The determinants of international financial integration revisited: the role of networks and geographic neutrality*

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Abstract

Over the last two decades, the degree of international financial integration has increased substantially, becoming an important area of research for many financial economists. This paper explores the determinants of the asymmetries in the international integration of banking systems. We consider an approach based on both network analysis and the concept of geographic neutrality. Our analysis focuses on the banking systems of 18 advanced economies from 1999 to 2005. Results indicate that banking integration should be assessed from the perspective of both inflows and outflows, given that they show different patterns for different countries. The parametric techniques point out the remarkable role of both geographic distance and trade integration. However, the most relevant results are yielded by nonparametric techniques, which we use due to the lack of well-established results on the determinants of trade in assets. These techniques reveal that the effect of the covariates on banking integration is not constant over the conditional distribution which (in practical terms) implies that the sign of the relationship varies across countries.

Keywords: banking integration, geographic neutrality, network analysis, nonparametric regression

JEL Classification: F15, F21, F36, Z13

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1. Introduction

Globalization can be defined as the increased integration of economies, reflected in international flows of trade, capital, investment and migration. Trade in assets has been part of what is referred to as international financial integration or what some authors have labeled as financial globalization. Although it is generally accepted that there has been an expansion of the degree of international financial integration over the last two decades, it is also generally agreed that financial globalization is primarily confined to rich countries (Mishkin, 2007). As a result, this phenomenon has become an increasingly relevant issue and a topical area of research for many economists. Certain initiatives such as the Financial Services Action Plan (FSAP) to integrate European financial markets and the degree to which these have been achieved to date have triggered off many studies (see, among many others Baele *et al.*, 2004; European Central Bank, 2007; García-Herrero and Wooldridge, 2007; Berger *et al.*, 2000; Portes *et al.*, 2001; Portes and Rey, 2005; Cabral *et al.*, 2002; European Central Bank, 2007; Lane and Milesi-Ferretti, 2008).

In their recent study, Lane and Milesi-Ferretti (2008) use measures of integration such as the level of foreign assets (liabilities) as a share of GDP. They observe that financial globalization is complex and its reach varies across countries, highlighting the fact that developed economies play a more relevant role in the process. While developed countries account for over 90% of the total outstanding foreign liabilities, about 8% is attached to emerging countries and the rest to other developing countries. Some other authors corroborate these findings (Kose *et al.*, 2006; Moshirian, 2008), according to whom the current data indicates that developed countries have been the most significant beneficiaries of financial globalization, followed by some specific emerging countries.[1] However, the empirical evaluation of financial integration, together with its causes and consequences, is still limited. Some reasons for this relate to the fact that the usual integration measures do not control for some relevant factors in the globalization process, which is characterized not only by the growing degree of openness but also by a network of interconnections that is becoming denser among economies (OECD, 2005; Arribas *et al.*, 2008, 2009a,b).

Several recent studies consider that, despite the forces that represent a drastic reduction in barriers to competition in the financial services industry (removal of barriers, deregulation, improvements in information processing and telecommunications, etc.), some financial markets—particularly commercial banking markets—currently remain far from globalized. In contrast, some others are quite integrated (Baele *et al.*, 2004), as corroborated by the velocity at which the current financial turmoil has spread worldwide. The evidence suggests that borders and distance continue to play an important role in the geography of financial flows, and that home bias is still relevant in the allocation of resources. In particular, many banking services remain local, probably as a consequence of competitive advantages that the superior information of banks about local and non financial suppliers and customers represents (Berger, 2003; Berger and Smith, 2003; Berger *et al.*, 2000, 2003).

However, the final assessment of the level of financial and banking integration hinges on the measures considered. Previous studies may be classified into two groups: those using price-based measures, and those using quantity-based measures. Studies falling into the former category are usually based on the law of one price (LOOP), according to which in financially integrated markets, assets generating identical returns should be priced identically, irrespective of where they are traded. However, these indicators may suffer from both theoretical and empirical problems if assets are not homogeneous, especially for emerging markets or developing economies where we perceive wide differentials in trust and confidence. In these economies, returns on financial instruments may incorporate risk and liquidity premia that are difficult to quantify and, in general, domestic financial markets might simply not be deep or liquid enough to allow for efficient arbitrage of price differentials (Kose *et al.*, 2006). In the particular case of banking on which we focus, it is often impossible to verify whether the LOOP holds due to wide differences in banking products and lack of data (Manna, 2004). In addition, since there is no volume equivalent to the LOOP, no single test can be run on volume data which by itself allows us to verify the null hypothesis of integration.

Some studies, especially those based on quantities (see, for instance, Pérez *et al.*, 2005), conclude that even if the LOOP holds because trade and monetary barriers are levied, economic integration may not be a natural phenomenon and people might still hold a disproportionate share of domestic assets, as predicted by the home equity bias literature (Lewis, 1999). As surveyed by Gropp and Kashyap (2009), this is a similar approach to that by Gual (2004), according to which retail bank flows in the European Union are less than 1 percent of total lending. The generalization of the home bias problem is apparent

[1] Such data corroborates the analysis by Obstfeld and Taylor (2005) regarding the patterns of financial globalization both in the 19^{th} and then in the 20^{th} century.

in the asymmetries observed for foreign financial investments which frequently show strong geographical biases. Under these circumstances, it is important to set the "standards" prevailing when using quantity-based indicators for measuring either financial or banking integration—as indicated above, there is no quantity-based equivalent to the LOOP. When building these standards we will be particularly concerned by the fact that, until very recently, quantity-based studies of financial and banking integration have dealt mostly with openness, disregarding the fact that integration may also advance because countries are more *balanced* in their relations with their financial partners—i.e., disregarding that financial links do actually constitute a *network*. The new approaches based on network analysis (see, for instance Kali and Reyes, 2009) try to fix this, by uncovering the structure of the financial/banking networks that economies forge. They are based on contemplating the flows between them as the vectors of a graph in which the nodes represent the countries, and then the degree of connectedness in the network is analyzed (von Peter, 2007; Kali and Reyes, 2009).[2]

Along with the literature on quantity-based and price-based indicators of banking integration, as recently reviewed by Gropp and Kashyap (2009), there are other approaches to measure banking integration such as Köhler (2009a,b), who use cross-border bank mergers. According to this approach, the absence of cross-country bank mergers and acquisitions, in comparison to the number of domestic bank mergers, is evidence against retail bank integration. Gropp and Kashyap (2009) have themselves proposed a recent metric for bank integration based on Stigler (1963), who considers that integration presumes new entry and that takeovers will lead to a convergence in profitability. Although both Köhler's (2009a; 2009b) and Gropp and Kashyap's (2009) have some advantages over traditional measures of bank integration, we consider there is still remarkable progress to be made using quantity-based indicators based on cross-border bank retail flows' information. Accordingly, our methods are more in line with those conceding cross-border flows as evidence of bank integration.

Specifically, in this paper we measure bank integration by merging some of the ideas of the network analysis literature with the concept of geographic neutrality (Krugman, 1996; Iapadre, 2006), which was introduced in the seventies by Kunimoto (1977) but has barely attracted the attention of the literature on economic integration. However, these ideas are relevant because they formalize the concept of the global village. They also relate to the literature analyzing regionalism (and its effects on the intensity of intra-regional and extra-regional trade), which considers the problem of prioritizing some connections over others vs no-country, or no-regional, preference situation. Specifically, the concept of geographic neutrality may be defined as the absence of preferential directions in flows: the geographic distribution of a country's trade is said to be neutral if the weight of every partner in the country's trade is equal to its weight in the world trade.[3] Following similar ideas in the financial area, Manna (2004) develops statistical indicators of the integration of the euro area banking system which estimate home bias and the distance of the actual distribution of cross-border positions from the distribution prevailing under the assumption of no-country preference.

These problems have also been dealt with when evaluating the differences between *de jure* and *de facto* financial integration measures,[4] which suggest that economic agents might be reluctant to go abroad be-

[2]The use of techniques of complex network analysis is not new in social sciences. See, for instance, the literature on social networks, examples of which include Annen (2003), Hanneman and Riddle (2005), Wasserman and Faust (1992), Wellman and Berkovitz (1988), or Rauch (2001). It is also gaining momentum in the international economics literature. Different studies analyze the structure and dynamics of international trade, using instruments such as centrality, network density, clustering, assortative mixing or maximum flow. The applications of these techniques to the study of the WTW focus their interest on the topological properties of the world network, and the evolution of the degree of connectedness among countries, the influence of the level of development on the position (central and peripheral) of the countries, and the role of the regional connectedness in the globalization context (Kali and Reyes, 2007), and economic growth (Kali *et al.*, 2007; Fagiolo *et al.*, 2007). Most of this literature values the importance of trade flows establishing a threshold (binary links) (Kim and Shin, 2002; Garlaschelli and Loffredo, 2005). However, some recent works (Fagiolo *et al.*, 2007, 2009) apply concepts of weighted network analysis (Barrat *et al.*, 2004; Barthélemy *et al.*, 2005) and study the intensity of flows specifically. They also look at if there is any symmetry in the relation between nodes in both directions (i.e., outflows and inflows), in which case the importance of flow does not depend on the direction of flow itself. This is not the case with bank flows, where the differences in direction turns out to be relevant.

[3]The situations of no-geographic preferences in flows would be an important reference in our analysis of the level of financial integration. They can be considered equivalent to scenarios called "zero gravity" in some studies (for instance Eaton and Kortum, 2002), because distance does not matter and/or remoteness does not exit. In these situations economies would be perfectly integrated through a complex network of connections.

[4]The shortcomings of the jure measures of integration are related to a variety of facts such as: (i) they do not accurately reflect the degree of openness of the capital account, since they are partially based on restrictions associated with foreign exchange transactions, which may not necessarily impede capital flows; (ii) they do not capture the degree of enforcement of capital controls (or the effectiveness of that enforcement), which can change over time even if the legal restrictions themselves

cause of the institutional barriers of source and destination countries (for instance, in terms of property rights and law enforcement), or the influence of regulation (Papaioannou, 2009), or the available information on foreign markets. Geographically neutral financial (or banking) flows would exist if a country B's share of A's outflows is equal to B's share of total world assets outside of A. Should we discard this fact, our measures of international financial/banking integration would be biased because of not including the potential asset trade diversion due to the changes in factors such as common currency, trade agreements, or several types of distances between countries.

Our study aims to measure international banking integration and its determinants, between 1999 and 2005, using available data on bilateral asset trade for a set of 18 countries that represents more than 80% of the world financial assets by 2005. We analyze bank outflows and inflows separately, which allows us to identify significant differences between their determinants. The main methodological contribution is that our integration indicators measure both the openness and the connectedness of the network which forms bilateral banking flows between countries. Therefore, the level of integration will also take into account the proportionality between financial flows among economies and their relative sizes. By acknowledging the role of bilateral connections between economies, the geography of trade relations and the distance between countries becomes central in the interpretation of integration.

The set of determinants has been chosen taking into account both previous literature on the subject and the available data. Specifically, recent evidence has shown the importance of the links between financial and trade integration, the influence financial development has on integration, the important role a country's social capital plays in attracting inflows, and the advantage (disadvantage) that a central geographical location (peripheral) represents for countries

Unfortunately, as stated by Portes and Rey (2005), there are very few well-established results on the determinants of trade in assets. The absence of a little theory underlying each investigation has resulted in studies which are mostly exploratory in nature. This literature has received renewed attention, but results vary a great deal because of the multiplicity of angles, such as the type of indicator used to measure integration (prices or quantities), the type of financial data considered (banking data or other assets), the coverage of the sample (global vs. regional comparisons), etc.

Under these circumstances, we consider it appropriate to evaluate how the selected covariates affect banking integration using more flexible techniques that do not stipulate any specific functional form, and which are more informative when the relationship between variables is harder to understand. Specifically, we will consider some of the nonparametric methods considered in Henderson and Millimet (2008) (among others) where a comparison between parametric and nonparametric methods in the context of the gravity model of bilateral trade is performed. Our results indicate that it is appropriate to use these methods, since the way the different covariates influence banking integration is involved, so we obtain a valuable assessment of the success of parametric models relative to a completely flexible alternative.

The paper is structured as follows. In Section 2 we define the Standard of Perfect Banking Integration (SPBI) and characterize the indicators of banking integration for each country and for global banking markets as a whole. Section 3 presents the determinants of integration, and Section 4 illustrates the empirical methodology. Section 5 and 6 are devoted to presenting the data and results, respectively. Section 7 concludes.

2. International banking integration indicators

As indicated previously, we consider that banking globalization is a complex phenomenon and, as such, indicators designed to measure it should attempt to uncover all aspects of this complexity, distinguishing explicitly that openness and integration might not necessarily be the same thing. Therefore, the integration of international banking markets starts with the cross-border banking flows, but its effects and scope also depend on the structure of current relations between banking markets. Relevant aspects of this structure include the number of countries each country is in contact with, whether the relationships are direct or indirect (i.e., whether flows cross third economies), the volume of cross-border banking activity between them, and the proportionality of this activity to the size of the banking markets.

We define the relative flow (banking assets or liabilities) or **degree of banking openness** of country

remain unchanged; (iii) these measures do not always reflect the actual degree of integration of an economy into international capital markets (Kose *et al.*, 2006).

i as

$$DBO_i = \frac{\sum_{j \in N \setminus i} X_{ij}}{\widehat{X}_i} \tag{1}$$

where N is the set of countries, i and j typical members of this set, X_i is the volume of banking assets in county i, X_{ij} refers to the banking market activity between countries evaluated as either the cross-border flows of assets or liabilities—i.e., the amount of bank assets of a given country that are owned by foreign banks. We define a_i as the country i's relative weight with respect to the world banking markets, i.e., $a_i = X_i / \sum_{j \in N} X_j$, then $\widehat{X}_i$ is the flow from country i to the world taking into account the weight in the international banking systems of the country under analysis, namely, $\widehat{X}_i = X_i - a_i X_i$.

The degree of banking openness yields non-negative results, where a value lower than 1 indicates that its cross-border banking flows are lower than those corresponding given the country's share of the world banking assets. In contrast, a value higher than 1 indicates that country i's cross-border banking flows are higher than those corresponding given the country's share of the world banking assets.

However, the international integration is not only a question of increasing the openness of countries but also of developing a network of direct and indirect relations between banking markets. From a globalization perspective the architecture of financial trade connections that each country has with the rest of the world cannot be disregarded. Some recent studies which analyze financial globalization from a network perspective have acknowledged how important it is to take into account that the immediate borrower and the ultimate risk are not always the same, since financial or banking flows may reach their final destination following indirect paths. Many trades follow these indirect paths by being conducted through intermediaries in third countries, such as the financial centers of the UK and the Caribbean.[5]

When geographic barriers disappear, the effect of relative distance slowdowns and the shares of different countries in the financial assets/liabilities of a country ought to be closer to the GDP's shares. In an extreme scenario of eradication of every possibility of remoteness, only the economic dimension of partners will matter (Arribas *et al.*, 2009b). These ideas are similar to those by the equity home bias literature, according to which the proportion of foreign assets held by domestic investors is too small in relation to the predictions of standard portfolio theory.

To analyze whether the connection of one country with others is proportional to the size in terms of banking assets or liabilities, we define the **degree of direct banking connection**. This degree measures the discrepancy between the direct cross-border banking flows in the *real* global banking system and those corresponding to a global banking system where each country *balances* its relationships with other individual countries in proportion to the size of their banking systems:

$$DDBC_i = \frac{\sum_{j \in N} \alpha_{ij} \beta_{ij}}{\sqrt{\sum_{j \in N} (\alpha_{ij})^2} \sqrt{\sum_{j \in N} (\beta_{ij})^2}}. \tag{2}$$

where $A = (\alpha_{ij})$ is the square matrix of relative flows, $\alpha_{ij} = \frac{X_{ij}}{\sum_{j \in N \setminus i} X_{ij}}$ when $i \neq j$ and $\alpha_{ii} = 0$; $B = (\beta_{ij})$ is the square matrix of degrees of openness in the perfectly balanced connected banking system, $\beta_{ij} = \frac{X_j}{\sum_{k \in N \setminus i} X_k}$ with $\beta_{ii} = 0$. This can be defined as *neutral* financial trade; therefore, it is the financial counterpart to the concept of geographic neutrality.

To control for the indirect relationships between countries, let us define $\gamma_i \in (0, 1)$ as the proportion of flow that country i receives from another country to be invested in the first country. The amount of these relationships may be remarkable if we take into account that many trades are conducted through intermediaries in third countries, such as the financial centers of the UK and the Caribbean (Warnock and Cleaver, 2003). In this case, the transactor country would not be the same as the country in which the security's issuer, ultimate purchaser, or seller is resident. Under the assumption that this proportion is equal to the proportion of financial flows of country i that remains as home financial investment, we can estimate $\gamma_i = X_{ii}/X_i$. Then, let Γ be the square diagonal matrix of direct flow proportions, so that the element ii of Γ is γ_i and the element ij, for $i \neq j$, is zero. The matrix of total flows from one country to another is

[5] As indicated by Warnock and Cleaver (2003), if a French resident purchases a US bond through a London-based broker, US capital flows data would show an inflow from the UK which means that, in practice, in US data, a disproportionate amount of purchases and sales of securities are attributed to residents of financial centers. Warnock and Cleaver (2003) refer to this as a geographical mismatch in the capital flows data.

the sum of the direct and indirect flows and can be estimated as

$$A^{\Gamma} = \sum_{n=1}^{\infty} \Gamma(I-\Gamma)^{n-1} A^{n}, \tag{3}$$

$$B^{\Gamma} = \sum_{n=1}^{\infty} \Gamma(I-\Gamma)^{n-1} B^{n} \tag{4}$$

where I is the identity matrix. Let α_{ij}^{Γ} be the element ij of the matrix A^{Γ} and β_{ij}^{Γ} be the element ij of the matrix B^{Γ}.

We define the **degree of total banking connection**:

$$DTBC_i^{\Gamma} = \frac{\sum_{j \in N} \alpha_{ij}^{\Gamma} \beta_{ij}^{\Gamma}}{\sqrt{\sum_{j \in N} \left(\alpha_{ij}^{\Gamma}\right)^2} \sqrt{\sum_{j \in N} \left(\beta_{ij}^{\Gamma}\right)^2}}. \tag{5}$$

The degree of total banking connections ranges in the $(0, 1)$ interval, and it measures the distance of the direct and indirect banking flows of a country from what its banking flows would be in a perfectly connected world. It should be close to 1 when the banking flows of a country are proportional to the size of the receiver countries (indirect international neutrality) and close to zero if the largest countries do not receive any banking services and the smallest receive all of them.

The **degree of banking integration** combines degrees of financial openness and total connection, provided that both set limits to the integration level achieved.

$$DBI_i^{\Gamma} = \sqrt{\min\{1/DBO_i, DBO_i\} \cdot DDBC_i^{\Gamma}} \tag{6}$$

The degree of integration of a country is the geometric average of its deviation from the balanced degree of openness and regularity by total connections.[6]

These indexes can be computed for both assets or liabilities depending on whether X_{ij} refers to flows of assets between countries or to flows of liabilities. We will use the super-index ^{out} or ^{in} respectively to distinguish among them. Hence, the indexes DBO^{out}, DBO^{in}, DBI^{out} and DBI^{out} have been computed.[7]

We can finally consider *global* indicators, controlling for each country's share of international banking assets. Specifically, the **degree of global banking openness** would be defined as

$$DGBO = \sum_{i \in N} a_i DBO_i, \tag{7}$$

the **degree of global direct banking connection** would be defined as:

$$DGDBC = \sum_{i \in N} a_i DDBC_i, \tag{8}$$

and the **degree of global banking integration** would be defined as:

$$DGBI = \sum_{i \in N} a_i DGBI_i, \tag{9}$$

where $a_i = X_i / \sum_{j \in N} X_j$. Following Frankel (2000), the degree of global banking integration could be interpreted as a **Standard of Perfect Banking Integration**.

[6] We provide results only for direct relationships for space reasons. They are available for the interested reader upon request.

[7] The indicators presented here have certain disadvantages, which are less stringent in other contexts. Specifically, if our indicators were applied to trade in goods (see Arribas *et al.*, 2009b), the available sample would be in general much larger, which is a clear advantage, especially when financial flows with out-of-sample countries are high. In addition, measuring the degree of banking integration carries additional disadvantages such as the need to decide on whether to use consolidated or non-consolidated banking data, which may differ remarkably for some banks.

3. On the determinants of international financial integration

Previous initiatives analyzing the determinants of cross-border asset holdings have considered a wide range of covariates. Unfortunately, as indicated by Portes and Rey (2005), there are very few well-established results on what the most relevant drivers of international trade in assets are.[8] One of them, by Aviat and Coeurdacier (2007), found that trade in goods and trade in assets are closely related. Another key finding is that by Portes and Rey (2005), who noticed that market size, efficiency of the transactions technology, and distance are the most important determinants of transaction flows. These studies, while being important, cannot be directly compared to ours, given that they use bilateral data in their regressions. This enables their authors to use some interesting information such as—in the case of Portes and Rey (2005)—the distance between each country pair, the volume of telephone call traffic, the number of branches in country j of banks headquartered in country i, the number of trading hours overlap between the main financial centers of each country pair, or the covariance of stock market returns. Aviat and Coeurdacier (2007) extend these covariates by also considering whether each country pair shares the language and their legal systems, whether there is a colonial link, or bilateral tax treaties, among others. Most of these variables are relevant yet remain out of our reach because of their bilateral nature. Therefore, although our indicators of financial integration have the virtue of being country-specific, this advantage might become a disadvantage when analyzing the determinants, since it impedes the usage of some relevant bilateral information.

On the other hand, there are authors such as Lane and Milesi-Ferretti (2003, 2008) who use country-specific information for analyzing the determinants of foreign assets and liabilities. Accordingly, their set of covariates differs when compared to the studies by Portes and Rey (2005), and Aviat and Coeurdacier (2007). But there are also several important coincidences and findings such as the relevance of trade openness and financial development.[9] Therefore, our set of drivers of financial globalization are rooted in the literature, taking into account both types of studies—those focusing on bilateral data and those using unilateral data.

Our first driver of financial integration is trade openness, which follows the above cited studies by Portes and Rey (2005), Aviat and Coeurdacier (2007), and Lane and Milesi-Ferretti (2003, 2008). Although the way through which trade influences financial flows remains unclear (see Aviat and Coeurdacier, 2007, for a detailed analysis), the sign of the relationship is generally found to be positive. Some results suggest that trade in goods directly results in corresponding financial transactions such as, for instance, trade credit, transportation costs, or export insurance (Vo and Daly, 2007). Obstfeld and Rogoff (2000) indicate the gains to international financial diversification and the extent of goods trade are strongly related because of the wedge created by trade costs between marginal rates of substitution, curbing the gains to asset trade. In addition, Foreign Direct Investment often makes financial positions and trade in goods to be jointly determined. Finally, some authors such as Lane and Milesi-Ferretti (2003) suggest that openness in goods markets might create an increased disposition for asset trade (the so-called "familiarity effect"), reducing home bias. These studies measure trade openness via standard measures such as total trade to GDP, and related. Alternatively, we propose using trade indicators analogous to the banking integration indicators introduced in Section 2. Hence, the degree of trade openness (DTO) would be equivalent to the degree of banking openness (DBO), the degree of direct trade connection ($DDTC$) would be equivalent to the degree of direct banking connection ($DDBC$), and the degree of trade integration (DTI) would be equivalent to the degree of banking integration (DFI). All definitions are analogous, the few differences relating to the nature of the flows (data on trade in goods instead of trade in assets), and the fact that GDP is used instead of the size of the financial sector. Therefore, the DTO follows the usual definition found in the literature but corrected for home bias—in order to take into account that larger countries trade less (Alesina and Spolaore, 1997). The $DDTC$ measures the gap between the real trade flows and those in which countries export proportionally to the size of the recipient economy (corresponding to a "perfectly" trade integrated world, in terms of Krugman's geographic neutrality concept).

Portes and Rey (2005) and Portes *et al.* (2001) have shown that physical distance, as a proxy for informational costs, has a strong negative effect on assets' trade flows, even when other informational proxies are considered. The difference in the information that agents have and manage about financial

[8]In the particular case of banking on which we focus, the number of studies analyzing the determinants is much scarcer.

[9]The set of covariates used in Lane and Milesi-Ferretti (2003) differs from that used in Lane and Milesi-Ferretti (2008) because the former study focused on advanced economies only, whereas the latter extended the analysis to developing countries.

markets generates the so called “home bias puzzle”, also reported by the literature on home equity bias (Lewis, 1999): the proportion of foreign assets held by domestic investors is too small relative to the predictions of standard portfolio theory. Some studies such as Kang and Stulz (1997) have found explanations for the asymmetric information that domestic and foreign investors manage, while others such as French and Poterba (1991) talk about the already mentioned “familiarity” effect. Home bias has declined significantly in the last decade but important deviations from full diversification still exist. In the particular case of foreign bank assets with which we are dealing, Buch (2005) has also found that banks hold significantly lower assets in distant markets, and that the importance of distance for the foreign asset holdings of banks has not changed. According to her, explanations may relate to the fact that information costs are of similar importance in banking as in other financial markets—following an interpretation of distance in terms of information costs. The rationale is straightforward: if banks lend customers information which is difficult to obtain and cannot raise bond or equity finance, we should expect enhanced responsiveness of banking assets to distance.[10] In addition, as suggested by Manna (2004), geographic proximity and language sharing provide a rationale for a home bias in banking retail products.

Given that our cross-border financial measures are country-specific, it is not possible to include the bilateral distance between each country pair i and j. Instead, we use a remoteness index ($REMOTE$), which measures the distance between each i country and the rest of the world. It has been constructed following the proposal by Nitsch (2000) and Deardorff (1998), who indicated that the relative distances of trading partners have an impact on the volume of trade and, consequently, remote countries such as Australia and New Zealand can be expected to trade more with each other.[11] The hypothesized sign is that remoteness should not be *a priori* relevant for cross-border asset trade, since transportation costs for financial assets are zero. However, as found by Portes *et al.* (2001), distance does indeed matter for cross-border asset trade and, consequently, the expected sign should be negative.

Recently, there has been extensive research effort put into answering the question as to whether differences in beliefs and preferences vary systematically across groups of individuals over time, and whether these differences explain discrepancies in outcomes. As indicated by Ekinci *et al.* (2008), in some cultures banks are not trusted and cash (or precious metals) is the only accepted store of value. Such savings vehicles are not optimal for financial intermediation and, thus, financial or banking integration. In this paper we consider the terms social capital and culture as synonyms, and assume trust and confidence are important determinants of both. In these circumstances, since financial contracts are trust-intensive, people are less likely to invest if they trust each other less and have no confidence in institutions, i.e., when the level of social capital is low (Ekinci *et al.*, 2008). Regarding financial exchange, Guiso *et al.* (2004) found that not only the legal enforceability of contracts matters but also the extent to which the financier trusts the financee. Therefore, we consider that the degree of financial openness and financial connection may depend on social capital—which we measure following several approaches.[12] Other authors that have considered the influence of these types of variables on financial openness and financial integration are Aviat and Coeurdacier (2007), or Papaioannou (2009). The former uses an index of corruption for both the importer and exporter countries, since it is likely that hidden bribes reduce transactions in international markets. The latter finds that foreign banks invest substantially more in countries with uncorrupt bureaucracies, high-quality legal system, and a non-government controlled banking system. These types of effects have also been analyzed by Anderson and Marcouiller (2002), who find that corruption and imperfect contract enforcement reduce international trade dramatically.

Some authors such as Ekinci *et al.* (2008) use the trust and confidence variables provided by the World Values Survey to proxy for social capital. The trust variable reports whether respondents agree with the statements “most people can be trusted” and “I trust other people in the country”. The confidence variable reports whether respondents agree to have confidence in the courts, parliament, and other institutions. Unfortunately, both variables have no time dimension. Alternatively, a related variable that is becoming increasingly used in the literature is the index constructed by the Heritage Foundation, which merges information on regulation, trade, taxation, government, monetary, investment, financial, property rights, and corruption (see, for instance Laeven and Majnoni, 2005). Appendix A provides a precise definition of the variable.

We also consider the financial development-related variables included in Lane and Milesi-Ferretti (2003,

[10] See Table 1 in Buch (2005) for a nice survey on studies relating distance and bilateral trade—both in goods and assets.
[11] Full details on the covariates used are provided in Appendix A.
[12] However, we must also admit that, as indicated by Fukuyama (2002), there is no agreement on what social capital is, which he defines as cooperation among people for common ends on the basis of shared informal norms and values.

2008) and, in general, the literature on the drivers of financial integration. As indicated by Vo and Daly (2007), well developed financial markets may attract foreign investors seeking to diversify their portfolios. Some authors such as Henry (2000a,b) have corroborated these claims, finding that financial market development impacts strongly on investment and international financial integration. Others have found that market size, transactions costs and informational frictions influence the magnitude of gross cross-border capital flows (Portes and Rey, 2005). The approaches vary from study to study. Lane and Milesi-Ferretti (2008) consider a single variable for measuring the level of financial development, made up by the sum of stock market capitalization and bank deposits as a share of GDP. Since both components of financial development are available ($MKTCAP$ and $DEPOSITS$), we will consider their impact on financial integration individually. Some other studies such as Lane and Milesi-Ferretti (2003) have also considered these variables separately.[13] Another financial development variable refers to the number and size of the stock exchanges in each country. This information is included in the analysis using two additional variables, namely, $FIN10$ (the number of each country's financial centers among the top ten world financial centers) and $FIN1050$ (the number of each country's financial centers among the top 50 world financial centers, excluding those included in $FIN10$).[14] However, disentangling the importance of financial centers in asset trade is hampered when we consider the fact that if a German resident purchases a US bond through a broker in London, US capital flows will show an inflow from the UK as indicated by Warnock and Cleaver (2003), this means in practice that, in US data, a disproportionate amount of securities' trade is attributed to residents of financial centres.[15] Finally, we also consider the $EURO$ dummy, taking the value of 1 for euro-area countries. Full details of all variables are provided in Appendix A.

We include some variables to control for macroeconomic conditions in the country under analysis. First, we consider the per capita income level in each country ($GDPPC$), which has been employed by Lane and Milesi-Ferretti (2003, 2008). Other previous studies have used this variable on the grounds that countries which are rich and well educated tend to be highly integrated (Edison *et al.*, 2002). Second, we consider the consumer price index change in each country ($CPICH$) (Papaioannou, 2009). Lemmen and Eijffinger (1996) have also found that inflation rates significantly explain international financial integration within the European Union. Some authors such as Vo and Daly (2007) argue that inflation might serve as a proxy for economic instability and therefore lead to a domestic currency depreciation which deterred foreign investors. However, the validity of this argument would be thwarted if high inflation countries were members of a currency union—which is the case for most countries in our sample. Unfortunately, there are some econometric problems when introducing jointly some of these variables because correlation among them (especially $GDPPC$ and $CPICH$) is high.

Finally, we have explored (but do not report) the impact of some other potential determinants such as the efficiency of the banking systems. It could be the case that inefficient banking systems encourage the entry of foreign banks from efficient banking systems. However, this variable was insignificant and did not alter the other results.

4. Empirical methodology

4.1. Parametric and nonparametric models

The alleged absence of well-established theories on the determinants of international financial integration constitutes an important difficulty for both selecting the relevant covariates and, more importantly, for specifying which the correct functional form might be. Indeed, some authors consider this can only be an exploratory exercise "given the lack of firm theoretical priors and the sparse prior literature" (Lane and Milesi-Ferretti, 2003). Therefore, not only Lane and Milesi-Ferretti (2003) but also other studies such as Vo and Daly (2007), Lane and Milesi-Ferretti (2008) or Pérez *et al.* (2005) generally consider linear models and use least squares for the estimations, with varying levels of complexity. These are parametric methods stipulating functional forms on the nature of the relationship between financial integration and its set of determinants. However, although linearity is usually imposed, this assumption does not always hold, constituting a certain arbitrariness.

[13] In particular, they consider $STKCAP$, which measures stock market capitalization, and $FINDEPTH$, which measures the ratio of liquid liabilities to GDP.

[14] Full details on the source of these variables are provided in Appendix A. There is a recent study (von Peter, 2007) which, using network analysis, constructs indexes of financial centers. Unfortunately, the information provided is for year 2007 only and, consequently, we must use the data source referred to in Appendix A.

[15] Warnock and Cleaver (2003) refers to this as a geographical mismatch in the capital flows data.

Furthermore, even if the functional form were correctly specified, a potential source of bias comes from the differential effects that the determinants might have on the tails of the distribution of financial integration. In other words, the estimated parameters may vary across locations. Some authors suggest that a more complete picture of covariate effects can be provided by estimating, for instance, a family of conditional quantile regressions (Koenker, 2005, p.20). These questions can be important in our specific setting in which, as documented by Lane and Milesi-Ferretti (2008), the magnitude of financial integration is different when comparing countries with different characteristics in the sample—in their case, developed and developing countries showed very disparate levels of financial integration. This could imply that, indeed, the effect of the covariates on financial integration might not be constant over the conditional distribution.[16]

Under these circumstances we consider not only parametric but also nonparametric regression models which provide an interesting, more flexible, alternative to explore the determinants of financial integration. By relaxing the functional form assumed by parametric models which is commonplace in the literature, it will be possible to assess the magnitude of the bias they generate. In addition, multicollinearity problems, which often plague the estimations on the determinants of financial integration, are strongly alleviated. Finally, although we could use quantile regression to evaluate the impact of the independent variables at different levels over the conditional distribution of financial integration, the nonparametric regression techniques proposed in this paper allow us to estimate the coefficients at each decile of the distribution, and thus accurately assess whether the estimated effects vary across locations.

The parametric model we stipulate for estimating how the different covariates affect the levels of DFO^{out}, DFO^{in}, DFI^{out} and DFO^{out} is,

$$Y_i = \beta_0 + \sum_{j=1}^{V} \beta_j Z_{ij} + \varepsilon_i, \ i = 1, \ldots, T \tag{10}$$

where Y_i represents each of the dependent variables (DFO^{out}, DFO^{in}, DFI^{out} and DFO^{out}), Z_i is a vector of regressors that may be either continuous or categorical, V is the number of regressors, ε_i is a mean zero additive error, i is the country, and T the total sample size.

The nonparametric counterpart to Equation (10) is based on the Li-Racine Generalized Kernel Estimation (Racine and Li, 2004; Li and Racine, 2004), which considers a nonparametric regression model

$$Y_i = m(Z_i) + \varepsilon_i, \ i = 1, \ldots, N \tag{11}$$

where $m(\cdot)$ is the (unknown) functional form. There are several choices for the type of nonparametric regression being used but, for simplicity, we use the local constant kernel estimator, originally proposed by Nadaraya (1964) and Watson (1964). See Li and Racine (2007) for details.

Since regressors may be either continuous or discrete (although the $EURO$ variable is the only purely categorical variable in our study), we define $Z_i = (Z_i^c, Z_i^d)$ where Z_i^c refers to the vector of continuous regressors, and Z_i^d refers to the vector of dichotomous regressors. Therefore, the underlying data is frequently a mix of categorical and continuous data that goes beyond the scope of traditional nonparametric kernel methods—which presumes that the underlying data is continuous in nature. In this case, we should consider "generalized product kernels" as those presented by Li and Racine (2007).

For the continuous variables case we can use, for instance, the second order Gaussian kernel, whose expression is:

$$w(x^c, Z_i^c, h) = \frac{1}{\sqrt{2\pi}} \exp\Big\{ -\frac{1}{2}\Big(\frac{Z_i^c - z^c}{h}\Big)^2 \Big\}, \tag{12}$$

where h is the bandwidth, which is obtained using least squares cross validation, and the weights integrate to unity. As indicated by Hayfield and Racine (2008), bandwidth selection is a key aspect of sound nonparametric and semiparametric kernel estimation, equivalent to model selection for parametric approaches.

If the variable was discrete instead, then we must first distinguish the cases where the categorical

[16] Previous research on trade that has taken into account these questions includes Fratianni and Kang (2006), who found that the trade elasticity with respect to distance varies depending on both the number of OECD countries in the i, j pair and the religious composition of the trading partners; Eaton and Kortum (2002), who estimate a spline in distance, allowing the marginal effect of distance to vary; or Rose (2000), who allows the impact of a currency union to vary according to income, income per capita, distance, and other variables (see Henderson and Millimet, 2008).

data is "ordered" and those in which it is not. Defining as $\mathcal{S}^d$ the support of Z^d, and using z_s^d and Z_{is}^d to denote the s^{th} component of z^d and Z_i^d $(i = 1, \ldots, T)$, respectively,[17] we define a discrete univariate kernel function for z_s^d and $Z_{is}^d \in \{0, 1, \ldots, c_s - 1\}$ as:

$$l^u(Z_{is}^d, z_s^d, \lambda_s) = \begin{cases} 1 - \lambda_s & \text{if } Z_{is}^d = z_s^d \\ \lambda_s/(c_s - 1) & \text{if } Z_{is}^d \neq z_s^d. \end{cases} \tag{13}$$

where λ_s is the bandwidth, which in this case is restricted to the range $[0, (d_s - 1)/d_s]$.

As the bandwidth on a continuous regressor becomes large, the implication is that the variable is irrelevant (since we are using local-constant least-squares). See Hall *et al.* (2007) and Li and Racine (2007) for further details.

4.2. Comparing parametric and nonparametric models

Model selection can be improved using, for instance, the criteria suggested by Henderson and Millimet (2008). The authors establish three possible ways, namely, the Hsiao *et al.* (2007) test, the Li (1996) test based on the comparison of density functions, and evaluating the forecast accuracy. The methods we propose follow closely their first two proposals. The null hypothesis of the Hsiao *et al.* (2007) test stipulates that the parametric model is correctly specified ($H_0 : Pr[E(x|z) = f(z, \beta)] = 1$), against the alternative that it is not ($H_1 : Pr[E(x|z) = f(z, \beta)] < 1$). Therefore, the focus is exclusively on the parametric model.

Complementarily, we use a refined version of the Li (1996) test (Li, 1999) to assess the ability of different models (in our case, parametric vs. nonparametric) to fit the observed data. In order to do this, we formally test whether the predicted values from the parametric and nonparametric differ significantly from the *observed* data. We can also test the predicted values from the parametric model against the predictions of the nonparametric one. Therefore, if f and g were the distributions corresponding to, let us say, the parametric model and the observed data, the null would be $H_0 : f(x) = g(x)$ against the alternative, $H_1 : f(x) \neq g(x)$. The specific details of both tests can be found in Henderson and Millimet (2008) and Hsiao *et al.* (2007).

5. Data

We use data from various sources. The dependent variables' data is made up of the financial integration indicator and its two components. Constructing them requires information on both total assets of the different banking industries and foreign assets and liabilities of commercial banks. They include loans and deposits, debt securities, other assets or liabilities (including equity participations), and claims and liabilities *vis-à-vis* the monetary authorities (Buch, 2005). The data on total assets are provided by the European Central Bank for European Union countries, and by the central bank of each remaining country in the sample, with some exceptions. The data on bilateral banking financial assets and liabilities are provided by the Bank for International Settlements (BIS),[18] which issues quarterly the international claims of its reporting banks on individual countries, geographically broken down by bank nationality. The specific database on consolidated statistics contains foreign claims of banks headquartered in 30 major financial centers. We consider the positions on an immediate borrower basis—defined as the country where the guarantor of a claim resides. Data on an immediate borrower basis cover mainly claims reported by domestic banks (those which have their head-office located in the reporting country), part of the claims of inside area foreign banks (their cross-border claims on residents in their home country on a non-consolidated basis), part of the claims of outside area foreign banks (their cross-border claims on all other countries including their home country on a non-consolidated basis), and offices of inside area foreign banks whose activities are not consolidated by their parent bank. Regarding the businesses to be reported, these are made by on-balance sheet financial claims, among which all items representing claims on other individual countries or economies should be included. The instruments include primarily certificates of deposit (CDs), promissory notes and other negotiable paper issued by non-residents, banks' holdings of international notes and coins, foreign trade-related credits, claims under sale and repurchase

[17] See the proposal by Aitchison and Aitken (1976) for unordered discrete variables.

[18] See `http://www.bis.org/statistics/consstats.htm`, section 9B, "Foreign claims by nationality of reporting banks, immediate borrower basis. Historical series: by reporting country".

agreements with non-residents, deposits and balances placed with banks, loans and advances to banks and non-banks, holdings of securities and participations including equity holdings in unconsolidated banks or non-bank subsidiaries.[19]

Information on covariates also comes from several sources. Some of them are provided by the CHELEM data set.[20] The trade integration covariates (DTO, $DDTC$, DTI) are constructed using information on exports and GDP. Both exports and GDP are included in CHELEM, as well as population. Data on social capital is gathered from the Index of Economic Freedom constructed by the Heritage Foundation. The change in CPI ($CPICH$) is constructed from the IMF International Financial Statistics. $BANK50$ is constructed yearly from Bankscope IBCA data. $DEPOSITS$ is constructed from information provided by central banks, whereas $MKTCAP$ is provided by the World Bank (World Development Indicators). Finally, $FIN10$ and $FIN1050$ have been constructed from information in The Global Financial Centers Index report (Yeandle *et al.*, 2008). All variables are measured in current US dollars with the exception of per capita GDP, which is measured in constant US dollars. See Appendix A for full details.

The number of countries and years in the study is limited by the available information. The analysis is made up of eighteen countries and seven years (1999–2005). Enlarging either the number of countries or the length of the period involved loses some information in the other dimension, so we decided to keep this reasonable balance in terms of countries and years. Although information on additional countries was available for some years (Australia, Brazil, Canada, Chile, Mexico, Panama and Taiwan), the gains in terms of total bank assets were not substantial, as the current sample accounts for more than 90% of sample including the additional countries. We also use data from consolidated banks, in order to avoid the problem of double counting, which may arise when using unconsolidated balance sheet data. In addition, consolidated data are the only publicly available until now.

Table 1 reports some summary statistics. Of special note is the sharp decline in the share of international bank assets by Japanese banks (from 21.25% in 1999 to 11.45% by 2005). It is also clear that the US financial system is far less "bancarized" than European countries such as France, Germany, Italy or Spain. Indeed, the total assets of the US banking system in terms or GDP are clearly the lowest in the sample, both in 1999 and 2005. At the other extreme are Ireland and Switzerland, whose total assets in terms of GDP by 2005 are 612.02% and 570.30%, respectively.

It is also apparent that, as indicated from columns seven through twelve, cross-border claims have increased rapidly for all countries and they are now over 30 times larger in absolute terms than thirty years ago (McGuire and Tarashev, 2006). These tendencies have taken place not only in absolute terms (columns 11–12) but also as a percentage of GDP (columns 7–8), or as percentage of total assets (columns 9–10). The four last columns in Table 1 (columns 13–16) disclose information on how representative our sample is compared to a hypothetical sample including all cross-border claims. The coverage varies from country to country, and is not very high for some particular countries such as Austria or Greece but, on average, is fairly high.

Table 1 contains information on outflows only, so as to save space and also because the information on total consolidated foreign claims of the sample countries as a percentage either of their total foreign claims or their total assets (i.e., the information reported by columns 13-16) is not available for inflows. However, the results reported in the following sections are performed for both directions of foreign claims, i.e., not only bank assets held abroad by banks of a given country (cross-border bank *outflows*), but also on bank assets of each country owned by foreign banks (cross-border bank *inflows*). We will refer to each direction using the *out* (outflows) and *in* (inflows) superscripts, to simplify the exposition of results.

6. Results

6.1. The integration of the international banking systems: general trends

Table 2 shows results on the degree of banking openness, degree of direct banking connection and degree of banking integration for years 1999 and 2005. We notice that the most open banking systems (DBO) in terms of assets held abroad by 2005 are those of Switzerland, the Netherlands, and Belgium—the assets held abroad by banks from these countries represent 81.9%, 75.6%, and 63.0% of their total assets. In contrast, the Greek, Italian and US banking markets are far less internationalized, as shown by degrees

[19] Complete details are available through `http://www.bis.org/statistics/consbankstatsguide.htm`.

[20] Information on CHELEM (*Comptes Harmonisés sur les Echanges et l'Economie Mondiale*, or Harmonised Accounts on Trade and The World Economy) database is available at URL `http://www.cepii.fr/anglaisgraph/bdd/chelem.htm`.

of financial openness of 5.3%, 8.4%, and 8.9% by 2005. In many instances cross-border banking flows have increased sharply. For some countries they have almost doubled (Denmark), or even tripled (the Netherlands and Sweden). Of special note is the case of some large European countries whose degrees of openness increased a great deal. Patterns differ when considering the bank assets of each country owned by foreign banks (inflows). Results vary especially for the most extreme cases. Some countries whose DBO^{out} is quite high (e.g., Switzerland) become much more closed in the case of inflows. The US is at the opposite extreme. Disparity, though, is the general tendency: some countries now become much more open—apart from the US, this is also the case of Finland, Greece, Italy, Portugal, or the UK—whereas others become less financially open—Belgium, Canada, France, Germany, Japan, the Netherlands, Sweden, or Switzerland.

The degree of direct banking connection ($DDBC$) in Table 2 indicates whether cross-border bank flows are balanced in terms of the banking systems size of both the sending and recipient countries. According to the geographic neutrality idea, cross-border asset holdings of each country's banks should be directed preferably towards France, Germany, Japan, UK, or the US, whereas Denmark, Finland, Greece or Portugal should attract less cross-border flows (in absolute terms). Some of the countries with lower levels of $DDBC^{out}$ are the Nordic countries in our sample. These are countries with strong economic and financial ties, suggesting that the incentives of economic agents to go abroad might be geographically biased by these already established links. The only non-Nordic country with $DDBC^{out} < 60\%$ as of 2005 is Canada, which shares a common characteristic with these three countries, namely, the existence of strong links with its neighbor (the US, in spite of the border effect; see McCallum, 1995). In this case, although the size of the US banking markets is big, it might be attracting too much of Canada's cross-border bank asset holdings—i.e., the cross-border flows are not *balanced*. There are also some countries whose $DDBC$ does not overhang for being either too high or too low, which is the case of Ireland. However, Ireland's $DDBC$ exhibits the highest growth between 1999 and 2005, reflecting the fact that its cross-border financial flows have become more balanced, in terms of number and size of Ireland's financial partners. Whereas by 1999 the UK and the US accounted for more than 85% of Ireland's foreign claims (54.9% and 31.5%, respectively), by 2005 some of its largest European partners account for higher shares of its foreign assets. Specifically, the UK and the US have fallen in their relative importance (now representing only 42.2% and 10.3% of Irish foreign claims), whereas Germany, Italy, Spain and France account for 15.6%, 9.6%, 5.3% and 4.9%, respectively. This implies that, as suggested by the definition of the degree of regularity of financial connections, Ireland's cross-border flows are now more *balanced*. Explanations for this pattern may be manifold, such as the adoption of the euro, which might have constituted an incentive for Irish financial agents to go abroad and trade more intensely with euro area partners. Results vary if we reverse the direction of the flows and examine each country's assets owned by foreign banks ($DDBC^{in}$). According to the results, the Nordic countries are still at the bottom, i.e., they show geographic bias, regardless of the directions of their financial flows, although some countries move upwards (Canada).

Results for the degree of financial integration (DBI) are also reported in Table 2. Information is split according to the same criteria, namely, the direction of the flows, and the initial and final years. Since DBI^{out} (outflows) combines DBO^{out} and $DDBC^{out}$, its tendencies can be explained via the evolution of its components. Disparities among countries are more pronounced in the case of the degree of banking openness, whereas the $DDBC$ values are more homogeneous. Thus, differences are determined mainly by the degree of banking openness and, as such, the countries more financially integrated are Belgium, the Netherlands, or Switzerland. However, although the more financially integrated countries in the sample are small, large countries have also participated in this process: both Germany and France have $DBI^{out} > 50\%$ by 2005, and Japan, the UK or Spain also go beyond the 40% line. Extending the analysis to the cross-border flows in the opposite direction, both Italy and in particular the US become much more integrated.

The resulting scenario is that countries follow several paths to achieve their degrees of international banking integration. Both openness and balance in the volume and direction of cross-border flows are relevant. Its relevance, though, offers several perspectives: whereas openness generates marked differences between countries, the degree of direct banking connection is more homogeneous, and higher. However, this indicator also shows differences across countries and over time, suggesting a geographical bias exists for the bilateral asset trading, as documented by previous literature. In addition, both domestic and foreign banks contribute differently to the integration level of each country, the extreme and opposite cases being represented by Switzerland and the US

Table 3 provides information on all global indicators—in which we consider the weight of the total bank assets in each country. These indicators have been computed taking into account the weight of each country's banking system in the sample. Results indicate that, regardless of the direction of the asset flows, the level of global integration attained as of 2005 is quite similar in terms of outflows or inflows (45.4% and 46.6%, respectively). Therefore, although the pace is rapid (by 1999, the $DGBI$ was mostly below 40%), we are still not halfway to the theoretical full potential of international financial integration—i.e., to the Standard of Perfect Financial Integration. The increase in $DGBI$ has been mostly driven by the increase in the degree of global financial openness, whose advance has been proportionally higher. In contrast, the contribution of the $DDBC$ has even been small for $DDBC^{out}$ and negative for $DDBC^{in}$, yet this finding was partly to be expected because the values of $DDBC$ were already high by 1999.

6.2. Determinants of banking integration

Results on the determinants of banking openness (DBO) are displayed in tables 4 and 5, which consider outflows and inflows, respectively. We run OLS regressions for the pooled data. The covariates enter the model sequentially. Therefore, in column (1) of Table 4 only $REMOTE$ is included in the regression, which is both negative and significant, and explains close to 10% of variation in DBO^{out}. Once other variables are included in the model, the sign is negative throughout, although in some instances it is not significant. Thus, it seems that distance and financial openness are negatively related, corroborating previous results by Portes and Rey (2005) and Buch (2005), amongst others.

We add trade openness (DTO) to the set of regressors in columns (2)–(12), which improves the overall explanatory power substantially—from 8.1% to 29.2% (adjusted R^2). Its impact is positive and strongly significant throughout. It is also the covariate with the strongest impact on DBO^{out}.[21] In contrast, our other component of trade integration, the degree of direct trade connection ($DDTC$), which is added to the specification in columns (3)-(12), is not significant. In addition, its contribution to the adjusted R^2 is negligible. This finding stands with previous results (see, for instance Aviat and Coeurdacier, 2007).

GDP per capita ($GDPPC$) is added to the specification in columns (4)–(12), contributing to a raise in $\bar{R}^2$ from 30.5% to 41.6%. Its impact on DBO^{out} is positive throughout, and significant in most instances. The behavior of this variable is clearly influenced by the $CPICH$, since $GDPPC$'s significance declines abruptly once $CPICH$ enters the specification. The high (negative) correlation between $GDPPC$ and $CPICH$ underlie this trend. However, we consider both variables are important determinants of financial openness and, in addition, the multicollinearity tests performed indicated the problem was not particularly severe. The $CPICH$ variable is included in columns (8)–(12). Its impact is negative and highly significant throughout, making the $\bar{R}^2$ increase from 59.0% to 65.4%.

The set of financial development regressors show mixed results. The ones used more intensely in the literature, $MKTCAP$ and $DEPOSITS$, which are added to the specification in columns (5)–(12) and (6)–(12), respectively, are positive and significant throughout. Their contribution to the overall fit ($\bar{R}^2$) is also remarkable, from 41.6% to 54.0% (in the case of $MKTCAP$), and from 54.0% to 59.1% (in the case of $DEPOSITS$). These results are also in line with previous results found by the literature. Both covariates are relevant, yet the impact of $MKTCAP$ is higher than that of $DEPOSITS$.[22]

In contrast, the impact of $BANK50$ (how many banks each country has among the top 50 banks in the world) is mostly positive yet not significant. Its contribution to the $\bar{R}^2$ is virtually negligible. This result could be emerging because of some opposed effects, since some countries such as the US show low DBO^{out} but have the highest share of large banks, and the opposite holds for countries such as the Netherlands (with high DBO^{out} and also a remarkable number of large banks).

$FIN10$ and $FIN1050$ enters with different signs in columns (9)–(12) and (10)–(12), respectively. Both of them are significant throughout, and the contribution to the overall fit is non-negligible in both instances ($\bar{R}^2$ increases from 65.4% to 71.0% in the case of $FIN10$, and to 76.3% in the case of $FIN1050$). The overall impact on DBO^{out} is also remarkable, as indicated by the standardized coefficients. The apparent contradiction regarding the sign of the relationship is easy to explain when taking into account that, for instance, Switzerland (the country with highest DBO^{out}) is, together with the US, the country with the highest number of financial centers ($FIN10 = 2$). However, it has no medium-sized financial centers ($FIN1050 = 0$). In contrast, some other countries with a remarkable number of medium-sized financial centers such as Canada, the UK and, especially, the US (all of them with $FIN1050 = 3$) do not particularly excel in DBO^{out}.

[21] This may be further corroborated via standardized coefficients, not reported here but available from the authors upon request.

[22] This information is available by computing standardized coefficients—not reported for space reasons.

The last three regressors have been used by the literature to varying degrees. The $HERITAGE$ variable, included in columns (11)–(12), turns out to be unimportant in explaining variation in the level of financial openness. The impact is negative yet insignificant in all instances. Therefore, the joint impact of the $HERITAGE$ components (namely, regulation, trade, fiscal, government, monetary, investment, financial, property rights, corruption, and labor) is not relevant for explaining bank outflows. $EURO$ is included in the specification in columns (12), and is unimportant as well. In accordance with these results, the $\bar{R}^2$ remains unaffected.

Table 5 provides the inflows' counterpart to Table 4. This specific analysis for each direction of the flows is important, since both the signs and significance of the regressors are remarkably altered. One might expect that both the sign and significance of $REMOTE$ should not change. That is, if distance and DBO^{out} are negatively related, distance and DBO^{in} should be too. However, this is not the case, since the variable is not significant in many instances and, in addition, the sign is reversed—the impact is now positive. The explanation is provided by the behavior of some particular countries, given that some of the most distant countries (the US, Greece and Finland) are also those with the highest DBO^{in} (see Table 2).[23]

When adding the trade variables to the specification in columns (2)–(12) (DTO) and (3)–(12) ($DDBC$), results also vary markedly. The degree of trade openness (DTO) is not significant throughout and, in some instances, the sign is even negative. Although this result looks *a priori* striking, we should take into account that the DTO has been computed using exports only. Therefore, one might expect exports to go hand in hand with financial *outflows* (DBO^{out}), but not necessarily with financial *inflows*. This result is also consistent with previous literature such as Lane and Milesi-Ferretti (2008), who found that trade is relevant for financial assets, yet not for financial liabilities. It could also be *a priori* difficult to explain the highly significant and negative sign throughout $DDTC$. The magnitude of the impact is also high (standardized coefficients). This result could also be explained by the behavior of some specific countries such as Finland, Greece or the US, whose degrees of direct trade connection are low (for different reasons) whereas their DBO^{in} are high.

Both $MKTCAP$ and $DEPOSITS$, which enter the specification in columns (4)–(12) and (5)–(13), respectively, are now insignificant. Lane and Milesi-Ferretti (2008) also obtain a similar result, since they find that the impact of financial development on financial assets is positive and significant, but not for financial liabilities. Indeed, the only financial development significant variable throughout is $FIN1050$, whose impact on DBO^{in} is reversed with respect to that on DBO^{out}—it is now positive. This could suggest that these types of centers might be an important channel for domestic financing.

The sign of $CPICH$ is also reversed, as one might *a priori* expect. This variable is included in columns (8)–(12). Explanatory power rises sharply from 17.3% to 36.5%. Among the last two regressors included in our model, $EURO$ is not significant, as already found for DBO^{out}. However, the impact of $HERITAGE$ is positive and highly significant, suggesting that when law enforcement is high (there are also more guarantees that the contracts will be fulfilled), business opportunities abroad are attractive and, therefore, cross border asset holdings become engaging. This variable also contributes to increasing explanatory power (from 47.0% to 51.8%) but, compared with the model specified for DBO^{out}, the fit is much poorer (51.9% vs. 76.2%).

We have also performed estimations to explain the variations in $DDBC$ and DBI (for both outflows and inflows). However, for space reasons, we concentrate on DBI.[24] These are reported in Table 6 (outflows) and Table 7 (inflows). In general, results corroborate those found for the DBO. The only remarkable discrepancy relates to $HERITAGE$, whose impact on DBI^{out} is now negative and significant throughout. Explanations could be similar to those provided above for the DBO. If institutions are trustworthy and law enforcement is high, business opportunities in the home country could be more attractive than business opportunities abroad.

[23]In order to check the robustness of the results, we run the regressions excluding some potentially outlying observations such as the US—especially in the case of inflows. In some cases, results were strongly affected. However, given the high number of intrinsic behaviors, it is difficult to decide which countries to exclude from the analysis in order to perform the robustness check. We consider that the nonparametric analysis fits this particular context better. In addition, including extra estimations is problematic in terms of total paper length.

[24]Results on $DDBC$ are available from the authors upon request.

6.3. Nonparametric analysis

Although the results above are undoubtedly interesting, some of the findings are difficult to reconcile. For instance, the impact of remoteness on both financial openness and financial integration depends on the direction of the flows. In the case of outflows, it is mostly negative and significant, yet in the case of inflows it is mostly positive and non significant. This finding is difficult to justify, given that the impact of distance should be *a priori* immune to the direction of flows.

A forensic view of both the data and previous results (see the initial paragraphs Section 6.1) reveals that some individual countries are determining the nature of the relationship between $REMOTE$ and DBO and DBI. As indicated earlier, the US is a large economy distant from many other countries in the sample. If the link between $REMOTE$ and both DBO (or DBI) were negative for all countries, we should expect low values for both DBO and DBI—at least when compared with many other sample countries. However, although that is the case for the US outflows, it is not for the inflows, which are by and large the highest. Under these circumstances, any parametric model will face difficulties in fitting the data, because of their lack of flexibility—the so-called "parametric straitjacket".

Figure 1 represents the nonparametric regression counterpart to Table 6, estimated using the methods introduced in Section 4. They are not exact counterparts because the former displays results from *univariate* nonparametric regression, whereas the latter shows results from *multivariate* parametric (OLS) regressions. This implies that all other variables are held at their median values. We report results for the DBI^{out} variable only, for space reasons, although they have also been performed for the remaining depending variables. In general, results yielded by OLS regressions are corroborated, but some important subtleties are revealed by the nonparametric analysis. Table 6 shows that $REMOTE$ and DTO have strongly significant impacts on DBI^{out}, with opposite signs. However, the nonparametric analysis reveals that, in the case of $REMOTE$, the impact is strongly negative because of the bulk of observations that lie in the vicinity of $REMOTE = 0.05$. This trend reverses for larger values of $REMOTE$, but then significance decreases substantially, as revealed by wider error bands. Therefore, it seems that the mechanisms operating are not the same for all sample countries. Regarding DTO, Figure 1 also shows that the error bands widen up for larger values of the covariate ($DTO > 0.4$), whereas lower values corroborate the high and positive sign found in Table 6.[25]

The remaining subfigures in Figure 1 generally corroborate the parametric results, but more information is disclosed. The fuzzy trend of $DDTC$ in Figure 1 matches both its non-significance and changeable sign in Table 6. $GDPPC$ impacts positively on DBI^{out}, but it is mostly insignificant, although this result might be corrupted by the high (negative) correlation among $GDPPC$ and $CPICH$. Consistently, Figure 1.d shows an upward trend of the regression line; however, the error bands are not wide enough to conclude that the impact of the variable is not significant.

In general, financial development variables ($MKTCAP$, $DEPOSITS$ and $BANK50$) coincide, and reinforce the results reported in Table 6. Graphical results for $FIN10$ and $FIN1050$ are not displayed because of their "semi"-categorical nature. The impact of $MKTCAP$ on DBI^{out} is positive, but significance is lost for high values of $MKTCAP$. The peculiar aspect of $BANK50$ regression line in Figure 1.g helps to explain why parametric regressions yield non-significant coefficients, since the impact is positive for $BANK50 < 5$, then it becomes negative, and finally (for $BANK50 > 20$) becomes positive again. Therefore, underlying the non-significance found through OLS there could exist different mechanisms operating for countries with varying levels of $BANK50$. The narrow error bands also suggest that the impact of the variable is more significant that what the parametric analysis suggests. $DEPOSITS$ enter the model linearly, buttressing the signs yielded by the OLS regressions. Although *a priori* Figure 1.h suggests the impact of $CPICH$ on financial integration does not mimic the negative sign in Table 6, a deeper scrutiny reveals that significance (narrower error bands) occurs mainly for the range of $CPICH$ observations for which a negative link with financial integration exists, whereas for other ranges of $CPICH$ the link is positive but with lower significance (wider error bands).

Finally, Figure 1.i indicates $HERITAGE$ enters the analysis linearly. However, its impact on DBI^{out} is positive, contradicting the parametric analysis in Table 6, which show a strongly negative link. The underlying explanation might relate to the fact that, as indicated above, Figure 1 displays *univariate* counterparts to the *multivariate* results in Table 6. Should we run a separate univariate regression $DBI_i^{out} = \beta_0 + \beta_1 HERITAGE_i + \varepsilon_i$, then the estimated coefficient is positive and highly significant,

[25] Most of the nonparametric estimations in this article have been carried out using the `np` package by Hayfield and Racine (2008), implemented in `R`.

suggesting the parametric model (12) might be misspecified.

Proper nonparametric counterparts to Model (12) in tables 6 and 7 are reported in tables 8 and 9. Table 8 displays the mean nonparametric estimates of the determinants of financial integration, as well as the coefficients at each decile of the distribution, considering both outflows and all covariates included in model (12); Table 9 reports analogous information for inflows. Therefore, comparison between results in tables 6 and 7 with those in tables 8 and 9 is direct.[26] Standard errors are reported in parenthesis. Both tables also provide the mean nonparametric estimates, in order to facilitate comparisons with the parametric models. The densities of the gradients are reported in Figure 2.

Table 8 indicates that, when examining DBI^{out}, the parametric estimate for $REMOTE$ (-1.340, see Table 6) is well above the corresponding mean (-0.0585) and 90$^{\text{th}}$ percentile (-0.3880) of the nonparametric estimates. Thus, the nonparametric specification indicates that the parametric specification vastly overstates the effect of $REMOTE$. This conclusion is drawn when analyzing *mean* values. However, the effect varies depending on the decile of the distribution, since for larger values (above 60%) it becomes positive, corroborating the results found through the graphical analysis. The mean nonparametric estimate of the degree of openness (0.0035) is also substantially lower than its parametric counterpart (0.403). The positive impact exists for roughly 80% of the sample. The impact of some variables on DFI^{out} is essentially zero ($DDTC$, $BANK50$, $CPICH$ and $FIN10$). The remaining variables ($GDPPC$, $MKTCAP$, $HERITAGE$ and $EURO$) also impact DBI^{out} with the same sign as the parametric model *on average*, since the coefficients at each decile of the distribution vary. For instance, GDP and $MKTCAP$ have a positive sign for the majority of the sample (around 70%), whereas in the case of $FIN1050$ and $HERITAGE$ the negative sign prevails for roughly 60% and 50%, respectively.

Table 9 provides the nonparametric counterpart to column (12) in Table 7. In contrast to the parametric estimate, the *mean* nonparametric estimate of $REMOTE$ is negative, which is in accordance with previous findings in the literature and is also consistent with the sign found for DBI^{out} since, *a priori*, if distance influences negatively asset trade this should be independent of the direction of the flows. However, this negative sign only prevails for roughly 40% of the sample, whereas for the remainder it is mainly positive; therefore, the sign of the parametric model is strongly misleading, since it does not capture the nonlinearities present in the data. The sign of DTO is coincidental for both *mean* parametric and nonparametric estimates. However, it is negative for roughly 30% of the sample. In some cases the nonparametric estimates are virtually zero, suggesting $DEPOSITS$, $CPICH$ and $FIN1050$ could enter the model linearly. For the remainder, we always find varying signs at the different deciles of the distribution, suggesting the linear fit is off the mark. The bandwidths corresponding to the nonparametric regression run are reported in Table 10. As indicated by Hall *et al.* (2007), since we are using local-constant least-squares, the bandwidths on our continuous regressors tending towards infinity imply that the variable is irrelevant (see also Li and Racine, 2007).

Therefore, results indicate that the added flexibility of nonparametric models allows disentangling some of the relationships among the variables considered, which are intricate. In addition, we can formally test whether the parametric model is indeed appropriate. The Hsiao *et al.* (2007) test provides means to do it, and results are reported in Table 11. Results are striking given that, even for the most encompassing model (model (12)), which includes all contemplated regressors, we always reject the null that this parametric linear model is correctly specified. Although rejection is stronger for inflows (the J_N value is higher in virtually all instances), p-values lead in all cases to reject the null even at the 1‰ significance level.

The validity of the parametric approach is further analyzed in Table 12, which provides results on the Li (1999) test, and its corresponding graphical counterpart in figures 3 through 6. Results are not entirely coincidental with those provided by the Hsiao *et al.* (2007) test because the tests differ greatly—for instance, the Li (1999) test is based on estimating density functions which require stipulating a bandwidth, which we estimated using different methods for simplicity. When comparing the observed values with those predicted by the parametric model (what in the Table is labeled as "Actual vs. predicted (parametric)"), the null hypothesis of equality of distributions is always rejected at the 1% significance level for the inflows. In the case of the outflows, the only cases in which it cannot be rejected are those models including the majority of the regressors. Figures 3—6 display graphical counterparts to Table 12 for models (1), (4), (8) and (12).[27] Clearly, we visually corroborate that although results on the Li (1999) test indicate that actual and parametric predictions do not differ significantly for model (12) in DBI^{out}, Figure 5.d indicates

[26] We do not report information on DBO regressions for space reasons, although they are available from the authors upon request.

[27] We only provide results for these models for space reasons.

differences do indeed exist.

In contrast, the nonparametric models estimated using equations (11)–(13) report a more successful story. In this case, for all dependent variables and all models excepting Model (1), we cannot reject the null of equality of distributions of actual and predicted data—what in Table 12 is referred to as "Actual vs. predicted (nonparametric)". Indeed, graphically (figures 3–6) we observe that only Model (1) performs poorly in terms of predictive power, whereas model (12) usually performs much better. However, we also notice that performance is worse for inflows, suggesting the behavior of both DBO^{in} and DBI^{in} is more difficult to model. We should also acknowledge that the parametric models we are specifying are somewhat naïve, since we could have stipulated a model with nonlinearities and so forth. However, our point is that, since no established theory exists as to how the different covariates affect financial integration, applying a nonparametric model may be more appropriate.

7. Conclusions

Over the last few years, the interest in the effect of financial globalization in general and banking globalization in particular has been spurred by the increase of cross-border asset holdings, especially in advanced countries. In this paper, we provide some new findings on the drivers of international financial integration, focusing on the case of banking flows, from a different point of view. First, whereas the literature on the determinants of financial integration is becoming voluminous, we think there is an issue largely overlooked, namely, the precise definition of what international financial (and banking) integration is. Second, the banking systems of the countries under study are sufficiently different in character that a theory of financial integration tailored for some countries may not neatly fit others. The issue is especially severe when such theories are lacking (Portes and Rey, 2005).

In our proposal, we consider financial integration and financial openness are not necessarily the same thing. This is a key factor since either the existence or lack of consensus on what the drivers of financial globalization are could be ascribed to the difficulties in properly measuring the extent of financial openness and/or integration. We develop a new indicator of financial integration which considers it to be composed not only of financial openness but also of financial *connection*. In addition, we define a Standard of Perfect Banking Integration (given that we apply our methods to the context of banking integration). This indicator could be regarded as the quantities counterpart to the law of one price, considered by the literature which focuses on financial integration from a prices point of view. In the particular case of bank flows we are dealing with, this may be very important because data on prices are usually either lacking or poor. We deem it relevant to distinguish between financial inflows and financial outflows since results—as it has been the case—might differ a great deal.

Regarding our set of explanatory variables, we have tried to be as parsimonious as possible and to include most of the covariates identified by the growing literature on the drivers of financial globalization. Although no formal theory exists as to what these drivers are, there is certain consensus in that geographical distance, trade, and financial development influence financial openness. Some other variables such as social capital have been less extensively employed, but its impact on financial openness is not negligible either. We have also considered that, in order to estimate accurately how the different covariates affect our financial integration variables, it is worth including in the analysis some recent advances in nonparametric econometrics, since some of the relationships to be modelled are rather involved.

Our findings supplement most of the previous stylized facts in several dimensions. In terms of the indicators on financial openness and financial integration, we learn that depending on the direction of financial flows (outflows or inflows), the assessment on the financial openness and integration of each country might vary a great deal. This is especially the case of the US and Switzerland. Over time, although financial integration increases, we are still far from the theoretical full potential (the Standard of Perfect International Integration). In addition, countries advance in their "specialization". In other words, countries which are more open from the outflows perspective become more open from this perspective yet not from the inflows.

In accordance with these findings, the influence of the independent variables varies depending on the direction of the flows. Whereas the determinants of financial openness and financial integration from the outflows perspective are in line with previous findings, results change from the inflows perspective. However, many of these results can be explained away once we control for the behavior of some particular countries in our sample. We have accomplished this by using nonparametric techniques, whose flexibility makes it possible to uncover all features data might hide. It is also important to note that the specification of nonparametric models is pertinent since, as shown by both the Hsiao *et al.* (2007) and Li (1999) tests, the parametric models used so far by the literature misspecify the functional forms linking our set of covariates to financial integration, especially when nonlinearities arise.

The future research agenda comprises two immediate goals. First, given the influence of extreme observations, we should take into account some additional flexible techniques within the nonparametric and semiparametric econometrics field. Second, because of the data requirements to construct our indices of financial integration and the length of the sample, the analysis had to be restricted to eighteen countries only. By shrinking the time span of the sample it could be possible to include some developing countries in the analysis, which could provide some additional interesting results. As indicated earlier, because the financial integration process in developing countries might be sufficiently different from that of developed countries the same theory may not fit both cases.

Finally, we should also refer, perhaps as a third immediate goal in our research agenda, to the links between our indicators of bank integration and the recent international financial crisis. It was not possible to explore explicitly these links in the current version of the paper because of our sample period, which ends before the bulk of the crisis took place. However, as more up-to-date information becomes available that covers the years in which the crisis has hit most sample countries the hardest, it will be possible to consider a set of testable hypotheses. Ideally, some of them should explore whether the countries whose banking systems are more integrated are also those in which the financial crisis has been more severe. However, the links might be involved, since we present a broader concept of banking integration which considers both bank *openness* and bank *connection*, and the banking systems in each country also differ a great deal. These remain as open and intriguing questions to be explored in immediate research initiatives.

Appendix A. Data description

- $REMOTE$ – **Remoteness:** remoteness is defined following the definition by Nitsch (2000). According to this author, we can define the remoteness of a country i as the reciprocal of country j's GDP divided by the bilateral distance between country i and country j summed over all trading partners of country i (in the sample):

$$R_i = (\sum_k [Y_j/D_{ij}])^{-1} \tag{14}$$

  As found in other research studies, Belgium and the Netherlands, for year 2005, are the least remote countries in the sample. On the other hand, Japan and the US are the most remote countries. The advantage of this measure over considering distance alone is that we control for the fact that remote countries—such as New Zealand and Australia—will trade more with each other than two countries that are separated by the same absolute distance but are closer to other markets—such as Spain and Sweden [Source: CHELEM].

- DTO – **Degree of trade openness:** we define trade openness in a similar fashion to the degree of banking openness (DBO), yet considering trade flows instead of banking flows. Therefore, the definition is:

$$DTO_i = \frac{\sum_{j\in N} X_{ij}}{\widehat{Y}_i} \tag{15}$$

  where DTO_i is the degree of trade openness of country i, X_{ij} are the exports (or imports) from country i to country j, N is the sample size, $\widehat{Y}_i$ is the home bias-corrected GDP of country i, and $X_{ii} = 0$ [Source: CHELEM].

- $DDTC$ – **Degree of direct trade connection:** we define trade connection similarly to banking connection. Therefore, $DDTC$ is defined following equation (2), where $A = (\alpha_{ij})$ is the matrix of relative trade flows (either exports or imports) in the real world, $\alpha_{ij} = \frac{X_{ij}}{\sum_{j\in N\setminus i} X_{ij}}$, $B = (\beta_{ij})$ is the matrix of trade flows in the *perfectly trade connected world*, and $\beta_{ij} = Y_j/(\sum_{k\in N\setminus i} Y_k)$ [Source: CHELEM].

- $GDPPC$ – **GDP per capita:** logarithm of per capita GDP, in US dollars and adjusted with local CPI [Source: CHELEM].

- $MKTCAP$ – **Market capitalization:** market capitalization of listed companies, as percentage of GDP [Source: World Development Indicators (WDI, World Bank)].
- $DEPOSITS$ – **Deposits:** total bank deposits in each country, in US dollars, divided by GDP [Source: European Central Bank, Swiss National Bank, Bank of Japan, Federal Reserve System].
- $BANK50$ – **Banks among largest 50:** number of banks in each country among the 50 largest banks in the world, in terms of total assets [Source: BankScope].
- $CPICH$ – **Consumer price index change:** consumer price index change [Source: International Financial Statistics (IFS, International Monetary Fund)].
- $FIN10$ – **Financial centers among largest 10:** number of financial centers in each country among the 10 largest world financial centers [Source: The Global Financial Centres Index, Z/Yen Group].
- $FIN1050$ – **Financial centers among largest 50, excluding 10 largest:** number of financial centers in each country among the 50 largest world financial centers, excluding the top 10 [Source: The Global Financial Centres Index, Z/Yen Group].
- $HERITAGE$ – **Economic freedom:** index of overall economic freedom constructed by the Heritage Foundation, defined as an unweighted average of 10 economic freedoms. These are business freedom, trade freedom, fiscal freedom, government size, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption, and labor freedom [Source: Heritage Foundation].

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Table 1: Data by country (outflows), 1999 and 2005

Country	Total bank assets[a]		Shares of the international banking markets		Total assets as % of GDP		Total consolidated foreign claims as % of GDP		Total consolidated foreign claims as % of total assets		Total consolidated foreign claims[a]		Total consolidated foreign claims of the sample countries as % of their total foreign claims		Total consolidated foreign claims of the sample countries as % of total assets	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Austria	488,939	850,800	1.38	1.54	229.43	263.86	47.61	97.14	20.75	34.95	67,261	139,299	66.30	46.85	13.76	16.37
Belgium	718,791	1,247,769	2.03	2.25	283.19	318.31	151.66	242.75	53.55	72.14	318,891	759,217	82.84	84.34	44.36	60.85
Canada	1,120,339	1,994,859	3.17	3.60	172.04	159.40	44.85	41.97	26.07	23.43	250,845	395,502	85.89	84.61	22.39	19.83
Denmark	356,402	668,469	1.01	1.21	204.89	242.87	28.75	57.85	14.03	22.39	32,263	112,474	64.52	75.15	9.05	16.83
Finland	120,251	291,268	0.34	0.53	93.31	139.07	24.27	37.85	26.01	25.10	24,845	53,309	79.45	72.92	20.66	18.30
France	3,643,785	6,455,200	10.30	11.66	250.28	289.38	57.66	83.64	23.04	27.55	662,008	1,450,788	78.86	81.57	18.17	22.47
Germany	5,704,621	8,092,034	16.13	14.61	266.12	278.39	80.59	100.01	30.28	34.54	1,333,868	2,255,130	77.21	80.68	23.38	27.87
Greece	181,933	337,394	0.51	0.61	148.27	137.74	NA	16.95	NA	11.32	NA	18,425	NA	48.26	NA	5.46
Ireland	304,193	1,362,671	0.86	2.46	315.10	612.02	77.97	246.16	24.74	36.46	69,435	437,845	92.25	88.13	22.83	32.13
Italy	1,649,453	3,066,158	4.66	5.54	137.36	166.21	21.53	20.48	15.67	11.77	198,396	233,485	76.74	64.69	12.03	7.61
Japan	7,517,125	6,340,539	21.25	11.45	172.90	146.09	23.62	36.46	13.66	26.07	762,596	1,196,335	74.27	72.38	10.14	18.87
Netherlands	988,225	1,999,945	2.79	3.61	237.78	304.13	97.29	265.95	40.91	83.01	312,146	1,499,115	77.20	90.30	31.59	74.96
Portugal	250,547	426,226	0.71	0.77	205.94	221.33	37.12	49.71	18.03	21.38	30,082	64,201	66.60	70.46	12.01	15.06
Spain	1,048,501	2,600,531	2.96	4.70	169.68	212.46	41.30	75.74	24.34	32.75	194,915	783,021	76.37	91.93	18.59	30.11
Sweden	477,890	854,200	1.35	1.54	188.35	221.91	35.70	141.13	18.95	59.10	69,596	384,685	76.84	76.20	14.56	45.03
Switzerland	1,402,756	2,165,757	3.97	3.91	529.59	570.30	363.78	526.25	68.69	89.18	886,789	1,682,795	92.03	87.12	63.22	77.70
United Kingdom	3,802,069	7,870,559	10.75	14.21	259.55	335.63	59.14	111.81	22.78	31.28	565,207	1,804,436	65.25	73.30	14.87	22.93
United States	5,596,500	8,753,600	15.82	15.81	60.72	66.31	7.36	8.29	12.12	11.75	468,448	708,844	69.04	68.90	8.37	8.10

[a] In millions of current $US.

Table 2: DBO, $DDBC$ and DBI, 1999 and 2005 (%)

Country	DBO_i				$DDBC_i$				DBI_i			
	Outflows		Inflows		Outflows		Inflows		Outflows		Inflows	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Austria	13.77	16.50	16.90	18.00	80.98	83.81	66.93	66.97	33.39	37.18	33.63	34.72
Belgium	45.47	63.02	25.38	29.45	67.07	77.84	74.76	73.07	55.22	70.04	43.56	46.39
Canada	22.66	20.71	11.48	11.94	55.92	59.15	93.36	88.07	35.60	35.00	32.74	32.43
Denmark	9.24	17.24	15.02	36.29	58.67	55.21	74.78	32.26	23.28	30.85	33.52	34.22
Finland	20.42	18.37	30.29	42.40	53.89	36.20	60.17	23.49	33.17	25.79	42.69	31.56
France	21.62	27.78	11.83	14.66	90.50	91.21	82.69	85.97	44.24	50.33	31.28	35.50
Germany	32.03	37.25	11.45	17.50	86.86	88.72	85.57	80.68	52.75	57.49	31.30	37.57
Greece	0.00	5.30	24.33	42.14	NA	75.91	83.07	62.46	NA	20.05	44.96	51.31
Ireland	23.10	33.77	35.15	33.48	55.01	77.52	76.05	81.54	35.65	51.17	51.70	52.25
Italy	12.20	8.37	24.98	24.86	78.05	89.49	75.15	80.58	30.86	27.37	43.33	44.76
Japan	15.29	22.88	8.20	10.12	73.82	72.18	87.65	79.56	33.60	40.64	26.80	28.37
Netherlands	29.05	75.57	28.36	32.91	84.46	86.92	68.20	70.26	49.53	81.05	43.98	48.08
Portugal	11.54	14.52	20.38	34.60	70.09	76.47	64.03	59.04	28.44	33.32	36.12	45.20
Spain	14.00	25.24	15.07	22.24	76.41	70.26	77.73	80.68	32.70	42.11	34.23	42.36
Sweden	14.76	46.06	16.60	18.13	61.33	47.82	76.69	57.93	30.09	46.93	35.68	32.41
Switzerland	66.86	81.94	7.98	8.00	72.04	68.54	79.06	86.86	69.41	74.94	25.11	26.36
United Kingdom	17.01	28.64	37.06	42.30	75.16	70.26	77.74	82.15	35.75	44.85	53.67	58.95
United States	9.23	8.94	47.10	72.52	83.33	90.06	90.01	84.59	27.74	28.38	65.11	78.32
Unweighted mean	21.01	30.67	21.53	28.42	71.98	73.20	77.42	70.90	38.32	44.31	39.41	42.26
Standard deviation	0.15	0.22	0.11	0.16	0.12	0.15	0.09	0.18	0.12	0.17	0.10	0.13
Coefficient of variation	0.73	0.73	0.51	0.56	0.16	0.21	0.11	0.26	0.31	0.39	0.26	0.30

Table 3: Global degrees ($DGBO$, $DDGBC$, $DGBI$), 1999–2005 (%)

Year	$DGBO$		$DGDBC$		$DGBI$	
	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows
1999	20.85	21.13	78.23	83.32	38.95	39.58
2000	23.22	23.84	80.44	85.63	41.69	42.57
2001	24.84	25.79	81.50	84.34	42.86	43.88
2002	25.18	26.41	81.03	81.42	42.72	43.87
2003	24.99	25.81	80.17	81.45	42.43	43.36
2004	27.71	28.65	78.41	80.40	44.37	45.41
2005	28.78	30.48	79.88	80.25	45.41	46.64

Table 4: The drivers of DBO, outflows, 1999–2005

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
(Intercept)	0.319***	0.101**	0.013	−2.305***	−1.496***	−2.106***	−1.951***	−0.793	0.023	−0.868*	−0.889*	−0.894*
	(0.025)	(0.042)	(0.063)	(0.475)	(0.444)	(0.446)	(0.488)	(0.509)	(0.495)	(0.480)	(0.478)	(0.521)
$REMOTE$	−1.155***	−0.202	−0.450	−1.026***	−0.591*	−0.561*	−0.729**	−1.057***	−0.869***	−1.442***	−1.439***	−1.438***
	(0.333)	(0.331)	(0.355)	(0.346)	(0.316)	(0.298)	(0.367)	(0.344)	(0.317)	(0.308)	(0.306)	(0.307)
DTO		0.562***	0.535***	0.401***	0.481***	0.403***	0.413***	0.463***	0.581***	0.436***	0.479***	0.478***
		(0.091)	(0.092)	(0.088)	(0.080)	(0.078)	(0.079)	(0.073)	(0.071)	(0.070)	(0.075)	(0.079)
$DDTC$			0.186*	−0.009	−0.059	−0.156*	−0.142	−0.158*	−0.136*	0.035	0.044	0.045
			(0.102)	(0.102)	(0.091)	(0.089)	(0.090)	(0.083)	(0.076)	(0.076)	(0.076)	(0.083)
$GDPPC$				0.250***	0.156***	0.215***	0.199***	0.095*	0.013	0.100**	0.123**	0.124**
				(0.051)	(0.048)	(0.048)	(0.052)	(0.052)	(0.051)	(0.049)	(0.051)	(0.053)
$MKTCAP$					0.125***	0.127***	0.126***	0.126***	0.067***	0.091***	0.090***	0.090***
					(0.022)	(0.020)	(0.020)	(0.019)	(0.021)	(0.020)	(0.019)	(0.020)
$DEPOSITS$						0.087***	0.084***	0.084***	0.058***	0.069***	0.070***	0.070***
						(0.022)	(0.022)	(0.020)	(0.019)	(0.017)	(0.017)	(0.019)
$BANK50$							0.003	0.006*	−0.004	0.005	0.004	0.004
							(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
$CPICH$								−0.052***	−0.053***	−0.034***	−0.031***	−0.031***
								(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
$FIN10$									0.133***	0.068**	0.087***	0.087***
									(0.027)	(0.028)	(0.030)	(0.031)
$FIN1050$										−0.063***	−0.057***	−0.057***
										(0.012)	(0.013)	(0.013)
$HERITAGE$											−0.352	−0.351
											(0.228)	(0.235)
$EURO$												0.001
												(0.032)
R^2	0.088	0.303	0.322	0.435	0.558	0.611	0.613	0.676	0.731	0.782	0.786	0.786
$\bar{R}^2$	0.081	0.292	0.305	0.416	0.540	0.591	0.590	0.654	0.710	0.763	0.766	0.764
F	12.0	26.7	19.3	23.2	30.3	31.1	26.7	30.5	35.1	41.2	38.1	34.6
p	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Log-likelihood	34.7	51.6	53.3	64.8	80.4	88.3	88.6	99.9	111.7	124.8	126.1	126.1
N	126	126	126	126	126	126	126	126	126	126	126	126

*, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively. Standard errors reported in parentheses.

Table 5: The drivers of *DBO*, inflows, 1999–2005

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
(Intercept)	0.230***	0.243***	0.374***	0.035	0.182	−0.065	0.550	−0.765*	−0.851*	−0.002	0.043	−0.164
	(0.017)	(0.033)	(0.048)	(0.393)	(0.413)	(0.436)	(0.458)	(0.456)	(0.486)	(0.475)	(0.453)	(0.491)
REMOTE	0.321	0.265	0.635**	0.551*	0.630**	0.642**	−0.023	0.350	0.330	0.877***	0.868***	0.877***
	(0.229)	(0.260)	(0.269)	(0.286)	(0.294)	(0.292)	(0.345)	(0.308)	(0.311)	(0.304)	(0.290)	(0.290)
DTO		−0.033	0.007	−0.012	0.002	−0.029	0.008	−0.049	−0.061	0.077	−0.015	−0.039
		(0.072)	(0.069)	(0.073)	(0.074)	(0.076)	(0.074)	(0.065)	(0.070)	(0.069)	(0.071)	(0.074)
DDTC			−0.278***	−0.306***	−0.315***	−0.354***	−0.302***	−0.285***	−0.287***	−0.450***	−0.469***	−0.436***
			(0.077)	(0.084)	(0.084)	(0.087)	(0.085)	(0.074)	(0.075)	(0.076)	(0.072)	(0.078)
GDPPC				0.037	0.019	0.044	−0.020	0.099**	0.107**	0.024	−0.026	−0.012
				(0.042)	(0.045)	(0.047)	(0.049)	(0.047)	(0.050)	(0.048)	(0.048)	(0.050)
MKTCAP					0.023	0.023	0.019	0.019	0.025	0.003	0.004	0.006
					(0.020)	(0.020)	(0.019)	(0.017)	(0.021)	(0.019)	(0.018)	(0.019)
DEPOSITS						0.035	0.024	0.025	0.028	0.017	0.015	0.008
						(0.021)	(0.021)	(0.018)	(0.019)	(0.017)	(0.017)	(0.018)
*BANK*50							0.011***	0.007**	0.008**	−0.000	0.002	0.001
							(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
CPICH								0.059***	0.059***	0.042***	0.034***	0.034***
								(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
*FIN*10									−0.014	0.048*	0.007	0.012
									(0.027)	(0.027)	(0.029)	(0.029)
*FIN*1050										0.060***	0.048***	0.050***
										(0.012)	(0.012)	(0.012)
HERITAGE											0.762***	0.815***
											(0.216)	(0.222)
EURO												0.033
												(0.030)
R^2	0.016	0.017	0.112	0.117	0.126	0.146	0.219	0.406	0.407	0.512	0.560	0.565
$\bar{R}^2$	0.008	0.001	0.090	0.088	0.090	0.103	0.173	0.365	0.361	0.470	0.518	0.518
F	2.0	1.1	5.1	4.0	3.5	3.4	4.7	10.0	8.9	12.1	13.2	12.2
p	0.163	0.341	0.002	0.004	0.006	0.004	0.000	0.000	0.000	0.000	0.000	0.000
Log-likelihood	82.0	82.1	88.5	88.9	89.5	91.0	96.6	113.8	114.0	126.2	132.7	133.4
N	126	126	126	126	126	126	126	126	126	126	126	126

*, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively. Standard errors reported in parentheses.

Table 6: The drivers of DBI, outflows, 1999–2005

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
(Intercept)	0.481***	0.298***	0.227***	−1.521***	−0.828*	−1.496***	−1.204**	−0.247	0.330	−0.407	−0.437	−0.547
	(0.022)	(0.038)	(0.058)	(0.450)	(0.443)	(0.435)	(0.464)	(0.484)	(0.484)	(0.470)	(0.457)	(0.498)
REMOTE	−0.901***	−0.129	−0.317	−0.740**	−0.398	−0.373	−0.714**	−1.006***	−0.874***	−1.355***	−1.344***	−1.340***
	(0.287)	(0.291)	(0.312)	(0.314)	(0.300)	(0.278)	(0.340)	(0.323)	(0.308)	(0.300)	(0.292)	(0.293)
DTO		0.464***	0.448***	0.366***	0.420***	0.338***	0.359***	0.406***	0.493***	0.349***	0.415***	0.403***
		(0.083)	(0.083)	(0.081)	(0.076)	(0.072)	(0.073)	(0.068)	(0.069)	(0.070)	(0.072)	(0.076)
DDTC			0.146	0.014	−0.025	−0.126	−0.099	−0.109	−0.093	0.059	0.075	0.093
			(0.091)	(0.092)	(0.086)	(0.082)	(0.083)	(0.077)	(0.073)	(0.075)	(0.073)	(0.079)
GDPPC				0.187***	0.108**	0.173***	0.143***	0.056	−0.001	0.071	0.110**	0.117**
				(0.048)	(0.048)	(0.046)	(0.049)	(0.050)	(0.050)	(0.048)	(0.049)	(0.051)
MKTCAP					0.095***	0.095***	0.093***	0.094***	0.049**	0.074***	0.073***	0.074***
					(0.021)	(0.019)	(0.019)	(0.018)	(0.021)	(0.020)	(0.019)	(0.019)
DEPOSITS						0.091***	0.086***	0.085***	0.067***	0.077***	0.079***	0.076***
						(0.020)	(0.020)	(0.019)	(0.018)	(0.017)	(0.017)	(0.018)
*BANK*50							0.006*	0.008***	0.001	0.009**	0.007**	0.007*
							(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
CPICH								−0.044***	−0.045***	−0.027***	−0.020**	−0.020**
								(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
*FIN*10									0.098***	0.037	0.068**	0.071**
									(0.026)	(0.027)	(0.029)	(0.029)
*FIN*1050										−0.058***	−0.049***	−0.048***
										(0.012)	(0.012)	(0.013)
HERITAGE											−0.597***	−0.568**
											(0.220)	(0.227)
EURO												0.018
												(0.031)
R^2	0.076	0.269	0.284	0.367	0.463	0.545	0.556	0.620	0.662	0.718	0.736	0.737
$\bar{R}^2$	0.068	0.256	0.266	0.346	0.440	0.521	0.529	0.593	0.634	0.693	0.710	0.708
F	9.8	21.9	15.6	17.0	20.0	22.9	20.4	23.0	24.3	28.3	27.9	25.4
p	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Log-likelihood	51.7	66.0	67.4	74.9	84.9	94.9	96.5	105.9	113.0	124.3	128.2	128.4
N	122	122	122	122	122	122	122	122	122	122	122	122

*, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively. Standard errors reported in parentheses.

Table 7: The drivers of DBI, inflows, 1999–2005

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
(Intercept)	0.415***	0.422***	0.519***	0.579	0.727*	0.441	1.123***	−0.201	−0.329	0.418	0.443	0.210
	(0.015)	(0.029)	(0.043)	(0.355)	(0.372)	(0.391)	(0.400)	(0.377)	(0.401)	(0.385)	(0.378)	(0.409)
$REMOTE$	0.249	0.221	0.495**	0.510*	0.589**	0.603**	−0.134	0.242	0.212	0.693***	0.688***	0.699***
	(0.203)	(0.230)	(0.242)	(0.258)	(0.265)	(0.261)	(0.301)	(0.255)	(0.257)	(0.247)	(0.242)	(0.241)
DTO		−0.016	0.014	0.017	0.032	−0.004	0.037	−0.021	−0.039	0.083	0.032	0.006
		(0.064)	(0.063)	(0.066)	(0.067)	(0.068)	(0.064)	(0.054)	(0.057)	(0.056)	(0.059)	(0.062)
$DDTC$			−0.205***	−0.200***	−0.209***	−0.254***	−0.196***	−0.179***	−0.182***	−0.326***	−0.336***	−0.298***
			(0.069)	(0.076)	(0.076)	(0.078)	(0.074)	(0.061)	(0.062)	(0.061)	(0.060)	(0.065)
$GDPPC$				−0.007	−0.024	0.004	−0.066	0.053	0.066	−0.007	−0.034	−0.019
				(0.038)	(0.040)	(0.042)	(0.043)	(0.039)	(0.041)	(0.039)	(0.040)	(0.042)
$MKTCAP$					0.023	0.024	0.019	0.019	0.028	0.008	0.009	0.011
					(0.018)	(0.018)	(0.017)	(0.014)	(0.017)	(0.016)	(0.015)	(0.015)
$DEPOSITS$						0.041**	0.029	0.029*	0.033**	0.024*	0.023	0.015
						(0.019)	(0.018)	(0.015)	(0.016)	(0.014)	(0.014)	(0.015)
$BANK50$							0.012***	0.008***	0.010***	0.002	0.004	0.003
							(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
$CPICH$								0.060***	0.060***	0.045***	0.040***	0.040***
								(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
$FIN10$									−0.021	0.034	0.011	0.017
									(0.022)	(0.022)	(0.024)	(0.024)
$FIN1050$										0.053***	0.046***	0.048***
										(0.010)	(0.010)	(0.010)
$HERITAGE$											0.414**	0.474**
											(0.181)	(0.184)
$EURO$												0.037
												(0.025)
R^2	0.012	0.012	0.078	0.078	0.090	0.124	0.238	0.481	0.485	0.589	0.607	0.614
$\bar{R}^2$	0.004	−0.004	0.055	0.048	0.053	0.080	0.193	0.446	0.445	0.553	0.569	0.573
F	1.5	0.8	3.4	2.6	2.4	2.8	5.3	13.6	12.1	16.5	16.0	15.0
p	0.222	0.461	0.019	0.041	0.042	0.013	0.000	0.000	0.000	0.000	0.000	0.000
Log-likelihood	97.3	97.3	101.7	101.7	102.5	104.9	113.7	137.9	138.4	152.6	155.4	156.6
N	126	126	126	126	126	126	126	126	126	126	126	126

*, ** and *** denote significance at 10%, 5%, and 1% significance levels, respectively. Standard errors reported in parentheses.

Table 8: Nonparametric estimates of the distribution of DBI^{out} determinants, 1999–2005

	REMOTE	*DO*	*DDC*	*GDPPC*	*MKTCAP*	*DEPOSITS*	*BANK*50	*CPICH*	*FIN*10	*FIN*1050	*HERITAGE*	*EURO*
Mean	−5.85E − 02	3.48E − 03	−1.32E − 16	1.63E − 01	4.99E − 03	−7.95E − 03	4.30E − 18	−7.57E − 17	6.39E − 187	−2.62E − 04	−8.13E − 03	2.03E − 03
(s.e.)	(3.35E − 01)	(8.12E − 03)	(2.35E − 09)	(8.44E − 02)	(5.71E − 03)	(7.51E − 03)	(9.29E − 11)	(1.65E − 09)	(5.01E − 02)	(1.35E − 03)	(5.62E − 02)	(0.00E + 00)
10%	−5.88E − 01	−3.49E − 04	−3.95E − 16	−1.85E − 01	−8.45E − 03	−2.93E − 02	−1.64E − 17	−3.74E − 15	−9.72E − 190	−3.58E − 04	−1.06E − 01	−2.03E − 06
(s.e.)	(9.33E − 02)	(2.26E − 03)	(6.53E − 10)	(2.35E − 02)	(1.59E − 03)	(2.09E − 03)	(2.58E − 11)	(4.60E − 10)	(1.39E − 02)	(3.76E − 04)	(1.56E − 02)	(0.00E + 00)
20%	−3.25E − 01	−4.73E − 05	−1.35E − 16	−6.24E − 02	−1.72E − 03	−1.70E − 02	−9.49E − 19	−1.82E − 15	−6.60E − 224	−1.54E − 07	−5.63E − 02	−5.55E − 17
(s.e.)	(1.30E − 01)	(3.16E − 03)	(9.14E − 10)	(3.29E − 02)	(2.22E − 03)	(2.92E − 03)	(3.61E − 11)	(6.43E − 10)	(1.95E − 02)	(5.26E − 04)	(2.19E − 02)	(0.00E + 00)
30%	−2.12E − 01	1.34E − 04	−4.88E − 17	−1.75E − 03	−5.17E − 04	−1.02E − 02	1.67E − 67	−8.48E − 16	−6.58E − 239	−3.10E − 10	−4.00E − 02	0.00E + 00
(s.e.)	(1.66E − 01)	(4.02E − 03)	(1.16E − 09)	(4.18E − 02)	(2.83E − 03)	(3.72E − 03)	(4.60E − 11)	(8.18E − 10)	(2.48E − 02)	(6.68E − 04)	(2.78E − 02)	(0.00E + 00)
40%	−1.25E − 01	3.68E − 04	−1.93E − 17	3.44E − 02	3.61E − 04	−5.24E − 03	7.52E − 33	−3.99E − 16	1.55E − 283	−5.85E − 13	−1.82E − 02	0.00E + 00
(s.e.)	(2.04E − 01)	(4.94E − 03)	(1.43E − 09)	(5.14E − 02)	(3.48E − 03)	(4.57E − 03)	(5.66E − 11)	(1.01E − 09)	(3.05E − 02)	(8.23E − 04)	(3.42E − 02)	(0.00E + 00)
50%	−4.27E − 02	6.31E − 04	−1.62E − 18	1.08E − 01	1.75E − 03	−2.76E − 03	6.62E − 24	6.39E − 17	2.91E − 224	−2.63E − 113	−5.30E − 03	0.00E + 00
(s.e.)	(2.62E − 01)	(6.35E − 03)	(1.84E − 09)	(6.60E − 02)	(4.47E − 03)	(5.87E − 03)	(7.26E − 11)	(1.29E − 09)	(3.92E − 02)	(1.06E − 03)	(4.39E − 02)	(0.00E + 00)
60%	8.46E − 03	1.13E − 03	2.34E − 17	1.85E − 01	4.25E − 03	−7.38E − 04	1.41E − 19	7.39E − 16	6.07E − 204	−2.49E − 227	2.04E − 03	5.55E − 17
(s.e.)	(3.30E − 01)	(8.00E − 03)	(2.31E − 09)	(8.32E − 02)	(5.63E − 03)	(7.40E − 03)	(9.15E − 11)	(1.63E − 09)	(4.94E − 02)	(1.33E − 03)	(5.54E − 02)	(0.00E + 00)
70%	7.10E − 02	2.35E − 03	4.59E − 17	2.86E − 01	6.69E − 03	1.02E − 04	2.93E − 18	1.52E − 15	3.63E − 191	6.34E − 25	1.97E − 02	1.11E − 16
(s.e.)	(3.81E − 01)	(9.22E − 03)	(2.66E − 09)	(9.58E − 02)	(6.49E − 03)	(8.53E − 03)	(1.05E − 10)	(1.88E − 09)	(5.69E − 02)	(1.53E − 03)	(6.38E − 02)	(0.00E + 00)
80%	1.83E − 01	5.30E − 03	9.34E − 17	4.23E − 01	1.15E − 02	1.52E − 03	9.47E − 18	3.15E − 15	1.98E − 189	8.82E − 10	4.12E − 02	1.46E − 08
(s.e.)	(4.86E − 01)	(1.18E − 02)	(3.40E − 09)	(1.22E − 01)	(8.28E − 03)	(1.09E − 02)	(1.35E − 10)	(2.39E − 09)	(7.26E − 02)	(1.96E − 03)	(8.14E − 02)	(0.00E + 00)
90%	3.88E − 01	1.23E − 02	2.17E − 16	6.13E − 01	2.58E − 02	7.85E − 03	3.43E − 17	7.10E − 15	5.57E − 187	5.65E − 06	9.49E − 02	6.89E − 05
(s.e.)	(6.66E − 01)	(1.61E − 02)	(4.66E − 09)	(1.68E − 01)	(1.14E − 02)	(1.49E − 02)	(1.84E − 10)	(3.28E − 09)	(9.96E − 02)	(2.68E − 03)	(1.12E − 01)	(0.00E + 00)

Table 9: Nonparametric estimates of the distribution of DBI^{in} determinants, 1999–2005

	REMOTE	*DO*	*DDC*	*GDPPC*	*MKTCAP*	*DEPOSITS*	*BANK*50	*CPICH*	*FIN*10	*FIN*1050	*HERITAGE*	*EURO*
Mean	−2.14E − 02	4.40E − 03	−2.97E − 03	1.41E − 01	1.51E − 04	1.19E − 17	−4.38E − 05	3.01E − 17	6.46E − 04	−8.13E − 18	6.91E − 03	8.47E − 04
(s.e.)	(3.01E − 01)	(1.42E − 02)	(6.12E − 03)	(6.32E − 02)	(1.13E − 03)	(2.53E − 10)	(3.25E − 04)	(2.59E − 10)	(2.29E − 03)	(2.00E − 10)	(2.48E − 02)	(0.00E + 00)
10%	−7.00E − 01	−9.71E − 03	−1.28E − 02	−1.87E − 01	−8.40E − 04	−3.06E − 17	−4.44E − 04	−1.75E − 16	−6.58E − 05	−1.99E − 17	−5.06E − 02	−1.39E − 16
(s.e.)	(1.12E − 01)	(5.27E − 03)	(2.28E − 03)	(2.35E − 02)	(4.22E − 04)	(9.41E − 11)	(1.21E − 04)	(9.62E − 11)	(8.51E − 04)	(7.43E − 11)	(9.24E − 03)	(0.00E + 00)
20%	−3.17E − 01	−4.99E − 03	−3.67E − 03	−5.26E − 02	−3.59E − 04	−2.14E − 17	−1.89E − 04	−7.51E − 17	−9.57E − 07	−1.16E − 17	−2.54E − 02	−5.55E − 17
(s.e.)	(1.50E − 01)	(7.07E − 03)	(3.05E − 03)	(3.16E − 02)	(5.66E − 04)	(1.26E − 10)	(1.62E − 04)	(1.29E − 10)	(1.14E − 03)	(9.96E − 11)	(1.24E − 02)	(0.00E + 00)
30%	−2.17E − 01	−9.57E − 04	−1.79E − 03	6.87E − 03	−1.26E − 04	−9.65E − 18	−6.08E − 05	−3.37E − 17	−5.52E − 12	−3.10E − 18	−1.10E − 02	0.00E + 00
(s.e.)	(1.89E − 01)	(8.90E − 03)	(3.84E − 03)	(3.97E − 02)	(7.13E − 04)	(1.59E − 10)	(2.04E − 04)	(1.62E − 10)	(1.44E − 03)	(1.25E − 10)	(1.56E − 02)	(0.00E + 00)
40%	−9.69E − 02	8.60E − 04	−9.69E − 04	9.12E − 02	−4.09E − 05	−4.15E − 18	−3.49E − 06	7.92E − 18	−3.50E − 25	−2.80E − 20	−4.02E − 03	0.00E + 00
(s.e.)	(2.36E − 01)	(1.11E − 02)	(4.80E − 03)	(4.95E − 02)	(8.89E − 04)	(1.98E − 10)	(2.55E − 04)	(2.03E − 10)	(1.79E − 03)	(1.56E − 10)	(1.94E − 02)	(0.00E + 00)
50%	2.66E − 04	3.29E − 03	−4.08E − 04	1.42E − 01	1.35E − 05	9.29E − 20	−1.05E − 07	2.41E − 17	−1.85E − 168	−6.48E − 23	4.21E − 03	0.00E + 00
(s.e.)	(2.73E − 01)	(1.29E − 02)	(5.56E − 03)	(5.75E − 02)	(1.03E − 03)	(2.30E − 10)	(2.96E − 04)	(2.35E − 10)	(2.08E − 03)	(1.82E − 10)	(2.26E − 02)	(0.00E + 00)
60%	1.30E − 01	6.26E − 03	7.57E − 05	1.82E − 01	1.17E − 04	5.45E − 18	−3.50E − 34	5.71E − 17	5.33E − 68	6.19E − 81	1.04E − 02	5.55E − 17
(s.e.)	(3.05E − 01)	(1.44E − 02)	(6.21E − 03)	(6.41E − 02)	(1.15E − 03)	(2.57E − 10)	(3.30E − 04)	(2.62E − 10)	(2.32E − 03)	(2.02E − 10)	(2.52E − 02)	(0.00E + 00)
70%	2.86E − 01	9.04E − 03	4.86E − 04	2.52E − 01	2.41E − 04	1.21E − 17	5.51E − 12	8.92E − 17	3.58E − 12	1.14E − 26	2.22E − 02	1.04E − 10
(s.e.)	(3.65E − 01)	(1.72E − 02)	(7.43E − 03)	(7.68E − 02)	(1.38E − 03)	(3.07E − 10)	(3.95E − 04)	(3.14E − 10	(2.78E − 03)	(2.42E − 10)	(3.01E − 02)	(0.00E + 00)
80%	4.75E − 01	1.44E − 02	8.13E − 04	3.59E − 01	6.58E − 04	4.07E − 17	4.38E − 05	1.36E − 16	7.30E − 06	7.93E − 21	4.20E − 02	2.54E − 06
(s.e.)	(4.14E − 01)	(1.95E − 02)	(8.43E − 03)	(8.71E − 02)	(1.56E − 03)	(3.49E − 10)	(4.48E − 04)	(3.56E − 10)	(3.15E − 03)	(2.75E − 10)	(3.42E − 02)	(0.00E + 00)
90%	6.75E − 01	2.65E − 02	1.47E − 03	4.99E − 01	1.45E − 03	7.75E − 17	3.24E − 04	2.12E − 16	1.40E − 04	8.10E − 19	6.13E − 02	6.83E − 04
(s.e.)	(5.03E − 01)	(2.37E − 02)	(1.02E − 02)	(1.06E − 01)	(1.90E − 03)	(4.23E − 10)	(5.44E − 04)	(4.33E − 10)	(3.83E − 03)	(3.34E − 10)	(4.15E − 02)	(0.00E + 00)

Table 10: Nonparametric regression, bandwidths (Racine, 1997; Racine *et al.*, 2006)

Variable	DBO^{out}	DBO^{in}	DBI^{out}	DBI^{in}
$REMOTE$	0.002	∞	0.005	0.004
DO	∞	0.014	0.211	0.089
DDC	∞	0.018	∞	0.205
$GDPPC$	0.018	0.026	0.020	0.020
$MKTCAP$	0.346	0.269	0.299	1.107
$DEPOSITS$	0.095	0.278	0.228	∞
$BANK50$	3.339	2.312	∞	3.86
$CPICH$	0.512	∞	∞	∞
$FIN10$	0.029	14.970	0.034	0.549
$FIN1050$	0.795	0.081	1.266	∞
$HERITAGE$	0.024	∞	0.030	0.051
$EURO$	0.490	0.000	0.163	0.251

Table 11: Appropriateness of the parametric specification (Hsiao *et al.*, 2007)

		Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)
DBO^{out}	J-statistic	6.957	2.387	5.594	3.923	6.236	2.650	4.905	3.847	4.247	3.915	2.309	2.370
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DBO^{in}	J-statistic	5.986	5.934	5.541	5.343	3.782	2.839	5.114	5.106	4.778	5.510	4.983	5.240
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DBI^{out}	J-statistic	7.783	2.733	6.921	3.821	4.388	3.821	5.439	3.158	4.917	3.563	2.310	3.929
	p-value	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DBI^{in}	J-statistic	7.278	7.186	5.951	5.820	5.566	5.723	5.283	6.227	6.405	6.268	6.202	6.475
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: p-values obtained using 399 bootstrap repetitions.

Table 12: Parametric vs. nonparametric models (Li, 1999)

			Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)
DBO^{out}	Actual vs. predicted (nonparametric)	T-statistic	8.680	1.811	1.939	1.794	–0.006	0.024	1.100	0.617	0.909	1.415	0.509	0.434
		p-value	0.000	0.038	0.035	0.070	0.383	0.370	0.095	0.198	0.130	0.085	0.223	0.263
	Actual vs. predicted (parametric):	T-statistic	37.503	14.583	9.043	15.701	5.583	4.157	4.579	7.137	5.017	3.472	1.994	1.993
		p-value	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.005	0.038	0.030
	Predicted (parametric) vs. predicted (nonparametric):	T-statistic	32.200	12.183	11.442	16.683	6.037	4.425	5.015	7.606	5.098	3.863	2.450	2.430
		p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.033	0.025
DBO^{in}	Actual vs. predicted (nonparametric)	T-statistic	13.330	2.700	0.969	1.069	1.069	1.070	0.804	1.111	1.103	1.101	1.153	1.314
		p-value	0.000	0.018	0.163	0.110	0.158	0.140	0.175	0.128	0.090	0.110	0.118	0.118
	Actual vs. predicted (parametric):	T-statistic	42.672	37.674	17.480	16.012	16.563	15.255	13.356	8.473	8.410	6.649	7.388	7.313
		p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted (parametric) vs. predicted (nonparametric):	T-statistic	34.121	37.322	15.629	15.872	15.912	13.367	12.879	7.935	8.205	5.638	7.919	7.778
		p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DBI^{out}	Actual vs. predicted (nonparametric)	T-statistic	10.024	2.533	2.334	0.901	–0.548	0.422	–0.059	–0.317	–0.173	0.782	–0.262	1.347
		p-value	0.000	0.018	0.035	0.135	0.650	0.290	0.460	0.545	0.495	0.173	0.548	0.875
	Actual vs. predicted (parametric):	T-statistic	37.700	15.605	14.459	11.446	5.156	3.667	2.787	3.910	2.285	1.936	1.222	0.961
		p-value	0.000	0.000	0.000	0.000	0.000	0.005	0.008	0.008	0.035	0.048	0.103	0.145
	Predicted (parametric) vs. predicted (nonparametric):	T-statistic	34.600	15.826	18.160	12.427	5.279	3.841	2.913	4.173	2.670	2.551	1.472	1.444
		p-value	0.000	0.000	0.000	0.000	0.000	0.008	0.015	0.003	0.023	0.033	0.090	0.070
DBI^{in}	Actual vs. predicted (nonparametric)	T-statistic	9.156	0.494	–0.133	–0.123	0.013	–0.325	–0.121	–0.076	0.128	–0.005	–0.093	0.000
		p-value	0.000	0.250	0.438	0.475	0.395	0.533	0.465	0.420	0.320	0.425	0.478	0.418
	Actual vs. predicted (parametric):	T-statistic	42.813	42.074	17.114	17.230	19.085	14.719	9.880	4.927	4.408	2.602	4.048	4.232
		p-value	0.000	0.000	0.000	0.000	0.395	0.000	0.000	0.005	0.005	0.002	0.013	0.005
	Predicted (parametric) vs. predicted (nonparametric):	T-statistic	26.320	38.263	16.115	16.683	17.995	14.022	8.983	4.097	3.450	2.292	3.296	3.361
		p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.015	0.028	0.005	0.018

Note: p-values obtained using 399 bootstrap repetitions.

Figure 1: Nonparametric regression, DBI^{out}

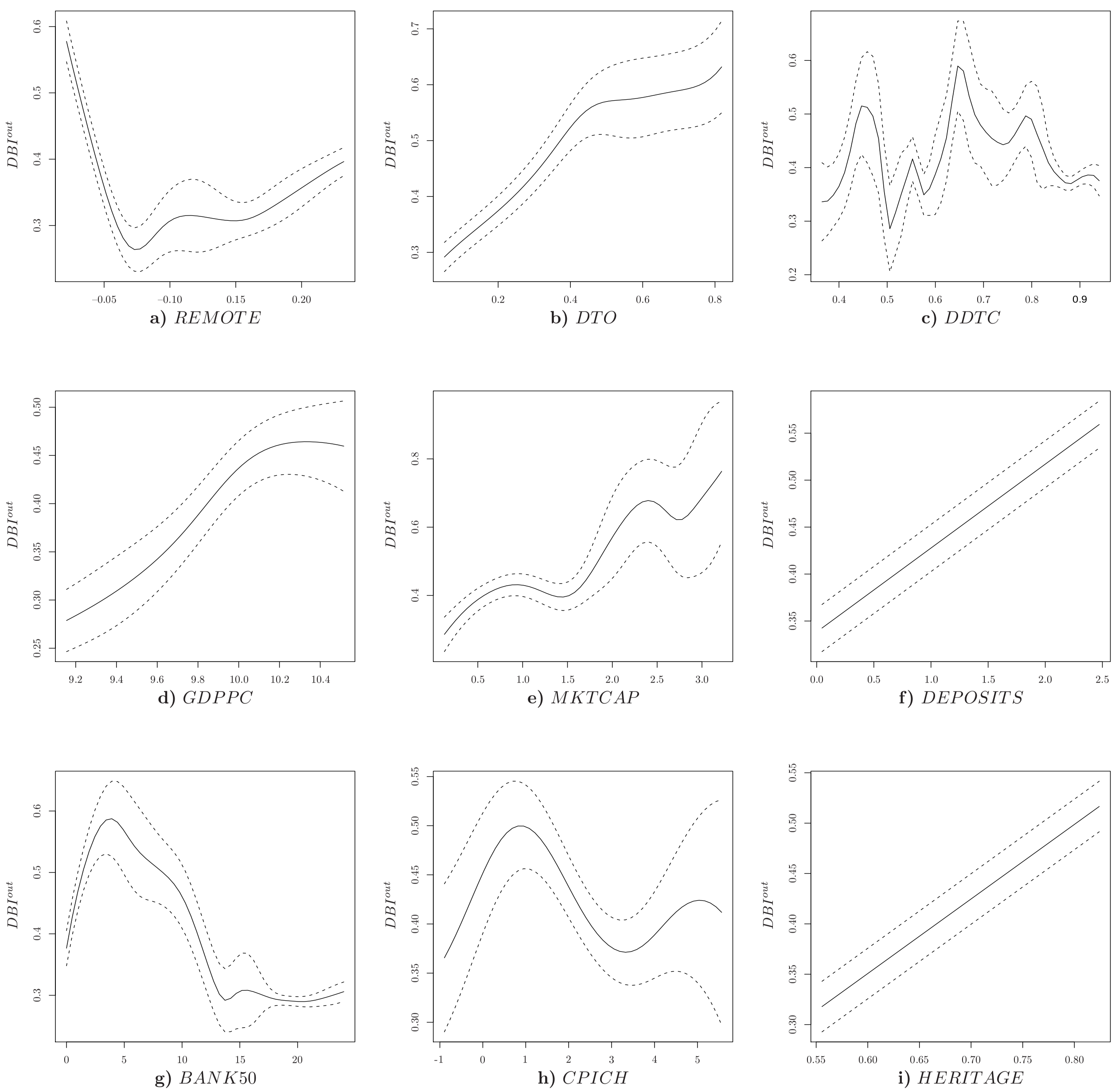


Figure 2: Nonparametric regression, densities of the gradients, local bandwidths, DBI^{out}

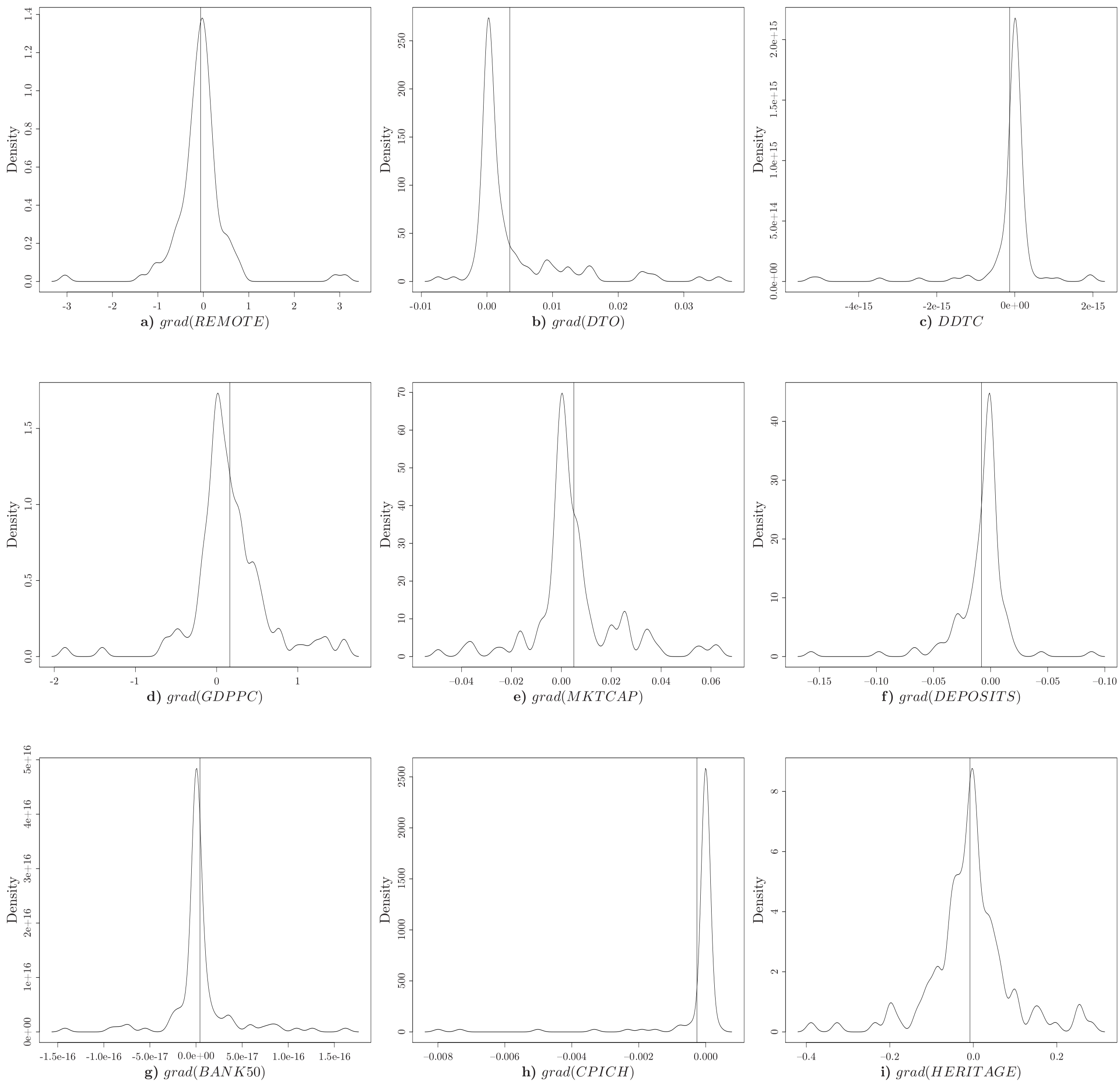
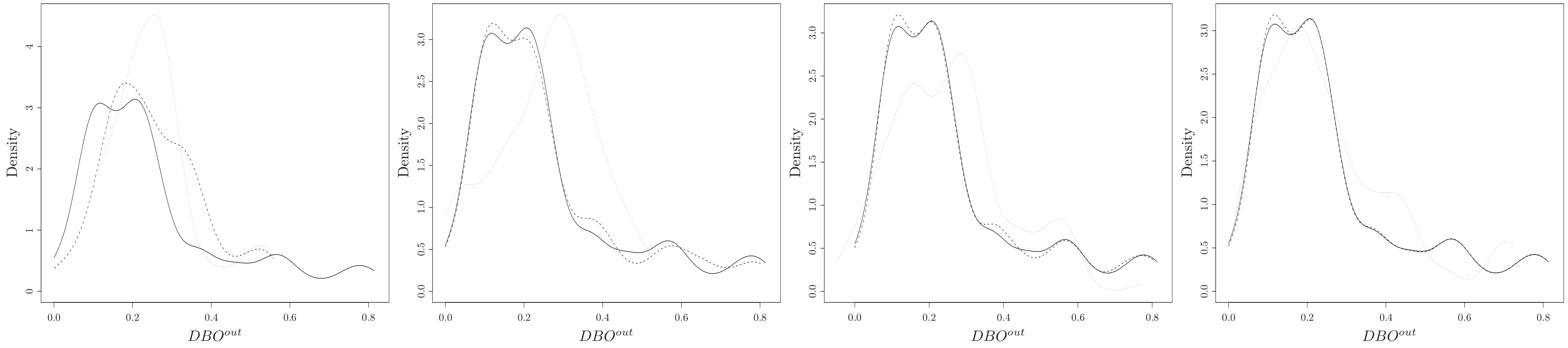


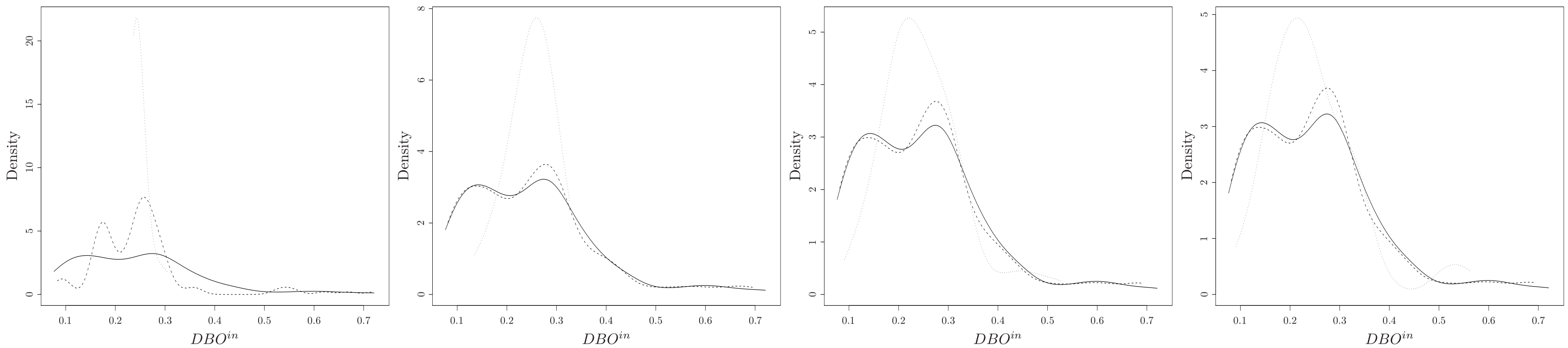
Figure 3: Kernel density estimates, DBO^{out}



a) Model 1 **b)** Model 4 **c)** Model 8 **d)** Model 12

—— Actual ······ Parametric ------ Nonparametric

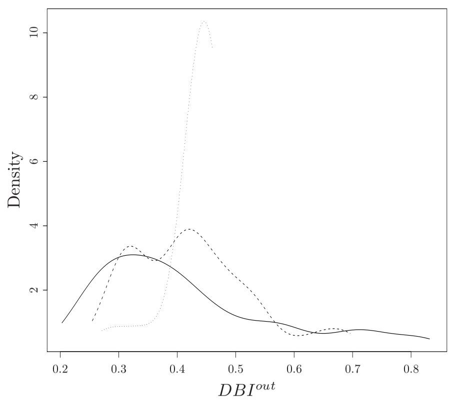
Figure 4: Kernel density estimates, DBO^{in}



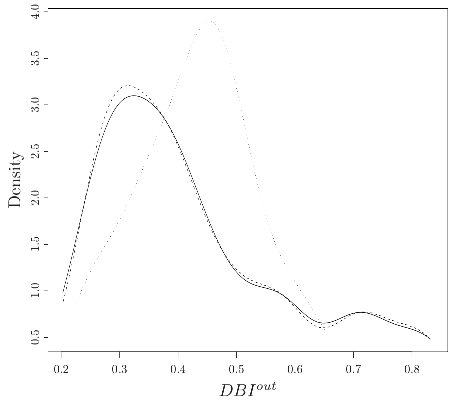
a) Model 1 **b)** Model 4 **c)** Model 8 **d)** Model 12

—— Actual ······ Parametric ------ Nonparametric

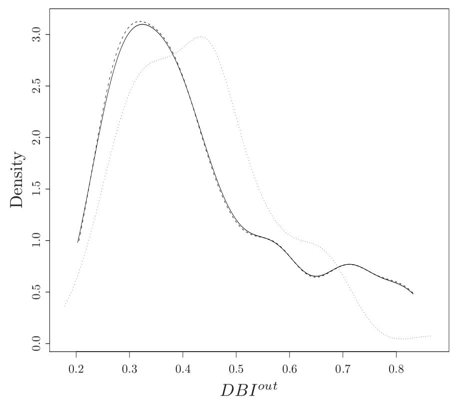
Figure 5: Kernel density estimates, DBI^{out}



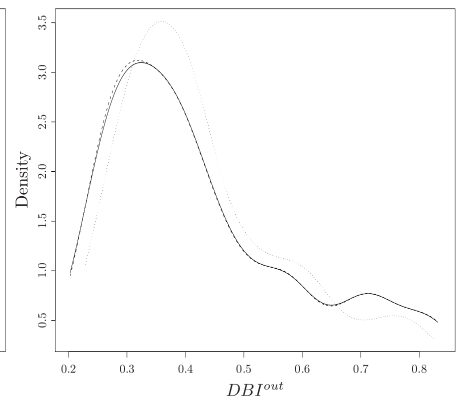
a) Model 1



b) Model 4



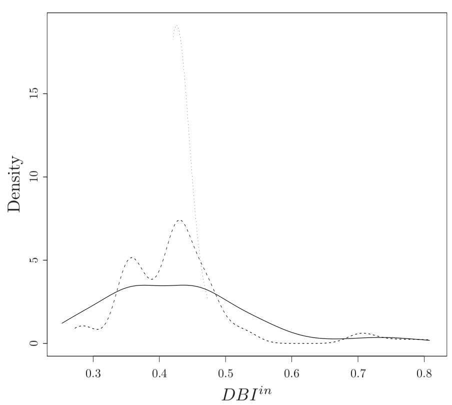
c) Model 8



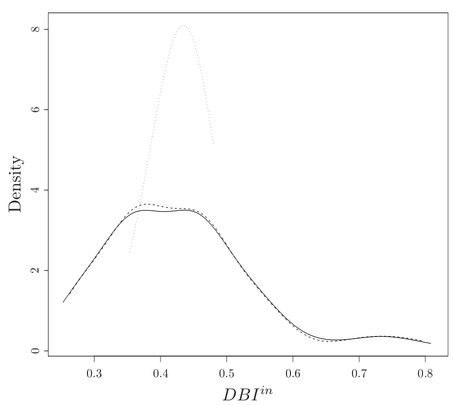
d) Model 12

—— Actual ······ Parametric ------ Nonparametric

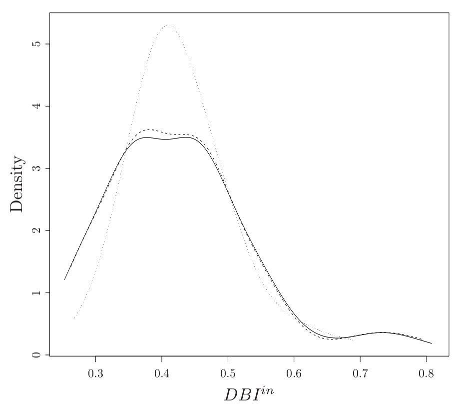
Figure 6: Kernel density estimates, DBI^{in}



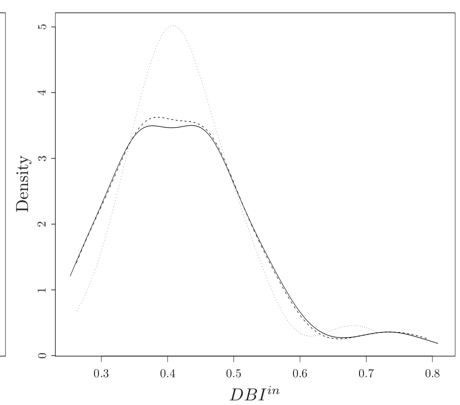
a) Model 1



b) Model 2



c) Model 8



d) Model 12

—— Actual ······ Parametric ------ Nonparametric