Financial freedom and bank efficiency:

Evidence from the European Union

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Abstract

This paper investigates the dynamics between the financial freedom counterparts of the economic freedom index drawn from the Heritage Foundation database and bank efficiency levels. We rely on a large sample of commercial banks operating in the 27 European Union member states over the 2000s. After estimating bank-specific efficiency scores using Data Envelopment Analysis (DEA), we develop a truncated regression model combined with bootstrapped confidence intervals to test our main hypotheses. Results suggest that the higher the degree of an economy's financial freedom, the higher the benefits for banks in terms of cost advantages and overall efficiency. Our results also show that the effects of financial freedom on bank efficiency tend to be more pronounced in countries with freer political systems in which governments formulate and implement sound policies and higher quality governance.

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1. Introduction

Recent research in banking is increasingly using the indexes of "economic freedom" as explanatory variables in regressions that consider various aspects of bank performance in general (e.g., Demirguc-Kunt et al., 2004) and bank efficiency specifically (e.g., Chortareas et al., 2011). There exists indeed a powerful rational for doing so, and the view that the liberty of individuals to pursue their economic goals leads to efficient outcomes is as old as the economics science itself. The development of quantitative indexes of economic freedom over the last two decades allowed to explicitly analyze the effects of liberal economic institutions (or the lack of them) on various aspects of economic performance. Nevertheless, in the banking literature the indexes of economics freedom have been used only as control variables and/or have been inaccurately interpreted as regulation indexes. Moreover, the recent financial crisis revealed fundamental weaknesses in the regulatory framework of financial institutions. Different analysts and policymakers attribute the recent travails of the financial industry to too little, too much, or inappropriate regulation[1] with a consensus being formed toward stronger and new forms[2] of regulation. An emerging question in the midst of this debate is if and how economic and financial freedom may affect the performance of financial institutions.

This paper constitutes the first attempt, to our knowledge, to explicitly characterize the effects of "financial freedom" indexes on bank efficiency, controlling for the banking, economic, and institutional variables that one typically encounters in financial literature. We focus explicitly on the financial counterparts of the economic freedom indexes and we distinguish between the concepts of financial freedom and regulation. Our analysis can also be interpreted as a robustness check of the constructed freedom indexes themselves. Banks

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[1] For example, recall the failure of the Financial Crisis Inquiry Commission (henceforth, FCIC) to reach a consensus and the presence of two dissenting views (FCIC, 2011).

[2] E.g., HM Treasury (2010).

that operate under a high degree of financial freedom and fail to display, ceteris paribus, higher levels of productive efficiency would be in contrast with basic tenets of economic theory.

We obtain efficiency scores for banks operating in 27 European Union (EU) countries using Data Envelopment Analysis (DEA) over the period 2001-2009, utilizing 6,744 bank observations. We then regress the efficiency estimates on the financial/economic freedom indexes from the Heritage Foundation (2010), which aim at capturing the "greater independence in financial and banking markets from government control". We employ the Simar and Wilson's (2007) truncated regression model combined with bootstrapped confidence intervals and we carry out a sensitivity analysis for robustness using a fractional logit estimator. Our analysis controls for bank-specific variables accounting for financial strength, relative size of the institutions and a proxy for credit risk. In addition, we consider institutional variables to account for government quality.

The rationale for the hypothesized relationship between financial freedom and bank efficiency is straightforward: the less are the constraints faced by financial institutions on how to manage their business the more effective they should be in controlling their costs, thus resulting in a more efficient resources allocation process. Our focus is on the commercial banking business rather than on the activities of large complex financial institutions. Moreover, our interest is confined explicitly on a specific bank performance measure, i.e., productive efficiency. Of course, one could argue that excessive financial freedom may contribute to financial institutions' propensity to take on greater risks, which in turn may have contributed to the recent global and European crises. This dimension, however, is beyond the scope of the present paper.

No research exists, to our knowledge, focusing explicitly on the effects of financial freedom on the productive efficiency of financial institutions. The banking literature typically

considers the effects of the regulatory environment of banks (e.g., capital requirements, regulatory policies, and banking supervision) on banking system development, banking crises, and bank efficiency (this latter is often proxied by accounting ratios, e.g., Barth et al., 2006). Studies that consider the effects of economic freedom on bank performance typically treat the freedom index as one of the control variables (e.g., Claessens and Laeven, 2004; Goddard et al., 2011), and include other aspects of bank performance than efficiency such as the interest rate margins (Demirguc-Kunt et al., 2004). Other relevant research considers explicitly bank efficiency focusing on banking reforms and liberalization (e.g., Fries and Taci, 2005). Moreover, the existing research typically focuses on the aggregate freedom index and not on the specific financial freedom counterparts, which gives rise to the possibility of misspecification bias (Heckelman and Stroup, 2000).

Our results indicate that there is a strong link between financial freedom and bank efficiency. In particular, the higher the degree of an economy's financial freedom, the better the banks' performance is in terms cost advantages and overall efficiency. The evidence also suggests that any beneficial effects of financial freedom on bank efficiency tend to be more pronounced in countries with freer political systems in which governments formulate and implement sound policies and higher quality governance.

The remaining of the paper is organized as follows: Section 2 reviews the literature on the economic and financial freedom indexes and its potential relationship with bank efficiency. Section 3 presents the empirical methodology and the data. Section 4 discusses the empirical results, and Section 5 concludes.

2. Literature review

Using the economic freedom indexes, extensive empirical evidence has been produced focusing on the effect of economic freedom on growth (e.g., De Haan and Sturm, 2000; Gwartney, 2009). Other studies consider the effects of economic freedom on inequality (Sala-i-Martin, 2007), income convergence (Xu and Haizheng, 2008), aggregate productive efficiency (Adkins et al., 2002), entrepreneurship (Nystrom, 2008), labour markets (Feldmann, 2009) and migration flows (Ashby, 2010). Indexes of economic freedom have also been used as explanatory variables in financial economics (e.g., Roychoudhury and Lawson, 2010) and in characterizing the effects of the recent global recession (Giannone, et. al., 2011).

The empirical literature considering the effects of the economic freedom indexes on various aspects of the economy is extensive but a common thread that emerges from the evidence is that economies enjoying a high degree of economic freedom can, on balance, achieve better economic outcomes. In the financial economics and banking literature the indexes of economic freedom have been used as control variables in various contexts (e.g., Roychoudhury and Lawson, 2010).

Extensive research has been developed over the last two decades gauging financial institutions' efficiency using econometric and linear programming techniques.[3] The reasons for the surge in bank efficiency studies include the changes in the regulatory and operating environment which render banks more concerned about controlling their costs while optimising revenues. In addition, bank inefficiencies can have direct implications for social welfare in the form of deadweight social costs as inefficient banks could price their output above marginal social cost, achieving excessive profits. Moreover, in the aftermath of the global financial crisis, achieving high levels of efficiency on the cost side has become a critical factor for the survival of financial institutions.

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[3] For comprehensive survey see Goddard et al. (2001).

While theoretical models analyzing explicitly the role of economic freedom on bank efficiency have not been developed, as far as we are aware, the effects of restrictions on a number of aspects of the banking business have been widely analyzed. Flannery (1984), for example, considering the restrictions faced by U.S. commercial banks in establishing more than one full service office location, observes that constraints preventing free entry to the banking industry may force unit banks to operate with a socially inefficient combination of inputs. The analysis of banking efficiency has been considered in various contexts, but some contributions focus explicitly on the effects of the institutional environment within which banks operate (see, among others, Demirguc-Kunt et al., 2004; Barth et al., 2006). Evidence suggests that economic, regulatory, and institutional differences play a crucial role in the efficient operation of banks, and can explain the discrepancies in efficiency among banking sectors in different countries.

Following this path, a number of studies have already included indicators that examine the degree of financial liberalisation. La Porta et al. (1998) do not directly account for banking sector's efficiency but include traditional indicators of common law, creditor rights, rule of law and find that countries with more robust investor protection (where agency costs are restricted by the law) have larger capital markets. The "rule of law" has been also used to capture the effects of severe enforcement practices for any given level of creditors or shareholders' protection. In contrast, Fries and Taci (2005) consider the role of banking sector reform and liberalization in the transition countries to capture the effect on bank cost efficiency. The key explanatory variable of interest is an index of banking sector reform published by the European Bank for Reconstruction and Development (EBRD) Transition Reports. Their results show that progress in banking reform is significantly associated with a decrease in banks' costs.

Focusing on the impact of regulatory and supervisory restrictions, Demirguc-Kunt et al. (2004) find that regulatory restrictions on banking activities are associated with higher level of interest margins. Other studies argue that more openness in the banking markets, in terms of increased foreign penetration, reduces bank margins and improvise the efficiency of the banking systems (Claessens et al., 2001). Barth et al. (2006) examine bank regulation using data from more than 150 countries and conclude that strengthening capital standards or empowering supervisors does not boost bank performance, reduce corruption in lending, or lower banking system fragility. Other recent studies focusing on the relationship between regulatory restrictions and bank efficiency measured with frontier methods include Pasiouras et al. (2009). Similarly, evidence produced by Chortareas et al. (2012) indicates that the effect of banking regulation and supervision on bank performance appears to change with the type of regulation.

The main rationale for government's involvement in the financial sector relies on the "market failure" approach which postulates that various imperfections prevent competitive markets from delivering the most efficient outcomes.[4] Information asymmetries (e.g., Stiglitz, 2002) play an important role among these imperfections. Government intervention is often justified in order to prevent the development of monopoly power and excessive risk taking by banks (e.g., Freixas and Santomero, 2004). On the other side of this debate stand the views that emphasize government failures. Greater independence of banks from government control allows the bank boards to be accountable to their shareholders while limited financial freedom can distort the incentives of bankers' boards that are accountable to government bodies and strive to meet particular government imposed regulations.

Similar debates have reemerged in the aftermath of the 2007-09 global financial crisis on various issues, including regulation, capital requirements, and government

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[4] This rational permeates, for example, the Turner Review (2009), produced by the UK's Financial Services Authority in response to the Chancellor's of the Exchequer request.

interference in the financial industry. One approach points to the deregulation of financial services and institutions as a fundamental reason that led to the crisis, while other approaches suggest that the seeds of the crisis were sown by a particular set of regulations rather than deregulation per se. Moreover, limited financial freedom may have encouraged financial institutions to create opaque new instruments and miscalculate risk. The current debate, in the context of the European crisis raises issues such whether the eurozone needs further centralization of banking supervision leading to a "banking union" with a centralized regulator and a eurozone-wide deposit insurance.

Overall, only a relatively limited number of studies use economic freedom indexes among several other control variables in the analysis of banking efficiency (e.g. Demirguc-Kunt et al., 2004; Chortareas et al., 2011). The main focus of these studies, however, is on the banks' institutional and regulatory environment. To our knowledge, no systematic attempt exists to explicitly measure the impact of financial/economic freedom on the efficiency of financial institutions and this is the task that we pursue in the following sections.

3. Data and methodology

3.1. Data sources

The dataset used in this study is composed of individual bank data sourced from unconsolidated statements of banks operating in the 27 European Union member countries, as made available through the BankScope database of Bureau van Dijk. We focus on commercial banking, which comprises one of the largest segments of depository institutions in Europe. To this end, bank holding companies, investment banks and securities houses, savings banks, real estate and mortgage banks, non-banking credit institutions, and other

specialised governmental credit institutions are excluded from the analysis. The chosen time span is 2001 to 2009, avoiding the period of the ongoing European crisis which implies a structural break for banks. We have also scrutinized the data to avoid inconsistencies, reporting errors, and double counting of institutions. Moreover in order to obtain a relatively homogenous dataset and assure credibility of the efficiency indexes, we apply the "Jackstrap" methodology.[5] Implementing the aforementioned screening methods, results in 6,744 commercial bank observations. The sample is unbalanced, while the average number of observations used is around 750 per year. Table 1 illustrates the number of banks included in the sample, as well as their total assets expressed in million euros.

<Insert Table 1 about here>

Data for the economic freedom are collected from the Heritage Foundation (2010) and data on the institutional and governance quality are drawn from the World Bank database by Kaufmann et al. (2010). There exist two major attempts to measure economic freedom producing the corresponding indexes, namely the *Economic Freedom of the World* Annual Reports produced by the Fraser Institute and the *Index of Economic Freedom* created by the Heritage Foundation and the Wall Street Journal. Both indexes are highly credible and their results are compatible in general. While the *Economic Freedom of the World* has been used extensively in the literature, in this paper we use the Heritage Foundation's *Index of Economic Freedom* for practical purposes because one of its components measures the "Finance Freedom."

In particular, the *Index of Economic Freedom* focuses explicitly on the components of "financial freedom" (previously dubbed "banking freedom") while the corresponding

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[5] For more details and application of the "Jackstrap" methodology see, Stosic and Sampaio de Sousa (2003); Chortareas et al. (2011).

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counterpart of the *Economic Freedom of the World* focuses on the "regulation of credit". The two indexes are not identical. A difference highlighted by Heckelman and Stroup (2000) is that the Heritage index of Freedom reflects primarily policy variables which are under the government's control while the Fraser index is dominated by outcome variables. The two indexes, however, produce consistent overall rankings (e.g., De Haan & Sturm, 2000). Finally, we should mention that for robustness purposes we have tested the key hypotheses of this paper using the *Economic Freedom of the World* data (albeit for shorter periods) and the results point to the same direction as the ones reported below.

3.2. Measuring bank efficiency: Non-parametric DEA

To examine the impact of economic and financial freedom on bank efficiency, we use a two-stage approach. In the first stage, we derive input-oriented non-parametric efficiency scores. In the second stage the DEA efficiency scores are regressed against a variety of economic freedom and other bank-specific and institutional control variables.

The DEA approach employs a linear programming framework and makes some fairly general assumptions about the underlying production technology to yield an estimate of the Farrell's (1957) efficiency measure for each bank in a given sample. The first version of DEA (Charnes et al. 1978) assumes constant returns to scale (CRS), i.e. a change in inputs is followed by a change in the same proportion of the outputs. In this paper, we employ an input-oriented DEA model with variable returns to scale (VRS) developed by Banker et al. (1984), i.e. the VRS relaxes the constant returns to scale assumption and allows for the possibility that the banks' production technology may exhibit increasing, constant, or

decreasing returns to scale. In the linear programming problem, the VRS specification adds a convexity constraint to the original Charnes et al.'s (1978) model[6].

Banks' efficiencies are measured relative to a common frontier by pooling the data across countries estimated separately for each year. This approach allows us to estimate efficiency differentials not only between commercial banks within a country but across countries as well as using the same benchmark. Accordingly, we adopt the intermediation approach, which assumes that banks use deposits, labor and capital to produce loans and other earning assets. Selected descriptive statistics for the inputs and outputs used in the DEA efficiency measurement are presented in Table 2.

<Insert Table 2 about here>

3.3. Economic freedom and bank efficiency

In the second stage, the efficiency scores serve as the dependent variable in the estimation of the following equations:

$$EFF_{i,k} = \alpha + \beta_1 H_i + \beta_2 B_{i,k} + \beta_3 YEAR_t + \varepsilon_{i,k} \qquad \text{(1a)}$$

$$EFF_{i,k} = \alpha + \beta_1 FINFREE_i + \beta_2 B_{i,k} + \beta_3 I_i + \beta_4 YEAR_t + \varepsilon_{i,k} \qquad \text{(1b)}$$

where i indexes country i, k indexes bank k, H_i is a vector of economic freedom indicators in country i, $B_{i,k}$ is a vector of bank-specific characteristics for each bank k in country i, I_i is a vector of governance indicators in country i, $YEAR_t$ is a yearly dummy variable

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[6] The input orientation implies input minimisation while keeping a given output level.

controlling inter alia for other macroeconomic and technical changes, and $\varepsilon_{i,k}$ is the error term. The dependent variable *EFF* is the managerial efficiency measure, measuring how far the bank is from the estimated efficient frontier.[7] Equation (1b) includes the financial freedom variable (FINFREE), which proxies for banking and financial freedom, and additional controls using governance indicators, as constructed by the Worldwide Governance Indicators (WGI) of the World Bank (Kaufmann, et al., 2010) to account for the quality of institutional development in each country. The main hypothesis we wish to test is whether better governance, as measured by six complementary indexes each one capture a different dimension of government quality, may have affected bank efficiency. Thus, we want to prevent our indexes of economic freedom capturing the effects of these governance and political indicators.

To estimate equations 1a and 1b we employ the Simar and Wilson (2007) parametric regression bootstrap, which incorporates the parametric structure and distributional assumptions of the equations, to estimate bootstrap confidence intervals for the parameter estimates $\hat{\beta}_{1-3}$. This is achieved by using 2000 bootstrap replications. As a sensitivity analysis, we also estimate equations 1a and 1b using Papke and Wooldridge's (1996) fractional logit estimator (discussed below).

The data for the variables accounting for economic freedom (variables in vector H_i of equations 1a and 1b) are obtained from the *Heritage Foundation*'s (2010) database. Specifically, we define the vector H_i as follows:

$$H_i = (FINFREE_i, GOVERNEXP_i, PROPERTY_i, CORRFREE_i, BUSINESS_i, INDEX_i) \qquad (2)$$

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[7] In other words, this is a relative measure that implies the best-practice banks are by definition one hundred per cent efficient, while the others are characterized as inefficient relative to them.

where FINFREE, is an overall indicator of financial and banking freedom with larger values signifying more freedom. This variable has been used as a proxy of the degree of openness of the banking industry (see among others, Demirguc-Kunt et al. 2004; Chortareas et al., 2011). An open and transparent banking environment facilitates access to financing and encourages competition to provide efficient financial intermediation between households, firms, as well between and investors and entrepreneurs.

In order to control for other freedom counterparts and to capture a country's broader environment within which economic activity takes place, the vector H_i also includes the following variables from the Heritage foundation: government spending, property rights, freedom from corruption and business freedom. High levels of government spending (GOVERNEXP) indicate enhanced government involvement in the economy. Higher values of the Property Rights index (PROPERTY) indicate a high degree of protection of private property rights. Freedom from corruption (CORRFREE) is defined as the failure of integrity in the system, a distortion by which individuals are able to gain at the expense of the whole. Freedom from corruption is expected to promote equitable treatment and greater regulatory efficiency (Miller and Holmes, 2010). The Business Freedom variable (BUSINESS) is a proxy of the ability to establish and run a business without interference from the government. Burdensome and redundant regulatory rules are the most common barriers to the free conduct of business activities. Finally, the economic freedom index variable (INDEX), is an aggregate measure of a country's overall economic freedom from 10 different viewpoints. The economic freedom indicators take values in a scale from 0 to 100, where higher values indicating an economic environment or set of policies that is most conducive to economic freedom.

The regression specifications in equations 1a and 1b account for bank- specific $B_{i,k}$ control variables; while equation 1b further includes country-specific I_i institutional control variables as a robustness check. The corresponding vectors are defined as follows:

$$B_{i,k} = (EQAS_{i,k}, ROAE_{i,k}, LNTA_{i,k}, CR_{i,k}) \tag{3}$$

$$I_i = (VOICE_i, STABILITY_i, GOVERN_i, REG_i, LAW_i, CORR_i) \tag{4}$$

The vector, $B_{i,k}$, described in equation 3, includes other bank-specific factors that might influence the efficiency of a particular bank included in the second-stage regression model. The bank-specific variables include the following: (i) level of capitalization, proxied by the equity over total assets ratio (EQAS); (ii) profitability, measured by the return on average equity (ROAE); (iii) bank size, defined as the logarithm of the bank's total assets (LNTA); and (iv) credit risk, captured by the total loans to assets ratio (CR).

The vector of institutional control variables, I_i, in the efficiency equation 4 includes the following variables from Kaufman et al. (2010) dataset on institutional development: voice and accountability (VOICE), political stability (STABILITY), government effectiveness (GOVERN), regulatory quality (REG), rule of law (LAW) and control of corruption (CORR). The six governance indicators are measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes. Finally, the set of YEAR dummy variables in equations 1a and 1b controls, inter alia, for other macroeconomic, regulatory and technological changes in the economy. Table 3 reports the descriptive statistics for the variables employed in the model. The Table shows average efficiency scores of about 72%, thus suggesting that banks have considerable scope for reducing wasted inputs while at the same time increasing desirable output

<Insert Table 3 about here>

4. Results

4.1. Financial freedom and bank efficiency

To consider to what extent economic and financial freedom affect the efficient operation of banks, we regress the estimated efficiency scores on economic freedom indexes along with a selection of bank-specific and institutional variables. Equations 1a and 1b are estimated using Simar and Wilson's (2007) truncated regression model and confidence intervals are computed using 2000 bootstrap replications.

Tables 4 and 5 report the parameter estimates and their bootstrapped confidence intervals.

<Insert Tables 4 and 5 about here>

Each model in Table 4 presents the results derived from alternative economic freedom variables while controlling for a selected set of relevant bank-specific variables frequently employed in banking studies. In particular, the first column in Table 4 reports the basic regression model that includes the financial freedom variable and bank-specific control variables (model 1). The next five columns include alternative economic freedom control variables one at a time (models 2-6), while the last column (model 7) tests whether all the economic freedom variables are significant as a group. Table 5 reports results from robustness checks, which consist in incorporating key governance indicators in the specification. We start from the basic regression model (model 1) and proceed with further

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controlling for institutional and bank-specific factors. To avoid problems of multicollinearity we include institutional control variables one by one (models 1-6).

The financial freedom coefficient is positive at the 1% level of statistical significance in all models tested. The estimated results reveal strong evidence that a higher degree of restrictions and controls in the economy can have a significant role in reducing banks' efficiency scores. These results are broadly in line with recent empirical evidence considering the implications of liberalization and reforms in the financial sector (e.g., La Porta et al., 1998; Fries and Taci, 2005). Indeed, one would expect that when financial intermediaries operate in a less restricted environment they may be more likely to engage in competitive policies thus achieving higher levels of operating and other efficiencies. As noted above, there is not a direct mapping from financial freedom to bank regulation but nevertheless the two concepts are closely related. In this sense the results are broadly consistent with recent evidence provided by Barth et al. (2006), that greater controls may hinder bank performance.[8] Therefore, our evidence broadly suggests that policies that constrain banks' degree of financial freedom may result in an inefficient resources allocation process. This corroborates previous findings showing that regulatory restrictions tend to boost interest margins, for 72 countries around the globe (Demirguc-Kunt, et al., 2004).

The results also document a strong link between bank efficiency and government spending, property rights, freedom from corruption and business freedom. Banks in countries where the overall environment is conducive to the protection of the private sector property rights and the financial system is characterized by relatively high levels of openness tend to have higher efficiency levels. Put it differently, all coefficient estimates for the Heritage Foundation variables describing the country's financial environment indicate a positive and statistically significant relationship at the 1% level. Moreover, our results suggest that a

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[8] Efficiency in Barth, et al. (2006), however, is measured with accounting ratios and not with frontier analysis.

strong negative relationship between government spending and efficiency exists, implying that excessive government spending often leads to inefficiency, possibly through the channels of bureaucracy, waste, and lower productivity.

Table 5 shows the result from the estimation of equation (1b) which focuses on the relationship between efficiency and financial freedom, taking explicitly into account the governance and institutional settings. We conduct six regressions used as additional robustness checks for the obtained results. We consider the financial freedom along with selected institutional environment variables – such as the voice and accountability (VOICE), political stability (STABILITY), government effectiveness (GOVERN), regulatory quality (REG), rule of law (LAW) and control of corruption (CORR). The obtained results broadly corroborate the findings of the regressions based on equation 1a. In general, economic freedom and better institutional quality allow for more efficient financial institutions.

Turning to the bank-specific control variables in Tables 4 and 5, we find that the equity over total assets ratio (EQAS) variable has a positive sign. This is not a surprising finding and is supported by the literature that is consistent with the argument that higher capitalization contributes to alleviating agency problems between managers and shareholders (Mester, 1996). The effects of profitability and bank size on efficiency are also positive and significant in all the alternative specifications considered, suggesting that larger banking institutions with higher profitability ratios, benefit substantially banks' efficiency levels. Finally, the total loans to total assets ratio also carries a positive and significant sign, indicating that banks with higher proportions of loans may increase the pressures on management to effectively deal with credit risk, thus improving the efficiency of the banking institutions. It could also imply that banks that are more focused on the traditional banking business are on average more efficient.

The results on the institutional control variables suggest that banks operating under more open institutional frameworks are more likely to achieve higher efficiency levels. All tested variables are highly significant and positive to varying degrees, being particularly high for the variable VOICE – that measures the degree of freedom of expressions and free media in a country's system – and REG, a proxy for regulatory quality. This suggests that more developed and democratic systems are conducive to the more efficient operations of financial institutions. It also implies that the capacity of the government to effectively formulate and implement sound policies and promote socially desirable investments can enhance the efficiency in the industry and economy welfare. The regulatory quality proxy (REG) captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (Kaufmann et al., 2010). That is, this variable indicates good regulation and not more regulation. The index of regulatory quality displays a positive but very low correlation with the index of financial freedom and displays.

Overall, it appears that economic freedom is a key element of the environment within which financial institutions operate. More financial/banking freedom seems to be associated with higher efficiency scores in European banking. Furthermore, when controlling for institutional development, our results reveal a strong link between the quality of institutions and bank efficiency.

4.2. Sensitivity analysis

For robustness purposes, we re-estimate the second-stage regression models specified in equations 1a and 1b using the Papke and Wooldridge's (1996) 'fractional logit' estimator. The justification for carrying out this additional analysis is based on McDonald (2009) who

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argues that DEA efficiency is not the outcome of a truncated process but rather the outcome of a fractional logit process (it takes values between zero and one) and thus, not a latent variable.[9]

We report the results in Tables 6 and 7, which overall appear to corroborate the key findings reported in Tables 4 and 5. Specifically, we continue to find a positive and significantly high effect of economic freedom indexes on banks' productive efficiency. We also find the same relationships when controlling for institutional variables across all models, indicating that the degree of openness and democratic political systems may have a positive effect on bank efficiency.

<Insert Tables 6 and 7 about here>

4.3. Discussion

The financial freedom counterpart of the economic freedom indexes captures the "greater independence in financial and banking markets from government control." This definition of financial freedom indexes is closely related to the broad concept of deregulation that is, the removal of artificial barriers that prevent entry and/or competition between products, markets and institutions. Thus one may expect that the financial freedom counterparts of the economic freedom indexes can inversely correlate with the degree of regulatory tightness in banking.[10] The two concepts, however, are not identical. Financial freedom indicates limited government influence/control in financial and banking markets and, in addition to the regulatory framework, it takes into account the extent of state

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[9] The application of Papke and Wooldridge's (1996) quasi-likelihood estimation allows us to cross-check our results in case the efficiency estimates are not generated by a truncated data-generating process (DGP), as described by Simar and Wilson (2007), but are simply generated by a fractional logit process (McDonald, 2009).
[10] For example, the freedom indexes inversely relate with the measures of activity restrictions and official supervisory power provided by Barth et al. (2006).

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intervention in banks and in the allocation of credit, as well as the possible obstacles in opening and operating financial services firms (for both domestic and foreign individuals). Even the indexes of regulatory quality used in the paper are weakly correlated with the index of financial freedom in the same way that are correlated with the corruption and property rights components of the overall index. Thus, the interpretation of limited financial freedom as bank regulatory restrictiveness would not be appropriate. Regulatory tightness and measures of financial freedom can be closely associated but they do not identify with each other, either in scope or in terms of measurement.

Given their scope, the indexes of economic freedom have been criticized of incorporating a degree of ideological bias. But even if this is the case, as Ashby and Sobel (2008) observe, they measure indeed what they are supposed to measure. In one sense, our analysis puts the very consistency of the constructed freedom indexes in the microscope, operating as a control for their validity. If banks that enjoy a high degree of economic/financial freedom were characterized by poor efficiency performance, ceteris paribus for the effects of banking and institutional variables, and under the typical assumptions of the neoclassical analytical framework, it would possibly imply flaws in the measurement of the freedom index (or in the assumptions underplaying the economic model).

5. Conclusions

This paper contributes to the existing literature by focusing on the relationship between the different components of the economic freedom indexes on the efficient operations of banks. Our main focus is on the index of financial freedom that measures an economy's banking system effectiveness as well as independence from government control and interference in the financial sector. We first produce DEA efficiency scores for 6,744

bank observations operating in 27 European countries between 2001 and 2009. Then, we use a robust bootstrap procedure to regress the first-stage efficiency scores on economic freedom indexes, while controlling for governance indicators and bank specific characteristics. In addition, we carry out a sensitivity analysis for robustness using a fractional logit estimator.

The results show that a clear positive association between the financial counterparts of the economic freedom indexes and the bank efficiency measures exist. This suggests that excessive government interference in the financial institutions activities may adversely affect the efficient operation of banks. Banks operating in countries characterized by a high degree of economic and financial freedom and good governance tend to display relatively higher levels of efficiency on the cost side. These imply a more effective management in controlling costs while maximising the revenue streams in contexts characterised by policies that improve banks' degree of freedom thus resulting in a more efficient resources allocation process. Controlling for these broader, national characteristics, including freedom as captured by the freedom indexes, can explain cross-bank differences in terms of efficiency. The recent global financial crisis has put the discussion regarding governments' interference in the financial system on a new basis.

Assessing the effects of a free financial and banking environment for financial institutions' efficiency has direct implications in the context of this debate, especially in the aftermath of the "Great Recession" and the European crisis, which increase the prominence of systemic risk and prompt policymakers to search for new supervisory and macroprudential policy frameworks. A further challenge that emerges in our line of research is to consider whether "excessive" financial freedom may contribute to financial institutions' propensity to take on greater risks, which in turn may have contributed to the recent global and European crises. Given that our focus is on one aspect of bank performance (efficiency) and on commercial banking only, this question is beyond the scope of the present paper.

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Table 1.

Time and size distribution of EU-27 banks

Year	Number	Asset size (€million)		
	of obs.	Mean	Median	St.Dev.
2001	813	8,907.6	776.8	45,488.1
2002	791	8,657.2	768.3	42,821.8
2003	764	9,939.6	761.2	47,338.7
2004	708	10,368.7	970.2	51,645.9
2005	921	11,522.8	981.4	66,524.2
2006	836	13,157.9	1,174.9	73,641.4
2007	834	14,643.1	1,352.0	84,656.5
2008	765	19,849.5	1,421.3	116,134.0
2009	312	24,005.6	1,823.9	104,326.6
Average	749			
Total	6,744			

Source: Bankscope.

Table 2.

Bank inputs and outputs (€million)

Variable	Mean		St.Dev.		Median	
	2001	2009	2001	2009	2001	2009
Inputs						
Personnel expenses	75.5	140.9	350.9	537.6	9.4	17.3
Total Fixed Assets	60.3	90.0	242.6	332.8	6.0	8.8
Interest expenses	379.6	540.3	1,804.8	2,272.4	27.4	34.5
Outputs						
Total Loans	3,707.0	9,538.6	16,329.0	32,877.0	296.4	814.8
Total Other Earning Assets	4,107.0	10,997.8	21,975.0	51,797.0	277.6	519.0

Table 3.

Descriptive statistics for the variables employed in the cross sectional regressions: Mean, Median and Standard Deviations for 2001-2009[a]

Symbol	Definition	Mean	St.Dev.	Median
EFF	Data Envelopment Analysis (DEA) efficiency scores	0.72	0.22	0.73
Economic Freedom Variables				
FINFREE	Financial Freedom	66.97	15.06	70.00
GOVERNEXP	Government Spending	33.32	16.00	31.70
PROPERTY	Property Rights	75.38	16.62	70.00
CORRFREE	Freedom from Corruption	68.08	17.96	71.00
BUSINESS	Business Freedom	77.06	9.98	70.30
INDEX	Index of Economic Freedom	67.74	6.43	68.10
Bank-Specific Control Variables				
EQAS	Shareholder's Equity / Total Assets	10.36	9.23	7.87
ROAE	Return on Average Equity	7.93	22.36	8.15
LNTA	Logarithm of Total Assets	9.56	3.61	8.44
CR	Total Loans / Total Assets	0.50	0.27	0.53
Institutional Control Variables				
VOICE	Voice and Accountability	1.25	0.27	1.30
STABILITY	Political Stability	0.83	0.34	0.82
GOVERN	Government Effectiveness	1.35	0.57	1.52
REG	Regulatory Quality	1.29	0.37	1.28
LAW	Rule of Law	1.25	0.54	1.38
CORR	Control of Corruption	1.31	0.70	1.41

[a] All financial variables measured in millions Euros.

   Sources: The Heritage Foundation and Down Jones & Company, Inc., (2010); Governance Matters (Kaufman et al., 2010); Bankscope and own calculations.

Table 4.

Truncated regression analysis using equation (1a)

Years: 2001-2009							
Dep.Var.: EFF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Economic Freedom variables							
FINFREE	0.001***	-	-	-	-	-	0.002***
GOVERNEXP	-	-0.002***	-	-	-	-	-0.002***
PROPERTY	-	-	0.001***	-	-	-	0.001
CORRFREE	-	-	-	0.001***	-	-	-0.000
BUSINESS	-	-	-	-	0.002***	-	-0.001
INDEX	-	-	-	-	-	0.003***	-
Bank Specific variables							
EQAS	0.001	0.001	0.001	0.001	0.001	0.001	0.001*
ROAE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
LNTA	0.035***	0.035***	0.035***	0.036***	0.036***	0.036***	0.035***
CR	0.149***	0.119***	0.152***	0.148***	0.141***	0.155***	0.137***
Constant	0.053***	0.228***	0.031***	0.053***	-0.006***	-0.088**	0.133***
Year Dummies	YES	YES	YES	YES	YES	YES	YES
Observations	6744	6744	6744	6744	6744	6744	6744
Number of Countries	27	27	27	27	27	27	27

Note: FINFREE= Financial Freedom, GOVERNEXP= Government Spending, PROPERTY= Property Rights, CORRFREE= Freedom from Corruption, BUSINESS= Business Freedom, INDEX= Index of Economic Freedom, EQAS= Equity/Assets, ROAE= Return on Average Equity, LNTA= LN of Total Assets, CR= Total Loans/Total Assets, Constant= constant term.

Estimation of the models is based on Simar and Wilson (2007), Algorithm 1, using 2000 bootstrap replications for the confidence intervals of the estimated coefficients.

*p<0.1 Significance from zero at the 10% level according to bootstrap confidence intervals.

**p<0.05 Significance from zero at the 5% level according to bootstrap confidence intervals.

***p<0.01 Significance from zero at the 1% level according to bootstrap confidence intervals.

Table 5.

Truncated regression analysis using equation (1b)

Years: 2001-2009						
Dep.Var.: EFF	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Financial Freedom variable						
FINFREE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
Bank Specific variables						
EQAS	0.001*	0.001*	0.001*	0.001*	0.001	0.001
ROAE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
LNTA	0.035***	0.036***	0.035***	0.036***	0.035***	0.036***
CR	0.156***	0.155***	0.155***	0.157***	0.154***	0.153***
Institutional variables						
VOICE	0.070***	-	-	-	-	-
STABILITY	-	0.038**	-	-	-	-
GOVERN	-	-	0.033***	-	-	-
REG	-	-	-	0.050***	-	-
LAW	-	-	-	-	0.020***	-
CORR	-	-	-	-	-	0.015***
Constant	-0.010***	0.023***	0.026***	0.019***	0.034***	0.037***
Year Dummies	YES	YES	YES	YES	YES	YES
Observations	6744	6744	6744	6744	6744	6744
Number of Countries	27	27	27	27	27	27

Note: FINFREE= Financial Freedom, EQAS= Equity/Assets, ROAE= Return on Average Equity, LNTA= LN of Total Assets, CR= Total Loans/Total Assets, VOICE= Voice and Accountability, STABILITY= Political Stability, GOVERN= Government Effectiveness, REG= Regulatory Quality, LAW= Rule of Law, CORR= Control of Corruption, Constant= constant term.

Estimation of the models is based on Simar and Wilson (2007), Algorithm 1, using 2000 bootstrap replications for the confidence intervals of the estimated coefficients.

*$p<0.1$ Significance from zero at the 10% level according to bootstrap confidence intervals.

**$p<0.05$ Significance from zero at the 5% level according to bootstrap confidence intervals.

***$p<0.01$ Significance from zero at the 1% level according to bootstrap confidence intervals.

Table 6.

QMLE analysis using equation (1a)

Years: 2001-2009							
Dep.Var.: EFF	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Economic Freedom variables							
FINFREE	0.006***	-	-	-	-	-	0.007***
GOVERNEXP	-	-0.005***	-	-	-	-	-0.005***
PROPERTY	-	-	0.005***	-	-	-	0.003*
CORRFREE	-	-	-	0.005***	-	-	-0.000
BUSINESS	-	-	-	-	0.006***	-	-0.004**
INDEX	-	-	-	-	-	0.014***	-
Bank Specific variables							
EQAS	0.016***	0.016***	0.016***	0.016***	0.016***	0.016***	0.017***
ROAE	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
LNTA	0.177***	0.175***	0.178***	0.178***	0.178***	0.179***	0.176***
CR	0.339***	0.247***	0.345***	0.328***	0.306***	0.363***	0.323***
Constant	-2.187***	-1.543***	-2.225***	-2.112***	-2.249***	-2.780***	-1.923***
Year Dummies	YES	YES	YES	YES	YES	YES	YES
Observations	6744	6744	6744	6744	6744	6744	6744
Number of Countries	27	27	27	27	27	27	27

Note: FINFREE= Financial Freedom, GOVERNEXP= Government Spending, PROPERTY= Property Rights, CORRFREE= Freedom from Corruption, BUSINESS= Business Freedom, INDEX= Index of Economic Freedom, EQAS= Equity/Assets, ROAE= Return on Average Equity, LNTA= LN of Total Assets, CR= Total Loans/Total Assets, Constant= constant term.

Estimated using Papke and Wooldridge (1996) Quasi-Likelihood estimation method.

*p<0.1 Significance from zero at the 10% level.

**p<0.05 Significance from zero at the 5% level.

***p<0.01 Significance from zero at the 1% level.

Table 7.

QMLE analysis using equation (1b)

Years: 2001-2009						
Dep.Var.: EFF	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Financial Freedom variable						
FINFREE	0.005***	0.006***	0.005***	0.004***	0.006***	0.006***
Bank Specific variables						
EQAS	0.016***	0.017***	0.017***	0.017***	0.016***	0.016***
ROAE	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
LNTA	0.177***	0.178***	0.177***	0.178***	0.178***	0.178***
CR	0.358***	0.352***	0.357***	0.365***	0.353***	0.349***
Institutional variables						
VOICE	0.210***	-	-	-	-	-
STABILITY	-	0.089**	-	-	-	-
GOVERN	-	-	0.109***	-	-	-
REG	-	-	-	0.181***	-	-
LAW	-	-	-	-	0.060**	-
CORR	-	-	-	-	-	0.040**
Constant	-2.383***	-2.259***	-2.285***	-2.317***	-2.246***	-2.231***
Year Dummies	YES	YES	YES	YES	YES	YES
Observations	6744	6744	6744	6744	6744	6744
Number of Countries	27	27	27	27	27	27

Note: FINFREE= Financial Freedom, EQAS= Equity/Assets, ROAE= Return on Average Equity, LNTA= LN of Total Assets, CR= Total Loans/Total Assets, VOICE= Voice and Accountability, STABILITY= Political Stability, GOVERN= Government Effectiveness, REG= Regulatory Quality, LAW= Rule of Law, CORR= Control of Corruption, Constant= constant term.

Estimated using Papke and Wooldridge (1996) Quasi-Likelihood estimation method.

*$p<0.1$ Significance from zero at the 10% level.

**$p<0.05$ Significance from zero at the 5% level.

***$p<0.01$ Significance from zero at the 1% level.