	(0.106)	(0.101)
PSC/GDP	0.000287**	0.000322**	0.000269*	0.000193	0.000322**	0.000294**	0.000256	0.000231
	(0.000143)	(0.000130)	(0.000148)	(0.000174)	(0.000141)	(0.000142)	(0.000162)	(0.000159)
lnDENS	-0.00269	-0.00379**	-0.00320*	-0.000688	-0.00354*	-0.00311	-0.00284	-0.00380
	(0.00226)	(0.00182)	(0.00190)	(0.00227)	(0.00202)	(0.00190)	(0.00298)	(0.00264)
MW-FR	0.000709						0.00234	
	(0.00192)						(0.00162)	
HF-FR		-0.000482					-0.00126	
		(0.000746)					(0.00123)	
CCB-FR			-0.00406				-0.00240	
			(0.00377)				(0.00439)	
DISS-FR				-0.0138***			-0.0143***	
				(0.00492)			(0.00539)	
HR-FR					-0.00296		-0.00127	
					(0.00313)		(0.00324)	
CON-FR						-0.00139	0.00582	
						(0.00310)	(0.00383)	
LR-FR								-0.00342
								(0.00517)
Constant	0.672	0.855	0.657	-0.521	1.123	0.759	0.342	-0.459
	(0.747)	(0.658)	(0.708)	(0.825)	(0.932)	(0.770)	(0.988)	(0.933)
Observations	2,906	2,906	2,906	2,269	2,906	2,906	2,269	2,269
R-squared	0.051	0.051	0.052	0.099	0.052	0.051	0.103	0.095
Number of banks	425	425	425	373	425	425	373	373

Note: The table reports the fixed-effects regression results for the MW-FR (hiring and minimum wage regulation), HF (hiring-firing regulation), CCB (centralised collective bargaining), HR-FR (hours regulation), DISS-FR (dismissal cost) and the overall labour regulation (LR-FR) variables over the 2000-2010 periods. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

Table 5: The Impact of Labour Regulation on Bank Performance using the Fraser Index: Dynamic Panel Models

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF	(5) INEF	(6) INEF	(7) INEF	(8) INEF
L.INEF	0.543***	0.528***	0.539***	0.535***	0.540***	0.541***	0.555***	0.538***
	(0.108)	(0.107)	(0.107)	(0.102)	(0.107)	(0.108)	(0.106)	(0.0975)
lnTA	-0.0234*	-0.0266**	-0.0230*	-0.0145	-0.0225*	-0.0245*	-0.0229	-0.0134
	(0.0129)	(0.0116)	(0.0127)	(0.0148)	(0.0126)	(0.0130)	(0.0154)	(0.0128)
LA	0.0198	0.0106	0.0254	0.0879**	0.0450	0.0139	0.0956**	0.0800*
	(0.0525)	(0.0547)	(0.0552)	(0.0427)	(0.0574)	(0.0579)	(0.0432)	(0.0443)
EA	-0.306*	-0.329**	-0.339**	-0.244*	-0.363**	-0.353**	-0.278**	-0.262*
	(0.168)	(0.153)	(0.166)	(0.146)	(0.152)	(0.171)	(0.135)	(0.135)
LLPL	0.0314*	0.0347**	0.0337**	-0.152	0.0305*	0.0290	-0.136	-0.159
	(0.0182)	(0.0157)	(0.0166)	(0.161)	(0.0165)	(0.0183)	(0.168)	(0.176)
NIM	0.0109***	0.0104***	0.0108***	0.0102**	0.0100***	0.0114***	0.00922**	0.0101**
	(0.00327)	(0.00339)	(0.00325)	(0.00444)	(0.00318)	(0.00350)	(0.00421)	(0.00474)
ROA	0.000205	0.000208	0.000436	-0.00258	0.000275	7.87e-05	-0.000947	-0.00320
	(0.00359)	(0.00271)	(0.00313)	(0.00468)	(0.00296)	(0.00357)	(0.00409)	(0.00500)
LIQAS	-0.0928*	-0.111**	-0.0841	-0.0280	-0.0690	-0.0930*	-0.0403	-0.0554
	(0.0515)	(0.0531)	(0.0539)	(0.0356)	(0.0539)	(0.0553)	(0.0376)	(0.0386)
lnGDPcap	0.107	0.0555	0.115	0.268***	0.0583	0.125	0.212*	0.114
	(0.0883)	(0.0954)	(0.0902)	(0.101)	(0.0992)	(0.0935)	(0.125)	(0.125)
PSC/GDP	0.000364**	0.000530***	0.000336*	0.000106	0.000380**	0.000364**	0.000246	0.000336
	(0.000183)	(0.000185)	(0.000183)	(0.000204)	(0.000191)	(0.000184)	(0.000228)	(0.000211)
lnDENS	-0.00333	-0.00565*	-0.00247	0.00390	-0.00239	-0.00255	0.00137	-0.00283
	(0.00246)	(0.00315)	(0.00245)	(0.00274)	(0.00260)	(0.00249)	(0.00398)	(0.00376)
MW-FR	-0.00183						-0.00285**	
	(0.00134)						(0.00138)	
HF-FR		-0.00211**					-0.000454	
		(0.00100)					(0.00101)	
CCB-FR			-0.00195				0.00136	
			(0.00242)				(0.00266)	
DISS-FR				-0.0113***			-0.0120***	
				(0.00413)			(0.00458)	
HR-FR					-0.00411		-0.00602	
					(0.00264)		(0.00385)	
CON-FR						0.00434	0.00104	
						(0.00289)	(0.00270)	
LR-FR								-0.00947**
								(0.00406)
Constant	-0.689	-0.0942	-0.779	-2.446**	-0.206	-0.871	-1.732	-0.911
	(0.973)	(1.051)	(0.989)	(1.170)	(1.095)	(1.010)	(1.407)	(1.416)
Observations	2,456	2,456	2,456	2,159	2,456	2,456	2,159	2,159
Number of banks	381	381	381	355	381	381	355	355

Note: The table reports the dynamic panel regression results for the MW-FR (hiring and minimum wage regulation), HF (hiring-firing regulation), CCB (centralised collective bargaining), HR-FR (hours regulation), DISS-FR (dismissal cost) and the overall labour regulation (LR-FR) variables over the 2000-2010 periods. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

Table 6: The Impact of Labour Regulation on Bank Performance using the OECD Index of Employment Protection: Fixed Effects Models

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF	(5) INEF
lnTA	0.00418	0.00105	0.00258	0.00282	0.00131
	(0.0119)	(0.0121)	(0.0119)	(0.0120)	(0.0122)
LA	-0.00148	-0.0140	-0.0130	-0.00519	-0.0136
	(0.0462)	(0.0456)	(0.0440)	(0.0463)	(0.0457)
EA	-0.168*	-0.180**	-0.175**	-0.164*	-0.182**
	(0.0871)	(0.0837)	(0.0810)	(0.0852)	(0.0841)
LLPL	-0.00724	-0.00756	-0.00748	-0.00816	-0.00723
	(0.0678)	(0.0675)	(0.0676)	(0.0677)	(0.0676)
NIM	0.0178***	0.0187***	0.0185***	0.0179***	0.0188***
	(0.00641)	(0.00617)	(0.00605)	(0.00645)	(0.00617)
ROA	-0.00406	-0.00401	-0.00408	-0.00396	-0.00402
	(0.00279)	(0.00274)	(0.00274)	(0.00280)	(0.00273)
LIQAS	-0.0496	-0.0565	-0.0547	-0.0479	-0.0577
	(0.0557)	(0.0551)	(0.0546)	(0.0551)	(0.0553)
lnGDPcap	-0.270***	-0.230**	-0.211**	-0.291***	-0.218**
	(0.104)	(0.108)	(0.103)	(0.100)	(0.109)
PSC/GDP	0.000726***	0.000584***	0.000563***	0.000757***	0.000561***
	(0.000164)	(0.000175)	(0.000167)	(0.000164)	(0.000174)
lnDENS	0.000797	0.00209	-0.000177	0.00261	0.00150
	(0.00221)	(0.00221)	(0.00218)	(0.00226)	(0.00221)
EMPREG-OECD	0.0854***			0.0925***	
	(0.0326)			(0.0324)	
EMPTEMP-OECD		-0.0113		-0.0115	
		(0.03474)		(0.03482)	
EMPCOLL-OECD			0.0246	-0.00561	
			(0.0196)	(0.0194)	
EMP-OECD					-0.0154
					(0.0103)
Constant	2.568**	2.450**	2.109**	2.836***	2.331**
	(1.021)	(1.063)	(1.018)	(0.999)	(1.071)
Observations	2,461	2,461	2,479	2,461	2,461
R-squared	0.082	0.078	0.071	0.087	0.076
Number of banks	412	412	412	412	412

Note: The table reports the fixed-effects regression results for the overall Strictness of Employment Protection Index published by the OECD as well as its components. EMP-OECD stands for the overall index, EMPREG-OECD stands for the strictness of regulation related to employees on regular contracts, EMPTEMP-OECD stands for the strictness of regulation related to employees in fixed-term/temporary contracts and EMPCOLL-OECD accounts for additional costs for collective dismissals. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable is the cost inefficiency scores(INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

Table 7: The Impact of Labour Regulation on Bank Performance using the OECD Index of Employment Protection: Dynamic Panel Models

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF	(5) INEF
L.INEF	0.614***	0.611***	0.673***	0.594***	0.603***
	(0.109)	(0.132)	(0.102)	(0.107)	(0.132)
lnTA	-0.0243**	-0.0156	-0.00210	-0.0203	-0.0200
	(0.0122)	(0.0110)	(0.00981)	(0.0157)	(0.0123)
LA	-0.0347	-0.0298	0.0117	-0.0240	-0.0227
	(0.0542)	(0.0571)	(0.0643)	(0.0577)	(0.0616)
EA	-0.226	-0.218	-0.243	-0.235	-0.266
	(0.171)	(0.159)	(0.190)	(0.170)	(0.162)
LLPL	0.0218	0.0231	0.0242	0.0222	0.0275
	(0.0340)	(0.0326)	(0.0338)	(0.0345)	(0.0307)
NIM	0.00994*	0.0123**	0.0141**	0.0101*	0.0108**
	(0.00578)	(0.00559)	(0.00681)	(0.00573)	(0.00533)
ROA	-0.00506	-0.00352	-0.00227	-0.00485	-0.00277
	(0.00774)	(0.00746)	(0.00806)	(0.00783)	(0.00696)
LIQAS	-0.140**	-0.124**	-0.0593	-0.130**	-0.124*
	(0.0561)	(0.0610)	(0.0598)	(0.0552)	(0.0635)
lnGDPcap	0.0490	-0.0799	-0.0950	0.0721	0.0376
	(0.107)	(0.137)	(0.0992)	(0.104)	(0.161)
PSC/GDP	0.000612***	0.000591***	0.000513***	0.000566***	0.000530**
	(0.000183)	(0.000214)	(0.000155)	(0.000207)	(0.000239)
lnDENS	0.00305	0.00247	0.00144	0.00368	0.00336
	(0.00210)	(0.00205)	(0.00239)	(0.00235)	(0.00216)
EMPREG-OECD	0.0953***			0.101***	
	(0.0209)			(0.0254)	
EMPTEMP-OECD		0.00531		0.00855	
		(0.00828)		(0.00812)	
EMPCOLL-OECD			0.0313**	0.0101	
			(0.0142)	(0.0248)	
EMP-OECD					0.0382**
					(0.0176)
Constant	-0.309	1.061	0.855	-0.683	-0.143
	(1.108)	(1.468)	(0.993)	(1.140)	(1.705)
Observations	2,031	2,031	2,049	2,031	2,031
Number of banks	366	366	366	366	366

Note: The table reports the dynamic panel regression results for the overall Strictness of Employment Protection Index published by the OECD as well as its components. EMP-OECD stands for the overall index, EMPREG-OECD stands for the strictness of regulation related to employees on regular contracts, EMPTEMP-OECD stands for the strictness of regulation related to employees in fixed-term/temporary contracts and EMPCOLL-OECD accounts for additional costs for collective dismissals. The dependent variable is the cost inefficiency scores(INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

Table 8: The Impact of Labour Regulation on Bank Performance using the Fraser Index: Interaction with the Rule of Law

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF	(5) INEF	(6) INEF	(7) INEF
L.INEF	0.512***	0.512***	0.498***	0.496***	0.543***	0.500***	0.511***
	(0.101)	(0.105)	(0.105)	(0.107)	(0.108)	(0.0986)	(0.104)
lnTA	-0.0121	-0.0163	-0.0190	-0.0204	-0.0132	-0.0164	-0.0154
	(0.0143)	(0.0130)	(0.0144)	(0.0152)	(0.0136)	(0.0138)	(0.0130)
LA	0.0680	0.0701	0.0758*	0.0892**	0.0803**	0.0745*	0.0732*
	(0.0423)	(0.0432)	(0.0438)	(0.0393)	(0.0407)	(0.0406)	(0.0430)
EA	-0.240	-0.260*	-0.285*	-0.209	-0.242*	-0.273*	-0.245*
	(0.151)	(0.145)	(0.170)	(0.143)	(0.138)	(0.146)	(0.141)
LLPL	-0.149	-0.173	-0.168	-0.153	-0.179	-0.156	-0.168
	(0.177)	(0.180)	(0.182)	(0.170)	(0.177)	(0.181)	(0.183)
NIM	0.0130***	0.0114**	0.0125**	0.0103**	0.0129***	0.0127***	0.0108**
	(0.00481)	(0.00495)	(0.00488)	(0.00462)	(0.00440)	(0.00479)	(0.00486)
ROA	-0.00460	-0.00419	-0.00460	-0.00373	-0.00420	-0.00352	-0.00377
	(0.00514)	(0.00563)	(0.00577)	(0.00511)	(0.00488)	(0.00514)	(0.00520)
LIQAS	-0.0513	-0.0561	-0.0453	-0.0171	-0.0373	-0.0422	-0.0551
	(0.0410)	(0.0406)	(0.0400)	(0.0362)	(0.0353)	(0.0373)	(0.0392)
lnGDPcap	0.168	0.137	0.166	0.282***	0.266**	0.158	0.143
	(0.104)	(0.118)	(0.107)	(0.105)	(0.127)	(0.118)	(0.125)
PSC/GDP	0.000302	0.000400*	0.000458**	0.000233	0.000289	0.000358*	0.000378*
	(0.000223)	(0.000214)	(0.000226)	(0.000232)	(0.000216)	(0.000216)	(0.000218)
lnDENS	-0.00233	-0.00306	-0.00109	-0.00281	-0.00185	-0.00158	-0.00308
	(0.00297)	(0.00367)	(0.00305)	(0.00341)	(0.00315)	(0.00298)	(0.00361)
RL-WB	-0.0166	-0.0541	-0.0606	-0.156**	-0.222***	-0.0163	-0.0950
	(0.0354)	(0.0368)	(0.0634)	(0.0613)	(0.0541)	(0.0269)	(0.0818)
MW-FR	-0.00686**						
	(0.00348)						
MW-FR*RL-WB	0.0105*						
	(0.00568)						
HF-FR		0.000730					
		(0.00249)					
HF-FR*RL-WB		0.00258					
		(0.00370)					
CCB-FR			-0.0204				
			(0.0133)				
CCB-FR*RL-WB			0.0280*				
			(0.0170)				
DISS-FR				-0.000404			
				(0.00513)			
DISS-FR*RL-WB				0.0158**			
				(0.00707)			
HR-FR					-0.0161**		
					(0.00720)		
HR-FR*RL-WB					0.0306***		
					(0.00921)		
CON-FR						-0.000907	
						(0.00690)	
CON-FR*RL-WB						0.00988	
						(0.00974)	
LR-FR							0.00193
							(0.0105)
LR-FR*RL-WB							-0.0122
							(0.0133)
Constant	-1.521	-1.185	-1.391	-2.632**	-2.658*	-1.408	-1.258
	(1.196)	(1.322)	(1.221)	(1.206)	(1.426)	(1.344)	(1.419)
Observations	2,159	2,159	2,159	2,159	2,159	2,159	2,159
Number of banks	355	355	355	355	355	355	355

Note: The table reports the dynamic panel regression results of the interaction of the rule of law (RL-WB) with the MW-FR (hiring and minimum wage regulation), HF (hiring-firing regulation), CCB (centralised collective bargaining), HR-FR (hours regulation), DISS-FR (dismissal cost) and the overall labour regulation (LR-FR) variables over the 2000-2010 periods. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

Table 9: The Impact of Labour Regulation on Bank Performance using the OECD Index of Employment Protection: Interaction with the Rule of Law

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF
L.INEF	0.617***	0.591***	0.590***	0.583***
	(0.0992)	(0.121)	(0.144)	(0.130)
lnTA	-0.0187*	-0.0115	0.00166	-0.0128
	(0.0112)	(0.0107)	(0.00959)	(0.0115)
LA	0.00994	0.00811	0.0496	0.0198
	(0.0442)	(0.0435)	(0.0504)	(0.0462)
EA	-0.0878	-0.104	-0.107	-0.0879
	(0.0954)	(0.0889)	(0.125)	(0.0985)
LLPL	-0.102	-0.192	-0.0703	-0.234
	(0.234)	(0.181)	(0.211)	(0.233)
NIM	0.0143***	0.0177***	0.0193***	0.0169***
	(0.00535)	(0.00604)	(0.00671)	(0.00610)
ROA	-0.0105	-0.0114	-0.0119	-0.0129
	(0.00816)	(0.00773)	(0.00781)	(0.00959)
LIQAS	-0.0967**	-0.0797**	-0.0132	-0.0719*
	(0.0413)	(0.0402)	(0.0370)	(0.0434)
lnGDPcap	0.0853	-0.00376	-0.0138	0.0837
	(0.155)	(0.145)	(0.142)	(0.164)
PSC/GDP	0.000569**	0.000597***	0.000556***	0.000528**
	(0.000240)	(0.000229)	(0.000183)	(0.000242)
lnDENS	0.00293	0.00231	-0.000521	0.00348
	(0.00346)	(0.00249)	(0.00389)	(0.00265)
RL-WB	-0.0941*	-0.0264	-0.102	-0.0445
	(0.0507)	(0.0404)	(0.112)	(0.0569)
EMPREG-OECD	0.134***			
	(0.0329)			
EMPREG-OECD*RL-WB	0.0448*			
	(0.0240)			
EMPTEMP-OECD		-0.00971		
		(0.0135)		
EMPTEMP-OECD*RL-WB		0.0163		
		(0.0180)		
EMPCOLL-OECD			0.0537*	
			(0.0304)	
EMPCOLL-OECD*RL-WB			-0.0164	
			(0.0232)	
EMP-OECD				0.00962
				(0.0252)
EMP-OECD*RL-WB				0.0239
				(0.0271)
Constant	-0.896	0.194	-0.196	-0.728
	(1.679)	(1.580)	(1.351)	(1.795)
Observations	1,734	1,734	1,752	1,734
Number of banks	340	340	340	340

Note: The table reports the dynamic panel regression results of the interaction of the rule of law (RL-WB) with the overall Strictness of Employment Protection Index published by the OECD as well as its components. EMP-OECD stands for the overall index, EMPREG-OECD stands for the strictness of regulation related to employees on regular contracts, EMPTEMP-OECD stands for the strictness of regulation related to employees in fixed-term/temporary contracts and EMPCOLL-OECD accounts for additional costs for collective dismissals. The dependent variable is the cost inefficiency scores(INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

Table 10: The Impact of Labour Regulation on Bank Performance using the Fraser Index: Interaction with the Crisis Dummy

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF	(5) INEF	(6) INEF	(7) INEF
L.INEF	0.537***	0.525***	0.516***	0.527***	0.535***	0.563***	0.545***
	(0.117)	(0.113)	(0.114)	(0.116)	(0.117)	(0.109)	(0.102)
lnTA	-0.0257*	-0.0287**	-0.0247*	-0.0150	-0.0246*	-0.0231*	-0.0230*
	(0.0136)	(0.0123)	(0.0132)	(0.0148)	(0.0137)	(0.0140)	(0.0139)
LA	0.0305	0.0133	0.0262	0.0826*	0.0459	-0.00126	0.0376
	(0.0539)	(0.0546)	(0.0542)	(0.0429)	(0.0562)	(0.0586)	(0.0399)
EA	-0.320*	-0.338**	-0.348**	-0.248*	-0.364**	-0.327*	-0.193
	(0.167)	(0.152)	(0.165)	(0.148)	(0.148)	(0.177)	(0.125)
LLPL	0.0323*	0.0341**	0.0333**	-0.131	0.0308*	0.0270	-0.101
	(0.0172)	(0.0159)	(0.0157)	(0.167)	(0.0159)	(0.0199)	(0.170)
NIM	0.0110***	0.0104***	0.0114***	0.0105**	0.0101***	0.0131***	0.0123**
	(0.00328)	(0.00354)	(0.00327)	(0.00446)	(0.00332)	(0.00459)	(0.00519)
ROA	0.000191	0.000252	0.000326	-0.00265	0.000397	-0.000705	-0.00425
	(0.00336)	(0.00267)	(0.00313)	(0.00464)	(0.00292)	(0.00412)	(0.00418)
LIQAS	-0.0780	-0.101*	-0.0788	-0.0283	-0.0617	-0.0858	-0.0650*
	(0.0520)	(0.0535)	(0.0529)	(0.0369)	(0.0512)	(0.0586)	(0.0390)
lnGDPcap	0.0711	0.0608	0.103	0.256**	0.0479	0.216**	0.159
	(0.0984)	(0.104)	(0.0937)	(0.120)	(0.109)	(0.100)	(0.130)
PSC/GDP	0.000295	0.000536***	0.000327*	0.000106	0.000397*	0.000226	0.000347
	(0.000187)	(0.000202)	(0.000180)	(0.000207)	(0.000209)	(0.000204)	(0.000228)
lnDENS	-0.00645**	-0.00620*	-0.00424	0.00265	-0.00272	-0.00623**	-0.0109**
	(0.00292)	(0.00335)	(0.00281)	(0.00350)	(0.00272)	(0.00289)	(0.00434)
CRISIS-DUM	0.0333***	0.0427***	0.0560*	0.0151	0.0207	0.133***	0.155***
	(0.0104)	(0.0112)	(0.0294)	(0.0218)	(0.0231)	(0.0223)	(0.0204)
MW-FR	-0.000574						
	(0.00137)						
MW-FR*CRISIS-DUM	-0.00494***						
	(0.00168)						
HF-FR		-0.00212**					
		(0.00104)					
HF-FR*CRISIS-DUM		-0.00405***					
		(0.00125)					
CCB-FR			-0.00102				
			(0.00254)				
CCB-FR*CRISIS-DUM			-0.0149*				
			(0.00792)				
DISS-FR				-0.00994**			
				(0.00405)			
DISS-FR*CRISIS-DUM				-0.00171			
				(0.00236)			
HR-FR					-0.00254		
					(0.00321)		
HR-FR*CRISIS-DUM					-0.00300		
					(0.00396)		
CON-FR						-0.000602	
						(0.00293)	
CON-FR*CRISIS-DUM						-0.0534***	
						(0.00867)	
LR-FR							-0.0180***
							(0.00418)
LR-FR*CRISIS-DUM							-0.0632***
							(0.00786)
Constant	-0.280	-0.119	-0.625	-2.315*	-0.0802	-1.785*	-1.128
	(1.070)	(1.126)	(1.031)	(1.357)	(1.181)	(1.075)	(1.478)
Observations	2,456	2,456	2,456	2,159	2,456	2,456	2,159
Number of banks	381	381	381	355	381	381	355

Note: The table reports the dynamic panel regression results of the interaction of the crisis dummy (CRISIS-DUM) for the years 2008-2010 with the MW-FR (hiring and minimum wage regulation), HF (hiring-firing regulation), CCB (centralised collective bargaining), HR-FR (hours regulation), DISS-FR (dismissal cost) and the overall labour regulation (LR-FR) variables over the 2000-2010 periods. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

Table 11: The Impact of Labour Regulation on Bank Performance using the OECD Index of Employment Protection: Interaction with the Crisis Dummy

VARIABLES	(1) INEF	(2) INEF	(3) INEF	(4) INEF
L.INEF	0.617***	0.610***	0.693***	0.597***
	(0.0996)	(0.121)	(0.106)	(0.120)
lnTA	-0.0243*	-0.0168	0.00471	-0.0214*
	(0.0125)	(0.0117)	(0.0108)	(0.0127)
LA	-0.0390	-0.0163	0.0311	-0.00893
	(0.0543)	(0.0614)	(0.0658)	(0.0653)
EA	-0.241	-0.240	-0.182	-0.283*
	(0.175)	(0.169)	(0.213)	(0.163)
LLPL	0.0208	0.0238	0.0196	0.0291
	(0.0381)	(0.0345)	(0.0396)	(0.0302)
NIM	0.0104*	0.0124**	0.0148*	0.0109**
	(0.00617)	(0.00579)	(0.00761)	(0.00537)
ROA	-0.00566	-0.00369	-0.00428	-0.00264
	(0.00912)	(0.00820)	(0.00976)	(0.00709)
LIQAS	-0.157***	-0.122*	-0.0601	-0.123*
	(0.0579)	(0.0623)	(0.0608)	(0.0633)
lnGDPcap	-0.00208	-0.153	-0.191	-0.0597
	(0.141)	(0.188)	(0.135)	(0.211)
PSC/GDP	0.000683***	0.000662***	0.000510***	0.000622**
	(0.000189)	(0.000254)	(0.000184)	(0.000281)
lnDENS	-0.00442*	-0.00190	-0.00103	-0.00236
	(0.00263)	(0.00280)	(0.00309)	(0.00301)
CRISIS-DUM	0.00298	0.0170	0.0258	0.0298*
	(0.0179)	(0.0137)	(0.0211)	(0.0162)
EMPREG-OECD	0.0927***			
	(0.0222)			
EMPREG-OECD*CRISIS-DUM	0.00121			
	(0.00872)			
EMPTEMP-OECD		0.00735		
		(0.00883)		
EMPTEMP-OECD*CRISIS-DUM		0.00554		
		(0.00472)		
EMPCOLL-OECD			0.0469***	
			(0.0161)	
EMPCOLL-OECD*CRISIS-DUM			0.00737*	
			(0.00435)	
EMP-OECD				0.0409**
				(0.0179)
EMP-OECD*CRISIS-DUM				0.0115*
				(0.00670)
Constant	0.214	1.809	1.652	0.854
	(1.404)	(1.956)	(1.308)	(2.209)
Observations	2,031	2,031	2,049	2,031
Number of banks	366	366	366	366

Note: The table reports the dynamic panel regression results of the interaction of the crisis dummy (CRISIS-DUM) for the years 2008-2010 with the overall Strictness of Employment Protection Index published by the OECD as well as its components. EMP-OECD stands for the overall index, EMPREG-OECD stands for the strictness of regulation related to employees on regular contracts, EMPTEMP-OECD stands for the strictness of regulation related to employees in fixed-term/temporary contracts and EMPCOLL-OECD accounts for additional costs for collective dismissals. The dependent variable is the cost inefficiency scores(INEF) calculated using SFA and assuming a common frontier across countries. To avoid collinearity problems with the selected variables, we first analyse correlations of all the selected variables. We observe that there is not a high level of correlation between the variables used in the models. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust Standard errors are in parentheses.

APPENDIX

Table A1: Summary of the literature on measuring cost efficiency using parametric and non-parametric approaches in the EU-15

Authors	Approach	Countries Considered	Period	Main Results
Allen and Rai (1996)	DFA, SFA	12 EU countries, Australia, Canada, Japan and USA	1988-1992	Italian, French, UK and US less efficient than Japanese, Austrian, German, Danish, Swedish and Canadians ones. Prevalence of input X-inefficiencies far outweighs that of output inefficiencies (as measures by economies of scale and scope).
Pastor, Perez and Quesada (1997)	DEA, Malmquist TFP index	6 EU countries and USA	1992	France highest efficiency level followed by Spain. UK the lowest level of efficiency.
Hasan et al. (2000)	DEA	10 EU countries	1993	Takes into account environmental variables related to the main economic conditions in each country and the country-level accessibility to banking services. Overall, the results based on cross-country efficiency scores suggest that the banks from Spain, Denmark, Portugal and Belgium are relatively more technically efficient in their own respective countries and successful in maintaining high levels of scores if they decide to move to any other sample European country. Harder for banks from other countries to establish profitable networks in Spain, Portugal or Denmark due to adverse environmental conditions. Banks from France and Italy are found to be less efficient institutions across the board.
Berger et al. (2000)	DFA	4 EU countries and the US	1992-1998	On average, domestic banks have higher cost and profit efficiency than foreign banks. The disaggregated results suggest that domestic banks may be more efficient than foreign banks from most foreign countries; may be about equally efficient with foreign banks from some foreign countries; but may be less efficient than foreign banks from one (the U.S.) of the foreign countries. Support for a limited form of the global advantage hypothesis.
Dietsch and Lozano-Vivas (2000)	DFA	Spain and France	1998-1992	Incorporation of country–specific environmental variables in the cost function (macroeconomic, financial structure and regulation and banking accessibility). Without environmental variables, the cost efficiency scores of Spanish banks are quite low compared to those of the French banks. However, when environmental variables are included in the model, the differences between both banking industries are reduced substantially. Environmental variables contribute significantly to the difference in efficiency scores between the two countries.

Bikker (2001)	SFA	9 EU countries	1989-1997	On average, Spanish, French and Italian banks appear to be less efficient than those in Germany, the Netherlands and the UK, while banks in Luxembourg, Belgium and Switzerland are the most efficient. Large differences in average X-inefficiencies and cost-levels between countries exist, Spain being around 40% above and Luxembourg about 35% below the European average.
Maudos et. al. (2002)	DEA	10 EU countries	1993-1996	Cost and profit efficiency estimation. Wide range of variation in efficiency levels in the banking systems of the European Union, the variation in terms of profit efficiency being greater than in terms of cost efficiency. high levels of efficiency in costs and lower levels in profits. Medium-sized banks reach the highest levels of efficiency in both costs and profits. The growth of the market, measured by the real growth rate of GDP, allows higher levels of efficiency to be achieved. Banks that operate in markets with a higher network density are less cost efficient.
Lozano-Vivas, Pastor and Pastor (2002)	DEA	10 EU countries	1993	Focus on country level environmental variables. Significant influence of environmental variables on efficiency scores as comparing the basic DEA and the environmental DEA average efficiency scores is observed that the worse the country-specific environmental conditions the greater the changes in the scores. Environmental variables, which play an important role in explaining differences in efficiency, are related to the accessibility of banking services and to the particular economic conditions. Most efficient banks from almost any of the 10 European countries, with the exception of Italy and the Netherlands, have enough competitive viability to be able to operate in a more unified European banking market.
Bikker (2002)	SFA	14 EU countries and Switzerland	1990-1997	Inefficiencies in 1997 are nearly 45% lower than in 1990 implying that deregulation, liberalisation and ongoing financial and monetary integration in the EU have increased competitive pressures and enforced European banks to operate more economically. Banks in Luxembourg and Switzerland are the most efficient ones. Banks from Germany, in Denmark, the Netherlands, Portugal and the UK take a n intermediate position, whereas those from Belgium, France, Greece, Italy and Spain are the least efficient ones. Large banks are twice as inefficient as small banks. The estimated inefficiency is also dependent on the type of bank. Cooperative and savings banks have, on average, relatively small inefficiencies of over, respectively, 15% and 20%, whereas commercial banks have inefficiencies, which are two or three times higher.
Cavallo and Rossi (2002)	SFA	6 EU countries	1992-1997	Significant efficiency gaps among the performances of banks in different countries and of different institutional types. In particular, it is found that the Central-European model is the one that operates closest to the efficient frontier. The analysis suggests that, at the beginning of European Monetary Union, national barriers and regulatory frameworks are still responsible for deviation from the efficient frontiers.

Guevara and Maudos (2002)	DFA	14 EU countries	1993-1997	For cost efficiency the greatest differences within groups occur when the total sample is divided into institutional groups (commercial banks, saving banks, co-operative banks and other banks), the country effect and the type of productive specialization being more important in explaining the differences between groups. Profit efficiency inequalities are explained to a certain extent by country-specific factors (degree of competition, barriers to entry etc)/
Molyneaux and Williams (2005)	SFA	10 EU countries	1996-2003	Co-operative banks benefited from substantial gains in both profit and cost productivity. Annual profit improvements range between 4% and 8% for the majority of co-operative banks, with even larger cost productivity gains. Best practice co-operative banks have moved further away from other banks in terms of increasing profits and reducing costs.
Hollo and Nagy (2006)	SFA	25 EU countries (englarged EU)	1999-2003	Focus on country level environmental (exogenous to the banks) differences. Evidence about the existence of an X-efficiency gap, as well as suggesting that the competitive edge of old EU members in relation to cost-efficiency is decreasing over time. Controls for country level environmental factors, particularly for inflation, the level of development, the closely linked depth of financial intermediation and the regulatory architecture - reduce the size of the actual gap between the old and new member states. Efficiency gap in terms of profit efficiency is also detected but only but only if the impact of home market conditions on profitability is controlled. If factors originating from the operational environment are controlled, significant differences in profit-efficiency between the two regions no longer exist.
Weil (2009)	FF	10 EU countries	1994-2005	Improvement in cost efficiency in all EU banking sectors as well as convergence in efficiency across EU countries. Evidence supports the view that financial integration has taken place on the EU banking markets in the years under study.
Girardone, Nankervis, and Velentza, (2009)	SFA	15 EU countries	1998-2003	On the whole the results reject the agency theory hypothesis that managers of privately-owned banks are more cost efficient than those of mutual banking institutions because of capital market devices as it is found that mutual banks operating in EU-15 countries are significantly more cost efficient than commercial banks. Results are mixed concerning the financial structure hypothesis that in developed financial systems bank efficiency should not be statistically different across bank-vs market-based economies.
Koutsomanoli-Filippaki and Mamatzakis (2009)	SFA	15 EU countries	1998-2005	Considerable variation in the speed of adjustment across banking systems, while over time it appears that continuing efforts to advance financial integration have led to some improvement in the speed of adjustment to the long-run equilibrium

Casu and Girardone (2010)	DEA	15 EU countries	1997-2003	Results seem to provide supporting evidence of convergence of efficiency levels towards an EU average. However, the potential gains brought about by increased integration have been offset by a decrease in the overall efficiency levels.
Brissimis, Delis and Tsionas (2010)	SFA	13 EU countries	1996-2003	Technical and allocative efficiency are close to 80% and 75% respectively. Overall economic efficiency shows an improving trend. The most technically efficient banking sectors were found to be those of Austria, Germany and the UK, the same sectors also recording the lower allocative inefficiency scores. In contrast, the banking sectors of Ireland, Portugal and Italy have much more to gain from improving their efficiency level.

Note: SFA stands for stochastic frontier analysis, DEA stands for Data Envelopment Analysis, FF stands for Fourier-Flexible, DFA stands for Data Frontier Analysis

Table A2: The labour regulation components of the Fraser index of economic freedom used in the study

Variable	Category	Nature	Score	Description	Source
LR-FR	Labour Regulations	Component of the Regulation of Credit, Labour and Business	0-10 (higher the better)	This variable takes values between 0 and 10 with higher values indicating greater economic freedom. A measure of the extent to which labour market rigidities are present. In order to earn high marks in the LR component, a country must allow market forces to determine wages and establish the conditions of hiring and firing, and refrain from the use of conscription. This component is the average of six subcomponents: Bi: Hiring regulations and minimum wage, Bii: Hiring and firing regulations, Biii: Centralised collective bargaining, Biv: Hours regulations, Bv: Mandated cost of worker dismissal, Bvi: Conscription.	Fraser Index of Economic Freedom
MW-FR	Hiring regulations and minimum wage	Subcomponent of the Regulation of Labour	0-10 (higher the better)	This sub-component is based on the World Bank's Doing Business Difficulty of Hiring Index, which is described as follows: "The difficulty of hiring index measures (i) whether fixed-term contracts are prohibited for permanent tasks; (ii) the maximum cumulative duration of fixed-term contracts; and (iii) 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." Countries with higher difficulty of hiring are given lower ratings. • Source World Bank, Doing Business (various issues), <http://www.doingbusiness.org/>.	Fraser Index of Economic Freedom
HF-FR	Hiring and firing regulations	Subcomponent of the Regulation of Labour	0-10 (higher the better)	This sub-component is based on the Global Competitiveness Report question: "The hiring and firing of workers is impeded by regulations (= 1) or flexibly determined by employers (= 7)." The question's wording has varied slightly over the years. • Source World Economic Forum, Global Competitiveness Report (various issues), <http://www.weforum.org/en/initiatives/gcp/index.htm>.	Fraser Index of Economic Freedom
CCB-FR	Centralized collective bargaining	Subcomponent of the Regulation of Labour	0-10 (higher the better)	This sub-component is based on the Global Competitiveness Report question: "Wages in your country are set by a centralized bargaining process (= 1) or up to each individual company (= 7)." The question's wording has varied slightly over the years. • Source World Economic Forum, Global Competitiveness Report (various issues), <http://www.weforum.org/en/initiatives/gcp/index.htm>.	Fraser Index of Economic Freedom

HR-FR	Hours regulations	Subcomponent of the Regulation of Labour	0-10 (higher the better)	This sub-component is based on the World Bank's Doing Business Rigidity of Hours Index, which is described as follows: "The rigidity of hours index has 5 components: (i) whether there are restrictions on night work; (ii) whether there are restrictions on weekly holiday work; (iii) whether the work week can consist of 5.5 days; (iv) whether the work week can extend to 50 hours or more (including overtime) for 2 months a year to respond to a seasonal increase in production; and (v) whether paid annual vacation is 21 working days or fewer. For questions (i) and (ii), when restrictions other than premiums apply, a score of 1 is given. If the only restriction is a premium for night work and weekly holiday work, a score of 0, 0.33, 0.66 or 1 is given according to the quartile in which the economy's premium falls. If there are no restrictions, the economy receives a score of 0. For questions (iii), (iv) and (v), when the answer is no, a score of 1 is assigned; otherwise a score of 0 is assigned." • Note This component was previously called "Mandated cost of hiring a worker" and was based on the World Bank's Doing Business data on the cost of all social security and payroll taxes and the cost of other mandated benefits including those for retirement, sickness, health care, maternity leave, family allowance, and paid vacations and holidays associated with hiring an employee. Because of pressure from the International Labour Organization, this measure was dropped from the Doing Business project. In order to maintain as much consistency over time as possible, we have revised the dataset back to 2002 with these data replacing the previous values. • Source World Bank, Doing Business (various issues), <http://www.doingbusiness.org/>.	Fraser Index of Economic Freedom
DISS-FR	Mandated cost of worker dismissal	Subcomponent of the Regulation of Labour	0-10 (higher the better)	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. 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 108 weeks (1.5 standard deviations above average) and 0 weeks, respectively. Countries with values outside the range marked off by Vmax and Vmin received ratings of either zero or ten, accordingly. • Source World Bank, Doing Business (various issues), <http://www.doingbusiness.org/>.	Fraser Index of Economic Freedom
CON-FR	Conscription	Subcomponent of the Regulation of Labour	0-10 (higher the better)	Data on the use and duration of military conscription were used to construct rating intervals. Countries with longer conscription periods received lower ratings. A rating of 10 was assigned to countries without military conscription. When length of conscription was six months or less, countries were given a rating of 5. When length of conscription was more than six months but not more than 12 months, countries were rated at 3. When length of conscription was more than 12 months but not more than 18 months, countries were assigned a rating of 1. When conscription periods exceeded 18 months, countries were rated zero. If conscription was present, but apparently not strictly enforced or the length of service could not be determined, the country was given a rating of 3. In cases where it is clear conscription is never used, even though it may be possible, a rating of 10 is given.If a country's mandated national service includes clear non-military options, the country was given a rating of 5. • Source International Institute for Strategic Studies, The Military Balance (various issues); War Resisters International, World Survey of Conscription and Conscientious Objection to Military Service, <http:// www.wri-irg.org/programmes/world_survey/>.	Fraser Index of Economic Freedom

Note: The table reports only the components of the Fraser index of economic freedom used in this study. The index consists of five areas: (1) size of government; (2) legal structure and security of property rights; (3) access to sound money; (4) freedom to exchange with foreigners; and (5) regulation of credit, labour, and business.

Table A3: Strictness of Employment of Protection Index-OECD

Variable	Score	Headline	Description	Source
EMPREG-OECD	0-6 (higher means more strict)	Strictness of Employment Protection: Indicator for Dismissal of Employees on Regular Contracts,	This index incorporates three aspects of dismissal protection: (i) procedural inconveniences that employers face when starting the dismissal process, such as notification and consultation requirements; (ii) notice periods and severance pay, which typically vary by tenure of the employee; and (iii) difficulty of dismissal, as determined by the circumstances in which it is possible to dismiss workers, as well as the repercussions for the employer if a dismissal is found to be unfair (such as compensation and reinstatement).	OECD: Indicators of Employment Protection
EMPTEMP-OECD	0-6 (higher means more strict)	Strictness of Employment Protection: Indicator for Strictness of Regulation on Temporary Contracts,	This index quantifies regulation of fixed-term and temporary work agency contracts with respect to the types of work for which these contracts are allowed and their duration. This measure also includes regulation governing the establishment and operation of temporary work agencies and requirements for agency workers to receive the same pay and/or conditions as equivalent workers in the user firm, which can increase the cost of using temporary agency workers relative to hiring workers on permanent contracts.	OECD: Indicators of Employment Protection
EMPCOLL-OECD	0-6 (higher means more strict)	Strictness of Employment Protection: Additional costs for collective dismissals:	Most countries impose additional delays, costs or notification procedures when an employer dismisses a large number of workers at one time. This measure includes only additional costs which go beyond those applicable for individual dismissal. It does not reflect the overall strictness of regulation of collective dismissals, which is the sum of costs for individual dismissals and any additional cost of collective dismissals.	OECD: Indicators of Employment Protection