The Impact of Business Regulations on Bank Performance in the European Union (2000-2010)

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WORK NOT SUBMITTED ELSEWHERE FOR EXAMINATION

I hereby declare that this thesis has not been, and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature:…….

UNIVERSITY OF SUSSEX

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SUMMARY

This thesis examines the impact of several types of business regulations on bank performance, as measured by cost efficiency, in the EU economies over the 2000-2010 periods. First we investigate the impact of credit, labour and business regulation on the performance of the banking systems of the EU-10. The regulation indices are sourced from the *Fraser Index of Economic Freedom* (Gwartney et. al, 2012). In further analysis, we decompose the credit regulation variable in its components (private ownership of banks, foreign bank competition, private sector credit, limitations from interest rate controls and regulations) in order to find which type of credit regulation is more important for performance.

Second, we examine the impact of several type of business regulations derived from the "*Doing Business*" project of the World Bank on bank performance as measured by cost efficiency in the EU-10 economies. More specifically we use regulation indices related to: i) *starting a business*, ii) *getting credit*, iii) *paying taxes*, iv) *enforcing contracts*, v) *resolving insolvency*, vi) *protecting investors*, and vii) *employing workers*. We put special emphasis on regulations related to *"getting credit", "paying taxes"* and *"starting a business"* as the first type is directly relevant to the banking sector while the next two on the top of the EU agenda. In further analysis we investigate if the impact of business regulation on bank performance is influenced by institutional quality as measured by rule of law and corruption variables.

Third, we assess the impact of different types of labour regulation on bank performance, as measured by cost efficiency, in the five countries of the eurozone periphery (Greece, Ireland, Italy, Portugal, Spain) over the 2000-2010 periods. We source the labour regulation variables from the *Fraser Index of Economic Freedom* (Gwartney et. al, 2012) and from the *Employment Protection Index* produced by the Organisation for Economic Co-operation and Development (OECD). In further analysis we investigate if the impact of labour regulation on bank performance is influenced by the country-level law enforcement capacity.

Finally, some conclusions are provided along with limitations of this research and an agenda for future work.

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"Dedicated to my family Manolis, Ioanna and Kallia; they always believe in me and to Theodora; I always believe in her"

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Chapter 1: Introduction

This thesis investigates the impact of financial-specific and more general economy-wide regulations on bank performance, as measured by cost efficiency, in the enlarged European Union (EU-27) over the 2000-2010 periods. This introductory section will discuss why it is important to examine the determinants of the performance of the banking sector in the EU and why we are focusing on regulations.

A well developed and well-functioning banking system is a central element of financial development which in turn is a major determinant in the process of economic growth and development (Levine and Zervos, 1998; Levine et al., 2000; Christopoulos and Tsionas 2004; Hassan et al. 2011).[1] This is because banks, by acting as intermediaries, enable the execution of five important functions that decrease transaction costs in the credit market. In this way, the banking sector becomes a driver of investment growth, which in turn leads to economic growth (Levine, 1997; Levine 2005). These five functions are according to Levine (2005) the following: i) The production of ex ante information about potential investments and capital allocation, ii) The ex post monitoring of investment projects, iii) The facilitation of trading, diversification and management of risk, iv) The mobilization and pool of savings, and v) The ease of the exchange of goods and services. Given these important functions that financial institutions such as banks carry out, it is natural to expect that when banks perform poorly the negative effects on the real economy can be severe as the recent financial crisis has clearly demonstrated. This is because banks that are in a risky position as a result of poor performance tend to reduce credit availability to the rest of the economy (Bernanke 1983; Ashcraft 2005). This is especially true in the recent crisis (Ivashina and Scharfsteinb, 2010) and for firms and sectors that are more dependent on bank capital (Kroszner et al, 2007;

[1] There is also the view that economic growth can be a determinant of financial development. Such studies do not exclude that financial development is a determinant of economic growth but they rather find a bidirectional causality between these two (Shan et al., 2001, Hassan et al., 2011). It is also useful to note that the direction of causality that favors financial development as a determinant of economic growth becomes stronger the higher the level of economic development of a country (Calderon and Liu, 2003; Hassan et al. 2011). This last observation is important for the context of this thesis as most of the EU economies are highly developed while some of them are the catching up stage (the new member states that are finalizing their transition from planned to market economies).

Dell'Ariccia et al., 2008; Chava and Purnanandam, 2011). This reduction of the credit availability can lead to a reduction in investment activity and thus a decrease in capital investment, job growth and economic growth in general. The studies that have examined the impact of banking crises on economic growth provide evidence that poor performance and increased risk in the banking sector of an economy has detrimental effects on growth (Boyd et al., 2005; Demirgüç-Kunt et al., 2006; Furceri and Mourougane, 2012). Another issue, that highlights the importance of banks for an economy and has been demonstrated in the ongoing sovereign debt crisis in the EU is that the poor performance of the banking sector can lead to significant increases of public debt and deficit (Reinhart and Rogoff, 2009; 2010). Part of this increased in government debt could be a result of increased government intervention in the banking sector in the form of bank bailouts and bank recapitalization measures. Such type of costly government interventions are usually justified by policy makers on the grounds that they are essential measures in order to mitigate the negative effects of a banking crisis, as for example the reduction in the credit supply in the real economy. The empirical evidence on the success of such measures though remains inconclusive as some studies find that government intervention in the banking sectors moderates the negative effect of bank crisis on economic performance (Giannetti and Simonov, 2009; Laeven and Valencia, 2013) while some other studies find that such policies were not able to mitigate the effects of a bank crisis on the real economy (Claessens et al. 2005; Dell'Arricia et al., 2008). It is important to note that according to Reinhart and Rogoff (2009) it is not the direct costs of policies to support the banking sector that drive the increase of government debt and deficit in a period of banking crisis but rather a steep decrease in government tax revenue and other increased in government spending to counter the recession. In the view of Reinhart and Rogoff (2009) the higher the extent that the crisis of the banking sector has led an economy to a recession the higher the possibility that a sovereign debt crisis could occur because of decreased government revenue and increased government spending. Mody and Sandri (2012) on the other hand provide evidence that the sovereign risk of the countries in the euro area, especially for the ones in the EU periphery, has increased because of greater expectation of public spending in support of risky banks. Furthermore Ang and Longstaff (2013) provide evidence from the EU and the US that crises in the financial markets can have an independent from the macroeconomic fundamentals

effect on sovereign risk. Although there is not a consensus in terms of the channel through which the poor performance and the riskiness of the banking sector can negatively affect an economy's public debt and deficit, there is a consensus that bank crises can lead to a deterioration in the public finances.

The choice of focusing this thesis on the determinants of the performance of the banking sector in the EU becomes then a relevant and timely issue. The banking sector is of great importance for the EU economies. This is because the majority of these countries have financial systems that are bank-based rather than market-based (see for example Demirgüç-Kunt and Maksimovic (2002).[2] Secondly, several countries of the EU, especially the ones in the periphery, are still in the midst of severe recession, that has started in the beginning of 2008 as a banking crisis and has spread to the real economy through less availability of credit (Hristov et al., 2012; Gaiotti 2013). This economic slowdown feeds back to the banking sector creating a situation of mutual destabilization between the banking sector and the real economy. Finally the progress of the crisis in the EU from the bank and the real economy level to the sovereign level has depleted the fiscal ammunition of governments to wither this double banking and real economy crisis.

The focus of this thesis on the impact of regulation on bank performance is motivated by the fact that the extant bank performance literature examines a limited type of regulations that are related to prudential supervision and bank-specific regulation mainly using the Barth et al. (2001) dataset.[3] However banks *de facto* and *de jure* operate within the regulatory framework of the country that they are located. The regulatory framework of a country covers a wide range of economy-wide regulations such as labour and other types business regulation that could affect the performance of the banking sector.[4] Stringent labour regulation for example could affect directly the labour costs of banks and thus have a direct impact on their

[2] Over time the distinction between bank-based and market-based financial systems for the continental European economies subdues as they become more similar to the anglosaxon market-based systems (Rajan and Zingales, 2003; Bruno et al. 2012). The banking sector though in the majority of the EU economies remains of crucial importance.

[3] The Barth et al. (2001) dataset contains data on bank regulation that are related to official supervisory power, capital requirements, private monitoring and activities restrictions.

[4] Several types of economy wide regulations are examined with respect to their impact on bank performance. These type of regulations include: labour regulation, business regulation, tax regulation, contract regulation, insolvency regulation, protecting investors regulation and bankruptcy regulation. These are sourced from economic freedom indices such the Fraser Index of Economic Freedom and the *"Doing Business"* project of the World Bank.

performance. It could also affect the performance of the non-bank firms in an economy and this could be channeled to the banking sector through an impact on the non performing loans. The same could apply for other types of regulation such as tax regulation. The first contribution of this thesis then is to analyze the importance of several types of non financial-specific regulation on bank performance.

There are also some types of financial regulations that are not covered by the Barth et al. (2001) dataset and are not adequately examined in the banking literature in terms of their impact on bank performance. Such types of regulation include the existence and the coverage of credit bureaus and registries, the depth of credit information available in the credit registries and the strength of creditor rights. The credit information infrastructure of an economy as well as the strength of creditor rights is of major importance for banks located in this country. This is because they can facilitate easier and less costly loan origination through the decrease in the credit market of issues such as adverse selection and moral hazard (Pagano and Jappelli, 1993; Kalberg and Udell, 2003; Acharya et al., 2011). We also examine financial regulations that are related to barriers to foreign and private bank competition and interest rate controls. The second contribution of this thesis then is that it examines the impact of these types of financial regulation on bank performance.

Furthermore, regulation by default implies an interaction of the public sector, that is the regulation enforcement mechanism, and the economic agents of an economy. This interaction can be influenced by the country-level institutional quality. In countries with higher level of law observance a regulation is more likely to be actually enforced. On the other hand, in economies characterized by lower levels of rule of law a regulation is more likely to exist on paper but not enforced in practice. Similarly, another indicator of institutional quality, corruption, can influence the impact of regulation on bank performance. This is because corruption can either represent an additional cost in the interaction of a firm with the state bureaucracy of the regulation enforcement mechanism[5] or be able to speed-up bureaucratic processes and enable firms to circumvent excessive regulation and thus incur

[5] This is the *"sand the wheel"* hypothesis of corruption (see, for example, Murphy et al., 1993)

efficiency gains[6]. The third contribution of this thesis then is that it investigates the extent to which institutional quality, as measured by rule of law and control of corruption, influences the impact of regulations on bank performance in the EU economies.

Finally, it is important to select an appropriate measure of bank performance. In this thesis we use cost efficiency as a measure of bank performance. Frontier efficiency estimations measure the performance of a decision making unit (DMU), such as banks, in comparative terms with the best performing DMUs of an industry. The use of frontier estimations of bank cost efficiency is employed in this thesis on the grounds that they are considered superior measures of firm performance in comparison with more accounting based measures of performance such as the cost to income ratio and other financial ratios (Berger and Humphrey, 1997; Bauer et al., 1998). This is because frontier estimations of bank efficiency are able to account for all the inputs, input prices and outputs of bank operations (Thanassoulis et al., 1996; Berger and Humphrey, 1997). In this way they offer an objective numerical efficiency score and ranking of a banks (Berger and Humphrey, 1997) that can be used for academic research, regulatory and other purposes (Bauer et al., 1998). Additionally, we opt for cost efficiency estimation instead of profit efficiency because the ability of banks to control costs in general is an important objective for bank management as it is the efficient use of resources that determines success in the financial sector (Spong et al., 1995). Furthermore, cost efficiency is preferable to profit efficiency because of the realistic assumption that bank managers have greater control over inputs and input costs rather than over outputs (Goddart et al., 2001; Casu and Girardone, 2006).

This thesis is organized into five chapters. The next chapter, Chapter 2, examines the impact of business, labour and credit regulation on bank performance in the ten new EU member countries of Central and Eastern Europe. These regulation indices are sourced from the *Fraser Index of Economic Freedom* (Gwartney et. al, 2012). Using data from IBCA-Bankscope we derive bank cost efficiency scores using a parametric approach (data envelopment analysis) for the period prior to and immediately following the accession of these economies in the EU (2000-2010).

[6] This is the *"grease the wheel"* hypothesis of corruption (see, for example Lui, 1985).

These scores are then used in fixed effects panel models, dynamic panel models and dynamic panel vector autoregression (VAR) models to estimate the impact of these types of regulation on bank-specific efficiency in these economies. In further analysis we decompose the credit regulation index into its components to find specifically which type of credit regulation matters most for bank performance . These components are: i) private ownership of banks, ii) foreign bank competition, iii) private sector credit and iv) limitations from interest rate controls and regulations. Finally, we provide some robustness checks with an alternative economic freedom index; the *Heritage Foundation Index of Economic Freedom.*

In Chapter 3 we provide a comprehensive analysis of the impact of business and financial specific regulations on bank performance as measured by cost efficiency in the EU-27 over the 2004-2010 periods. In order to derive estimates of bank cost efficiencies we use data from IBCA-Bankscope and employ a parametric approach (stochastic frontier analysis). These are then regressed in both fixed effects and dynamic panel models over several types of business regulation. To this end we employ for the first time in the banking literature a unique dataset of a wide range of regulation indices from the "*Doing Business*" project of the World Bank. More specifically we use regulation indices related to: i) *starting a business*, ii) *getting credit*, iii) *paying taxes*, iv) *enforcing contracts*, v) *resolving insolvency*, vi) *protecting investors*, and vii) *employing workers*. These general categories of business regulations are decomposed to account for diverse regulatory aspects. In further analysis we use interaction terms between the business regulation variables and institutional quality measures such as the rule of law and the control of corruption. These institutional quality measures are sourced from the *World Governance Indicators* of the World Bank. The purpose of using in the econometric analysis the interaction terms between the business regulation variables and the rule of law and control of corruption variables is to examine if the individual effect of business regulation on bank performance becomes is influenced by higher levels of institutional quality. In further analysis we interact the business regulation variables of the *getting credit* and *protecting investors* categories with a crisis dummy for the years 2008-2010. In this way we explore if the individual impact of these regulations on bank performance subdues or becomes magnified in the years of the crisis.

Chapter 4 focuses on the impact of labour regulation on bank performance, as measured by cost efficiency, in the five countries of the eurozone periphery (Greece, Ireland, Italy, Portugal, Spain) over the 2000-2010 periods. These countries of the EU are currently struggling to wither a crisis that is related in three fronts: the banking sector, the real economy and the sovereign level. One of the measures they are adopting in order to improve their economic performance is the reduction of the strigency of labour regulation. Thus, it is timely and interesting to explore what impact labour regulation could have on the bank performance in these economies. To this end we use data from IBCA-Bankscope and employ a parametric approach (stochastic frontier analysis) in order to derive estimates of bank-specific cost inefficiencies. In a second stage analysis we regress these inefficiencies over several labour regulation variables along with bank-specific and country-level control variables. We source the labour regulation variables from the *Fraser Index of Economic Freedom* (Gwartney et. al, 2012) and from the *Employment Protection Index* produced by the Organisation for Economic Co-operation and Development (OECD). Several types of labour regulation such as dismissal costs, minimum wage, hiring regulation, centralised collective bargaining regulation, hours regulation and conscription regulation are being employed in the models. We also examine dismissal cost regulation related to regular employment contracts, temporary employment contracts and collective dismissals. In further analysis we interact the labour regulation variables with the rule of law variable sourced from the *World Governance Indicators* of the World Bank. The purpose of this analysis is to examine whether the individual impact of labour regulations on bank performance subdues or becomes magnified at higher levels of law observance. Finally we interact the labour regulation variables with a crisis dummy for the years 2008-2010 to examine if the impact of labour regulation on bank performance becomes more or less important in the crisis years.

Finally, in Chapter 5 we present a summary of the contributions of this thesis and provide some concluding remarks and public policy implications. We also discuss limitations of this research and an agenda for future research.

Chapter 2:The Impact of Regulation of Credit, Labour and Business on Bank Performance in the EU-10 Economies

2.1 Introduction and Literature Review

The on-going financial crisis poses many challenges but also provides an opportunity to enhance efforts for constructive financial consolidation. In particular, a major concern for policy makers and market participants in the financial markets is related to the debate on the role of financial regulation and its impact on bank performance. This chapter focuses on the impact of regulation on banking sector performance, as this is of major importance to the well-functioning of financial markets. However, the importance of regulation is not limited to the banking sector. Particularly during a prolonged financial crisis, poor bank performance may have heavy negative effects for the overall economy because of the potential destabilisation of the financial system and the effect of restricted credit. The recent vulnerability of the financial markets provides a strong motivation to further study the importance of regulation.

It is important to note that regulation is a very complex series of activities. Therefore, its nature and impact differs from highly specialised applications to industrial sectors to more general legal requirements directed to the economy as a whole. The literature that relates regulation to bank performance so far has been largely dominated by aspects specific to the banking/financial sector as this type of prudential regulation is considered by policy makers to be an important foundation for a sound financial system. In recent years there has been an increasing amount of cross-country empirical studies that link financial regulation and supervisory practices to bank performance (Barth et al., 2004 ; Barth et al. 2013 ; Beck et al., 2006; Delis et al., 2011 ; Pasiouras, 2008; Pasiouras et al., 2009) [7]. A consensus in

[7] Barth et al. (2004) examines the supervisory practices and regulations in the banking sectors of 107 economies and finds a positive and significant impact of private monitoring on bank performance but not a statistically significant relationship between bank performance and official supervisory power and capital strigency. Beck et al. (2006) in a study of 2,500 firms across 37 countries find that supervisory strategy that focuses on empowering private monitoring of banks by forcing them to disclose accurate information to the private sector tends to lower the degree to which corruption of

the literature on what constitutes good regulation, or how specific regulations influence the performance and stability of the banking sector (see e.g. Demirgüç-Kunt et al., 2008) has not been established. What is striking though is the absence of any studies that have examined the impact of non-financial regulation on bank performance. This is of additional importance in light of the recent financial crisis as many countries have enhanced their efforts to improve competitiveness and foster growth with structural reforms directed towards their business environment while at the same time supporting their financial sector to weather the crisis. Even the richest countries have found this to be far from easy.

Early empirical studies of bank crisis determinants such as Demirgüç-Kunt and Detragiache (1998, 2002) find that better institutional quality at the country-level decreases the probability of a banking crisis and limits the impact of moral hazard due to deposit insurance. In these studies, institutional variables such as rule of law and quality of bureaucracy are interpreted as proxies for bank-specific supervision and regulation because of alternative data unavailability. Data on bank-specific regulation led to studies that focus on regulation while indices of non-bank specific institutional and regulatory quality are used as control variables. The research philosophy behind such an approach is to examine not only whether bank-specific regulation exists as legislation but also to what extent this is being enforced in practice. Even in such a framework the importance of the non-financial institutional and regulatory framework in explaining cross-country differences in bank

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bank officials is an obstacle to firms raising external finance. Pasiouras (2008) examines the effect of a series of financial regulations on the performance of banks as measured by technical efficiency and finds that although strict capital adequacy, market discipline and powerful supervision are positively associated with efficiency, the effect is statistically significant only for regulation related to market discipline. In another study, Pasiouras et al. (2009) investigate the impact of the three pillars of Basel II and restrictions on bank activities on efficiency. They find that regulation that enhances market discipline and the supervisory power of the authorities is positively related with bank efficiency. On the other hand, restrictions on bank activities increase profit efficiency but reduce cost efficiency, while stricter capital requirements have the opposite effect. Barth et al. (2013) examined whether bank regulation, supervision and monitoring improves bank efficiency, based on an unbalanced panel of 4,000 observations in 72 countries for 1999-2007. They find that tighter restrictions on bank activities have a negative impact on bank efficiency, while increased regulation has a marginally positive effect on efficiency. They also find that enhanced official supervisory power is positively associated with efficiency only in countries with independent supervisory authorities. In a more recent study, Delis et al. (2011) examine the relationship between the banking regulatory and supervision framework and banking productivity in 22 transition economies. Their results indicate that private monitoring and restrictions on bank activities have a positive impact on productivity while regulation related to the first and second pillars of Basel II (capital requirements and official supervisory power) do not appear to have a statistically significant impact on productivity although they appear to gain importance in the post financial crisis period (after 2007).

performance is emphasized by Demirgüç-Kunt et al. (2004)[8]. On the other hand, studies that explicitly focus on the importance of country-level institutional/regulatory quality as determinants of bank efficiency are very scarce (Hasan et al. 2009; Lensink et al., 2008).

Three issues emerge from the literature that examines the impact of country-level regulation on bank performance. Firstly, most studies focus on prudential and supervisory regulation specific to the banking/financial sector. Secondly, country-level regulatory or institutional variables have been mostly used as control variables when the importance of banking/financial regulation is examined. Finally, the scant literature that explicitly examines the impact of institutions and regulation on bank performance does not differentiate clearly between alternative types of regulatory/institutional quality, which is important in order to prioritise reform efforts.

In this chapter we contribute to the literature in several ways. Firstly, we use the regulation components of the *Fraser Index of Economic Freedom* to examine the impact of credit (financial) regulation, on bank performance in the EU-10 economies. The credit regulation index used in this study moves away from prudential and supervisory regulation issues as it relates mostly to regulation concerned with the ownership structure of national banking system, that is, government-owned, private-owned and foreign-owned banks. Previous research on the link between bank ownership and performance finds that privately owned banks perform better than their government owned counterparts (Berger et al., 2005; Cornet et al., 2010; Lin and Zhang, 2009; Mian, 2003; Mico et al., 2007). The comparatively poor performance of government-owned banks compared with those

[8] Demirgüç-Kunt et al. (2004) in a study of 1,400 banks across 72 countries find that once they control for variables reflecting the non-financial regulatory framework such as the general level of economic freedom and the extent of protection of property rights, bank regulations become insignificant as determinants of net interest margins in the banking sector while the non-financial regulatory indicators negatively affect net interest margins and overheads. The authors conclude that bank regulations cannot be viewed in isolation from the non-bank regulatory and institutional framework. In another study Demirgüç-Kunt et al. (2008) examine whether compliance with the Basel Core Principles (BCPs) for Effective Banking Supervision improves bank soundness. The authors confirm a significant and positive relationship between bank soundness and compliance with principles related to information provision while their results remain robust after controlling *inter alia* for country level institutional quality as proxied by the rule of law. However, the overall index of BCP loses much of its statistical significance once institutional quality is controlled for. Furthermore most of the other components of the BCPs index are found not to be significant determinants of bank soundness in regressions where the rule of law index is included.

in private ownership can be attributed to political influence in the former group (Carvahlo, 2010; Cole, 2009; Dinc, 2005; Khwaja and Mian, 2005; Mico et al., 2007; Sapienza, 2004).

Private banks can be categorized into foreign and domestic. The theoretical framework used in research related to the comparative performance between these is based on two alternative hypotheses proposed by Berger et al. (2000). In the first hypothesis, the *"home advantage"*, domestic banks can operate more efficiently than foreign banks in their own country as they are more familiar with the local business environment and institutional framework. In the alternative hypothesis, the *"global advantage"*, foreign banks may possess enough firm-specific advantages to overcome the liability of foreignness and so even outperform local competitors in the host economy. In terms of emerging and developing economies most of the evidence supports the *"global advantage"* hypothesis as noted by several authors (Bonin et al., 2005; Classens et al., 2001; Detragiache et al., 2008; Grigorian and Manole, 2006; Micco et al., 2007). However, other studies find support for the *"home advantage"* hypothesis (Nikiel and Opiela, 2008; Yildirim and Phillipatos, 2007). Finally, some studies do not find significant differences in terms of performance between domestic and foreign banks (Crystal et al., 2001; Mian, 2003).

The second contribution of this chapter is the investigation of the impact of labour and business regulation on bank performance. With respect to labour regulation its relevance to the banking sector is twofold. First of all the ability of banks to control costs in general, and personnel expenses in particular, is an important objective for bank management as it is the efficient use of resources that determines success in the financial sector (Spong et al., 1995). Secondly, to the extent that labour regulation has a negative or positive impact on the performance of firms located within a national jurisdiction this could affect the performance of the domestic banking sector through spillover effects such as lower or higher loan default rates.

The existence of labour market regulation is based on the rationale that employees benefit from protection from arbitrary actions by employers. However, it may increase the costs of firms to employ workers and adjust employment to the optimal level (Nickel, 1997). Most of the empirical studies that relate labour regulation to economic outcomes such as output and unemployment (e.g., Blanchard and

Portugal, 2001; Blanchard and Wolfers, 2000; Botero et al., 2004; Heckman and Pagés, 2003; Lazear, 1990; Nickel and Layard, 1999) find that strict labour regulation has a negative impact on economic performance. While there is a growing consensus in the literature related to the effects of labour regulation on employment, relatively less is known about the impact of labour regulation on productivity. Furthermore, in studies that focus on productivity growth the evidence is mixed. A stream of recent papers finds a negative impact of labour regulation on investment and productivity growth (Autor et al., 2007; Bassanini et al., 2009; Besley and Burgess, 2004). Such productivity losses can be explained by rising employment costs as a result of stricter employment protection legislation (Bassanini and Ernst 2002; Scarpetta and Tressel 2004). On the other hand, other studies find that more strict labour regulation can lead to productivity gains (Deakin and Sarkar, 2008; Storm and Naastepad, 2009) as firms and employees are more inclined to invest in enhancing firm-specific skills in the workforce (Auer, 2007; Wasmer, 2006).

Business regulations and bureaucratic procedures that restrain business entry and reduce competition may also affect bank performance through spillover effects. In particular regulatory entry barriers can lead to decreased competition through a reduction in new firms entering an industry (Ciccone and Papaioannou, 2007; Klapper et al., 2006). This decreased competitive pressure can lead to lower investment (Alesina et al., 2005), reduced growth (Loayza et al., 2005) and less productivity (Bastos and Nasir, 2004; Bourlès et al., 2010; Nicoletti and Scarpetta, 2003). Thus, strict business regulation can have a negative effect on the performance of firms and so affect the fulfilment of the obligations these firms have to the domestic banking sector. In addition, increased business regulation is found to induce informality (Loayza et al., 2005) so making it harder for banks to assess the creditworthiness of a firm. Furthermore, in order to evaluate the relative importance of regulation of credit, labour and business in comparison with other elements of economic freedom we include in the initial estimations the remaining economic freedom variables. These are: limited size of government, legal structure and property rights, access to sound money and freedom to trade with foreigners.

Finally, we focus this study on a sample of banks in the EU-10 economies that are involved actively in a process of financial integration. This is a group whom a wider definition of regulation is likely to improve significantly their performance. Previous

studies related to bank performance in transition economies and the ownership structure in transitional banking systems have used both country-specific case studies and cross-country frameworks although no consensus has been reached (Asaftei and Kumbhakar, 2005; Bonin et al., 2005 ; Dimova, 2004 ; Fang et al., 2011; Fries and Taci, 2005; Green et al., 2004 ; Hasan and Marton, 2003; Havrylchyk, 2006; Kasman and Yildirim, 2006 ; Kosac et al., 2009; Mamatzakis et al., 2008; Matousek and Taci, 2004; Nikiel and Opiela, 2008; Opiela, 2001; Pruteanu-Podpiera, 2008; Taci and Zampieri, 1998). In this chapter the credit regulation components of the *Fraser Index* allows greater insight into this issue and this is the final contribution of the study. The *Fraser Index* labour and business regulation components are used for the first time in the context of bank performance in an application to EU-10 countries currently in transition to full market economies.

The rest of this chapter is structured as follows. Section 2.2 describes the data and the methodology, Section 2.3 presents the econometric results and the final section concludes.

2.2 Variables and Methodology

2.2.1 Measuring Cost Efficiency

The literature has followed two distinct approaches in modelling the efficiency of financial institutions. These are based on productive and intermediary activity, and have been effectively distinguished by Humphrey (1985). Similarly, the techniques commonly used to estimate efficiency also fall into two distinct groups, econometric models (Stochastic Frontier Approach, Thick Frontier Approach, and Distribution Free Approach) and a non-parametric, frontier approach originally developed by Farrell (1957), using linear programming techniques (Data Envelopment Analysis and Free Disposal Hull Analysis).[9] Non-parametric frontier estimation does not require the imposition of any specific structure of the cost efficiency frontier. Thus, the efficiency measurement would not be biased because of a misspecification of the cost function (see Bauer et al., 1998). The probability of a misspecification of the cost function in the context of transition and developing economies is high because

[9] See Ferrier and Lovell (1990) for a comparison of parametric and non-parametric models for the financial sector.

market imperfections, as for example a high involvement of the government in the banking sector, could distort the prices of inputs and therefore render complicated the estimation of the cost function with parametric approaches (Bhattacharyya et al., 1997; Ataullah et al., 2004; Claessens and Van Horen, 2012). Thus, non-parametric approaches such as DEA are common in efficiency studies focused on transition economies, where assumptions of competitive markets with cost-minimisation may not be appropriate (see for example Grigorian and Manole, 2006). Given the process of transition of the EU-10 economies is not complete in a large portion of the years of this study (2000-2010), a non-parametric approach (DEA) is the method of choice of this chapter.

To measure cost-efficiency using Data Envelopment Analysis (DEA), it is assumed that all banks have access to the same technology that defines the production possibilities set. Each is benchmarked using linear programming against the most efficient (frontier) banks and scores derived that range from zero to one. The deterministic nature of the frontier attributes the entire difference between the most efficient bank, which serves as the reference point for the construction of the efficiency frontier, with an inefficient one exclusively on values of inputs and outputs, with no random error. As in other studies on bank efficiency (see for example Gaganis and Pasiouras, 2009), it is assumed that banks operate at variable returns to scale (VRS) as under VRS each bank is compared only against other units of similar size, instead of against all banks (Avkiran, 1999), which is important here as there is considerable size variation (see Table 1)

Table 1: Descriptive Statistics (2000-2010)

Country	P1	P2	P3	Y1	Y2	TA	EA	LLPL	LA	INFL	GDPgr	GDPcap	DCP	C5
BULGARIA	0.0119	0.0245	1.2014	994,392	308,946	1,482,995	12.12	1.17	61.51	5.84	3.51	10,616.88	55.95	63.76
CZECH REPUBLIC	0.0087	0.0227	0.8862	3,668,513	3,691,819	7,715,710	11.03	0.76	45.86	1.98	3.34	20,353.30	43.13	72.71
ESTONIA	0.0179	0.0225	1.0626	2,142,949	380,466	2,717,674	14.54	2.33	59.51	4.86	3.96	15,944.76	75.18	99.32
HUNGARY	0.013	0.0382	1.1589	3,853,288	1,310,376	5,546,250	11.41	1.56	66.19	5.75	1.97	16,421.45	52.99	75.03
LATVIA	0.0157	0.0211	1.2268	781,240	356,612	1,216,388	10.93	5.28	48.85	7.09	3.29	13,090.75	75.64	69.34
LITHUANIA	0.0146	0.0247	1.5757	1,589,779	386,575	2,186,101	10.54	1.41	63.01	3.1	4.23	13,977.37	42.97	87.98
POLAND	0.0164	0.0302	0.6929	3,164,059	1,962,997	5,399,393	13.12	1.72	55.1	2.92	4.19	14,985.64	39.68	76.55
ROMANIA	0.0229	0.0393	1.3297	1,540,218	389,876	2,516,014	14.98	2.3	54.18	16.08	4.19	9,647.33	27.4	77.47
SLOVAKIA	0.0102	0.0193	1.0401	1,959,089	1,725,623	3,924,168	9.57	0.94	49.66	3.69	4.16	16,993.58	38.69	82.96
SLOVENIA	0.012	0.0303	1.7559	2,195,967	995,228	3,303,470	9.13	1.14	65.42	3.95	2.82	23,654.81	56.01	75.39
Average EU-10	0.0148	0.0273	1.0956	2,332,650	1,312,550	3,930,403	11.84	1.91	56.24	5.81	3.55	15,470.13	48.19	75.47

Note: Figures represent sample means. P1 stands for the price of labour, P2 stands for the price of funds, P3 stands for the price of fixed assets, Y1 stands for net loans in thousands of US$, Y2 stands for other earning assets in thousands of US$, TA stands for total assets in thousands of US$, LLPL stands for the loan loss provisions to total loans ratio, EA stands for the equity to assets ratio, LA stands for the loans to assets ratio, C5 stands for the sum of the total assets of the five biggest banks in terms of assets in a country over the total banking assets in a country, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPgr stands for rate of growth of GDP per capita at constant 2005 $, GDPcap is GDP per capita in purchasing power parity (PPP) at constant 2005 US$, INFL stands for the inflation rate.

Source: Fitch-IBCA for the bank-specific variables, the 2012 version of the “"New Database on Financial Development and Structure" developed by Beck et al. (2000) for the C5 variable, the World Development Indicators of the World Bank for the DCP, GDPgr, GDPcap and INFL variables.

Following Charnes et al. (1978), the input oriented measure of each bank under the constant returns to scale (CRS) assumption requires solving the following linear programme:

$$min_{\theta,\mu}\theta$$

$$\textit{such that } -y_i + Y\mu \geq 0$$

$$\theta x_i - X\mu \geq 0$$

$$\mu \geq 0 \qquad (1)$$

, where $\theta \leq 1$ is the scalar efficient score and μ is a N x 1 vector of constants. If $\theta = 1$ the bank is efficient as it lies on the frontier, whereas if $\theta < 1$ the bank is inefficient and needs 1- θ reduction in the input levels to reach the frontier. The linear programming is solved N times, once for each bank in the sample, and a value of θ is obtained for each bank representing its technical efficiency (TE) score. The CRS linear programming problem is modified to account for variable returns to scale (VRS) as the sample banks range from large state owned institutions to smaller, private banks by adding the convexity constraint $N1'\mu = 1$ to equation (1) in order to provide:

$$min_{\theta,\mu}\theta$$

$$\textit{such that } -y_i + Y\mu \geq o$$

$$\theta x_i - X\mu \geq 0$$

$$N1'\mu = 1$$

$$\mu \geq 0 \qquad (2)$$

, where N1 is an N x 1 vector of ones. By following this approach, a convex hull of intersecting planes is formed that envelope the data points more tightly than the CRS conical hull and thus provides technical efficiency scores that are greater than or equal to those obtained using the CRS model. To calculate allocative efficiency (AE), w_i is assumed to be an N x 1 vector of input prices for the *i*-th bank and the following cost minimisation problem is solved:

$$min_{\mu,x_i^*}\ w_i' x_i^*$$

$$such\ that\ -y_i + Y\mu \geq 0$$

$$x_i^* + X\mu \geq 0$$

$$\mu \geq 0$$

(3)

where x_i^* is the cost-minimizing vector of input quantities for the *i*-th bank, given the input prices w_i and the output levels y_i. The total cost efficiency (CE) of the *i*-th bank is calculated as:

$$CE=\frac{w_i' x_i^*}{w_i' x_i}$$

(4)

, CE is the ratio of minimum cost to observed cost, for the *i*-th bank. The allocative efficiency (AE) then is calculated as AE=CE/TE. All three measures can take values between 0 and 1 with higher values indicating higher efficiency.

Inputs, input prices and outputs are chosen using the intermediation approach and follow Tanna et al. (2011). This views banks as financial institutions whose primary purpose is to borrow funds from depositors and transform them to loans and securities. For the construction of the cost efficiency frontier net loans and other earning assets are outputs. The inputs are financial capital (deposits and short-term funding), labour (personnel expenses) and physical capital (fixed assets). The price of financial capital is defined as the interest expenses on deposits divided by total deposits, the price of labour is defined as the ratio between personnel expenses and total assets, while the price of physical capital is defined as overhead expenses (excluding personnel expenses) to fixed assets. Finally a common cost efficiency frontier for all the new EU member countries for each year separately is calculated following Havrylchyk (2006) in order to examine how the fast paced liberalisation and deregulation affected the efficiency of the banking sector. The bank data are from IBCA-Bankscope for 2000-2010. The sample includes commercial banks following other studies in the region (see for example Grigorian and Manole, 2006; Kasman and Yildirim, 2006) and, after removing errors and inconsistencies, we end

up with a sample of 192 institutions and 1,045 bank/year observations in an unbalanced panel. This represents the majority of the financial institutions in the new member transition economies.

2.2.2 The *Fraser Index of Economic Freedom* and its Components

The focus of this chapter is to examine the impact of credit, labour and business regulation on bank efficiency using the regulation variables of the *Fraser Index of Economic Freedom* (Gwartney et. al, 2012). Inclusion of this index is common in the economics literature[10] and consists of five factors: size of government (GOV-FR); legal structure and security of property rights (LEG-FR); access to sound money (MON-FR); freedom to exchange with foreigners (TRD-FR); and regulation of credit, labour, and business (REG-FR). These are weighted to form a composite index, with 0 indicating the lowest and 10 the highest level of economic freedom. In this chapter, we put a special emphasis on regulation and particularly credit regulation and its impact on the banking industry. In the initial estimates though we include the rest of the economic freedom variables in order to examine their importance for the banking industry vis-à-vis regulation.

The credit regulation component is decomposed to account for the following: i) private ownership of banks measured as percentage of deposits held in privately owned banks, ii) foreign competition defined as barriers to entry for foreign banks (rate of approval of foreign bank applications) and the share of foreign banks over the total banking sector assets, iii) private sector credit, measuring the extent that government borrowing does not crowd out private borrowing, and iv) limitations from interest rate controls and regulations.

The first two subcomponents provide evidence on the extent to which the banking industry is dominated by private firms and whether foreign banks are permitted to compete in the marketplace. The final two subcomponents indicate the extent to which credit is supplied to the private sector and whether controls on interest rates interfere with the credit market.

The composite labour (LR-REG) and business regulations (BR-REG) components are also added to examine their impact on bank performance. The LR-REG variable

[10] See for example Carlsson and Lundstrom (2002).

is designed to measure the extent to which labour market rigidities are present. In order to earn high marks in the LR-REG 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. The BR-REG variable identifies the extent to which regulations and bureaucratic procedures restrain entry and reduce competition. In order to score high in this part of the index, countries must allow markets to determine prices and refrain from regulatory activities that hinder entry into the market and increase the cost of production. They also must refrain from using their power to extract financial payments and reward some businesses at the expense of others.

The average scores of the economic freedom components across the EU-10 economies for 2000-2010 are in Table 2.

Table 2: Economic freedom in the EU 10 economies (2000-2010)

Country	GOV-FR	LEG-FR	MON-FR	TRD-FR	REG-FR	ALL-FR
BULGARIA	6.47	4.85	8.93	7.46	7.33	7.00
CZECH REPUBLIC	3.37	6.70	9.11	7.99	7.31	6.90
ESTONIA	6.53	7.17	9.30	8.69	7.46	7.82
HUNGARY	4.40	6.73	9.14	8.06	7.14	7.08
LATVIA	5.80	6.58	8.90	7.84	6.94	7.21
LITHUANIA	5.55	6.11	8.80	7.57	6.80	6.97
POLAND	5.71	6.18	9.05	7.19	6.78	6.97
ROMANIA	6.70	5.76	7.49	7.18	6.21	6.66
SLOVAKIA	5.81	6.02	8.87	8.39	7.10	7.24
SLOVENIA	4.86	6.88	8.89	7.57	6.48	6.93
Average EU-10	5.43	6.26	8.80	7.69	6.90	7.01

Note: Figures are in means and range from 0-10. Higher values denote a more liberal economic environment. GOV-FR: size of government expenditures, taxes, and enterprise, LEG-FR: legal structure and security of property rights, MON-FR: access to Sound Money, TRD-FR: freedom to trade Internationally, REG-FR: Regulation of credit, labour, and business, ALL-FR: The overall score of economic freedom in a country is measured as the average of the GOV-FR, LEG-FR, MON-FR, TRD-FR and REG-FR components. Source: The 2012 version of the *Fraser Index of Economic Freedom.*

Note that although the level of general economic freedom (ALL-FR) is 7.01 in the region, some components of the economic freedom are below that, for example the size of government (GOV-FR), the protection of legal rights (LEG-FR) and regulation (REG-FR) have values of 5.43, 6.26 and 6.90 respectively. It seems that reforms related to sound money (MON-FR) and trade liberalisation (TRD-FR) are more prevalent in the EU-10 economies as the regional averages for these indices are measured at 8.80 and 7.69 respectively. At the country level, the best performers, in terms of overall economic freedom (ALL-FR), are Estonia (7.82), Slovakia (7.24) and Latvia (7.21). Moreover, Estonia and Latvia score better than the regional average in all the major components of the index of economic freedom. On the other hand, Romania (6.66) and the Czech Republic (6.90) represent the worst performers in terms of the overall economic freedom (ALL-FR). In Table 3 the economic freedom variables over time in the EU-10 are shown.

Table 3: Economic freedom over time in the EU 10 economies (2000-2010)

Year	GOV-FR	LEG-FR	MON-FR	TRD-FR	REG-FR	ALL-FR
2000	4.39	6.7	6.99	7.7	6.34	6.42
2001	4.61	6.12	7.99	7.84	5.95	6.5
2002	4.52	6.04	8.34	7.68	6.56	6.63
2003	5.22	6.02	8.53	7.71	6.78	6.85
2004	5.39	5.94	8.68	7.77	6.88	6.93
2005	5.66	6.26	8.97	7.62	7.03	7.1
2006	5.5	6.44	9.02	7.65	6.97	7.11
2007	5.88	6.37	9.04	7.77	7.11	7.23
2008	5.92	6.31	9.01	7.69	7.08	7.2
2009	5.69	6.38	9.34	7.64	7.13	7.23
2010	5.6	6.29	9.25	7.61	7.16	7.18
Average EU-10	5.43	6.26	8.8	7.69	6.9	7.01

Note: Figures are in means and range from 0-10. Higher values denote a more liberal economic environment. GOV-FR: size of government expenditures, taxes, and enterprise, LEG-FR: legal structure and security of property rights, MON-FR: access to Sound Money, TRD-FR: freedom to trade Internationally, REG-FR: Regulation of credit, labour, and business, ALL-FR: The overall score of economic freedom in a country is measured as the average of the GOV-FR, LEG-FR, MON-FR, TRD-FR and REG-FR components. Source: The 2012 version of the *Fraser Index of Economic Freedom.*

The overall economic freedom (ALL-FR) for the sample has generally improved over the period under study, increasing from 6.42 in 2000 to 7.18 in 2010. The most improved component is access to sound money (MON-FR), which increased from

6.99 in 2000 to 9.25 in 2010. The variables reflecting government size (GOV-FR) and regulation (REG-FR) have also been improved over this period but less notably. It is noteworthy that two economic freedom components, legal rights protection (LEG-FR) and freedom to exchange with foreigners (TRD-FR), have slightly declined over the period of the study.

In Table 4 the cross-country scores of the subcomponents of the regulation component (REG-FR) of the economic freedom index for 2000-2010 are shown.

Table 4: Regulation in the EU 10 economies (2000-2010)

Country	CR-REG	CR-OWN	CR-COMP	CR-PRS	CR-IR	LR-REG	BR-REG
BULGARIA	9.77	9.59	8.96	9.88	9.85	6.58	5.60
CZECH REPUBLIC	8.95	8.47	8.06	8.38	10.00	6.94	5.97
ESTONIA	9.75	9.85	8.59	9.58	9.80	5.82	6.84
HUNGARY	8.64	9.20	7.50	6.82	9.92	6.51	6.25
LATVIA	9.24	9.75	7.69	8.56	9.42	5.43	6.04
LITHUANIA	8.99	8.75	8.38	8.49	9.73	5.49	5.96
POLAND	8.55	7.90	8.81	7.76	10.00	6.12	5.65
ROMANIA	7.57	5.01	7.14	8.22	9.48	4.99	6.08
SLOVAKIA	9.00	9.59	8.00	7.42	10.00	6.60	5.68
SLOVENIA	8.77	7.28	7.49	9.03	10.00	4.51	6.06
Average EU-10	8.78	8.27	8.01	8.26	9.82	5.92	5.96

Note: Figures are in means and range from 0-10. Higher values denote a more liberal economic environment. CR-REG: composite credit regulations index, CR-OWN: that is the percentage of deposits held in privately owned banks, CR-COMP that is foreign banks barriers to entry and foreign bank presence in the domestic market, CR-PRS that is government borrowing that does not crowd out private sector borrowing, CR-IR that is limitations interest rate controls, LR-REG: composite labour regulations index, BR-REG: composite business regulations index. Source: The 2012 version of the *Fraser Index of Economic Freedom.*

It is very obvious that reforms related to credit regulation (CR-REG) are more established in the EU-10 economies compared with freedom in the labour market (LR-REG) and business regulation (BR-REG). Indeed, the regional average for credit regulation (CR-REG) is at the 8.78 level while the corresponding values for labour regulation (LR-REG) and business regulation (BR-REG) are 5.92 and 5.96 respectively. At the country level, the best performers, in terms of credit regulation (CR-REG), are Bulgaria (9.77) and Estonia (9.75) while the worst is Romania (7.57). In terms of labour regulation (LR-REG) the most liberalised labour markets are the Czech Republic (6.94) and Slovakia (6.60) while Slovenia (4.51) and Romania (4.99) represent the countries with the most rigid labour regulation in the EU-10 region. Moreover, business regulation (BR-REG) is significantly more liberal in Estonia (6.84) than the rest of the EU-10 economies, while Bulgaria (5.60) and

Poland (5.65) are the countries with the most strict business regulation (BR-REG). When it comes to the subcomponents of the credit regulation (CR-REG) index, we notice that reforms related to interest rate controls (CR-IR) are almost complete in the EU-10 as the regional average is 9.82 and no country scores below 9.40. On the other hand, the rest of the credit regulation (CR-REG) subcomponents have substantial room for improvement as the regional averages for private ownership of banks (CR-OWN), competition from foreign banks (CR-COMP) and freedom from government borrowing (CR-PRS) is 8.27, 8.01 and 8.26 respectively. There is also a significant heterogeneity in the speed that reforms for each regulation sub-component have been adopted in the EU-10 economies as shown in Table 5.

Table 5: Regulation over time in the EU 10 economies (2000-2010)

Year	CR-REG	CR-OWN	CR-COMP	CR-PRS	CR-IR	LR-REG	BR-REG
2000	7.63	4.75	6.00	8.24	9.91	4.90	6.48
2001	8.09	6.33	5.95	8.10	9.86	4.85	4.90
2002	8.50	7.97	7.55	7.84	9.70	5.43	5.75
2003	8.77	8.02	7.49	8.44	9.85	5.56	6.02
2004	8.50	7.99	7.65	7.65	9.86	5.67	6.46
2005	9.07	8.81	8.59	8.67	9.74	5.84	6.15
2006	9.05	8.84	8.59	8.56	9.76	5.95	5.88
2007	9.19	8.83	8.59	8.95	9.78	6.26	5.81
2008	9.06	8.76	8.62	8.66	9.75	6.21	5.92
2009	8.83	8.80	8.64	7.79	9.89	6.57	5.92
2010	8.88	8.94	.	7.70	10.00	6.48	6.05
Average EU-10	8.78	8.27	8.01	8.26	9.82	5.92	5.96

Note: Figures are in means and range from 0-10. Higher values denote a more liberal economic environment. CR-REG: composite credit regulations index, CR-OWN: that is the percentage of deposits held in privately owned banks, CR-COMP that is foreign banks barriers to entry and foreign bank presence in the domestic market , CR-PRS that is government borrowing that does not crowd out private sector borrowing, CR-IR that is limitations in interest rate controls, LR-REG: composite labour regulations index, BR-REG: composite business regulations index. Source: The 2012 version of the *Fraser Index of Economic Freedom.*

Both credit regulation (CR-REG) and labour regulation (LR-REG) have significantly improved over time in the EU-10 economies. Credit Regulation (CR-REG) has improved from 7.63 in 2000 to 8.88 in 2010 while freedom from labour regulation (LR-REG) has increased from 4.90 to 6.48 over the same period. On the other hand, business regulation has experienced a slight deterioration from 6.48 in 2000 to 6.05 in 2010. The subcomponents of the credit regulation (CR-REG) that show the highest level of improvement over the period are the private ownership of banks (CR-OWN) and the competition from foreign banks (CR-COMP). The index

for the private ownership for banks (CR-OWN) has increased from 4.75 in 2000 to 8.94 in 2010 while the competition from foreign banks was 8.64 in 2009 when it was 6.00 in 2000. Freedom from government borrowing (CR-PRS) is the only credit regulation subcomponent that has experienced a decrease as it has a value of 7.70 in 2010 in comparison with 8.24 in 2000

2.2.3 Bank-specific and Country-specific Control Variables

A number of control variables are used in order to account for individual bank characteristics: total assets (TA) measures the size of the asset portfolio of each bank and is expected to have a positive impact on cost efficiency as it may indicate higher diversification (Mester, 1993); the ratio of loans to assets (LA), which is also expected to be positive as it represents well-functioning intermediation by the bank; the ratio of equity to total assets (EA) captures the risk preferences of the bank and is expected to be positive as a higher ratio suggests that managers have greater incentives to ensure bank performance and minimise costs; and finally the loan loss provisions as a share of total loans (LLPL) is a proxy for default risk as it measures the quality of the credit portfolio. However, the use of such a proxy for default risk is related both to endogenous factors (*"the bad management"* hypothesis) and exogenous to the bank such as systemic economic or financial crises (*"the bad luck"* hypothesis). Finally according to the *"skimping"* hypothesis, banks that dedicate a lot of resources to screening the quality of their loan portfolio may experience decreased cost efficiency in the short-term which is compensated by higher cost efficiency in the medium and long-term because of low level of loan defaults.

To control for financial sector development, domestic credit to the private sector as a share of GDP (DCP) is used. In addition, to account for the level of competition in the banking industry in each country, we use the assets of the five largest banks as a share of assets of all commercial banks (the C5 ratio). Finally, to control for the general level of economic development and capture the sophistication of the domestic market, real GDP per capita in purchasing power parity (PPP) is used while to control for the dynamism of each economy we use the annual GDP growth (GDPgr).

2.3 Results and Discussion

2.3.1 Cost Efficiency Estimates

Cost efficiency estimates are reported in Table 6. Those efficiency scores represent averages over the period 2000-2010.

Table 6: Country level bank cost efficiency in the EU 10 economies (2000-2010)

Country	EFF
BULGARIA	0.685
CZECH REPUBLIC	0.860
ESTONIA	0.790
HUNGARY	0.900
LATVIA	0.704
LITHUANIA	0.710
POLAND	0.847
ROMANIA	0.674
SLOVAKIA	0.765
SLOVENIA	0.748
Average EU-10	0.771

Note: The table reports the mean efficiency scores by country over the 2000-2010 period. The cost efficiencies (EFF) were estimated with the data envelopment analysis (DEA) methodology using annual frontiers and variable returns to scale (VRS).

One cannot fail to notice that the average bank cost efficiency for the sample is relatively low at the 77%, that is, these banks need to improve by 23%, to reach the cost efficiency frontier. Such efficiency scores are comparable with other studies in transition and emerging economies (see for example Kasman and Yildirim, 2006; Tecles and Tabak, 2010). At the country level, banks in Romania and Bulgaria have the lowest cost efficiency levels, with scores of 0.674 and 0.685 respectively, whereas banks in Hungary are the best performers with efficiency scores at around 0.9. Note also that some geographic clusters emerge in terms of bank efficiency scores as countries located in central-eastern Europe (Poland, Hungary, Czech Republic) have the highest bank efficiency scores, the Baltic states (Latvia, Estonia and Lithuania) are characterised by medium efficiency scores, while the Balkan states of Bulgaria and Romania have the most inefficient banking sectors.

Table 7: Annual bank cost efficiency in the EU 10 economies (2000-2010)

Year	EFF
2000	0.824
2001	0.752
2002	0.773
2003	0.750
2004	0.760
2005	0.769
2006	0.780
2007	0.786
2008	0.755
2009	0.757
2010	0.782
Average EU-10	0.771

Note: The table reports the mean efficiency scores by year over the 2000-2010 period. The cost efficiencies (EFF) were estimated with the data envelopment analysis (DEA) methodology using annual frontiers and variable returns to scale (VRS).

In terms of the time series, there is a real inconsistency in the early years (2000-2002) while a weak positive trend can be spotted from 2003 (0.75) to 2007 (0.786), that is the years immediately before and just after EU accession. In the years 2008 and 2009, when the financial crisis was on full steam, bank efficiency in the EU-10 economies deteriorated from its 2007 peak while it bounced back in 2010.

2.3.2 The Determinants of Cost Efficiency –Fixed Effects Results

As a first step of the analysis of the cost efficiency determinants we run the following general model in a fixed effects framework:

$$EFF_{i,t} = \alpha_0 + \beta_1 x_{i,t} + \beta_2 s_{i,t} + \beta_3 m_{i,t} + \beta_4 EcFr_{i,t} + e_{i,t} \quad (5)$$

where $EFF_{i,t}$ is the vector of bank specific cost efficiency scores from stage one, $x_{i,t}$ is a vector of bank specific explanatory variables, $m_{i,t}$ is a vector of macroeconomic control variables, $s_{i,t}$ is a vector of financial structure variables and $EcFr_{i,t}$ a vector of economic freedom variables from the *Fraser Index* and $e_{i,t}$ is a vector of random errors.

2.3.2.1 Major Components of the *Fraser Index of Economic Freedom*

The first stage of the analysis considers the impact of the overall index of economic freedom (ALL-FR) and its major components, government size (GOV-FR), legal rights protection (LEG-FR), access to sound money (MON-FR), freedom to exchange with foreigners (TRD-FR) and the composite regulation index (REG-FR), on bank cost efficiency. Seven models are estimated for the period 2000-2010. The models 1 to 5 include the bank-specific, macroeconomic and financial structure variables and each time one of the five major components of the economic freedom index. Model 6 includes the control variables and the regressors of all the major components of the economic freedom index simultaneously, while model 7 includes the control variables and the overall index of economic freedom (ALL-FR). These results are presented in Table 8.

Table 8: Fixed effects results for cost efficiency and the economic freedom components from the *Fraser Index* (2000-2010)

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF	(6) EFF	(7) EFF
lnTA	0.0496***	0.0497***	0.0506***	0.0513***	0.0492***	0.0472***	0.0515***
	(0.0104)	(0.0107)	(0.0107)	(0.0104)	(0.0106)	(0.0104)	(0.0104)
EA	0.111	0.129	0.122	0.117	0.110	0.101	0.116
	(0.0802)	(0.0796)	(0.0800)	(0.0793)	(0.0782)	(0.0793)	(0.0799)
LA	0.0313	0.0335	0.0325	0.0343	0.0392	0.0425	0.0312
	(0.0319)	(0.0322)	(0.0321)	(0.0314)	(0.0323)	(0.0322)	(0.0316)
LLPL	-0.116	-0.0841	-0.0846	-0.0792	-0.107	-0.148	-0.0872
	(0.228)	(0.230)	(0.228)	(0.225)	(0.231)	(0.234)	(0.224)
lnGDPcap	-0.0227	-0.0857*	-0.0822*	-0.0775*	-0.121**	-0.0647	-0.0304
	(0.0482)	(0.0455)	(0.0452)	(0.0449)	(0.0507)	(0.0509)	(0.0512)
INFL	0.000132	0.000211	0.000457	0.000327	0.000880	0.000293	-0.000133
	(0.000760)	(0.000738)	(0.000740)	(0.000732)	(0.000756)	(0.000779)	(0.000811)
GDPgr	0.00153***	0.00157***	0.00160***	0.00168***	0.00176***	0.00169***	0.00144***
	(0.000531)	(0.000511)	(0.000528)	(0.000515)	(0.000531)	(0.000555)	(0.000549)
DCP	-7.08e-05	0.000148	0.000226	0.000209	0.000357	-2.54e-05	-2.41e-05
	(0.000347)	(0.000362)	(0.000367)	(0.000358)	(0.000363)	(0.000339)	(0.000357)
C5	4.51e-05	0.000361	0.000210	0.000367	0.000141	0.000192	0.000157
	(0.000419)	(0.000461)	(0.000455)	(0.000480)	(0.000447)	(0.000465)	(0.000437)
GOV-FR	-0.0126**					-0.0149**	
	(0.00576)					(0.00592)	
LEG-FR		0.0162**				0.0180**	
		(0.00693)				(0.00704)	
MON-FR			-0.000635			0.000702	
			(0.00269)			(0.00269)	
TRD-FR				-0.0155		-0.0115	
				(0.0143)		(0.0149)	
REG-FR					0.0174**	0.0226***	
					(0.00809)	(0.00830)	
ALL-FR							-0.0212
							(0.0130)
Constant	0.335	0.726*	0.794**	0.841**	1.055***	0.582	0.450
	(0.386)	(0.376)	(0.371)	(0.373)	(0.403)	(0.410)	(0.395)
Observations	1,045	1,045	1,045	1,045	1,045	1,045	1,045
F-test	14.45***	12.63***	11.89***	15.22***	15.78***	18.33***	12.07***
R-squared	0.145	0.143	0.138	0.140	0.143	0.161	0.142
Number of banks	192	192	192	192	192	192	192

Note: The table reports the fixed effects regression results for the major components of the *Fraser Index of Economic Freedom*. The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. GOV-FR stands for limitation in the government size, LEG-FR stands for legal structure and security of property rights, MON-FR stands for access to sound money, TRD-FR stands for freedom to exchange with foreigners, REG-FR is the composite index of regulation in credit, labour and business, ALL-FR stands for the overall index of economic freedom, lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. The use of the fixed effects specification is justified after a Hausman test for each model. 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.

In terms of the bank-specific control variables, the natural logarithm of total assets (lnTA) has a positive and statistically significant at the 1% level impact on bank efficiency, implying that larger banks with more diversified portfolios enjoy higher level of efficiency (Mester, 1993). This confirms evidence that large banks in the new member states have benefited more, in terms of average cost reduction, from technological progress (Kasman and Kirbas-Kasman, 2006). The rest of the bank-specific variables have the expected sign but their coefficients are not statistically different than zero. When it comes to the country level macroeconomic variables the level of economic development (lnGDPcap) has a negative and statistically significant impact at the 10% level in some of the models in Table 8 (Models 2 to 5). The positive and significant coefficient on the proxy for the general level of economic development could indicate the higher operating and financial costs for supplying a given level of services (Dietsch and Lozano-Vivas, 2000). Furthermore, the impact of GDP growth on efficiency is positive and statistically significant at the 1% level, indicating that higher growth rate is associated with lower banking costs in line with Kasman and Yildirim (2006). Finally, the financial structure controls, private sector credit to GDP (DCP) and the concentration ratio in each country's banking system (C5) do not exert a statistically significant impact on efficiency.

When it comes to the economic freedom components, limitations in the size of government (GOV-FR) have a negative and statistically significant at the 10% level impact on efficiency (Model 1 of Table 8). This implies that bank cost efficiency is enhanced when credit is directed to the state. In this sample, good practice in risk assessment is in its infancy and government borrowing is less costly with respect to screening and probably more secure as the probability of default is lower than debt to the private sector given that loans directed towards the public sector are covered by explicit or implicit government guarantees (Mian, 2003). Furthermore, increased foreign bank presence in the EU-10 economies may favour lending to the government instead of non-transparent private firms (Berger et al. 2001; Mian, 2003), for which credit risk assessment based on robust information becomes more difficult and so more risky. Moreover , the impact of the legal structure and property rights (LEG-FR) has a positive and statistically significant at the 5% level impact on efficiency. This of no surprise as weak and poorly enforced property rights are

associated with higher bank costs such as low recovery rates and higher time spent in repossessing collateral following a loan default (Bae and Goyal, 2009). Strong property rights may also have a positive impact in the non-financial sector of a country and improve bank efficiency through spillover effects as in countries with more secure property rights firms allocate resources more efficiently and grow faster (Classens and Laeven, 2003; Knack and Keefer, 1995). Finally, the composite index of regulation (REG-FR) is statistically significant at the 5% level and exerts a positive impact on efficiency (see model 5 in Table 8). Moreover its coefficient is larger than the ones for limitations in government size (GOV-FR) and the legal structure and property rights (LEG-FR) implying that liberal regulation in the credit, labour and business markets is the most important channel through which economic freedom affects bank performance. The rest of the economic freedom components, access to sound money (MON-FR) and trade freedom (TRD-FR), as well as the general economic freedom index (ALL-FR), do not have a statistically significant impact on efficiency. Finally, it is important to note that results remain robust in model 6 of Table 8 where the regressors of all the economic freedom components are included.

2.3.2.2 Credit (CR-REG), Labour (LR-REG) and Business Regulation (BR-REG)

The next stage in the analysis considers the impact of the subcomponents of the regulation variable (REG-FR) of the *Fraser Index of Economic Freedom* on cost efficiency. These subcomponents include the composite credit regulation (CR-REG) and then two aspects of this: labour market conditions (LR-REG) and business regulations (BR-REG).

Four models are estimated for the period 2000-2010. As in section 3.2.1 the regressors include the bank-specific variables, financial structure and macroeconomic variables as controls and the composite credit regulation (CR-REG) in the first model, the labour market regulation (LR-REG) in the second and business regulation (BR-REG) in the third. In the fourth model all the regulation subcomponents are included. These results are in Table 9.

Table 9: Fixed effects results for credit, labour and business regulations as bank cost efficiency determinants in the new EU member states (2000-2010)

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
lnTA	0.0510***	0.0532***	0.0501***	0.0521***
	(0.0107)	(0.0105)	(0.0107)	(0.0106)
EA	0.123	0.128	0.118	0.121
	(0.0805)	(0.0777)	(0.0784)	(0.0780)
LA	0.0318	0.0341	0.0351	0.0374
	(0.0321)	(0.0314)	(0.0316)	(0.0316)
LLPL	-0.0797	-0.0687	-0.0918	-0.0827
	(0.230)	(0.227)	(0.229)	(0.231)
lnGDPcap	-0.0779*	-0.0786*	-0.102*	-0.101*
	(0.0451)	(0.0447)	(0.0534)	(0.0536)
INFL	0.000398	3.62e-05	0.000779	0.000347
	(0.000719)	(0.000740)	(0.000875)	(0.000900)
GDPgr	0.00163***	0.00156***	0.00176***	0.00164***
	(0.000515)	(0.000513)	(0.000528)	(0.000523)
DCP	0.000183	0.000119	0.000259	0.000214
	(0.000369)	(0.000357)	(0.000363)	(0.000363)
C5	0.000238	0.000379	0.000182	0.000319
	(0.000440)	(0.000450)	(0.000452)	(0.000449)
CR-REG	-0.00133			0.00298
	(0.00366)			(0.00401)
LR-REG		0.0136***		0.0146***
		(0.00393)		(0.00445)
BR-REG			0.00469	0.00344
			(0.00524)	(0.00533)
Constant	0.754**	0.630*	0.956**	0.806*
	(0.370)	(0.368)	(0.442)	(0.449)
Observations	1,045	1,045	1,045	1,045
F-test	11.22***	14.27***	9.81***	15.93***
R-squared	0.138	0.148	0.139	0.149
Number of banks	192	192	192	192

Note: The table reports the fixed effects regression results for the regulation subcomponents of the *Fraser Index of Economic Freedom.* The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. CR-REG stands for credit regulation, LR-REG stands for labour regulation, BR-REG stands for business regulation, lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. The use of the fixed effects specification is justified after a Hausman test for each model. 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.

In the first and third models, the composite credit regulation (CR-REG) and the business regulation (BR-REG) are not statistically significant. However, the impact of labour regulation (LR-REG) in the second model is statistically significant at the 1% level and exerts a positive impact on efficiency. These results are further confirmed in model 4 that includes all the regulation subcomponents, as the coefficient on increased labour market liberalisation (LR-REG) is statistically significant at the 1% level while retaining its positive sign. The other two regulation variables, credit regulation (CR-REG) and business regulation (BR-RG) remain statistically insignificant in the fourth model. The positive impact of liberal labour regulation on bank performance is in line with previous studies that find a negative effect of strict labour regulation on economic performance (Autor 2007; Bassanini et al. 2009) due to increased costs associated with such regulation. Furthermore, liberal reforms in the labour market may decrease employee complacency and associated absenteeism (Ichino and Riphahn, 2005; Riphahn 2004), which in turn could increase bank performance. Evidence has shown that liberalisation of labour regulation in respect with dismissal costs has resulted in productivity gains due to increased redundancy of unproductive workers who were previously retained due to high dismissal costs (Eslava et al., 2004). With respect to the bank-specific, macroeconomic and financial structure control variables the results remain similar to section 2.3.2.1. Bank size (lnTA) and GDP growth are positively associated with efficiency while the general level of economic development has a negative impact on efficiency.

2.3.2.3 Decomposing Credit Regulations

A surprising result is that industry specific regulation, such as credit regulation (CR-REG), does not have an impact on bank specific efficiency. A possible cause could be the high degree of aggregation in this regulation index. To investigate this further and examine the impact of credit regulation on bank efficiency, we next consider its main components. These are CR-OWN, that is the percentage of deposits held in privately owned banks, CR-COMP, that is foreign banks presence in the domestic market, CR-PRS, that is government borrowing that does not crowd out private sector borrowing, and lastly CR-IR, that is limitation in the interest rates controls that lead to high spreads and/or negative real interest rates. These results are shown in Table 10.

Table 10: Fixed effects results for types of credit regulations as bank cost efficiency determinants in the new EU member states (2000-2010)

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF
lnTA	0.0494***	0.0510***	0.0511***	0.0519***	0.0544***
	(0.0106)	(0.0105)	(0.0106)	(0.0107)	(0.0109)
EA	0.113	0.100	0.123	0.120	0.109
	(0.0808)	(0.0784)	(0.0793)	(0.0790)	(0.0791)
LA	0.0345	0.0388	0.0326	0.0321	0.0368
	(0.0323)	(0.0328)	(0.0317)	(0.0315)	(0.0319)
LLPL	-0.0973	-0.331	-0.0852	-0.0528	-0.317
	(0.233)	(0.261)	(0.227)	(0.226)	(0.261)
lnGDPcap	-0.0915**	-0.106*	-0.0766*	-0.0879*	-0.100*
	(0.0459)	(0.0565)	(0.0450)	(0.0455)	(0.0565)
INFL	0.000576	0.000631	0.000532	-0.000260	-0.000374
	(0.000738)	(0.000747)	(0.000744)	(0.000728)	(0.000802)
GDPgr	0.00167***	0.00155**	0.00169***	0.00168***	0.00156**
	(0.000523)	(0.000698)	(0.000512)	(0.000520)	(0.000706)
DCP	0.000295	0.000343	0.000168	0.000184	0.000172
	(0.000359)	(0.000420)	(0.000373)	(0.000361)	(0.000417)
C5	0.000177	0.000267	0.000268	0.000228	0.000370
	(0.000444)	(0.000461)	(0.000439)	(0.000444)	(0.000453)
CR-OWN	0.00172				-0.00529
	(0.00182)				(0.00474)
CR-COMP		0.00114			0.00502
		(0.00244)			(0.00334)
CR-PRS			-0.00234		-0.00185
			(0.00176)		(0.00173)
CR-IR				-0.0130**	-0.0163**
				(0.00618)	(0.00640)
Constant	0.878**	0.990**	0.746**	0.956**	1.085**
	(0.376)	(0.460)	(0.370)	(0.391)	(0.472)
Observations	1,045	927	1,045	1,045	927
F-test	9.34***	10.67***	10.11***	12.55***	14.49***
R-squared	0.139	0.141	0.139	0.141	0.148
Number of banks	192	190	192	192	190

Note: The table reports the fixed effects regression results for the decomposed credit regulation index of the *Fraser Index of Economic Freedom*. The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. CR-OWN stands for percentage of deposits held in privately owned banks, CR-COMP stands for foreign banks barriers to entry and presence in the domestic market, CR-PRS stands for government borrowing that does not crowd out private sector borrowing, CR-IR stands for interest rate controls, lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. The use of the fixed effects specification is justified after a Hausman test for each model. 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.

These results show that the ownership structure related variables, private ownership (CR-OWN) and foreign bank competition (CR-COMP) carry the expected positive sign but their impact on efficiency is statistically insignificant (see models 1 and 2 in table 9). On the other hand, the impact of limitations in the interest rate controls variable (CR-IR) has a negative and statistically significant at the 5% level impact on efficiency (see model 4 in Table 9). This lends support to the *"competition-fragility"* hypothesis according to which increased competition in the banking industry induces banks to take more risks in order to increase returns (Carletti and

Hartmann, 2003; Demsetz et al.,1996), increasing in that way the probability of bank failure (Keeley, 1990) and/or reducing performance in terms of the quality of a bank's loan portfolio (Jimenez et al., 2010). Interest rate controls can act as barrier for banks to take on increased risk that could negatively affect their performance such as investments in high-risk, high-return projects (Bhattacharya, 1982; Hellman et al., 2000). Finally, the variable that reflects the extent to which government borrowing does not crowd out private borrowing (CR-PRS), is negatively correlated with efficiency (see model 3 in Table 9) and although not statistically significant it lends some additional support to the negative and statistically significant relationship between efficiency and limitations in government size (GOV-FR) found in section 2.3.2.1. This implies that cost efficiency is enhanced when credit is directed to the state. The results for the decomposed credit regulation variables remain robust when all its subcomponents are included in the model (see model 5 in Table 9). With respect to the bank specific, macroeconomic and financial structure control variables the results remain largely similar to previous sections (2.3.2.1 and 2.3.2.2).

2.3.3 The Determinants of Cost Efficiency – Dynamic Panel Data Results

To further examine the impact of economic freedom and in particular the impact of regulation on the efficiency of the banking systems of the EU-10 economies we employ a dynamic panel data analysis. The use of instrumental variables in this analysis deals with potential endogeneity issues. In particular, the Arellano and Bover (1995) and Blundell and Bond (1998) two-step 'system' GMM estimator is used and thus equation (3) takes the following form:

$$EFF_{i,t} = a_0 + \beta_1 EFF_{i,t-1} + \beta_2 x_{i,t} + \beta_3 s_{i,t} + 4\, m_{i,t} + \beta_5 EcFr_{i,t} + e_{i,t} \quad (6)$$

where $EFF_{i,t}$ is the vector of bank-specific cost efficiency scores from stage one, $x_{i,t}$ is a vector of bank specific explanatory variables, $m_{i,t}$ is a vector of macroeconomic control variables, $s_{i,t}$ is a vector of financial structure variables and $EcFr_{i,t}$ a vector of economic freedom variables from the *Fraser Index* and $e_{i,t}$ is a vector of random errors.

2.3.3.1 Major Components of the *Fraser index of Economic Freedom*- Dynamic Estimation

Table 11 reports the results of the dynamic panel data estimation for the models that include the overall index of economic freedom (ALL-FR) as well as its five major components.

Table 11: Dynamic panel results for cost efficiency and the general economic freedom components from the *Fraser Index* (2000-2010)

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF	(6) EFF	(7) EFF
L.EFF	0.508***	0.511***	0.500***	0.498***	0.517***	0.500***	0.527***
	(0.121)	(0.121)	(0.123)	(0.119)	(0.104)	(0.103)	(0.119)
lnTA	0.0472***	0.0482***	0.0482***	0.0481***	0.0474***	0.0480***	0.0489***
	(0.0122)	(0.0121)	(0.0124)	(0.0120)	(0.0109)	(0.0102)	(0.0121)
EA	0.224*	0.222*	0.206	0.223*	0.198*	0.170	0.227**
	(0.118)	(0.125)	(0.128)	(0.120)	(0.105)	(0.118)	(0.113)
LA	0.0997***	0.0894**	0.102***	0.0970***	0.0843**	0.0766**	0.0945***
	(0.0374)	(0.0365)	(0.0366)	(0.0365)	(0.0347)	(0.0331)	(0.0356)
LLPL	0.204	0.184	0.237	0.191	0.166	0.185	0.249
	(0.351)	(0.334)	(0.336)	(0.332)	(0.337)	(0.347)	(0.337)
lnGDPcap	-0.0139	-0.0359	-0.00777	-0.0116	-0.0574	-0.0711	-0.0523
	(0.0679)	(0.0669)	(0.0662)	(0.0675)	(0.0696)	(0.0671)	(0.0718)
INFL	-0.00287***	-0.00270***	-0.00275***	-0.00279***	-0.00238***	-0.00213***	-0.00242***
	(0.000856)	(0.000819)	(0.000855)	(0.000833)	(0.000817)	(0.000823)	(0.000878)
GDPgr	0.00115**	0.00124**	0.00112**	0.00111**	0.00112**	0.00118**	0.00125**
	(0.000564)	(0.000575)	(0.000565)	(0.000553)	(0.000560)	(0.000571)	(0.000567)
DCP	-0.000905**	-0.000854**	-0.000936**	-0.000918**	-0.00114***	-0.00125***	-0.000999**
	(0.000419)	(0.000407)	(0.000412)	(0.000400)	(0.000386)	(0.000407)	(0.000417)
C5	-0.000145	-2.98e-05	-0.000227	-0.000221	-0.000539	-0.000500	-0.000157
	(0.000501)	(0.000532)	(0.000504)	(0.000490)	(0.000539)	(0.000572)	(0.000499)
GOV-FR	0.00282					-0.00483	
	(0.00799)					(0.00761)	
LEG-FR		0.0127				0.0143	
		(0.0105)				(0.0104)	
MON-FR			0.000939			0.00173	
			(0.00368)			(0.00285)	
TRD-FR				0.00211		-0.00484	
				(0.0184)		(0.0183)	
REG-FR					0.0393***	0.0458***	
					(0.0115)	(0.0121)	
ALL-FR							0.0319
							(0.0197)
Constant	-0.145	-0.0235	-0.197	-0.166	0.0533	0.109	-0.0212
	(0.548)	(0.520)	(0.529)	(0.536)	(0.545)	(0.534)	(0.547)
Observations	871	871	871	871	871	871	871
Number of banks	177	177	177	177	177	177	177
N of instruments	65	65	65	65	65	65	65
Wald	191.39***	205.41***	183.89***	197.61***	228.01***	224.33***	189.50***
AR2 p-value	0.1114	0.1002	0.1057	0.1097	0.3237	0.2998	0.1700
Hansen-J p-value	0.146	0.141	0.132	0.140	0.125	0.163	0.154

Note: The table reports the dynamic panel regression results for the major components of the *Fraser Index of Economic Freedom*. The two-step system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer* corrected (robust) standard errors. The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. GOV-FR stands for limitation in the government size, LEG-FR stands for legal structure and security of property rights, MON-FR stands for access to sound money, TRD-FR stands for freedom to exchange with foreigners, REG-FR is the composite index of regulation in credit, labour and business, ALL-FR stands for the overall index of economic freedom, lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. 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. *Windmeijer* corrected (robust) standard errors are in parentheses.

In terms of the bank-specific variables, the natural logarithm of total assets (lnTA) is positively associated with efficiency and is statistically significant at the 1% level. This confirm the results of the fixed effects analysis that larger banks with diversified portfolios enjoy higher efficiency (Mester, 1993). The ratio of loans to assets (LA) has also a positive and statistically significant impact on efficiency at the 1% level in most models implying that banks with high intermediation capacity operate more efficiently (Carvallo and Kasman, 2005). Finally, the equity to assets ratio (EA) is statistically significant at the 10% level in some of the models and positively correlated with efficiency, lending some support in the view that the more capital at risk, the stronger are shareholders' incentives to monitor management and assure that the bank operates efficiently (Pasiouras, 2008) . When it comes to the country level macroeconomic variables, GDP growth (GDPgr) is positively associated with efficiency confirming the fixed effects results. On the other hand, inflation (INFL) and the private sector credit to GDP variable (DCP) have a negative and statistically significant impact on efficiency at the 1% and 5% level respectively. Higher levels of inflation can increase overhead costs for banks (Demirgüç-Kunt et al., 2004), while increased financial deepening, as proxied by the DCP variable, may weaken risk assessment in the loan origination process and thus lead to lower levels of operational efficiency (Duenwald et al., 2005). Additionally, the lagged efficiency is positive and significant at the 1% level and its high magnitude implies the suitability of the dynamic panel data estimation.

An important result in terms of the economic freedom components is the one of model 5 in Table 11. The coefficient of the composite index of regulation in credit, labour and business (REG-FR) is statistically significant at the 1% level and has a positive impact on efficiency. On the other hand, none of the other economic freedom components (GOV-FR, LEG-FR, MON-FR, TRD-FR) as well as the overall index of economic freedom (ALL-FR) has a statistically significant impact on efficiency. The results remain robust in model 6 of table 11 when the regressors of all the major components of economic freedom are included in the same specification. The results of the dynamic panel analysis reveal that the most important channel through which economic freedom has an impact on the efficiency of the banking sector in the EU-10 economies is through regulation. The rest of the dynamic panel analysis will focus on what types regulation are important for bank performance.

2.3.3.2 Credit (CR-REG), Labour (LR-REG) and Business Regulation (BR-REG)- Dynamic Estimation

To examine further the impact of regulation on bank efficiency we decompose composite regulation (REG-FR) to its major subcomponents as in section 2.3.2.2: credit regulation (CR-FR), labour regulation (LR-FR) and business regulation (BR-FR). The results are in Table 12.

Table 12: Dynamic panel results for credit, labour and business regulations as bank cost efficiency determinants in the new EU member states (2000-2010)

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
L.EFF	0.481***	0.575***	0.500***	0.538***
	(0.114)	(0.112)	(0.114)	(0.103)
lnTA	0.0512***	0.0447***	0.0454***	0.0482***
	(0.0116)	(0.0117)	(0.0120)	(0.0110)
EA	0.216*	0.212*	0.215*	0.202*
	(0.111)	(0.120)	(0.116)	(0.107)
LA	0.0885**	0.0899**	0.0959***	0.0764**
	(0.0368)	(0.0362)	(0.0355)	(0.0338)
LLPL	0.116	0.238	0.163	0.179
	(0.358)	(0.309)	(0.333)	(0.342)
lnGDPcap	-0.0379	-0.0391	-0.0141	-0.0659
	(0.0650)	(0.0704)	(0.0695)	(0.0695)
INFL	-0.00274***	-0.00266***	-0.00260***	-0.00246***
	(0.000799)	(0.000886)	(0.000865)	(0.000841)
GDPgr	0.00107*	0.00121**	0.00113**	0.00109*
	(0.000568)	(0.000557)	(0.000546)	(0.000579)
DCP	-0.000880**	-0.000683*	-0.00109**	-0.000873**
	(0.000372)	(0.000378)	(0.000475)	(0.000418)
C5	-0.000189	-0.000187	-0.000315	-0.000343
	(0.000479)	(0.000479)	(0.000548)	(0.000531)
CR-LEG	0.0109**			0.0154***
	(0.00532)			(0.00546)
LR-LEG		0.0216***		0.0236***
		(0.00785)		(0.00778)
BR-LEG			0.00852	0.00555
			(0.00719)	(0.00716)
Constant	-0.0278	-0.0365	-0.123	0.0422
	(0.510)	(0.564)	(0.550)	(0.547)
Observations	871	871	871	871
Number of banks	177	177	177	177
N of instruments	65	65	65	65
Wald	215.23***	222.56***	194.75***	242.54***
AR2 p-value	0.1251	0.4431	0.1876	0.4299
Hansen-J p-value	0.225	0.134	0.151	0.116

Note: The table reports the dynamic panel regression results for the regulation subcomponents of the *Fraser Index of Economic Freedom*. The two-step system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer* corrected (robust) standard errors. The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. CR-REG stands for credit regulation, LR-REG stands for labour regulation, BR-REG stands for business regulation, lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. 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. *Windmeijer* corrected (robust) standard errors are in parentheses.

These confirm the findings of the fixed effects models in section 2.3.2.2 with respect to the relationship between labour regulation (LR-REG) and bank efficiency. In particular, the impact of labour regulation (LR-REG) on bank efficiency (see model 2 of Table 12) is positive and statistically significant at the 1% level. Another channel through which liberalisation of the labour markets can affect positively bank performance is by increased innovation (Barbosa and Faria, 2011; Koeniger, 2005) especially in primary innovation such as the introduction of new products (Saint Paul, 2002). Furthermore, more liberal labour regulation may have a positive impact in the size and sales turnover of the firms located in a country (Almeida and Carneiro, 2009) and reduce the levels of the unofficial economy (Botero et al., 2004) thus improving loan quality and making it easier for banks to evaluate the creditworthiness of firms. An important result of the dynamic analysis, that was not revealed in the fixed effects analysis, is that credit regulation (CR-REG) has a positive and statistically significant at the 5% level impact on bank efficiency (see model 1 of table 12). This result remains robust and increases in significance from the 5% level to the 1% level in model 4 of table 12 when we control also for labour (LR-REG) and business regulation (BR-REG). Finally, the coefficient for the business regulation (BR-REG) is positively associated with efficiency but not significantly different from zero.

2.3.3.3 Decomposing Credit Regulations- Dynamic Estimation

In Table 13 the composite credit regulation (CR-REG) index is decomposed into its own subcomponents and their specific effects on bank efficiency estimated.

Table 13. Dynamic panel results for types of credit regulations as bank cost efficiency determinants in the new EU member states (2000-2010)

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF
L.EFF	0.492***	0.432***	0.501***	0.493***	0.428***
	(0.112)	(0.0829)	(0.120)	(0.118)	(0.0869)
lnTA	0.0497***	0.0591***	0.0485***	0.0483***	0.0597***
	(0.0109)	(0.0138)	(0.0127)	(0.0123)	(0.0127)
EA	0.204*	0.216**	0.224*	0.224*	0.219**
	(0.111)	(0.106)	(0.122)	(0.124)	(0.103)
LA	0.0846**	0.0750**	0.0970**	0.0978***	0.0705**
	(0.0354)	(0.0309)	(0.0377)	(0.0362)	(0.0331)
LLPL	-0.0220	-0.584*	0.190	0.123	-0.599*
	(0.380)	(0.344)	(0.338)	(0.347)	(0.347)
lnGDPcap	-0.0269	-0.0981	-0.0214	-0.00225	-0.105
	(0.0634)	(0.0698)	(0.0690)	(0.0695)	(0.0663)
INFL	-0.00298***	-0.00443***	-0.00272***	-0.00362***	-0.00424***
	(0.000780)	(0.000963)	(0.000841)	(0.00102)	(0.00102)
GDPgr	0.00101*	0.00102	0.00114**	0.00104*	0.000936
	(0.000600)	(0.000640)	(0.000557)	(0.000564)	(0.000666)
DCP	-0.000982**	-0.000919**	-0.000869**	-0.000885**	-0.000893**
	(0.000395)	(0.000430)	(0.000387)	(0.000398)	(0.000386)
C5	-0.000129	-0.000417	-0.000150	-0.000111	-0.000321
	(0.000466)	(0.000534)	(0.000495)	(0.000505)	(0.000538)
CR-OWN	0.00832***				0.00600
	(0.00244)				(0.00828)
CR-COMP		0.0172***			0.0148***
		(0.00412)			(0.00420)
CR-PRS			0.000246		-4.61e-05
			(0.00245)		(0.00262)
CR-IR				-0.0126	-0.00164
				(0.00885)	(0.00727)
Constant	-0.0871	0.462	-0.0740	-0.121	0.499
	(0.504)	(0.523)	(0.544)	(0.557)	(0.498)
Observations	871	757	871	871	757
Number of banks	177	174	177	177	174
N of instruments	65	55	65	65	65
Wald	245.62***	191.94***	203.48***	197.51***	201.08***
AR2 p-value	0.2085	0.1775	0.1030	0.1105	0.2190
Hansen-J p-value	0.245	0.144	0.180	0.154	0.127

Note: The table reports the dynamic panel regression results for the decomposed credit regulation index of the *Fraser Index of Economic Freedom.* The two-step system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer* corrected (robust) standard errors. The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. CR-OWN stands for percentage of deposits held in privately owned banks, CR-COMP stands for foreign banks barriers to entry and presence in the domestic market, CR-PRS stands for government borrowing that does not crowd out private sector borrowing, CR-IR stands for interest rate controls, lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. 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. *Windmeijer* corrected (robust) standard errors are in parentheses.

The positive association of private ownership (CR-OWN) with bank efficiency found in the fixed effects analysis is further confirmed in the dynamic panel analysis but now is statistically significant at the 1% level (see model 1 in Table 13). This results implies that private ownership of banks increases performance through better allocation of credit in the economy that results from less political interference (Dinc, 2005; Khwaja and Mian, 2005) and more adherence to market discipline (Mian, 2003). The competition from foreign banks (CR-COMP) is also statistically significant at the 1% and has a positive coefficient (see model 2 in Table 13). The result for the CR-COMP variable is expected as it is a measure of openness. Furthermore, the interpretation of this variable has two dimensions. Firstly, the extent to which foreign banks are allowed to enter the domestic market may have a positive impact on the efficiency of domestic banks due to enhanced competition as any moral hazard arising from protection against external competition is removed. Secondly, the level of operations of foreign banks asserts a positive impact on efficiency because they bring technological innovation in domestic markets as well as advanced management and risk assessment expertise sourced from their global operations. This result provides evidence for the *"global advantage"* hypothesis posed by Berger et al. (2000) and supports the literature on the advantages of the presence of foreign banks in host country markets and the ability for foreigners to hold equity in domestic banks (Bonin et al., 2005; Fries and Taci, 2005; Grigorian and Manole, 2006; Hasan and Marton, 2003). However, in model 5 of Table 13 when all the credit regulation variables are included in the specification, the foreign competition variable (CR-COMP) retains its statistical significance at the 1% level while the private ownership variable (CR-OWN) becomes insignificant. This implies that foreign ownership and not mere private ownership matters most for bank performance in the EU-10 economies. Finally, the dynamic panel analysis does not confirm the fixed effects results that limitations on the interest rate controls (CR-IR) have a statistically significant impact on bank efficiency.

2.3.4 Sensitivity Analysis[11] – Panel Vector Autoregressive (VAR) estimation

As part of the sensitivity analysis the flexible framework of a panel-VAR analysis is used. [12] In a panel-VAR specification all variables are entering as endogenous and one of its major advantages is that it examines the underlying dynamic relationships compared to the static functional form of a standard fixed effects model.
For the estimation of each panel VAR we follow the same procedure. As a first step, the optimal lag order j is assumed for the right-hand variables in the system of equations (Lutkepohl, 2006). The Arellano-Bond GMM estimator is used for the lags of j=1,2 and 3. The optimal lag order of one is based on the Akaike Information Criterion (AIC), confirmed by Arellano-Bond AR tests. To test for autocorrelation, more lags are added. The Sargan tests show that for lag ordered one, the null hypothesis cannot be rejected and thus the VAR model is of order one. The lag order of one preserves the degrees of freedom and information, given the low time frequency of the data.

2.3.4.1 Impulse Response Functions (IRFs) and Variance Decompositions (VDCs) for Foreign Bank Competition (CR-COMP), Interest Rate Controls (CR-IR), Bank Market Concentration (C5) and Efficiency (EFF)

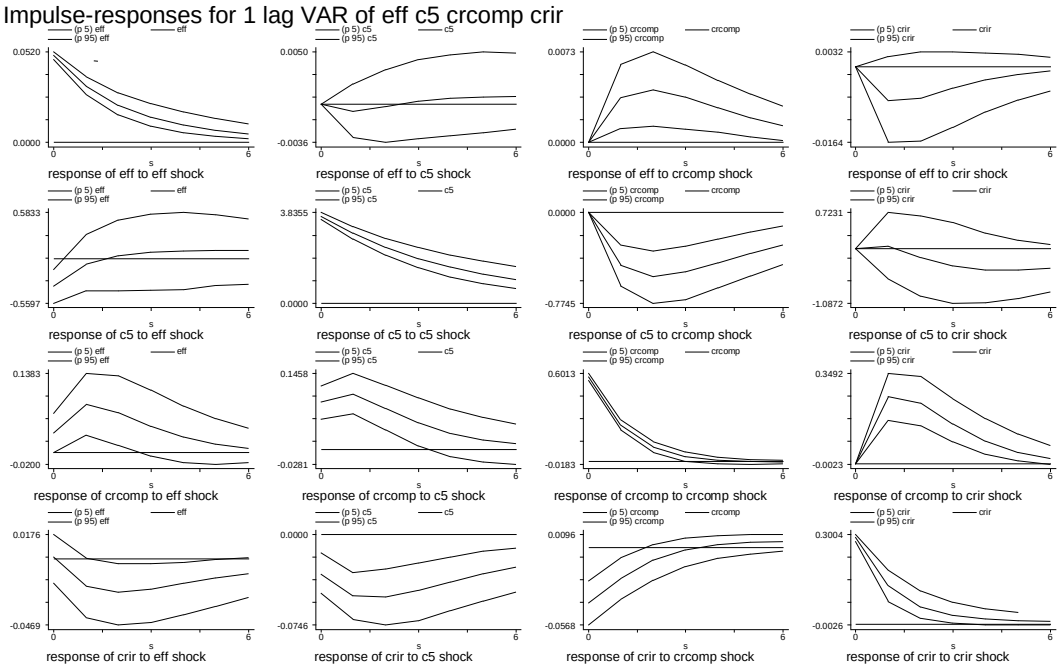
The panel-VAR framework allows the examination of the impact of the components of credit regulation on cost efficiency in more detail and is included here as part of the sensitivity analysis. Credit regulation is decomposed into four components: ownership (CR-OWN), competition (CR-COMP), private sector credit (CR-PRS) and restrictions on interest rates (CR-IR). The Arellano-Bond GMM estimator for the lag of j=1 is used.

The impulse response functions (IRFs) derived from the unrestricted panel-VAR in the case of bank cost efficiency (EFF), bank market concentration (C5), foreign bank competition (CR-COMP) and limitations in the interest rate control (CR-IR)

[11] We have also performed robustness checks in a fixed effect econometric framework using alternative indicators for foreign bank competition and an alternative index of economic freedom (the *Heritage Foundation Index of Economic Freedom*) for regulation in credit, labour and business. The results confirm the corresponding results of the *Fraser Index* and are depicted in tables B1 and B2 of Appendix B respectively.
[12] For a formal exposition of the panel VAR methodology see Appendix C.

variables are reported in Figure 1 The plots show the response of each variable in the panel-VAR (EFF, C5, CR-COMP and CR-IR) to its own innovation and to the innovations of the other variables. The first row shows the response of efficiency (EFF) to an one standard deviation shock in the C5, CR-COMP and CR-IR variables.

Figure 1: Impulse response functions (IRFs) for foreign bank competition (CR-COMP), interest rate controls (CR-IR), bank market concentration (C5) and efficiency (EFF)



It becomes apparent that the effect of foreign bank competition (CR-COMP) on cost efficiency (EFF) is positive over the whole period. The peak response of efficiency to CR-COMP is after the second year, and converges towards equilibrium thereafter. In the case of foreign bank competition (CR-COMP), the panel VAR analysis appears to confirm the previous dynamic panel results. Following improvements in levels of competitive market conditions, foreign banks bring technological innovations into the domestic market and enhance the performance of all banks, foreign and domestic, as in Asaftei and Kumbhakar (2005), Bonin et al. (2005), Fries and Taci (2005), Havrylchyk (2006) and Pruteanu-Podpiera (2008). Furthermore, the response of efficiency (EFF) to a shock in the limitation of interest rate controls (CR-IR) is negative in the period under study and lends support to the

"competition-fragility" hypothesis as discussed in section 2.3.2.3. Finally, the response of efficiency (EFF) to a shock in the concentration ratio of the banking industry (C5) is initially negative but turns positive after the second period of the study.

Table 14: Variance decompositions (VDCs) for cost efficiency (EFF), bank market concentration (C5) and the decomposed credit regulation index(CR-REG)

Variance Decompositions (VDCs) for foreign bank competition (CR-COMP), interest rate controls (CR-IR), bank market concentration (C5) and efficiency (EFF)					
	s	EFF	C5	CR-COMP	CR-IR
EFF	10	0.95714	0.00065	0.01283	0.02938
C5	10	0.00479	0.94173	0.03067	0.02281
CR-COMP	10	0.02690	0.04893	0.66951	0.25466
CR-IR	10	0.01727	0.10443	0.01879	0.85951
Variance Decompositions (VDCs) for private ownership of banks (CR-OWN), private sector credit (CR-PRS), bank market concentration (C5) and efficiency (EFF)					
	s	EFF	C5	CR-OWN	CR-PRS
EFF	10	0.99073	0.00057	0.00248	0.00622
C5	10	0.01433	0.89170	0.08198	0.01199
CR-OWN	10	0.14567	0.22380	0.54872	0.08181
CR-PRS	10	0.13074	0.26750	0.03319	0.56856

Notes: s defines the periods ahead of VDCs. EFF is Efficiency, CR-OWN is the percentage of deposits held in privately owned banks, CR-COMP is foreign banks barriers to entry and foreign bank presence in the domestic market, CR-PRS is government borrowing that does not crowd out private sector borrowing, CR-IR is limitations in interest rate controls, C5 is the five firm concentration ratio of each country's banking system.

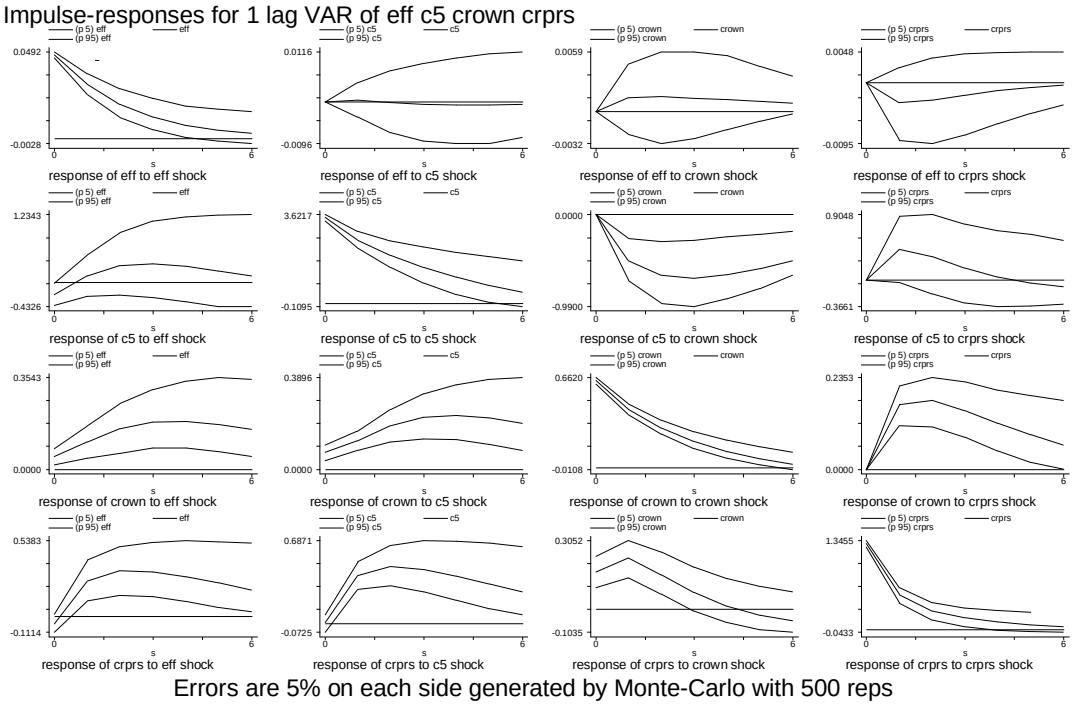
Table 14 presents further evidence of the importance of credit specific regulation for bank efficiency as reported by the variance decompositions (VDC) estimations for its components. These results are consistent with the impulse response functions (IRFs), and provide support for the importance of regulation with respect to foreign bank competition (CR-COMP) in explaining the variation in cost efficiency (EFF). Specifically, around 1.3% of forecast error variance of cost efficiency after 10 years is explained by foreign bank competition (CR-COMP) regulation disturbances. Limitations in the interest rate controls (CR-IR) are also confirmed to be important

determinants of bank efficiency (EFF) as 2.94% of the forecast error variance of efficiency (EFF) after 10 years is explained by shocks in the CR-IR variable. Finally, disturbances in the concentration ratio (C5) of the banking industry appear to have minimal impact in forecasting efficiency (EFF) confirming the results of the fixed effects and dynamic panel analysis.

2.3.4.2 Impulse Response Functions (IRFs) and Variance Decompositions (VDCs) for Private Ownership (CR-OWN), Private Sector Credit (CR-PRS), Bank Market Concentration (C5) and Efficiency (EFF)

The impulse response functions (IRF) derived from the unrestricted panel-VAR in the case of bank cost efficiency (EFF) and regulation related to private sector credit (PRS), private ownership of banks (CR-OWN) and the concentration ratio of the banking industry (C5) are presented in Figure 2. The first row shows the response of efficiency (EFF) to an one standard deviation shock in C5, CR-OWN and CR-PRS.

Figure 2: Impulse response function (IRFs) for private ownership of banks (CR-OWN), private sector credit (CR-PRS), bank market concentration (C5) and efficiency (EFF)



The response of efficiency (EFF) to a shock of the private ownership (CR-OWN) is positive in all the years under study, while it peaks on the first period confirming the results of the dynamic panel analysis in section 3.3.3 related to the positive impact of private ownership on bank efficiency. On the other hand, the response of efficiency to a shock of the private sector credit (CR-PRS) variable is negative throughout the study, implying that credit direct towards the government is less costly for the banking sector. These results are further confirmed by the variance decomposition (VDC) estimations in Table 14. In a 10 year time frame around 0.25% of the forecast error variance of efficiency (EFF) can be explained by disturbances in the private ownership variable while around 0.62% from disturbances in the private sector credit (CR-PRS) variable. Finally, disturbances in the concentration ratio (C5) of the banking industry appear to have minimal impact in forecasting efficiency (EFF) as found in section 2.3.4.1

2.4 Conclusion

In this chapter we investigated the relationship between bank efficiency and credit, labour and business regulation in the banking industry of the new EU member states. These countries from Central and Eastern Europe have had little more than a decade to manage the transition from central planning to a market economy. Established non-parametric methods (data envelopment analysis) are used for efficiency scores estimation and these scores are used in both fixed effects and dynamic panel data models to investigate the impact of credit, labour and business regulation of bank efficiency.

Using the *Fraser Index of Economic Freedom* we find that, among the five major components (government size, legal structure and property rights protection, access to sound money, trade freedom and regulation), the composite regulation index that includes regulation in credit, labour and business has the strongest influence on the banking sector and it has a consistently positive and statistically significant impact on bank efficiency regardless of the specification of the estimating equation.

Furthermore, by decomposing the regulation index into its three components (credit, business and labour regulation) we find that strict labour regulation is associated with lower bank efficiency lending support to the view that more liberal labour

markets are associated with increased economic performance. Furthermore, decomposing credit regulation provides a rich of results. In particular, aspects of foreign ownership and competition as well as private ownership are significantly associated with increased bank efficiency. The dynamic panel-VAR results using impulse response functions and variance decomposition support the validity of these results further.

The results of this chapter are timely as several EU member states appear to have fragile financial systems. Regulation of the banking sectors in the transition countries is relatively new and this study shows that it enhances bank operating performance. Overall, credit regulation in the transition countries is recent and this study shows it enhances bank operating performance. Labour regulation also asserts a negative impact on inefficiency. These results are valuable for both academics and policy makers in their attempts to understand what could drive bank efficiency.

Appendices to Chapter 2

Appendix A

Table A1: The overall components of the *Fraser Index of Economic Freedom*

Variable	Category	Nature	Description
GOV-FR	Size of Government: Expenditures, Taxes, and Enterprise	Composite	This variable takes values between 0 and 10 with higher values indicating greater economic freedom and is the average of four components: A) General government consumption spending as a percentage of total consumption, B) Transfers and subsidies as a percentage of GDP, C) Government enterprises and investment, D) Top marginal tax rate (Di: Top marginal income tax rate, Dii: Top marginal income and payroll tax rate). The four components of this index indicate the extent to which countries rely on the political process to allocate resources and goods and services. Taken together, the four components of measure the degree to which a country relies on personal choice and markets rather than government budgets and political decision-making. Therefore, countries with low levels of government spending as a share of the total, a smaller government enterprise sector, and lower marginal tax rates earn the highest ratings in this area.
LEG-FR	Legal Structure and Security of Property Rights	Composite	This variable takes values between 0 and 10 with higher values indicating greater economic freedom and is the average of seven components: A) Judicial independence, B) Impartial courts, C) Protection of property rights, D) Military interference in rule of law and the political process, E) Integrity of the legal system, F) Legal enforcement of contract, G) Regulatory restrictions on the sale of real property. Protection of persons and their rightfully acquired property is a central element of economic freedom and a civil society. The key ingredients of a legal system consistent with economic freedom are rule of law, security of property rights, an independent judiciary, and an impartial court system. Components indicating how well the protective function of government is performed were assembled from three primary sources: the International Country Risk Guide, the Global Competitiveness Report, and the World Bank's Doing Business project.
MON-FR	Access to Sound Money	Composite	This variable takes values between 0 and 10 with higher values indicating greater economic freedom and is the average of four components: A) Money growth, B) Standard deviation of inflation, C) Inflation: Most recent year, D) Freedom to own foreign currency bank accounts. In order to earn a high rating in this area, a country must follow policies and adopt institutions that lead to low (and stable) rates of inflation and avoid regulations that limit the ability to use alternative currencies.
TRD-FR	Freedom to Trade Internationally	Composite	This variable takes values between 0 and 10 with higher values indicating greater economic freedom and is the average of five components: A) Taxes on international trade (Ai: Revenues from trade taxes as % of the trade sector, Aii: Mean tariff rate, Aiii) Standard Deviation of tariff rates), B) Regulatory trade barriers (Bi: Non-tariff trade barriers, Bii: ii Compliance cost of importing & exporting), C) Size of trade sector relative to expected, D) Black-market exchange rates, E) International capital market controls (Ei: Foreign ownership/investment restrictions, Eii: Capital controls). The components in this area are designed to measure a wide variety of restraints that affect international exchange: tariffs, quotas, hidden administrative restraints, and exchange rate and capital controls. In order to get a high rating in this area, a country must have low tariffs, a trade sector larger than expected, easy clearance and efficient administration of customs, a freely convertible currency, and few controls on the movement of capital.

REG-FR	Regulation of Credit, Labour, and Business	Composite	This variable takes values between 0 and 10 with higher values indicating greater economic freedom . When regulations restrict entry into markets and interfere with the freedom to engage in voluntary exchange, they reduce economic freedom. The fifth area of the index focuses on regulatory restraints that limit the freedom of exchange in credit, labor, and product market. This index is the average of three components: A) Credit market regulations (Ai: Private ownership of banks, Aii: Foreign bank competition, Aiii: Private sector credit, Aiv: Interest rate controls/negative real interest rates), B) Labour market regulations (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), C) Business regulations (Ci: Price controls, Cii: Administrative requirements, Ciii: Bureaucracy costs, Civ: Starting a business, Cv: Extra payments/bribes/favouritism, Cvi: Licensing restrictions, Cvii: Cost of tax compliance)

Table A2: The regulation components of the *Fraser Index of Economic Freedom*

Variable	Category	Nature	Description
CR-OWN	Credit Regulations	Component	Data on the percentage of bank deposits held in privately owned banks were used to construct rating intervals. Countries with larger shares of privately held deposits received higher ratings. When privately held deposits totalled between 95% and 100%, countries were given a rating of 10. When private deposits constituted between 75% and 95% of the total, a rating of 8 was assigned. When private deposits were between 40% and 75% of the total, the rating was 5. When private deposits totalled between 10% and 40%, countries received a rating of 2. A zero rating was assigned when private deposits were 10% or less of the total.
CR-COMP	Credit Regulations	Component	If a country approved all or most foreign bank applications and if foreign banks had a large share of the banking sector assets, then the country received a higher rating.
CR-PRS	Credit Regulations	Component	This sub-component measures the extent to which government borrowing crowds out private borrowing. When data are available, this sub-component is calculated as the government fiscal deficit as a share of gross saving. Since the deficit is expressed as a negative value, higher numerical values result in higher ratings. The formula used to derive the country ratings for this sub-component was (−Vmax − Vi) / (Vmax + Vmin) multiplied by 10. Vi is the deficit to gross investment ratio, and the values for Vmax and Vmin are set at 0 and −100.0%, respectively. The formula allocates higher ratings as the deficit gets smaller (i.e., closer to zero) relative to gross saving. If the deficit data are not available, the component is instead based on the share of private credit to total credit extended in the banking sector. Higher values are indicative of greater economic freedom. Thus, the formula used to derive the country ratings for this sub-component was (Vi − Vmin) / (Vmax − Vmin) multiplied by 10. Vi is the share of the country's total domestic credit allocated to the private sector and the values for Vmax and Vmin are set at 99.9% and 10.0%, respectively. The 1990 data were used to derive the maximum and minimum values for this component. The formula allocates higher ratings as the share of credit extended to the private sector increases.
CR-IR	Credit Regulations	Component	Data on credit-market controls and regulations were used to construct rating intervals. Countries with interest rates determined by the market, stable monetary policy, and positive real deposit and lending rates received higher ratings. When interest rates were determined primarily by market forces and the real rates were positive, countries were given a rating of 10. When interest rates were primarily determined by the market but the real rates were sometimes slightly negative (less than 5%) or the differential between the deposit and lending rates was large (8% or more), countries received a rating of 8. When the real deposit or lending rate was persistently negative by a single-digit amount or the differential between them was regulated by the government, countries were rated at 6. When the deposit and lending rates were fixed by the government and the real rates were often negative by single digit amounts, countries were assigned a rating of 4. When the real deposit or lending rate was persistently negative by a double-digit amount, countries received a rating of 2. A zero rating was assigned when the deposit and lending rates were fixed by the government and real rates were persistently negative by double-digit amounts or hyperinflation had virtually eliminated the credit market.
CR-REG	Credit Regulations	Composite	Composite index of the above
LR-REG	Labour Regulation	Composite	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.
BR-REG	Business Regulations	Composite	The variable aims to identify the extent to which regulations and bureaucratic procedures restrain entry and reduce competition. In order to score high in this part of the index, countries must allow markets to determine prices and refrain from regulatory activities that retard entry into business and increase the cost of producing products. They also must refrain from using their power to extract financial payments and reward some businesses at the expense of others.

Appendix B: Robustness Regressions

Table B1: Robustness check - efficiency and foreign bank competition

VARIABLES	(1) EFF	(2) EFF
lnTA	0.0494***	0.0431***
	(0.0107)	(0.0164)
EA	0.101	0.237***
	(0.0782)	(0.0851)
LA	0.0340	0.0511
	(0.0317)	(0.0355)
LLPL	-0.260	-0.134
	(0.244)	(0.250)
lnGDPcap	-0.187***	0.0200
	(0.0605)	(0.0628)
INFL	0.000630	-0.00141
	(0.000758)	(0.000877)
GDPgr	0.00246***	0.00108
	(0.000706)	(0.000781)
DCP	0.000202	-0.000777*
	(0.000392)	(0.000436)
C5	-0.000463	-9.22e-05
	(0.000422)	(0.000519)
FDI-Banks	0.00262***	
	(0.000667)	
FDI-assets		4.76e-05
		(0.000484)
Constant	1.695***	-0.0237
	(0.507)	(0.480)
Observations	927	707
F-test	18.27***	12.32***
R-squared	0.171	0.118
Number of banks	190	174

Note: The table reports the fixed effects regression results for alternative measures of foreign bank competition in the domestic market using data from Claessens and van Horen (2013). The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. FDI-Banks stands for the percentage of the number of foreign owned banks to the number of the total banks in an economy, FDI-assets stands for the percentage of the total banking assets that are held by foreign banks in an economy. lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. The use of the fixed effects specification is justified after a Hausman test for each model. 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 B2: Robustness check- efficiency and regulation in credit, labour and business using an alternative economic freedom index (*The Heritage Foundation Index of Economic Freedom*)

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
lnTA	0.0523***	0.0402***	0.0518***	0.0428***
	(0.0107)	(0.0151)	(0.0108)	(0.0155)
EA	0.132*	0.170	0.123	0.184
	(0.0793)	(0.119)	(0.0799)	(0.119)
LA	0.0288	0.0355	0.0362	0.0327
	(0.0315)	(0.0400)	(0.0328)	(0.0395)
LLPL	-0.0415	0.0586	-0.0793	0.0895
	(0.228)	(0.184)	(0.227)	(0.193)
lnGDPcap	-0.0955**	0.0617	-0.0903**	0.0646
	(0.0465)	(0.0581)	(0.0450)	(0.0548)
INFL	0.000690	-0.00246***	0.000328	-0.00261***
	(0.000729)	(0.000809)	(0.000722)	(0.000773)
GDPgr	0.00163***	0.000884	0.00169***	0.000819
	(0.000517)	(0.000560)	(0.000519)	(0.000546)
DCP	0.000288	-0.00123***	0.000329	-0.00125***
	(0.000378)	(0.000452)	(0.000368)	(0.000442)
C5	0.000150	-0.000551	0.000524	-0.00126
	(0.000434)	(0.000855)	(0.000472)	(0.000807)
FIN-HER	0.000565			0.000968**
	(0.000404)			(0.000447)
LAB-HER		0.00304***		0.00285**
		(0.00115)		(0.00110)
BUS-HER			-0.000527	0.000430
			(0.000498)	(0.000446)
Constant	0.854**	-0.492	0.855**	-0.585
	(0.376)	(0.463)	(0.363)	(0.459)
Observations	1,045	725	1,045	725
F-test	15.50***	13.19***	14.78***	18.67***
R-squared	0.141	0.123	0.140	0.138
Number of banks	192	175	192	175

Note: The table reports the fixed effects regression results for alternative measures of economic freedom related to credit, labour and business using data from the *Heritage Foundation Index of Economic Freedom.* The dependent variable is the cost efficiency scores calculated using a DEA methodology and assuming variable returns to scale (VRS) and a common annual frontier. FIN-HER stands for financial freedom, LAB-HER stands for labour freedom, BUS-HER stands for business freedom, lnTA stands for the natural logarithm of total assets, EA stands for the equity to assets ratio, LA stands for the loan to assets ratio, LLPL stands for the loan loss provisions to total loans ratio, lnGDPcap stands for the natural logarithm of GDP per capita at purchasing power parity (PPP) terms, INFL stands for inflation, GDPgr stands for GDP growth, DCP stands for private sector credit to GDP, C5 stands for the five-firm concentration ratio of each country's banking industry. The use of the fixed effects specification is justified after a Hausman test for each model. 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 C: Panel VAR Methodology

We examine the underlying causality links between cost efficiency (EFF), the five firm concentration in a country's banking industry (C5), and bank regulation variables using a first order 4x4 panel-VAR model:

$$X_{it} = \mu_i + \Phi X_{it-1} + e_{i,t}, \quad i = 1,\ldots, N,\ t = 1,\ldots,T. \tag{1}$$

, where X_{it} is a vector of four random variables, that is, the bank specific cost efficiency (EFF_{it}), the concentratio ratio ($C5_{it}$) and two credit regulation variables, namely foreign bank competition ($CR\text{-}COMP_{it}$) and limitations in the interest rate controls ($CR\text{-}IR_{it}$). Thus, Φ is an 4x4 matrix of coefficients, μ_i is a vector of m individual effects and $e_{i,t}$ are iid residuals. The panel-VAR takes the following form:

$$\begin{aligned}
EFF_{it} &= \beta_{10} + \sum_{j=1}^{J} \beta_{11} EFF_{1it-j} + \sum_{j=1}^{J} \beta_{12} C5_{1it-j} + \sum_{j=1}^{J} \beta_{13} CR-COMP_{1it-j} + \sum_{j=1}^{J} \beta_{14} CR-IR_{1t-j} + e_{1i,t} \\
C5_{it} &= \beta_{20} + \sum_{j=1}^{J} \beta_{21} EFF_{1it-j} + \sum_{j=1}^{J} \beta_{22} C5_{1it-j} + \sum_{j=1}^{J} \beta_{23} CR-COMP_{1it-j} + \sum_{j=1}^{J} \beta_{24} CR-IR_{1it-j} + e_{2i,t} \\
CR-COMP_{it} &= \beta_{30} + \sum_{j=1}^{J} \beta_{31} EFF_{1it-j} + \sum_{j=1}^{J} \beta_{32} C5_{1it-j} + \sum_{j=1}^{J} \beta_{33} CR-COMP_{1it-j} + \sum_{j=1}^{J} \beta_{34} CR-IR_{1it-j} + e_{3i,t} \\
CR-IR_{it} &= \beta_{40} + \sum_{j=1}^{J} \beta_{41} EFF_{1it-j} + \sum_{j=1}^{J} \beta_{42} C5_{1it-j} + \sum_{j=1}^{J} \beta_{43} CR-COMP_{1it-j} + \sum_{j=1}^{J} \beta_{44j} CR-IR_{1it-j} + e_{4i,t}
\end{aligned} \tag{2}$$

The moving averages (MA) form of the model sets EFF_{it}, $C5_{it}$, $CR\text{-}COMP_{it}$ and $CR\text{-}IR_{it}$ equal to a set of present and past residuals e_1, e_2, e_3 and e_4 from the panel-VAR estimation:

$$EFF_{it} = \mu_{10} + \sum_{j=1}^{J} b_{11} e_{1it-j} + \sum_{j=1}^{J} b_{12} e_{2it-j} + \sum_{j=1}^{J} b_{13} e_{3it-j} + \sum_{j=1}^{J} b_{14} e_{4it-j}$$

$$C5_{it} = \mu_{20} + \sum_{j=1}^{J} b_{21} e_{1it-j} + \sum_{j=1}^{J} b_{22} e_{2it-j} + \sum_{j=1}^{J} b_{23} e_{3it-j} + \sum_{j=1}^{J} b_{24} e_{4it-j}$$

$$CR - COMP_{it} = \mu_{30} + \sum_{j=1}^{J} b_{31} e_{1it-j} + \sum_{j=1}^{J} b_{32} e_{2it-j} + \sum_{j=1}^{J} b_{33} e_{3it-j} + \sum_{j=1}^{J} b_{34} e_{4it-j}$$

$$CR - IR_{it} = \mu_{40} + \sum_{j=1}^{J} b_{41} e_{1it-j} + \sum_{j=1}^{J} b_{42} e_{2it-j} + \sum_{j=1}^{J} b_{43} e_{3it-j} + \sum_{j=1}^{J} b_{44} e_{4it-j}$$

(3)

Under the endogeneity assumption the residuals will be correlated and therefore the coefficients of the MA representation are not interpretable. As a result, the residuals must be orthogonal. We orthogonalize the residuals by multiplying the MA representation with the Cholesky decomposition of the covariance matrix of the residuals. The orthogonalized, or structural, representation is:

$$EFF_{it} = \mu_{10} + \sum_{j=1}^{J} b_{11} \varepsilon_{1it-j} + \sum_{j=1}^{J} b_{12} \varepsilon_{2it-j} + \sum_{j=1}^{J} b_{13} \varepsilon_{3it-j} + \sum_{j=1}^{J} b_{14} \varepsilon_{4it-j}$$

$$C5_{it} = \mu_{20} + \sum_{j=1}^{J} b_{21} \varepsilon_{1it-j} + \sum_{j=1}^{J} b_{22} \varepsilon_{2it-j} + \sum_{j=1}^{J} b_{23} \varepsilon_{3it-j} + \sum_{j=1}^{J} b_{24} \varepsilon_{4it-j}$$

$$CR - COMP_{it} = \mu_{30} + \sum_{j=1}^{J} b_{31} \varepsilon_{1it-j} + \sum_{j=1}^{J} b_{32} \varepsilon_{2it-j} + \sum_{j=1}^{J} b_{33} \varepsilon_{3it-j} + \sum_{j=1}^{J} b_{34} \varepsilon_{4it-j}$$

$$CR - IR_{it} = \mu_{40} + \sum_{j=1}^{J} b_{41} \varepsilon_{1it-j} + \sum_{j=1}^{J} b_{42} \varepsilon_{2it-j} + \sum_{j=1}^{J} b_{43} \varepsilon_{3it-j} + \sum_{j=1}^{J} b_{44} \varepsilon_{4it-j}$$

(4)

and

$$\begin{pmatrix} \beta_{11j}\beta_{12j}\beta_{13j}\beta_{14j} \\ \beta_{21j}\beta_{22j}\beta_{23j}\beta_{24j} \\ \beta_{31j}\beta_{32j}\beta_{33j}\beta_{34j} \\ \beta_{41j}\beta_{42j}\beta_{43j}\beta_{44j} \end{pmatrix} = \begin{pmatrix} b_{11j}b_{12j}b_{11j}b_{12j} \\ b_{21j}b_{22j}b_{23j}b_{24j} \\ b_{31j}b_{32j}b_{33j}b_{34j} \\ b_{41j}b_{42j}b_{43j}b_{44j} \end{pmatrix} P \begin{pmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \\ \varepsilon_{3it} \\ \varepsilon_{4it} \end{pmatrix} = P^{-1} \begin{pmatrix} e_{1it} \\ e_{2it} \\ e_{3it} \\ e_{4it} \end{pmatrix}$$

(5)

where P is the Cholesky decomposition of the covariance matrix of the residuals:

$$\begin{pmatrix} Cov(e_{1it}, e_{1it}) Cov(e_{1it}, e_{2it}) Cov(e_{1it}, e_{3it}) Cov(e_{1it}, e_{4it}) \\ Cov(e_{2it}, e_{1it}) Cov(e_{2it}, e_{2it}) Cov(e_{2it}, e_{3it}) Cov(e_{2it}, e_{4it}) \\ Cov(e_{3it}, e_{1it}) Cov(e_{3it}, e_{2it}) Cov(e_{3it}, e_{3it}) Cov(e_{3it}, e_{4it}) \\ Cov(e_{4it}, e_{1it}) Cov(e_{4it}, e_{2it}) Cov(e_{4it}, e_{3it}) Cov(e_{4it}, e_{4it}) \end{pmatrix} = PP^{-1}$$

(6)

We introduce fixed effects in the above panel-VAR model to ensure heterogeneity in the levels, denoted μ_i. In addition, as in Love and Zicchino (2006) we are forward mean-differenced the data following the Helmert procedure (Arellano and Bover, 1995). Last we employ Monte Carlo simulations to estimate standard errors for the impulse response functions (IRFs). Note that for simplicity and facilitating the exposition of the vectors and matrixes of panel-VAR model (1) we constrain our analysis to two credit regulation variables (CR-COMP and CR-IR). In the empirical section, we include a second panel-VAR with the other two credit regulation variables (CR-OWN and CR-PRS).

Chapter 3: The Impact of Business Regulation on Bank Performance in the EU-27

3.1 Introduction

Business regulations are central to policy making as setting them right would foster competitiveness and boost economic growth, whereas excess regulation could prove harmful to the economy. Another important focal point of policy makers is the performance of the banking sector, as this is of major significance to the well-functioning of financial markets in particular and the economy in general. Moreover, the recent financial crisis demonstrated that poor bank performance asserts a negative effect on the overall economy due to the systemic financial stability implications and credit constraints. Given the prominence of both regulation and bank performance is not surprising that there has been an extensive literature (Demirgüç-Kunt and Detragiache 1998, Barth et al., 2004; Beck et al., 2006; Pasiouras, 2008; Pasiouras et al., 2009; Barth et al. 2013; Delis et al., 2011, Delis and Staikouras, 2011)[13], in particular regarding bank specific regulation. However, to the best of our knowledge the impact of wider regulations that could affect the day-to-day bank operations has not been examined. To this end, we fill a gap by studying the impact that wider business regulations, targeting to improve competitiveness, could have on bank performance, whilst we also focus on bank specific regulations.

[13] Barth et al. (2004) finds that private monitoring regulation has a positive and significant effect on bank performance. In the same study official supervisory power and regulation for capital requirements are found not be significantly related with the performance of financial institutions. Beck et al. (2006) confirm the importance of private monitoring regulation for the banking sector. In a study of 2,500 banks across 37 countries they find that enhancing private monitoring of banks by obliging them to reveal truthful information to the private sector has as a result to decrease the level to which corruption of bank staff posits a hurdle for companies to access finance. In another study, Pasiouras et al. (2009) investigate the impact of the three pillars of Basel II and restrictions on bank activities on efficiency. They find that market discipline regulation and the supervisory authority is positively related with bank efficiency. On the other hand, restrictions on bank activities increase profit efficiency but reduce cost efficiency, while stricter capital requirements have the reverse impact. Other studies that examine the impact of financial regulation on bank performance include Pasiouras (2008), Barth et al. (2013), Delis et al. (2011), Delis and Staikouras, (2011).

In early empirical studies variables that reflect the quality of institutions such as bureaucratic quality or law observance serve as proxies for regulation and supervision that is specific to the banking sectors. Demirgüç-Kunt and Detragiache (1998, 2002) provide evidence that improved institutional quality is negatively related with the probability of banking crises and reduces the effect of moral hazard due to deposit insurance regulation. The availability of data for regulation specific to the banking sector steered research that use these data as main regulatory variables while general country-level institutional quality measures serve as control variables. A proliferation of research that examines the impact of bank supervision and regulation on bank performance has not reached yet an agreement on how specific types of bank regulation affect bank performance or what in general is a good regulation for the financial sector.

Furthermore, extant research of the impact of non-financial regulation on bank performance is limited although banks operate within the wide spectrum of regulations of the country they are located. This is so despite that some studies have demonstrated the importance of non-financial institutional and regulatory framework in explaining cross-country differences in bank performance (Demirgüç-Kunt et al. 2004, 2008; Lensink et al. 2008; Hasan et al. 2009).

Overall, the literature that links regulation to bank performance is dominated by bank-specific regulation, while institutional quality measures serve as control variables. Furthermore, the limited literature that focuses specifically on how non-financial regulation and institutional quality could affect bank performance uses wide measures, as for example law observance, making it harder to derive specific policy implications in order to prioritise efforts to improve the regulatory framework.

In the light of the above, this chapter provides a missing link by examining a wide range of bank but also country-specific regulation on performance. Firstly, we examine in both fixed effects and dynamic panel models how several types of business regulation derived from the *"Doing Business"* project of the World Bank affect bank performance (as measured by efficiency) in the EU-27 economies over the 2004-2010 period. In particular we employ models that account for business regulation in the following categories: *starting a business; getting credit;*

protecting investors; enforcing contracts; paying taxes; resolving insolvency and *employing workers.* Secondly, we investigate the extent to which the impact of each type of regulation is conditional on institutional quality measures such as the rule of law and control of corruption. Finally, as sensitivity analysis, we examine for the existence of any potential heterogeneity in the impact of *getting credit* and *protecting investors* regulation on bank performance during the crisis.

Although we examine several (seven) types of business regulation we place emphasis on *getting credit* regulation as is directly linked with the banking sector and of some importance for financial stability. Also, for the first time in the banking literature we investigate the impact of entry and tax regulation on performance, both making the top of the agenda of EU's policy makers as they perceived to improve competitiveness and hence expedite the recovery from the recent financial and sovereign debt crisis. A first glimpse at the results reveal that there is not one size fits all effect of regulation on performance. The observed variability is of interest for policy making as it highlights where one could focus to boost bank performance and thus financial stability. The rest of this chapter is structured as follows. Section 3.2 presents the data and the underlying methodology, Section 3.3 presents the related literature and develops hypotheses to be tested, Section 3.4 reports and discusses the results, whilst the final section offers some concluding comments related to policy making.

3.2 Data and Variables

3.2.1 Measuring Bank Performance

We use data from IBCA-Bankscope for the 2004-2010 period. The sample includes 2046 commercial and savings banks and, after removing errors and inconsistencies, 11,421 bank/year observations remain in an unbalanced panel. The sample includes the majority of such banks in the EU-27 economies.

In this study we measure bank performance in terms of cost efficiency. To this end we opt for the stochastic frontier analysis (SFA) and follow the Battese and Coelli (1995) methodology in order to estimate bank cost efficiency. The major advantage of the SFA methodology is that both random error and inefficiency are incorporated in a composite error term (Berger and Humphrey, 1997). The

allowance for measurement error in the SFA estimation produces bank-specific efficiency estimates that reflect more accurately managerial competence in comparison with non-parametric approaches of efficiency estimation such as DEA that do not allow for measurement error caused by lack. In addition to this, the disadvantage of parametric approaches of imposing a structure on the efficiency frontier poses less of a problem here as the banks of our sample are located in countries (EU-27) that at the time period (2004-2010) we examine could be considered as market economies. [14]

The Battese and Coelli (1995) model is suitable for panel data and allows controlling for country-level environmental differences in a single stage estimation. The Battese and Coelli (1995) cost SFA model takes the form:

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

, where $TC_{i,t}$ the total cost for firm (bank) *i* at year *t*, P_{it} is a vector of input prices $Y_{i,t}$ is a vector of outputs of the firm, $N_{i,t}$ a vector of fixed netputs while $Z_{i,t}$ is a vector of country-specific environmental variables. $v_{i,t}$ represents random errors that are assumed to be i.i.d. and have $N(0,\sigma_v^2)$ while $u_{i,t}$ represents non-negative inefficiency effects that are assumed to be independently but not identically distributed.

Moreover, we employ a flexible translog cost specification:

$$lnTC_{i,t} = \alpha_0 + \sum_i \alpha_i lnP_{i,t} + \sum_i \beta_i lnY_{i,t} + {}^1/_2 \sum_i \sum_j \alpha_{ij} lnP_{i,t} lnP_{j,t} + {}^1/_2 \sum_i \sum_j \beta_{ij} lnY_{i,t} lnY_{j,t} +$$

[14] As we note in Chapter 2 the misspecification of the efficiency frontier in parametric approaches such as SFA is more probable in economies that cannot be considered market economies (Bhattacharyya et al., 1997; Ataullah et al., 2004; Claessens and Van Horen, 2012). In the current chapter (Chapter 3) we focus on banks located in the EU-27 over the 2004-2010 period. Altough we include in our sample banks located in the new member states (EU-10), we cover only the post-accession to the EU period (after 2004). Thus, it is realistic to assume that in the 2004-2010 period the new member states have already accomplished most the the structural reforms towards a market economy as such reforms were a prerequisite for entering the EU. Furthermore, there is a stream of recent studies that estimates efficiency in the new member states with SFA (see for example Fang et al., 2011; Kosac and Zoric, 2011).

$$+\sum_i\sum_j \delta_{ij} lnP_{i,t} lnY_{j,t} + \sum_i \zeta_i lnN_{i,t} + {}^1\!/_2 \sum_i\sum_j \zeta_{ij} lnN_{i,t} lnN_{j,t} + {}^1\!/_2 \sum_i\sum_j \theta_{ij} lnP_{i,t} lnN_{j,t} +$$

$$+\sum_i\sum_j \kappa_{ij} lnY_{i,t} lnN_{j,t} + \mu_1 t + {}^1\!/_2\, \mu_2 t^2 + \sum_i \nu_i t lnP_{i,t} + \sum_i \xi_i t lnY_{i,t} + \sum_i \rho_i t lnN_{i,t} +$$

$$+\sum_\iota \varphi_i Z_{k,t} + u_{i,t} \pm v_{i,t} \qquad (2)$$

In the quadratic terms of the stochastic frontier model (2) we impose standard linear homogeneity and symmetry restrictions. We estimate (2) using maximum likelihood method parameterized in terms of the variance parameters $\sigma_{\varepsilon t}^2 = \sigma_{ut}^2 + \sigma_{vt}^2$ and $\gamma = \sigma_{ut}^2 / \sigma_{\varepsilon t}^2$.

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, represents the total cost of each bank in the sample.

Furthermore, we include equity 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 banks with higher equity capital, which denotes that the shareholders have more capital at stake, may behave in a more risk averse manner than banks with lower level of equity but still optimally

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

Finally, for environmental variables ($Z_{i,t}$) we take account of GDP growth and inflation as proxies for the dynamism and the macroeconomic stability of each country. To control for the level of concentration in the banking industry, we use the assets of the five largest banks as a share of assets of all commercial banks (the C5 ratio), while to capture heterogeneity in bank competition we employ the Lerner index at the country level.[15]

3.2.2 Business Regulations

Once we obtain the efficiency scores for each bank *i* for each year *t* we provide second stage regressions analysis with a wide range of World Bank business regulation indexes along with several control variables.[16] We opt for seven categories of business regulation available by the "*Doing Business*" project of the World Bank. Each of these broad categories is composed of different indices that

[15] The Lerner index is a measure of market power in the banking market. It is defined as the difference between output prices and marginal costs. In this study the Lerner index at the country level is used. This is calculated with the following formula: $Lerner_{i,t} = (PTA_{i,t} - MCTA_{i,t}) / PTA_{i,t}$, where $PTA_{i,t}$ is the price of total assets of the banks in a country proxied by the ratio of total bank revenues to total bank assets for country *i* at time *t*, and $MCTA_{i,t}$ is the marginal cost of the total assets of the banking system for country *i* at time *t*. Higher values of the Lerner index indicate less bank competition. The source is the Global Financial Development Database of the World Bank (Cihak et al., 2012).

[16] A number of control variables are used to account for individual bank characteristics: total assets (TA) represent the size of each bank. Bank size might have a positive impact on bank performance as it may indicate higher diversification (Mester, 1993). On the other hand bank size can affect negatively performance if economies of scale and scope are not realised. The extant empirical evidence on the impact of size on bank efficiency is mixed (see for example Altunbas et al., 2001; Carbo et al., 2002; Bikker, 2002; Maudos and De Guevara, 2007). We also include the ratio of loans to assets (LA), which represents well-functioning intermediation by the bank. Similarly, the equity to assets ratio (EA) and the return on equity (ROE) are employed as control variables as they represent increased motivation from the part of shareholders to monitor management and increased capacity to generate value for the shareholder. Furthermore, we include the loan loss provisions to total loans (LLPL) as a measure the quality of the credit portfolio and a proxy for risk. The relationship between risk and performance could be either negative, according to the "bad management" and the "bad luck" hypothesis, or positive, according to the "skimping hypothesis" (Berger and DeYoung, 1997). In terms of the country-level control variables, we opt for the domestic credit to the private sector as a share of GDP (DCP) in order to account for the level of financial development. Moreover, to control for the general level of economic development we use real GDP per capita (GDPcap) in purchasing power parity (PPP) terms.

measure a specific aspect of regulation rigidity faced by firms operating in a specific country. Namely we include in our models regulation related to the following categories.

- *Starting a business*: This category includes both bureaucratic and cost related indices that pose hurdles to entrepreneurship in each country.
- *Getting credit*: Two kinds of credit regulation are included here. The strength of creditor rights such as the collateral efficacy and the availability as well as the quality (depth) of the credit information registries.
- *Paying taxes*: Regulation related to procedural related tax regulation as well as the level of corporate profit taxation is included in this category.
- *Enforcing contracts*: This topic measures bureaucracy as well as cost related regulation regarding the efficiency of contract enforcement at the country level.
- *Resolving insolvency*: Procedural and cost related measures are also included in this type of business regulation, which accounts for country-level bankruptcy legislation.
- *Protecting investors*: This category of business regulation includes measures related to firm transparency as measured by disclosure regulation as well as measures that rate how well the interests of shareholders are protected against management exploitation of firms for personal benefit.
- *Employing workers*: Labour regulation measures are included in this index. They are related with the cost of labour (minimum wage) and dismissal costs regulation.

A major advantage of the "*Doing Business*" indices in comparison with other indices that attempt to rate country-level business environment, as for example the widely used economic freedom indices, is that each category of regulation is highly decomposed enabling to spot specific areas of business regulation that could affect bank performance. This could support the prioritisation of reform efforts in a more focused manner.

3.3 Related Literature and Hypothesis Development

In this section we review in detail the various channels through which the seven types of business regulation sourced from the *"Doing Business"* project of the World Bank could affect bank efficiency.

3.3.1 Starting a Business

Business regulations and bureaucratic procedures that restrain business entry and thus reduce competition may affect bank efficiency through spillover effects. In particular regulatory entry barriers can lead to lower levels of competition through a reduction in the number of new firms entering an industry (Ciccone and Papaioannou, 2007; Klapper et al. 2006). This decreased competitive pressure can lead to lower investment (Alesina et al. 2005), lower growth (Loayza et al. 2005) and less productivity (Bastos and Nasir, 2004; Bourlès et al., 2010; Nicoletti and Scarpetta, 2003). Thus, stringent regulation of entry can have a negative effect on the performance of firms and so affect the fulfilment of the obligations these firms have to the banking sector. In addition, increased business regulation is found to induce informality (Loayza et al. 2005) making it harder, and so more costly, for banks to assess the creditworthiness of a firm (Hoff and Stiglitz, 1993; Besley, 1995). Therefore our first research hypothesis H1.A states that:

H1.A: Stringent *starting a business* regulation could have a negative effect on bank efficiency.

3.3.2 Getting Credit

3.3.2.1 Creditor Rights

Creditor rights have the potential to decrease the information asymmetry between lenders and borrowers and thus increase bank efficiency by limiting adverse selection and moral hazard issues. In a strong creditor rights environment, banks are able to use collateral requirements to differentiate the risk level of the projects of seemingly comparable loan applicants. This reduction in adverse selection happens through signalling. Candidate borrowers with lower risk projects, and thus

lower risk of loan default, post higher levels of collateral that candidate borrowers with higher risk projects would not be willing to post (Bester, 1985; Besanko and Thakor, 1987a; Besanko and Thakor, 1987b; Dell'Ariccia and Marquez, 2006). Strong creditor rights enable also a reduction in the moral hazard of borrowers by inducing them to be more reluctant in engaging in risk-taking activities (Acharya et al., 2011) and increasing their leverage (Vig, 2013, Cho et al, 2014). This in turn could increase bank efficiency because of lower loan defaults. Even after a loan default, banks operating in high creditor rights country are more likely to realize their claims against debtors (Haselmann et al, 2010) limiting in this way their losses. However, strong creditor rights may also lead to efficiency losses by increasing the moral hazard of lenders. Manove et al. (2001) show that the use of collateral in the process of loan origination could lead to a significant decrease in screening efforts and as a consequence induce banks to provide credit to a high number of worthless projects. Similar findings are also evident in the study of Zazzaro (2005). As a result, strong creditor rights may increase loan defaults (Jiménez and Saurina, 2004) and bank risk (Houston et al., 2010) and thus lead to lower bank efficiency. Drawing from these arguments, the second hypothesis H2.A, along with the competing hypothesis H2.B, can be stated as:

H2.A (H2.B) : Creditor rights could have a positive (negative) impact on bank efficiency.

3.3.2.2 Credit Information Sharing

Credit information sharing refers to access on information related to the past behaviour of borrowers. A high level of credit information sharing reduces adverse selection as it makes it easier for banks to assess the creditworthiness of potential borrowers (Pagano and Japelli, 1993; Kalberg and Udell; 2003). Thus, at higher levels of information sharing bank efficiency could increase because of lower screening costs and lower loan defaults. Credit information sharing can also reduce the moral hazard of borrowers because it can have a disciplinary effect on them (Klein 1992; Padilla and Pagano, 1997; 2000). This is because borrowers would try to avoid being black listed and as a result excluded from future bank financing. In

this way information sharing can have a negative impact on the access to credit for risky borrowers (Hertzberg et al., 2011, Doblas-Madrid and Minetti, 2013), which could further lead to lower default rates (Japelli and Pagano, 2002) and lower risk (Houston et al., 2010). The improvement of a bank's loan portfolio through lower risk and loan defaults could lead to higher bank efficiency. However, credit information sharing could also have a negative effect on bank efficiency by increasing the moral hazard of lenders. The reduction of the information asymmetries between creditors and borrowers could result in a relaxation of lending standards and lower levels of loan screening effort (Dell'Ariccia and Marquez, 2006). As a consequence bank efficiency could decrease because of a deterioration in the quality of a bank's loan portfolio. Thus our third hypothesis H3.A, along with the competing hypothesis H3.B, can be stated as:

H3.A (H3.B): Credit information sharing could have a positive (negative) impact on bank efficiency.

3.3.3 Paying Taxes

Another important regulation that has not been investigated in detail in terms of its link to bank efficiency refers to tax regulation, also in light of the recent austerity throughout the EU. The literature that relates explicit and implicit taxation on the banking sector finds a pass-through effect from the banking sector to bank's customers (Demirgüç-Kunt and Huizinga, 1999; Demirgüç-Kunt and Huizinga, 2001; Albertazzi and Gambacorta ,2010; Chiorazzo and Milani, 2011). This pass-through effect might have a direct effect on bank credit risk and thus efficiency, as increased loan interest rates might lead to an increase of non-performing loans. Through another channel, stringent tax regulation does little to boost growth as it acts as disincentive to investment growth (Arnold, 2008; Schwellnus and Arnold, 2008; Vartia, 2008; Arnold et al., 2011). In turn, lower firm growth in the non-banking sectors could also have adverse implications on the banking industry through higher loan defaults. Thus our fourth hypothesis H4.A is formulated as follows:

H4.A: Stringent *paying taxes* regulation could have a negative impact on bank efficiency.

3.3.4 Enforcing Contracts

The competence of each country's legal system to enforce contracts is of relevance for bank efficiency. Studies from the law and finance literature find that judicial capacity has a direct effect on financial outcomes (La Porta et al., 1997; Qian and Strahan, 2007). For the banking sector, a low degree of judicial efficiency increases the interest rates that banks charge for loans (Laeven and Majnoni, 2005; Qian and Strahan, 2007). As a consequence, poor contract enforcement can lead to higher loan default rates (Cristini et al., 2001; Pinheiro and Cabral, 2001) and thus lower bank efficiency. Another channel through which low contract enforceability could harm bank efficiency is by increasing loan screening costs. Low judicial efficiency tends to reduce firm size (Beck et al., 2006; Laeven and Woodruff; 2007). Larger firms are more transparent for banks than smaller firms since they disclose more "hard" financial information (Berglöf and Pajuste, 2005; Brown et al., 2009). Thus, it is easier and less costly for a bank to assess the creditworthiness of a large firm. On the other hand, there is the possibility that a high degree of contract enforcement could have a negative impact on bank efficiency. Zazzaro (2005) develops a theoretical model in which improvements in contract enforcement reduce the incentive of creditors to screen borrowers adequately. Consistent with the theoretical prediction of Zazzaro (2005), Jappelli et al. (2005) find that poor contract enforcement is associated with a lower level of non-performing loans. Following the above discussion our fifth hypothesis H5.A, along with the competing hypothesis H5.B, is specified as:

H5.A (H5.B) : Efficient *enforcing contracts* regulation could have a positive (negative) impact on bank efficiency.

3.3.5 Protecting Investors

Strong investor protection regulation, through aligning the interests of managers with that of shareholders, has a positive impact on firm operating performance and firm value (La Porta et al., 2002; Klapper and Love; 2004). In particular, managers operating in countries with strong investor protection legislation are less likely to use firm resources for their own benefit while they tend to invest in projects with

higher potential benefit to the shareholders (Wurgler, 2000; Shleifer and Wolfenzon, 2002; Bekaert et al., 2010). Better firm performance due to stronger investor protection regulation could be channelled in the banking sector through lower loan defaults. Through another channel, stronger investor protection at the country level can decrease bank costs through easier and less costly monitoring. Countries with stronger investor protection tend to exhibit a higher number of listed and large firms (La Porta et al., 1997; Kumar et al., 1999). Listed and large firms are more transparent for banks because of higher availability of "hard" financial information as the law enforces them to produce extensive information about their activities through annual reports and other publications (La Porta et al., 2000; Loderer and Waelchli, 2010). Consequently, our sixth hypothesis H6.A is the following:

H6.A: Strong *protecting investors* regulation could have a positive impact on bank efficiency.

3.3.6 Resolving Insolvency

La Porta et al. (1998) show that debt enforcement mechanisms are important for the development of the financial markets around the world. One important debt enforcement mechanism is a creditor friendly bankruptcy regulation. When the bankruptcy regulation is fast, involves a high loan recovery rate and a low cost of enforcement, creditors are less affected since they can retrieve a greater portion of a bankrupt firm's assets at a low cost. Davydenko and Franks (2008) provide empirical evidence that a creditor friendly bankruptcy regulation leads to a higher recovery rate of defaulted loans. Furthermore, creditor friendly bankruptcy regulation could decrease the firm cost of debt through lower loan rates (Funchal, 2008; Araujo et al., 2012). Lower loan rates in turn could improve bank efficiency by decreasing non-performing loans. On the other hand, a more creditor friendly bankruptcy regulation could disincentive banks from carefully screening borrowers (Manove et al.; 2001; Zazzaro, 2005) leading in this way to a higher level of loan defaults. As a consequence, a creditor friendly bankruptcy regulation could have a

negative effect on bank efficiency. Thus our seventh hypothesis H7.A and the competing hypothesis H7.B is specified as follows:

H7.A (H7.B): A more creditor friendly *resolving insolvency* regulation could have a positive (negative) effect on bank efficiency.

3.3.7 Employing Workers

Labour regulation could have an impact on bank efficiency 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., 1995). 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). Furthermore, labour regulation can affect bank efficiency 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. In studies that focus on the impact of labour regulation on productivity growth the evidence is mixed. A stream of recent papers finds a negative impact of labour regulation on investment and productivity growth (Autor et al. 2007; Bassanini et al. 2009; Besley and Burgess 2004). Such productivity losses can be explained by rising employment costs as a result of stricter employment protection legislation (Bassanini and Ernst 2002; Scarpetta and Tressel 2004). On the other hand, other studies find that more strict labour regulation can lead to productivity gains (Deakin and Sarkar, 2008; Storm and Naastepad, 2009) as firms and employees are more inclined to invest in enhancing firm-specific and industry-specific skills in the workforce (Auer 2007; Wasmer 2006). Thus, the eighth and final hypothesis H8.A and the competing hypothesis H8.B are formulated as follows:

H8.A (H8.B): Stringent *employing workers* regulation could have a positive (negative) effect on bank efficiency.

3.3.8 The Interaction of Regulations and Institutional Quality

An interesting question that arises is whether the effects of different types of business regulation on bank performance differ according to the level of institutional quality of each country. To explore this issue we interact business regulations with the rule of law (RL-WB) variable that serves as a proxy of the country-level legislation implementation capacity, but also the degree of compliance.[17] It might be the case that in the presence of low level of law observance a specific regulation maybe in place but at the same time it might not be followed by the economic agents. Interacting the rule of law (RL-WB) variable with the different types of business regulation enables us to identify if the individual effect of each type of business regulation on bank performance is more subdued when the law might exist on paper but less implemented in practice.

Moreover, we also take into account corruption by interacting the control of corruption (COR-WB) variable with the regulation variables so as to investigate the "*grease the wheel*" or the "*sand the wheels*'' hypotheses. The "*grease the wheel*" hypothesis denotes that higher levels of corruption may speed up bureaucratic processes (see, for example Lui, 1985) and could thus increase firm operational efficiency while the "*sand the wheels*'' hypothesis contends that higher levels of corruption represent an additional cost when dealing with public sector bureaucracy (Murphy et al., 1993) and so further impede operational efficiency. Negative (positive) and significant coefficients for the interaction terms would suggest that the negative (positive) individual impact of a specific business regulation on bank performance would be less (more) pronounced in the presence of higher institutional quality. Both of the institutional quality measures, rule of law (RL-WB) and control of corruption (COR-WB) are sourced from the *World Governance Indicators* of the World Bank.

[17] The use of interaction terms between institutional development indices, such as measures of rule of law, and regulation is common in the banking and finance literature. For example Cull et al. (2002) find that in weak regulatory environments, explicit deposit insurance schemes are related to declines in financial depth. In another study Beck et al. (2004) find that the negative relationship between bank concentration and financing obstacles is diminished in countries with higher institutional quality.

3.4 Results and Discussion

3.4.1 Bank Performance Estimates

Table 1: Bank Efficiencies EU-27 (2004-2010) based on Stochastic Frontier Analysis (SFA)

Country Bank Efficiency in the EU-27					
Country	**EFF**	**s.d.**	**Country**	**EFF**	**s.d.**
AUSTRIA	0.861	0.150	LATVIA	0.793	0.084
BELGIUM	0.767	0.147	LITHUANIA	0.739	0.112
BULGARIA	0.683	0.116	LUXEMBOURG	0.675	0.171
CYPRUS	0.817	0.148	MALTA	0.728	0.209
CZECH REPUBLIC	0.775	0.124	NETHERLANDS	0.737	0.159
DENMARK	0.907	0.064	POLAND	0.752	0.117
ESTONIA	0.783	0.123	PORTUGAL	0.797	0.124
FINLAND	0.825	0.115	ROMANIA	0.606	0.119
FRANCE	0.791	0.148	SLOVAKIA	0.749	0.127
GERMANY	0.883	0.087	SLOVENIA	0.902	0.058
GREECE	0.827	0.075	SPAIN	0.879	0.11
HUNGARY	0.597	0.133	SWEDEN	0.857	0.103
IRELAND	0.818	0.131	UNITED KINGDOM	0.746	0.162
ITALY	0.886	0.103	EU-27	0.834	0.138
Over Time Bank Efficiency in the EU-27 (2004-2010)					
year	**EFF**	**s.d.**	**year**	**EFF**	**s.d.**
2004	0.826	0.143	2008	0.808	0.146
2005	0.846	0.129	2009	0.844	0.135
2006	0.845	0.135	2010	0.846	0.129
2007	0.827	0.14			

Note: The table reports the mean cost efficiency scores (EFF) by country and by time over the 2004-2010 periods. The cost efficiencies were estimated using stochastic frontier analysis and assuming a common cross-country frontier.

Cost efficiency scores are reported in Table 1, showing the average score over the period 2004-2010[18]. The average bank cost efficiency for the sample is 0.834, a figure that conforms with previous studies for the EU (Koutsomanoli-Filippaki and

[18] Regarding the translog cost function using the Battese and Coelli (1995) model refer to table A1 in the appendix. The results for the environmental (Z) variables show that the inflation rate (INFL) has a positive impact on inefficiency while GDP growth (GDPgr) exerts a negative effect on inefficiency in line with Yildirim and Philippatos (2007). The concentration ratio (C5) has a negative effect on inefficiency in line with Lensink et al. (2008). Furthermore, the Lerner index at the country level has negative effect on inefficiency lending support to the "*competition-fragility"* hypothesis (Berger et al., 2008) according to which higher competition can lead to a deterioration in the quality of bank loans (Jimenez et al., 2010) and higher risk (Keeley, 1990).

Mamatzakis, 2009; Weill 2009; Casu and Girardone, 2010). It is worth noting that despite increased levels of financial integration between the old member states (EU-15) and the new member states (EU-10) significant differences in terms of bank efficiency still persist. For example the efficiency scores for Hungary, Romania and Bulgaria are significantly behind the average efficiency score for the EU-27. In terms of the time series, there is a significant drop of efficiency in 2008. This is not coincidental as 2008 represents the peak of the financial crisis. Bank performance in the EU-27 economies seems to bounce back during 2009 and 2010.

3.4.2 The Impact of the Control Variables

Before proceeding in the analysing the impact of different types of business regulation on bank performance we provide an overview of the results of bank-specific, macroeconomic and financial structure variables (see Tables 2-24). The intermediation ratio (LA), bank size (lnTA), the equity to assets ratio (EA) and the profitability ratio (ROE) exert a positive impact on bank performance in line with previous studies (Miller and Noulas, 1996; Isik and Hasan, 2003; Casu and Girardone, 2004; Rao, 2005). On the other hand, the net interest margin (NIM) exerts a negative impact on performance lending support to the view that banks pass inefficiencies to consumers using higher interest rates. Furthermore, the loan loss provision to total loans ratio (LLPL) is positively associated with performance. Such finding resembles the *"skimping*" hypothesis (Berger and DeYoung; 1997), according to which banks that put less effort on loan screening could be more cost efficient in short time periods. Finally, in terms of the macroeconomic and financial structure control variables, we find that the general level of economic development (lnGDPcap) and the level of financial development (DCP) are negatively related with bank performance. The negative impact of the general level of economic development (lnGDPcap) on bank performance could indicate the higher operating and financial costs for supplying a given level of services in richer markets. (Dietsch and Lozano-Vivas, 2000).

3.4.3 The Impact of Business Regulations

3.4.3.1 *Starting a Business*

Tables 2 and 3 report the fixed effects and dynamic panel[19] results for the *starting a business* category respectively. The *starting a business* category of business regulations accounts for the following indices: i) entry procedures, ii) entry time, iii) entry cost and iv) entry minimum capital.

[19] In all the dynamic panel models in this study we use the two-step system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) specification with *Windmeijer*-corrected (robust) standard errors.

Table 2: *Starting a Business* - Fixed Effects Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF
lnTA	0.0148**	0.0141*	0.0118	0.0141*	0.0116
	(0.00738)	(0.00727)	(0.00738)	(0.00738)	(0.00746)
EA	0.0135	0.0101	0.00428	0.0115	0.00345
	(0.0662)	(0.0661)	(0.0659)	(0.0662)	(0.0661)
LA	0.0893***	0.0911***	0.0834***	0.0896***	0.0867***
	(0.0214)	(0.0212)	(0.0214)	(0.0211)	(0.0216)
LLPL	0.246***	0.243***	0.235***	0.242***	0.230***
	(0.0788)	(0.0787)	(0.0783)	(0.0784)	(0.0779)
NIM	-0.00625***	-0.00608***	-0.00598***	-0.00625***	-0.00597***
	(0.00191)	(0.00191)	(0.00192)	(0.00191)	(0.00193)
ROE	0.000520***	0.000527***	0.000533***	0.000532***	0.000545***
	(0.000161)	(0.000161)	(0.000165)	(0.000164)	(0.000167)
lnGDPcap	-0.109***	-0.129***	-0.120***	-0.131***	-0.150***
	(0.0275)	(0.0300)	(0.0273)	(0.0289)	(0.0327)
DCP	-0.000386***	-0.000408***	-0.000451***	-0.000374***	-0.000438***
	(9.76e-05)	(9.77e-05)	(9.69e-05)	(9.71e-05)	(9.83e-05)
RL-WB	-0.0308**	-0.0257*	-0.0323**	-0.0259*	-0.0250
	(0.0153)	(0.0153)	(0.0152)	(0.0154)	(0.0158)
lnPRO-SB	-0.00773				0.0172*
	(0.00888)				(0.0101)
lnDAYS-SB		-0.00629**			-0.00418
		(0.00275)			(0.00296)
COST-SB			-0.00260***		-0.00246***
			(0.000744)		(0.000787)
MINCAP-SB				-0.000156***	-0.000113**
				(4.62e-05)	(4.79e-05)
Constant	1.811***	2.023***	1.985***	2.031***	2.265***
	(0.245)	(0.282)	(0.253)	(0.272)	(0.307)
Observations	10,883	10,883	10,883	10,883	10,883
F-test	8.73***	8.68***	9.68***	9.54***	7.74***
R-squared	0.036	0.037	0.040	0.037	0.041
Number of banks	2,014	2,014	2,014	2,014	2,014

Note: The table reports the fixed-effects regression results for the *starting a business* category of business regulation. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA stands for the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. PR-SB: the total number of procedures required to register a firm, DAYS-SB: the total number of days required to register a firm, COST-SB: cost required to complete each procedure, MINCAP-SB: the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation and is recorded as a percentage of the economy's income per capita. 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 3: *Starting a Business* - Dynamic Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF
L.EFF	0.531***	0.519***	0.487***	0.511***	0.477***
	(0.0492)	(0.0517)	(0.0522)	(0.0495)	(0.0533)
lnTA	0.0188**	0.0165*	0.0166*	0.0170*	0.0136
	(0.00941)	(0.00936)	(0.00919)	(0.00916)	(0.00911)
EA	0.435***	0.423***	0.410***	0.410***	0.385***
	(0.114)	(0.118)	(0.118)	(0.115)	(0.118)
LA	-0.0542	-0.0553	-0.0577	-0.0529	-0.0588*
	(0.0358)	(0.0356)	(0.0358)	(0.0354)	(0.0356)
LLPL	0.0639	0.0853	0.0355	0.00940	-0.0141
	(0.123)	(0.123)	(0.115)	(0.110)	(0.109)
NIM	-0.00848***	-0.00828***	-0.00838***	-0.00883***	-0.00867***
	(0.00184)	(0.00186)	(0.00182)	(0.00180)	(0.00178)
ROE	0.000795***	0.000839***	0.000866***	0.000870***	0.000943***
	(0.000234)	(0.000243)	(0.000248)	(0.000253)	(0.000266)
lnGDPcap	-0.412***	-0.432***	-0.420***	-0.432***	-0.453***
	(0.0348)	(0.0368)	(0.0341)	(0.0342)	(0.0388)
DCP	0.000128	0.000118	3.52e-06	0.000137	3.40e-05
	(0.000164)	(0.000169)	(0.000168)	(0.000160)	(0.000170)
RL-WB	0.0324	0.0328	0.0191	0.0422**	0.0327
	(0.0204)	(0.0203)	(0.0204)	(0.0205)	(0.0207)
lnPRO-SB	-0.0109				0.0222
	(0.0126)				(0.0136)
lnDAYS-SB		-0.00679			-0.00494
		(0.00419)			(0.00469)
COST-SB			-0.00357***		-0.00272**
			(0.00106)		(0.00131)
MINCAP-SB				-0.000221***	-0.000196***
				(6.99e-05)	(7.34e-05)
Constant	4.345***	4.603***	4.544***	4.577***	4.890***
	(0.301)	(0.359)	(0.308)	(0.312)	(0.377)
Observations	8,871	8,871	8,871	8,871	8,871
Number of banks	1,897	1,897	1,897	1,897	1,897
N of instruments	31	31	31	31	31
Wald	346.78***	343.01***	351.17***	355.48***	360.88***
AR2 p-value	0.1518	0.1319	0.1428	0.1120	0.1876
Hansen-J p-value	0.250	0.443	0.278	0.246	0.446

Note: The table reports the dynamic panel results for the *starting a business* category of business regulation. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA stands for the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. PR-SB: the total number of procedures required to register a firm, DAYS-SB: the total number of days required to register a firm, COST-SB: cost required completing each procedure, MINCAP-SB: the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation and is recorded as a percentage of the economy's income per capita. 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.

The fixed effects results reveal that all the four indices that capture the effect of hurdles to start a new business are negatively related with efficiency (see models 1 to 4 of Table 2) while three of them are statistically significant. In particular, the entry time (lnDAYS-SB) is statistically significant at the 5% level, while the entry cost (COST-SB) and entry minimum capital (MINCAP-SB) variables are significant at the 1% level. All indices are negatively related with efficiency. Following a specific to general specification in our empirical estimations we run a regression that includes all the *starting a business* indices (see model 5 of Table 2). In the fixed effects model the entry cost (COST-SB) and entry minimum capital (MINCAP-SB) variables retain their statistical significance at the 1% and 5% levels respectively while the entry time variable (lnDAYS-SB) becomes insignificant. The dynamic panel results in Table 3 further confirm the fixed effects results as far concerns the entry cost (COST-SB) and entry minimum capital (MINCAP-SB) variables (see modes 3, 4 and 5 of Table 3). It is evident that the financial obstacles in *starting a business*, rather than the procedural ones, matter negatively for bank performance. A potential channel through which financial obstacles in *starting a business* can impede bank performance is because of reduced performance of existing firms in a country (Nicoletti and Scarpetta, 2003; Alesina et al. 2005; Klapper, 2006; Bourlès et al., 2010) because of lower levels of competition (Klapper et al. 2006; Ciccone and Papaioannou, 2007). This reduced firm performance could negatively affect the fulfilment of the obligations these firms have to the banking sector (loans). Moreover, adding red tape in terms of starting business is found to induce informality (Loayza et al. 2005) so making it harder and more costly for banks to evaluate the creditworthiness of a firm (Hoff and Stiglitz, 1993; Besley, 1995). Another channel through which *starting a business* regulation could have a negative impact on bank performance is because it could reduce the innovation efforts of firms (Amable et al. 2009; Barbosa and Faria, 2011). This decreased innovation effort could affect negatively firm profitability (Leiponen, 2000; Cefis and Ciccarelli, 2005, Cozza et al. 2012) which in turn could impair the performance of the banking sector because of increased loan defaults. Lastly, the interaction terms between *starting a business* regulation and institutional quality are not significant as the results in Table 4 demonstrate. Overall, the results of this section lend support to hypothesis H1.

Table 4: *Starting a Business* - Interactions with Institutional Quality.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF	(6) EFF	(7) EFF	(8) EFF
L.eff	0.531***	0.509***	0.475***	0.514***	0.549***	0.521***	0.483***	0.533***
	(0.0494)	(0.0517)	(0.0575)	(0.0497)	(0.0519)	(0.0519)	(0.0561)	(0.0508)
lnTA	0.0189**	0.0175*	0.0160*	0.0177*	0.0213**	0.0185*	0.0192**	0.0197**
	(0.00929)	(0.00947)	(0.00916)	(0.00914)	(0.00944)	(0.00946)	(0.00917)	(0.00908)
EA	0.432***	0.436***	0.401***	0.411***	0.432***	0.429***	0.408***	0.420***
	(0.115)	(0.119)	(0.120)	(0.112)	(0.111)	(0.119)	(0.115)	(0.108)
LA	-0.0542	-0.0592*	-0.0588	-0.0552	-0.0539	-0.0600*	-0.0564	-0.0541
	(0.0358)	(0.0358)	(0.0359)	(0.0356)	(0.0349)	(0.0353)	(0.0352)	(0.0349)
LLPL	0.0679	0.0802	0.0366	0.0115	0.0175	0.0636	0.0217	-0.0182
	(0.123)	(0.125)	(0.115)	(0.110)	(0.127)	(0.135)	(0.119)	(0.116)
NIM	-0.00850***	-0.00829***	-0.00837***	-0.00878***	-0.00880***	-0.00848***	-0.00854***	-0.00919***
	(0.00184)	(0.00186)	(0.00181)	(0.00180)	(0.00199)	(0.00202)	(0.00196)	(0.00198)
ROE	0.000824***	0.000896***	0.000868***	0.000858***	0.000784***	0.000847***	0.000819***	0.000779***
	(0.000239)	(0.000251)	(0.000249)	(0.000252)	(0.000237)	(0.000249)	(0.000247)	(0.000251)
lnGDPcap	-0.411***	-0.435***	-0.422***	-0.431***	-0.378***	-0.430***	-0.403***	-0.398***
	(0.0345)	(0.0385)	(0.0343)	(0.0342)	(0.0341)	(0.0388)	(0.0324)	(0.0324)
DCP	0.000140	0.000111	2.05e-05	0.000120	0.000159	9.88e-05	-1.95e-05	0.000131
	(0.000169)	(0.000174)	(0.000166)	(0.000161)	(0.000166)	(0.000169)	(0.000169)	(0.000161)
RL-WB	0.0363	0.0532	0.0331	0.0326				
	(0.0408)	(0.0333)	(0.0230)	(0.0230)				
lnPRO-SB	-0.00982				-0.0239			
	(0.0162)				(0.0154)			
RL-WB*lnPRO-SB	-0.00156							
	(0.0179)							
lnDAYS-SB		0.00278				-0.00667		
		(0.0137)				(0.0108)		
RL-WB*lnDAYS-SB		-0.00790						
		(0.00914)						
COST-SB			-0.00185				-0.00255*	
			(0.00185)				(0.00150)	
RL-WB*COST-SB			-0.00150					
			(0.00140)					
MINCAP-SB				-0.000393*				-0.000422**
				(0.000205)				(0.000178)
RL-WB*MINCAP-SB				0.000133				
				(0.000131)				
COR-WB					0.0162	0.0602***	0.0413***	0.0215*
					(0.0242)	(0.0204)	(0.0140)	(0.0112)
COR-WB*lnPRO-SB					0.00762			
					(0.0133)			
COR-WB*lnDAYS-SB						-0.00568		
						(0.00627)		
COR-WB*COST-SB							-0.00145	
							(0.00114)	
COR-WB*MINCAP-SB								0.000169
								(0.000112)
Constant	4.336***	4.599***	4.563***	4.570***	3.976***	4.533***	4.301***	4.191***
	(0.300)	(0.368)	(0.310)	(0.313)	(0.315)	(0.377)	(0.306)	(0.304)
Observations	8,871	8,871	8,871	8,871	8,871	8,871	8,871	8,871
Number of banks	1,897	1,897	1,897	1,897	1,897	1,897	1,897	1,897
N of instruments	32	32	32	32	32	32	32	32
Wald	345.81***	326.18***	359.38***	354.00***	360.62***	349.64***	370.26***	373.60***
AR2 p-value	0.1494	0.1052	0.1756	0.1239	0.1647	0.1359	0.1113	0.1624
Hansen-J p-value	0.179	0.378	0.443	0.452	0.585	0.625	0.575	0.735

Note: The table reports the dynamic panel results for the *starting a business* category of business regulation and their interaction with institutional quality. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law, COR-WB stands for control of corruption. PR-SB: the total number of procedures required to register a firm, DAYS-SB: the total number of days required to register a firm, COST-SB: cost required completing each procedure, MINCAP-SB: the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation and is recorded as a percentage of the economy's income per capita. 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.

3.4.3.2 *Getting Credit*

Tables 5 and 6 present results of the fixed effects and the dynamic models respectively for business regulation related to *getting credit*. This category of business regulations includes the following indices: i) legal rights of creditors ii) credit information depth, iii) public credit registry coverage and iv)private credit registry coverage.

Table 5: *Getting Credit* - Fixed Effects Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF
lnTA	0.0136*	0.0119	0.0137*	0.00893	0.00779
	(0.00759)	(0.00761)	(0.00803)	(0.00817)	(0.00851)
EA	0.0146	0.00829	0.0204	0.0119	0.00626
	(0.0784)	(0.0785)	(0.0823)	(0.0851)	(0.0870)
LA	0.0739***	0.0709***	0.0716***	0.0676***	0.0683***
	(0.0225)	(0.0226)	(0.0226)	(0.0225)	(0.0224)
LLPL	0.278***	0.277***	0.279***	0.250***	0.249***
	(0.0893)	(0.0891)	(0.0894)	(0.0912)	(0.0901)
NIM	-0.00415**	-0.00391**	-0.00493***	-0.00416**	-0.00411**
	(0.00176)	(0.00178)	(0.00171)	(0.00178)	(0.00178)
ROE	0.000658***	0.000680***	0.000654***	0.000687***	0.000682***
	(0.000159)	(0.000163)	(0.000165)	(0.000173)	(0.000174)
lnGDPcap	-0.249***	-0.266***	-0.222***	-0.273***	-0.303***
	(0.0307)	(0.0318)	(0.0295)	(0.0332)	(0.0349)
DCP	-0.000571***	-0.000603***	-0.000592***	-0.000699***	-0.000676***
	(0.000111)	(0.000111)	(0.000111)	(0.000109)	(0.000106)
RL-WB	0.0293*	0.00665	0.00318	0.00880	0.00475
	(0.0164)	(0.0154)	(0.0155)	(0.0160)	(0.0165)
LEG-CG	-0.00572***				-0.00108
	(0.00160)				(0.00223)
DEPTH-CG		0.00938***			0.0129***
		(0.00361)			(0.00382)
PB-CG			-0.000247		-0.000277
			(0.000279)		(0.000337)
PV-CG				0.000772***	0.000844***
				(0.000209)	(0.000240)
Constant	3.236***	3.389***	2.965***	3.521***	3.790***
	(0.290)	(0.302)	(0.275)	(0.323)	(0.341)
Observations	9,274	9,274	9,062	9,027	8,905
F-test	14.80***	14.54***	13.90***	15.41***	13.42***
R-squared	0.053	0.053	0.051	0.054	0.057
Number of banks	1,943	1,943	1,933	1,926	1,926

Note: The table reports the fixed-effects regression results for the *getting credit* category of business regulation. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and a assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. LEG-CG: this index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending, PB-CG: this indicator reports the number of individuals and firms listed in a public credit registry with information on their borrowing history from the past 5 years, PR-CG: This indicator reports the number of individuals and firms listed by a private credit bureau with information on their borrowing history from the past 5 years, DEPTH-CG: this index measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau. 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: *Getting Credit* - Dynamic Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF
L.EFF	0.533***	0.481***	0.543***	0.537***	0.526***
	(0.0493)	(0.0511)	(0.0541)	(0.0526)	(0.0549)
lnTA	0.0158*	0.0262***	0.0248**	0.0171*	0.0204*
	(0.00935)	(0.00897)	(0.00983)	(0.00960)	(0.0105)
EA	0.418***	0.465***	0.499***	0.487***	0.495***
	(0.121)	(0.112)	(0.110)	(0.113)	(0.112)
LA	-0.0401	-0.0513	-0.0531	-0.0495	-0.0523
	(0.0343)	(0.0344)	(0.0357)	(0.0362)	(0.0347)
LLPL	0.0761	0.0691	0.0470	0.0642	0.0732
	(0.121)	(0.117)	(0.126)	(0.131)	(0.137)
NIM	-0.00842***	-0.00856***	-0.00926***	-0.00762***	-0.00776***
	(0.00193)	(0.00182)	(0.00185)	(0.00178)	(0.00173)
ROE	0.000753***	0.000812***	0.000711***	0.000762***	0.000710***
	(0.000231)	(0.000233)	(0.000240)	(0.000261)	(0.000258)
lnGDPcap	-0.387***	-0.424***	-0.415***	-0.434***	-0.397***
	(0.0354)	(0.0335)	(0.0374)	(0.0474)	(0.0517)
DCP	0.000169	3.82e-05	0.000229	0.000121	0.000169
	(0.000159)	(0.000165)	(0.000160)	(0.000176)	(0.000180)
RL-WB	0.0484**	0.0418**	0.0331	0.0376*	0.0610***
	(0.0207)	(0.0194)	(0.0211)	(0.0204)	(0.0214)
LEG-CG	-0.00825***				-0.00871**
	(0.00232)				(0.00339)
DEPTH-CG		0.0185***			0.0113*
		(0.00433)			(0.00591)
PB-CG			-0.000983		-0.00112*
			(0.000691)		(0.000640)
PV-CG				0.000255	8.39e-05
				(0.000261)	(0.000258)
Constant	4.136***	4.292***	4.252***	4.547***	4.103***
	(0.303)	(0.296)	(0.317)	(0.416)	(0.421)
Observations	8,871	8,871	8,675	8,648	8,535
Number of banks	1,897	1,897	1,886	1,881	1,879
N of instruments	31	31	31	31	34
Wald	394.78***	366.15***	298.66***	286.74***	361.79***
AR2 p-value	0.1652	0.1180	0.2604	0.1885	0.2620
Hansen-J p-value	0.436	0.345	0.621	0.418	0.158

Note: The table reports the dynamic panel regression results for the *getting credit* category of business regulation .The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL: the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. LEG-CG: this index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending, PB-CG: this indicator reports the number of individuals and firms listed in a public credit registry with information on their borrowing history from the past 5 years, PR-CG: this indicator reports the number of individuals and firms listed by a private credit bureau with information on their borrowing history from the past 5 years, DEPTH-CG: this index measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau. 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.

An interesting result emerges as strengthening the protection of creditor rights (LEG-CG) would reduce performance in both the fixed effects and the dynamic panel specifications (see model 1 in Table 5 and model 1 in Table 6). This result would imply that strong creditor rights do little to motivate bank managers to actively engage in screening loans in line with the empirical findings of Manove et al. (2001) and Zazzaro (2005). Furthermore, low levels of creditor rights induce banks to originate loans with shorter maturities in order for banks to be able to stop lending when the deterioration in the creditworthiness of a borrower becomes evident (Diamond, 2004). Borrowers of loans with short maturities are screened more often when they apply for refinancing. Although more frequent screening of borrowers represents a cost for banks it could be the case that the benefits in terms of the quality of a bank's credit portfolio because of more frequent monitoring outweigh such costs.

On the other hand, the depth of credit information (DEPTH-LEG) has a positive and statistically significant at the 1% level impact on bank performance in both the fixed effects (see model 2 in Table 5) and dynamic specifications (see models 2 and 5 in Table 6). Moreover, the impact of the private sector credit registry coverage (PR-CG) is positively related to bank performance at the 1% level in the fixed effects specification (see models 4 and 5 in Table 5). The results related to positive impact of the private sector credit registry coverage (PR-CG) on efficiency lends support to the view that credit information sharing can promote bank performance through increased discipline of borrowers (Klein, 1992; Vercammen, 1995; Pagano, 1997; Padilla and Pagano, 2000). Along these lines, Houston et al. (2010) find that increased credit information sharing at the country-level increases bank profitability, lowers bank risk but also decreases the likelihood of financial crisis and increases economic growth. Furthermore, credit information sharing improvements may contribute to the reduction of the significant informational disadvantages foreign and new entrant banks have in a market (Bofondi and Gobbi, 2006; Gianneti and Ongena, 2009), improving in that way their performance.

The positive and significant impact of the credit information depth (DEPTH-LEG) underlines the importance of credit registries and of information regarding the

underlying quality. Similarly, the negative impact, at the 10% significance level, of the public registry coverage (PB-CG) on bank performance in the dynamic analysis (see model 5 of Table 6) could reflect that, in general, public credit registries have relatively lower quality compared to private ones. Overall, the results of this section lend support to hypothesis H2.B for creditor rights and H3.A for credit information sharing.

Table 7: *Getting Credit* - Interaction with Institutional Quality

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF	(6) EFF	(7) EFF	(8) EFF
L.EFF	0.532***	0.512***	0.537***	0.533***	0.559***	0.509***	0.545***	0.539***
	(0.0529)	(0.0565)	(0.0543)	(0.0522)	(0.0515)	(0.0540)	(0.0556)	(0.0523)
lnTA	0.0175*	0.0213**	0.0249**	0.0157	0.0204**	0.0228**	0.0224**	0.0188*
	(0.00984)	(0.00925)	(0.00976)	(0.00956)	(0.00983)	(0.00962)	(0.0101)	(0.00984)
EA	0.420***	0.432***	0.496***	0.502***	0.419***	0.427***	0.469***	0.494***
	(0.121)	(0.115)	(0.108)	(0.110)	(0.116)	(0.115)	(0.106)	(0.105)
LA	-0.0373	-0.0495	-0.0491	-0.0513	-0.0381	-0.0502	-0.0422	-0.0570
	(0.0349)	(0.0344)	(0.0355)	(0.0359)	(0.0338)	(0.0343)	(0.0349)	(0.0353)
LLPL	0.0720	0.0900	0.0529	0.0638	-0.00959	0.0106	-0.0181	0.0432
	(0.119)	(0.113)	(0.128)	(0.126)	(0.119)	(0.114)	(0.131)	(0.129)
NIM	-0.00851***	-0.00825***	-0.00915***	-0.00773***	-0.00946***	-0.00891***	-0.00959***	-0.00778***
	(0.00189)	(0.00176)	(0.00188)	(0.00175)	(0.00220)	(0.00184)	(0.00205)	(0.00184)
ROE	0.000747***	0.000810***	0.000716***	0.000735***	0.000645***	0.000751***	0.000706***	0.000668***
	(0.000228)	(0.000220)	(0.000240)	(0.000257)	(0.000227)	(0.000226)	(0.000252)	(0.000251)
lnGDPcap	-0.394***	-0.437***	-0.417***	-0.412***	-0.370***	-0.410***	-0.395***	-0.415***
	(0.0360)	(0.0329)	(0.0380)	(0.0499)	(0.0391)	(0.0338)	(0.0366)	(0.0471)
DCP	0.000142	8.83e-05	0.000220	5.40e-05	0.000226	0.000104	0.000251	3.44e-05
	(0.000165)	(0.000160)	(0.000159)	(0.000170)	(0.000158)	(0.000162)	(0.000160)	(0.000175)
RL-WB	0.0443	0.159**	0.0325	0.0768***				
	(0.0480)	(0.0664)	(0.0209)	(0.0276)				
LEG-CG	-0.00904				0.00315			
	(0.0118)				(0.00883)			
RL-WB*LEG-CG	0.000560							
	(0.00710)							
DEPTH-CG		0.0279***				0.0243***		
		(0.00673)				(0.00615)		
RL-WB*DEPTH-CG		-0.0206*						
		(0.0112)						
PB-CG			-0.00120				-0.00137*	
			(0.000998)				(0.000729)	
RL-WB*PB-CG			0.000207					
			(0.000880)					
PV-CG				0.00126***				0.000938***
				(0.000465)				(0.000357)
RL-WB*PV-CG				-0.000817**				
				(0.000372)				
COR-WB					0.0800**	0.0958*	0.0136	0.0615***
					(0.0344)	(0.0544)	(0.0121)	(0.0196)
COR-WB*LEG-CG					-0.00666			
					(0.00479)			
COR-WB*DEPTH-CG						-0.0137		
						(0.0106)		
COR-WB*PB-CG							0.00162*	
							(0.000896)	
COR-WB*PV-GC								-0.000358
								(0.000291)
Constant	4.186***	4.400***	4.275***	4.305***	3.817***	4.161***	4.093***	4.292***
	(0.315)	(0.293)	(0.324)	(0.449)	(0.321)	(0.317)	(0.320)	(0.411)
Observations	8,871	8,871	8,675	8,648	8,871	8,871	8,675	8,648
Number of banks	1,897	1,897	1,886	1,881	1,897	1,897	1,886	1,881
N of instruments	32	32	32	32	32	32	32	32
Wald	395.04***	390.24***	298.80***	319.54***	399.47***	383.28***	314.69***	328.29***
AR2 p-value	0.1645	0.1926	0.2478	0.1833	0.2106	0.1944	0.3145	0.2011
Hansen-J p-value	0.397	0.451	0.517	0.490	0.313	0.516	0.648	0.696

Note: The table reports the dynamic panel regression results for the *getting credit* category of business regulation and their interaction with institutional quality .The dependent variable (EFF) is the cost efficiency scores calculated using SFA and a assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, L/A stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law, COR-WB stands for control of corruption. LEG-CG: this index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending, PB-CG: this indicator reports the number of individuals and firms listed in a public credit registry with information on their borrowing history from the past 5 years, PR-CG: this indicator reports the number of individuals and firms listed by a private credit bureau with information on their borrowing history from the past 5 years, DEPTH-CG: this index measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau. 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.

The interaction terms between the *getting credit* variables and the institutional quality as measured by the rule of law (RL-WB) and the control of corruption variables (COR-WB) reveal the complexities associated with this category of regulation. In particular, in model 2 of Table 7 the interaction term between the credit information depth (DEPTH-CG) and the rule of law (RL-WB) is negative and statistically significant at the 10% level while the individual effect of the credit information depth (DEPTH-CG) is positive and significant at the 1% level. The positive individual effect of the credit information depth on bank performance seems subdues when higher levels of rule of law (RL-WB) prevail. Similarly, in model 4 of Table 7 the interaction between the private sector credit registry coverage (PV-CG) and the rule of law (RL-WB) is negative and significant at the 10% level while the individual effect of the private sector credit registry coverage (PV-CG) is positive and significant at the 1% level. This can be justified by increased confidence and reliance on hard (purely financial) information in the presence of higher rule of law (RL-WB) while at the same time banks could ignore critical soft (relationship type) information that could improve the lending decision (Petersen and Rajan, 1995; Stein 2002). An alternative explanation could be that the marginal informational benefit for banks derived from credit information depth (DEPTH-CG) and the private sector credit registry coverage (PV-CG) is higher at lower levels of rule of law (RL-WB) where contract obligations such as loans are comparatively less respected (Klein, 1992). Finally, an interesting finding is the positive and significant, at the 10% level, impact on bank performance of the interaction term between control of corruption (COR-WB) and the public credit registry coverage variable (PB-CG) when the individual effect of the public credit registry coverage (PB-CG) is negative and significant at the 10% level (see model 7 of Table 7). This finding suggests that reliance of banks on public credit registries is beneficial in terms of performance in case of low levels of corruption where information of public registries might become more reliable.

3.4.3.3 *Paying Taxes*

The *paying taxes* category of regulations accounts for the following indices: i) number of tax payments per year, ii) time dedicated at the firm level in order to handle taxation regulation and iii) profit tax.

Table 8: *Paying Taxes* - Fixed Effects Panel Analysis

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
lnTA	0.0133	0.0157*	0.0147*	0.0124
	(0.00892)	(0.00865)	(0.00891)	(0.00916)
EA	0.00317	0.0175	0.0138	-3.69e-05
	(0.102)	(0.101)	(0.102)	(0.103)
LA	0.0601**	0.0642***	0.0628***	0.0589**
	(0.0240)	(0.0239)	(0.0239)	(0.0241)
LLPL	0.303***	0.300***	0.295***	0.298***
	(0.114)	(0.113)	(0.113)	(0.114)
NIM	-0.00153	-0.00159	-0.00153	-0.00148
	(0.00211)	(0.00211)	(0.00213)	(0.00213)
ROE	0.000633***	0.000614***	0.000615***	0.000634***
	(0.000179)	(0.000175)	(0.000175)	(0.000179)
lnGDPcap	-0.341***	-0.346***	-0.352***	-0.346***
	(0.0409)	(0.0413)	(0.0410)	(0.0415)
DCP	-0.000761***	-0.000757***	-0.000785***	-0.000783***
	(0.000151)	(0.000161)	(0.000150)	(0.000158)
RL-WB	-0.000768	0.00419	0.00743	0.00220
	(0.0173)	(0.0178)	(0.0180)	(0.0185)
lnTAX-NUM	-0.0149**			-0.0149**
	(0.00581)			(0.00579)
lnTAX-HOURS		-0.00721		0.00718
		(0.0261)		(0.0269)
TAX-PRO			-0.000486	-0.000430
			(0.000469)	(0.000483)
Constant	4.257***	4.266***	4.324***	4.305***
	(0.420)	(0.431)	(0.430)	(0.435)
Observations	7,660	7,660	7,660	7,660
F-test	11.62***	10.90***	11.38***	10.33***
R-squared	0.052	0.050	0.051	0.052
Number of banks	1,865	1,865	1,865	1,865

Note: The table reports the fixed-effects regression results for the *paying taxes* category of business regulation.. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. TAX-NUM: the total number of tax payments per year, TAX-HOURS: the time it takes to prepare, file and pay (or withhold) the corporate income tax, the value added tax and social security contributions (in hours per year), TAX-PROFIT: the amount of taxes on profits paid by the business as a percentage of commercial profits. 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: *Paying Taxes* - Dynamic Panel Analysis

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
L.EFF	0.441***	0.500***	0.433***	0.487***
	(0.0622)	(0.0638)	(0.0663)	(0.0664)
lnTA	0.00890	0.00543	0.0100	0.00377
	(0.00896)	(0.00864)	(0.00949)	(0.00877)
EA	0.522***	0.498***	0.528***	0.452***
	(0.159)	(0.158)	(0.162)	(0.162)
LA	-0.0781**	-0.0357	-0.0647*	-0.0439
	(0.0349)	(0.0333)	(0.0353)	(0.0340)
LLPL	0.231	0.125	0.215	0.126
	(0.160)	(0.156)	(0.158)	(0.157)
NIM	-0.00662***	-0.00736***	-0.00659***	-0.00718***
	(0.00186)	(0.00187)	(0.00188)	(0.00186)
ROE	0.00101***	0.000993***	0.000961***	0.00105***
	(0.000295)	(0.000285)	(0.000288)	(0.000295)
lnGDPcap	-0.436***	-0.482***	-0.469***	-0.465***
	(0.0370)	(0.0350)	(0.0408)	(0.0375)
DCP	0.000215	4.23e-06	0.000195	-6.37e-05
	(0.000195)	(0.000180)	(0.000201)	(0.000177)
RL-WB	0.00431	-0.0318	0.0137	-0.0407*
	(0.0236)	(0.0244)	(0.0248)	(0.0244)
lnTAX-NUM	-0.0280***			-0.0221**
	(0.00935)			(0.00947)
lnTAX-HOURS		-0.200***		-0.193***
		(0.0386)		(0.0430)
TAX-PRO			-0.000924**	1.10e-05
			(0.000443)	(0.000482)
Constant	4.890***	6.405***	5.183***	6.310***
	(0.382)	(0.425)	(0.452)	(0.435)
Observations	7,351	7,351	7,351	7,351
Number of banks	1,822	1,822	1,822	1,822
N of instruments	30	30	30	32
Wald	356.11***	420.11***	336.28***	426.17***
AR2 p-value	0.2245	0.4399	0.1479	0.4774
Hansen-J p-value	0.404	0.431	0.390	0.617

Note: The table reports the dynamic panel regression results for the *paying taxes* category of business regulation. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. TAX-NUM: the total number of tax payments per year, TAX-HOURS: the time it takes to prepare, file and pay (or withhold) the corporate income tax, the value added tax and social security contributions (in hours per year), TAX-PROFIT: the amount of taxes on profits paid by the business as a percentage of commercial profits. 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.

The results indicate that taxation regulation asserts a negative impact on bank performance. In particular the number of tax payments per year (lnTAX-NUM) negatively affects bank performance in both the fixed effects and dynamic specifications (see models 1 and 4 of Table 8 and Table 9). In the dynamic analysis (see models 2 and 3 of Table 9) sub-taxation regulation indices such as tax hours (lnTAX-HOURS) and profit taxation (TAX-PRO) are negatively associated with bank performance at the 1% and 5% levels respectively.

The finding that bureaucracy related taxation indices (see lnTAX-NUM and lnTAX-HOURS) have negative effect on bank performance could be explained by increased levels of firm informality due to the stringency of such regulation (La Porta and Shleifer, 2008). This increased informality would make it harder and more costly for banks to assess the credit worthiness of a firm (Hoff and Stiglitz, 1993; Besley, 1995). Furthermore, there is evidence that lower levels of firm formality, as measured by tax compliance, is associated with lower firm profitability and higher risk (Fajnzylber et al., 2006) that could increase loan defaults. Another channel trough which stringent taxation regulation can negatively affect bank performance would be the reduction of investment and entrepreneurial activity in the economy (Djankov et al., 2010, Da Rin et al., 2011).

Additionally, the tentative evidence that profit taxation (TAX-PRO) is negatively associated with bank performance (see model 3 in Table 9) would suggest that increasing the taxation burden induces higher levels of loan defaults because of the pass-through effect from banks to borrowers (Demirgüç-Kunt and Huizinga, 1999; Demirgüç-Kunt and Huizinga, 2001; Albertazzi and Gambacorta , 2010; Chiorazzo and Milani, 2011) and the reduction of the performance of the non-financial firms because of less capital investment (Arnold, 2008; Schwellnus and Arnold, 2008; Vartia, 2008; Arnold et al., 2011).

Turning into the interaction terms between taxation regulation and the rule of law (RL-WB) and the control of corruption (COR-WB) it is revealed that the impact of some types of tax regulation on bank performance depends on institutional quality.

Table 10: Paying Taxes - Interactions with Institutional Quality

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF	(6) EFF
L.EFF	0.454***	0.500***	0.453***	0.504***	0.534***	0.489***
	(0.0615)	(0.0635)	(0.0687)	(0.0653)	(0.0656)	(0.0723)
lnTA	0.00786	0.00510	0.00910	0.0196**	0.0195**	0.0193**
	(0.00883)	(0.00857)	(0.00932)	(0.00881)	(0.00914)	(0.00957)
EA	0.503***	0.505***	0.506***	0.603***	0.612***	0.576***
	(0.158)	(0.157)	(0.163)	(0.158)	(0.162)	(0.164)
LA	-0.0705**	-0.0351	-0.0609*	-0.0535	-0.0234	-0.0507
	(0.0339)	(0.0333)	(0.0347)	(0.0325)	(0.0320)	(0.0338)
LLPL	0.227	0.144	0.194	0.207	0.118	0.204
	(0.160)	(0.158)	(0.155)	(0.173)	(0.170)	(0.168)
NIM	-0.00668***	-0.00736***	-0.00671***	-0.00738***	-0.00764***	-0.00714***
	(0.00182)	(0.00187)	(0.00186)	(0.00182)	(0.00183)	(0.00185)
ROE	0.000962***	0.00101***	0.000984***	0.000886***	0.000922***	0.000873***
	(0.000291)	(0.000287)	(0.000292)	(0.000273)	(0.000272)	(0.000265)
lnGDPcap	-0.481***	-0.483***	-0.476***	-0.500***	-0.512***	-0.501***
	(0.0378)	(0.0349)	(0.0402)	(0.0362)	(0.0349)	(0.0396)
DCP	0.000144	1.86e-05	0.000352	0.000264	8.82e-05	0.000299
	(0.000190)	(0.000184)	(0.000238)	(0.000182)	(0.000182)	(0.000213)
RL-WB	-0.178***	0.0210	0.106*			
	(0.0553)	(0.280)	(0.0606)			
lnTAX-NUM	-0.113***			-0.0687***		
	(0.0269)			(0.0166)		
RL-WB*lnTAX-NUM	0.0705***					
	(0.0193)					
lnTAX-HOURS		-0.187***			-0.261***	
		(0.0657)			(0.0631)	
RL-WB*lnTAX-HOURS		-0.00979				
		(0.0533)				
TAX-PRO			0.00135			-0.000796
			(0.00140)			(0.00133)
RL-WB*TAX-PRO			-0.00168*			
			(0.000929)			
COR-WB				-0.0214	-0.400*	0.0840*
				(0.0355)	(0.226)	(0.0434)
COR-WB*lnTAX-NUM				0.0367***		
				(0.0125)		
COR-WB*lnTAX-HOURS					0.0855**	
					(0.0423)	
COR-WB*lnTAX-PRO						-0.000226
						(0.000774)
Constant	5.602***	6.342***	5.104***	5.337***	6.683***	5.218***
	(0.417)	(0.525)	(0.456)	(0.383)	(0.504)	(0.458)
Observations	7,351	7,351	7,351	7,351	7,351	7,351
Number of banks	1,822	1,822	1,822	1,822	1,822	1,822
N of instruments	31	31	31	31	31	31
Wald	382.37***	443.90***	343.15***	421.12***	441.14***	389.76***
AR2 p-value	0.3060	0.4421	0.1604	0.3454	0.3970	0.1744
Hansen-J p-value	0.308	0.381	0.355	0.468	0.385	0.668

Note: The table reports the dynamic panel regression results for the *paying taxes* category of business regulation and their interaction with institutional quality. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law, COR-WB stands for control of corruption. TAX-NUM: the total number of tax payments per year, TAX-HOURS: the time it takes to prepare, file and pay (or withhold) the corporate income tax, the value added tax and social security contributions (in hours per year), TAX-PROFIT: the amount of taxes on profits paid by the business as a percentage of commercial profits. 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.

In model 1 of Table 10 the interaction term between rule of law (RL-WB) and the number of tax payments per year (TAX-NUM) asserts a positive and significant, at the 1% level, impact on bank performance, whilst the individual effect of the TAX-NUM variable is negative and significant at the 1% level. At higher levels of rule of law, one of the channels through which tax regulation can affect negatively bank performance, namely the higher level of firm informality (La Porta and Shleifer, 2008) which could increase the cost of financial intermediation (Hoff and Stiglitz, 1993; Besley, 1995) , may become restrained. This is because rule of law and judicial efficiency are able to decrease the level of the unofficial economy (Loayaza, 1996; Johnson et al., 1998; Friedman et al., 2000). Finally, the interaction term between the control of corruption variable (COR-WB) and tax hours (lnTAX-HOURS) (see model 5 of Table 10) positively and significantly at the 5% level affects performance, whilst the individual effect of the lnTAX-HOURS variable is negative at the 1% level. This result conforms with the "*sand the wheels*" (Murphy et al., 1993) hypothesis according to which higher levels of corruption impose additional costs to economic agents. In this context, the negative interaction between the control of corruption variable (COR-WB) and the number of tax hours (lnTAX-HOURS) could indicate that the lower level of additional costs that are incurred by firms in form of corruption when they deal with tax payments may be a factor contributing to the free up of capital available for firms to fulfil their obligations (loans) to the banking sector. Overall, the results of this section lend support to hypothesis H4.A.

3.4.3.4 *Enforcing Contracts*

Moving to the *enforcing contracts* category of regulations the econometric results are presented in Tables 11 and 12. This category accounts for the following indices: i) contracts time, ii) contracts cost and iii) contract procedures.

Table 11: *Enforcing Contracts* - Fixed Effects Panel Analysis

VARIABLES	(1) EFF	(2) EFF	(3) EFF
lnTA	0.0155**	0.0153**	0.0153**
	(0.00735)	(0.00727)	(0.00728)
EA	0.0163	0.0151	0.0151
	(0.0662)	(0.0661)	(0.0660)
LA	0.0909***	0.0909***	0.0909***
	(0.0212)	(0.0211)	(0.0211)
LLPL	0.246***	0.243***	0.244***
	(0.0788)	(0.0784)	(0.0787)
NIM	-0.00635***	-0.00629***	-0.00638***
	(0.00190)	(0.00190)	(0.00190)
ROE	0.000517***	0.000519***	0.000520***
	(0.000162)	(0.000162)	(0.000162)
lnGDPcap	-0.110***	-0.111***	-0.113***
	(0.0273)	(0.0273)	(0.0272)
DCP	-0.000368***	-0.000371***	-0.000381***
	(9.69e-05)	(9.71e-05)	(9.81e-05)
RL-WB	-0.0305**	-0.0293*	-0.0307**
	(0.0152)	(0.0157)	(0.0152)
lnTIME-CON	0.00349		
	(0.0172)		
COST-CON		0.000761	
		(0.00116)	
lnPRO-CON			-0.0545
			(0.0740)
Constant	1.772***	1.785***	2.016***
	(0.283)	(0.247)	(0.364)
Observations	10,883	10,883	10,883
F-test	8.47***	8.63***	8.57***
R-squared	0.036	0.036	0.036
Number of banks	2,014	2,014	2,014

Note: The table reports the fixed-effects regression results for the *enforcing contracts* category of business regulation. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. TIME-CON: the time (in terms of days) to resolve a dispute, counted from the moment the plaintiff files the lawsuit in court until payment. This includes both the days when actions take place and the waiting periods between, COST-CON: the cost in court fees and attorney fees, where the use of attorneys is mandatory or common, expressed as a percentage of the debt value, PRO-CON: the average number of procedures to enforce a contract. The list of procedural steps compiled for each economy traces the chronology of a commercial dispute before the relevant court, 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 12: *Enforcing Contracts* - Dynamic Panel Analysis

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
L.EFF	0.528***	0.514***	0.554***	0.544***
	(0.0497)	(0.0484)	(0.0524)	(0.0527)
lnTA	0.0197**	0.0170*	0.0228**	0.0212**
	(0.00952)	(0.00910)	(0.00919)	(0.00916)
EA	0.441***	0.420***	0.454***	0.441***
	(0.117)	(0.116)	(0.108)	(0.109)
LA	-0.0453	-0.0566	-0.00954	-0.0114
	(0.0357)	(0.0359)	(0.0349)	(0.0355)
LLPL	0.113	0.0971	0.0158	0.0314
	(0.128)	(0.121)	(0.114)	(0.115)
NIM	-0.00834***	-0.00818***	-0.00897***	-0.00873***
	(0.00187)	(0.00187)	(0.00180)	(0.00182)
ROE	0.000793***	0.000802***	0.000801***	0.000801***
	(0.000232)	(0.000241)	(0.000223)	(0.000224)
lnGDPcap	-0.418***	-0.402***	-0.471***	-0.463***
	(0.0349)	(0.0341)	(0.0342)	(0.0353)
DCP	0.000155	0.000155	-0.000106	-0.000106
	(0.000163)	(0.000162)	(0.000165)	(0.000165)
RL-WB	0.0346*	0.0455**	0.0301	0.0352*
	(0.0203)	(0.0202)	(0.0190)	(0.0193)
lnTIME-CON	0.00545			0.00775
	(0.0177)			(0.0172)
COST-CON		0.00356**		0.00170
		(0.00152)		(0.00155)
lnPRO-CON			-0.463***	-0.452***
			(0.112)	(0.119)
Constant	4.329***	4.179***	6.463***	6.283***
	(0.352)	(0.303)	(0.555)	(0.634)
Observations	8,871	8,871	8,871	8,871
Number of banks	1,897	1,897	1,897	1,897
N of instruments	31	31	31	33
Wald	344.36***	342.59***	372.77***	373.92***
AR2 p-value	0.1596	0.1577	0.2364	0.2385
Hansen-J p-value	0.475	0.561	0.414	0.775

Note: The table reports the dynamic panel regression results for the *enforcing contracts* category of business regulation. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and a assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. TIME-CON: the time (in terms of days) to resolve a dispute, counted from the moment the plaintiff files the lawsuit in court until payment. This includes both the days when actions take place and the waiting periods between. COST-CON: the cost in court fees and attorney fees, where the use of attorneys is mandatory or common, expressed as a percentage of the debt value, PRO-CON: the average number of procedures to enforce a contract. The list of procedural steps compiled for each economy traces the chronology of a commercial dispute before the relevant court. 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.

None of the enforcing contracts variables has a statistically significant impact on bank performance in the fixed effects specification (see Table 11). On the other hand, the dynamic panel analysis reveals that the cost of contract enforcement (COST-CON) is positively related to performance at the 5% level (see model 2 of Table 12). This finding is in line with the negative association of the strength of creditor rights with bank performance discussed in section 3.4.3.2. In more detail, when the enforcement of contracts and in effect of loans is costly, bank managers may engage in more careful screening in the loan origination process (Manove et al., 2001; Zazzaro, 2005) improving in that way the quality of the bank's loan portfolio. The contract procedures variable (lnPRO-CON), on the other hand, has a negative and statistically significant impact at the 1% level on performance while this result, unlike the one of the contract costs (COST-CON) variable, remains robust in the fourth model of Table 12 where the rest of the *enforcing contracts* regulation variables are accounted for. Overall, the results of this section lend support to the hypothesis H5.B.

Table 13: *Enforcing Contracts* - Interactions with Institutional Quality

VARIABLES	(1) eff	(2) eff	(3) eff	(4) eff	(5) eff	(6) eff
L.eff	0.529***	0.525***	0.564***	0.551***	0.541***	0.569***
	(0.0511)	(0.0501)	(0.0530)	(0.0511)	(0.0481)	(0.0531)
lnTA	0.0217**	0.0168*	0.0250***	0.0229**	0.0186**	0.0244***
	(0.00961)	(0.00933)	(0.00919)	(0.00989)	(0.00917)	(0.00945)
EA	0.440***	0.417***	0.454***	0.456***	0.415***	0.449***
	(0.116)	(0.119)	(0.106)	(0.114)	(0.112)	(0.112)
LA	-0.0415	-0.0544	-0.00778	-0.0390	-0.0569	-0.0204
	(0.0359)	(0.0362)	(0.0345)	(0.0358)	(0.0352)	(0.0350)
LLPL	0.0688	0.103	0.00710	0.0767	0.0739	-0.0102
	(0.126)	(0.128)	(0.114)	(0.136)	(0.132)	(0.116)
NIM	-0.00868***	-0.00785***	-0.00897***	-0.00910***	-0.00844***	-0.00942***
	(0.00185)	(0.00188)	(0.00179)	(0.00203)	(0.00210)	(0.00184)
ROE	0.000798***	0.000747***	0.000808***	0.000767***	0.000694***	0.000767***
	(0.000232)	(0.000218)	(0.000219)	(0.000234)	(0.000230)	(0.000222)
lnGDPcap	-0.424***	-0.410***	-0.458***	-0.419***	-0.363***	-0.459***
	(0.0355)	(0.0345)	(0.0338)	(0.0394)	(0.0338)	(0.0324)
DCP	0.000136	0.000154	-0.000115	0.000143	0.000211	-1.05e-05
	(0.000166)	(0.000162)	(0.000164)	(0.000168)	(0.000158)	(0.000167)
RL-WB	0.0608	0.0623	-0.692**			
	(0.124)	(0.0410)	(0.351)			
lnTIME-CON	0.0130			-0.0564		
	(0.0368)			(0.0486)		
RL-WB*lnTIME-CON	-0.00411					
	(0.0188)					
COST-CON		0.00383			0.00426	
		(0.00331)			(0.00264)	
RL-WB*COST-CON		-0.000751				
		(0.00188)				
lnPRO-CON			-0.693***			-0.653***
			(0.169)			(0.134)
RL-WB*lnPRO-CON			0.206**			
			(0.100)			
COR-WB				-0.161	0.0371	-0.576**
				(0.135)	(0.0281)	(0.227)
COR-WB*lnTIME-CON				0.0296		
				(0.0217)		
COR-WB*COST-CON					0.000158	
					(0.00135)	
COR-WB*lnPRO-CON						0.171***
						(0.0654)
Constant	4.325***	4.248***	7.108***	4.684***	3.719***	6.990***
	(0.422)	(0.308)	(0.673)	(0.589)	(0.340)	(0.638)
Observations	8,871	8,871	8,871	8,871	8,871	8,871
Number of banks	1,897	1,897	1,897	1,897	1,897	1,897
N of instruments	32	32	32	32	32	32
Wald	344.81***	347.28***	392.03***	350.49***	366.23***	384.76***
AR2 p-value	0.1535	0.1850	0.2252	0.1858	0.2328	0.2988
Hansen-J p-value	0.491	0.578	0.372	0.486	0.187	0.327

Note: The table reports the dynamic panel regression results for the *enforcing contracts* category of business regulation and their interaction with institutional quality. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law, COR-WB stands for control of corruption. TIME-CON: the time (in terms of days) to resolve a dispute, counted from the moment the plaintiff files the lawsuit in court until payment. This includes both the days when actions take place and the waiting periods between. COST-CON: the cost in court fees and attorney fees, where the use of attorneys is mandatory or common, expressed as a percentage of the debt value, PRO-CON: the average number of procedures to enforce a contract. The list of procedural steps compiled for each economy traces the chronology of a commercial dispute before the relevant court. 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 13 presents a positive and significant effect of the interaction between contract procedures (lnPRO-CON) and the rule of law (RL-WB) (see model 3 of Table 13). Note that, the individual effect of the contract procedures (lnPRO-CON) on bank performance is negative at the 1% level. The combination of the above results imply that the negative impact of contract procedures on bank performance becomes restrained in the presence of higher levels of law observance that may act as block for further delays (Ashan, 2013). Finally, in model 6 of Table 13 the effect of contract procedures (lnPRO-CON) on bank performance remains negative at the 1% as the coefficient of its interaction with the control of corruption variable (COR-WB), providing evidence in accordance with the "*grease the wheel*" hypothesis (Lui, 1985) of corruption.

3.4.3.5 *Protecting investors*

The *protecting investors* category accounts for the following indices: i) extent of disclosure, ii) extent of director liability and iii) ease of shareholder suits. Regulation related to the protection of investors appears to be an important determinant of bank performance (see Table 14 and Table 15).

Table 14: *Protecting Investors* - Fixed Effects Panel Analysis

	(1)	(2)	(3)	(4)
VARIABLES	EFF	EFF	EFF	EFF
lnTA	0.0158*	0.0147*	0.0148*	0.0139
	(0.00865)	(0.00873)	(0.00874)	(0.00882)
EA	0.0166	0.0135	0.0158	0.0115
	(0.101)	(0.101)	(0.101)	(0.101)
LA	0.0632***	0.0632***	0.0621***	0.0606**
	(0.0238)	(0.0239)	(0.0239)	(0.0239)
LLPL	0.300***	0.301***	0.304***	0.306***
	(0.113)	(0.113)	(0.109)	(0.109)
NIM	-0.00167	-0.00160	-0.00146	-0.00153
	(0.00210)	(0.00211)	(0.00211)	(0.00210)
ROE	0.000614***	0.000620***	0.000617***	0.000627***
	(0.000174)	(0.000176)	(0.000173)	(0.000175)
lnGDPcap	-0.342***	-0.341***	-0.372***	-0.360***
	(0.0410)	(0.0410)	(0.0431)	(0.0434)
DCP	-0.000703***	-0.000760***	-0.000786***	-0.000760***
	(0.000153)	(0.000151)	(0.000151)	(0.000153)
RL-WB	0.00946	0.00727	-0.00458	0.00227
	(0.0175)	(0.0175)	(0.0177)	(0.0178)
DISC-PI	-0.00499***			-0.00445***
	(0.00134)			(0.00134)
LIA-PI		0.0262***		0.0254***
		(0.00822)		(0.00823)
SUI-PI			0.0495**	0.0470**
			(0.0199)	(0.0199)
Constant	4.207***	4.071***	4.247***	4.050***
	(0.420)	(0.424)	(0.422)	(0.427)
Observations	7,669	7,669	7,669	7,669
F-test	13.50***	12.39***	12.37***	13.43***
R-squared	0.051	0.051	0.052	0.054
Number of banks	1,867	1,867	1,867	1,867

Note: The table reports the fixed-effects regression results for the *protecting investors* category of business regulation. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. DISC-PI: an index that measures the extent of disclosure, LIA-PI: an index that measures the extend of director liability, SUI-PI: an index that accounts for the shareholders' ability to sue officers and directors for misconduct. 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 15: *Protecting Investors* - Dynamic Panel Analysis

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
L.EFF	0.474***	0.489***	0.490***	0.484***
	(0.0655)	(0.0654)	(0.0706)	(0.0675)
lnTA	0.0129	0.0196**	0.00599	0.0195*
	(0.00899)	(0.00963)	(0.00953)	(0.0101)
EA	0.592***	0.468***	0.551***	0.474***
	(0.164)	(0.166)	(0.169)	(0.163)
LA	-0.0734**	-0.0145	-0.0547	-0.0153
	(0.0350)	(0.0347)	(0.0340)	(0.0352)
LLPL	0.220	0.0373	0.448***	0.240
	(0.160)	(0.162)	(0.151)	(0.171)
NIM	-0.00669***	-0.00670***	-0.00462**	-0.00524***
	(0.00188)	(0.00192)	(0.00184)	(0.00196)
ROE	0.000929***	0.000918***	0.000984***	0.000994***
	(0.000284)	(0.000290)	(0.000283)	(0.000296)
lnGDPcap	-0.439***	-0.511***	-0.453***	-0.509***
	(0.0377)	(0.0425)	(0.0373)	(0.0429)
DCP	0.000356*	-1.03e-05	0.000308	-4.26e-05
	(0.000208)	(0.000188)	(0.000196)	(0.000198)
RL-WB	0.0208	-0.0466*	0.0178	-0.0338
	(0.0249)	(0.0239)	(0.0240)	(0.0235)
DISC-PI	-0.00256			-0.000524
	(0.00194)			(0.00192)
LIA-PI		0.0940***		0.0929***
		(0.0181)		(0.0192)
SUI-PI			-0.0397*	0.00129
			(0.0231)	(0.0303)
Constant	4.739***	5.043***	5.172***	5.005***
	(0.388)	(0.394)	(0.406)	(0.389)
Observations	7,359	7,359	7,359	7,359
Number of banks	1,824	1,824	1,824	1,824
N of instruments	30	30	30	32
Wald	355.65***	304.86***	347.37***	328.93***
AR2 p-value	0.1999	0.1939	0.2762	0.2102
Hansen-J p-value	0.417	0.406	0.693	0.516

Note: The table reports the dynamic panel regression results for the *protecting investors* category of business regulation. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. DISC-PI: an index that measures the extent of disclosure, LIA-PI: an index that measures the extend of director liability, SUI-PI: an index that accounts for the shareholders' ability to sue officers and directors for misconduct. 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.

The fixed effect results show that the extent of director liability (LIA-PI) and ease of shareholder suits (SUI-PI) have a significant, at the 1% level, and positive impact on bank performance (see models 2, 3 and 4 of Table 14). The dynamic panel analysis confirms these results for the extent of director liability (LIA-PI) variable (see models 2 and 4 of Table 15). Legislation that protects the interests of investors from director misconduct has a beneficial effect on the banking sector in terms of efficiency. This result is in line with previous studies that confirm that managers operating in countries with strong investor protection legislation are less likely to use firm resources for their own benefit at the expense of shareholders while they tend to invest in projects with higher potential benefit the shareholders (Wurgler, 2000; Shleifer and Wolfenzon, 2002; Bekaert, Harvey and Lundblad, 2010). A surprising result is that the extent of disclosure variable (DISC-PI) is negatively associated with bank performance in the fixed effects specification (see models 1 and 4 of Table 14). Disclosure regulations can raise the cost structure of a firm not only because of the direct expenses related to such legislation, as for example meeting stricter accounts regulation, but also through magnifying or even creating new agency problems (Hermalin and Weisbach, 2012). Finally, the interactions between protecting investor regulation and the rule of law (RL-WB) and the control of corruption (COR-WB) in Table 16 show that the impact of *protecting investors* regulation on bank performance is not dependent on institutional quality. Overall, the evidence from this section is supportive for hypothesis H6.A.

Table 16: *Protecting Investors* - Interactions with Institutional Quality.

VARIABLES	(1) eff	(2) eff	(3) eff	(4) eff	(5) eff	(6) eff
L.eff	0.470***	0.490***	0.495***	0.514***	0.501***	0.512***
	(0.0655)	(0.0651)	(0.0692)	(0.0695)	(0.0678)	(0.0690)
lnTA	0.0126	0.0187*	0.00647	0.0241**	0.0294***	0.0204**
	(0.00904)	(0.00989)	(0.00989)	(0.00963)	(0.00985)	(0.00947)
EA	0.575***	0.471***	0.545***	0.654***	0.583***	0.590***
	(0.167)	(0.168)	(0.163)	(0.165)	(0.163)	(0.158)
LA	-0.0755**	-0.0164	-0.0492	-0.0532	-0.0132	-0.0476
	(0.0350)	(0.0354)	(0.0352)	(0.0335)	(0.0343)	(0.0335)
LLPL	0.201	0.0208	0.429**	0.216	0.132	0.318*
	(0.163)	(0.159)	(0.173)	(0.168)	(0.174)	(0.188)
NIM	-0.00669***	-0.00679***	-0.00471**	-0.00672***	-0.00677***	-0.00596***
	(0.00189)	(0.00193)	(0.00197)	(0.00189)	(0.00185)	(0.00199)
ROE	0.000954***	0.000914***	0.000954***	0.000763***	0.000839***	0.000923***
	(0.000295)	(0.000292)	(0.000286)	(0.000254)	(0.000267)	(0.000263)
lnGDPcap	-0.436***	-0.510***	-0.443***	-0.466***	-0.530***	-0.455***
	(0.0385)	(0.0427)	(0.0364)	(0.0372)	(0.0410)	(0.0357)
DCP	0.000363*	-2.51e-05	0.000308	0.000361*	5.54e-05	0.000377**
	(0.000212)	(0.000186)	(0.000194)	(0.000219)	(0.000189)	(0.000181)
RL-WB	0.0104	-0.00797	-0.0309			
	(0.0746)	(0.0799)	(0.134)			
DISC-PI	-0.00502			0.0239		
	(0.0209)			(0.0161)		
RL-WB*DISC-PI	0.00115					
	(0.0112)					
LIA-PI		0.105***			0.0816***	
		(0.0253)			(0.0165)	
RL-WB*LIA-PI		-0.00827				
		(0.0161)				
SUI-PI			-0.0437			-0.00867
			(0.0371)			(0.0327)
RLWB*SUI-PI			0.00829			
			(0.0222)			
COR-WB				0.147***	0.0989*	0.0332
				(0.0423)	(0.0548)	(0.0978)
COR-WB*DISC-PI				-0.0125*		
				(0.00711)		
COR-WB*LIA-PI					-0.00890	
					(0.0114)	
COR-WB*SUI-PI						0.00699
						(0.0169)
Constant	4.733***	4.997***	5.079***	4.569***	4.980***	4.700***
	(0.388)	(0.407)	(0.452)	(0.374)	(0.385)	(0.408)
Observations	7,359	7,359	7,359	7,359	7,359	7,359
Number of banks	1,824	1,824	1,824	1,824	1,824	1,824
N of instruments	31	31	31	31	31	31
Wald	359.29***	310.11***	359.08***	390.97***	361.20***	371.46***
AR2 p-value	0.1913	0.1973	0.2625	0.1772	0.1682	0.1981
Hansen-J p-value	0.331	0.521	0.690	0.232	0.536	0.355

Note: The table reports the dynamic panel regression results for the *protecting investors* category of business regulation and their interaction with institutional quality. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and a assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. DISC-PI: an index that measures the extent of disclosure, LIA-PI: an index that measures the extend of director liability, SUI-PI: an index that accounts for the shareholders' ability to sue officers and directors for misconduct. 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.

3.4.3.6 *Resolving Insolvency*

This category accounts for the following indices: i) insolvency time, ii) insolvency cost and iii) insolvency recovery rate.

Table 17: *Resolving Insolvency* - Fixed Effects Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
lnTA	0.0158**	0.0154**	0.0154**	0.0148**
	(0.00729)	(0.00728)	(0.00727)	(0.00728)
EA	0.0121	0.0128	0.0161	0.00771
	(0.0661)	(0.0661)	(0.0662)	(0.0663)
LA	0.0901***	0.0937***	0.0908***	0.0897***
	(0.0211)	(0.0213)	(0.0211)	(0.0212)
LLPL	0.261***	0.240***	0.246***	0.254***
	(0.0804)	(0.0788)	(0.0789)	(0.0799)
NIM	-0.00625***	-0.00621***	-0.00634***	-0.00604***
	(0.00189)	(0.00190)	(0.00190)	(0.00189)
ROE	0.000501***	0.000523***	0.000517***	0.000504***
	(0.000159)	(0.000163)	(0.000162)	(0.000159)
lnGDPcap	-0.111***	-0.130***	-0.111***	-0.148***
	(0.0274)	(0.0308)	(0.0273)	(0.0318)
DCP	-0.000301***	-0.000345***	-0.000370***	-0.000256**
	(0.000101)	(9.86e-05)	(9.88e-05)	(0.000103)
RL-WB	-0.0352**	-0.0334**	-0.0302*	-0.0240
	(0.0154)	(0.0153)	(0.0166)	(0.0166)
lnTIME-INS	0.0216***			0.0373***
	(0.00643)			(0.00783)
COST-INS		0.00104***		0.00144***
		(0.000344)		(0.000368)
REC-INS			1.24e-05	0.000754***
			(0.000223)	(0.000266)
Constant	1.793***	1.992***	1.800***	2.093***
	(0.246)	(0.284)	(0.245)	(0.289)
Observations	10,883	10,883	10,883	10,883
F-test	10.20***	8.50***	8.47***	9.16***
R-squared	0.037	0.036	0.035	0.040
Number of banks	2,014	2,014	2,014	2,014

Note: The table reports the fixed-effects regression results for the *resolving insolvency* category of business regulation. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLP is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. REC-INS: the recovery rate calculates how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm, COST-INS: the average cost of bankruptcy proceedings. The cost of the proceedings is recorded as a percentage of the estate's value. TIME-INS: the average time (in terms of years) to close a business. Information is collected on the sequence of procedures and on whether any procedures can be carried out simultaneously. 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 18: *Resolving Insolvency* - Dynamic Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
L.EFF	0.522***	0.513***	0.531***	0.524***
	(0.0489)	(0.0514)	(0.0490)	(0.0537)
lnTA	0.0198**	0.0157*	0.0152	0.0135
	(0.00950)	(0.00938)	(0.00968)	(0.00944)
EA	0.435***	0.419***	0.398***	0.409***
	(0.117)	(0.119)	(0.121)	(0.120)
LA	-0.0489	-0.0581	-0.0472	-0.0409
	(0.0354)	(0.0358)	(0.0354)	(0.0354)
LLPL	0.0955	0.0944	0.0946	0.0734
	(0.124)	(0.126)	(0.120)	(0.123)
NIM	-0.00841***	-0.00833***	-0.00822***	-0.00864***
	(0.00187)	(0.00187)	(0.00184)	(0.00185)
ROE	0.000754***	0.000825***	0.000791***	0.000873***
	(0.000230)	(0.000241)	(0.000229)	(0.000257)
lnGDPcap	-0.409***	-0.433***	-0.399***	-0.399***
	(0.0347)	(0.0370)	(0.0348)	(0.0416)
DCP	0.000246	0.000191	0.000269	0.000241
	(0.000170)	(0.000164)	(0.000170)	(0.000169)
RL-WB	0.0312	0.0293	0.0320	0.0318
	(0.0204)	(0.0216)	(0.0208)	(0.0226)
lnTIME-INS	0.0238***			-0.00841
	(0.00760)			(0.0192)
COST-INS		0.00117***		0.000368
		(0.000386)		(0.000638)
REC-INS			-0.00138***	-0.00176*
			(0.000378)	(0.000961)
Constant	4.268***	4.593***	4.320***	4.382***
	(0.303)	(0.345)	(0.302)	(0.364)
Observations	8,871	8,871	8,871	8,871
Number of banks	1,897	1,897	1,897	1,897
N of instruments	32	32	32	34
Wald	440.42***	412.21***	434.70***	452.74***
AR2 p-value	0.2176	0.2136	0.2459	0.2360
Hansen-J p-value	0.416	0.465	0.446	0.378

Note: The table reports the dynamic panel regression results for the *resolving insolvency* category of business regulation. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. REC-INS: the recovery rate calculates how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm, COST-INS: the average cost of bankruptcy proceedings. The cost of the proceedings is recorded as a percentage of the estate's value. TIME-INS: the average time (in terms of years) to close a business. Information is collected on the sequence of procedures and on whether any procedures can be carried out simultaneously. 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.

All the *resolving insolvency* variables appear to have a positive and statistically significant impact on bank performance in the fixed effect models (see models 1, 2 and 4 of Table 17). The impact of the recovery rate (REC-INS) variable, though, is significant only in model 4 of Table 17 where we control for the rest of the resolving insolvency variables. The positive impact of insolvency time (lnTIME-INS) and insolvency cost (COST-INS) is further confirmed in the dynamic panel analysis (see models 1 and 2 of Table 18). On the other hand the recovery rate variable (REC-INS) is negatively associated with bank performance at the 1% significance level in model 3 of Table 18. This result of the recovery rate variable (REC-INS) remains significant in model 4 of Table 18 where all the resolving insolvency variables are accounted for. The positive association of time to insolvency (lnTIME-INS) with bank performance could indicate, in accordance with previous evidence, that the recovery rate for creditors is higher for firms that can stay in business during the bankruptcy procedure (Franks et al, 2004). In addition, the positive association between bank performance and insolvency costs (COST-INS) and the negative association between the recovery rate (REC-INS) on bank performance suggests that a careful loan screening exercise during the loan origination process pays off (Manove et al., 2001; Zazzaro, 2005) even in the presence of creditor friendly bankruptcy regulation (Franks and Sussman, 2005).

The interaction terms between resolving insolvency regulation and the rule of law (RL-WB) and the control of corruption (COR-WB) show that the impact of these types of insolvency regulation on bank performance is conditional on institutional quality.

Table 19: *Resolving Insolvency* - Interactions with Institutional Quality.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF	(6) EFF
L.EFF	0.562***	0.500***	0.554***	0.556***	0.517***	0.556***
	(0.0508)	(0.0548)	(0.0504)	(0.0514)	(0.0529)	(0.0519)
lnTA	0.0224**	0.0181*	0.0159*	0.0242***	0.0178*	0.0194**
	(0.00895)	(0.00953)	(0.00921)	(0.00938)	(0.00953)	(0.00953)
EA	0.393***	0.428***	0.366***	0.405***	0.416***	0.389***
	(0.115)	(0.119)	(0.120)	(0.121)	(0.120)	(0.123)
LA	-0.0473	-0.0518	-0.0518	-0.0471	-0.0583	-0.0450
	(0.0334)	(0.0366)	(0.0335)	(0.0335)	(0.0356)	(0.0334)
LLPL	-0.0112	0.0904	0.0688	-0.0269	0.0851	0.0658
	(0.106)	(0.132)	(0.110)	(0.113)	(0.137)	(0.121)
NIM	-0.00823***	-0.00831***	-0.00780***	-0.00891***	-0.00855***	-0.00853***
	(0.00181)	(0.00185)	(0.00180)	(0.00188)	(0.00204)	(0.00190)
ROE	0.000678***	0.000820***	0.000642***	0.000619***	0.000789***	0.000583***
	(0.000224)	(0.000237)	(0.000208)	(0.000226)	(0.000243)	(0.000212)
lnGDPcap	-0.429***	-0.441***	-0.427***	-0.429***	-0.426***	-0.421***
	(0.0335)	(0.0389)	(0.0333)	(0.0332)	(0.0401)	(0.0353)
DCP	0.000154	0.000133	0.000321**	0.000194	0.000249	0.000411**
	(0.000162)	(0.000166)	(0.000162)	(0.000166)	(0.000167)	(0.000167)
RL-WB	-0.0276	0.0593	0.188***			
	(0.0228)	(0.0480)	(0.0379)			
lnTIME-INS	-0.172***			-0.132***		
	(0.0548)			(0.0454)		
RL-WB*lnTIME-INS	0.100***					
	(0.0275)					
COST-INS		0.00497			0.00520	
		(0.00471)			(0.00323)	
RL-WB*COST-INS		-0.00237				
		(0.00297)				
REC-INS			0.00225**			0.000830
			(0.000879)			(0.000913)
RL-WB*REC-INS			-0.00242***			
			(0.000497)			
COR-WB				-0.00293	0.0644***	0.124***
				(0.0127)	(0.0248)	(0.0282)
COR-WB*lnTIME-INS				0.0619***		
				(0.0180)		
COR-WB*COST-INS					-0.00166	
					(0.00170)	
COR-WB*REC-INS						-0.00131***
						(0.000397)
Constant	4.536***	4.599***	4.362***	4.477***	4.410***	4.304***
	(0.298)	(0.381)	(0.287)	(0.316)	(0.396)	(0.301)
Observations	8,871	8,871	8,871	8,871	8,871	8,871
Number of banks	1,897	1,897	1,897	1,897	1,897	1,897
N of instruments	33	33	33	33	33	33
Wald	472.63***	412.74***	480.92***	415.00***	360.79***	409.16***
AR2 p-value	0.2366	0.2075	0.3027	0.1871	0.1703	0.2377
Hansen-J p-value	0.607	0.375	0.644	0.541	0.506	0.522

Note: The table reports the dynamic panel regression results for the *resolving insolvency* category of business regulation and their interaction with institutional quality. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law, COR-WB stands for control of corruption. REC-INS: the recovery rate calculates how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm, COST-INS: the average cost of bankruptcy proceedings. The cost of the proceedings is recorded as a percentage of the estate's value. TIME-INS: the average time (in terms of years) to close a business. Information is collected on the sequence of procedures and on whether any procedures can be carried out simultaneously. 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.

Model 1 of Table 19 shows that the effect of insolvency time (ln-TIME-INS) on bank performance is negative whilst its interaction with the rule of law (RL-WB) is positive, implying that insolvency time could have a positive impact on bank performance in line with Franks et al. (2004), in presence of high levels of rule of law and judicial efficiency, which ensures that creditors continue to receive payments during the time that a firm remains operational. Similarly, the interaction between the insolvency time (lnTIME-INS) and the control of corruption (COR-WB) is positive (see model 4 of Table 19) in line with the "*sand the wheels*" hypothesis (Murphy et al., 1993), whereas the individual effect of insolvency time on bank performance is negative. Finally, in model 3 of Table 19 there is a negative effect stemming from the interaction between recovery rate (REC-INS) and the rule of law (RL-WB), while the individual effect of the recovery rate (REC-INS) on bank performance is positive. This suggests an excessive reliance, at the expense of careful monitoring, of bank managers on the recovery rate in case of insolvency (REC-INS) when the observance of law is high. Overall, the results of this section lend support to the hypothesis H7.A but also to the competing hypothesis H7.B as far as concerns the recovery rate variable (REC-INS).

3.4.3.7 *Employing Workers*

Finally the impact of regulation related to *employing workers* on bank performance is depicted in Tables 20 and 21. The components of this category are the following: i) minimum wage, ii) severance payment and iii) notice period for worker dismissal.

Table 20: *Employing Workers* - Fixed Effects Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
lnTA	0.0158	0.00963	0.00747	0.0108
	(0.0138)	(0.00986)	(0.00978)	(0.0178)
EA	0.00437	-0.0498	-0.0547	-0.0668
	(0.107)	(0.118)	(0.119)	(0.132)
LA	0.0312	0.0540**	0.0520*	0.00963
	(0.0296)	(0.0270)	(0.0270)	(0.0364)
LLPL	0.416***	0.254	0.249	0.460***
	(0.103)	(0.156)	(0.157)	(0.115)
NIM	0.00396	-0.00404**	-0.00384**	0.000826
	(0.00274)	(0.00187)	(0.00186)	(0.00239)
ROE	0.000586***	0.000738***	0.000736***	0.000736***
	(0.000181)	(0.000171)	(0.000171)	(0.000183)
lnGDPcap	-0.361***	-0.421***	-0.407***	-0.433***
	(0.0568)	(0.0428)	(0.0385)	(0.0625)
DCP	-0.000820***	-0.000614***	-0.000626***	-0.000609**
	(0.000240)	(0.000156)	(0.000156)	(0.000259)
RL-WB	0.0306	0.0115	0.00461	0.0559**
	(0.0228)	(0.0197)	(0.0196)	(0.0258)
MW-EW	0.543***			0.669***
	(0.122)			(0.130)
NOT-EW		-0.00155**		-0.00202***
		(0.000643)		(0.000726)
SEV-EW			0.00510	0.00482
			(0.00465)	(0.00550)
Constant	4.247***	5.104***	4.858***	4.921***
	(0.650)	(0.450)	(0.423)	(0.788)
Observations	6,105	6,294	6,294	4,730
F-test	10.59***	13.38***	14.73***	11.62***
R-squared	0.063	0.073	0.073	0.082
Number of banks	1,790	1,843	1,848	1,769

Note: The table reports the fixed-effects regression results for the *employing workers* category of business regulation. The use of the fixed effects specification is justified after a Hausman test for each model. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. MW-EW: ratio of minimum wage to average wage, SP-EW: severance pay for redundancy dismissal after 20 years of continuous employment (in salary weeks), NOT-MW: notice period for redundancy dismissal after 20 years of continuous employment (in salary weeks). 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 21: *Employing Workers* - Dynamic Panel Analysis.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
L.EFF	0.462***	0.404***	0.379***	0.645***
	(0.0772)	(0.0705)	(0.0688)	(0.136)
lnTA	0.0279**	0.00458	-0.0119	0.0160
	(0.0112)	(0.0109)	(0.0101)	(0.0197)
EA	0.633***	0.311	0.292	0.398
	(0.193)	(0.206)	(0.218)	(0.273)
LA	-0.0704*	-0.0456	-0.0831**	-0.0893**
	(0.0386)	(0.0377)	(0.0402)	(0.0442)
LLPL	0.259***	-0.139	0.184	0.379**
	(0.0750)	(0.250)	(0.304)	(0.161)
NIM	-0.00625**	-0.00768***	-0.00568***	-0.00512*
	(0.00244)	(0.00195)	(0.00207)	(0.00279)
ROE	0.000911***	0.000930***	0.00119***	0.00105***
	(0.000306)	(0.000272)	(0.000271)	(0.000315)
lnGDPcap	-0.450***	-0.581***	-0.514***	-0.702***
	(0.0510)	(0.0417)	(0.0430)	(0.0688)
DCP	0.000316	0.000258	0.000410**	0.000233
	(0.000376)	(0.000191)	(0.000174)	(0.000399)
RL-WB	-0.0507*	0.0169	0.0384	0.0740**
	(0.0291)	(0.0249)	(0.0255)	(0.0324)
MW-EW	0.0309			0.908***
	(0.172)			(0.132)
SEV-EW		0.00886***		0.00589**
		(0.00208)		(0.00248)
NOT-EW			0.000340	-0.00355***
			(0.000922)	(0.000968)
Constant	4.721***	6.187***	5.917***	6.946***
	(0.532)	(0.383)	(0.428)	(0.777)
Observations	5,853	6,009	6,009	4,503
Number of banks	1,743	1,791	1,791	1,705
N of instruments	27	24	24	23
Wald	290.38***	362.35 ***	374.77***	258.58***
AR2 p-value	0.3124	0.0718	0.1284	0.0862
Hansen-J p-value	0.528	0.499	0.360	0.358

Note: The table reports the dynamic panel regression results for the *employing workers* category of business regulation. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. MW-EW: ratio of minimum wage to average wage, SP-EW: severance pay for redundancy dismissal after 20 years of continuous employment (in salary weeks), NOT-MW: notice period for redundancy dismissal after 20 years of continuous employment (in salary weeks). 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.

Minimum wage (MW-EW) and severance payment (SEV-EW) are positively related to bank performance in both the fixed effects and dynamic specifications. In more detail, the minimum wage (MW-EW) has a positive and statistically significant impact at the 1% level in the fixed effects panel (see models 1 and 4 of Table 20) and it retains its significance level in the dynamic panel (see model 4 of Table 21). Similarly, the positive coefficient of the impact of severance payment (SEV-EW) on bank performance is statistically significant at the 1% in the dynamic panel specifications (see models 2 and 4 of Table 21). On the other hand, the variable related to the notice period of worker dismissal (NOT-EW) is negatively and significantly related with bank performance in both the fixed effects and dynamic models (see models 2 and 4 of Table 20 and model 4 of Table 21). The magnitude of the coefficients though of the minimum wage (MW-EW) and the severance payment (SEV-EW) variables are larger than the coefficient of the notice dismissal variable implying that, overall, stricter employment legislation has a positive impact on bank performance. Stringent labour regulation can have a positive impact on bank performance as it could increase the length of the relationship between employees and employers, rising in that way the returns on the acquisition of firm and industry specific skills (Wasmer, 2006). Furthermore, more stringent labour regulation can have a negative impact on labour turnover, reducing in that way costs, and lead to job matches of high quality (Auer, 2007).

Moreover, significant employment security provides workers with insurance against wage risk (Agell, 1999) and thereby could stimulate workers to raise their productivity. These results also conform to extant studies in the labour economics literature with regards to the impact of labour regulation on economic performance (Storm and Naastepad, 2009; Deakin and Sarkar, 2008). Finally, the interaction terms of the employment legislation variables and institutional quality reveals that the impact of strict labour regulation on bank performance is conditional on law observance.

Table 22: *Employing Workers* - Interactions with Institutional Quality.

VARIABLES	(1) eff	(2) eff	(3) eff	(4) eff	(5) eff	(6) eff
L.eff	0.465***	0.379***	0.389***	0.502***	0.439***	0.452***
	(0.0777)	(0.0682)	(0.0734)	(0.0767)	(0.0735)	(0.0764)
lnTA	0.0199*	0.00897	0.00619	0.0241**	0.00792	0.0126
	(0.0114)	(0.0118)	(0.0114)	(0.0110)	(0.0110)	(0.0114)
EA	0.525***	0.467**	0.324	0.623***	0.482**	0.389*
	(0.195)	(0.214)	(0.211)	(0.191)	(0.238)	(0.218)
LA	-0.0596	-0.0523	-0.0436	-0.0607	-0.0548	-0.0406
	(0.0369)	(0.0379)	(0.0378)	(0.0373)	(0.0369)	(0.0362)
LLPL	0.243***	0.125	-0.139	0.266***	0.255	-0.108
	(0.0789)	(0.292)	(0.253)	(0.0846)	(0.308)	(0.264)
NIM	-0.00593**	-0.00659***	-0.00766***	-0.00660***	-0.00623***	-0.00800***
	(0.00243)	(0.00198)	(0.00197)	(0.00239)	(0.00214)	(0.00205)
ROE	0.000980***	0.00113***	0.000924***	0.000920***	0.00106***	0.000852***
	(0.000317)	(0.000263)	(0.000273)	(0.000305)	(0.000257)	(0.000268)
lnGDPcap	-0.492***	-0.549***	-0.578***	-0.550***	-0.520***	-0.575***
	(0.0503)	(0.0403)	(0.0411)	(0.0514)	(0.0395)	(0.0464)
DCP	0.000113	0.000346**	0.000229	0.000233	0.000334*	0.000371*
	(0.000370)	(0.000172)	(0.000198)	(0.000345)	(0.000202)	(0.000206)
RL-WB	-0.130***	-0.0614*	0.00460			
	(0.0389)	(0.0354)	(0.0305)			
MW-EW	-0.538*			-0.0703		
	(0.282)			(0.166)		
RL-WB*MW-EW	0.526***					
	(0.197)					
NOT-EW		-0.00333***			0.000646	
		(0.00123)			(0.000992)	
RL-WB*NOT-EW		0.00889***				
		(0.00261)				
SEV-EW			0.00734***			0.00800***
			(0.00228)			(0.00259)
RL-WB*SEV-EW			0.00105			
			(0.00116)			
COR-WB				0.00775	0.0206	0.0377*
				(0.0288)	(0.0263)	(0.0202)
COR-WB*MW-EW				0.240**		
				(0.103)		
COR-WB*NOT-EW					0.00259*	
					(0.00150)	
COR-WB*SEV-EW						0.000233
						(0.000823)
Constant	5.395***	5.947***	6.164***	5.664***	5.578***	5.935***
	(0.553)	(0.399)	(0.380)	(0.526)	(0.429)	(0.449)
Observations	5,853	6,009	6,009	5,853	6,009	6,009
Number of banks	1,743	1,791	1,791	1,743	1,791	1,791
N of instruments	28	25	25	28	25	25
Wald	314.61***	424.32***	382.70***	315.93***	448.14***	414.65***
AR2 p-value	0.489	0.0436	0.1637	0.3612	0.0772	0.330
Hansen-J p-value	0.302	0.320	0.256	0.287	0.239	0.316

Note: The table reports the dynamic panel regression results for the *employing workers* category of business regulation and their interaction with institutional quality. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. MW-EW: ratio of minimum wage to average wage, SP-EW: severance pay for redundancy dismissal after 20 years of continuous employment (in salary weeks), NOT-MW: notice period for redundancy dismissal after 20 years of continuous employment (in salary weeks). 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.

An important finding is that the interaction between rule of law (RL-WB) and the minimum wage (MW-EW) is positive and significant (see model 1 of Table 22), whereas the individual effect of minimum wage (MW-EW) on bank performance is negative. This interaction suggests that minimum wage (MW-EW) could prove beneficial for bank performance when such legislation is actually enforced. The mere existence of the minimum wage regulation without its strict enforcement may induce informality (Ullyssea, 2010; Almedia and Carneiro, 2011) making it harder for banks to evaluate the creditworthiness of individuals which could in turn result to decreased performance of the banking sector. Overall, the empirical evidence from this section is more supportive of hypothesis H8.A rather than for the competing hypothesis H8.B.

3.4.4 Sensitivity Analysis: Is the Impact of Getting Credit and Protecting Investors regulation on Bank Performance heterogeneous in the Crisis Years?

As part of sensitivity analysis we examine if the *getting credit* and *protecting investors* regulation variables have a heterogeneous impact on bank performance over the financial crisis. For this reason we follow Anginer et al. (2012) and use a crisis dummy variable for the years from 2008 to 2010. Then we interact the crisis dummy with the different indices of the *getting credit* and *protecting investors* regulation variables. Results are depicted in Tables 23 and 24.

Table 23: *Getting Credit* - Interactions with the Crisis Dummy.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF
L.EFF	0.519***	0.462***	0.541***	0.540***
	(0.0526)	(0.0545)	(0.0575)	(0.0581)
lnTA	0.0200**	0.0321***	0.0258***	0.0215**
	(0.00981)	(0.00902)	(0.00978)	(0.00954)
EA	0.432***	0.466***	0.504***	0.495***
	(0.120)	(0.106)	(0.111)	(0.114)
LA	-0.0342	-0.0349	-0.0510	-0.0381
	(0.0344)	(0.0349)	(0.0358)	(0.0357)
LLPL	0.0529	0.0242	0.0362	0.0109
	(0.122)	(0.117)	(0.126)	(0.128)
NIM	-0.00869***	-0.00869***	-0.00940***	-0.00787***
	(0.00192)	(0.00175)	(0.00183)	(0.00173)
ROE	0.000653***	0.000658***	0.000694***	0.000667**
	(0.000239)	(0.000242)	(0.000260)	(0.000271)
lnGDPcap	-0.382***	-0.435***	-0.415***	-0.435***
	(0.0377)	(0.0364)	(0.0413)	(0.0475)
DCP	0.000152	1.64e-05	0.000223	0.000178
	(0.000167)	(0.000169)	(0.000169)	(0.000177)
RL-WB	0.0469**	0.0531***	0.0338	0.0484**
	(0.0218)	(0.0205)	(0.0226)	(0.0223)
LEG-CG	-0.00987***			
	(0.00230)			
CRISIS DUM	-0.0247**	-0.0565***	0.000816	-0.0224***
	(0.0103)	(0.0163)	(0.00284)	(0.00707)
LEG-CG*CRISIS DUM	0.00318**			
	(0.00142)			
DEPTH-CG		0.0152***		
		(0.00419)		
DEPTH-CG*CRISIS DUM		0.0103***		
		(0.00292)		
PB-CG			-0.000754	
			(0.000695)	
PB-CG*CRISIS DUM			-0.000263	
			(0.000262)	
PV-CG				0.000107
				(0.000312)
PV-CG*CRISIS DUM				0.000305***
				(7.54e-05)
Constant	4.045***	4.331***	4.238***	4.471***
	(0.321)	(0.319)	(0.350)	(0.416)
Observations	8,871	8,871	8,675	8,648
Number of banks	1,897	1,897	1,886	1,881
N of instruments	33	33	33	33
Wald	398.22***	421.57***	340.49***	382.32***
AR2 p-value	0.1085	0.1683	0.2718	0.3141
Hansen-J p-value	0.317	0.2622	0.553	0.432

Note: The table reports the dynamic panel regression results for the *getting credit* category of business regulation and their interaction with the crisis dummy (CRISIS DUM). The CRISIS DUM variable takes a value of 1 for the years 2008 to 2010 and zero otherwise. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law, COR-WB stands for control of corruption. LEG-CG: this index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending, PB-CG: this indicator reports the number of individuals and firms listed in a public credit registry with information on their borrowing history from the past 5 years, PR-CG: this indicator reports the number of individuals and firms listed by a private credit bureau with information on their borrowing history from the past 5 years, DEPTH-CG: this index measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau. 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.

The interaction between the creditor rights (LEG-CG) and the crisis dummy (CRISIS DUM) (see model 1 of Table 23) is positive and significant at the 5% level. On the other hand, the individual effect of creditor rights (LEG-CG) asserts a negative and significant impact on performance, which is in line with the previous findings of this chapter. The positive sign of the interaction between creditor rights (LEG-CG) and the crisis dummy (CRISIS DUM) implies that although the individual effect of creditor rights on bank performance is negative, it becomes restrained during the crisis. Agency problems that restrict a firm's access to credit are particularly important during periods of economic contraction (Bernanke and Gertler; 1989) and increased creditor rights may moderate them as they warrant a higher level of recovery of impaired loans. Furthermore, the interaction between the depth of credit information (DEPTH-CG) and the crisis dummy (CRISIS DUM) (see model 2 of Table 23) has a positive and significant effect on performance, whilst the individual effect of the depth of credit information (DEPTH-CG) is positive. It appears that the positive impact of the depth of credit information (DEPTH-CG) on bank performance strengthens during the crisis, acting as an assistance mechanism for banks to make more informed decisions with regards to the supply of credit. Similarly, the positive and significant interaction between the private sector credit registry coverage (PV-CG) and the crisis dummy (CRISIS DUM) in model 4 of Table 23 suggest that during the crisis, higher credit registry coverage supports performance.

Next we examine if the different types of regulation of the *protecting investors* category had a heterogeneous impact on the performance of banks located in the EU-27 economies during the crisis period.

Table 24: *Protecting Investors* - Interactions with the Crisis Dummy.

VARIABLES	(1) EFF	(2) EFF	(3) EFF
L.EFF	0.441***	0.421***	0.482***
	(0.0705)	(0.0717)	(0.0777)
lnTA	0.0167*	0.0280***	0.00825
	(0.00884)	(0.0102)	(0.00944)
EA	0.590***	0.482***	0.515***
	(0.160)	(0.159)	(0.168)
LA	-0.0624*	0.00311	-0.0446
	(0.0351)	(0.0351)	(0.0338)
LLPL	0.187	0.0430	0.432***
	(0.159)	(0.159)	(0.154)
NIM	-0.00710***	-0.00706***	-0.00454**
	(0.00183)	(0.00184)	(0.00181)
ROE	0.000751***	0.000720***	0.000816***
	(0.000276)	(0.000279)	(0.000276)
lnGDPcap	-0.428***	-0.497***	-0.442***
	(0.0386)	(0.0440)	(0.0381)
DCP	0.000398*	-5.73e-05	0.000418**
	(0.000222)	(0.000203)	(0.000209)
RL-WB	0.00911	-0.0437*	0.0176
	(0.0275)	(0.0260)	(0.0266)
CRISIS-DUM	-0.0158*	-0.0396***	0.0106
	(0.00934)	(0.00990)	(0.0174)
DISC-PI	-0.00215		
	(0.00194)		
CRISIS-DUM*DISC-PI	0.00178		
	(0.00159)		
LIA-PI		0.0822***	
		(0.0174)	
CRISIS-DUM*LIA-PI		0.00732***	
		(0.00205)	
SUI-PI			-0.0369
			(0.0231)
CRISIS-DUM*SUI-PI			-0.00266
			(0.00296)
Constant	4.597***	4.883***	5.005***
	(0.387)	(0.401)	(0.413)
Observations	7,359	7,359	7,359
Number of banks	1,824	1,824	1,824
N of instruments	32	32	32
Wald	430.45***	357.37***	402.73***
AR2 p-value	0.2163	0.1404	0.2013
Hansen-J p-value	0.341	0.126	0.448

Note: The table reports the dynamic panel regression results for the *protecting investors* category of business regulation and their interaction with the crisis dummy (CRISIS DUM). The CRISIS DUM variable takes a value of 1 for the years 2008 to 2010 and zero otherwise. The dependent variable (EFF) is the cost efficiency scores calculated using SFA and assuming common frontier across countries. TA stands for total assets, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, LA stands for the loan to total assets ratio, NIM stands for net interest margin, ROE stands for return of equity, DCP stands for the ratio of domestic credit to the private sector over GDP, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, RL-WB stands for rule of law. DISC-PI: an index that measures the extent of disclosure, LIA-PI: an index that measures the extend of director liability, SUI-PI: an index that accounts for the shareholders' ability to sue officers and directors for misconduct. 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.

We find that the interaction between the director liability index (LIA-PI) with the crisis dummy (CRISIS-DUM) is positive and significant at the 1% level (see model 2 of Table 24) while the individual effect of the director liability index (LIA-PI) is positive and significant at the 1% level. The results for the individual effects confirm the fixed effects and dynamic analysis results in Table 14 and Table 15. The result of the interaction term denotes that in times of crisis the positive effect of the director liability index (LIA-PI) on bank performance is further enhanced. This is consistent with the findings of Peni and Vähämaa (2012) who argue that banks with stronger corporate governance mechanisms performed better during the financial crisis. Furthermore, improved corporate governance regulation can positively affect firm performance in the non-financial sector (Ammann et al., 2011; Brown and Caylor, 2006, Brown and Caylor 2009; Gompers et al. 2003), especially at times of crisis when the deterioration of economic conditions can lead to increased expropriation by managers (Johnson et al, 2000; Mitton, 2002; Baek et al. 2004). This positive impact of corporate governance regulation on the performance of non-financial firms could be channelled to the banking sector via spillover effects such as lower loan defaults.

3.5 Conclusion

Our results, from both fixed effects models as well as dynamic panel specifications, confirm that several types of business regulation have a heterogeneous in terms of sign and magnitude impact on bank performance, as measured by cost efficiency, in the EU-27 over 2004-2010. In some detail, the strength of creditor rights is negatively related with bank performance, whereas credit information sharing improves bank efficiency. Regulation related to business entry is reported to have a negative effect on bank performance. The same applies for taxation regulation. On the other hand, labour regulation, in terms of minimum wage and dismissal costs, as well as regulation related to investor protection, with the exception of mandatory corporate disclosure, exert a positive impact on bank performance.

This study also finds, in many cases, a statistically significant impact of the interaction terms between the business regulation variables and country-specific institutional quality as measured by the rule of law (RL-WB) and corruption (COR-

WB) variables. The impact of these interaction terms on bank performance is heterogeneous in terms of sign. For example, the positive impact of information sharing on bank performance, as measured by private sector credit registry coverage, subdues in the presence of higher law observance, as the interaction term between rule of law (RL-WB) and the private sector credit registry coverage (PV-CG) is negative. Similarly, the coefficient of the interaction term between tax hours (TAX-HOURS) and control of corruption (COR-WB) is positive, which implies that the negative individual effect of (TAX-HOURS) on bank performance becomes more restrained in the presence of higher control of corruption (COR-WB).

Regarding policy implications, regulators should take into account that enhancing creditor rights could have an adverse impact on bank performance. On the other hand strengthening regulation related to credit information sharing is warranted as it improves bank performance especially at the crisis period. In addition, less rigid business entry regulations in the EU not only could positively affect competitiveness but also significantly increase bank performance. Taxation regulation exerts a negative effect on bank performance. For many EU economies the taxation level is a mean of increased government revenue in order to wither the sovereign debt crisis. However, governments should simplify at least the bureaucracy related tax compliance costs in order to offset this negative taxation impact. EU regulators should also take into account that less rigid labour market regulation, a policy measure that many EU economies are adapting to improve their competitiveness, may adversely affect bank performance. Furthermore, the enhancement of corporate governance regulation is desirable as the extent of director liability is found to exert a positive effect on bank performance especially during the crisis. Finally, the quality of institutions such as the rule of law and control of corruption does matter in terms of the impact of business regulation on bank performance and policy makers should take note of this.

Appendix to Chapter 3

Table A1: Cost Function following Battese and Coelli (1995)

	Coefficient	Standard Errors	t-ratio
$\ln P_1$	0.448	0.031	14.24
$\ln P_2$	0.308	0.026	11.67
$\ln Y_1$	0.622	0.02	31.24
$\ln Y_2$	0.552	0.017	32.753
$\ln N_1$	0.079	0.014	5.78
$\ln N_2$	-0.218	0.026	-8.252
$(\ln P_1)^2$	0.135	0.005	29.484
$(\ln P_2)^2$	-0.066	0.003	-19.197
$(\ln P_1)(\ln P_2)$	-0.102	0.007	-13.997
$(\ln Y_1)^2$	0.114	0.002	70.281
$(\ln Y_2)^2$	0.121	0.002	70.725
$(\ln Y_1)(\ln Y_2)$	-0.312	0.005	-62.475
$(\ln P_1)(\ln Y_1)$	-0.04	0.003	-15.16
$(\ln P_2)(\ln Y_1)$	0.01	0.002	3.921
$(\ln P_1)(\ln Y_2)$	-0.02	0.003	-6.832
$(\ln P_2)(\ln Y_2)$	0.005	0.003	1.906
$(\ln N_1)^2$	0.009	0.002	4.922
$(\ln N_2)^2$	-0.057	0.006	-10.049
$(\ln N_1)(\ln N_2)$	-0.023	0.004	-5.126
$(\ln N_1)(\ln Y_1)$	0.002	0.002	1.299
$(\ln N_1)(\ln Y_2)$	-0.005	0.001	-3.443
$(\ln N_1)(\ln P_1)$	-0.005	0.002	-2.225
$(\ln N_1)(\ln P_2)$	0.018	0.002	8.323
$(\ln N_2)(\ln Y_1)$	0.036	0.003	10.349
$(\ln N_2)(\ln Y_2)$	0.039	0.003	12.881
$(\ln N_2)(\ln P_1)$	0.077	0.005	15.648
$(\ln N_2)(\ln P_2)$	-0.025	0.005	-5.146
t	0.027	0.009	3.053
$(t)^2$	-0.008	0.001	-6.952
$t(\ln P_1)$	0.005	0.002	2.915
$t(\ln P_2)$	0.008	0.002	4.24
$t(\ln Y_1)$	0.001	0.001	0.639
$t(\ln Y_2)$	-0.007	0.001	-6.194
$t(\ln N_1)$	0.002	0.001	1.713
$t(\ln N_2)$	0.005	0.001	3.695
constant	-3.029	0.093	-32.701
Z variables affecting cost inefficiency			
C5	-0.013	0.002	-7.264
GDPgr	-0.01	0.003	-3.798
INFL	0.025	0.005	4.553
Lerner	-0.702	0.038	-18.482
Country Dummies	yes		
Number of observations	11428		
Log likelihood	4665.24		

Notes: The table depicts the estimations of the cost efficiency frontier and the correlates of bank cost inefficiencies using the Battese and Coelli (1995) model. P_1 and P_2 stand for the input prices of labour and physical capital Y_1 and Y_2 stand for the outputs of loans and other earning assets respectively, N_1 and N_2 are the fixed netputs of fixed assets and equity. As environmental (Z) variables that could affect inefficiency we employ the five banks concentration ratio (C5), GDP growth (GDPgr), the Lerner index at the country level as a measure of bank competition (Lerner) and the inflation rate (INFL). We also impose country dummies.

Chapter 4: The Impact of Labour Regulation on Bank Performance in the Eurozone Periphery (Greece, Italy, Ireland, Portugal and Spain)

4.1 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., 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)[20]. Environmental (country-level) variables are 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).

An important source of cross-country heterogeneity inthe business environment in which firms operate 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. 2013; 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

[20] For a summary of bank efficiency studies focusing in the European Union see table A1 in Appendix A.

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.

The first contribution of this chapter then is that it focuses on country-level factors in order 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. The second contribution of this study is that it investigates if labour regulation affects bank performance. This is important in the context of the economies of the Eurozone periphery because reductions in the stringency of labour regulation is one of the key policies that these countries adopt in order to wither the crisis and restore competitiveness.

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., 1995). Input prices in the banking sector, such as labour costs, can differ significantly in a cross-country framework because of labour regulation differences (Dietsch and Lozano-Vivas, 2000). Casu and Girardone (2010) also argue that the financial integration taking place in the EU implies increased integration of the prices of bank inputs, 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 spillover 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 banking sector.

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 regarding the impact of labour regulation on 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 labour 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 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 exerts a negative and statistically significant impact on the performance of banks located in the Eurozone periphery mainly via the regulation of dismissal costs. The rest of this chapter is organised as follows; section 4.2 provides a description of the data and variables used, section 4.3 presents and discusses the results while section 4.4 concludes.

4.2 Data and Variables

4.2.1 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. The major advantage of the SFA methodology is that both random error and inefficiency are incorporated in a composite error term (Berger and Humphrey, 1997). The allowance for measurement error in the SFA estimation produces bank-specific (in)efficiency estimates that reflect more

accurately managerial competence in comparison with non-parametric approaches of efficiency estimation such as DEA that do not allow for measurement error caused by lack. In addition to this, the disadvantage of parametric approaches of imposing a structure on the efficiency frontier poses less of a problem here as the banks of our sample are located in countries that are considered market economies. [21]

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:

$$lnTC_{i,t} = \alpha_0 + \sum_i \alpha_i lnP_{i,t} + \sum_i \beta_i lnY_{i,t} + {}^1/_2 \sum_i \sum_j \alpha_{ij} lnP_{i,t} lnP_{j,t} + {}^1/_2 \sum_i \sum_j \beta_{ij} lnY_{i,t} lnY_{j,t} +$$
$$+ \sum_i \sum_j \delta_{ij} lnP_{i,t} lnY_{j,t} + \sum_i \zeta_i lnN_{i,t} + {}^1/_2 \sum_i \sum_j \zeta_{ij} lnN_{i,t} lnN_{j,t} + {}^1/_2 \sum_i \sum_j \theta_{ij} lnP_{i,t} lnN_{j,t} +$$
$$+ \sum_i \sum_j \kappa_{ij} lnY_{i,t} lnN_{j,t} + \mu_1 t + {}^1/_2 \mu_2 t^2 + \sum_i \nu_i t lnP_{i,t} + \sum_i \xi_i t lnY_{i,t} + \sum_i \rho_i t lnN_{i,t} +$$
$$+ \sum_\iota \varphi_i Z_{k,t} + u_{i,t} \pm v_{i,t} \quad (2)$$

[21] As we note in Chapter 2 the misspecification of the efficiency frontier by employing parametric approaches such as SFA is more possible in economies that cannot be considered market economies (Bhattacharyya et al., 1997; Ataullah et al., 2004; Claessens and Van Horen, 2012).

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 riskaverse manner than firms with lower level of equity but still optimally (efficiently) given the risk preferences of their shareholders. We also include each bank's level of fixed assets, as a proxy for physical capital, which is 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. 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 (GDPgr) as an indicator of the dynamism of each economy. To control for macroeconomic stability we include the inflation rate (INFL). 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).

4.2.2 Determinants of Bank Performance (Cost inefficiency)

The next part of the analysis uses the cost inefficiency scores obtained with the methodology described in 4.2.1 to estimate the impact of labour regulation on the performance of banks located in the EU periphery. We also use bank-specific and country-specific control variables.

4.2.2.1 Labour Regulations

The focus of this chapter is to examine the impact of labour regulations on the performance of the banking sector of the EU periphery countries and therefore the *Fraser Index of Economic Freedom* (Gwartney et. al, 2012) is included in the model[22]. The use of this index is common in the economics literature 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) Mandated cost of worker dismissal (DISS-FR) and vi)

[22] See table A2 of Appendix A for more details related to the *Fraser Index of Economic Freedom.*

Obligatory conscription to military service (CON-FR). The overall labour regulation index (LR-FR) is the average of these six subcomponents[23].

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 Organisation of Economic Co-Operation and Development (OECD). The overall OECD *Strictness of Employment Protection* index[24] (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. This breakdown of dismissal costs in categories according to employment type allow us to further investigate how dismissal cost regulation could affect bank performance.

[23] Note that the subcomponent (v), dismissal regulation, is available for these economies from 2002 to 2010. This implies that the overall index of labour regulation using the *Fraser Index of Economic Freedom* is available from 2002-2010. The rest of the subcomponents are available for the 2000-2010 period.

[24] See table A3 of Appendix A for more details related to this index.

Table 1: Labour Regulation in the Economies of the Eurozone Periphery(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**
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 *Strictness of Employment Protection* 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 *Strictness of Employment Protection* index for EMP-OECD, EMPREG-OECD, EMPTEMP-OECD and EMPCOLL-OECD.

In terms of the *Fraser Index,* the overall labour regulation (LR-FR) performance of Ireland is significantly higher, with a 7.55 score, than the rest of the periphery economies. This reflects the strong adoption of liberal economic policies in this country in recent years. On the other hand the periphery economies located in southern Europe 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 periphery economies scores lower than 1.9.

With respect to the subcomponents of the *Fraser Index* a relatively similar picture emerges with Ireland being the highest 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* labour regulation subcomponents although there are cases that a country might be performing well in a specific component. For example Italy is the highest performer in terms of dismissal costs (DISS-FR) scoring 9.67 when the overall 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 periphery 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 these economies.

Similar initial conclusions can also be derived by having a cursory look in the individual subcomponents of the OECD *Strictness of Employment Protection* index. 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 subcomponents. 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 index while the worst performers differ in each component. Portugal is the most strictly regulated periphery 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.

Table 2 : Cross-Country Labour Regulation Over Time in the Economies of the Eurozone Periphery (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, 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 *Strictness of Employment Protection* 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 *Strictness of Employment Protection* index for EMP-OECD, EMPREG-OECD, EMPTEMP-OECD and EMPCOLL-OECD.

The time series data on the regulation indices in Table 2 suggest that some periphery 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* of labour regulation (LR-FR) scores from 4.87 in 2002 to 6.48 in 2010. This improvement is also reflected in the overall OECD *Strictness of Employment Protection* index (EMP-OECD), which has decreased from 2.51 in 2000 to 1.89 in 2008. Portugal and Greece have also improved significantly in terms of the overall OECD index (EMP-OECD). The EMP-OECD score for Greece has declined from 3.50 in 2000 to 2.73 in 2008, while the corresponding figures for Portugal are 3.67 in 2000 and 2.88 in 2009.

4.2.2.2 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 as it represents the level of focus on traditional banking activities (Fries and Taci, 2005). As a proxy for bank default risk we use the loan loss provisions as a share to total loans (LLPL). 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 issues, 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 (DCP) while to control for the general level of economic development the real GDP per capita (GDPcap) in purchasing power parity (PPP) terms is employed. These measures of development are used regularly in the bank efficiency literature (Grigorian and Manole, 2006; 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.

4.3 Results and Discussion

4.3.1 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[25].

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

Cross-Country Inefficiency Scores			
	Mean	**s.d.**	**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
Average	0.169	0.090	3130
Cross-Time Inefficiency Scores			
	Mean	**s.d.**	**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.

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 recently experienced tremendous difficulties in its banking system. On the other hand, the

[25] For the results of the stochastic frontier estimation see table B1 of Appendix B.

banking systems of the periphery economies of southern Europe, with the exception of Portugal, are found to performing better than the periphery 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.

4.3.2 The Determinants of Bank Performance (Cost Inefficiency)

4.3.2.1 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 resembles 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 (DCP) have a positive impact on bank inefficiency in line with previous studies (Dietsch and Lozano-Vivas, 2000; Grigorian and Manole, 2006; Kasman and Yildirm, 2006).

4.3.2.2 The Impact of Labour Regulation on Bank Performance using the *Fraser Index*

Tables 4 and 5 report the fixed effects and dynamic panel[26] results respectively for the subcomponents and the overall score of the Fraser index of labour regulation.[27]

[26] In all of our dynamic panel models we use the two-step system GMM estimator (Arellano and Bover, 1995) specification with *Windmeijer*-corrected (robust) standard errors.

[27] Note also that except this traditional two stage set-up approach (estimation of inefficiency scores in the first stage and consequently regression of these inefficiency scores over the labour regulation variables), we have also performed additional robustness checks with regards to the impact of labour regulation on bank inefficiency by employing the single stage estimation approach of Battese and Coelli (1995). The results remain similar in the single stage estimation framework and are depicted in Table B2 of the appendix of Chapter 4.

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)
DCP	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
F-test	5.33***	5.02***	6.31***	9.65***	5.13***	5.55***	8.28***	9.78***
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 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. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, MW-FR is hiring and minimum wage regulation, HF-FR stands for hiring-firing regulation, CCB stands for centralised collective bargaining, HR-FR is hours regulation, DISS-FR stands for dismissal cost regulation and, LR-FR stands for the overall labour regulation. 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)
DCP	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
N of instruments	66	66	66	65	66	66	70	65
Wald	86.19***	75.21***	78.98***	81.86***	70.22***	81.80***	84.15***	78.37***
AR2 p-value	0.2809	0.2552	0.2650	0.2259	0.2585	0.2683	0.2456	0.2348
Hansen-J p-value	0.561	0.210	0.213	0.186	0.144	0.139	0.547	0.190

Note: The table reports the dynamic panel results for the 2000-2010 periods. The two step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer*-corrected robust standard errors. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, MW-FR is hiring and minimum wage regulation, HF-FR stands for hiring-firing regulation, CCB stands for centralised collective bargaining, HR-FR is hours regulation, DISS-FR stands for dismissal cost regulation and, LR-FR stands for the overall labour regulation. 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.

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 Index* of labour regulation 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) is 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 channelled mainly through the regulation of dismissal costs and less through rigidities in the hiring process. These results are 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.

4.3.2.3 The Impact of Labour Regulation on Bank Performance using the OECD *Strictness of Employment Protection* index

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 *Strictness of Employment Protection* index as a measure of regulation rigidities in the dismissal process. These results are available in Tables 6 and 7.

Table 6: The Impact of Labour Regulation on Bank Performance using the OECD *Strictness of Employment Protection* index - 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)
DCP	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
F-test	7.63***	5.49***	5.77***	7.02***	5.65***
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 2000-2009 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. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, EMP-OECD stands for the overall index of employment protection strictness, 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. 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 *Strictness of Employment Protection* index - 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)
DCP	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
N of instruments	56	56	66	58	56
Wald	153.23***	185.55***	386.02***	171.95***	155.76***
AR2 p-value	0.3405	0.3352	0.3141	0.3484	0.3473
Hansen-J p-value	0.520	0.436	0.347	0.763	0.518

Note: The table reports the dynamic panel results for the 2000-2009 periods. The two step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer*-corrected robust standard errors. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, EMP-OECD stands for the overall index of employment protection strictness, 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. 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.

The overall OECD employment protection variable (EMP-OECD) has 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 4.3.2.2 with regards to the impact of dismissal costs on bank inefficiency using the *Fraser Index.* Moving to the three subcomponents of the OECD index, 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 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 *Strictness of Employment Protection* index adds further validity to the results obtained with the use of the *Fraser Index* that the main channel through which labour regulation can harm bank performance is through dismissal costs. Labour regulation rigidities, such as high dismissal costs, could also have a negative effect on bank performance because they can act as barriers to entry for new firms (Scarpetta et al. 2004; 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 (Loayza, 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 reduces the incentives of firms to innovate (Saint Paul, 2002; Michie and Sheehan, 2003; Koeniger, 2005; Barbosa and Faria, 2011).

4.3.2.4 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 actually 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 *Strictness of Employment Protection* index are presented in Tables 8 and 9 respectively.

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)
DCP	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
N of instruments	67	67	67	67	67	67	67
Wald	107.86***	87.78***	89.49***	90.53***	86.89***	84.64***	87.23***
AR2 p-value	0.2329	0.2115	0.2309	0.2331	0.2285	0.2213	0.2167
Hansen-J p-value	0.383	0.169	0.212	0.180	0.583	0.278	0.149

Note: The table reports the dynamic panel results for the 2000-2010 periods for the labour regulation components of the *Fraser Index of Economic Freedom* and their interaction with the rule of law . The two step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer*-corrected robust standard errors. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, MW-FR is hiring and minimum wage regulation, HF-FR stands for hiring-firing regulation, CCB stands for centralised collective bargaining, HR-FR is hours regulation, DISS-FR stands for dismissal cost regulation, LR-FR stands for the overall labour regulation, and RL-WB stands for rule of law. 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 *Strictness of Employment Protection* index - 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)
DCP	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
N of instruments	57	57	67	57
Wald	109.78***	104.25***	74.48***	105.13***
AR2 p-value	0.3232	0.3223	0.2865	0.3500
Hansen-J p-value	0.467	0.310	0.197	0.154

Note: The table reports the dynamic panel results for the 2000-2009 periods for the labour regulation components of the OECD *Strictness of Employment Protection* and their interaction with the rule of law. The two step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer*-corrected robust standard errors. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, RL-WB stands for rule of law, EMP-OECD stands for the overall index of employment protection strictness, 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. 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.

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 negative and statistically significant at the 10% level coefficient. Similarly, the interaction between hours regulation (HR-FR) and the rule of law (RL-WB) is negative 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 negatively 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 *Strictness of Employment Protection* index. 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 *Strictness of Employment Protection* index, and the rule of law (RL-WB) show that the negative impact of rigid labour regulation on bank performance is magnified in the presence of higher levels of law observance. These results are in accordance with Caballero et al. (2013) who find that it is the actual enforcement of labour regulation that can affect negatively economic performance by reducing productivity growth due to increased compliance costs. Furthermore Almeida and Carneiro (2009) find that the enforcement of labour regulation reduces several measures of firm performance such as output, sales, capital stock and productivity. This decreased firm performance of the firms located in countries with more strictly enforced labour regulation could be channelled to the banking sector via higher levels of loan defaults.

4.3.2.5 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 subdues or becomes 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 *Strictness of Employment Protection* index. These estimations are available in tables 10 and 11.

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)
DCP	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
N of instruments	68	68	68	67	68	68	67
Wald	111.96***	126.24***	119.67***	110.40***	90.10***	102.21***	97.27***
AR2 p-value	0.2845	0.2806	0.2621	0.2216	0.2627	0.2593	0.2316
Hansen-J p-value	0.471	0.112	0.357	0.456	0.234	0.152	0.398

Note: The table reports the dynamic panel results for the 2000-2010 periods for the labour regulation components of the *Fraser Index of Economic Freedom* and their interaction with the crisis dummy (CRISIS DUM). The CRISIS DUM variable takes a value of 1 for the years 2008 to 2010 and zero otherwise. The two step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer*-corrected robust standard errors. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, MW-FR is hiring and minimum wage regulation, HF-FR stands for hiring-firing regulation, CCB stands for centralised collective bargaining, HR-FR is hours regulation, DISS-FR stands for dismissal cost regulation, and LR-FR stands for the overall labour regulation. 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 *Strictness of Employment Protection* index - 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)
DCP	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
N of instruments	58	58	68	58
Wald	158.77***	214.48***	556.34***	215.42***
AR2 p-value	0.3439	0.3483	0.3177	0.3492
Hansen-J p-value	0.107	0.198	0.158	0.124

Note: The table reports the dynamic panel results for the 2000-2009 periods for the labour regulation components of the OECD *Strictness of Employment Protection* and their interaction with the crisis dummy (CRISIS DUM). The CRISIS DUM variable takes a value of 1 for the years 2008 to 2009 and zero otherwise. The two step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) is used with *Windmeijer*-corrected robust standard errors. The dependent variable is the cost inefficiency scores (INEF) calculated using SFA and assuming a common frontier across countries. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, EMP-OECD stands for the overall index of employment protection strictness, 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. 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.

In model 7 of Table 10 the overall *Fraser Index* of 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 Index* of labour regulation. 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 individual 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. 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 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 loan defaults.

4.4 Conclusion

In this study we explore if labour regulation is a statistically significant determinant 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 *Strictness of 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 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 subdues 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.

Appendices to Chapter 4

Appendix A

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 pros. 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 (2010)	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*

Variable	Category	Nature	Score	Description	Source
LR-FR	Labour Regulations	Component of the Regulation of Credit, Labour and Business	0-10 (higher more liberal)	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 more liberal)	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 more liberal)	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 more liberal)	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 more liberal)	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 more liberal)	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 more liberal)	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: OECD *Strictness of Employment of Protection* Index

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 *Strictness of Employment Protection* index
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 *Strictness of Employment Protection* index
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 *Strictness of Employment Protection* index

Appendix B

Table B1: Cost Function with Stochastic Frontier Analysis (SFA)

	Coefficient	Standard Errors	p-value
constant	1.25837***	0.4060	0.0019
$\ln P_1$	0.51400***	0.0832	0.0000
$\ln P_2$	0.07553	0.0771	0.3274
$\ln Y_1$	0.38092***	0.0507	0.0000
$\ln Y_2$	0.49455***	0.0509	0.0000
$\ln N_1$	0.25340***	0.0398	0.0000
$\ln N_2$	-0.17064*	0.0882	0.0529
$(\ln P_1)^2$	0.11215***	0.0089	0.0000
$(\ln P_2)^2$	0.05877***	0.0116	0.0000
$(\ln P_1)(\ln P_2)$	-0.20894***	0.0208	0.0000
$(\ln Y_1)^2$	0.13349***	0.0038	0.0000
$(\ln Y_2)^2$	0.15226***	0.0040	0.0000
$(\ln Y_1)(\ln Y_2)$	-0.29902***	0.0086	0.0000
$(\ln P_1)(\ln Y_1)$	-0.04819***	0.0054	0.0000
$(\ln P_2)(\ln Y_1)$	0.03945***	0.0069	0.0000
$(\ln P_1)(\ln Y_2)$	0.00338	0.0059	0.5693
$(\ln P_2)(\ln Y_2)$	-0.01417**	0.0064	0.0265
$(\ln N_1)^2$	0.00451	0.0043	0.2984
$(\ln N_2)^2$	-0.01049	0.0147	0.4752
$(\ln N_1)(\ln N_2)$	0.01613	0.0107	0.1301
$(\ln N_1)(\ln Y_1)$	-0.00675*	0.0036	0.0626
$(\ln N_1)(\ln Y_2)$	-0.01683***	0.0033	0.0000
$(\ln N_1)(\ln P_1)$	-0.01349***	0.0049	0.0055
$(\ln N_1)(\ln P_2)$	0.04169***	0.0061	0.0000
$(\ln N_2)(\ln Y_1)$	0.01970***	0.0068	0.0037
$(\ln N_2)(\ln Y_2)$	0.00777	0.0072	0.2803
$(\ln N_2)(\ln P_1)$	0.06172***	0.0099	0.0000
$(\ln N_2)(\ln P_2)$	-0.06023***	0.0123	0.0000
t	0.00444	0.0165	0.7873
$(t)^2$	0.00200**	0.0010	0.0476
$t(\ln P_1)$	0.01249***	0.0023	0.0000
$t(\ln P_2)$	-0.00570**	0.0027	0.0321
$t(\ln Y_1)$	0.01005***	0.0016	0.0000
$t(\ln Y_2)$	0.00218	0.0014	0.1257
$t(\ln N_1)$	0.00014	0.0013	0.9163
$t(\ln N_2)$	-0.01347***	0.0024	0.0000
C3	-0.00032	0.0003	0.2371

GDPgr	-0.00456**	0.0021	0.0334
INFL	0.02508***	0.0050	0.0000
Country Dummies		yes	
Sigma-squared(v)			0.0258
Sigma-squared(u)			0.0486
Sigma(v)			0.1606
Sigma(u)			0.2205
Number of observations			3130
Log likelihood			546.5325

Notes: The table depicts the estimations of the cost efficiency frontier using stochastic frontier analysis (SFA). P_1 and P_2 stand for the input prices of labour and physical capital Y_1 and Y_2 stand for the outputs of loans and other earning assets respectively, N_1 and N_2 are the fixed netputs of fixed assets and equity. As environmental (Z) variables we employ the three banks concentration ratio (C3), GDP growth (GDPgr), and the inflation rate (INFL). We also impose country dummies.

Table B2: Labour Regulations as Cost Inefficiency Determinants. Estimations that employ the Battese and Coelli (1995) Methodology.

Variables	Fraser Index		OECD Index	
constant	-2.231	***	-2.678	**
lnTA	-0.012		-0.034	
LA	0.147	***	0.232	***
EA	-0.201	***	-0.173	***
LLPL	-0.004	*	-0.020	
NIM	0.065	***	0.004	*
ROA	-0.038	**	-0.230	*
LIQAS	-0.010		-0.035	
lnGDPcap	0.026	***	0.019	***
DCP	0.001		0.002	*
lnDENS	-0.054	**	-0.003	*
MW-FR	-0.003	*		
HF-FR	-0.001			
CCB-FR	0.002			
DISS-FR	-0.074	***		
HR-FR	0.002			
CON-FR	0.001			
EMPREG-OECD			0.131	***
EMPTEMP-OECD			-0.030	
EMPCOLL-OECD			-0.010	
Log-lik	-952.483		-737.694	
LR test of the one sided error (x2)	1262.810		512.813	
Banks	373		412	
Observations	2269		2461	

Notes: The parameter estimates in this Table were obtained simultaneously with the parameters of the stochastic frontier using the Battese and Coelli (1995) model and present the effect of the covariates on the inefficiency term. TA stands for total assets, LA stands for the loan to total assets ratio, EA is the equity to assets ratio, LLPL is the ratio of loan loss provision to total loans, NIM stands for net interest margin, ROA stands for return on assets, LIQAS stands for the liquid assets to total assets ratio, GDPcap is GDP per capita in purchasing power parity (PPP) constant 2005 international $, DCP stands for the ratio of domestic credit to the private sector over GDP, DENS stands for population density, MW-FR is hiring and minimum wage regulation, HF-FR stands for hiring-firing regulation, CCB stands for centralised collective bargaining, HR-FR is hours regulation, DISS-FR stands for dismissal cost regulation, 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. 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. We also impose country and year dummies.

Chapter 5: Conclusions

This thesis explores in a comprehensive way the impact that country-level business regulation had on the performance of the banking sector in the European Union over the 2000-2010 period. This topic is a novel contribution on the literature that examines the determinants of bank performance and has important public policy implications. The contribution begun by examining the impact of labour, business and credit related regulation on the performance, as measured by cost efficiency, of banks in the EU-10 (transition) economies over the 2000-2010 periods (Chapter 2). During the last decade the EU-10 countries have almost completed their transition from centrally planned to free market economies making the assessment of the impact of non-transition related regulations on bank performance a timely issue. In particular, we have estimated cost efficiency scores for banks located in the EU-10 over the 2000-2010 periods using a non-parametric approach (DEA). Then we have regressed these scores in fixed effects, dynamic panel and panel vector autoregression (VAR) models over the regulation variables available in the *Fraser Index of Economic Freedom*. An important finding is that more liberal labour regulation is positively related with bank efficiency. This could be attributed to the direct reduction of personnel costs for the banks in the EU-10 but also increased performance of the firms in the non-financial sector due to less stringent labour regulation that could be channelled in the banking sector via a reduction in loan defaults. In terms of credit regulation, we have found a robust positive impact of the internationalisation of the banking systems of the EU-10 economies on bank efficiency. The index we have used captures both foreign bank presence and barriers to entry for foreign banks so the positive relationship between bank system internationalisation and bank performance could have a double interpretation. Foreign banks may bring the benefit of superior screening and risk management techniques in the EU-10 economies improving in that way performance. Furthermore, a reduction in the barriers to entry in the domestic market for foreign banks may reduce moral hazard by domestic banks and induce them to improve their performance. Finally, we find that business regulation does not exert a significant impact on bank performance in the EU-10 economies over the 2000-2010 period.

The public policy implications are clear from this chapter and suggest that the increased internationalisation of the EU-10 banking systems as well as a less stringent regulation of labour could prove beneficial for bank performance.

In Chapter 3 we have examined the impact of several types of business regulation on bank performance, as measured by cost efficiency, in the whole of the EU (EU-27) over the 2004-2010 period by using regulatory data from the *"Doing Business"* project of the World Bank. In particular we examine the impact on bank performance of regulations related to: *getting credit, paying taxes, starting a business, enforcing contracts, protecting investors, resolving insolvency* and *employing workers.* We put special emphasis on the "*getting credit"* type of regulations as they are directly relevant to the banking sector. We also give a strong emphasis to the "*paying taxes"* and *" starting a business"* type of regulations. This is because "*paying taxes"* related regulation is central to the efforts of EU policymakers to increase government revenue and improve public finances as a measure to wither the sovereign debt crisis while the *" starting a business"* type of regulations is of importance for EU governments to improve competitiveness in the aftermath crisis but also to close the competitiveness gap between the US and the EU and wither competition from emerging markets such as China and India. It is a useful endeavour then to examine the effect that reforms in business regulation could have on the banking systems of the EU economies. To this end, we have estimated cost efficiency scores for banks in the EU-27 over the 2004-2010 periods using stochastic frontier analysis. Then we have regressed these scores in fixed effects and dynamic panel models over the regulation variables of the *Doing Business"* project of the World Bank. The results of this research are important as for the first time in the literature is examined the impact of business regulations on bank performance and significant results emerge. As far as concerns the "*getting credit"* type of regulations, we find that the strength of creditor rights has a negative impact on bank performance but on the other hand the depth of creditor rights as well as the population coverage of credit bureaus have a positive effect of bank efficiency. Strong creditor rights might increase moral hazard and complacency in the loan origination process and this might lead to an increase in loan defaults decreasing in that way performance. On the other hand increased quality and coverage of credit information induces banks to make better informed choices to who they loan to and

this could lead to improvements of bank performance. In the light of these results important policy implications emerge. Regulators in the EU-27 should focus more on credit information infrastructure rather than the mere strengthening of creditor rights in order to improve the performance of the banking system. In some way credit information infrastructure could also act as a creditor rights enhancement mechanism as bank customers would avoid to get blacklisted and be excluded from future financing. Furthermore we find that stringent regulation related to "*starting a business"* has a negative impact on bank performance as measured by cost efficiency. This could be attributed to the decreased performance of the non-banking sectors due to decreased competition that could be channelled to the banking sector due to increased loan defaults. Similar results are obtained for the *"paying taxes"* category of business regulations. Increased taxation burden both in terms of bureaucracy related regulation (number of tax payments per year and time dedicated by a firm for tax compliance) and profit taxation has a negative on bank performance in the EU-27. These results lead to important policy implications. A decrease in the burden of "*starting a business"* type of regulations could lead not only to an increase in the competitiveness of the EU-27 economies but also have a positive effect in their banking systems. This result is timely as several EU economies, especially the ones of the EU periphery, try to simplify their *"starting a business*" regulation in order to improve competitiveness and in this way wither the sovereign debt crisis. On the other hand, the results for the *"paying taxes"* regulation can serve as a warning that when governments want to use taxation as a measure of increased government revenue in order to improve public finances they could harm the banking sector of the economy. Governments, should at least try to improve the bureaucracy related components of the *"paying taxes"* type of regulations.

In many cases we also find that the individual effect of several business regulation variables is influenced by institutional quality as measured by the rule of law and control of corruption variables. This is a second important contribution of Chapter 3. The rationale of interacting the business regulation variables with the rule of law is to capture the extent to which regulations are in place but are not actually enforced. The interaction of the business regulation variables with the control of corruption variable serves to explore the "*grease the wheels*" (Lui, 1985) and the "*sand the*

wheels''(Murphy et al., 1993) hypotheses of corruption[28]. An important finding is that the positive impact of the quality of credit information variable (depth of credit information) and of the coverage of private sector credit registries subdues at higher levels of rule of law. This could mean that the informational advantages that the depth of credit information and of the private sector credit registries coverage gives to banks are more important for countries with lower level of rule of law where contracts, as for example loans, are less respected. This finding is important in terms of public policy as it warrants the improvement of the credit information depth for the countries of the EU that are characterised by lower levels of rule of law. This is especially true for the countries of the EU periphery such as Greece, Italy, Spain and Portugal but also for some of the new EU member states. Another important finding is with regards the *"paying taxes"* type of regulations and their interaction with the control of corruption variable. More particularly, the main effect of the number of yearly tax payments and of the time dedicated by firms to comply with tax regulation on bank performance is negative but this effect subdues in the presence of higher control of corruption providing evidence of the *"sand the wheels"* hypothesis. A public policy implication from this is that the reduction of the bureaucracy related taxation regulatory burden becomes of increased importance for the EU economies with higher levels of corruption. In many other cases we also find that the impact of business regulations on bank performance in the EU-27 is influenced by institutional quality. This implies regulators should take a note of institutional quality when prioritising and implementing reforms.

In Chapter 4 we investigate in detail the impact of different types of labour regulation on the performance, as measured by cost efficiency, of banks located in the countries of the Eurozone Periphery (Greece, Ireland, Italy, Portugal and Spain) over the 2000-2010 period. These countries are still in the process of recovering from the sovereign debt crisis and regulatory reforms are at the top of their economic

[28]As it is explained in Chapter 3, the "*grease the wheel*" hypothesis denotes that higher levels of corruption may speed up bureaucratic processes (see, for example Lui, 1985) and could thus increase firm operational efficiency while the "*sand the wheels*'' hypothesis contends that higher levels of corruption represent an additional cost when dealing with public sector bureaucracy (Murphy et al., 1993) and so further impede operational efficiency.

policy agenda in order to restore national competitiveness. Furthermore, these countries (with the exception of Ireland) until recently were characterised by stringent regulation of labour. To estimate cost efficiency scores we use SFA. We then regress these scores in fixed effect and dynamic panel models over several labour regulation variables and other bank-specific and country-specific control variables. To increase the credibility of our results we use labour regulation variables from two sources: the *Fraser Index of Economic Freedom* and the *Strictness of Employment Protection Index* from the OECD. We identify that stringent labour regulation overall has a negative impact on bank performance. By decomposing the labour regulation index of the *Fraser Index of Economic Freedom* we find that the specific type of labour regulation that harms bank performance is dismissal cost regulation and hiring and minimum wage regulation. The results from the alternative labour regulation index, the OECD *Strictness of Employment Protection Index*, confirms the result for the dismissal cost regulation and further identifies that the main channel through which stringent regulation of dismissals harms bank performance is through the protection of employees in regular contracts. This result supports, at least in terms of bank performance, the recent regulatory efforts of the government in the Eurozone periphery to make labour regulation less stringent at least with regards to dismissal costs and hiring and minimum wage regulation. Furthermore we find, in accordance with the labour economics literature, that the negative effect of labour regulation on bank performance is more pronounced in countries where such regulation is actually enforced (i.e. in countries with higher levels of rule of law). Finally we find that the negative impact of labour regulation on bank performance is magnified during the crisis years (2008-2010). As these countries are still in a recession phase, a fast implementation of liberal reforms in their labour markets is warranted for improvement in the performance of their banking sectors.

This study is not short of limitations. We use cost efficiency as a measure of bank performance. However, the examination of profit efficiency is also of great interest. Firms, such as banks, are profit maximising units and the target of profit maximisation does not necessarily imply a cost minimisation of the production of bank services. Berger and Mester (1997) for example do not find a positive correlation between bank profit and bank cost efficiency and argue that profit

efficiency, in comparison with cost efficiency, represents a more complete measure of performance of the banking sector as it incorporates the revenue side of a bank's balance sheet. A future investigation of the impact of business regulations on bank performance as measured by profit efficiency would be a useful and interesting endeavour. Future research could also examine the impact of business regulation on bank performance using standard financial ratios such as the cost to income ratio or the return on assets (ROA). Such financial ratios represent, in comparison with efficiency estimation, crude measures of bank performance. However it would be interesting to investigate if the impact of different types of business regulation on bank performance is verified using these type of variables as measures of bank performance.

A second important limitation of this study is that it does not examine the heterogeneity of the impact of the bank-specific type of regulations, as for example the depth of information in the credit registries and the strength of creditor rights, on the performance of foreign *vis*-à-*vis* domestic banks. The theoretical premise behind this are the *"home advantage" and the "global advantage"* hypotheses posed by Berger et al. (2000). If the *"global advantage"* hypothesis holds then we would expect for example the positive impact of credit information depth on bank performance to be less pronounced for foreign banks as their strong firm-specific advantages (such as superior loan monitoring technologies) might enable them to operate more efficiently *vis*-à-*vis* domestic competitors even in countries characterised by low levels of credit information depth. On the other hand, if the *"home advantage"* hypothesis holds then domestic banks would be able to operate more efficiently than foreign banks at a given level of bank-specific type of regulation as they have the extra advantage to operate with better knowledge of the domestic environment. It is important to note that this avenue of future research also allows the investigation of the impact of regulatory distance (see for example Lensink et al., 2008) on foreign bank performance. The concept of regulatory distance could serve as measure of the liability of being foreign. For example a subsidiary of a bank located in an economy with low levels of credit information depth while its parent originates from a country with high levels credit information depth faces increased liability of foreignness and this could have an impact on its performance.

Another important limitation of the research carried out in this thesis is that several regulation variables that are examined in terms of their impact on bank performance are country wide regulations (for example the labour regulation variables used in this study) and not specific to the banking sector. This makes it hard to disentangle if the impact of such regulatory variables on bank performance is occurring because of the direct effect these regulation can have on banks or indirectly by influencing the performance of the non-banking sectors, which could consequently be channelled to the banking sector. In this thesis for the types of regulation that are country wide and not bank-specific we have given arguments for both of these potential channels. Future research could focus on creating measures of regulations directly relevant to the banking sector, as for example bank-specific labour regulation measures, in order to overcome this issue.

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