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Social Capital and Bank Performance

An International Comparison for OECD Countries

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Abstract

Over the last few years there has been a remarkable increase in the number of published studies dealing with social capital issues. A plethora of studies has also analyzed the efficiency of several banking industries. In this article we merge the two literatures by analyzing how social capital affects bank efficiency for a sample of financial institutions in OECD countries. The analysis is performed using activity analysis techniques, and social capital is controlled for by entering the analysis as an environmental variable. A key feature of our study is the higher complexity of the social capital measure used, compared to other simpler measures hitherto considered in the literature. Results suggest that disregarding the effect of social capital can be irrelevant for some financial institutions, yet the effect cannot be overlooked for others that operate in low-social-capital environments. In these cases, efficiency scores are biased downwards, and controlling for social capital enables these banks to move up in the efficiency rankings.

Key words

Banking firm, efficiency, environmental conditions, social capital.

Resumen

En los últimos años ha habido un aumento notable en el número de artículos que tratan diversos aspectos relacionados con el concepto de capital social. Asimismo, existe gran cantidad de estudios que han analizado la eficiencia de las empresas bancarias. En este documento de trabajo combinamos las dos literaturas, analizando cómo el capital social de las economías afecta a la eficiencia bancaria para una muestra de instituciones financieras de distintos países de la OCDE. El análisis se realiza usando *activity analysis,* y el capital social se controla considerándolo en el análisis como una variable ambiental. Una característica importante de este trabajo es la mayor complejidad del indicador de capital social utilizado, comparada con otras medidas mucho más simples hasta ahora consideradas en la literatura. Los resultados sugieren que no considerar el efecto de capital social puede ser irrelevante para algunas instituciones financieras. Sin embargo, el efecto no puede ser pasado por alto para otras que funcionan en ambientes con bajo capital social y cuyos índices de eficiencia están sesgados a la baja.

Palabras clave

Empresa bancaria, eficiencia, condiciones ambientales, capital social.

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C O N T E N T S

1. Introduction

SOCIAL capital—broadly, social networks, the reciprocities that arise from them, and the value of these for achieving mutual goals—has become an influential concept in understanding and debating the modern world (Baron, Fiel and Schuller, 2000, p.1). In the specificities of the economic arena, some authors argue that, although it is also becoming an influential concept, some controversies still act as a major barrier to its general pervasiveness. In particular, according to Durlauf (2002), different opinions are offered on its precise meaning—i.e., whether it refers exclusively to a form of social networks, or whether it should be equated to trust and trustworthiness—, the notions that the social relations referred to by social capital are themselves problematic, and that even when definitions are agreed upon, no consensus exists on how to measure social capital. Most of the problems raised also deal with the way social capital shifts the focus of analysis from the behavior of individual agents to the pattern of relations between agents, social units and institutions, which constitutes a minor revolution in the field of economics (Baron, Fiel and Schuller, 2000: 35).

In spite of these threatening points of view, and the fact that only a minority (albeit growing) of economists are familiar with it, social capital appears to be both quantifiable and, as shown by some recent empirical applications (see, for instance Hall and Jones, 1999; Annen, 2003; Grafton, Knowels and Owen, 2004; Beugelsdijk and Van Schaik, 2005) related to traditional economic variables like GDP growth rates (Fine and Green, 2000). Indeed, acording to Fukuyama (1995), if social capital can be set alongside the other columns of physical, financial and human capital, the result might be a more integral knowledge of both the economic and non-economic worlds. Therefore, many studies have used the concept as a productive resource emerging from the *social links* among individuals, granting them greater benefits and opportunities than those enjoyed by members of other societies in which those links do not exist, or are weaker. In such circumstances, social capital would be conceived as a set of intangible circumstances such as values, norms, attitudes, trust, social networks, etc., which allow a society to perform more efficiently.

Although Hanifan (1916) coined the concept of social capital almost one century ago, its use by economists has been intensified only over the last few years to explain a variety of economic phenomena such as economic growth (Zak and Knack, 2001; Iyer, Kitson and Toh, 2005), labor productivity (Hall and Jones, 1999), or the development of financial systems (Ongena and Smith, 2000; Guiso, Sapienza and Zingales, 2004). Most of these research studies suggest that social capital impacts positively on the economic phenomena under analysis, influencing and conditioning the potential performance of economies. Therefore, the results obtained in the cited research studies reveal that social capital is an important issue to control for when forecasting the full potential of economies.

In the case of banking, a broad literature exists on a particular type of social capital which originates and evolves between the financial institution itself and its customers. This type of capital emerges through the establishment of repeated and/or lasting transactional relations, which increase the knowledge the two parties have of each other, and generates the trust and positive attitudes typically associated with social capital. The repeated interaction between lender and borrower boosts their confidence in one another, thus strengthening social ties, and leading to an increase in social capital. The result is not only beneficial for the customer, but also for the financial institution, since the information advantages generated through transactional ties between lenders and borrowers lead to increased effectiveness in its accomplishment. In addition to this, social ties generate social capital which factors in as an important input for future transactions not only in the credit decision-making process, but in many other decision-making processes. The increased level of social capital improves the conditions under which financial contracts are fulfilled.

This approach, known as *relationship banking*, seeks to analyze whether the preferential treatment generated through repeated interaction affects a variety of aspects of banking activity. As such, it is regarded as an important determinant of financial systems' performance in developed countries and, consequently, a number of studies have analyzed a variety of related issues such as, how relationship banking affects the competitive conditions in the industry (Degryse and Ongena, 2005), accessibility and/or credit rationing (Ferri and Messori, 2000), the cost of credit (Degryse and Ongena, 2005), or the amount of loan losses (Ferrary, 2003).

However, this paper seeks to analyze an economic phenomenon barely explored so far in the literature: by adopting a different perspective to that commonly considered in relationship banking studies, we analyze whether the level of social capital in different countries has an impact on the efficient provision of banking services. Therefore, we do not attempt to analyze bank efficiency from a relationship banking point of view [1] but to analyze whether the alleged positive impact of social capital on a variety of economic phenomena also applies to bank efficiency.

Our sample is made up of the banking industries in 28 OECD countries, containing data on commercial banks, savings banks and credit unions. Our results are manifold, but the most general findings suggest that the higher the level of social capital in the society, the higher the bank cost efficiency measured. Put differently and from a social capital perspective, larger amounts of social capital available in each society lead to cost savings in the intermediation process. We find it is essential to control for social capital in order to unbiasedly assess the performance of each bank in our sample.

The study proceeds as follows. After this introduction, section 2 justify presents the rationale for relating social capital to bank performance, along with its impact on efficiency. Section 3 describes the methodology employed, while section 4 and section 5 results present the data and results, respectively. Finally, section 6 details the most relevant conclusions.

1. The existence of repeated and/or lasting ties between each bank and its clients may affect its efficiency. However, this issue lies beyond the scope of our paper.

2. On the Links between Social Capital and Bank Performance

THE literature on relationship banking [2] demonstrates that repeated and lasting interaction between the bank and the borrower facilitates monitoring and screening, and can overcome problems of asymmetric information (Boot, 2000), i.e., it has an impact on many aspects of banking activity. However, banks not only benefit from the social capital generated throughout their relations with clients, but also from the existing social capital in the society in which the bank operates. This section explores the different ways by which the social capital in each society affects bank activity and bank performance.

The most direct way in which social capital impacts on banking activity in general, and banking performance in particular, is through the increase in the confidence and trust of the individuals participating in different banking relationships in the institutions and systems that control the social, economic and political welfare in the society. Accordingly, for economies with high levels of social capital, individuals have a mutual trust, either due to the moral attitudes learned during their education, or because of existing social and legal mechanisms that penalize default behaviour—in this case, breach of contracts—. As we shall see, this mutual trust has positive effects, not only for the bank and its clients, but also for the society considered, as a whole.

Because of their very nature, banking contracts belong to a special type of contract where trust between parties is essential. Each depositor expects the bank not only to pay interests in due time and form, but also that the money in her/his bank account will be refunded upon request. Likewise, regarding the loan contracts, the bank expects the borrower to repay the amount lent in accordance with to the terms stipulated in the agree-

2. See, for instance, the articles in the special issue of the *Journal of Financial Intermediation* devoted to the topic (volume 9, 2000), or the review by Ongena and Smith (2000).

ment. In both cases we can verify that each side trusts the other, i.e., both parties expect that the other will repay the money under the terms stipulated in the agreement. Obviously, this type of fund exchange rests on an institutional and legal framework which prosecutes breach of contract; however, this breach of contract is also penalized by the mutual trust between parties, which directly depends on the social capital in the society. According to this reasoning, we may conclude that the higher the amount of social capital in the society, the higher its (positive) influence, not only on the observance of bank contracts, but also on the number of relationships (Guiso, Sapienza and Zingales, 2004).

Defining social capital as people's trust in institutions and the system enables us to understand the reasons why in low-social-capital societies where the level of financial development is relatively low, financial transactions are more intense within narrow subgroups, such as families and friends (Fukuyama, 1995; Banfield, 1958). In short, social capital is an essential input for the efficient performance of the banking system, since its existence has a positive impact on the legal enforceability of banking contracts, which contribute to easing the transmission of funds from the lender to the borrower, leading to an improvement in the environmental conditions in which banks operate, which may ultimately influence their efficiency.

More specifically, multiple paths exist by which social capital may influence banking activity and, ultimately, bank efficiency. Some of them emphasize the positive impact of social capital on the environment in which banking activity takes place, by reducing certain costs. Others relate to the increased turnover for banking firms due to the higher level of social capital in the society. Explanations for some of these paths follow.

a) Social capital reduces information, transmission and monitoring cost: reducing information costs is one of the key factors related to the relevance of social capital. As Levine (1997) suggests, information and transaction costs are lower in developed financial markets. The empirical evidence shows that, in communities where access to financial markets is difficult, the necessary information is obtained through social capital in the guises of networks and internal alliances within the community (Morduch, 1999; Ferrary, 2003). On the other hand, in developed financial systems, the task of reducing information asymmetries is performed by banks, which compile and process information. In social-capital-intensive economies, information requirements for both the lender and the borrower are lower, being replaced by the trust in markets and institutions. In addition, complementary mechanisms are in place provided by public authorities, such as socializing information through the creation of national bad debtors' (defaulters) files, and firms' ratings which enable both parties to obtain information about each other, facilitating a reduction of information asymmetries (Ferrary, 2003). According to these arguments, *cæteris paribus,* the higher the level of social capital in the society, the lower the information, monitoring and transaction costs associated to the bank operations which are necessary to fulfil contracts.

It is also argued (Vega-Redondo, 2006) that social capital and social networks reduce information costs due to the existence of network economies, which simplify the inherent complexity in the relationships among individuals, and increase the fluency with which information is transmitted within the social network. Therefore, in segmented and isolated societies, in which there are no ties between individuals of social groups, the costs to banks of obtaining information on their clients cannot be spread out to obtain information on other clients or groups of individuals, due to the absence of relationships between them. In contrast, in cases where ties between individuals are strong, the resources devoted by the bank to increasing its knowledge about its clients pay dividends in terms of the information in gathers on other potential clients with whom the bank's clients have ties, therefore leading to cost reductions.

b) Social capital reduces risk premium, thus lowering financial and credit costs: another way by which social capital influences bank performance relates to the reduction of the risk premium that participating parties mutually require to offset any eventual breach of contract by either of them. Each party not only establishes bonds of mutual trust—whose strength increases proportionally to the intensity of the relationship in terms of breadth, repetition, and duration (relationship banking)—but also trusts that the legal enforceability of contracts is guaranteed by institutions and the system in general (social capital), which will stave off breach of contract—or at least the probability of this happening—. Thus, depositors will trust the bank to observe the deposit contract, paying back the deposited funds and the interests according to the terms of the contract and, therefore, will ask for a lower risk premium to put the money in the bank, which will reduce the interest rate on deposits and, therefore, the financial costs for banks.

From the bank point of view, in social-capital-intensive societies, the bank trusts that the borrower will repay the amount lent in accordance with terms stipulated in the loan agreement, contributing to reducing the risk premium, and therefore to reduce the cost of credit for the borrower. In addition to this, we may expect this credit cost reduction to encourage the demand for credit.

Previous empirical evidence has been reported by Petersen and Rajan (1994, 1995) and, more recently, by Elyasiani and Goldberg (2004), who analyze how the ties (relationship social capital) between the bank and the borrower affect both supply and credit costs. Their results corroborate the hypothesis that the higher the level of social capital, the higher the supply of credit and the lower its cost will be.

c) Social capital reduces loan losses: higher levels of social capital in the society not only lead to lower information costs, but also to higher quality information collected to assess risk insolvency. Thus we may expect that the higher the level of social capital, via improvements in the quality of information, the greater the decline of loan losses will be. On this point, Ferrary (2003) states that, to reduce risk evaluation uncertainty, the bank analyst complements objective methods or, if these are unavailable, substitutes them with information acquired through informal relations based on trust. The quality of risk evaluation and the reduction of asymmetric information risk will depend upon the quality of the social capital existing in the environment in which the analyst operates, as well as on his/her fitting into the social networks in this environment.

However, improvements in the quality of information are not the only ways by which social capital affects loan losses, since the social costs (isolation and/or exclusion from the community) associated to failure to pay could be so damaging to the borrower that they discourage default behavior [3].

Several studies have analyzed the existence of an empirical link between social capital and bad, or doubtful, bank loans. On this point, Karlan (2004) finds evidence that higher levels of social capital lead to higher repayment and higher savings. Likewise, Ferri and Messori (2000) show that banks in the Northeast and Center of Italy with a strong orientation toward relationship banking, and therefore, a higher level of social capital, have a lower incidence of bad and doubtful loans.

d) Social capital increases loan supply and diminishes rationing: in some cases, reducing information asymmetries through information gathering and processing is not profitable for the bank, since loan costs (basically obtaining and processing information) are high compared to the expected profitability of the transaction, and the risks of the transaction are excessive.

3. Karlan (2004) observed direct evidence that members monitor loan performance through social networks, that relationships deteriorate after default, and that through successful monitoring, individuals know who to punish and who not to punish after default.

In addition, not many individuals or firms have a sufficiently large volume of assets to offer as collateral in the case of inability to pay back a loan. In these cases, banks, which have the ability to collect and process information, could decide not to make the loan, generating credit rationing.

In line with the above rationale, social capital contributes to reducing information asymmetries and costs, and thus its existence can make transactions profitable which otherwise would be loss-making. Therefore, social capital contributes to increasing loan supply and reducing credit rationing [4].

However, although banks benefit from the social capital in the society through the increase in their turnover, small businesses and marginal communities, which usually have credit restrictions, will also benefit from the existence of social capital, since it enables them to obtain credit more easily (less rationing), and a lower cost, since the risk premium also diminishes.

Petersen and Rajan (1994, 1995), Ferri and Messori (2000) and Elyasiani and Goldberg (2004) corroborate that the higher the social capital, the higher the credit supply will be.

e) Social capital encourages customers' use of bank products: as commented on earlier, all banking contracts can be considered as a confidence relationship in which the principal trusts the agent. Thus, when someone accepts a payment using a check or a credit card, the principal trusts that the agent is not out of funds. The fulfilment of the check contract depends on the level of trust in the agent which, simultaneously, depends on the level of social capital. Therefore, *cæteris paribus,* individuals living in low-social-capital environments will use bank products to a lesser extent, due to its trust-intensive nature (Guiso, Sapienza and Zingales, 2004).

From the perspective of portfolio selection, assets depend not only on their intrinsic risk, but also on the probability of them being expropriated and, therefore, on the required level of trust. Guiso, Sapienza and Zingales, (2004) use this rationale to conclude that when the level of social capital (and trust) is low, households will invest larger shares of their portfolios in low-trust-intensive assets such as cash and smaller shares in high-trust-intensive assets such as bank deposits, firms' shares, etc.

For the aforementioned reasons, since both traditional bank outputs (such as bank deposits and loans) and non-traditional bank outputs (usually proxied by fee-income) are high-trust-intensive contracts, we may expect

4. From the demand side, we must consider that the decrease in the cost of credit due to the decrease in the premiums for risk associated to higher levels of social capital generates an increase of credit demand.

that their use will be higher for households and firms in high-social-capital societies. On the other hand, in low-social-capital societies we may expect more intense reliance on transactions within narrow subgroups, such as families and friends (Guiso, Sapienza and Zingales, 2004).

Banks will also benefit from the level of social capital in the society due to its positive influence on firms and households' demand for bank products, which will enable them to issue more deposits, make more loans and raise more fee income in charges for the services rendered.

The empirical evidence on this matter is robust. Historically, trust crises in the guises of panic runs have led to the use of cash to the detriment of deposits (e.g., 1929 crisis). Guiso, Sapienza and Zingales (2004) result also show a positive and significant link between social capital and the use of checks and credit cards, and a negative and significant link between social capital and the use of cash.

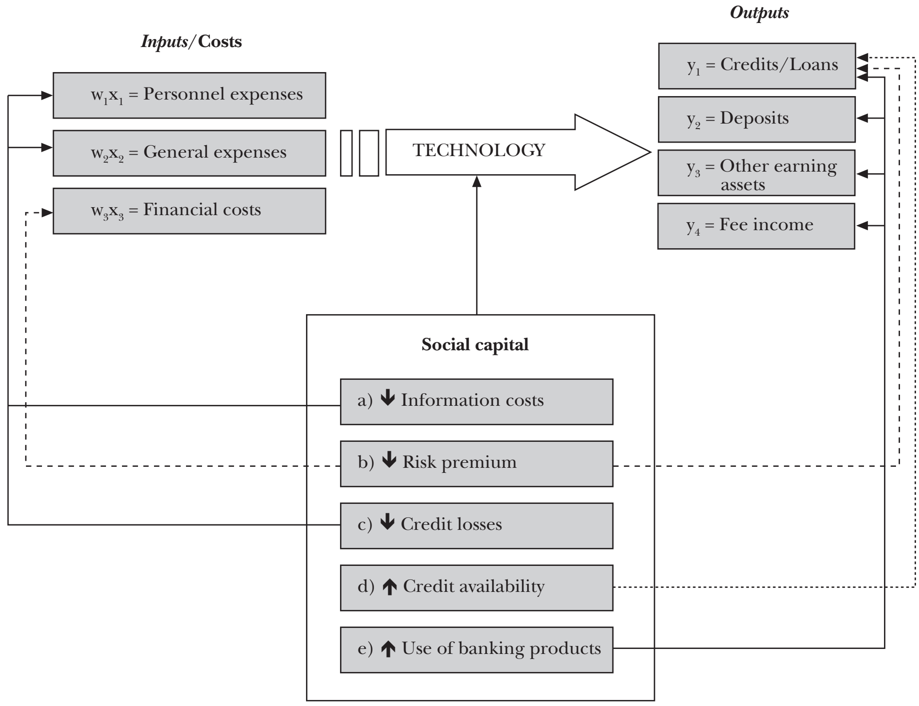
In summary, in these lines we have described different ways by which social capital impacts on banking activity. Social capital reduces monitoring, information, transactional, financial and loan loss provisions costs, and increases credit supply as well as any other types of banking products, in general high-trust-intensive products. All this implies that bank efficiency will be higher in high-social-capital economies.

It must be noted that the aforementioned effects have an impact on the cost side of bank activity; in some cases due to the reduction in the quantity of inputs required for the bank to operate—cases a) and c)—; in others reducing the price of a certain input, such as the financial costs for deposits —case b)—. In cases d) and e) it has a positive impact on bank outputs. In that respect, the appropriate measure of efficiency is cost efficiency.

Graphic 2.1 provides a graphic illustration of the ways by which social capital impacts on bank cost efficiency. The process of intermediation consists basically of obtaining a range of bank outputs (e.g., credits and loans, y_1; deposits, y_2; other earning assets, y_3; fee-income, y_4) using some inputs $(x_i, i = 1, ..., N)$ for which prices are charged $(w_i, i = 1, ..., N)$, in such a way that costs are raised (e.g., personnel expenses, w_1x_1; general expenses, w_2x_2; financial costs, w_3x_3). The process by which inputs turn into outputs is efficient when, through input prices and technology, the bank obtains outputs at the lowest costs.

The impact of social capital turns out to be crucial in this process, since the higher the social capital in the society: (a)The lower the information costs, leading to a reduction in the personnel expenses (w_1x_1) and general expenses (w_2x_2;), required to obtain such information; (b) the lower the risk premium required by depositors, which reduces the financial costs for the

GRAPHIC 2.1: Social capital and cost efficiency



bank (w_3x_3) and, therefore, also reduces the cost of credit for the financier, leading to a beneficial effect on the credits and loans made by banks (y_1); (c) the lower the number of bad and doubtful loans (loan losses), therefore not only loan loss provisions will decrease, but also the personnel expenses (w_1x_1) and administration expenses (w_2x_2) involved in recovering bad loans will be lower; (d) the higher the loan supply (y_1), since it reduces asymmetries and information costs; and (e) the higher the use of bank products, leading to a positive effect on traditional bank outputs (credits, loans and deposits, i.e., y_1, y_2, y_3), and a positive effect on non-traditional bank outputs (usually proxied by fee-income, y_4).

3. Methodology

3.1. Measuring efficiency

Efficiency can be measured through a variety of different methods, which fall into two broad categories: parametric and nonparametric methods. The biggest advantage of nonparametric methods is their flexibility, since no functional form has to be specified for the frontier or the error term. However, due to their deterministic nature, they cannot disentangle inefficiency from random error. On the other hand, parametric methods allow for this disentanglement, but on the downside, they have to previously specify a functional form for the unobserved frontier, as well as making assumptions on the distribution of the error term and the inefficiency.

No consensus exists as to which method is most suitable to measure efficiency. Several monographs have provided painstaking descriptions of the techniques that have been developed over the last three decades or so (see, for instance, Fried, Lovell and Schmidt,1993a). However, because results are usually non-coincidental (Ferrier and Lovell, 1990), more recent monographs have dealt exclusively with one of the two techniques. For instance, Lovell and Kumbhakar (2000) deal exclusively with efficiency via Stochastic Frontier Analysis (SFA), one of the most popular parametric technique methods. On the other hand, Färe and Grosskopf (2004) exclusively examine Data Envelopment Analysis (DEA), the most popular technique in the nonparametric field [5].

However, the evolution of parametric and nonparametric techniques has not been entirely balanced. Up to the early nineties, both groups of techniques made significant progress, but newer proposals have leaned towards the nonparametric field. For instance, Cazals, Florens and Simar (2002) proposed a nonparametric estimator which is more robust to outliers than DEA or FDH (Free Disposable Hull, a version of DEA in which the convexity as-

5. However, due to the intense use of nonparametric methods to measure efficiency in the Operations Research literature, several other contributions focus exclusively on the nonparametric field, essentially DEA. See, for instance, Cooper, Seiford and Tone (1999), Cooper, Seiford and Zhu (2004), or Thanassoulis (2001).

sumption is dropped). Aragon, Daouia and Thomas-Agnan (2005) presented a nonparametric estimator for the efficiency frontier based on conditional quartiles of an appropriate distribution associated with the production process. More recently, Martins-Filho and Yao (2006) have proposed a nonparametric estimator of frontiers which *envelope* data and is more robust to outliers than previously proposed methods.

Therefore, following the path cleared by the most up-to-date tendencies, we measure bank efficiency using nonparametric methods. Although we do not adopt the most recent techniques considered in the above paragraph, due to difficulties in handling data for input or output prices, state-of-the-art techniques are used since social capital will enter the analysis following the recent contribution by Ruggiero (2004). In addition to this, we combine the nonparametric DEA technique with nonparametric statistical methods, which are essential to the studies by Cazals, Florens and Simar (2002), Aragon, Daouia and Thomas-Agnan (2005) and Martins-Filho and Yao (2006).

3.2. Social capital as an environmental variable

Since Farrell (1957), the literature on efficiency measurement using nonparametric methods has grown impressively. Later, Charnes, Cooper and Rhodes (1978) introduced what is known as Data Envelopment Analysis mentioned above to compute Farrell's measure of efficiency under constant returns to scale (CRS). Since then, a number of contributions have been published, enabling efficiency measurement under variable returns to scale (VRS) (Banker, Charnes and Cooper, 1984), using nonradial measures (Färe and Lovell, 1978; Zhu, 1996), or controlling for non-discretionary inputs (Banker and Morey, 1986a, 1986b; Ray, 1991; Ruggiero, 1996, 1998, 2004; Fried, Schmidt and Yaisawarng, 1999).

Section 2 explained the multiple paths by which social capital can influence bank efficiency. We may consider social capital as an input of the production process that is beneficial for banks. From the methodological point of view, the problem lies in considering the social capital in each economy as an additional input to the optimization problem. However, in contrast to what occurs for other inputs, banks cannot discretionarily modify the social capital of the environment in which they operate; thus, it must be treated differently to the rest of the inputs—i.e., as a non-discretionary input—. Several methods exist to account for environmental, or non-discretionary, variables in DEA (Fried and Lovell, 1996; Rouse, 1996). They can be classified into two- and three-stage methods.

Banker and Morey (1986a, 1986b) proposed the most straightforward method for this, based in one stage only. Their procedure consists of treating discretionary inputs separately from non-discretionary inputs, disallowing radial reductions for the latter, in an attempt to restrain the comparison only to firms, or decision making units (DMUs) under the same, or worse, environmental conditions. This is the most direct and easily interpretable method, and it has therefore been used intensively. However, it has certain disadvantages, since the direction of influence for each variable must be known *a priori*.

Ruggiero (1996) refined Banker and Morey's (1986a, 1986b) method, removing the convexity constraint on the non-discretionary inputs. In so doing, non-discretionary inputs are treated as factors that determine the position of the frontier. In other words, they operate as constraints by generating multiple frontiers, excluding DMUs operating under more favorable environments according to the non-discretionary variable.

Two-stage methods are also used in the literature. The most widely-employed two-stage procedure aims to explain the efficiency scores obtained in the first stage by means of an *ex post* regression including a set of control variables which may include environmental variables [6]. This type of method has some disadvantages. One is that censored models (such as TOBIT) are needed in the second stage to control for the fact that efficiency scores are bounded between (0,1) [7]. However, further trouble arises because of using parametric methods in the second stage, due to the fact that parametric methods presuppose *independence* of observations, but efficiency scores obtained via nonparametric methods in the first stage are *dependent* in the statistical sense—they are obtained via linear programming—. Simmar and Wilson (2006) provide a good exposition of the econometric problems derived from combining these two types of methodologies and propose an alternative, the bootstrap method, to overcome them. Balaguer-Coll, Prior and Tortosa-Ausina (2006) provide a simpler method based on nonparametric regression and bivariate density estimation.

Finally, Fried and Lovell (1996) propose a three-stage procedure. In the first stage, a DEA model is used, including both inputs and outputs. In the second stage either DEA or SFA models can be used to control for the effect of environmental variables. To do this, the slacks obtained in the first stage are corrected by the effect of non-discretionary variables. Finally, in

6. This method was first applied by Timmer (1971).

7. Instead of adjusting the efficiency scores, other authors proposed an alternative two-stage approach that consists of adjusting the residuals (slacks) obtained in the first stage (see McCarty and Yaisawarng, 1993; Fried, Lovell and Vanden Eeckaut, 1993b).

the third stage the corrected variables are used to obtain the environment-adjusted efficiency scores.

In our study, a single-stage method is used, considering the refinement proposed by Ruggiero (2004). As mentioned earlier, the biggest drawback of this procedure is that the direction in which the environmental variable considered affects efficiency must be known *a priori*. In our case, the direction in which social capital affects efficiency is well known *a priori*, and has also been theoretically justified in section 2 [8].

To illustrate the methodology, let us assume there exist $r = 1, \ldots, R$ banking firms. Let us suppose that bank i produces P outputs $y_i = (y_{i1}, \ldots, y_{iP}) \in \mathbb{R}^P_{++}$ using M inputs $x_i = (x_{i1}, \ldots, x_{iM}) \in \mathbb{R}^M_{++}$, paying for them prices $w_i = (w_{i1}, \ldots, w_{iM}) \in \mathbb{R}^M_{++}$. Cost efficiency for bank i can be measured by solving the following linear programming problem, which compares bank i with the remaining R-1 banks in the sample (Charnes, Cooper and Rhodes, 1978):

$$\begin{aligned} &\text{Min} \sum_{m=1}^{M} w_{im}\, x_{im} \\ &s.t. \sum_{r=1}^{R} \lambda_r y_{rp} \geq y_{ip} \qquad p = 1, \ldots, P \\ &\sum_{r=1}^{R} \lambda_r x_{rm} \leq x_{im} \qquad m = 1, \ldots, M \\ &\sum_{r=1}^{R} \lambda_r = 1, \lambda_r \geq 0, \qquad r = 1, \ldots, R \end{aligned} \tag{3.1}$$

The solution to this problem $x_i^* = (x_{i1}^*, \ldots, x_{iM}^*)$ corresponds to the optimal input vector, i.e., the one that minimizes the outputs' production costs, given input prices, and has been obtained by comparing bank i to a linear combination of inputs which produces the same, or more, of each output using the same, or less, of each input. Optimal costs will be $C_i^* = \Sigma_{m=1}^{M} w_{iM}\, x_{im}^*$ which, by definition, will be the same, or less than the observed costs fo

8. However, analyses have been carried out to determine whether the influence of social capital on efficiency is positive or negative. Following Lozano-Vivas, Pastor and Pastor (2002), to determine whether an environmental variable—in our case social capital—should enter the analysis as an input or an output we simply reverse its character. Thus, if we consider that social capital has a positive influence, we should model it as an input (Cooper and Pastor, 1996); on the other hand, if we think that social capital has a negative influence it should be entered as an output in the model. Therefore, the sign of the influence of social capital on efficiency is determined by comparing both assumptions—i.e., including it as an additional input or output in an intertemporal model. Later, the statistical differences between mean efficiency scores obtained when controlling for social capital—considering it as an input and as an output—and not controlling for social capital are tested for. The results obtained suggest that differences between means are only significant when social capital enters as an input in the model. In other words, social capital has a positive effect on efficiency.

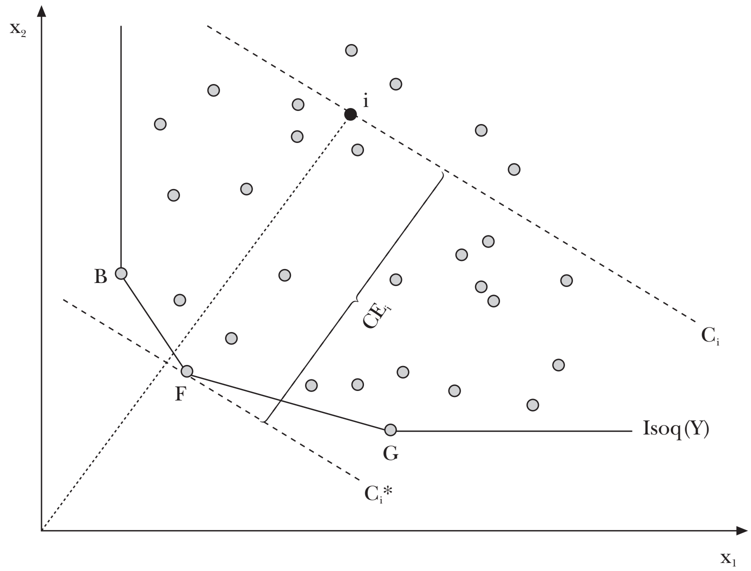
bank i, namely, $C_i = \Sigma_{m=1}^{M} w_{im} x_{im}$. Therefore, the cost efficiency score for bank i, CE_i, can be expressed as the ratio of its observed costs and its optimal costs, namely:

$$CE_i = \frac{C_i^*}{C_i} = \frac{\sum_{m=1}^{M} w_{im} x_{im}^*}{\sum_{m=1}^{M} w_{im} x_{im}} \tag{3.2}$$

where $CE_i \leq 1$.

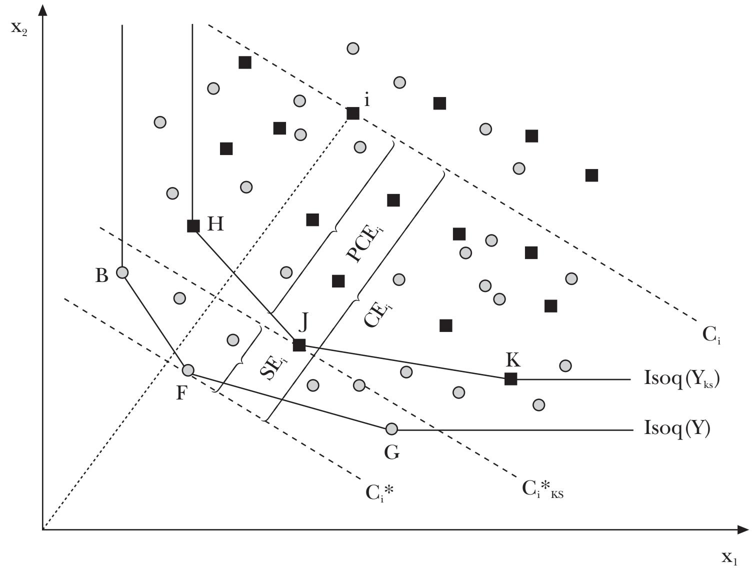
Graphic 3.1 illustrates this concept for the two inputs case. The isoquant curve is made up of a set of efficient banking firms, namely, *B, F, G* and their linear combinations. Given the relative prices for inputs, the minimum, or optimal, cost (C_i^*) is achieved via a linear combination of *B* and *F*; since firm *i* has C_i costs, total cost efficiency (CE_i) can be represented as the distance (ratio) between both isocost lines.

GRAPHIC 3.1: Cost efficiency in DEA models



However, this approach ignores the role of non-discretionary inputs, i.e., it disregards the circumstance that banks operating in different economies might face varying environmental conditions (i.e., varying social capital levels), which might have an impact on efficiency. For instance, let us assume bank *i* operates in an unfavorable environment, i.e., in a low-social-capital economy. For this bank, operating with a cost level as low as C_i^* is unfeasible. Comparing this bank to other banks operating in more favorable environments, i.e., in high-social-capital economies, is not appropriate, since results are biased because banks operating in unfavorable environments are being penalized. Graphic 3.2 illustrates this circumstance for bank *i*.

GRAPHIC 3.2: Cost efficiency and non-discretionary inputs in DEA models



Banking firm *i* can be compared with banks *H, J* and *K*, which operate under environmental conditions at least as favorable as those for firm *i* , i.e., with the same, or lower levels of social capital. Thus, the truly feasible optimal (i.e., minimal) costs for firm *i* are those represented by the C^{*}_{iKS} isocost, and its cost efficiency score would be represented by the distance between the isocost lines C^{*}_{iKS} and C_i.

Considering social capital as a non-discretionary input enables us to decompose total cost efficiency for bank *i* as follows:

$$CE_i = \frac{C_i^*}{C_i} = \underbrace{\left[\frac{C_{iKS}^*}{C_i}\right]}_{PCE_i} \underbrace{\left[\frac{C_i^*}{C_{iKS}^*}\right]}_{SE_i} \qquad (3.3)$$

where the first term in square brackets is the *pure cost efficiency* (cost efficiency adjusted by social capital) for bank *i*, PCE_i, which can be defined as the ratio between optimal costs, represented by the frontier made up of banks and linear combinations of banks operating under environments with the same or a lower level of social capital (C^{*}_{iKS}), and observed costs of bank *i*, (C_i).

The second term in square brackets represents the concept of *social efficiency* for bank i , (SE_i), and is defined as the ratio between the optimal costs attainable for bank i when it operates in a favorable environment, with higher levels of social capital (C_i^*), and the feasible optimal costs for bank i (C_{iKS}^*):

$$SE_i = \frac{C_i^*}{C_{iKS}^*} \tag{3.4}$$

Note that this indicator measures how the society penalizes the banking firm (by increasing its costs) because of the low relative level of social capital it faces.

In practical terms, the problem consists of computing the optimal costs for bank i, (C_{iKS}^*), comparing bank i only with those facing similar or more unfavorable environments—in terms of social capital—, which is achieved by solving a modified version of linear programming problem (1):

$$\begin{aligned}
&\text{Min} \sum_{m=1}^{M} w_{im}\, x_{im} \\
&s.t. \sum_{r=1}^{R} \lambda_r y_{rp} \geq y_{ip} \qquad p = 1, \ldots, P \\
&\sum_{r=1}^{R} \lambda_r x_{rm} \leq x_{im} \qquad m = 1, \ldots, M \\
&\sum_{r=1}^{R} \lambda_r = 1, \lambda_r \geq 0, \qquad r = 1, \ldots, R \\
&\lambda_r = 0 \text{ if } KS_r > KS_i
\end{aligned} \tag{3.5}$$

where an additional constraint has been inserted so as to restrain the scope of comparison, considering only those banks facing the same or more unfavorable environmental conditions as those for the bank under analysis—in our case operating in societies with the same, or a lower, level of social capital (KS)—. See Ruggiero (1996, 1998 and 2004).

3.3. Comparing efficiency distributions

Once efficiency scores have been computed with and without social capital there are several ways to present and compare results. Usually, conclusions are highly descriptive, based only on what summary statistics reveal. However, we may consider some additional methods which provide us with more thorough conclusions. In our case, results are obtained for several countries and different types of financial institutions in each country. Therefore, were interpretations confined to simple summary statistics, the probability of missing important information would be high.

Specifically, using kernel smoothing methods we will estimate nonparametrically the density functions corresponding to both *CE* and *PCE* indices. Several monographs cover this topic in depth (see Silverman, 1986) [9]. The kernel density estimator $\hat{f}$ for a univariate density f based on a sample of R efficiency indices (either *CE* or *PCE*) is $\hat{f}(x) = (Rh)^{-1} \Sigma_{i=1}^{R} K((CE_i - x)/h)$, where r is the banking firm index, CE_i represents its efficiency index, x is the evaluation point, h is the bandwidth and K is a kernel function satisfying certain properties [10]. Additionally, we must control for the fact that efficiency indices are bounded between (0,1), otherwise estimation is inconsistent (see Simar and Wilson, 2006). We use Silverman's (1986) reflection method, the basic idea of which consists of *reflecting* or *mirroring* the probability mass lying beyond the unity—where, theoretically, no probability mass should exist—. The kernel estimate disregarding the boundary condition can be shown to be biased an inconsistent (Simar and Wilson, 1998) [11].

Given our overall nonparametric setting, we also consider nonparametric methods to explore the statistical differences between our efficiency scores, since they focus on the *entire* distributions instead of confining the comparison to summary statistics, such as the mean, in the case of the two-sample t-test, or the median, in the case of the Kruskal-Wallis test.

Once densities are estimated, the Li (1996) test enables us to ascertain whether the observed *visual* differences are statistically significant. These instruments, despite their usefulness, have rarely been employed by economists. The test is based on measuring the distance between two densities $f(x)$ and $g(x)$ through the mean integrated square error, i.e.:

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9. See also Wand and Jones (1995); Pagan and Ullah (1999); Härdle et al. (2004).

10. Further decisions relate to the choice of kernel and the choice of bandwidth. Regarding the former, we considered the Gaussian method for its easiness to compute; regarding the latter, we chose the plug-in method suggested by Wand and Jones (1994). The details have been skipped for the sake of brevity, since they are provided in the literature cited throughout the text.

11. Although we have used a variety of statistical procedures to perform all computations, the FEAR package by Paul W. Wilson for the statistical software R provides code for both computing efficiencies and densities, considering the reflection method. See http://www.eco.utexas.edu/faculty/Wilson/Software/FEAR/fear.html.

$$I = I\,(f(x), g(x)) = \int_x (f(x) - g(x))^2\, dx = \int_x (f^2(x) + g^2(x) - 2\, f(x)\, g(x))\, dx = \\ = \int_x (f(x)\, dF(x) + g(x)\, dG(x) - 2g(x)\, dF(x)) \qquad (3.6)$$

where F and G are two candidates for the distribution of X, with density functions $f(x)$ and $g(x)$, which are estimated using kernel methods. Thus, $\hat{f}$ is the nonparametric *kernel* estimator referred to above. Since $\hat{f} = (Rh)^{-1} \Sigma_{i=1}^{R} K\,((x - CE_i)/h)$, and $\hat{g} = (Rh)^{-1} \Sigma_{i=1}^{R} K\,((y - CE_i)/h)$ a feasible estimator for I is:

$$\tilde{I} = \int_x (\hat{f}(x) - g(x))^2\, dx = \qquad (3.7)$$

$$= \frac{1}{R^2 h} \sum_{i=1}^{R} \sum_{\substack{j=1 \\ j \neq i}}^{R} \left[K\left(\frac{x_i - x_j}{h}\right) + K\left(\frac{y_i - y_j}{h}\right) - K\left(\frac{y_i - x_j}{h}\right) - K\left(\frac{x_i - y_i}{h}\right) \right]$$

In addition to this, the integrated square error is essential for estimating the statistic in which the test is based, whose general expression corresponds to:

$$T = \frac{Rh^{1/2}\, \tilde{I}}{\hat{\sigma}} \qquad (3.8)$$

where

$$\hat{\sigma} = \frac{1}{R^2 h \pi^{1/2}} \sum_{j=1}^{R} \sum_{i=1}^{R} \left[K\left(\frac{x_i - x_j}{h}\right) + K\left(\frac{y_i - y_j}{h}\right) + 2K\left(\frac{x_i - y_j}{h}\right) \right] \qquad (3.9)$$

and h is the bandwidth. See Li (1996), Fan and Ullah (1999), or Pagan and Ullah (1999) for full details. For an application, see the appendix in Kumar and Russell (2002). As mentioned above, economic applications of the test, despite its usefulness in nonparametric settings, are virtually non-existent.

4. Data and Variables

INTERNATIONAL comparisons of bank efficiency are complex, since the available information on the balance sheet and the profit and loss account of each bank must be homogeneous. We use data from the Bureau Van Dijk BankScope data base which provides us with this type of information—i.e., homogeneous data for all firms in our sample—. We use unconsolidated financial statements, or in their absence consolidated statements on individual commercial banks, savings banks and credit unions for the 1993-2001 period. These data are available for all OECD countries. However, Turkey was excluded from the study due to the lack of information about its social capital.

Because of the limitation of our database, we followed the intermediation approach for the choice of inputs and outputs for banking firms. For a good exposition on the problematic of measuring bank activity, see [berger-humphreymeasurement]. Specifically, regarding the choice of outputs, we selected credits and loans (y_1), deposits (y_2), other earning assets (y_3) and fee income (y_4). The inputs selected were personnel expenses (x_1), physical capital (x_2), and loanable funds (x_3). Input prices (w) are obtained as ratios between the costs generated by each input category and their quantities. Thus, total costs are obtained by adding together personnel expenses (w_1x_1), general expenses (w_2x_2) and financial costs (w_3x_3).

The social capital indicators used in the literature so far vary greatly. Most of them aim to measure the trust among individuals in a given community (see Iyer. Kitson and Toh, 2005). For instance, Guiso, Sapienza and Zingales (2004) use electoral turnout and blood donation as primary measures of social capital. Yet none of the indicators used so far is based on the concept of social capital considered as an accumulated stock of trust. In contrast, we consider the more complex measure proposed by Pérez et al. (2005, 2006). This indicator is, to date, the one that most rigorously approaches the theoretical economic concept of social capital, and the one with widest coverage in terms of time—covering the 1970–2001 period— and international scope—containing information for 28 countries—[12].

12. These data are used and presented in Pérez et al. (2006) available at http://w3.grupobbva.com/TLFB/tlfb/TLFBindex-pub.jsp. The fourth appendix in the working paper contains all data on social capital for OECD countries, and for the 1970-2001 period.

Contrary to other social capital indicators used in previous research studies, based on *ad hoc* measures bearing few links with the concept of capital in the economic sense (i.e., an asset which accumulates over time), our indicator of social capital stands alongside other measures of capital devised by economists. It is based on a model which combines individual trust decisions (micro level) with the aggregate effect to co-operate conveyed in social relationship networks (macro level), within a context in which the economic aspects are at the core of the analysis. The central role of economic aspects arises because, on the one hand, economic relations are considered to be one of the most important sources of interaction and trust creation among individuals and, on the other, because social capital is considered capital in the economic sense, i.e., it is produced through investment processes, and it depreciates over time.

Based on these premises, by Pérez et al. (2005, 2006) develop a theoretical model enabling identification of all elements essential to a social capital measure with solid fundamentals. The components contributing to social capital are the various productive factors (physical capital, labor, and human capital) contributing to personal income generation, the degree of connectedness existing within the trust network—along with its dimension—, the reciprocity among agents, the level of inequality in society, the marginal cost of investing in social capital along with its depreciation rate, the temporal discount rate and, finally, the expectations of individuals as to society fitting (life expectancy for those cases in which the emigration rate is low). Considering this model, a social capital measure is proposed which adopts proxies for variables that the theoretical model postulates as relevant.

Table 4.1 contains summary statistics (means) for the variables considered, both for banks' inputs, outputs and prices, and social capital. The first column contains the number of observations, which add up to 36,664 banking firms for the period under analysis (1993-2001). The last column contains data on the level of per capita social capital, which reveals remarkable disparities across countries. For instance, Switzerland and Norway have the highest endowments of social capital, with a value of 940 and 632, respectively. At the other extreme, Poland, Mexico and Spain have the lowest levels of social capital—with 42.6, 58.82 and 71.88, respectively—.

TABLE 4.1: Summary statistics for bank inputs, outputs and social capital, average 1993–2001 period

	# obs. 1993-2001	$y1$[a]	$y2$[a]	$y3$[a]	$y4$[a]	$x1$[a]	$x2$[a]	$x3$[a]	Social capital[b,c]
Australia	135	16,150,495.72	13,988,537.58	4,174,667.19	366,277.32	195,890.73	108,797.95	19,107,796.60	353.90
Austria	951	629,022.86	902,215.30	588,367.38	10,040.88	10,607.46	12,794.62	1,186,948.07	566.83
Belgium	372	8,244,551.60	14,949,100.10	9,482,655.94	183,799.22	160,685.91	199,839.74	17,388,428.94	198.02
Canada	307	13,638,838.38	18,422,462.52	9,618,345.19	590,218.77	391,067.48	185,957.72	22,077,679.56	419.93
Czech Republic	148	681,215.42	1,705,630.32	1,268,227.88	43,410.88	24,408.15	52,124.71	1,873,644.34	137.89
Denmark	731	1,249,376.55	1,947,489.71	1,293,250.36	19,193.08	26,647.59	19,274.17	2,310,231.30	180.71
Finland	69	9,781,763.17	12,943,979.32	9,916,115.86	78,376.08	77,098.21	109,309.36	18,156,340.88	171.75
France	2,105	4,886,458.61	7,887,737.73	6,293,562.94	153,362.91	105,708.92	69,281.45	9,957,042.38	136.60
Germany	15,106	974,451.04	1,459,113.10	856,646.40	11,608.68	16,206.04	15,960.25	1,790,177.89	496.36
Greece	135	4,313,536.62	7,768,150.26	5,916,585.88	139,314.36	138,265.62	168,326.43	9,813,360.36	101.82
Hungary	73	909,360.53	1,693,085.69	885,810.82	38,709.49	27,978.05	48,874.59	1,791,041.16	91.93
Ireland	82	1,876,542.05	3,708,706.77	3,182,055.78	16,822.30	3,804.26	25,114.03	4,792,237.72	399.09
Italy	3,238	1,187,728.74	1,229,139.46	651,294.06	24,978.87	28,256.39	29,560.25	1,709,554.00	109.32
Japan	1,846	9,135,631.86	12,442,597.92	5,265,944.03	53,354.49	69,459.61	188,775.90	14,171,061.27	577.32
South Korea	140	24,190,782.97	30,184,682.57	11,314,664.97	410,530.07	283,969.36	680,129.43	34,883,150.46	664.44
Luxembourg	912	1,272,405.31	4,548,177.09	4,019,635.07	36,332.03	16,266.90	18,073.60	5,082,317.43	690.27
Mexico	204	288,209.75	507,662.19	82,123.75	16,002.54	984.43	23,757.70	507,662.19	34.89
Netherlands	184	4,765,439.71	2,873,221.51	1,528,348.17	37,312.85	38,296.96	31,011.62	6,076,540.05	742.57
New Zealand	36	8,285,250.17	9,031,495.58	1,800,263.65	130,613.43	81,776.61	31,040.73	9,788,452.10	374.59
Norway	278	3,028,276.62	2,476,972.77	672,604.12	34,767.80	34,685.51	28,312.45	3,484,871.94	415.81
Polan	243	1,150,039.49	2,117,517.32	1,094,697.02	64,739.63	44,339.11	64,853.19	2,142,743.30	35.08
Portugal	225	5,887,763.37	7,770,868.82	2,824,455.80	235,921.39	72,569.84	126,800.04	8,923,561.29	280.53
Slovakia	90	349,067.23	1,036,831.76	737,925.97	20,881.22	13,152.25	42,551.81	1,050,412.13	69.75
Spain	1,101	4,247,375.29	6,124,711.73	2,783,052.68	56,158.80	84,289.01	122,423.29	6,675,055.44	141.66
Sweden	170	1,240,648.49	2,006,126.86	1,464,254.39	25,598.75	24,050.15	5,895.53	2,513,855.16	475.86
Switzerland	1,414	1,527,818.99	2,854,746.00	1,943,717.91	63,378.57	44,288.90	28,320.56	3,304,728.56	1,023.80
United Kingdom	298	8,138,213.78	11,014,380.42	6,720,913.66	246,052.16	172,142.43	93,042.26	13,186,837.46	403.01
USA	6,071	6,277,848.94	6,736,987.32	3,070,788.84	246,097.45	141,061.09	113,969.25	9,362,453.93	506.82
Total	**36,664**	**3,217,224.36**	**4,295,338.33**	**2,295,593.34**	**74,187.18**	**55,939.45**	**60,101.50**	**5,315,620.03**	**433.33**

[a] Thousands US$

[b] Volume index (no units), year 1970=100. See Pérez et al. (2005, 2006).

[c] Data on social capital are freely available at http://w3.grupobbva.com/TLFB/tlfb/TLFBindex_pub.jsp (appendix 4).

5. Results

TABLE 5.1 reports results on average cost efficiency *(CE)* for each country for the sample period, showing a roughly stable path: there has been a moderate 3% decline. For the whole period (last column), efficiency averages to 0.900, indicating that cost savings of up to 10% would be attainable if inputs were used efficiently. Among the most efficient are the Japanese banking system (averaging to 0.990) and the Swiss banking system (averaging 0.988). On the other hand, the Norwegian and Italian banking systems are the most inefficient, averaging to 0.832 and 0.726, respectively. The Spanish banking system is one of the most efficient, averaging to 0.977—third only to Japan and Norway—. However, the 40% increase in standard deviation, from 0.090 in 1993 to 0.125 in 2001, contrasts sharply with the more stable tendency existing for mean efficiency. This marked increase of the dispersion in cost efficiency could indicate that financial liberalization in the OECD countries has not entirely favored convergence among banking systems' efficiency.

However, average efficiencies in table 5.2 do not control for the effect of social capital on bank cost efficiency. In section 2 justify we described the various paths by which social capital affects efficiency. According to this rationale, disregarding social capital would lead to biased efficiency scores, penalizing those banks facing the most unfavorable environments in terms of low levels of social capital. Table 5.2 reports measures for *pure* cost efficiency *(PCE),* which are adjusted for social capital. These measures were obtained by solving the linear programming problem (3.1) for all banks, by comparing each bank with those facing similar, or more unfavorable environments with the same, or lower levels of social capital.

Pure cost efficiency *(PCE)* shows a similar evolution to that observed for cost efficiency *(CE),* although its decline is slightly lower—averaging to 2.5%—. If the entire period is analyzed, *PCE* averages to 0.912 for all 36,664 banks in our sample, only slightly higher than *CE* . When social capital enters the analysis, relative positions vary, and the Polish banking system is the most efficient, followed by Japan. Note that Poland is the country with the lowest social capital levels throughout the analyzed period (table 4.1). According to the cost efficiency measures which disregard social capital, Po-

TABLE 5.1: Cost efficiency $(CE = C^c/C)$, averages

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total (average)
Australia	0.894	0.884	0.887	0.898	0.896	0.889	0.886	0.880	0.853	0.884
Austria	0.926	0.906	0.904	0.896	0.906	0.851	0.862	0.926	0.938	0.900
Belgium	0.914	0.913	0.903	0.901	0.899	0.869	0.858	0.897	0.887	0.894
Canada	0.971	0.974	0.963	0.951	0.915	0.908	0.906	0.944	0.944	0.935
Czech Republic	0.991	0.971	0.980	0.943	0.937	0.880	0.879	0.932	0.882	0.918
Denmark	0.980	0.983	0.985	0.987	0.981	0.875	0.886	0.986	0.981	0.960
Finland	0.889	0.858	0.858	0.837	0.840	0.819	0.839	0.913	0.922	0.859
France	0.851	0.860	0.873	0.869	0.894	0.880	0.884	0.903	0.913	0.881
Germany	0.956	0.952	0.948	0.947	0.942	0.880	0.879	0.951	0.951	0.932
Greece	0.995	0.996	0.999	0.997	0.993	0.968	0.962	0.841	0.834	0.966
Hungary	—	1.000	0.967	0.895	0.871	0.876	0.827	0.928	0.933	0.893
Ireland	0.974	0.973	0.982	0.952	0.960	0.975	0.960	0.976	0.967	0.969
Italy	0.788	0.788	0.766	0.718	0.730	0.687	0.689	0.727	0.709	0.726
Japan	0.988	0.988	0.985	0.986	0.989	0.987	0.982	0.993	0.993	0.990
South Korea	0.874	0.863	0.867	0.858	0.829	0.856	0.899	0.906	0.902	0.870
Luxembourg	0.969	0.964	0.962	0.952	0.949	0.941	0.945	0.960	0.967	0.956
Mexico	0.757	0.822	0.855	0.822	0.970	0.892	0.907	0.993	1.000	0.891
Netherlands	0.979	0.990	0.988	0.981	0.968	0.938	0.949	0.951	0.947	0.967
New Zealand	—	0.991	0.996	0.979	0.982	0.961	0.955	0.956	0.955	0.966
Norway	0.949	0.921	0.902	0.869	0.800	0.777	0.787	0.807	0.774	0.832
Polan	0.997	0.998	0.986	0.971	0.966	0.898	0.904	0.979	0.962	0.953
Portugal	0.939	0.943	0.968	0.959	0.949	0.899	0.848	0.877	0.902	0.921
Slovakia	0.998	0.997	0.999	0.964	0.963	0.940	0.923	0.977	0.979	0.959
Spain	0.983	0.986	0.989	0.990	0.987	0.962	0.941	0.983	0.975	0.977
Sweden	0.978	0.976	0.980	0.965	0.973	0.959	0.946	0.962	0.991	0.980
Switzerland	0.843	0.875	0.876	0.875	0.863	0.841	0.840	0.877	0.858	0.860
United Kingdom	0.977	0.974	0.972	0.957	0.958	0.916	0.939	0.977	0.967	0.959
USA	0.905	0.883	0.886	0.872	0.865	0.843	0.812	0.841	0.837	0.862
Total	**0.926**	**0.922**	**0.919**	**0.910**	**0.908**	**0.866**	**0.857**	**0.905**	**0.900**	**0.900**
Std. dev.	**0.090**	**0.087**	**0.093**	**0.109**	**0.105**	**0.101**	**0.102**	**0.117**	**0.125**	**0.107**

TABLE 5.2: Pure cost efficiency (social capital adjusted) $(PCE = C_k^*/C)$, averages

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total (average)
Australia	0.910	0.956	0.957	0.950	0.933	0.937	0.942	0.904	0.885	0.929
Austria	0.928	0.908	0.905	0.895	0.906	0.852	0.862	0.926	0.938	0.901
Belgium	0.934	0.936	0.923	0.922	0.910	0.906	0.906	0.908	0.895	0.916
Canada	0.975	0.983	0.968	0.959	0.921	0.934	0.954	0.952	0.954	0.950
Czech Republic	0.992	0.987	0.981	0.958	0.954	0.916	0.941	0.941	0.907	0.943
Denmark	0.981	0.984	0.986	0.988	0.989	0.987	0.987	0.987	0.983	0.986
Finland	0.909	0.894	0.897	0.912	0.893	0.901	0.931	0.965	0.956	0.917
France	0.898	0.909	0.906	0.905	0.912	0.912	0.930	0.917	0.935	0.914
Germany	0.956	0.952	0.948	0.948	0.942	0.881	0.897	0.951	0.951	0.934
Greece	0.995	0.997	1.000	0.997	0.996	1.000	1.000	0.929	0.960	0.990
Hungary	—	1.000	0.973	0.944	0.896	0.927	0.920	0.946	0.989	0.939
Ireland	1.000	1.000	0.988	0.965	0.982	0.988	1.000	0.977	0.971	0.983
Italy	0.831	0.861	0.877	0.773	0.749	0.754	0.761	0.748	0.788	0.783
Japan	0.988	0.988	0.985	0.986	0.989	0.987	0.982	0.993	0.993	0.990
South Korea	0.884	0.889	0.876	0.868	0.837	0.894	0.934	0.906	0.902	0.884
Luxembourg	0.969	0.964	0.963	0.952	0.949	0.941	0.951	0.960	0.967	0.957
Mexico	0.865	0.876	0.900	0.870	0.990	0.994	0.994	0.998	1.000	0.945
Netherlands	0.984	0.993	0.991	0.983	0.968	0.939	0.949	0.951	0.947	0.969
New Zealand	—	1.000	1.000	1.000	0.997	0.988	0.971	0.980	0.979	0.986
Norway	0.949	0.921	0.902	0.869	0.800	0.777	0.787	0.815	0.798	0.837
Polan	0.997	0.998	0.999	0.990	0.993	0.998	0.995	0.992	0.993	0.994
Portugal	0.962	0.964	0.969	0.961	0.955	0.933	0.916	0.901	0.924	0.943
Slovakia	1.000	0.997	0.999	0.968	0.974	0.978	0.986	0.978	0.984	0.979
Spain	0.990	0.991	0.991	0.992	0.992	0.992	0.987	0.986	0.981	0.989
Sweden	0.991	0.987	0.989	0.986	0.979	0.973	0.990	0.973	0.992	0.988
Switzerland	0.843	0.875	0.876	0.875	0.863	0.841	0.840	0.877	0.858	0.860
United Kingdom	0.980	0.982	0.977	0.967	0.963	0.964	0.975	0.979	0.972	0.973
USA	0.912	0.900	0.894	0.874	0.871	0.845	0.823	0.842	0.838	0.869
Total	**0.935**	**0.935**	**0.932**	**0.918**	**0.913**	**0.881**	**0.884**	**0.909**	**0.914**	**0.912**
Std. dev.	**0.073**	**0.068**	**0.075**	**0.099**	**0.103**	**0.096**	**0.098**	**0.113**	**0.107**	**0.097**

land ranked twelfth. However, when social capital is controlled for—i.e., taking into account that Polish banks operate in one of the most unfavorable environments in the terms described in section 2—their performance ranks in the top position.

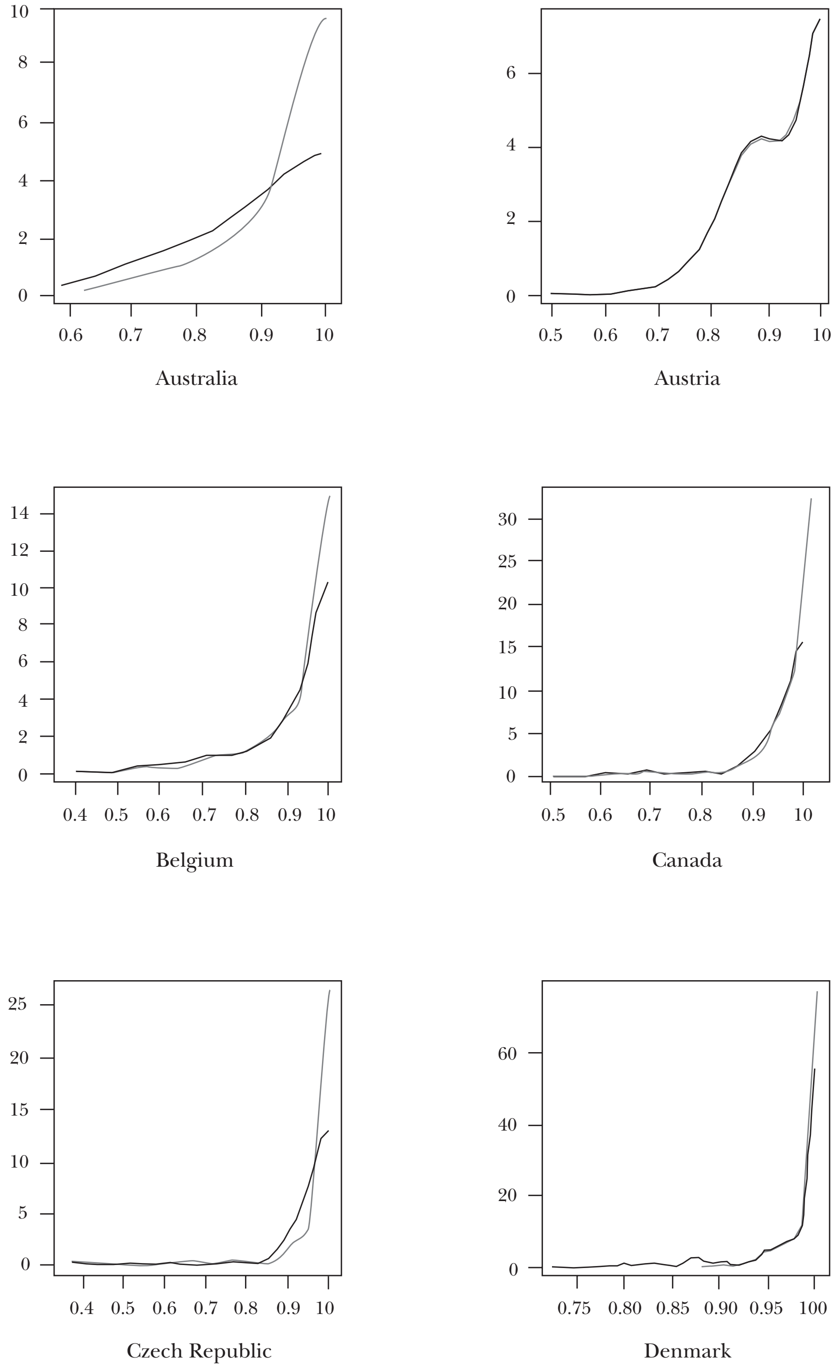
Similar tendencies hold for Mexico and Finland which, facing low levels of social capital, and also having low average cost efficiency scores for banks operating in their banking systems, move up six positions in the ranking for pure cost efficiency. Akin to Poland, when the negative effect that an unfavorable environment has on banks costs is controlled for, efficiency in Mexico and Finland is enhanced by more than 6%.

In contrast, Austria and Netherlands, whose social capital levels rank among the highest, move down in the pure cost efficiency ranking when the favorable conditions provided by their financial systems are controlled for, simply because there are other countries which now overtake them. However, that does not imply that their performance deteriorates. For instance, in the case of Austria, its average uncontrolled efficiency for1993 is $CE^{1993}_{Austria} = 0.926$ and it remains virtually unchanged ($PCE^{1993}_{Austria} = 0.928$) after it is controlled for.

Regarding dispersion measures, it should be emphasized that pure cost efficiency is roughly 10% lower than cost efficiency. Therefore, discrepancies are greatly reduced when controlling for the differing circumstances in which banks operate. Likewise, similarly to what occurs for cost efficiency, pure cost efficiency dispersion also increases by 33%, from 0.073 in 1993 to 0.097 in 2001. Other studies have also obtained a significant reduction of the disparities among countries when environmental variables were controlled for [(see Pastor and Serrano, 2005; Lozano-Vivas, Pastor and Pastor, 2002).

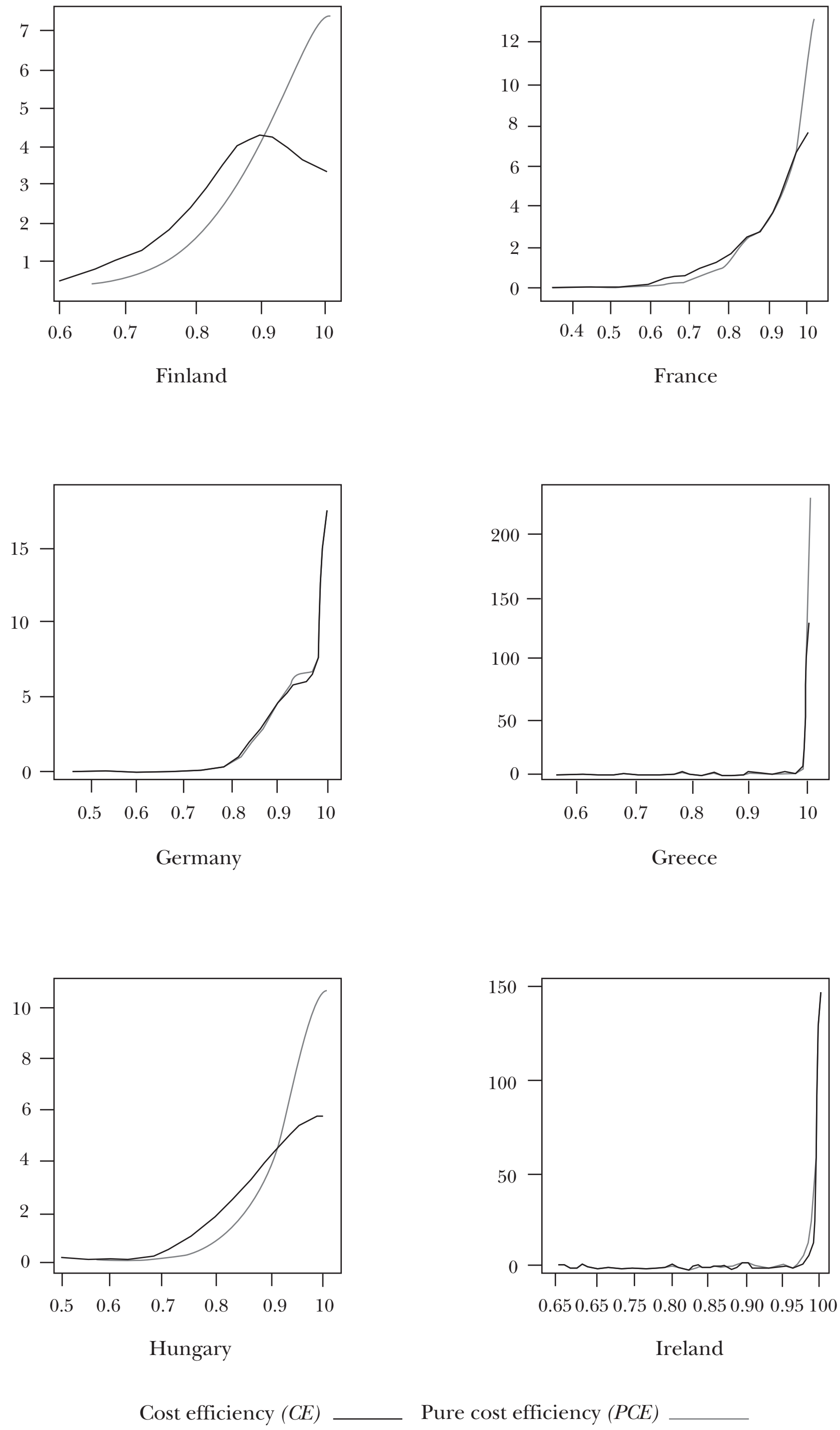
Graphic 5.1 shows densities for efficiency scores. The solid line in each sub-graphic is the density for uncontrolled efficiency scores *(CE),* and the dotted line represents densities controlling for social capital *(PCE).* Bandwidths for each density are provided in table 5.3. Each sub-graphic contains densities for each country in our sample. The scale of the *Y*-axis in graphic 5.1: Densities for cost efficiency *(CE)* and cost efficiency adjusted by social capital *(PCE),* 1993–2001 each sub-graphic varies so as to show the tendencies for each country more precisely—otherwise it would be difficult to compare results for Japan and South Korea, for instance, given their stark differences—. Probability mass tends to accumulate rightwards for both *CE* and *PCE* due to the usually large number of observations with a value of 1 —i.e., efficient units—. In cases where efficiency is higher, probability mass tends to be more concentrated rightwards. However, densities reveal features concealed by summary statistics. For instance, in some banking systems as efficient as the Swiss banking system there is also a large number of

GRAPHIC 5.1: Densities for cost efficiency *(CE)* and cost efficiency adjusted by social capital *(PCE)*, 1993-2001

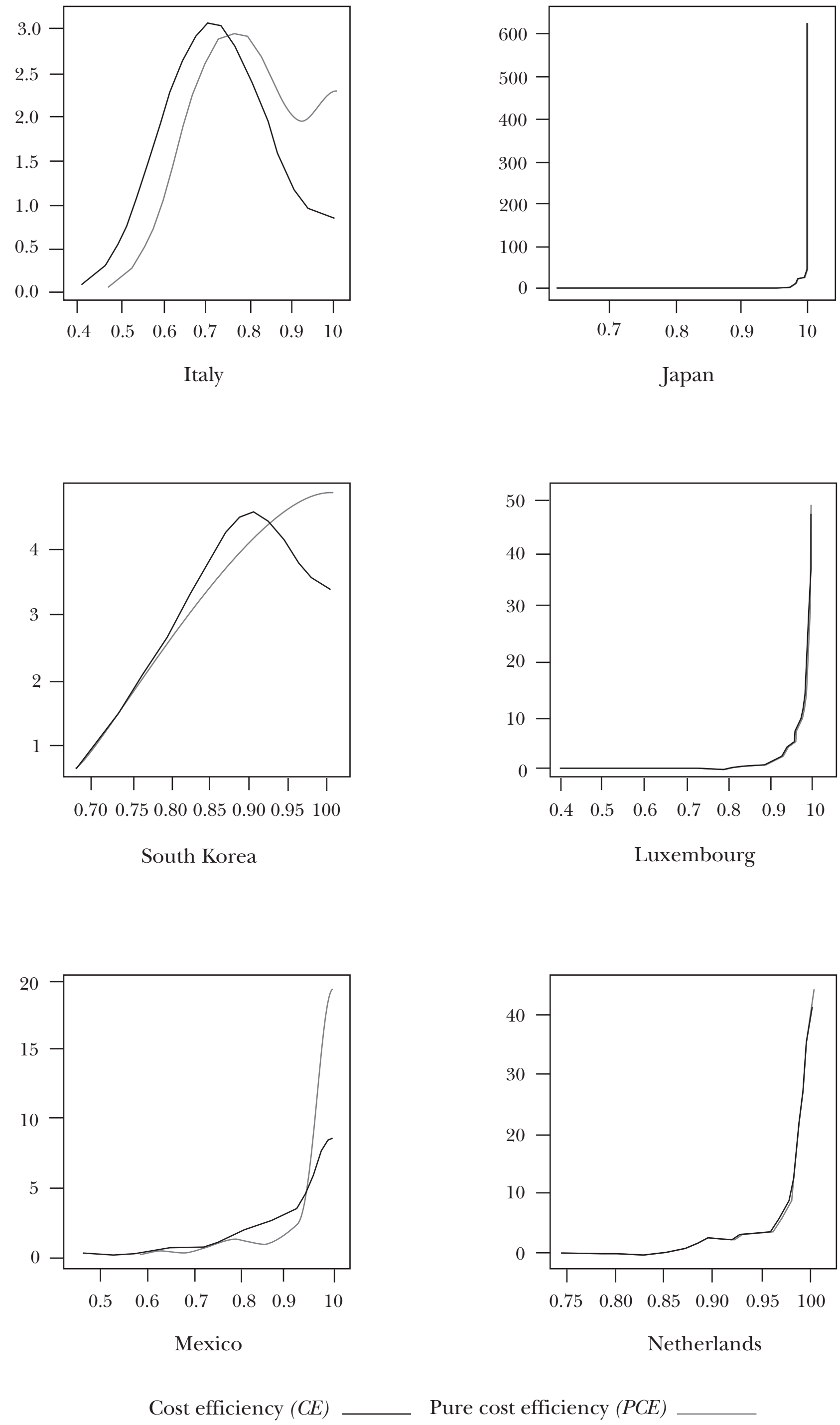


Cost efficiency *(CE)* ——— Pure cost efficiency *(PCE)* ———

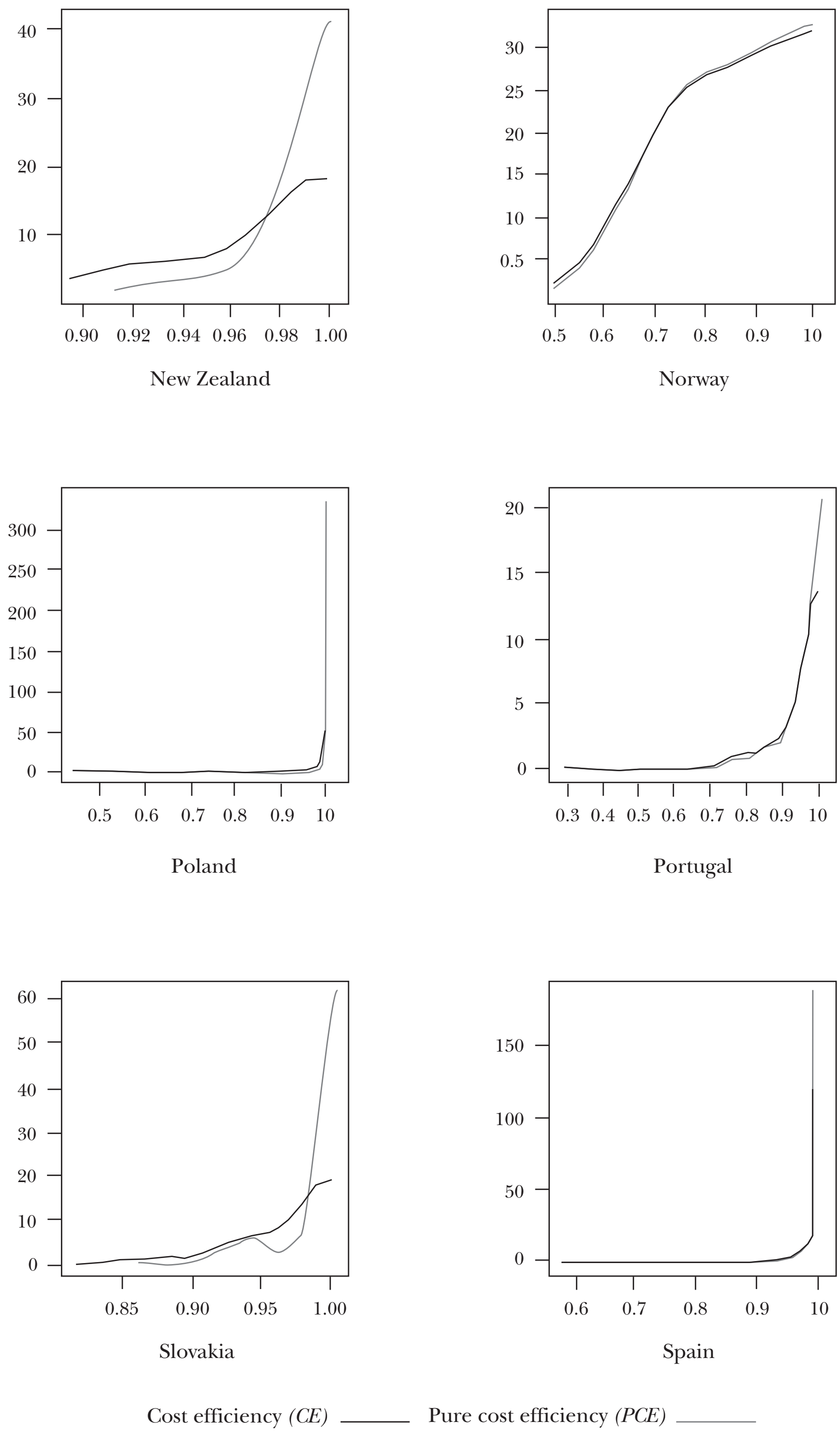
GRAPHIC 5.1 (continuation): **Densities for cost efficiency *(CE)* and cost efficiency adjusted by social capital *(PCE)*, 1993-2001**



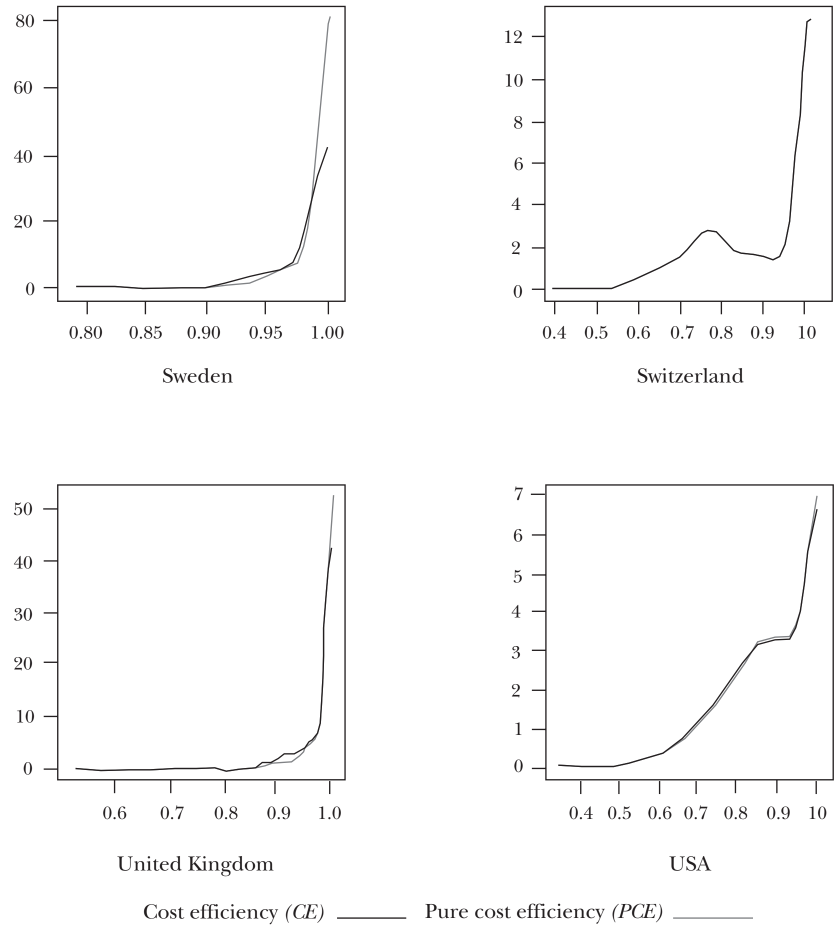
GRAPHIC 5.1 (continuation): **Densities for cost efficiency *(CE)* and cost efficiency adjusted by social capital *(PCE)*, 1993-2001**



GRAPHIC 5.1 (continuation): **Densities for cost efficiency *(CE)* and cost efficiency adjusted by social capital *(PCE)*, 1993-2001**



GRAPHIC 5.1 (continuation): **Densities for cost efficiency *(CE)* and cost efficiency adjusted by social capital *(PCE)*, 1993-2001**



banks constituting an outstanding mode between 0.7 and 0.8. Multimodality is also present for Austria or the USA, for instance. In other cases such as Finland, Italy or South Korea, the number of efficient banks is much lower, and the most perceptible modes are located well below the unity.

However, our main interest lies in comparing efficiency results when social capital is included. This effect is shown by the dotted line in each sub-graphic. The effect varies greatly across countries. In several cases, we observe that efficiency enhances ostensibly, as revealed by probability mass accumulating more tightly rightwards—suggesting a higher number of banking firms approaches the unity, i.e., the frontier—. This tendency is generalized, but is more apparent for countries with low levels of social capital such

TABLE 5.3: Bandwidths for CE and PCE densities

	h_{CE}	h_{PCE}
Australia	0.0865	0.0493
Austria	0.0274	0.0275
Belgium	0.0274	0.0247
Canada	0.0203	0.0115
Czech Republic	0.0257	0.0141
Denmark	0.0057	0.0064
Finland	0.0585	0.0538
France	0.0218	0.0189
Germany	0.0083	0.0083
Greece	0.0038	0.0031
Hungary	0.0612	0.0398
Ireland	0.0035	0.0129
Italy	0.0515	0.0443
Japan	0.0004	0.0004
South Korea	0.0513	0.0664
Luxembourg	0.0060	0.0059
Mexico	0.0378	0.0279
Netherlands	0.0096	0.0096
New Zealand	0.0237	0.0096
Norway	0.0885	0.0836
Poland	0.0070	0.0018
Portugal	0.0201	0.0160
Slovakia	0.0184	0.0082
Spain	0.0026	0.0027
Sweden	0.0123	0.0069
Switzerland	0.0212	0.0211
United Kingdom	0.0099	0.0102
USA	0.0240	0.0248

Note: Bandwidths for CE and PCE densities have been estimated using Sheather and Jones (1991) plug-in methods.

as Finland, Mexico or, more especially, Poland. However, the more striking tendencies are those found for countries with the highest levels of social capital, such as Austria, Germany, Japan, Netherlands, Norway, Switzerland, or the USA. In these cases, densities are virtually the same, i.e., banks move up or down only marginally in the efficiency rankings.

These results are complemented via Li's (1996) test, the summary of which is reported in table 5.4. The summary is provided for the usual significance levels. It broadly corroborates the analysis performed for densities. Accordingly, for cases in which controlled and uncontrolled densities differed, we obtain statistically significant results. That is the case for Australia,

TABLE 5.4: Distribution hypothesis tests[a] (Li, 1996) (1993-2001)

Country	Null hypothesis $(H_0)^b$	*T*-test statistics	*p*-value	10-Percent significance level (critical value=1.2816)	5-Percent significance level (critical value=1.6449)	1-Percent significance level (critical value=2.3263)
Australia	$f(CE^{Australia}) = g(PCE^{Australia})$	3.2652	0.0005	H_0 rejected	H_0 rejected	H_0 rejected
Austria	$f(CE^{Austria}) = g(PCE^{Austria})$	0.0280	0.4888	H_0 non rejected	H_0 non rejected	H_0 non rejected
Belgium	$f(CE^{Belgium}) = gf(PCE^{Belgium})$	4.3332	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Canada	$f(CE^{Canada}) = g(PCE^{Canada})$	5.2024	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Czech Republic	$f(CE^{Czech\ Republic}) = g(PCE^{Czech\ Republic})$	4.5698	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Denmark	$f(CE^{Denmark}) = g(PCE^{Denmark})$	26.344	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Finland	$f(CE^{Finland}) = g(PCE^{Finland})$	4.8706	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
France	$f(CE^{France}) = g(PCE^{France})$	32.5384	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Germany	$f(CE^{Germany}) = g(PCE^{Germany})$	Unfeasible	—	—	—	—
Greece	$f(CE^{Greece}) = g(PCE^{Greece})$	5.6958	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Hungary	$f(CE^{Hungary}) = g(PCE^{Hungary})$	3.4467	0.0003	H_0 rejected	H_0 rejected	H_0 rejected
Ireland	$f(CE^{Ireland}) = g(PCE^{Ireland})$	0.8984	0.1845	H_0 non rejected	H_0 non rejected	H_0 non rejected
Italy	$f(CE^{Italy}) = g(PCE^{Italy})$	68.1268	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Japan	$f(CE^{Japan}) = g(PCE^{Japan})$	0.0014	0.4994	H_0 non rejected	H_0 non rejected	H_0 non rejected
South Korea	$f(CE^{South\ Korea}) = g(PCE^{South\ Korea})$	0.9955	0.1598	H_0 non rejected	H_0 non rejected	H_0 non rejected
Luxembourg	$f(CE^{Luxembourg}) = g(PCE^{Luxembourg})$	0.0902	0.4641	H_0 non rejected	H_0 non rejected	H_0 non rejected
Mexico	$f(CE^{Mexico}) = g(PCE^{Mexico})$	17.921	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Netherlands	$f(CE^{Netherlands}) = g(PCE^{Netherlands})$	0.2653	0.3954	H_0 non rejected	H_0 non rejected	H_0 non rejected
New Zealand	$f(CE^{New\ Zealand} = f(CE^{New\ Zealand})$	1.392	0.0820	H_0 rejected	H_0 rejected	H_0 rejected
Norway	$f(CE^{Norway}) = g(PCE^{Norway})$	0.0399	0.4841	H_0 non rejected	H_0 non rejected	H_0 non rejected
Poland	$f(CE^{Poland}) = g(PCE^{Poland})$	34.6437	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Portugal	$f(CE^{Portugal}) = g(PCE^{Portugal})$	2.5367	0.0056	H_0 rejected	H_0 rejected	H_0 rejected
Slovakia	$f(CE^{Slovakia}) = g(PCE^{Slovakia})$	5.8414	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Spain	$f(CE^{Spain}) = g(PCE^{Spain})$	47.0879	0.0000	H_0 rejected	H_0 rejected	H_0 rejected
Sweden	$f(CE^{Sweden}) = g(PCE^{Sweden})$	1.0559	0.1455	H_0 non rejected	H_0 non rejected	H_0 non rejected
Switzerland	$f(CE^{Switzerland}) = g(PCE^{Switzerland})$	0.0007	0.4997	H_0 non rejected	H_0 non rejected	H_0 non rejected
United Kingdom	$f(CE^{United\ Kingdom)} = g(PCE^{United\ Kingdom})$	3.8215	0.0001	H_0 rejected	H_0 rejected	H_0 rejected
USA	$f(CE^{USA}) = g(PCE^{USA})$	Unfeasible	—	—	—	—

[a] The functions $f(\cdot)$ and $g(\cdot)$ are (kernel) distribution functions for uncontrolled *(CE)* and controlled *(PCE)* efficiency scores, respectively.

[b] The null hypothesis tests for the equality of distributions $H_0 : f(x) = g(x), \forall x$, against the alternative, $H_1 : f(x) \neq g(x)$, for some x.

Belgium, Canada, Czech Republic, Denmark, Finland, France, Greece, Hungary, Italy, Mexico, Poland, Portugal, Slovakia, Spain and United Kingdom—i.e., differences between efficiency scores obtained with and without social capital are statistically significant at 1% significance level—. The test also corroborates the results for those countries whose banks' efficiency scores remained unaffected when controlling for social capital, showing no statistical differences. That is the case for Austria, Ireland, Japan, Luxembourg, Netherlands, Norway and Switzerland. Of special note is the case of South Korea, New Zealand and Sweden for which densities revealed differences, although these are not significant. This relatively conflicting finding may be explained by the fact that social capital per head in these countries is quite high, especially in South Korea (ranked 4 in social capital per head, see last column in table 4.1) and Sweden (ranked 9). In the case of New Zealand, although its ranking is lower (14), we must bear in mind that some evidence does exist on significant differences—at 10% level, with a *p*-value of 0.0820—.

Table 5.5 reports results for social inefficiency *(SE)*, which measures the penalization—in terms of banking costs—which the society imposes on the banking firm according to the level of social capital present in each country: the lower the level, the higher the penalization on bank costs. For the whole sample period, the value for social efficiency is 0.987, indicating that if social capital levels were similar to, or higher than those corresponding to the country with the highest level of social capital, banking firms' costs could be reduced by 1.3%. Obviously, circumstances differ across countries. For instance, in Italy, the social inefficiency indicator is 0.926, with 7.4% of cost savings, whereas in some other outstanding cases such as Finland, Mexico, or Hungary, cost savings are 6.3%, 5.7% and 4.9%, respectively.

To illustrate the magnitude of potential cost savings, table 5.6 reports social inefficiencies with respect to Gross Domestic Product (GDP). The last column presents the accumulated potential savings with respect to GDP in 2001. Note that there are several countries for which substantial savings (over 3% of GDP) could be attained. That is the case for Italy (5.044%), Belgium (4.621%), or Finland (3.687%). Yet in other instances such as Switzerland (0.000%), Japan (0.004%) or the Netherlands (0.036%) the savings would much lower.

In addition, to analyze whether the impact of social capital on efficiency differs according to the size of each bank, we ranked banking sizes, according to asset quartiles. Table 5.7 reports results for cost efficiency and pure cost efficiency. However, results do not suggest any particular tendency for this association. Likewise, we constructed banking firms' quartiles according to the levels of social capital they face (see table 5.8). In this case, re-

TABLE 5.5: Social inefficiency $(SE = C^*/C_k^*)$**, averages**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total (average)
Australia	0.982	0.925	0.927	0.945	0.960	0.949	0.941	0.974	0.964	0.952
Austria	0.998	0.998	0.999	1.001	0.999	0.998	1.000	0.999	1.000	0.999
Belgium	0.979	0.976	0.979	0.977	0.988	0.959	0.947	0.987	0.991	0.976
Canada	0.996	0.991	0.995	0.992	0.993	0.972	0.950	0.991	0.990	0.984
Czech Republic	1.000	0.984	0.999	0.984	0.982	0.961	0.934	0.991	0.973	0.974
Denmark	0.999	0.999	0.999	0.999	0.992	0.887	0.898	0.998	0.998	0.974
Finland	0.978	0.960	0.957	0.918	0.941	0.909	0.902	0.946	0.965	0.937
France	0.948	0.945	0.964	0.960	0.980	0.966	0.950	0.985	0.976	0.964
Germany	1.000	1.000	1.000	1.000	1.000	0.999	0.979	1.000	1.000	0.997
Greece	1.000	1.000	0.999	1.000	0.997	0.968	0.962	0.905	0.869	0.976
Hungary	—	1.000	0.994	0.948	0.972	0.945	0.898	0.981	0.944	0.951
Ireland	0.974	0.973	0.994	0.986	0.978	0.987	0.960	1.000	0.996	0.986
Italy	0.948	0.915	0.873	0.929	0.975	0.912	0.905	0.972	0.900	0.926
Japan	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
South Korea	0.989	0.971	0.990	0.989	0.990	0.957	0.962	1.000	1.000	0.984
Luxembourg	0.999	1.000	0.999	1.000	1.000	1.000	0.994	1.000	1.000	0.999
Mexico	0.875	0.937	0.950	0.945	0.980	0.897	0.912	0.995	1.000	0.943
Netherlands	0.994	0.997	0.997	0.998	1.000	0.998	1.000	1.000	1.000	0.998
New Zealand	—	0.991	0.996	0.979	0.985	0.973	0.983	0.975	0.975	0.979
Norway	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.990	0.970	0.994
Polan	1.000	1.000	0.987	0.981	0.973	0.900	0.908	0.987	0.969	0.958
Portugal	0.976	0.978	0.998	0.998	0.994	0.963	0.926	0.973	0.976	0.977
Slovakia	0.998	1.000	1.000	0.996	0.989	0.961	0.936	0.998	0.996	0.979
Spain	0.993	0.995	0.998	0.998	0.995	0.970	0.953	0.996	0.994	0.988
Sweden	0.986	0.989	0.991	0.979	0.994	0.986	0.955	0.989	0.999	0.992
Switzerland	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
United Kingdom	0.997	0.991	0.995	0.990	0.995	0.951	0.963	0.998	0.995	0.986
USA	0.992	0.981	0.991	0.997	0.994	0.997	0.987	0.999	0.999	0.993
Total	**0.990**	**0.986**	**0.986**	**0.991**	**0.995**	**0.984**	**0.969**	**0.995**	**0.985**	**0.987**
Std. dev.	**0.040**	**0.042**	**0.048**	**0.040**	**0.023**	**0.040**	**0.043**	**0.027**	**0.056**	**0.042**

TABLE 5.6: Potential cost savings attributable to social capital. Percentage with respect to GDP

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Accum. (%)[a]
Australia	0.010	0.041	0.064	0.090	0.082	0.096	0.100	0.092	0.090	0.696
Austria	0.046	0.041	0.043	0.066	0.020	0.079	0.075	0.026	0.007	0.448
Belgium	0.142	0.318	0.358	0.513	0.651	0.790	0.548	0.655	0.275	4.621
Canada	0.000	0.001	0.001	0.129	0.104	0.064	0.221	0.241	0.263	0.973
Czech Republic	0.001	0.071	0.008	0.201	0.234	0.249	0.182	0.043	0.029	0.967
Denmark	0.099	0.123	0.105	0.121	0.173	0.191	0.246	0.205	0.236	1.558
Finland	0.070	0.135	0.208	0.494	0.778	0.723	0.669	0.407	0.117	3.687
France	0.235	0.376	0.322	0.307	0.348	0.239	0.229	0.312	0.245	2.790
Germany	0.026	0.033	0.015	0.019	0.032	0.047	0.112	0.043	0.036	0.405
Greece	0.000	0.009	0.000	0.000	0.011	0.035	0.048	0.651	0.855	1.583
Hungary	0.000	0.000	0.000	0.426	0.055	0.073	0.306	0.102	0.197	1.059
Ireland	0.059	0.087	0.028	0.051	0.057	0.062	0.011	0.001	0.009	0.247
Italy	0.164	0.368	0.854	0.832	0.567	0.461	0.418	0.372	0.818	5.044
Japan	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
South Korea	0.025	0.061	0.051	0.095	0.056	0.328	0.399	0.000	0.004	0.904
Luxembourg	0.083	0.070	0.240	0.040	0.154	0.138	0.443	0.007	0.000	1.097
Mexico	0.001	0.001	0.005	0.003	0.002	0.010	0.008	0.051	0.000	0.067
Netherlands	0.008	0.010	0.006	0.006	0.000	0.007	0.000	0.000	0.000	0.036
New Zealand	0.000	0.008	0.004	0.156	0.128	0.226	0.072	0.235	0.239	1.168
Norway	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.286	0.309
Polan	0.000	0.000	0.026	0.034	0.070	0.134	0.111	0.013	0.034	0.370
Portugal	0.046	0.040	0.028	0.056	0.103	0.172	0.321	0.534	0.288	1.572
Slovakia	0.000	0.000	0.000	0.036	0.039	0.150	0.591	0.040	0.025	0.876
Spain	0.055	0.102	0.110	0.143	0.178	0.156	0.256	0.134	0.208	1.323
Sweden	0.052	0.055	0.087	0.081	0.045	0.065	0.045	0.102	0.114	0.699
Switzerland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Kingdom	0.000	0.001	0.002	0.006	0.002	0.010	0.013	0.011	0.016	0.060
USA	0.024	0.046	0.052	0.019	0.048	0.040	0.029	0.020	0.018	0.238
Total	**0.039**	**0.070**	**0.091**	**0.095**	**0.093**	**0.088**	**0.091**	**0.072**	**0.087**	**0.691**
Std. dev.	**0.040**	**0.042**	**0.048**	**0.040**	**0.023**	**0.040**	**0.043**	**0.027**	**0.056**	**0.042**

[a] Sum of potential savings for 1993–2001 period w.r.t. 2001 GDP. Results in last column are expressed as percentage for the sake of clarity.

TABLE 5.7: Cost efficiency *(CE)* and cost efficiency adjusted for social capital *(PCE)* relative to assets

	Asset quartile	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
CE	25%	0.940	0.941	0.933	0.920	0.914	0.820	0.844	0.887	0.886	0.896
	50%	0.929	0.931	0.925	0.918	0.910	0.852	0.839	0.910	0.906	0.901
	75%	0.906	0.903	0.903	0.899	0.898	0.881	0.846	0.909	0.905	0.894
	100%	0.927	0.915	0.916	0.902	0.908	0.913	0.897	0.912	0.904	0.910
PCE	25%	0.950	0.950	0.944	0.925	0.918	0.844	0.873	0.895	0.909	0.909
	50%	0.937	0.938	0.935	0.923	0.913	0.864	0.862	0.912	0.913	0.909
	75%	0.918	0.919	0.916	0.907	0.899	0.889	0.882	0.910	0.912	0.905
	100%	0.935	0.933	0.934	0.918	0.920	0.925	0.917	0.920	0.922	0.924
Total		**0.926**	**0.922**	**0.919**	**0.910**	**0.908**	**0.866**	**0.857**	**0.905**	**0.900**	**0.900**
Std. dev.		**0.090**	**0.087**	**0.093**	**0.109**	**0.105**	**0.101**	**0.102**	**0.117**	**0.125**	**0.107**

Note: banks were ranked by total assets, and the sample was divided into quartiles. Average values for each quartile were calculated for the banks included in each quartile.

TABLE 5.8: Cost efficiency *(CE)* and cost efficiency adjusted for social capital *(PCE)* relative to social capital

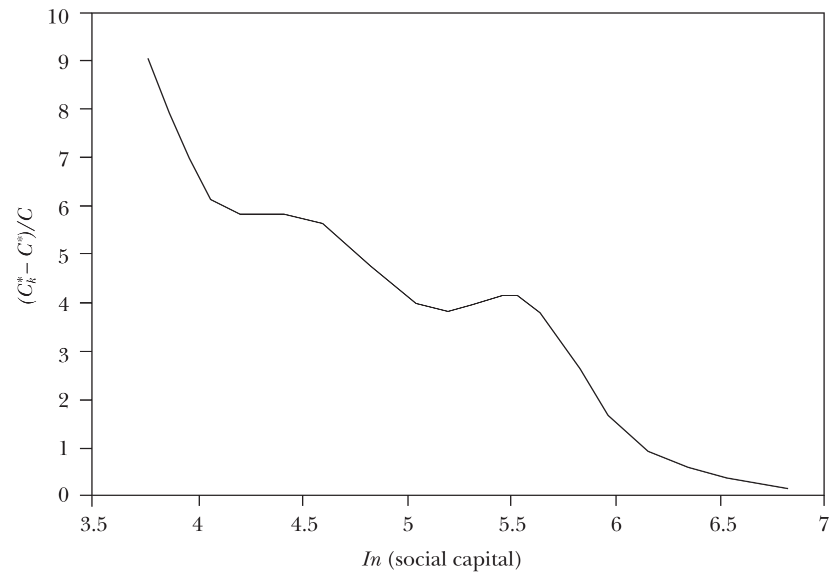
	Social capital quartile	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
CE	25%	0.913	0.866	0.844	0.831	0.849	0.814	0.779	0.795	0.786	0.825
	50%	0.832	0.944	0.912	0.953	0.942	0.884	0.880	0.920	0.948	0.910
	75%	0.909	0.890	0.893	0.884	0.921	0.882	0.881	0.947	0.949	0.910
	100%	0.955	0.950	0.946	0.940	0.913	0.870	0.848	0.908	0.902	0.921
PCE	25%	0.940	0.913	0.916	0.869	0.865	0.866	0.847	0.813	0.845	0.868
	50%	0.869	0.959	0.933	0.963	0.955	0.951	0.941	0.933	0.957	0.938
	75%	0.916	0.907	0.902	0.888	0.923	0.885	0.901	0.948	0.951	0.917
	100%	0.955	0.951	0.946	0.940	0.914	0.871	0.854	0.908	0.903	0.922
Total		**0.956**	**0.952**	**0.948**	**0.948**	**0.942**	**0.881**	**0.897**	**0.951**	**0.951**	**0.934**
Std. dev.		**0.995**	**0.997**	**1.000**	**0.997**	**0.996**	**1.000**	**1.000**	**0.929**	**0.960**	**0.990**

Note: banks were ranked by social capital, and the sample was divided into quartiles. Average values for each quartile were calculated for the banks included in each quartile.

sults do clearly indicate that firms facing lower social capital levels experience higher penalizations on their efficiency indices. For banking firms in the first quartile, as a consequence of operating in unfavorable environments, their costs are around 5% higher for the whole period, although the level reaches 7% in 2001. For banks in the second quartile, social penalization is lower (3%), yet it also reaches a high value (7%) in 2001.

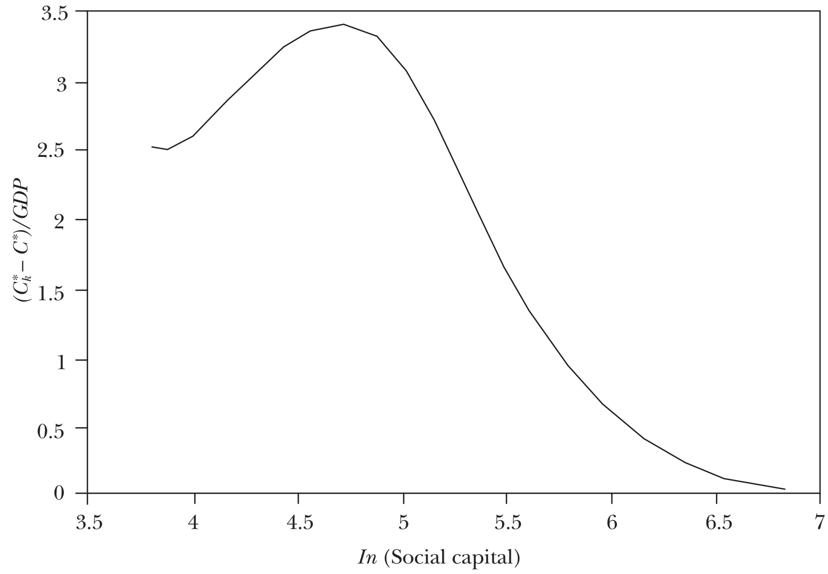
To illustrate the existing relationship between social capital levels and potential cost savings, graphics 5.2 and 5.3 display nonparametric regressions in which cost savings are related, in terms of total costs and in GDP terms for the whole period [13]. In both cases we observe a negative relationship between potential cost savings and the level of social capital in the economy.

GRAPHIC 5.2: Potential costs reduction (1993-2001)



13. We consider nonparametric methods to maintain consistency with instruments used throughout the article. The curves correspond to nonparametric regression estimations in which the dependent variable y corresponds to costs savings $(C_k^* - C^*)/C$, and the independent variable x corresponds to the logarithm of per capita social capital. This type of regression consist of explaining the value of the dependent variable yi as a function of x_i as $y_i = m(x_i) + \varepsilon_i$, $i = 1, ..., n$, where ε_i is a random variable reflecting how y varies in the neighborhood of $m(x)$, where $m(x)$ is the mean response curve. The idea of nonparametric regression consists of weighting the response variable in the vicinity of x, in such a way that y_i observations are weighted depending on their distance from x_i to x, i.e., we use the estimator $\hat{m}_h(x) = n^{-1} \sum_{i=1}^{n} W_{hi}(x) Y_i$, where $W_{hi}(\cdot)$ defines a weighted function depending on a smoothing parameter, or bandwidth, h, and the $x_1, x_2, ..., x_n$ explanatory variables. Most of the nonparametric regression techniques are based on weighted averages of the response variable y_i. We consider one of the most popular methods, the Nadaraya-Watson estimator, although the methodological variety is remarkable (see Härdle, 1990).

GRAPHIC 5.3: Potential costs reduction with respect to GDP (1993-2001)



6. Conclusions

THE aim of this study was to analyze how the level of social capital in each society impacts on the efficiency with which their respective banking industries operate. Therefore, it has sought to combine two rapidly expanding branches of literature: the role of social capital when measuring economic performance, and the efficiency of financial institutions.

The study is original in several aspects. First, to date there have been no attempts to merge these two branches of economics. Second, in contrast to previous studies that analyze issues related to banking aspects of relationship social capital (relationship banking), we consider social capital as an environmental variable which affects banking activity in general and bank performance in particular, i.e., the efficiency with which banks provide their products and services. Finally, we consider a measure of social capital which approaches the theoretical concept of social capital more rigorously than previous measures hitherto used.

We have justified a series of ways by which social capital affects banking activity in general and bank efficiency in particular. Specifically, we provide rationale to indicate that the higher the social capital in the societies, the lower the monitoring, information, transactional, financial, and insolvency costs, and the higher the credit supply and intensity of use of banking products for clients. All this suggests that bank efficiency can be higher in economies with higher social capital levels.

The analysis was approached from an international perspective, considering all 28 OECD countries with the exception of Turkey. We used nonparametric methods to measure efficiency, and the social capital variable was introduced into the analysis as a non-discretionary output in the production process. This strategy enables bank cost efficiency to be decomposed into two components. The first relates to pure cost efficiency, while the second one relates to what has been defined as *social efficiency,* i.e., an indicator of the cost penalization experienced by banks operating in unfavorable environments.

Results suggest that, indeed, banks conducting their activity in unfavorable environments—i.e., in low-social-capital societies—, are penalized in terms of costs. Considering the entire set of countries, the savings would be roughly 1.3% of costs. Results are especially informative for countries with low levels of social capital such as Italy, where increasing social capital would lead to cost savings of about 7.4%.

A comparison of the densities (estimated nonparametrically using kernel methods) for efficiency scores obtained under the two scenarios considered (without/with social capital) lends greater precision to the analysis. Specifically, for several countries with high levels of social capital, results are virtually identical either with or without social capital. Yet at the other extreme there are several examples of countries for which densities differ greatly when social capital enters the analysis. The Li (1996) test reinforced the results obtained via examination of densities, by indicating the instances in which the observed differences were statistically significant.

The most outstanding conclusion we may draw is that it is crucial to consider the effects of social capital on the conditions prevailing in the environment in which banks operate when assessing how they perform. Although the global analysis yields interesting results, it conceals some peculiarities that would only be uncovered when assessing the tendencies for each particular country.

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