Financial System Architecture and the Patterns of International Trade

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Abstract

Countries differ in the extent to which their financial systems rely on banks or on financial markets. We offer a model featuring a complex relationship between countries' financial system architecture and their comparative advantage. Countries with capital markets that are relatively more efficient than their banking systems gain comparative advantage in sectors with strong dependence on market finance. Moreover, countries specialising in sectors that depend on market finance develop their capital markets more than their banking systems. To empirically investigate these links, we construct a measure of sector bank dependence and establish a bi-directional relationship between countries' comparative advantage and their financial systems architecture.

Keywords: Financial Systems, Trade Patterns, Banks, Direct Finance

JEL Classification: F10, G20, G21

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1. Introduction

Our work brings together two strands of the literature on financial development. The first strand relates financial development to the patterns of international trade. The second strand relates financial architecture to technological choice and economic development.

It is well established in the literature within the first strand that there is a very strong relationship between financial development and the patterns of international trade. In particular, it has been found that in countries where the financial sector is highly developed, financially dependent sectors have a comparative advantage in international trade relative to those sectors that are less financially developed. There is also strong evidence that the relationship is bi-causal. For example, Manova (2008) has found evidence that financial development, by benefitting those sectors that are financially dependent on external sources of funds drives the patterns of international trade. Do and Levchenko (2007) offer support for the reverse link by empirically documenting that those countries that had in the past a comparative advantage in sectors that are dependent on external sources of finance were also the countries that encouraged more strongly the development of their financial sectors.

The second strand of the literature on financial development emphasizes the role of financial architecture, and in particular, the division of external finance between direct and intermediate finance, as a driver of technological choice and economic development.[1] Allen and Gale (2001) in their comparative study of financial systems observe that a country's financial architecture is closely related to the financial needs of the main sectors driving the country's economic development. For example, in Germany and Japan, where manufacturing has played a key role within the economy, banks have been the main providers of external funds. Bank finance is best suited for sectors that specialize in standardized products where the dispersion of information is not critical. In contrast, in the US where innovation of new products has been the main driver of growth, capital market finance has been the main source of external finance as it facilitates the dispersion of information.

The first stand of the literature has not explored the complex interaction between a country's comparative advantages and the variety of financial sources potentially available to its firms (its 'financial architecture'), while the second strand has focused exclusively on closed

[1] Market finance is also known as direct finance, while bank finance is a type of intermediate finance. In market finance we include both new equity issues and investment grade bond financing. Banks traditionally have offered debt contracts to their clients, however, more recently, with the introduction of universal banking where they are allowed to engage in both commercial banking and investment banking activities, banks are also involved in equity participation (e.g. private equity).

economies thereby ignoring any relationship between a country's financial architecture and its patterns of international trade. In this paper, we bring these two strands together, by exploring, both theoretically and empirically, the complex interactions between the pattern of trade and financial architecture. In doing this our paper emphasises financial architecture as a new channel of comparative advantage, and comparative advantage as a channel for the development of financial architecture. Empirically, we show that these interactions are borne out in the data for OECD countries and also quantify the importance of the two potential channels identified in our theoretical framework.

We develop a theoretical model of an open two-sector Holmström and Tirole (1997) economy where both bank and market finance co-exist. Our goal is to derive predictions about the relationship between the patterns of international trade and cross-country variations in financial architecture that we can take to the data. Entrepreneurs in both sectors require external finance and can obtain it either from the capital market or from intermediaries (banks) who also provide monitoring services. The ability of entrepreneurs to obtain external finance and the source of funds open to them depend on their endowments of the unique input in production. Credit rationing arises in the model in order to mitigate moral hazard. Only those entrepreneurs with sufficiently high endowments can obtain funds from the capital market, but some of the others might be able to obtain finance from banks, albeit at a higher cost.

We begin by differentiating the sectors so that one is relatively more bank-dependent. The Allen and Gale (2001) observation, mentioned above, that a country's financial architecture is related to the technologies used by its comparative advantaged sectors, finds a theoretical foundation within the corporate finance literature (e.g. Allen and Gale, 1999; Boot and Thakor, 1997) and also empirical support (Tadesse, 2006). Our approach is closely related to Boot and Thakor (1997) who emphasize informational frictions, and in particular, moral hazard, as important determinants of the choice of the source of external funds. Tadesse (2006) finds other industry characteristics, such as asset tangibility and R&D intensity, to be important determinants of financial architecture.

We thus assume that the optimal financial source depends on the nature of the technology used in production which, in turn, implies that the *ranking* of sectors according to their dependence on bank finance is the same across countries.[2] Then, starting from a position

[2] This assumption plays a crucial role in our empirical methodology. It has been extensively discussed by the financial economics literature linking financial architecture and economic performance. See Black and Moersch (1998); Demirguc-Kunt and Levine (2001); Levine (2002); and Carlin and Mayer (2003) who provide some

where the two countries are identical so that international trade is absent, we weaken the efficiency of the banking system in one of them. We find not only that the country with the lower quality banking system ends up with a relatively less developed financial sector but also that it has a comparative disadvantage in the bank-finance dependent sector. Next, restarting from the symmetric position, we introduce a small technological advantage in one of the two sectors in one country. We show not only that this country will have a comparative advantage in that sector but also that it will develop relatively more than the other country the financial source on which that sector is relatively more dependent. In each case we find an association between financial architecture and the pattern of international trade; but in one case the driver is technology while in the other it is the relative quality of financial institutions.

Our first step in our empirical work is to see whether the hypothesized link between comparative advantage and financial architecture is present in the data. To do this, we apply a methodology similar to that used by Rajan and Zingales (1998). We construct a novel indicator that captures the relative dependence of each sector on bank versus market finance in the total use of external finance. We follow the literature on financial development (e.g. Demirguc-Kunt *et al*., 2013; Levine 2002) by including both new equity and debt finance in our measure of market finance.[3]

Using this indicator, we document a strong and significant relationship between cross-country differences in financial system architecture and export patterns for OECD countries. The exporting sectors of countries where bank finance is the dominating external finance source are those that depend relatively more heavily on bank finance. In contrast, countries where market finance is stronger have exporting sectors for which bond and equity finance is relatively more important.[4]

We argue that the above relationship must be driven by countries with high levels of economic development. Firstly, it is only in these countries that market finance is widely available and thus financial architecture plays an important role. Secondly, given that economic development depends on technological choice we would expect our supposition that the same

evidence in support of this supposition. As we also discuss in more detail below, this assumption is more relevant for relatively wealthy economies where market finance is more widely available.

[3] Market finance can be implemented either by debt or equity. Bolton and Freixas (2000) develop a closed economy model designed to highlight important differences between equity and bonds, in addition to bank-finance. Unfortunately, their model seems too complex to be extended to a multi-country world.

[4] The qualification 'relatively' in the last two sentences is important. On average, bank dependence would be much higher in countries where bank finance is more prominent relative to direct finance. When comparing sectors, what matters is the ratio of bank to direct finance and not the absolute values.

industries must be using the same technologies is more likely to be valid within a group of countries with similar levels of economic development. We show that the link between financial architecture and the patterns of international trade is borne out in the data for OECD members; that is, countries at relatively high levels of financial and economic development. We find no evidence that the distinction between market-based and bank-based financial systems has any impact on the export structure of non-OECD countries. Instead, it appears that for these countries what matters is the country's overall level of financial development and its interaction with each sector's external finance dependence.

We next seek evidence on the two mechanisms underlying the link between comparative advantage and financial architecture identified by our model. We begin by looking for any effects of financial market development on trade patterns. Like Defever and Suedekum (2014), Jaud *et al.* (2019) and Manova (2008), we use the dates of equity market liberalization for each country to identify exogenous shifts in financial development. While this empirical line of research shows that such liberalizations have a stronger effect on the exports of sectors that are more dependent on external finance, we complement this literature by identifying a stronger effect for sectors that depend relatively more on market finance.[5] Thus, our results offer support for the first of our explanations.

We then look at the impact of countries' trade patterns on the development of their banking sectors relative to their financial markets. We follow the instrumental variable strategy of Do and Levchenko (2007), who show that the external finance requirements of a country's exports affect its financial development. Here, we show that the bank finance requirements of a country's exports affect the development of its banking sector relative to its financial market, providing support for our second explanation.

In summary, our empirical findings reveal complex interactions between a country's financial architecture and its sectoral export patterns. From a quantitative point of view, we identify large effects able to explain a substantial part of the patterns of trade of developed economies. Our cross section estimates for OECD countries indicate that moving from a less to a more bank-intensive financial architecture would result in an increase in the volume of trade of about 20 percentage points for sectors relying on bank-finance relative to those relying on market-finance. We also quantify the importance of the two potential channels identified in our theoretical framework. Our panel estimates indicate that equity liberalization is comparable

[5] The index fits our work better given that we make a distinction between market finance and bank finance and equity finance is clearly a larger component of market finance than total external finance.

to moving from a financial architecture similar to that of Japan to one that is similar to the US. Further, a technological change that would shift a country's comparative advantage from market-dependent to bank-dependent sectors, would result in an increase in the country's bank development. However, the quantitative effects from this channel are relatively small and can only explain at most one fifth of the gap between the relative bank development of Japan and that of the US.

2. Related Literature

The literature exploring the link between financial constraints and international trade is well-established. The theoretical work in this field focuses predominantly on the impact of financial constraints on the patterns of international trade (e.g. Antras and Caballero, 2009; Beck, 2002; Chaney, 2013; Ju and Wei, 2011; Kletzer and Bardhan, 1987; Matsuyama, 2005; Wynne, 2005). Empirical support for this link has been provided by Beck (2003), Berman and Héricourt (2010), Defever and Suedekum (2014), Jaud *et al.* (2018, 2019), Leibovici (2018) and Manova (2008, 2013) who find that financial development may act as a source of comparative advantage and, therefore, shape trade patterns.[6] According to this view comparative advantage is driven by institutional quality: countries with better quality financial institutions have deeper financial development and thus support the promotion of financially dependent sectors. There is also empirical support for the reverse link. Do and Levchenko (2007) find that financial development is driven by technological comparative advantage: countries that have a comparative advantage in sectors that depend on external finance have a stronger incentive to develop their financial systems. However, none of the above papers makes a distinction between financial sources which is the main focus here.

The literature that compares the impact of financial architecture on economic development is growing fast[7]. For example, Black and Moersch (1998), Cho *et al.* (2019),

[6] In a related study Carluccio and Fally (2012) find that financial constraints may affect the sourcing strategies of multinationals and thus their export patterns. Coulibaly, Sapriza, and Zlate (2013) show that domestic firms managed to ameliorate the effects of the financial crisis by using trade credit. However, neither paper looks at issues related either to financial development or comparative advantage.

[7] In a different but related literature, Beck, Degryse and Kneer (2014) explore the relative impact of intermediation finance on growth. Arcand, Berkes and Panizza (2015), Cecchetti and Kharroubi (2012), Law and Singh, (2014) explore the relationship between the size of the financial sector and economic growth. These papers show that there are thresholds beyond which finance does not impact growth. All these papers focus on total external finance rather than financial architecture which is the main concern of our work.

Demirguc-Kunt and Levine (2001), Demirguc-Kunt *et al.* (2013), Levine (2002) and Shen and Lee (2006) focus on the potential influence of bank- versus equity-finance on economic growth. Similarly, Rajan and Zingales (1998) and La Porta *et al.* (2000) identify the quality of the legal system and its associated contracting environment as key determinants of economic performance. Tadesse (2002) suggests that bank systems are more suitable for the very small firms in economies in their early stages of development. Langfield and Pagano (2016) link financial architecture with systemic risk. They find that a significant increase of the size of the banking system relative to the size of capital markets (stocks and bonds) is associated with more systemic risk and lower economic growth. Lastly Beck and Levine (2001) emphasize that the presence of high-quality institutions, including a legal infrastructure and sound accounting standards, is a pre-condition for the development of external finance markets. They empirically document that, as long as these conditions are met, having a bank-based system or a market-based system does not matter for overall financial development. However, it might matter for which industries gain a competitive advantage, an issue we explore here. Their conclusion is also related to our finding that the distinction between market-based and bank-based financial systems seems to mainly matter for (OECD) countries with high quality institutions and well-developed financial sectors.

With the exception of Cho *et al.* (2019), none of the above papers examine the impact that financial architecture might have on an open economy.[8] In this last paper, financial development is captured by changes in bank efficiency or a reduction in bond transactions costs. Cho *et al.* (2019) establish that (a) financial liberalization, by having differential effects on each type of financing, can affect the decision to export, and (b) trade liberalization can affect the type of financing that firms choose. However, their mechanism works through firm characteristics (size of firm) and thus through intra-industry reallocations which eliminates considerations of issues related to comparative advantage.

Particularly relevant for our work are three studies that explicitly identify technology as an important determinant of the choice of source of external finance. As we mentioned in the introduction, Allen and Gale (2001), in their comparative study of financial systems identify industry characteristics, such as, for example, R&D intensity and standardization in production

[8] Bergin and Corsetti (2020) argue that stabilization policies can affect comparative advantage by reducing macroeconomic uncertainty and by encouraging the expansion of a differentiated goods sector relative to a perfectly competitive sector. However, the paper focuses on monetary policy rather than financial architecture.

techniques, as important drivers of financial architecture. Boot and Thakor (2006) provide a theoretical foundation for the link between industry characteristics and financial system architecture and cite some cross-sectional observational evidence that supports their model. Empirical support for the link between technology (industry characteristics) and financial architecture is provided by Tadesse (2006) from a panel of 10 manufacturing industries across 34 countries.

Our work is also related to a strand of the corporate finance literature (see, Tirole, 2006) for a comprehensive review) that compares the advantages and disadvantages of intermediate and direct finance. Almost all the studies, both theoretical and empirical, focus on the differences between bank loans and public debt. On the theoretical side see, for example, Allen and Gale (1999), Berlin and Loeys (1988), Besanko and Kanatas (1993), Bhattacharya and Chiesa (1995), Boot and Thakor (1997), Boyd and Smith (1998), Chemmanur and Fulghieri (1994), Dewatripont and Maskin (1995), Diamond (1991), Holmström and Tirole (1997), Rajan (1992), Repullo and Suarez (1997) and Von Thadden (1995). An exception is Bolton and Freixas (2000) who make the distinction among all three major sources of external finance, that is bank loans, public debt and equity finance. Given that our goal is to extend the analysis to a two-country world, we have opted to use the Holmström and Tirole (1997) framework, following the literature linking financial architecture and economic performance that focuses on total market finance by combining bond and equity finance.

On the empirical side, studies that compare bank loans and public debt (bonds) include. Denis and Mihov (2003), Hale and Santos (2008), Krishnaswami *et al.* (1999). In their study of IPO financing, Helwege and Liang (1996) compare all three sources of funds. These studies identify firm characteristics that are important determinants of the source of external funds. For example, it has been documented that problems arising due to asymmetric information are more likely to inflict small and young firms which are unable to establish a good reputation and, therefore, find their access to external funds is limited to bank loans. Clearly for such firms the choice of source of external funds is not driven by technology and for this reason we have restricted our attention to publicly traded firms. Once more these empirical studies neglect the impact of the choice of financing sources on the patterns of international trade.

3. The Model

We begin this section with a brief explanation of the model and its properties and then proceed to the details and derivation of the results.

3.1 Model Outline

We embed a Holmström and Tirole (1997) model of financial frictions into a simple two-country (home, foreign), two-sector (1,2), one mobile factor (capital) and two sector specific factors (entrepreneurship), trade model with heterogeneous agents and show that the results offer two, potentially complementary explanations for the link between financial architecture and the patterns of international trade.

Three production technologies are available in this model. One is a simple deterministic base technology where one unit of capital yields one unit of each good.[9] The other two technologies are stochastic and sector-specific. Each firm using a stochastic technology requires an entrepreneur and a fixed investment (I) of capital, which is assumed to exceed the maximum individual capital holding. Those agents wishing to become entrepreneurs therefore require access to external finance, which can come from two sources – markets or banks. Banks act as monitors; but monitoring is costly. Therefore, market finance is preferred by entrepreneurs and only those unable to get it seek bank finance.[10]

Agents differ in their endowments of capital which is assumed to be sector specific with respect to the stochastic technology. In this economy agents have three options. Firstly, they can invest their endowment in the base technology. Secondly, they can invest their endowments in the capital market or in a bank. Thirdly, they can become an entrepreneur, obtain external finance and invest in the stochastic technology in their sector. They will choose whichever option gives them the highest return. In equilibrium the interest rate and the relative goods price adjust to clear the goods and capital markets.

We assume that agents can only borrow from domestic financial markets, and that the two countries are initially identical in every respect. It is clear that relative product prices will also be identical and there will be no international trade. We then consider a parameter change in one country (reduced efficiency in the banking sector or improved productivity in production of one of the goods) and use the resulting trading equilibrium to identify how this change both determines the pattern of international trade and creates differences in financial architecture.

[9]This is a default technology whose properties are chosen to simplify the solutions to the model. Given that our main results concern deviations from cases where the two sectors are symmetric it is helpful to keep the productivity levels the same.
[10] Of course, in reality almost all firms have recourse to both forms of finance, and this is also true of the 'representative' or 'average' firm in each sector in our model.

3.2. Closed-Economy Equilibrium

Consider an economy populated by a continuum of risk-neutral agents of mass 2. With respect to the stochastic technology, half the agents (unit mass) have capital and skills specific to sector 1 and the other half to sector 2. A unit of any type of capital employed using the base technology produces 1 unit of each good simultaneously. The distribution of endowments among the agents of each skill-type is uniform with support on the interval $[0, 1]$.

If an entrepreneur undertakes the fixed investment in sector j, then the technology either succeeds and yields Y^j units of output or fails and yields nothing. Following Holmström and Tirole (1997) we assume that the probability of success depends on the behavior of the entrepreneur. When the entrepreneur exerts effort the probability of success is equal to θ while when she shirks the probability of success is equal to 0, however, in the latter case she derives an additional benefit B^j, measured in units of output of that sector. We assume that the stochastic technology is more productive than the base technology only when entrepreneurs exert effort i.e. $\theta P^j Y^j > I \sum_j P^j$, and is below otherwise, i.e. $P^j B^j < I \sum_j P^j$, where P^j denotes the price of the sector j output. Since $I > 1$, an entrepreneur with capital A can raise the necessary finance $(I - A)$ by issuing debt or equity in the capital market or by obtaining loans from banks.[11] Both the capital market and the banking system are competitive. Let R denote the endogenous equilibrium interest rate in the capital market.

All lenders can verify the outcome of each project but cannot observe the level of entrepreneurial effort which gives rise to a moral hazard problem. We begin our analysis with the capital market. Under the assumption that borrowers are protected by limited liability, the financial contract specifies that the two parties receive nothing when the project fails.[12] Let V_m^j denote the payment to the lender when the project succeeds; which implies that the entrepreneur keeps $P^j Y^j - V_m^j \equiv \pi_m^j$. The lender's zero-profit condition, under the assumption that the borrower has an incentive to exert effort, is given by $\theta P^j V_m^j = (I - A)R$, which can be written as $\theta\left(P^j Y^j - \pi_m^j\right) = (I - A)R$. The left side is equal to the expected return to the lender and the right side is equal to the opportunity cost of the loan. The entrepreneur will exert effort if the incentive compatibility constraint $\theta \pi_m^j \geq P^j B^j$ is satisfied. This constraint sets a

[11] Notice that given that projects yield nothing in the case of failure there is no distinction between debt and equity.
[12] Having the lender making a payment to the borrower would only weaken incentives and given that all agents are risk neutral there is no need for insurance.

minimum on the entrepreneur's return which is a measure of agency costs $P^j \frac{B^j}{\theta}$. For a given contract the entrepreneur has a higher incentive to exert effort when the probability of success is higher and the benefit from shirking is lower. The constraint also implies that the maximum amount that the entrepreneur can pledge to the lender is $P^j\left(Y^j - \frac{B^j}{\theta}\right)$, and it is the inability of entrepreneurs to pledge a higher amount that limits their ability to raise more external funds. Substituting the incentive compatibility constraint in the lender's zero profit condition we obtain a threshold endowment, A_h^j, such that only those agents with endowments higher than this threshold can obtain market finance. The threshold is given by:

$$A_h^j = I - \frac{P^j}{R}\left[\theta Y^j - B^j\right] \tag{1}$$

Agents unable to obtain market finance might be able to obtain a bank loan. Banks act as monitors. By monitoring the activities of their clients, banks can reduce the private benefit to bB^j, where $b < 1$. But monitoring costs c units of capital per project financed.[13] If V_b^j denotes the loan repayment when the project succeeds, the entrepreneur keeps $P^jY^j - V_b^j \equiv \pi_b^j$. The bank's zero-profit condition is given by $\theta P^j V_b^j = (I + c - A)R$; which can be written as $\theta\left(P^jY^j - \pi_b^j\right) = (I + c - A)R$.[14] Again, the entrepreneur will exert effort if the incentive compatibility constraint $\theta\pi_b^j \geq P^j bB^j$ is satisfied. Substituting this constraint into the monitor's zero profit condition yields a new threshold, A_l^j, such that only those agents with endowments above A_l^j can obtain bank loans. The new threshold is given by:

$$A_l^j = I + c - \frac{P^j}{R}\left[\theta Y^j - bB^j\right] \tag{2}$$

Borrowing from banks is clearly more expensive than issuing bonds given the monitoring capital cost. The coexistence of a capital market and a banking system requires that $A_h^j > A_l^j$, which from (1) and (2) requires:

$$c < \frac{P^j}{R} B^j (1 - b) \tag{3}$$

That is the capital cost of the bank loan is less than the value of the reduction in the private benefit measured in units of capital.

[13] The exact specification of the monitoring technology is not important as long as we can rank sectors according to their dependence on each source of finance.
[14] In equilibrium an agent will be indifferent between buying bonds and depositing her endowments in a bank.

Finally, we assume that all agents have homothetic preferences allocating half of their income to each good. Then, in a symmetric equilibrium where $B^1 = B^2$ and $Y^1 = Y^2$ it is clear that $P^1 = P^2$ and the masses of agents obtaining finance from each source is the same across sectors.

The specific factor properties of the model can be illustrated using the competitive profit conditions. If for the purposes of presentation, we ignore the discreteness in production under the advanced technology, we can write these conditions in the usual way. For market financed output in sector j we have that the number of units of capital required to produce one unit of output of good j under the advanced technology is $a_{km}^{j} = \frac{I}{Y^j}$ .Since one entrepreneur is required per project, the number of units of entrepreneurial input per unit of output of good j under the advanced technology is $a_{ej} = \frac{1}{Y^j}$. Then the competitive profit condition in sector j under market financing is[15]

$$P^j = a_{km}^{j} R + a_{ej} \pi_m^j \tag{4}$$

All active entrepreneurs get a common (expected) return to their entrepreneurial input, but the total (expected) income of (active) entrepreneur 'e' in sector j is $\theta[\pi_m^j + RA_e]$, where A_e is this entrepreneur's capital holdings. Bank financed output has the same entrepreneurial input requirement, but the additional capital required due to monitoring means $a_{kb}^{j} = \frac{I+c}{Y^j}$. Thus

$$P^j = a_{kb}^{j} R + a_{ej} \pi_b^j \tag{5}$$

which implies that $\pi_m^j - \pi_b^j = Rc$ – i.e. the monitoring cost is paid out of the entrepreneurial rent, which is why entrepreneurs prefer market finance.

Production under the base technology involves a joint output of one unit of each product per unit of capital (of either type). Given that agents always have the option to invest their assets in the base technology, the equilibrium interest rate must satisfy $R \geq P^1 + P^2$, where the expression on the right is equal to the return of the base technology. In what follows we restrict attention to financially constrained equilibria where some endowments are invested in the base technology and financial market imperfections do affect allocation efficiency. [16] The competitive profit condition for the base technology then requires

[15] After substituting this gives $\pi_m^j = p^j Y^j - RI$ as expected.

[16] This is the more interesting case and it is also the more plausible case as there is always some investment in low risk assets.

$$P^1 + P^2 = R \quad (6)$$

Given product prices, we solve for R from (6) and then use (4) and (5) for each sector to solve for the 4 entrepreneurial rents.

Figure 1 depicts the production possibilities in the symmetric case. The endowment of each type of capital is $\frac{1}{2}$. Then E_F denotes the efficient equilibrium $(\frac{1}{2}\frac{\theta Y}{I}, \frac{1}{2}\frac{\theta Y}{I})$ where all capital is employed under the advanced technology. From E_F it is possible to produce more of one good by withdrawing capital from the other sector (where it used the advanced technology) and employing it under the base technology. Thus up to $\frac{1}{2}$ more units of good j can be produced, but only at the sacrifice of up to $\frac{1}{2}\left(\frac{\theta Y}{I} - 1\right)$ units of good i. The fully efficient production possibilities frontier is then as shown. Under our assumptions on preferences, E_F would be the closed economy equilibrium in the absence of financial constraints. Point E_Z denotes the production point when only the base technology is employed. In the symmetric case, a production point where financial constraints are binding but some production in each sector does take place under the advanced technology will lie at some point on the line segment $E_Z E_F$. If no external finance is available to entrepreneurs, the production point is at E_Z. If market finance is available, the production point moves away from E_Z towards E_F. The further introduction of banking finance moves this point even closer to E_F.

From now on we let good 2 be the numeraire, i.e. $P^2 \equiv 1$, and let P denote the relative price of good 1. We illustrate the relationship between the thresholds for sector 1 in Figure 2. The market finance threshold determined in (1) is the line denoted A_h^1, and the bank finance threshold from (2) is the line denoted A_l^1. If $\frac{P}{R} < \frac{c}{B^1[1-b]}$ (i.e. condition (3) is violated) then only market finance is chosen; otherwise both forms of finance are used. In sector j the demand for market finance is given by

$$MF^j = \int_{A_h^j}^{1} [I - A] dA = \left[I - \frac{1 + A_h^j}{2}\right]\left[1 - A_h^j\right] \quad (7)$$

The right side of this expression is the product of two terms denoting the number of entrepreneurs/projects financed $(1 - A_h^j)$ and the average finance required per project $\left(I - \frac{1 + A_h^j}{2}\right)$. Similarly, the sector's requirements for bank finance (BF^j) and external (total) finance (EF^j), are given by:

$$BF^j = \int_{A_l^j}^{A_h^j}[I - A]dA + \int_{A_l^j}^{A_h^j} cdA = \left[I - \frac{A_h^j + A_l^j}{2}\right]\left[A_h^j - A_l^j\right] + c\left[A_h^j - A_l^j\right] \quad (8)$$

$$EF^j = \int_{A_l^j}^{1}[I - A]dA + \int_{A_l^j}^{A_h^j} cdA = \left[I - \frac{1 + A_l^j}{2}\right]\left[1 - A_l^j\right] + c\left[A_h^j - A_l^j\right] \quad (9)$$

The first terms on the right of these expressions have analogous interpretations to that of market finance. The final term captures the additional capital required per project that is financed by bank lending.

With both financing options available, we follow the literature and say that sector j is more external finance dependent if its total borrowing exceeds that of the other sector, i.e. if $EF^j > EF^i$, and we define sector j's (relative) 'bank finance dependence' (BFD^j) as the ratio of its total borrowing from banks to its total external finance – i.e.

$$BFD^j = \frac{BF^j}{EF^j} = \frac{\left[I - \frac{A_h^j + A_l^j}{2}\right]\left[A_h^j - A_l^j\right] + c\left[A_h^j - A_l^j\right]}{\left[I - \frac{1 + A_l^j}{2}\right]\left[1 - A_l^j\right] + c\left[A_h^j - A_l^j\right]} \quad (10)$$

The investment in the base technology will equal the excess supply of capital in the financial market when $R = 1 + P$:

$$Z = 1 - [2 - A_l^1 - A_l^2]I - c[(A_h^1 - A_l^1) + (A_h^2 - A_l^2)] \quad (11)$$

Without any loss of generality, we restrict attention to the market for good 1. Each entrepreneur supplies Y^1 units of good 1 with probability θ. Each agent allocates half her income on good 1, hence her demand is equal to her nominal income divided by $2P$. The good 1 market clearing condition is then given by:

$$\int_{A_h^1}^{1}\left(\theta Y^1 - \frac{\theta P Y^1 - (I - A)(1 + P)}{2P}\right)dA + \int_{A_l^1}^{A_h^1}\left(\theta Y^1 - \frac{\theta P Y^1 - (I + c - A)(1 + P)}{2P}\right)dA + Z = \int_0^{A_l^1}\frac{A(1+P)}{2P}dA + \int_0^{A_l^2}\frac{A(1+P)}{2P}dA + \int_{A_h^2}^{1}\left(\frac{\theta Y^2 - (I - A)(1 + P)}{2P}\right)dA + \int_{A_l^2}^{A_h^2}\left(\frac{\theta Y^2 - (I + c - A)(1 + P)}{2P}\right)dA$$

The first two terms on the left equal the net supply (production minus consumption) of good 1 by those entrepreneurs who borrow from the capital market or from banks, respectively, and the last term is equal to the supply from the base technology. The first two terms on the right are equal to the demand for good 1 by lenders of each capital-ownership-type and the last two terms are equal to the demand for good 1 by the producers of good 2. Using (11) we can rewrite this condition as:

$$PX^1 = P\{\theta Y^1[1 - A_l^1] + Z\} = \{\theta Y^2[1 - A_l^2] + Z\} = X^2 \quad (12)$$

The first term in each bracket is the expected output of that good from capital employed under the stochastic technology. It is the product of the output per project (θY^j) times the number of projects ($1 - A_l^j$). The second term is the output from the base technology. We let X^j denote the output of good j. Thus (12) implies that the relative price of good 1 in terms of good 2 is equal to the ratio of (expected) aggregate production in sector 2 divided by that in sector 1.

At this point we introduce an asymmetry between the sectors that affects their access to external finance and imparts a bias towards a particular source of finance. To identify which sector is the more bank dependent we impose the following condition:

Condition 1. $\theta Y > [1 + b]\frac{B^1+B^2}{2}$ (13)

Our model requires that the financial frictions not be too large if the stochastic technology is to be employed using market (bank) finance – i.e. $\theta Y^j > B^j (> bB^j)$. Condition 1 is a stronger version of this requirement. Then

Proposition 1: *Suppose that initially there is a symmetric equilibrium where* $B^1 = B^2$ *and* $Y^1 = Y^2$ *and thus* $P = 1$, *and consider a small increase in* B^1. *Then, at the new equilibrium we have:*

(a) An increase in the relative price of good 1;
(b) Sector 2 has the larger demand for market finance;
(c) Sector 1 will be the relatively bank dependent sector; and
(d) The ranking of external finance dependence across sectors is ambiguous.

Proof: See Appendix 1.

Discussion: At the initial relative price, the increase in B^1 raises both thresholds in sector 1 and reduces good 1 output, thereby creating an excess demand which increases P. This increase in price then raises the interest rate. There are price, interest rate and direct effects in sector 1, and the latter two dominate the former. There are only interest rate effects in sector 2. In the new equilibrium there is an increase in both thresholds in both sectors, but both the market finance and banking threshold increases are larger in sector 1. Further, the market finance threshold increase is larger than the banking threshold in sector 1, so the number of bank-financed projects increases in this sector. The opposite happens in sector 2.

Because $A_h^1 > A_h^2$ in the new equilibrium, there are a greater number of market-financed projects and larger average market borrowing per project in sector 2 than in sector 1. Thus sector 2 has greater access to market finance ($MF^2 > MF^1$). Since both thresholds rise, we know that the average bank borrowing in sector 1 falls, while we noted that the number of projects using bank finance increases, leaving the change in bank financing in sector 1 ambiguous. However, in sector 2 both the average borrowing and the number of projects using bank finance fall, so that this sector's use of bank finance falls. This yields a presumption that $BF^1 > BF^2$, and Condition 1 is sufficient to ensure that this presumption holds. This outcome, along with the result that sector 1 uses less market finance, implies that sector 1 is now relatively bank dependent.

The sector which has greater recourse to external finance remains ambiguous. Since $A_l^1 > A_l^2$, Sector 2 has more projects that are externally financed than sector 1. But sector 1 has the larger number of bank-financed projects with their demand for additional capital (of c per project).

3.3. The Open Economy

Suppose that the world comprises two countries (Home and Foreign) as described in Proposition 1. Agents can only borrow from domestic financial markets. If the countries are initially identical in every respect their relative prices will be the same and there will be no international trade. In what follows, we consider a change in one country and use the resulting trading equilibrium to identify how these changes affect the pattern of international trade and create differences in financial architecture. The first change is a decrease in the efficiency of the banking system, so that financial institutions provide the driving force behind comparative advantage. The alternative change is an increase in productivity in one sector. Now technology differences will determine comparative advantage and differences in financial architecture.

3.3.1. Differences in Financial Institutions

Without any loss of generality, consider a lower banking efficiency (a higher b) in the Home country. Then:

Proposition 2: *Suppose that initially both countries are identical with $Y^1 = Y^2$ and $B^1 > B^2$. Consider a decrease in bank efficiency (an increase in b) at Home. Then in the resulting trading equilibrium*

(a) Home produces relatively more of and therefore exports good 2;

(b) Home has the lower bank finance dependency in each sector, so aggregate bank dependency is lower; and

(c) Sector 1 is relatively bank finance dependent at Home.

Proof: See Appendix 1.

Discussion: At the common free trade relative price (and hence common interest rate), a less efficient banking system at Home means lower output of both goods, but relatively lower output of good 1 because $B^1 > B^2$. Home exports good 2. The cross-country differences in sector 1 are illustrated in Figure 2. The banking threshold lines are A_l^1 for the foreign country and $A_l^{1\prime}$ (with $b' > b$) for the home country. At the common relative price and interest rate - hence common $\left(\frac{P}{R}\right)^*$, both countries have the same market finance threshold, while the home country's banking finance threshold is higher than the foreign.

While access to market finance in each sector is the same in the two countries, the higher Home bank-finance threshold in both sectors implies both home sectors are less bank finance dependent. Home therefore shows a lower aggregate bank dependency. In the trading equilibrium the two Home sectors face the same relative price, interest rate and parameters (particularly b) except that $B^1 > B^2$. In Proposition 1(c) we established that sector 1 was the bank finance dependent sector in these circumstances. ■

In summary, if a country has a relatively less efficient banking sector it will export the less bank dependent good and will exhibit a relatively lower dependence on bank finance overall.

3.3.2. Differences in Production Technologies

Without any loss of generality, but keeping the trade pattern the same, we consider an increase in productivity in sector 2 at Home.[17] Then:

Proposition 3: *Suppose that initially $Y^1 = Y^2$ and $B^1 > B^2$. Consider an increase in productivity (Y^2) in sector 2 at Home. In the resulting trading equilibrium*

(a) The home country produces relatively more of and therefore exports good 2;

(b) Sector 2 is the less bank dependent sector in the home country; and

(c) Aggregate bank dependency is lower in the home country.

Proof: See Appendix 1.

Discussion: At the common free trade relative price (and hence common interest rate R^*), the higher production efficiency of sector 2 in the Home country means that its external finance threshold is lower, and more capital is used under the stochastic technology. This yields an output gain to this sector in addition to the direct production efficiency gain. Home output of

[17] Equivalently, we could write $Y^2 = y^2 I$ and consider an increase in productivity y^2.

good 2 is higher and Home output of good 1 is the same as in the Foreign country, reflecting the Home country's comparative advantage in sector 2. The higher production efficiency in sector 2 also implies a lower market finance threshold and hence more market financed projects and a higher average borrowing per project. The threshold changes for sector 2 are illustrated in Figure 3, where the higher $Y^{2\prime}$ in the home country causes both its threshold lines to pivot downwards. In fact, both thresholds are lower by the same amount, implying that the numbers of bank financed projects in sector 2 are unchanged. But because the Home bank-financed entrepreneurs have lower average asset holdings, they borrow more per project so that bank financing in sector 2 also increases. The increased market finance dominates, however, and the bank dependency of sector 2 is lower. Sector 1 remains relatively bank finance dependent at Home. With bank dependency the same in sector 1 in both countries, and bank dependency in sector 2 lower at Home, the Home country shows a lower aggregate bank dependency. ■

In summary, if a country has a production-technology-based comparative advantage in the non-bank-finance dependent sector it will export the non-bank-finance dependent good and its economy will exhibit a relatively lower dependence on bank finance.

3.4. From Theory to Empirics

The previous analysis leads to testable implications that we will explore in the empirical section. According to Proposition 1, sectors can be differentiated and ranked in terms of their bank-dependence relative to their market-finance dependence. Therefore, our model provides us with a theoretical foundation for the Allen and Gale (2001) conjecture that technology is a main determinant of the source of external funding within a sector. Independently of this ranking, sectors can also be characterised according to their external finance (i.e. bank loans plus market finance). However, according to Proposition 1, the relative importance of external finance across sectors is ambiguous and without consequence for the predictions of our model. Empirically, we will consider the importance of a sector's bank finance dependence while controlling for its external finance dependence.

When considering an open economy, we change the efficiency of the banking system in one of the countries (Proposition 2) or the efficiency of one of the sectors in one of the countries (Proposition 3). Both exercises predict the same correlation between financial architecture (the relative sizes of the banking sector compared to the market finance sector) and the patterns of international trade. Countries with more developed banking have a comparative advantage in bank-dependent sectors and vice versa. This general prediction of our model is evaluated in section 4 for a sample of OECD countries, that is, countries with a relatively well-developed financial system and high level of external finance use.

While both Proposition 2 and Proposition 3 predict the same correlation stated above, they offer different predictions on the direction of causality. In section 5, we evaluate these different predictions:

According to Proposition 2, it is the financial architecture that drives the patterns of international trade. Empirically, we follow Manova (2008) and employ the date of equity market financial liberalization of a country as an exogenous boost that affects directly market finance and not the banking sector. We expect equity market liberalisation to offer a comparative advantage to those sectors that are market-dependent relative to those that are more bank-dependent. We evaluate this prediction in Section 5.1.

Proposition 3 predicts the reverse causal direction. A country with a comparative advantage in sectors that are relatively more bank- than market-finance dependent has an incentive to develop more its banking relative to its market finance sector. We test this prediction in Section 5.2. using the instrumental-variable methodology in Do and Levchenko (2007).

4. Are Financial Systems and Trade Patterns Linked?

Our aim in this section is to find if there is any support in the data for the Allen and Gale (2001) conjecture of a link between financial system architecture and international comparative advantage. According to their work, efficient matching between the sources of external finance and the various sectors of the economy depends on the technological characteristics of each sector that, in turn, determine the types of frictions that the corresponding contracting environment will have to overcome. Therefore, our first task is to construct an index that ranks sectors according to their relative use of bank finance compared to market finance.

4 .1. Bank Finance Dependence Index

Both our theoretical framework and empirical implementation are based on the idea that there are fundamental technological reasons for sectors to differ in their optimal level of bank finance compared to market finance. According to the theoretical literature in corporate finance (e.g. Allen and Gale, 2001, Tirole, 2006), as long as the choice of finance is driven by technological considerations and the choice of technology in each sector is similar across countries, then we would expect similar rankings. Of course, this may not be the case in non-OECD countries where market finance is poorly developed, and firms rely predominantly on banks for external financial.

There is also empirical evidence supporting the above observation that alternative sources of external finance might better be suited for the financing of particular technologies. For example, Rajan and Zingales (2001) make the distinction between those industries with a high proportion of intangible assets and high growth opportunities that are able to raise capital from equity markets and more traditional fixed capital intensive, smoke-stack, industries that have found banks to be willing providers of external finance. Using industry data, Carlin and Mayer (2003) compare the use of equity finance in the US with the proportion of investment financed by bank loans in Japan. They find that clothing and textiles have one of the highest levels of bank financing in Japan and raised almost no equity in the US. These observations are consistent with our assumption that the *ranking* of sectors according to their mode of finance is the same across countries.[18]

The construction of our measure of sectoral bank dependence strictly follows the methodology developed by Rajan and Zingales (1998). While their index ranks sectors according to their overall external finance requirements, our index will rank sectors according to their reliance on bank loans relative to funds raised in debt and equity markets.

4.1.1. Constructing the Index

We use firms' balance sheet information from Standard and Poor's Compustat North America database of over 24,000 US publicly traded companies. The sample employed includes all non-financial firms listed on the stock exchange during the period 1976-2004. Publicly listed companies provide arguably more reliable and complete information concerning their income and balance sheets as they have to follow stringent reporting requirements laid down by the Security and Exchange Commission. In addition, publicly listed companies are arguably less constrained in their choice of external finance source.

We sum across the whole period each firm's average short-term borrowing received from banks and then divide by the sum of each firm's total external finance to obtain each

[18] Textiles (321) and clothing (322) are in the top two sectors in our Bank Finance Dependence index. Carlin and Mayer (2003) also construct a measure of bank dependence using industry data on bank loans in Japan, which is similar in spirit to the index used here. For the 18 sectors for which data are available in the Japanese index, the correlation between this index and our Bank Finance Dependence index is 0.45 and is significant at the 5 percent level.

firm's bank finance dependence.[19] As in Rajan and Zingales (1998), we turn the firm-level information into a unique sectoral indicator of Bank Finance Dependence (BFD) by taking the median firm's value for each sector as the indicator of the sector's bank finance dependence.

$$BFD = \frac{Bank\ finance}{Bank\ finance + market\ finance}$$

We then convert the 4 digit SIC industry level Compustat data to the 3-digit ISIC revision 3 industry level, for which the sectoral-level trade data are available.[20] The bank dependence index is presented in Table 1 for the 28 3-digit ISIC sectors. The coefficient of correlation between Bank Finance Dependence (BFD) and the External Finance Dependence (EFD) developed by Rajan and Zingales (1998) is -0.172 and is not significant even at the 10% level. This is also the case for all the alternative EFD measures that we use in this paper.

[Please insert Table 1 about here]

4.1.2. Using the US Index as a proxy

There is a strong implicit assumption behind the methodology used by Rajan and Zingales (1998) and in the present paper, that the rankings of sectors, according to any of the measures of financial dependence, across countries with high levels of economic development are the same as those for the US.[21] Of course, we would also expect a country with a very developed market-finance sector such as the U.S. to have a higher proportion of projects funded through market-finance across all sectors relative to a country, like Japan, with a relatively highly developed banking sector.

To assess the stability of our BFD variable over time, we follow Rajan and Zingales (1998) and compare our index with that obtained using data for the period 1970-1979. The correlation between the two indices is 0.713 which is significant at the 1% level.

[19] The exact definition provided by Compustat for the variable used for the numerator is as follows: "… this item represents the approximate average aggregate short-term financing outstanding during the company's reporting year. Short-term borrowings are usually in the form of lines of credit with banks." The external finance measure represents finance obtained from both banks and the capital market. It includes average short-term borrowing, debt senior convertible, debt subordinated convertible, debt debentures, and preferred and ordinary stocks.

[20] We use the Haveman's concordance table to convert from 4-digit SIC revision 3 industry level to 4-digit ISIC revision 3 industry level and the United Nations concordance table to aggregate from 4-digit ISIC to 3-digit ISIC revision 2 industry level.

[21] Our supposition that sectoral technologies are the same across countries is a standard assumption of the Heckscher-Ohlin framework. Trade in that model is driven by differences in labor and capital endowments. If the optimal external finance source depends on technology, as conjectured by Allen and Gale (2001), then financial architecture must also have a strong impact on the patterns of international trade.

We have also computed our index using information only from U.S. firms that have been listed in Compustat for at least 10 years. Indeed, one might argue that firms at different stages of their product life cycle may behave differently in term of their choices of funding. The coefficient of correlation of the indices with or without young firms is 0.924 and is significant at the 1% level.[22]

These robustness exercises, as well as the theoretical arguments and the references to empirical evidence discussed at the beginning of section 4.1 support the idea that the BFD index is robust and stable over time and across countries. In principle, this is a conjecture that can be tested by estimating the index for many countries and then checking if the indices are correlated. Unfortunately, data for bank loans at the firm level are only provided for the US for sufficiently large samples.

However, what is available is information about the reliance of sectors on short-term and long-term finance which can be useful. As Demirguc-Kunt, and Maksimovic (2002) argue "the development of securities markets is more related to long-term financing, whereas the development of the banking sector is more related to the availability of short-term financing. Thus, differences in contracting environments that affect the relative development of the stock market and the banking system can have implications for which firms and projects obtain financing." (p. 359). We use sectoral data provided by Aswath Damodaran at the Stern Business School, New York University, which includes information about the relative use of short and long-term debt in the US and Europe. [23] We find a correlation of 0.5 significant at the 1 percent level between Europe and the US.

Obviously, the above ratio is not directly comparable to ours and this empirical evidence only provides an indirect support to our methodology. For example, short-term finance includes commercial paper which is raised in capital markets and banks often grant loans with long durations. Nevertheless, if the Allen and Gale (2001) conjecture that technology is a main determinant of the source of external funding rather than, say, maturity, is correct we would expect our index to be even more strongly correlated.

[22] Using the index based on data for the 70s or excluding newly listed firms to reproduce our main statistical table (See Table 3, discussed below) generate qualitatively similar results. These results are available upon request.

[23] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datacurrent.html

4.2. Cross-Section Analysis: Methodology and Data

In this section, we use the BFD index to estimate the relationships between cross-country differences in financial system architecture and the patterns of international trade. Our methodology follows Beck (2003) and Svaleryd and Vlachos (2005) and relies on the interaction between sectoral intensity in bank finance, captured by our new index, and countries' predominant source of domestic funds. At the country level, variations in financial system architecture are captured by the development of the banking sector relative to the development of equity and bond markets. The supposition is that in countries where the banking sector is more prominent than market finance, the leading export sectors ought to be those that rely relatively more on bank finance.

We estimate the following equation:

$$X_{ci} = \alpha_0 + \beta_1(BankDev_c \times BFD_i) + Z_{ci} + \gamma_c + \gamma_i + \varepsilon_{ci} \quad (14)$$

where X_{ci} is the log of exports for country c in industry i, measured at the 3-digit ISIC Revision 2 classification from the Trade and Production Database compiled by Nicita and Olarreaga (2006). The trade data are taken from the United Nations trade statistic database (Comtrade). The unit of measurement is the value of shipment in US dollars of exports of the reporting country for each of the 28 sectors. We cluster the standard errors at the country level, to allow for the possibility of correlations between the errors in the observations within a given country (see Angrist and Pischke, 2009).

BFD_i is our index of sectoral bank dependence. $BankDev_c$ is a measure of relative banking development for country c. For each country-year, we measure the share of funding provided by the banking sector in the total amount of external finance provided by both markets and intermediaries, using the Beck, Demirguc-Kunt and Levine (2009) dataset. The size of the banking sector is measured as the total value of deposit money bank assets. The denominator is measured in two different ways yielding two alternative indicators. In $BankDev_c(1)$, external finance is measured by adding the value of the numerator and the value of stock market capitalization; while in $BankDev_c(2)$ we also add the private bond market capitalisation to the denominator. Table 2 presents the variables $BankDev_c(1)$ and $BankDev_c(2)$ for the United States, UK, France, Japan and Germany for the year 2001.

Potential control variables (Z_{ci}) include the interaction between a sector's total external finance dependence (EFD_i), as measured by Rajan and Zingales (1998), and the country's financial development ($FinDev_c$), which is calculated as the amount of external finance provided by both markets and intermediaries relative to the size of the economy (total value as share of GDP), using the Beck *et al.* (2009) dataset. We also control for traditional sources of comparative advantage by introducing interaction terms between a country's factor abundance and an industry's factor intensity, for two factors, physical and human capital. Industry-level measures come from Braun (2003), while country-level measures are taken from the new version of the Penn World Tables (see Feenstra et al, 2015). Finally, γ_c and $\gamma_i$are country and industry specific effects, respectively. Given that BFD_i, EFD_i, $BankDev_c$ and $FinDev_c$ do not vary with time they are captured by the fixed effects.

Table 2: Bank Development in 2001.

COUNTRY	$BankDev_c(1)$	$BankDev_c(2)$
United States	0.287	0.192
United Kingdom	0.449	0.424
France	0.516	0.439
Germany	0.704	0.561
Japan	0.763	0.650

4.3. Cross-Country Analysis: Results

Table 3 presents results for the year 2001 for OECD countries (columns I and II) while we also provide results for non-OECD countries for comparison only (III and IV). The first row reports the estimated coefficients on the interaction between the country's Bank Development and the industry's Bank Finance Dependence. Columns II and IV also include the interaction of $FinDep_c$ with EFD_i to control for the effect of the overall external finance dependence of each sector on export patterns, as has been documented by Beck (2003), and Svaleryd and Vlachos (2005). All regressions include controls for the traditional sources of comparative advantage (physical and human capital).

The coefficient associated with our main variable of interest ($BankDev_c(1) \times BFD_i$) is positive, large and significant at the 5 percent level for both the full and OECD samples. When considering a country with a similar measure of relative bank development to that of Japan (*BankDev* = 0.763, see Table 2), the coefficient β_1 estimated in column I implies that exports by the 75th-percentile industry (*BFD* = 0.271) are larger by 38.7 percentage points relative to exports by the 25th-percentile industry (*BFD* = 0.146). The corresponding difference for a country with a similar financial architecture to that of US (*BankDev* = 0.287) is only 14.6 percentage points. Hence, an increase in the ratio of a country's bank development over total external finance by 48 percentage points, which is similar to moving from a US-type financial architecture to one close to that of Japan, implies an additional 24.1 percentage point increase in the volume of trade of those sectors that rely on bank-finance compared to those that rely on market-finance. The introduction of the second interaction term only marginally affects our results (column II).[24]

These findings support the Allen and Gale (2001) conjecture, that is, the exports of countries with a high measure of relative banking sector development are dominated by sectors that are more reliant on bank finance. As expected, this result is confined to the OECD countries. The estimates of β_1 are not significant for the non-OECD countries (columns III and IV). For non-OECD countries, only the overall level of a country's financial development seems to affect comparative advantage. These results are not surprising. As discussed extensively by the financial architecture literature (e.g. Levine, 2002), financial architecture is expected to play an important role only in countries where market finance is more widely available.

Table 3: Export Patterns, Financial Architecture and Bank Dependence

Countries included in the sample:	OECD		Non-OECD	
	I	**II**	**III**	**IV**
Bank Development (BankDev$_c$) × Bank Finance Dependence (BFD$_i$)	4.057*** (1.057)	3.943*** (1.120)	1.629 (2.024)	1.202 (2.056)
Financial Development (FinDev$_c$) × External Finance Dependence (EFD$_i$)		0.101 (0.131)		0.485*** (0.119)
# Observations	809	809	1,636	1,636
R-squared	0.832	0.832	0.770	0.772

The dependent variable is the log of exports to the rest of the world by each 3-digit ISIC sector for the year 2001. All regressions include a constant term, exporter and sector fixed effects. All regressions include physical and human capital interactions (capital abundance × capital intensity and human capital abundance × human capital intensity) to control for traditional comparative advantages. Robust standard-errors clustered at the country level are reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

[24] In Appendix 3, Table A.3.0, we have produced our results for OECD countries without any fixed effects (Column I). We have re-scaled our dependent variable by country's total exports and industry's total export (respectively in columns II and III). The interaction term remains very stable and significant across specifications.

4.4. Cross-Country Analysis: Discussion and Robustness

4.4.1 Economic and Financial Development

As stated throughout this paper, a high level of economic and financial development is necessary to study the link between financial architecture and the pattern of trade of a country.

This link was demonstrated in the previous section, where we used OECD membership to identify financially and economically developed countries. In this sub-section we consider an alternative measure of development - GDP per capita – and produce a series of regressions similar to that presented in Table 3 Column II. Our first regression includes only the 30 countries with the highest GDP per capita, and in each subsequent regression we add the country with the next highest GDP per capita, until our final regression includes all 92 countries.

In Appendix 3 Graphs A3.1 and A3.2, we present estimates from these 62 different regressions for the year 2001. Graph A3.1 presents the different point estimates and the 90% confidence intervals of the coefficient on $(BANDEV_c \times BFD_i)$ and confirms our hypothesis that financial architecture only matters for financially and economically developed countries. This coefficient loses its significance only when more than 80 countries are included in the regression – such that the average income of the countries included becomes low. Graph A3.2, where the set of estimates for the coefficient on $(BANDEV_c \times EFD_i)$ are presented, confirms that external finance dependence is of first importance for least developed countries. Indeed, the coefficient remains insignificant in all the regressions restricted to countries in the top 50 in terms of GDP per capita and becomes significant only when including additional low-income countries.

In Appendix 3, Table A.3.1 we also reproduce our results for OECD countries where we exclude countries identified by Levine (2002) as having a highly underdeveloped financial systems (column I and II). Among OECD countries, only Greece was reported in this category. Excluding this country leaves our result qualitatively unaffected.[25]

In order to account for the fact that that financial structure changes with economic development even within the group of OECD countries, we also add an interaction term between the GDP per capita and our BFD measure as an additional control variable. The resuts are reported in column III and IV of Appendix 3 Table A.3.1. We also apply Levine (2002)'s

[25] Given that Levine (2002) identifies those counties based on financial indicators for the period 1980-1995, we have reproduced the exercise using data for the year 2001. In this case, none of the OECD countries were reported with an underdeveloped financial system, supporting our decision to focus on OECD countries in our estimations.

restriction together with the interaction term between GDP per capita and BFD. In all cases, results remain qualitatively similar to those presented in our main Table 3 (See column V and IV of Table A.3.1).

4.4.2 Bank Finance. Equity and Bonds

In this paper, we follow the literature on financial architecture and explore the distinction between bank- and market-finance (see Demirguc-Kunt and Levine, 2001; Levine, 2002 and Demirguc-Kunt *et al.*, 2013). However, there is an important distinction to be made between Bank loans, bonds and equity as suggested by Bolton and Freixas (2000).

To explore this potential avenue of research, we have constructed alternative measures for bank finance dependence. More precisely, we have constructed three other alternative industry-level indices using firm-level information on outstanding bank loans, equity and bonds.

$$BFD\_equity_i = \frac{Bank\ finance}{Bank\ finance + Equity}$$

$$BFD\_bonds_i = \frac{Bank\ finance}{Bank\ finance + Bonds}$$

$$Bonds\_equity_i = \frac{Bonds}{Bonds + Equity}$$

We perform a similar exercise to that presented in Table 3 in order to evaluate if our results still hold when using these indices. The results for OECD countries are displayed in Appendix 3 Table A.3.3. The ratio comparing bank finance with equity (Columns I and II) and bank finance with bonds (Columns III and IV) generate positive and significant effects on the link between the financial architecture of a country and its pattern of trade across industries (though the second index only provide marginally significant results at the 10% level). However, the importance of bonds over equity (Columns V and VI) does not seems to be relevant to explain the link between financial architecture and the pattern of trade. These results reinforce our conviction that comparing bank finance with market finance is highly relevant.

4.4.3 Other robustness exercises

The results in Table 3 are for a single year. In Appendix 2 Graph A2.1, we repeat these estimations for each year between 1994 and 2004. The coefficient β_1 obtained in specification IV remains positive and significant at least at the 10 percent level in all cases. In addition, we conducted several robustness checks on the OECD sample. The results are presented in

Appendix 3 Table A3.2, where the coefficient β_1 remains positive and significant at the 10 percent level in all cases.

Above we followed Rajan and Zingales (1998) and turned the firm-level information into a unique sectoral indicator of Bank Finance Dependence (BFD_i) by taking the median firm's value for each sector. Alternatives are to use the 25th or the 75th percentile firms, and columns I and II of Table A3.2 present the estimates using these alternative indices for the OECD countries. Our conclusions are unaffected.

There are two potential shortcomings in the way BFD_i is constructed. First the denominator, which captures the external finance obtained from both banks and the capital market, does not include commercial paper. Second, our measure for Bank finance in the numerator may not include all long-term credit lines. We therefore reconstruct the BFD_i index in two alternative ways. Columns III and IV of Table A3.2 present the new estimates. The first, $BFD_i(1)$ is the ratio of outstanding bank loans to the total liabilities (Total Debt plus Equity), where the latter includes short and long-term debts from any institution as well as commercial paper.[26]

$$BFD_i(1) = \frac{Bank\ finance}{Total\ Liabilities}$$

The second alternative, $BFD_i(2)$ includes the long-term credit lines from banks in both the numerator and the denominator,

$$BFD_i(2) = 1 - \frac{Market\ finance}{Total\ Liabilities}$$

Column V reports results using our second indicator for bank development - $BankDev_c(2)$ - which includes the private bond market capitalisation in the denominator. Again, our conclusions are unaffected.

5. Causal Links between Trade Patterns and Financial Architecture

Our model offers two possible explanations for the link between financial market architecture and the patterns of international trade. In one explanation export patterns are driven by relative advantage in financial architecture. In the other explanation cross-country trade patterns, reflecting technology differences, are a source of differences in financial architecture. Certainly,

[26] A drawback of these two alternative ratios is that the denominator includes other less relevant items (such as income taxes payable, investment tax credit, other current liabilities).

there is no reason to believe that these two explanations are mutually exclusive. Over time financial development and technological change might co-evolve producing rich dynamic patterns. In this section, we look for evidence supporting either or both of these explanations.

5.1. Do Financial Markets Drive the Patterns of Trade?

To answer this question our identification strategy relies on time variation in the patterns of exports due to the liberalization of equity markets. The underlying hypothesis in the existing literature (Beck, 2003, Defever and Suedekum, 2014, Jaud *et al.*, 2019 and Manova, 2008) is that the development of equity markets following their liberalization would advantage sectors that are more dependent on external finance. However, if financial architecture also matters then the liberalization of equity markets would have particularly favored those sectors that are more dependent on market finance and less so on bank loans. We estimate the following equation:

$$X_{cit} = \alpha_0 + \beta_0 Lib_{ct} + \beta_1 (BFD_i \times Lib_{ct}) + Z_{cit} + \gamma_c + \gamma_i + \gamma_t + \varepsilon_{cit} \qquad (15)$$

As in section 4, X_{cit} is the log of exports for country c in industry i but now also for each year t in the period 1980-2004. Our focus is on the interaction term between a sector's bank dependence (BFD_i) and the country's equity market status (Lib_{ct}). We expect a negative coefficient for this interaction term indicating that when countries liberalize their equity markets they experience a disproportionate boost in their exports from sectors that are relatively less bank dependent. The dummy variable Lib_{ct} indicates whether the equity market in country c has been liberalized at time t and is zero (one) in all years before (after) the official equity market liberalization date. As a robustness check, an alternative dummy referring to the "first sign" of an upcoming liberalization is used. These two variables have been computed by Bekaert *et al.* (2002, 2005).[27] In all regressions, we control for traditional comparative advantages by including interaction terms between countries' abundance and sectors' intensity for both physical and human capital. We also control for country, sector and year fixed effects ($\gamma_c, \gamma_i, \gamma_t$ respectively). Because of possible serial correlation over time or across sector, we cluster the standard errors at the country level.

Table 4 shows our results. In column I, we estimate a negative and highly significant coefficient on the interaction between the equity liberalization dummy with each sector's bank dependence for OECD countries. Conditional on the time, country and industry invariant

[27] For some countries we rely on the dataset provided by Bekaert and Harvey (2004).

characteristics captured by the fixed effects, we find a disproportionally large effect of equity liberalization on the exports of sectors which rely relatively less on banks compared to equity markets.

Using the coefficients β_0 and β_1 estimated in column I, equity liberalization increases the value of trade by 8.8 percentage points in a sector that relies on equity-finance (25th percentile, BFD = 0.146) while it decreases trade by 12.2 percentage points in a sector that relies on bank-finance (75th percentile, BFD = 0.271). Hence, equity liberalization implies an export increase of 21 percentage points in a sector that relies on equity-finance compared to one relying on bank-finance. This order of magnitude is comparable to that obtained from our cross-country estimations in the previous section where we considered a shift from the financial architecture of the US to that of Japan.

In columns II, we introduce the interaction term between external finance dependence (EFD) and the equity liberalization dummy. The interaction term between EFD and equity liberalization is insignificant, while the interaction term between equity liberalization and each sector's bank dependence remain negative and significant at the 5% level. Interestingly, for non-OECD countries (column III), the interaction term between equity liberalization and each sector's bank dependence is insignificant, while the interaction term between external finance dependence (EFD) and the equity liberalization dummy appears positive and highly significant when this additional variable is introduced (column IV). Overall, this confirms that the composition of finance mainly shapes the comparative advantage of OECD countries, while aggregate external finance plays a critical role for the comparative advantage of countries with less developed financial sectors.

We test the robustness of these results using the variables discussed in sub-section 4.4.3. These include alternative BFD indices using the 25^{th} or the 75^{th} percentile instead of the median, and alternative BFD indices using either market finance or bank finance over total debt. In addition, as discussed by Manova (2008, section 7), while equity market liberalizations provide a shock to the availability of capital through the equity market, the exact timing of the liberalizaton process could be subject to endogeneity. Therefore, following Bekaert *et al.*

(2005), we use the alternative dating for equity liberalization captured by the "first sign" dummy, to alleviate concerns about possible anticipation effects.[28]

Table 4: Financial Market Development and Comparative Advantage

Countries included in the sample:	OECD		Non-OECD	
	I	**II**	**III**	**IV**
Equity Liberalization (Lib_{ct})	0.333	0.246	0.035	-0.187
	(0.206)	(0.232)	(0.215)	(0.224)
Equity Liberalization (Lib_{ct})	-1.679***	-1.582**	0.673	0.929
× Bank Finance Dependence (BFD_i)	(0.581)	(0.613)	(0.598)	(0.607)
Equity Liberalization (Lib_{ct})		0.262		0.674***
× External Finance Dependence (EFD_i)		(0.194)		(0.197)
Observations	17,529	17,529	28,373	28,373
R-squared	0.799	0.799	0.716	0.717

The dependent variable is the log of exports to the rest of the world by each 3-digit ISIC sector for the years 1979-2004. All regressions include a constant term, year, exporter and sector fixed effects. All regressions include physical and human capital interactions (capital abundance × capital intensity and human capital abundance × human capital intensity) to control for traditional comparative advantages. Standard-errors clustered at the country level are reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

Finally, we include country × year, industry × year and country × industry fixed effects. These fixed effects would capture any interaction between a country's factor abundance and an industry's factor intensity, as well as the interaction between the level of development of a country and industry's financial indices, such as BFD or EFD indices. The results are presented in Appendix 4. In all these specifications, our coefficient of interest (β_1) remains positive and significant at the 10 percent level.

5.2. Does the Pattern of Trade Drive Financial Architecture?

In this section we assess whether a country's financial market architecture is determined by the requirements of its exporting sectors. Our estimation strategy follows Do and Levchenko (2007). First, we construct a variable summarizing a country's requirements for bank loans in order to finance its exports. Second, we generate an instrument for this variable by estimating the effect of geography variables on trade volumes across sectors. Finally, we evaluate how

[28] Notice that if export growth results from the expectation of future equity market liberalization, the estimated impact of liberalization would be biased downwards.

cross-country differences in bank finance requirements impact on a country's financial market architecture.

We combine our industry-level measure of bank dependence (BFD_i) with export data to develop a measure of a country's requirement of bank loans to finance exports (hereafter $BFNX_{ct}$). In particular, we construct the following variable for each country.

$$BFNX_{ct} \ = \ \sum_{i=1}^{I} \omega_{ict} BFD_i \quad \text{with } \omega_{ict} = \frac{X_{ict}}{\sum_{i=1}^{I} X_{ict}} \qquad (16)$$

where ω_{ict} is the share of sector i's exports in total exports of country c in year *t*. For robustness we also construct in a similar way a variable that measures the external finance requirements for financing exports ($EFNX_{ct}$), by replacing BFD_i by EFD_i in (16).

The results from the cross-sectional OLS regression between $BankDev_c$ and $BFNX_c$,without relying on the IV strategy, are presented in Table A5.1 of Appendix 5. The level of a country's bank development appears to be positively and significantly correlated with its export dependence on bank finance for OECD countries, but not for either the full or the non-OECD sample.

Of course, a correlation does not imply causation, and it is to assess the causal link between the sectoral composition of exports of a country and its impact on the country's banking sector, that we rely on the IV strategy of Do and Levchenko (2007), extended to a panel setting. We build our instrument in a similar way to $BFNX_{ct}$ but where ω_{ict} is constructed from the predicted export values obtained from gravity equations estimated using bilateral trades on a cross section of 170 countries for each of the 28 sectors and 25 years independently. The data and the gravity equations estimated are identical to those used by Do and Levchenko (2007). The identification is made possible as the sectoral coefficients associated with standard gravity variables, such as distance or a common border, can be different for each sector and each year. As argued by Feyrer (2019), changes in transportation technology over time is shaping changes in international trade. Therefore, the sectoral gravity coefficients are likely to change over time, differentially across sectors, due to innovations in the aviation and marine transport sector, such as containerization. As an illustration, the coefficients associated with bilateral distance over time are provided for each sector in Graph A5.1 of Appendix 5.

As a result, for a given year, countries which are far away from their trading partners will have lower predicted export shares in sectors for which the coefficient on distance is higher.

From these variations, we obtain predicted values for X_{ict} that vary across countries and also across sectors and time. We can then use these values to construct a 'Predicted BFNX' variable, and use this new variable to estimate the following system of equations:

$$\textbf{First Stage}: \quad BFNX_{ct} = a_0 + b_1 Predicted\, BFNX_{ct} + Z_{ct} + \gamma_c + \gamma_t + \epsilon_{ct}$$

$$\textbf{Second Stage}: \quad BankDev_{ct} = \alpha_0 + \beta_1 \widehat{BFNX}_{ct} + Z_{ct} + \gamma_c + \gamma_t + \varepsilon_{ct}$$

In the first stage, the right-hand side includes the `predicted' export dependence on bank finance, as well as other control variables. In the second stage, the dependent variable is the measure of a country's bank development as defined in section 4.2 for those years in the period 1980-2004, for which the country's equity market has been already liberalized, so that its financial system architecture can be determined by its comparative advantage. We expect the requirement of bank finance for exports to impact positively on the level of bank development of a country, $\beta_1 > 0$. In both stages, we cluster the standard errors at the country level to accommodate for possible serial correlation over time.

In Table 5, we present the two-stage least squares (2SLS) estimates where we instrument BFNX using its predicted value obtained from the sectoral gravity equations. The top panel contains the full results of the second stage regression, while for ease of exposition the bottom panel reports only the coefficient and the standard errors associated with our instrument.

Looking at the first stage, the Predicted BFNX is significant at 1% in all columns.[29] Turning to the second stage, the ratio of a country's bank development to total finance ($BankDev_{ct}$) appears to be positively and significantly affected by the export dependence on bank finance (BFNX) for OECD countries (columns I and II); but not for non-OECD countries (columns III and IV). In columns II and IV we also control for the external finance requirements for exports (EFNX).

The coefficient obtained in column I ($\beta_1 = 0.592$) implies that moving from the 25th-percentile to the 75th-percentile country in terms of bank finance needed for exports (BFNX of respectively 0.198 and 0.231) is associated with an increase in the country's bank development of 1.9 percentage points. Using the coefficient obtained in column II ($\beta_1 = 2.459$)

[29] When only one instrument is used, Stock and Yogo (2005) suggest that a reliable instrument would be associated with a F-statistic above 10, which is satisfied in this case, Since the introduction of control variables may raise endogeneity issues, the F-stats that we report in Table 5 are the Angrist-Pischke F-stat, (Angrist and Pischke, 2009, pp. 217-18).

implies an 8.1 percentage point increase. These are small changes. For comparison, there is a gap of 48 percentage points between the level of bank development of Japan and that of the US (that is moving from 0.287 to 0.763, see Table 2).

Appendix 5, Table A5.2, presents our robustness results for this IV strategy for OECD countries. We use the alternative BFD Indices employed in sub-section 4.4.3, and our alternative indicator for bank development (BankDev2). The level of bank development of a country ($BankDev_c$) appears to be positively and significantly correlated with its export dependence on bank finance (BFNX).[30]

Table 5: Export Bank Dependence and Financial Architecture: Instrumental Variable

Countries included in the sample:	OECD	OECD	Non-OECD	Non-OECD
	III	**IV**	**V**	**VI**
	Panel A: Second Stage			
Bank Finance need for export (BFNX)	0.730**	2.459*	0.003	-0.082
	(0.278)	(1.224)	(0.107)	(0.171)
External Finance need for export (EFNX)		-0.885		0.134
		(0.577)		(0.216)
	Panel B: First Stage			
Predicted BFNX	0.933***	1.077***	1.596***	1.570***
	(0.056)	(0.170)	(0.279)	(0.427)
Observations	443	443	339	339
F-stat	281.90	39.95	32.84	13.54

In the second stage, the dependent variable is a country's banking sector development for the years 1979-2004. All regressions include a constant, year and exporter fixed effects. Standard-errors clustered at the country level are reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

Overall, these results suggest that the evolution of financial market architecture is affected by the financial requirements of sectors with strong exports in OECD countries, a reflection of technological comparative advantage. However, the quantitative effects from this channel are relatively small.

[30] Results for the full sample, which we omit for brevity, show a non-significant coefficient in all specifications.

6. Concluding Comments

In this paper we have established support for the Allen and Gale (2001) conjecture of a link between financial market architecture and export patterns. We presented a two-country, two-sector model where both banks and financial markets co-exist that offered two possible causal explanations for this link. In the first explanation, financial market development drives the relationship, so that countries with highly efficient banking systems are more likely to have a comparative advantage in those sectors that rely more on bank finance. The second explanation identified production technology as driving the relationship. Countries with a comparative advantage in sectors that rely on bank finance are more likely to develop their banking systems. Both these explanations could be at play in the data.

To determine whether the link itself is reflected in the data, we developed a novel indicator that captured the relative dependence of each sector on bank versus market finance. Using this new indicator, we found a strong and significant relationship between cross-country differences in financial system architecture and export patterns in the OECD countries. From a quantitative point of view, we show that moving from the US financial architecture to that of Japan would result in about 24 percentage points increase in the volume of trade for sectors relying on bank-finance relative to those relying on market-finance. However, we find no evidence of any effect for the non-OECD countries.

Having established that the link does exist, we employed techniques familiar from the literature on financial markets and trade, and found evidence supporting both our explanations of this link, at least in the OECD countries. The evidence suggested that the evolution of financial market architecture exerted a bias on export patterns. In particular, changes that favor the equity market relative to the banking sector, such as equity liberalization, will have a positive impact on those sectors of the economy that are relatively more dependent on market finance. Our estimates indicate that such a policy change is comparable to moving from a financial architecture similar to that of Japan to one that is similar to that of US, with an increase in the volume of exports of 21 percentage points in the sectors relying on market-finance compared to those relying on bank-finance. The evidence also suggested that the sectors in which a country has a comparative advantage have a significant impact on the evolution of its financial market architecture. However, the expected effects here are small. A technological change that would shift a country's comparative advantage from market-dependent to bank-dependent sectors would result in at most an 8.8 percentage points increase in the country's bank development. To put this in perspective, the gap between the level of bank development of Japan and that of the US is 48 percentage points.

Our results have policy implications. For developed countries, the simultaneous presence of causal links going from financial architecture to trade and from trade to financial architecture implies that policies targeting the development of trade or the financial sector may require coordination if they are not to work at cross purposes. For example, trade policies aimed and promoting bank-dependent exports combined with financial policies aimed at promoting market finance could partly frustrate each other. Governments in developing countries may seek to facilitate, or even guide, shifts in their country's comparative advantage. Their current dependence on bank finance may strongly influence which sectors can obtain the appropriate finance for the production expansion needed for exporting. These governments should remove impediments, not just to the general financing of exporting sectors, but to the appropriate forms of financing for their evolving comparative advantage.

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Table 1: Bank Finance Dependence and External Finance Dependence by sector

Industry Name (Industry code)	Bank Finance Dependence (BFD)	External Finance Dependence (EFD)
Food products (311)	0.201	0.137
Beverages (313)	0.222	0.077
Tobacco (314)	0.000	-0.451
Textiles (321)	0.430	0.400
Wearing apparel, except footwear (322)	1.000	0.029
Leather (323)	0.835	-0.140
Footwear (324)	0.213	-0.078
Wood products, except furniture (331)	0.106	0.284
Furniture, except metal (332)	0.224	0.236
Paper and products (341)	0.016	0.176
Printing and publishing (342)	0.058	0.204
Industrial chemicals (351)	0.044	0.253
Other chemicals (352)	0.266	0.219
Petroleum Refineries (353)	0.061	0.042
Misc. petroleum and coal products (354)	0.061	0.334
Rubber products (355)	0.240	0.226
Plastic products (356)	0.139	1.140
Pottery, china, earthenware (361)	0.347	-0.146
Glass and products (362)	0.075	0.528
Other non-metallic products (369)	0.107	0.062
Iron and steel (371)	0.082	0.087
Non-ferrous metals (372)	0.091	0.005
Fabricated metal products (381)	0.252	0.237
Machinery, except electrical (382)	0.098	0.445
Machinery, electric (383)	0.011	0.767
Transport equipment (384)	0.358	0.307
Prof and scientific equipment (385)	0.000	0.961
Other manufactured products (390)	0.408	0.470

Appendix 1: Proofs

Proof of Proposition 1

In the initial symmetric equilibrium $B^1 = B^2 = B;\ Y^1 = Y^2 = Y\ ;\ X^1 = X^2 = X$ and thus *P=1*. To establish the results in Proposition 1 we use the following relations:

From the market clearing equation (9) we have $\frac{dP}{dB^1} = \frac{\theta Y}{X^1}\left\{\frac{dA_l^1}{dB^1} - \frac{dA_l^2}{dB^1}\right\}$ (A1)

Because $R = 1 + P$, the thresholds in sector 1, which depend on $\frac{P}{R} = \frac{P}{1+P}$, are affected by a price change through two channels - a direct price effect - and an indirect interest rate effect. The thresholds in sector 2, which depend on $\frac{1}{R} = \frac{1}{1+P}$ are only affected through the interest rate channel. Thus (using $R = 1 + P = 2$ initially)

$$\frac{dA_l^1}{dB^1} = \frac{b}{2} - \frac{\theta Y - bB}{4}\frac{dP}{dB^1}, \text{ and } \quad \frac{dA_l^2}{dB^1} = \frac{\theta Y - bB}{4}\frac{dP}{dB^1} \qquad \text{(A2)}$$

(a). Substituting (A2) in (A1) and solving gives $\frac{dP}{dB^1} = \frac{b\theta Y}{2X^1 + \theta Y[\theta Y - bB]} > 0$ ■ (A3)

If we now substitute (A3) back into (A2) we obtain

$$\frac{dA_l^1}{dB^1} = \frac{b}{2}\left\{1 - \frac{H}{2}\right\} > 0, \text{ and } \quad \frac{dA_l^2}{dB^1} = \frac{b}{2}\frac{H}{2} > 0 \text{ where } H \equiv \frac{\theta Y\{\theta Y - bB\}}{2X^1 + \theta Y[\theta Y - bB]} < 1 \quad \text{(A4)}$$

which implies $\frac{dA_l^1}{dB^1} - \frac{dA_l^2}{dB^1} = \frac{b}{2}\{1 - H\} > 0.$ (A5)

So, the lower thresholds increase in both sectors, but by more in sector 1. If we now consider the upper thresholds we can use (1) and (A3) to solve for

$$\frac{dA_h^1}{dB^1} = \frac{1}{2}\left\{1 - b\frac{J}{2}\right\} > 0, \text{ and } \quad \frac{dA_h^2}{dB^1} = \frac{b}{2}\frac{J}{2} > 0 \text{ where } J \equiv \frac{\theta Y\{\theta Y - B\}}{2X^1 + \theta Y[\theta Y - bB]} < H \quad \text{(A6)}$$

which implies $\frac{dA_h^1}{dB^1} - \frac{dA_h^2}{dB^1} = \frac{1}{2}\{1 - bJ\} > 0$ (A7)

Both sector's upper thresholds also increase, again by more in sector 1. If we look at the change in the number of bank financed projects in each sector, we have from (A4) and (A6) that

$$\frac{dA_h^1}{dB^1} - \frac{dA_l^1}{dB^1} = \frac{1}{2}\left\{1 - b + \frac{b}{2}\{H - J\}\right\} > 0 \text{ and } \frac{dA_h^2}{dB^1} - \frac{dA_l^2}{dB^1} = -\frac{b}{4}[H - J] < 0 \quad \text{(A8)}$$

The range of bank financed projects increases in sector 1 (because the upper threshold has increased more than the lower threshold) and falls in sector 2.

(b). Since (4) and (A6) indicate that both the range and average borrowing of market financed projects fall as the upper threshold increases we know that recourse to market finance has decreased in both sectors. And because this upper threshold has increased more in sector 1 (see (A7), we know that this fall in demand for market finance is greater in sector 1. ■

(c) Consider $BF^1 = \left\{I + c - \frac{A_h^1 + A_l^1}{2}\right\}\{A_h^1 - A_l^1\}$ and $BF^2 = \left\{I + c - \frac{A_h^2 + A_l^2}{2}\right\}\{A_h^2 - A_l^2\}$ (A9)

From (A4), (A6) and (A8) we know that the average bank borrowing in sector 1 falls, while the number of projects using bank finance increases, leaving the change in bank financing in sector 1 ambiguous. But in sector 2 both the average borrowing and the number of projects using bank finance fall, so that this sector's use of bank finance falls. This along with the result (that sector 1 uses less market finance) yields a presumption that sector 1 is now relatively bank dependent. To establish a sufficient condition for this it is simplest to consider these expressions at their new equilibrium values where $B^1 > B^2$ and $P > 1$. From (A9), (1) and (2) we have

$$BF^1 - BF^2 = \left\{I + c - \frac{A_h^1 + A_l^1}{2}\right\}\{A_h^1 - A_l^1\} - \left\{I + c - \frac{A_h^2 + A_l^2}{2}\right\}\{A_h^2 - A_l^2\} \quad \text{(A10)}$$

$$= \frac{1}{2}\left\{c + \frac{P}{R}[2\theta Y - B^1[1+b]\right\}\left\{\frac{P}{R}B^1[1-b] - c\right\}$$

$$-\frac{1}{2}\left\{c + \frac{1}{R}[2\theta Y - B^2[1+b]]\right\}\left\{\frac{1}{R}B^2[1-b] - c\right\}$$

Since we are looking for a sufficient condition for $BF^1 > BF^2$ and BF^1 is increasing in P, a condition that holds when $P = 1$ will also hold for higher prices. Setting $P = 1$, multiplying out and cancelling terms we get

$$BF^1 - BF^2 = \frac{B^1 - B^2}{R}\left\{c + \frac{1-b}{R}\left[\theta Y - [1+b]\frac{B^1 + B^2}{2}\right]\right\} \quad \text{(A11)}$$

A sufficient condition for $BF^1 > BF^2$ is $\theta Y > [1+b]\frac{B^1+B^2}{2}$. ■ (A12)

(d). From (6) we have $EF^j = \left\{I - \frac{1+A_l^j}{2}\right\}\left[1 - A_l^j\right] + c\left[A_h^j - A_l^j\right]$. Since $A_l^1 > A_l^2$, the number of externally financed projects is higher in Sector 2. But the number of bank financed projects is higher in sector 1, and since bank financed projects require additional (borrowed) capital of c, it is possible that sector 1 has the greater recourse to external finance. This ambiguity is not resolved if we follow the procedure above. Substituting from (1) and (2) and simplifying, we find that

$$EF^1 - EF^2 = \frac{1}{2}\left\{\left\{\frac{P[\theta Y - bB^1]}{R}\right\}^2 - \left\{\frac{\theta Y - bB^2}{R}\right\}^2\right\} - \frac{c}{R}\{P[\theta Y - B^1] - [\theta Y - B^2]\} \quad \text{(A13)}$$

If $P \cong 1$, both terms in parentheses are negative and the sign is ambiguous, but it is more likely to be negative the smaller is c. ■

Proof of Proposition 2

We are comparing the two countries in the trading equilibrium where both face the same relative price, and therefore the same interest rate, and have identical parameters except that b is higher in the home country.

(a) *The home country produces relatively more of, and therefore exports, good 2.* Consider the difference in outputs between the home and foreign countries in the trading equilibrium.

$$X^1 = Z + \theta P Y^1[1 - A_l^1] \quad \text{and} \quad X^2 = Z + \theta Y^2[1 - A_l^2] \qquad \text{(A14)}$$

Then[31] $\frac{\partial[X^1 - X^2]}{\partial b} = \left\{-\theta P Y \frac{\partial A_l^1}{\partial b} + \theta Y \frac{\partial A_l^2}{\partial b}\right\} = -\frac{\theta Y}{R}\{[P]^2 B^1 - B^2\}$ (A15)

Implying $\frac{\partial[X^1 - X^2]}{\partial b} < 0$, since $B^1 > B^2$ and $P > 1$. So, Home output of the relatively bank dependent sector 1 is lower implying that Home imports this good. ■

(b) *The Home country has the lower bank dependency in each sector, so aggregate bank dependency is lower at Home.* With regard to the sources of finance, MF^j is unaffected by the difference in b, but

$$\frac{\partial EF^j}{\partial b} = \frac{\partial BF^j}{\partial b} = -\left\{I + c - A_l^j\right\}\frac{\partial A_l^j}{\partial b} \qquad \text{(A16)}$$

So $\frac{\partial BF^1}{\partial b} = -B^1\left[\frac{P}{R}\right]^2[\theta Y - bB^1] < 0$ and $\frac{\partial BF^2}{\partial b} = -B^2\left[\frac{1}{R}\right]^2[\theta Y - bB^2] < 0$

The demand for bank finance and external finance both fall in each sector. Also

$$\frac{\partial BFD^j}{\partial b} = \frac{MF^j}{[EF^j]^2}\frac{\partial BF^j}{\partial b} = -\frac{MF^j}{[EF^2]^2}\left\{I + c - A_l^j\right\}\frac{\partial A_l^j}{\partial b} < 0 \qquad \text{(A17)}$$

The country with the relatively less efficient banking sector has lower bank dependency in each sector. Given that access to market finance is the same in the two countries and that access to bank finance is lower in both sectors in the Home country, then Home bank dependency is lower in aggregate. ■

[31] The outputs produced using the CRS technology (Z) also change, but these changes are equal in the two sectors and cancel each other in (A15).

(c) Sector 1 is relatively bank finance dependent in the Home country. In the trading equilibrium the two Home sectors face the same relative price, interest rate and parameters except that $B^1 > B^2$. In Proposition 1(c) we established that Condition 1 was sufficient for sector 1 to be the bank finance dependent sector in these circumstances. So provided Condition 1 continues to hold at the higher b, and we assume that it does, then sector 1 is relatively bank finance dependent in the Home country. ■

Proof of Proposition 3

We are again comparing the two countries in the trading equilibrium where both face the same relative price, and therefore the same interest rate, and have identical parameters except that Y^2 is higher in the home country.

(a) The home country produces relatively more of, and therefore exports, good 2. Consider the difference in outputs between the home and foreign countries in the trading equilibrium, where both face the same relative price and interest rate, but $Y^2 > Y^1$ at Home. From (A14) we have

$$X^1 = Z + \theta P Y^1[1 - A_l^1] \qquad \text{and} \qquad X^2 = Z + \theta Y^2[1 - A_l^2]$$

So that in comparing the home with the foreign country we have

$$\frac{\partial[X^1 - X^2]}{\partial Y^2} = -\theta\left\{[1 - A_l^2] - Y^2\frac{\partial A_l^2}{\partial Y^2}\right\} = -\theta\left\{[1 - A_l^2] + Y^2\frac{\theta}{R}\right\} < 0 \qquad \text{(A18)}$$

If Home has a superior technology in good 2 it produces relatively more of good 2 at any given relative prices and hence exports good 2 in the trading equilibrium. ■

(b) Sector 2 is the less bank dependent sector in the Home country. In the trading equilibrium the sectors in the Home country face the same relative price and interest rate but differ in two respects $B^1 > B^2$ and $Y^2 > Y^1$. In Proposition 1(c) we established that Condition 1 was sufficient for sector 1 to be relatively bank finance dependent if $B^1 > B^2$. Thus, as long as the improvement in technology in sector 2 does not lead it to become more bank dependent, we expect sector 1 to remain the relatively bank finance dependent sector in the home country.

Given the relative price (hence the interest rate), the effect of the increase in Y^2 on the thresholds in sector 2 in the Home country are $\frac{\partial A_h^2}{\partial Y^2} = -\frac{\theta}{R} = \frac{\partial A_l^2}{\partial Y^2}$. Both thresholds fall by the same amount. This implies more projects are market financed in sector 2, and because the marginal projects are by less wealthy asset owners, the average amount borrowed also increases.

So market finance unambiguously increases. So does bank finance. Although the number of projects subject to bank financing is unchanged, the relatively wealthier bank borrowers have been able to switch to market finance and have been replaced by larger borrowers. The net result is the same number of projects but an increase in average borrowing. Total external finance clearly increases. These results are confirmed by

$$\frac{\partial MF^2}{\partial Y^2} = \frac{\theta}{R}\{I - A_h^2\} > 0 \tag{A19}$$

$$\frac{\partial BF^2}{\partial Y^2} = -\frac{\theta}{R}\{I + c - A_h^2\} + \frac{\theta}{R}\{I + c - A_l^2\} = \frac{\theta}{R}[A_h^2 - A_l^2] > 0 \tag{A20}$$

$$\frac{\partial EF^2}{\partial Y^2} = \frac{\theta}{R}\{I - A_l^2\} > 0 \tag{A21}$$

Looking at bank finance dependency in sector 2 we have

$$BFD^2 = \frac{BF^2}{EF^2} = \frac{BF^2}{MF^2+BF^2}$$

So $$\frac{\partial BFD^2}{\partial Y^2} = \frac{MF^2\frac{\partial BF^2}{\partial Y^2} - BF^2\frac{\partial MF^2}{\partial Y^2}}{[EF^2]^2} = \frac{\theta}{R}\frac{1}{[EF^2]^2}\{MF^2[A_h^2 - A_l^2] - BF^2[I - A_h^2]\} \tag{A22}$$

$$\frac{\partial BFD^2}{\partial Y^2} = -\frac{\theta}{R}\frac{[I-A_h^2][A_h^2-A_l^2]}{[EF^2]^2}\left\{\frac{[I-A_l^2]}{2} + c\right\} < 0 \tag{A23}$$

That is, the bank dependency of sector 2 is lower in the Home country as a result of the improvement in its technology. ■

(c) Aggregate bank dependency is lower in the Home country. The difference between aggregate bank finance dependency in the Home and Foreign countries in the trading equilibrium can be derived in a similar way.

$$BFD = \frac{BF}{EF}$$

so $$\frac{\partial BFD}{\partial Y^2} = \frac{1}{[EF]^2}\left\{EF\frac{\partial BF}{\partial Y^2} - BF\frac{\partial EF}{\partial Y^2}\right\} = \frac{1}{EF}\left\{\frac{\partial BF^2}{\partial Y^2} - BFD\frac{\partial EF^2}{\partial Y^2}\right\} \tag{A24}$$

Substituting from above

$$\frac{\partial BFD}{\partial Y^2} = \frac{1}{EF}\frac{\theta}{R}\{[A_h^2 - A_l^2] - BFD[I - A_h^2]\} = \frac{\theta[I-A_h^2]}{R.EF.}\left\{\frac{[A_h^2-A_l^2]}{[I-A_h^2]} - BFD\right\} \tag{A25}$$

Now $$\frac{[A_h^2-A_l^2]}{[I-A_h^2]} < \frac{[A_h^2-A_l^2]}{[1-A_h^2]} = \frac{BF^2}{\overline{BF}^2}\Big/\frac{EF^2}{\overline{EF}^2} = \frac{BF^2}{EF^2}\frac{\overline{EF}^2}{\overline{BF}^2} < \frac{BF^2}{EF^2} = BFD^2 < BFD \tag{A26}$$

Where we have used $I > 1$ and that average bank borrowing $(\overline{BF}^2)$ is higher than average borrowing $(\overline{EF}^2)$ since the agents with the least wealth are those that resort to bank finance.

So $\frac{\partial BFD}{\partial Y^2} < 0$. Thus, the aggregate bank dependency will be lower in the country with the comparative advantage in the non-bank dependent sector. ■

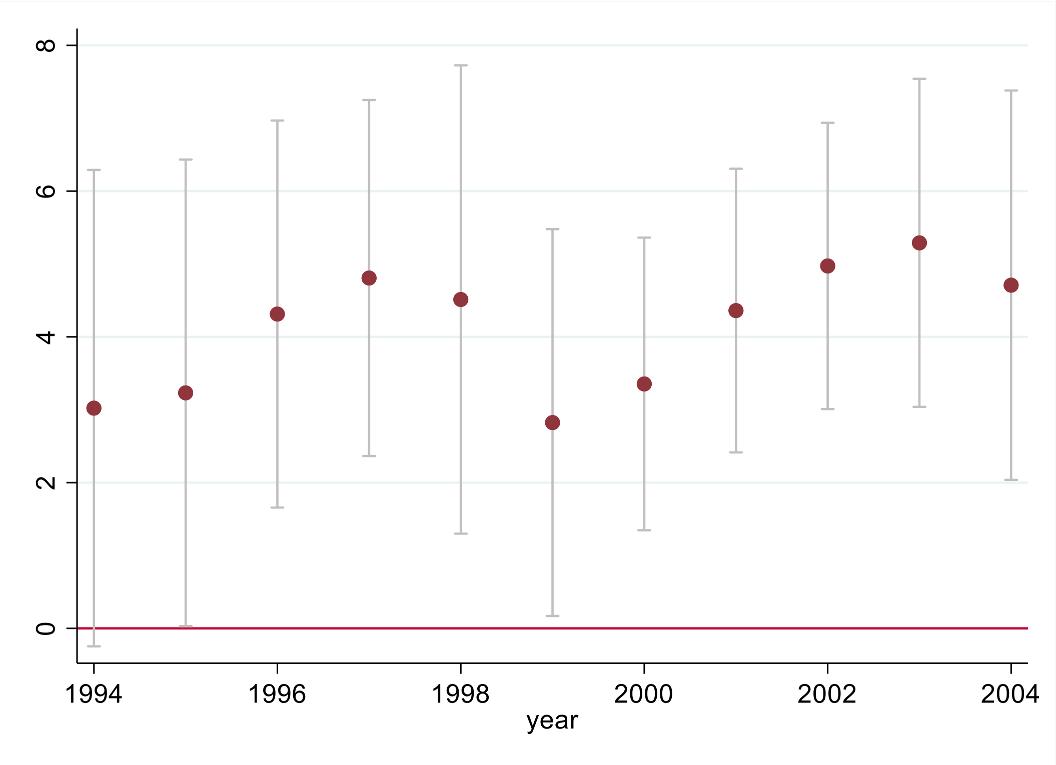
Appendix 2

We reproduce a similar exercise as the one presented in Table 3 Column II but for each year between 1994 and 2004 (one regression per year), where our dependent variable as well as our measure of banking development are for a given year.

$$X_{ci} = \alpha_0 + \beta_1(BANDEV_c \times BFD_i) + \beta_2(BANDEV_c \times EFD_i) + \gamma_c + \gamma_i + \varepsilon_{ci}$$

Standard errors are clustered at the country level. Graph A2.1 presents the different point estimates and the 90% confidence intervals of β_1.

Graph A2.1: Point estimates and confidence intervals of β_1 for each year.



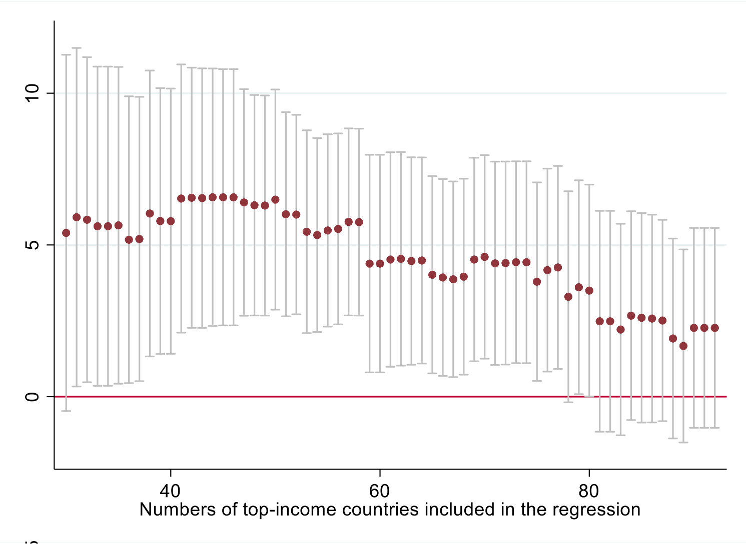
Appendix 3: Robustness checks

We produce a sequence of regressions, similar to that presented in Table 3 Column II, in which the nth regression ($n = 30,.,92$) includes only those n countries with the highest level of GDP per capita. Let C_n denote the set of n countries with the highest GDP per capita ($n = 30,.,92$). Then we regress ($c \in C_n$)

$$X_{ci} = \alpha_0 + \beta_1(BANDEV_c \times BFD_i) + \beta_2(BANDEV_c \times EFD_i) + \gamma_c + \gamma_i + \varepsilon_{ci}$$

Standard errors are clustered at the country level. In Graph A3.1, we report the coefficient β_1 associated with the interaction term $BANDEV_c \times BFD_i$ and the 90% confidence intervals. In Graph A3.2, we report the coefficient β_2 associated with the interaction term $BANDEV_c \times EFD_i$ and the 90% confidence intervals.

Graph A3.1: Point estimates and confidence intervals of β_1 for top-income countries.



Graph A3.2: Point estimates and confidence intervals of β_2 for top-income countries.

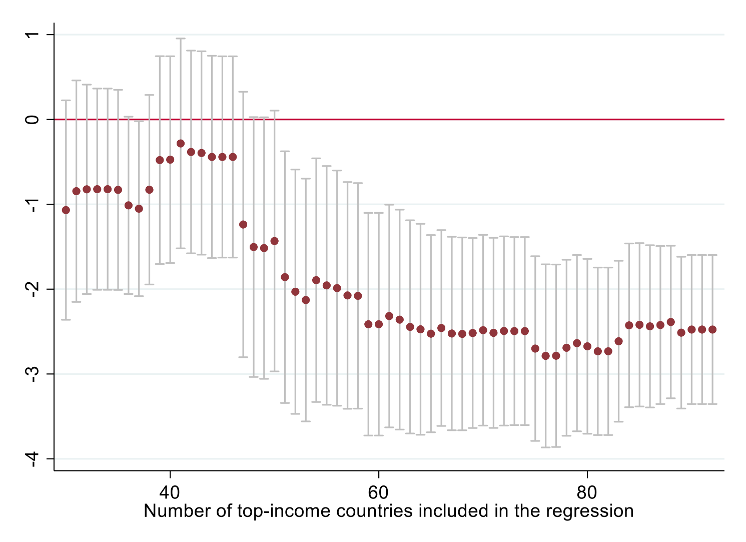


Table A.3.0: Results without fixed effects – OECD countries

	Without fixed effects **I**	Re-scaling by country's total exports **II**	Re-scaling by industry's total exports **III**
Bank Development ($BankDev_c$)	4.332***	4.801***	4.542***
× Bank Finance Dependence (BFD_i)	(1.122)	(1.266)	(1.213)
Bank Development ($BankDev_c$)	-2.669*	-0.467	
	(1.342)	(0.529)	
Bank Finance Dependence (BFD_i)	-0.480		-3.200***
	(0.910)		(0.762)
Observations	809	809	809
R-squared	0.069	0.636	0.713

All regressions include a constant term, exporter and sector fixed effects. All regressions include physical and human capital interactions (capital abundance × capital intensity and human capital abundance × human capital intensity) to control for traditional comparative advantages. Robust standard-errors clustered at the country level are reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

In column I, the dependent variable is the log of exports to the rest of the world by each 3-digit ISIC sector for the year 2001. In columns II and III, the dependent variable is the log of exports to the rest of the world by each 3-digit ISIC sector for the year 2001, after having re-scaled it by country's total exports and industry's total export (respectively in columns II and III).

Table A.3.1: Robustness: Financial and economic development – OECD countries

Additional robustness	Levine (2002)'s restriction		GDP per cap interaction		Levine (2002)'s restriction and GDP per cap interaction	
	I	**II**	**III**	**IV**	**V**	**VI**
Bank Development ($BankDev_c$)	4.289***	4.210***	2.837**	2.782*	3.112**	3.076**
× Bank Finance Dependence (BFD_i)	(1.020)	(1.084)	(1.340)	(1.382)	(1.312)	(1.358)
Financial Development ($FinDev_c$)		0.066		0.084		0.051
× External Finance Dependence (EFD_i)		(0.129)		(0.129)		(0.128)
GDP per cap			-1.475**	-1.426**	-1.366**	-1.338**
× Bank Finance Dependence (BFD_i)			(0.678)	(0.654)	(0.662)	(0.643)
# Observations	781	781	809	809	781	781
R-squared	0.835	0.835	0.833	0.833	0.836	0.836

The dependent variable is the log of exports to the rest of the world by each 3-digit ISIC sector for the year 2001. All regressions include a constant term, exporter and sector fixed effects. All regressions include physical and human capital interactions (capital abundance × capital intensity and human capital abundance × human capital intensity) to control for traditional comparative advantages. Robust standard-errors clustered at the country level are reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

Table A.3.2: Robustness: Alternative specifications for OECD countries

Alternative measure for BFD:	Using 25th pct	Using 75th pct	Bank finance / total debt	1 - (Market finance / total debt)	Alternative Bank Dev.
	I	**II**	**III**	**IV**	**V**
Bank Development ($BankDev_c$)	8.655***	3.362***	8.292***	5.137**	4.176***
× Bank Finance Dependence (BFD_i)	(3.069)	(1.126)	(2.605)	(1.997)	(1.107)
Financial Development ($FinDev_c$)	0.086	0.123	0.107	0.079	0.095
× External Finance Dependence (EFD_i)	(0.134)	(0.128)	(0.130)	(0.136)	(0.132)
Observations	809	809	809	809	809
R-squared	0.832	0.832	0.832	0.832	0.832

The dependent variable is the log of exports to the rest of the world for each 3-digit ISIC sector for the year 2001. All regressions include a constant term, exporter and sector fixed effects. All regressions include physical and human capital interactions (capital abundance × capital intensity and human capital abundance × human capital intensity) to control for traditional comparative advantages. Robust standard-errors clustered at the country level reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

Table A.3.3: Bank Loans, Equity and Bonds - OECD countries

Alternative measure for BFD:	Bank-finance / (Bank-finance + Equity)		Bank / (Bank-finance + Bonds)		Bonds / (Equity+ Bonds)	
	I	**II**	**III**	**IV**	**V**	**VI**
Bank Development ($BankDev_c$) × Bank Finance Dependence (BFD_i)	3.359*** (1.110)	3.223** (1.268)	2.528* (1.304)	2.589* (1.284)	-1.833 (2.534)	-2.731 (2.626)
Financial Development ($FinDev_c$) × External Finance Dependence (EFD_i)		0.060 (0.140)		0.130 (0.127)		0.157 (0.132)
Observations	809	809	809	809	809	809
R-squared	0.832	0.832	0.831	0.831	0.831	0.831

The dependent variable is the log of exports to the rest of the world for each 3-digit ISIC sector for the year 2001. All regressions include a constant term, exporter and sector fixed effects. All regressions include physical and human capital interactions (capital abundance × capital intensity and human capital abundance × human capital intensity) to control for traditional comparative advantages. Robust standard-errors clustered at the country level reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

Appendix 4: Financial Market Development and Comparative Advantage – OECD countries

Table A4.1: Robustness – OECD countries

Alternative measure for BFD:	Using 25th pct **I**	Using 75th pct **II**	Bank / total debt **III**	1 – (Equity / total debt) **IV**	First sign **V**	Additional fixed Effects **VI**
Equity Liberalization (Lib_{ct})	0.060	0.400	0.230	1.319**	0.201	
	(0.182)	(0.337)	(0.207)	(0.611)	(0.243)	
Equity Liberalization (Lib_{ct})	-3.595**	-0.938**	-3.792***	-1.876**	-1.582**	-1.051*
× Bank Finance Dependence (BFD_i)	(1.561)	(0.451)	(1.371)	(0.708)	(0.653)	(0.519)
Equity Liberalization (Lib_{ct})	0.184	0.374**	0.282	0.178	0.306	0.105
× External Finance Dependence (EFD_i)	(0.208)	(0.179)	(0.188)	(0.199)	(0.208)	(0.163)
Observations	17,529	17,529	17,529	17,529	17,529	17,524
R-squared	0.799	0.798	0.799	0.798	0.799	0.966

The dependent variable is the log of exports to the rest of the world by each 3-digit ISIC sector for the years 1979-2004. All regressions include a constant term, year and exporter and sector fixed effects. All regressions include physical and human capital interactions (capital abundance × capital intensity and human capital abundance × human capital intensity) to control for traditional comparative advantages. Standard-errors clustered at the country level reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level. Column VIII includes country×year, industry×year and country×industry fixed effects.

Appendix 5: Export Bank Dependence and Financial Architecture

Table A5.1 presents the cross-sectional OLS regression between a country's level of bank development over time and the corresponding level of bank finance required to finance exports, without relying on the IV strategy. We estimate the following equation:

$$BankDev_{ct} = \alpha_0 + \beta_1 BFNX_{ct} + \beta_1 EFNX_{ct} + GDP_{ct} + \gamma_c + \gamma_t + \varepsilon_{ct}$$

The variables are as defined in section 4.2. The columns of Table A5.1 follow the same sequence as those of Table 5. As in Table 5, the level of bank development of a country ($BankDev_{ct}$) appears to be positively and significantly correlated with its export dependence on bank finance ($BFNX_{ct}$) only for the OECD countries (column I). This result is robust to the introduction of the $EFNX_{ct}$ variable (column II).

Table A5.1: Export Bank Dependence and Financial Architecture: OLS

Countries included in the sample:	OECD **I**	OECD **II**	Non-OECD **III**	Non-OECD **IV**
Bank Finance needed for export (BFNX)	1.076* (0.551)	1.630** (0.676)	-0.091 (0.061)	-0.223** (0.082)
External Finance needed for export (EFNX)		-0.672* (0.373)		0.271* (0.144)
Observations	443	443	339	339
R-squared	0.827	0.832	0.768	0.772

The dependent variable is a country's banking sector development for the years 1979-2004. All regressions include a constant term, year and exporter fixed. Standard-errors clustered at the country level reported in parentheses. ***, **, *, indicate significance at the 1%, 5%, and 10% level.

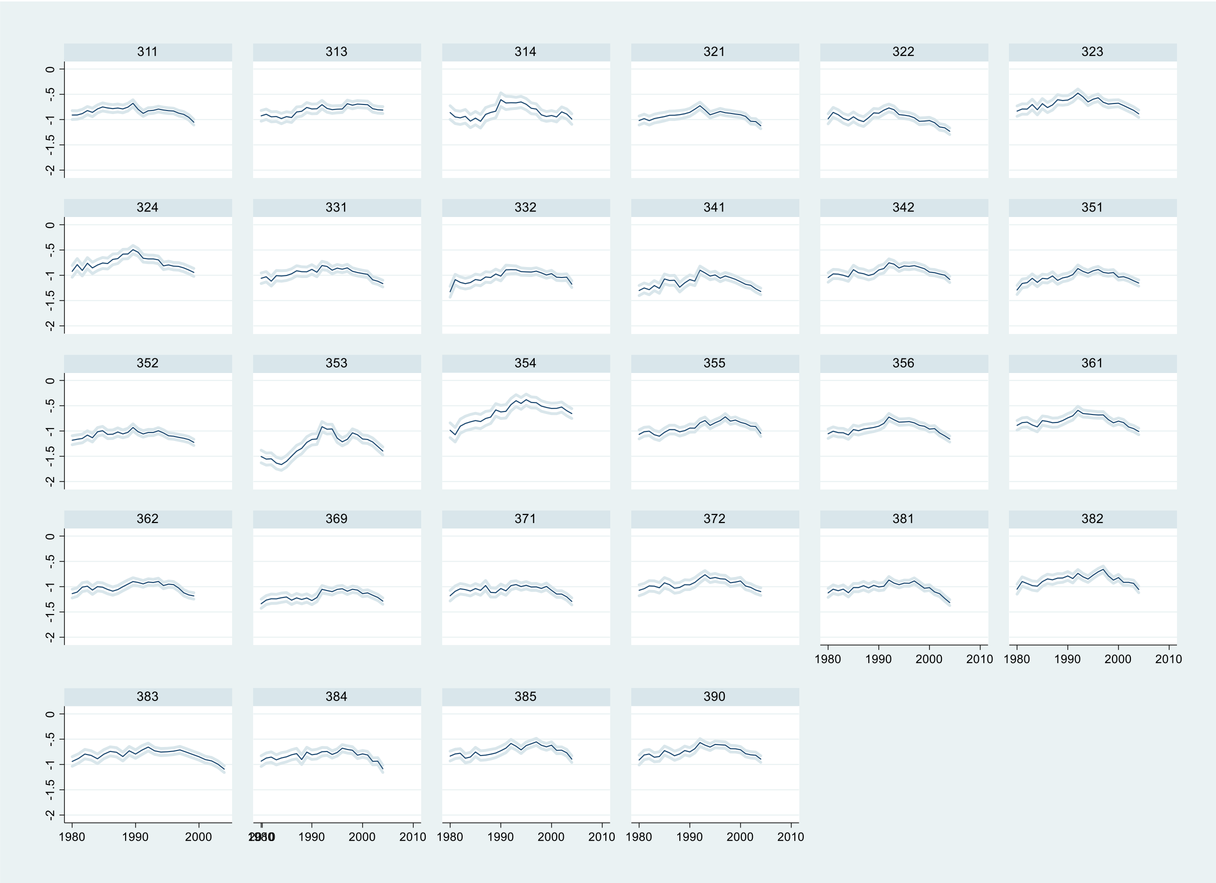
Table A5.2 provides the robustness results for the sample of OECD countries and discussed at the end of section 5.2.

Table A5.2: Export Bank Dependence and Financial Architecture: Instrumental Variable – Robustness– OECD countries

	Using 25th pct	Using 75th pct	Bank / total debt	1 - (Equity / total debt)	Alternative Bank Dev.
	I	**II**	**III**	**IV**	**V**
	Panel A: Second Stage				
Bank Finance needed for export (BFNX)	15.414**	1.064*	7.272**	0.648	1.840**
	(6.890)	(0.599)	(3.440)	(0.418)	(0.811)
External Finance needed for export (EFNX)	-0.536	-1.173	-0.993	-0.838	-0.669*
	(0.587)	(0.807)	(0.654)	(0.657)	(0.387)
	Panel B: First Stage				
Predicted BFNX	0.808***	0.914***	0.948***	1.056***	1.077***
	(0.245)	(0.075)	(0.168)	(0.034)	(0.170)
Observations	468	468	468	468	468
F-stat	10.89	147.39	32.01	977.82	39.95

In the second stage, the dependent variable is a country's banking sector development for the years 1979-2004. All regressions include a constant term, year and exporter fixed. Standard-errors clustered at the country level reported in parentheses. ***, **, *, † indicate significance at the 1%, 5%, 10% and 12% level.

Graph A5.1: Coefficients associated with bilateral distance for each sector.



The Graph provides the distance elasticity for each year and each sector, as well as the 10 percent confidence interval. Industry names associated with each Industry code are provided in Table 1. The coefficients are obtained from a gravity equation using bilateral trades on a cross section of 170 countries for each of the 28 sectors and 25 years independently. The data and the gravity equations estimated are identical to those used by Do and Levchenko (2007).

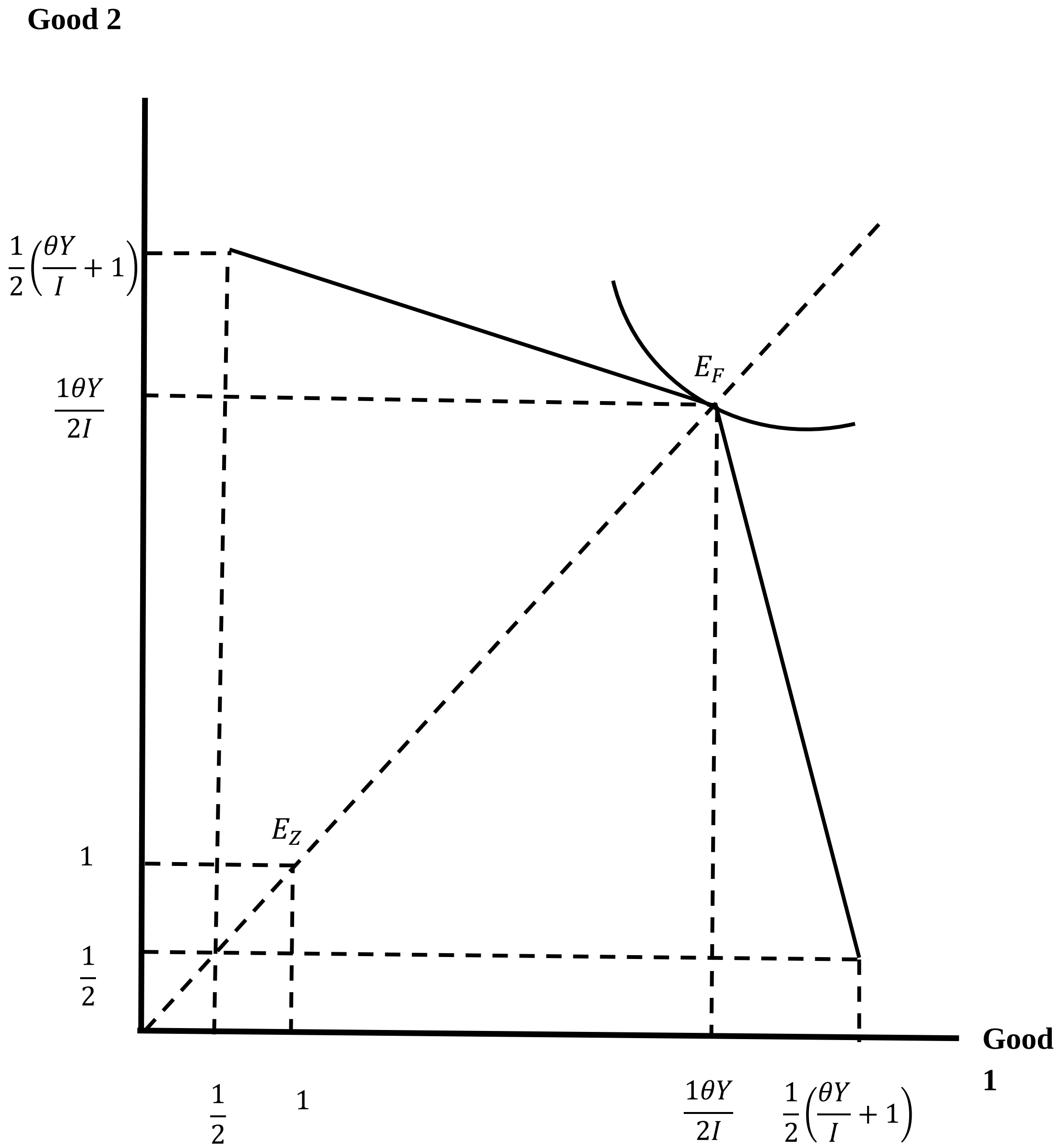


Figure 1: The symmetric equilibrium

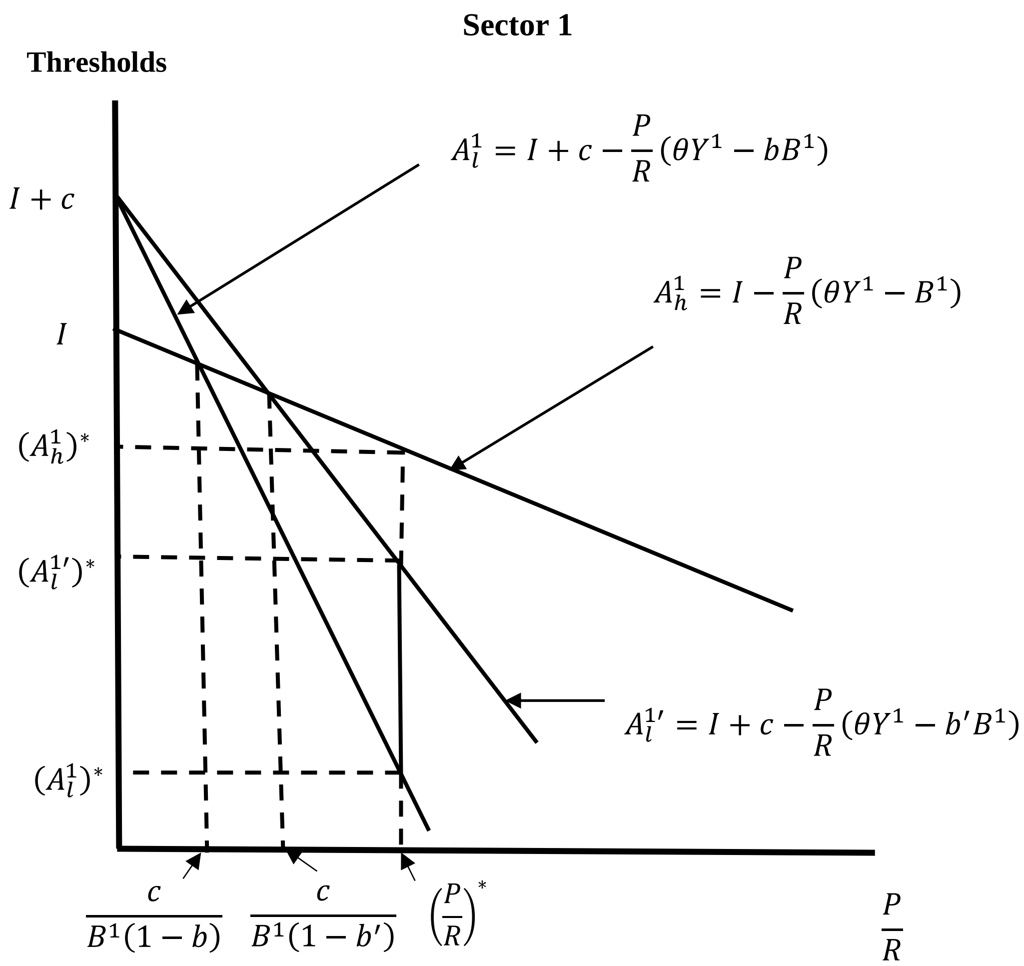


Figure 2: Thresholds and differences in bank monitoring efficiency

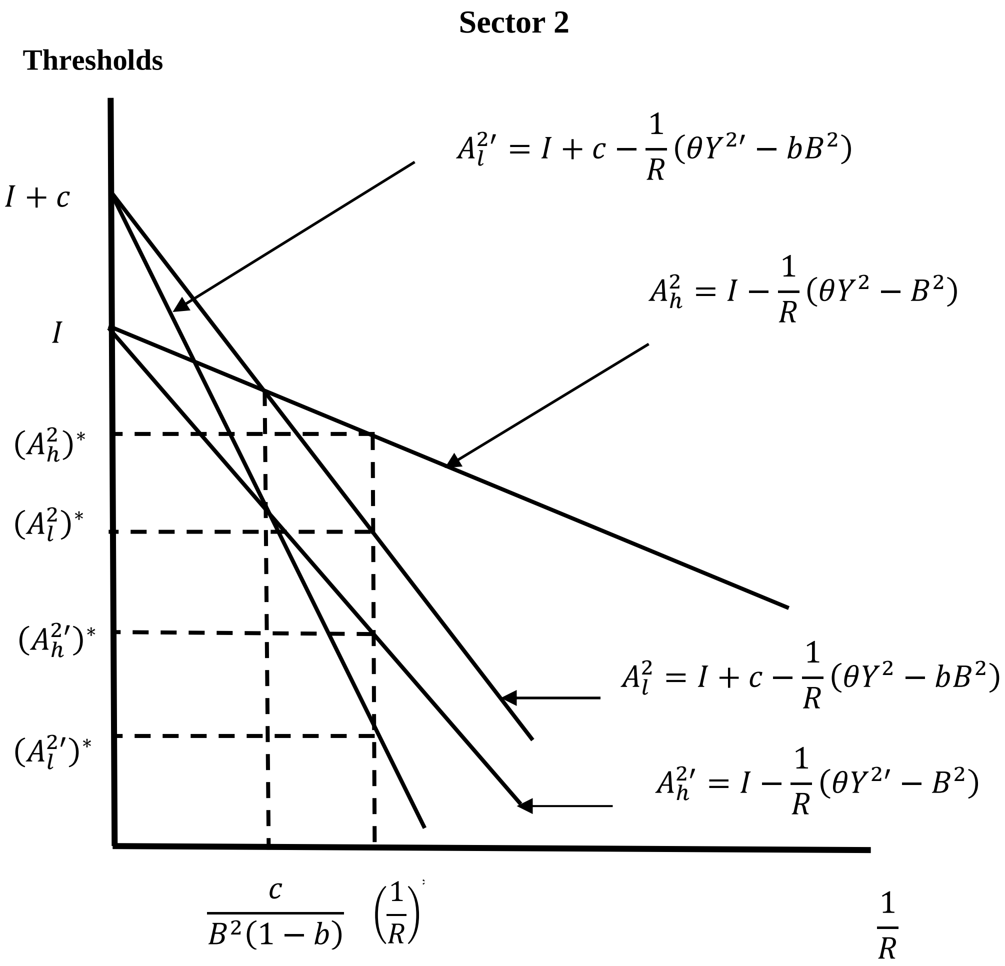


Figure 3: Thresholds and differences in sector productivity