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HOW LABOUR MARKET REGULATION SHAPES BANK PERFORMANCE IN EU-15 COUNTRIES?

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ABSTRACT

The European banking industry is undergoing significant structural changes and cost-cutting programs, also as a result of the financial crisis. Yet, the institutional features that affect banks' ability to adjust costs and in particular personnel expenses, which comprise a significant part of banks' non-interest cost structure, have not been adequately studied. This paper investigates the effect of labour market institutions and regulations on bank performance in EU-15 countries. Results indicate the existence of a negative relationship between bank performance and the liberalization of EU labour markets. However, when looking at the disaggregated components of the labour index, we find evidence that different forces are at play and that the liberalization of the minimum wage, hiring and firing regulations and the cost of dismissals could assert a positive effect on efficiency.

Keywords: Labour regulation; technical, allocative efficiency; DEA; banks.

JEl-classification: D22, D24, G21, L25, J30

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1. Introduction

Labour market reports for the banking industry have become ever more frequent in recent months. According to Reuters (*16.11.2012*), tens of thousands of bank staff have lost their jobs since 2009, and further layoffs have been announced. This comes as no surprise, as over the past decade the European banking system has undergone significant structural changes, which have been further precipitated by the financial crisis. As part of this restructuring process, banks have focused their efforts on improving operating performance through a reduction in operating costs. Indeed, the European banking industry has actively undergone cost-cutting measures to improve profitability by introducing organizational changes (such as outsourcing), and reducing both branch networks and the number of employees (ECB, 2003). The urgency to reduce costs and improve efficiency has increased in the current difficult economic environment with slow credit growth, high funding costs and increasing non-performing loans, as a result of the financial and the sovereign debt crisis. Moreover, the current crisis has clearly highlighted that the cycle of easy credit and growth in lending and revenues of the previous years masked serious underlying problems, such as the build-up of highly complex operating models and high cost structures, including personnel expenses.

Although personnel expenses comprise a relatively small fraction of banks' cost structure compared to other industries, they are at the centre of bank managers' cost-cutting efforts. Data for the EU-15 banking systems from the OECD Bank Profitability Report (2010)[1] suggest that personnel expenses as a share of total cost range from 5 per cent in Luxembourg to about 24 per cent in Greece. Moreover, staff expenses as a per cent of total bank costs were increasing up to 2004 in most countries, reaching about 35% in Greece, and above 25% in Spain, Italy, France and Denmark; however this trend was reversed in 2005. Overall, the data suggest that the rationalization of personnel expenses has been at the centre of managers' cost-reducing efforts over recent years.

Banks' ability to adjust staff costs and their responsiveness to changing circumstances are highly influenced, among others, by labour institutions and regulations. According to Boeri et al. (2008) labour market regulations can affect firms' choices over inputs, investments, technology, and output and at the aggregate level may also influence the allocation of resources across firms

[1] See Figure A1 in the Appendix.

and sectors of the economy, impacting on growth.[2] Labour market dynamics are influenced by limited wage-setting flexibility, as well as by regulatory constraints on hiring and firing, and by employment protection legislation (Bertola, 2009). While a number of studies have examined the impact of labour regulations at a macro level (e.g., Botero et al.,2004; Lazear, 1990), very few microeconomic cross-country empirical studies analyse the impact of labour market rigidities on firm level outcomes (Lafontaine and Sivadasan, 2007).

The aim of this paper is to investigate the effects of labour market regulation on technical and allocative efficiency in the European banking industry over the period 2005-2010. Efficiency is estimated using Data Envelopment Analysis (DEA), while a subcomponent of the Fraser Index on Economic Freedom is used to capture labour market regulation. A first glimpse at the results shows a negative relationship between bank performance and liberalization in EU labour markets. However, when disaggregating the labour market regulation index, we find evidence of different forces at play and that the liberalization of the minimum wage, hiring and firing regulations and the cost of dismissals has a positive effect on cost efficiency.

The rest of the paper is structured as follows: Section 2 briefly reviews the literature. Section 3 describes the variables and the dataset included in our study, while Section 4 presents the empirical specifications of the models and the main results. Finally, section 5 offers some concluding remarks and possible policy implications.

2. A review of the literature and stylized facts of labour market in the EU

Our study is related to various strands of the literature. Foremost, this paper relates to the literature on bank efficiency (for a review see Berger, 2007). A large part of this literature has focused on the European banking system (e.g. Altunbas et al., 2001; Lozano-Vivas et al., 2002; Maudos et al., 2002; Casu and Molyneux, 2003) and one of the common findings is the high level of cross-country heterogeneity. In addition, environmental (country-level) variables are found to be important in explaining cross-country heterogeneity in bank efficiency across the EU

[2] The effect of labour market regulations on economic outcomes is the subject of an ongoing debate among economists and policymakers (Boeri et al., 2008). Some argue that regulations affect negatively economic efficiency and therefore are detrimental for growth, while others argue that they are essential tools to correct market imperfections and achieve goals of redistribution without hampering efficiency (see Boeri and van Ours, 2008 for a discussion).

(e.g. Dietsch and Lozano-Vivas, 2000). Among these factors, several studies have focused on the effect of regulation on bank efficiency.

Our study is also related to the strand of literature that investigates the potential effects of regulation on the performance of financial institutions. Barth et al. (2004) examined bank regulations and supervisory practices in 107 countries and found a positive relationship between private monitoring and bank performance. Moreover, Pasiouras et al. (2009) examined the impact of regulations related to the three pillars of Basel II and found that banking regulations that enhance market discipline and empower the supervisory authorities have a positive effect on bank efficiency, while stricter capital requirements improve cost efficiency but reduce profit efficiency. In a more recent study, Barth et al. (2010) examined whether bank regulation, supervision and monitoring enhance bank efficiency and found that tighter restrictions on bank activities are negatively associated with efficiency, while greater stringency in capital regulation is marginally and positively associated with efficiency.

However, all the above-mentioned studies have focused mainly on the effect of bank regulation on efficiency, while the regulatory framework in other areas of the economy, such as labour and other business related legislation, has so far been neglected. This point is particularly emphasized by Demirguc-Kunt et al. (2004), who investigated the impact of a wider set of regulations on bank net interest margins and overhead costs while controlling for bank-specific characteristics. They find that tighter regulations on bank entry and bank activities raise the cost of financial intermediation, but bank regulations become insignificant when controlling for national indicators of economic freedom or property rights protection. They conclude that bank regulations cannot be viewed in isolation, as they reflect broad, national approaches to private property and competition.[3]

Studies that explicitly focus on the importance of country-level institutional or regulatory quality as determinants of bank efficiency are scarce. For example, Lensink et al. (2008) find that although foreign ownership negatively affects bank efficiency, the effect is less pronounced in countries with better regulatory and institutional framework. Moreover, higher institutional quality in the home country and greater similarity between home and host country institutional

[3] In another study Demirgüç-Kunt et al. (2008) found that country level institutional quality variables affect the relationship between bank soundness and compliance with the Basel Core Principles for Effective Banking Supervision (BCPs).

quality tend to reduce foreign bank inefficiency. Another study by Hasan et al. (2009) examines the impact of institutional quality on the cost and profit efficiency of the banking sector at the regional level in China and concludes that banks located in regions with a higher level of property rights protection and rule of law exhibit higher level of cost efficiency.

Our study is also related to the literature on labour market regulations. Labour market regulation is the subject of much theoretical work as well as extensive empirical research (Bertola, 2009). In particular, labour market regulations that constrain the ability of firms to adjust employment levels are an important and controversial public policy issue in many countries around the world. The relevant literature has mainly focused on the macroeconomic effects of labour market regulation and its impact on output and unemployment (Lazear, 1990; Blanchard and Wolfers, 2000; Botero et al., 2004; Nickell, 1997; Nickell and Layard, 1999; Heckman and Pages, 2003). More specifically, labour regulations are often cited as a determinant of economic performance in OECD countries (e.g. Freeman, 1988; Nickell and Layard, 1999). It appears that the literature (Freeman, 1988; Blanchard and Wolfers, 2000; Nickell, 1997; Nickell and Layard, 1999; Besley and Burgess, 2004) predominantly suggests that a higher degree of labour market regulation leads to efficiency losses for firms. This is manifested in rising employment costs as a result of stricter employment protection legislation (Bassanini and Ernst 2002; Scarpetta and Tressel 2004), which in turn, negatively affects firms' returns with respect to innovation and technology, resulting in declining productivity growth (Malcomson 1997). By contrast, labour market regulations, to the extent that they cause increased wage pressures, could result in higher labour productivity due to capital deepening and investment in capital-intensive industries (Autor et al., 2007). Apart from labour regulation per se, Cabellero et al. (2004) argues that the degree of enforcement of labour market regulation also plays a significant role. In a more recent work, Almeida and Carneiro (2009) also find that the enforcement of labour regulations plays a significant role, as it is found to negatively affect firm size and other firm characteristics.

2.1 Developments in the EU labour market

Over the last decade, the need to improve the functioning of EU labour markets has featured prominently in the priorities of the EU strategy, such as in the objectives of the Lisbon strategy to promote flexibility in the labour market combined with employment security and to

reduce labour market segmentation, while at the same time ensuring employment-friendly labour cost developments and wage-setting mechanisms (see Council Decision 2005/600/EC on Guidelines for the employment policies of the Member States).

In line with these priorities most EU countries implemented a wide range of labour market reforms. According to the European Commission (2012): "*Since the onset of EMU, there was clear awareness that a successful monetary union would have required reforming labour markets where needed in such a way to ease adjustment in the face of asymmetric shocks and to permit a prompt reaction of price competitiveness as a tool to absorb idiosyncratic shocks and favour the correction of macroeconomic imbalances.*" The need for timely and comprehensive labour market reforms has become even more pertinent in light of the recent sovereign debt crisis in the euro area, especially for countries under IMF/EC/ECB programs.

Against this background, this section provides a short description of the trends and main features of labour market reforms in the EU over the last decade. In order to do so, we employ the Fraser Index of Economic Freedom (Gwartney et. al, 2011) and particularly, one of the five components of the index, namely, labour market regulations.[4] This index ranges from 0 to 10, with 0 indicating the lowest and 10 the highest degree of liberalization in the labour market. It should be noted that this type of indicator quantifies the degree of stringency and distortions associated with existing regulations and institutions, and provides a synthetic measure of the anti-competitive implications of the existing regulations and institutions (European Commission, 2012). Thus, reforms are measured indirectly by looking at the evolution of the indicator over time.

Figure 1 presents the evolution of the Fraser Index on labour regulation over the period 2000-2010 for all EU-15 countries. Overall, we observe significant liberalization in European labour markets in all EU countries except Luxembourg. Consistent with the findings of the OECD (Brandt et al., 2005), there appears to be no clear relationship between the initial conditions of labour market performance and subsequent reform efforts. Moreover, according to

[4] The Fraser Index of Economic Freedom 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 components that form a composite index ranging from 0 to 10, with 0 indicating the lowest and 10 the highest level of economic freedom. The use of this index is common in the economic literature (see for example Carlsson and Lundstrom, 2002).

the European Commission (2012) the distribution of reforms across countries reveals that there is a relatively low degree of synchronization of reforms across countries over the whole decade.

(Insert Figures 1 and 2 about here)

We also examine the evolution of the sub-components of the Fraser Index on labour regulation over the period 2000-2010. In particular, the index is decomposed to into the following elements[5]: i) hiring regulations and minimum wage, ii) hiring and firing regulations, iii) centralized collective bargaining, iv) regulation of hours of work, v) mandated cost of worker dismissal and vi) conscription[6]. Note that the sub-components of the labour regulation index also take values from 0 to 10, with higher values suggesting greater economic freedom. In contrast, a low value of this index would imply that market rigidities operate.

In more detail, the first subcomponent of Frazer labour market regulation index, "*hiring regulations and minimum wage*" focuses on the difficulty of hiring and captures some fundamental labour market issues, such as: whether fixed-term contracts allow for permanent tasks, the maximum cumulative duration of fixed-term contracts; and the ratio of the minimum wage for a trainee or first-time employee to the average value added per worker. Looking at Figure 2 (*up left*), we observe significant differences across countries, both with regards to the trend of reforms as well as their direction and their intensity.

The second subcomponent of the Fraser Labour Index is "*hiring and firing regulations*" and captures whether labour market regulations hinder the hiring and firing of workers. Again in Figure 2 (*up right*), we observe a trend towards greater liberalization in hiring and firing regulations in most countries, although at a slow pace, suggesting that there may be room for additional liberalization in this area.

The third subcomponent of the Fraser Labour Index is "*centralized collective bargaining*" and refers to country level industrial relations and it captures whether wages are set by a centralized bargaining process or are left up to each individual company. As we can observe

[5] The data used to construct the Fraser Index and its sub-components are from external sources such as the IMF, World Bank, and World Economic Forum that provide data for a large number of countries. These raw data are transformed into component ratings and which are then used to construct both the area and summary scores. Complete methodological details can be found in the "Economic Freedom of the World: Annual Report 2012" (Appendix: Explanatory Notes and Data Sources (page 271)).

[6] We exclude the 6th sub-component of the Fraser Index on labour regulation from our analysis, as we consider it less relevant for the banking system.

from Figure 2 (*middle left*), there are diverging trends across countries, with about half of EU Member States exhibiting a trend towards higher centralization over time.

The fourth subcomponent of the Fraser labour Index, "*hours regulations*" captures various elements including: restrictions on night work; restrictions on weekly holiday work; 5.5 work week; 50 hours or more, including overtime, work week so as to respond to a seasonal increase in production; and 21 working days or fewer paid annual vacation. In Figure 2 (*middle right*), we observe a trend towards more liberalization over the period 2000-2010 across all countries but Greece and Spain.

The "*mandated cost of worker dismissal*" comprises the fifth subcomponent of the Fraser Labour Index and captures the cost of the advance notice requirements, severance payments, and penalties due when dismissing a redundant worker. In Figure 2 (*down left*), we observe that the vast majority of countries (except from Greece) exhibits significant progress in liberalizing mandated dismissal costs over the examined period.

3. Empirical model and data

The general empirical model used to study the relationship between banking sector efficiency and labour market regulation has the following form:

$$EFF_{itc} = \mu_i + \alpha EFF_{it-1c} + \beta \sum Z_{itc} + \gamma \sum Lreg_{ct} + \delta \sum M_{ct} + e_{i,t} \qquad (1)$$

In Eq. (1) the cost, technical or allocative efficiency of bank i at time t that operates in country c is written as a function of the efficiency of bank i at time t-1, the time- and country-dependent labour market regulation variable *Lreg*; a vector of variables that characterize the labour market regulation in each country, a vector of bank-level control variables Z, and a vector of control variables M that reflect the macroeconomic conditions in the banking systems examined. Finally, ε is the stochastic disturbance. For the estimation of Eq. (1) we opt for the Arellano and Bover (1995) dynamic panel data estimation method which employs instrumental variables, thus dealing with potential endogeneity bias.

3.1 Efficiency estimation

We estimate bank efficiency using a non-parametric approach, Data Envelopment Analysis, developed by Charnes et al. (1978). Our focus in this article is on frontier efficiency that is, on the distance (in terms of a cost function) of a Decision Making Unit (DMU) from the best-practice equivalent. This is given by a scalar measure ranging between zero (the lowest efficiency measure) and one (corresponding to the optimum DMU). The DEA measure compares each of the banks in the sample with the best practice in the sample. Efficiency consists of two components: technical efficiency, which reflects the ability of a DMU to maximize output given a set of inputs; and allocative efficiency, which reflects the ability of a DMU to use the given set of inputs in optimal proportions, assuming input prices and technology are known. This is particularly useful in the context of our analysis as it will enable us to examine whether technical and allocative inefficiencies are related to specific labour market regulations that affect the usage of inputs or the price of labour, respectively. We assume that the DEA methodology is well-known to the readers and limit our comments to the chosen specification of the empirical application.[7] In particular, we apply the cost minimization DEA model with variable-returns-to-scale using the software (DEAP) developed by Coelli (1996) and calculate the technical, allocative and cost efficiency scores of European banks in the sample.

Following Dietsch and Lozano-Vivas (2000), Maudos et al. (2002), and others we adopt the value-added approach for the definition of inputs and outputs, which recognizes that deposits have both input and output characteristics.[8] In particular, we use the following three outputs: loans, other earning assets and total deposits. Furthermore, in line with previous studies we select the following input prices: the price of borrowed funds is calculated as the ratio of interest expenses to total deposits and short-term funding; the price of labour is measured by the ratio of personnel expenses[9] to total assets, while the price of physical capital is calculated by dividing the expenditures on plant and equipment (i.e. overhead expenses net of personnel expenses) by fixed assets. The input characteristic of deposits is captured through the inclusion of the interest

[7] For more details on the DEA methodology see among others Banker et al. (1989) and Aly and Seiford (1993).
[8] A variety of approaches have been proposed in the literature for the definition of bank inputs and outputs; yet, there is little agreement among economists as to what unequivocally constitutes an acceptable definition, mainly because of the nature and functions of financial intermediaries.
[9] Personnel expenses include wages, salaries, social security costs, pension costs and other staff costs, including expensing of staff stock options (Bankscope database definitions).

expense paid on deposits in the input prices vector, while the output characteristic of deposits is captured through the inclusion of the stock of deposits in the output vector.

3.2 Control variables

A number of control variables are included in our analysis in order to account for individual bank characteristics, such as bank size, credit risk and profitability. These variables are: the logarithm of total assets, the net interest margin and the loan loss provisions ratio.

Bank Size: Although banks in the EU-15 banking systems have similar organizational structure and objectives, they vary significantly in size. Therefore, we include the logarithm of total assets to account for the size of each bank. Bank size is also a proxy for economies or diseconomies of scale and can lead to either higher or lower costs for banks. If large banks exercise market power, they may increase the costs for the sector through slack and inefficiency. In a similar vein, small banks operating mostly in local markets may have access to "soft" information about local conditions, engage in relationship lending and become more efficient than large banks (Berger, 2007). By contrast, if the size of a bank reflects market selection and consolidation through the survival of more efficient banks, market consolidation could be associated with lower costs and larger banks may be more cost efficient. Empirical evidence on the relationship between bank size and efficiency is inconclusive (see Altunbas et al., 2001; Carbo et al., 2002; Maudos and De Guevara, 2007).

Credit risk: Managing credit risk is an important part of banking operations. Changes in credit risk may reflect changes in the quality of a bank's loan portfolio and may affect bank performance. As a proxy for credit risk we use the ratio of loan loss provisions to gross loans. The relationship between inefficiency and credit risk could be positive according to the '*bad management*' or the '*bad luck*' hypotheses developed by Berger and DeYoung (1997), or negative under the '*skimping*' hypothesis.[10]

[10] Under the '*bad luck*' hypothesis of Berger and DeYoung (1997), exogenous events may cause an increase in a bank's problem loans and the additional managerial effort required to deal with these non-performing loans, will increase bank costs. The '*bad management*' hypothesis assumes that an inefficient bank manager will apply poor senior management practices to both day-to-day operations (increased cost inefficiency) and to managing the loan portfolio (lower credit quality). Under the '*skimping*' hypothesis, a bank may appear more cost efficient in the short

Profitability: Despite the rising importance of fee-based income as a proportion of total income, net interest margins remain one of the principal elements of bank net cash flows and profits. Thus, we employ the net interest margin as a traditional measure of bank performance, which is based on accounting data. This captures banks' primary intermediation function and serves as an indicator of the profitability of the banking industry.

3.3 Dataset and efficiency scores

Bank-level data for the estimation of efficiency are obtained from the Fitch IBCA-Bankscope database and includes commercial, savings and cooperative banks in EU-15 countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the UK) over the period 2005-2010. After removing errors and related inconsistencies, we end up with a balanced sample of 2,410 banks.

(Insert table 1 about here)

Table 1 presents the descriptive statistics of our sample as well as the average cost, technical and allocative efficiency scores by country over the period 2005-2010. Our results are in line with the vast majority of the literature that estimates the average cost efficiency of EU countries in the range of 0.70 to 0.85 (see for example Cavallo and Rossi, 2001; Casu and Girardone, 2004, 2006; Maudos and De Guevara, 2007). Specifically, the average cost efficiency level for all EU-15 countries is estimated at 0.71, ranging from 0.65 in Luxembourg to 0.90 in Ireland. Average technical efficiency is estimated at 0.82, while average allocative efficiency is calculated at 0.87 for the whole sample. Over time average cost efficiency increases slightly up to 2007 and decreases significantly thereafter. Allocative efficiency exhibits a similar trend, showing a clear downward trend after 2007. By contrast, technical efficiency follows an upward trend after 2008. Moreover, cross-country analysis reveals similar patterns in the evolution of efficiency scores over time across countries.

run if it allocates fewer resources to monitoring loans, because less operating expenses can support the same quantity of loans and other outputs.

4. Results and discussion

Table 2 presents the output from estimating Eq. (1) on the relationship between bank efficiency and labour market regulation. We estimate three alternative models, using cost efficiency, technical efficiency and allocative efficiency as the dependent variable, respectively; as a measure of labour market liberalization we employ the aggregate labour market regulation index. Overall, we observe that lagged inefficiency is significant at the 1% significance level in all specifications (Models 1-3), suggesting that the chosen dynamic specification is appropriate in the context of the present analysis.

(Insert Table 2 about here)

With respect to the relationship between labour market regulation and efficiency, we observe a negative sign for the labour regulation coefficient, which is statistically significant for both cost, technical and allocative efficiency. This result implies essentially that greater labour market liberalization would decrease bank efficiency. The labour economics literature provides mixed evidence with regard to the impact of labour regulation on economic performance (Bassanini et al., 2009). Theoretically, there are four potential ways in which labour market regulation can affect efficiency. From the employers' point of view, increasing employment protection could either improve economic performance by giving an incentive to firms to invest in labour-saving technology and innovate, or could induce them to innovate less, especially in more risky technologies. From the employees' point of view, higher employment protection might induce them to invest in firm specific knowledge, improving their productivity. On the other hand, tenure may reduce employees' motivation to build up specialized skills to raise their productivity. Our results show that in a firm, where it takes considerable time for the employees to acquire all necessary skills, greater freedom in, for example, hiring would harm bank performance. This is consistent with the findings of Black and Lynch (1996), who found that the knowledge and skills of employees through training activities are important to firm performance. In addition, Autor et al., (2007) argue that labour market regulations that enhance wage pressures would induce higher labour productivity due to capital deepening and investment in capital-intensive technologies. This is also consistent with the findings of Storm and Naastepad (2009) showing that a regulated and '*rigid*' industrial relations system promotes labour productivity growth in twenty OECD countries. In addition, Deakin and Sarkar (2008) show that labour

regulation that strengthens dismissal laws has positive effects on productivity growth in France and Germany, and in the United States over the long term (from the 1970s to mid-2000s). The reported result could also be attributed to the fact that the knowledge and skills of employees through training activities are important to firm performance (Black and Lynch, 1996). Related to this line of argument, Wasmer (2006) uses a matching model to show that employment protection, by reducing turnover and labour mobility, shifts human capital accumulation towards specific skills. In particular, workers are motivated to invest in firm-specific skills when the employment relationship is expected to last. This kind of specialization improves their productivity. By contrast, workers tend to invest much more in general skills when they perceive a high risk of losing their jobs because of the absence of employment protection. Furthermore, Auer (2007) argues that strict employment protection, and labour market regulation more generally, reduces excessive labour turnover, facilitates the reallocation of resources into activities having above-average productivity growth, and generates high-quality job matches. Likewise, significant employment security together with a compressed wage structure provide workers with insurance against wage risk (Agell, 1999), thereby stimulating investment in education by workers, having a strong positive impact on productivity growth. Moreover, and specific to the banking sector, a higher degree of labour market liberalization that increases turnover and labour mobility, may negatively impact on "relationship lending" in banking, thus negatively affecting bank efficiency. Such lending is based on the personal interaction and relationship between customers and bank employees.

Regarding bank-specific variables, total assets, loan loss provisions, net interest margin and the capitalization ratio all take the expected signs. More specifically, our results suggest that bank size has a positive effect on cost, technical and allocative efficiency, while banks with a higher capital ratio also exhibit higher efficiency. The ratio of loan loss provisions to loans, which captures credit risk and the quality of banks' loan portfolio, exhibits a negative relationship with bank efficiency (both cost, technical and allocative), which is consistent with the "bad management hypothesis" of Berger and DeYoung (1997). The net interest margin is positive in all specifications, consistent with expectations, but is statistically significant only in the case of allocative efficiency. Finally, regarding the macroeconomic variables, we find that the coefficient of GDP growth is only statistically significant in the case of technical efficiency

and takes a positive sign, while inflation appears to have a negative and statistically significant effect.

As a next step and in order to get a more accurate assessment of the importance of labour market regulation, we re-estimate the above equations using the sub-indices of the aggregate labour regulation index, which is decomposed into its different components, and these are in turn grouped into two categories: the first category incorporates the indicators with a direct effect on the price of labour (i.e. the minimum wage, the cost of dismissals) and are expected to have an impact on banks' allocative efficiency and their ability to respond to changes in input prices, while the second category of indicators includes variables that affect the general institutional setting and banks' ability to adjust the input of labour (i.e. hiring and firing regulations, centralized collective bargaining and mandated hours worked) and are expected to have an impact on banks' technical efficiency. Table 3 presents the estimated results using cost efficiency as the dependent variable, while Table 4 presents the results for technical and allocative efficiency.

(Insert Tables 3 and 4 about here)

Table 3 presents three alternative models. In the first model, we include the subcomponents of the labour market regulation index that directly affect the price of labour. Our results indicate a positive and statistically significant relationship between the liberalization of the minimum wage and cost efficiency, while we find a negative relationship between the liberalization of the cost of dismissals and cost efficiency, in line with the findings of Bassanini and Ernst (2002) and Scarpetta and Tressel (2004). Looking at the second category of sub-components of the labour market regulation index (model 2), our results suggest a positive and statistically significant relationship between cost efficiency and the liberalisation of the hiring and firing regulations. On the other hand, we find a negative and statistically significant relationship between cost efficiency and the collective bargaining sub-index, suggesting that a move towards less centralized bargaining has a negative effect on bank efficiency. Moreover, we also observe a negative relationship between cost efficiency and the liberalization of "hours regulation". Finally, in model 3 we present the regression results using all the sub-components of the Fraser Index in the same equation. We observe that the minimum wage sub-index and the "hours regulation" index retain their sign and level of significance, while the effect of centralized

bargaining and the hiring and firing regulations become insignificant. Moreover, we observe that the effect of the liberalization of the cost of dismissals becomes positive and statistically significant.

In order to shed more light onto our analysis, we also examine the effects of the sub-indices of the aggregate labour market regulation index on the two components of banks cost efficiency (allocative and technical efficiency). Results are presented in Table 4.

We observe that the effect of the liberalization of hiring and firing regulations has a significant positive effect on technical efficiency, as this allows banks to more easily adjust their labour input according to their needs. The coefficient of the central bargaining index is not statistically significant, while the "hours regulation" index has a negative impact on banks' technical efficiency, confirming our previous findings. Looking at allocative efficiency, we observe that the dismissal cost sub-index retains its negative sign and statistical significance as in the case of cost efficiency, while the coefficient for the minimum wage sub-component becomes negative, which contrasts with our previous findings.

Overall, we observe that the relationship between bank efficiency and labour market regulation is complex and the various sub-components of the labour market regulation index have different effects on bank efficiency. The reported results suggest the importance and complexity of the relationship between labour market regulations and bank performance.

5. Conclusion

The labour economics literature provides mixed evidence regarding the impact of labour regulation on firm economic performance, whilst the bank performance literature has so far neglected to examine the importance of labour regulation. This paper tries to fill this gap in the literature and examines the impact of labour regulation on bank performance in the context of the EU-15 banking system over the 2005-2010. We employ the Fraser index for labour regulation and its sub-components and investigate the relationship between labour market regulation and cost, technical and allocative efficiency in European banking. The results of our analysis show that, the effect of the aggregate labour regulation index on cost technical and allocative efficiency is negative. This is in line with Storm and Naastepad (2009) who provide evidence

that a relatively regulated and '*rigid*' industrial relations system promotes labour productivity growth in twenty OECD countries. However, when looking at the sub-components of the labour regulation index, we observe different forces at play and that the liberalization of the minimum wage and cost of dismissals has a positive effect on cost efficiency. Moreover, we also find that the liberalization of hiring and firing regulations impacts positively on bank efficiency. However, not all these results are confirmed when we examine the effect of labour market regulation on the sub-components of cost efficiency, namely, technical and allocative efficiency. Thus, our analysis suggests that the relationship between cost efficiency and labour market regulations is complex warranting further investigation.

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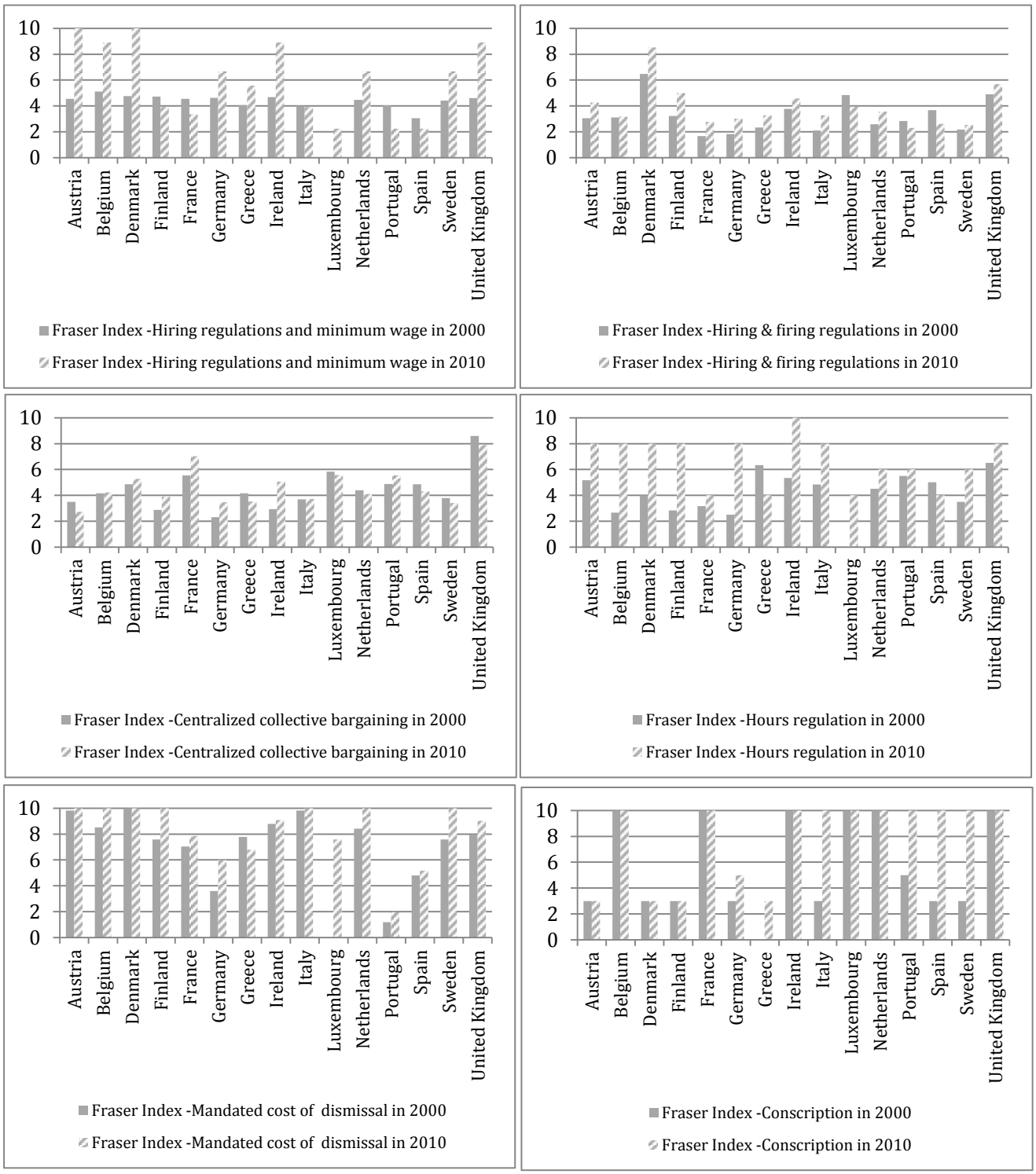
Figure 1: Fraser Index – Labour regulation in the EU (2000-2010)

Source: Fraser Institute, Economic Freedom Network.

Figure 2: Fraser Index – sub-components of the labour regulation index in the EU (2000-2010)



Source: Fraser Institute, Economic Freedom Network. **Note**: Data for Fraser Index – Mandated cost of dismissal are for 2002 for all countries. Data for Luxembourg are for 2003 (due to data availability issues).

Table 1: Descriptive statistics for the period 2005-2010

	Efficiency			Labour regulation						Bank-specific Control Variables				Macro Variables		Obs
	CEFF	TEFF	AEFF	LR-FR	MW-FR	HF-FR	CCB-FR	HR-FR	DISS-FR	LLP/L	EQ/A	NIM	TA	GDPgr	INFL	
Austria	0.69	0.81	0.85	6.08	9.82	4.17	2.57	7.13	9.87	0.83	7.87	2.29	3.85	1.58	1.90	846
Belgium	0.73	0.84	0.87	6.97	8.90	2.97	4.22	6.67	9.00	0.40	7.45	2.06	24.61	1.33	2.17	96
Denmark	0.72	0.81	0.89	7.47	10.00	8.00	5.73	8.00	10.00	1.18	12.92	3.60	11.32	0.42	2.07	312
Finland	0.79	0.84	0.94	5.18	5.03	4.35	3.70	6.67	8.40	0.17	7.71	1.17	71.24	1.28	1.72	24
France	0.78	0.85	0.92	5.62	3.30	2.70	6.48	4.00	7.30	0.43	9.10	2.21	57.94	0.85	1.55	666
Germany	0.69	0.80	0.86	4.38	6.70	2.53	3.23	5.80	4.40	0.88	6.50	2.59	2.28	1.32	1.58	8124
Greece	0.79	0.87	0.91	4.40	5.78	3.17	3.60	3.53	7.63	1.03	7.98	2.92	26.16	0.52	3.28	78
Ireland	0.90	0.95	0.95	7.63	8.90	4.30	4.12	10.00	8.48	3.46	5.01	1.67	94.03	0.90	1.65	30
Italy	0.72	0.83	0.87	6.45	6.05	2.63	3.67	6.67	9.60	0.57	11.53	3.01	5.63	-0.02	1.93	2880
Luxembourg	0.65	0.76	0.85	5.55	2.93	3.80	5.95	4.00	6.60	0.69	6.72	1.11	10.62	2.48	2.27	144
Netherlands	0.79	0.86	0.91	6.68	7.77	3.27	4.17	6.00	8.93	0.44	7.72	1.78	161.21	1.50	1.58	60
Portugal	0.80	0.87	0.91	5.17	5.77	2.50	5.62	5.53	1.43	0.52	6.18	1.70	28.97	0.52	1.83	66
Spain	0.78	0.89	0.87	5.13	2.20	2.82	5.27	5.67	4.93	0.55	9.06	2.35	30.46	1.35	2.55	486
Sweden	0.78	0.88	0.88	5.38	7.23	2.95	3.48	6.00	8.40	0.32	14.04	2.84	10.29	1.97	1.37	360
UK	0.74	0.84	0.87	8.20	8.90	5.38	7.92	8.67	8.33	1.26	9.60	2.07	122.81	0.97	2.62	288
EU-15	**0.71**	**0.82**	**0.87**	**5.19**	**6.55**	**2.88**	**3.71**	**6.06**	**6.30**	**0.78**	**8.20**	**2.62**	**10.79**	**1.04**	**1.75**	**14460**

Note: Figures are in means over the period 2005-2010. CEFF=cost efficiency; TEFF=technical efficiency; AEFF=allocative efficiency (all estimated using DEA). LR = aggregate labour market regulations index; MW: hiring and minimum wage regulation, HF: hiring and firing regulation, CCB: centralized collective bargaining, DISS: dismissal cost, HR: hours regulations. Higher values for labour regulation imply a more liberal regulatory environment. LLP/L=loan loss provisions to loans ratio (in %). EQ/A= equity to total assets (in %); NIM= net interest margin (in %); TA= total assets in billion euros. GDPgr=GDP growth; INFL= inflation rate. Obs= number of observations. **Sources**: Fitch-IBCA database for all bank-specific variables and own estimations and the 2011 version of the Fraser Index of Economic Freedom for labour regulation variables, World Development Indicators Database by the World Bank for all macroeconomic variables.

Table 2: Empirical results: cost, technical and allocative efficiency and labour market regulation (aggregate index)

	Dep.Var. *(1) CEFF*	*Dep.Var.* *(2) TEFF*	*Dep.Var.* *(3) AEFF*
EFF_{t-1}	0.489***	0.762***	0.637***
	(0.000)	(0.000)	(0.007)
LR	-0.120***	-0.009**	-0.122***
	(0.000)	(0.041)	(0.000)
lnTA	0.061***	0.007***	0.036***
	(0.000)	(0.000)	(0.000)
NIM	0.129	0.010	0.072***
	(0.184)	(0.321)	(0.000)
EQ/A	0.030***	0.004**	0.014***
	(0.000)	(0.023)	(0.000)
LLP/L	-0.072**	-0.049***	-0.090**
	(0.025)	(0.000)	(0.016)
GDPgr	-0.002	0.001*	-0.003
	(0.240)	(0.063)	(0.365)
INFL	-0.033***	-0.017***	-0.017**
	(0.003)	(0.000)	(0.012)
constant	-0.303	0.156***	0.268
	(0.464)	(0.009)	(0.175)
No of instruments	12	12	10
Wald X2	$X^2(8)$=1,098.91 (0.000)	$X^2(8)$= 2,595.26 (0.000)	$X^2(8)$= 4,614.26 (0.000)
AR(1) test	-3.2629 (0.001)	-3.406 (0.001)	-3.082 (0.002)
AR(2) test	0.96653 (0.334)	-1.614 (0.107)	0.898 (0.369)
Sargan test	$X^2(3)$=5.5042 (0.138)	$X^2(3)$=1.803 (0.614)	$X^2(1)$=0.377 (0.539)
No of banks	2,406	2,406	2,405

Note: Models 1-3 estimated using Arelano and Bover (1995) with robust standard errors. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. P-values are in parentheses.

Table 3: Empirical results: cost efficiency and labour market regulation sub-components

	(1)	(2)	(3)
EFF_{t-1}	0.365**	0.478**	0.437***
	(0.012)	(0.025)	(0.000)
HF-FR		0.055***	-0.011
		(0.000)	(0.374)
CCB-FR		-0.015***	0.001
		(0.000)	(0.828)
HR-FR		-0.072***	-0.083***
		(0.000)	(0.000)
MW-FR	0.020***		0.014***
	(0.002)		(0.000)
DISS-FR	-0.014***		0.065***
	(0.001)		(0.000)
lnTA	0.024***	0.019***	-0.010*
	(0.000)	(0.000)	(0.061)
NIM	0.070***	0.070***	-0.010
	(0.007)	(0.000)	(0.596)
EQ/A	-0.002	0.001	-0.016***
	(0.551)	(0.616)	(0.000)
LLP/L	-0.280***	-0.070**	-0.161***
	(0.002)	(0.025)	(0.000)
GDPgr	-0.009***	0.001	-0.002***
	(0.002)	(0.714)	(0.000)
INFL	0.035***	-0.053***	-0.023***
	(0.002)	(0.000)	(0.000)
constant	0.095	0.410***	0.884***
	(0.434)	(0.001)	(0.000)
No of instruments	13	12	20
Wald X^2	$X^2(9)$=191.12 (0.000)	$X^2(10)$= 3983.95 (0.000)	$X^2(12)$= 1790.03 (0.000)
AR(1) test	-2.110 (0.034)	-5.230 (0.000)	-3.058 (0.002)
AR(2) test	-1.352 (0.176)	1.660 (0.100)	-1.639 (0.101)
Sargan test	$X^2(3)$=3.288 (0.349)	$X^2(1)$=2.576 (0.109)	$X^2(7)$=10.267 (0.174)
No of banks	2406	2405	2406

Note: Models 1-3 estimated using Arelano and Bover (1995) with robust standard errors. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. P-values are in parentheses.

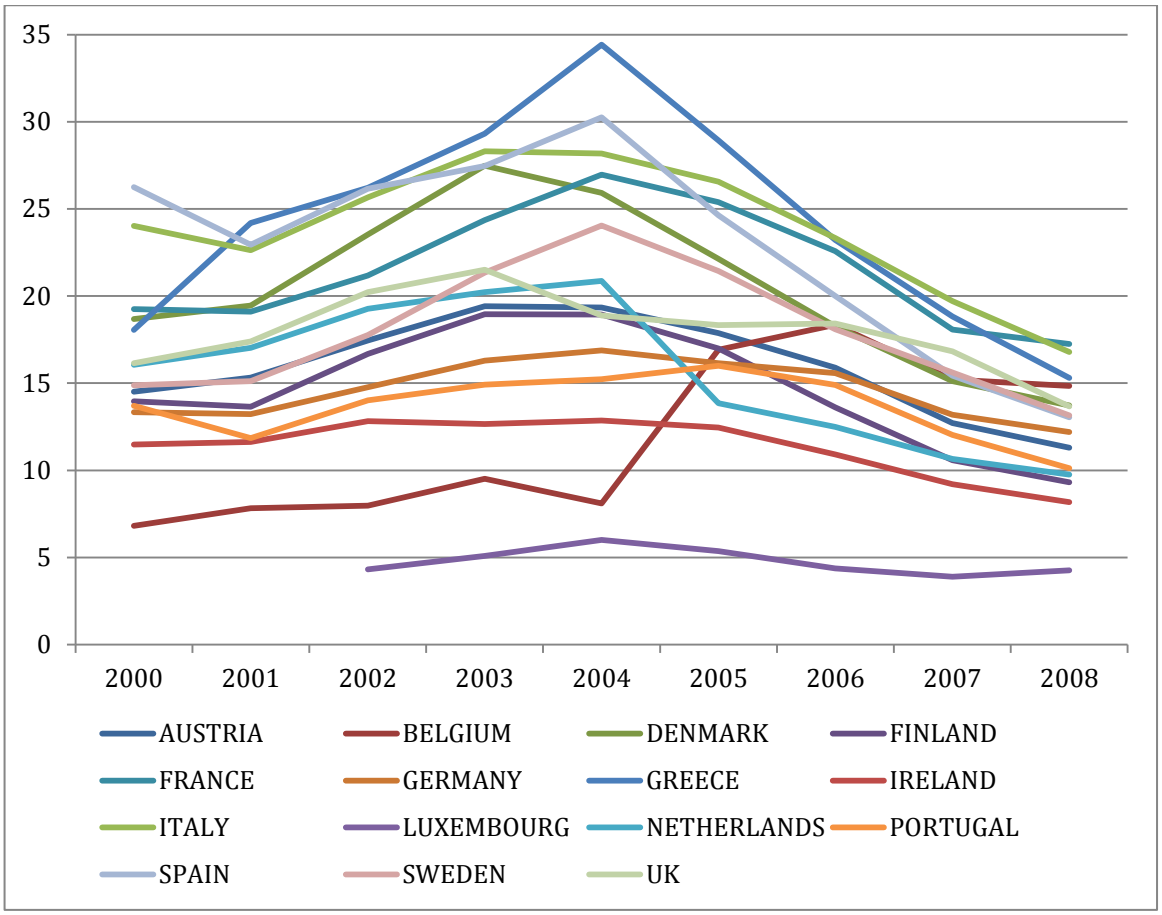
Table 4: Empirical results: technical and allocative efficiency and labour market regulation sub-components

	Dep.Var. TEFF	Dep.Var. AEFF
EFF_{t-1}	0.792***	0.929***
	(0.000)	(0.005)
HF-FR	0.005**	
	(0.033)	
CCB-FR	0.001	
	(0.501)	
HR-FR	-0.004***	
	(0.000)	
MW-FR		-0.049***
		(0.000)
DISS-FR		-0.076***
		(0.000)
lnTA	0.004***	0.033***
	(0.000)	(0.000)
NIM	0.014***	0.124***
	(0.000)	(0.000)
EQ/A	0.000	0.017***
	(0.618)	(0.000)
LLP/L	-0.021	-0.104***
	(0.191)	(0.001)
GDPgr	0.002***	-0.002
	(0.000)	(0.572)
INFL	-0.019***	-0.024***
	(0.000)	(0.000)
constant	0.127***	0.079
	(0.000)	(0.719)
No of instruments	14	11
Wald X^2	$X^2(10)=6715.00$ (0.000)	$X^2(9)=2750.14$ (0.000)
AR(1) test	-4.887 (0.000)	-3.065 (0.002)
AR(2) test	-0.9492 (0.343)	0.998 (0.318)
Sargan test	$X^2(3)=10.209$ (0.020)	$X^2(1)=0.2474$ (0.619)
No of banks	2405	2405

Note: Models estimated using Arelano and Bover (1995) with robust standard errors. ***, ** and * indicate 1%, 5% and 10% significance levels respectively. P-values are in parentheses.

ANNEX 1

Figure A1: Staff costs (in % of total cost) by country over time



Source: OECD Bank Profitability Report (2010).

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