Finance, investment, and growth

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Abstract

This paper examines the relation between the institutional structures of advanced OECD countries and the comparative growth and investment of 27 industries in those countries over the period 1970 to 1995. The paper reports a strong relation between the structure of countries' financial systems, the characteristics of industries, and the growth and investment of industries in different countries.

Keywords: financial systems, ownership, growth, investment, R&D

JEL classification: E2, G3, O4

1. Introduction

There is a large literature reporting a relationship between financial development and economic growth. This literature is concerned with the relation of growth to overall financial development, to the bank or market orientation of financial systems, and to the degree of legal enforcement of minority investor rights. It also considers whether the link between financial development and growth is particularly significant for firms and industries that are dependent on external finance. For recent surveys, see Levine (1997), Beck, Demirgüç-Kunt, Levine and Maksimovic (2001), and Wachtel (2001).

A common feature of these studies is that they relate to a combination of developing and developed countries. Commenting on studies of advanced economies, Levine notes in his survey of the nexus between finance and growth that "comparisons of financial structure and economic development using only these countries will tend to suggest that financial structure is unrelated to the level and growth rate of economic development" (1997, p. 720). Developed countries have a wide variation in the structure of financial systems and governance of companies. Some of these countries have large stock markets, while others have large banking systems. Some have dispersed share ownership, while others have highly concentrated ownership. This raises the question of what, if anything is the relation between the pronounced differences in financial structure of advanced countries and their economic growth and investment. Are all financial institutions equally well suited to all activities, industries, and countries? These are the issues addressed in this paper.

Several recent theoretical models point to a relation between types of financial system and types of economic activity. There are three classes of such theories of which Allen and Gale (2000) provide a summary. The first class emphasizes differences in the way in which financial systems accumulate information. Allen (1993) and Allen and Gale (1999) argue that stock markets allow investors to hold diverse views about investments, whereas banks can exploit economies in acquiring information about firms where there is a high degree of consensus. Securities markets are therefore particularly relevant where investors have diverse views (e.g., about new technologies). Banks can exploit economies of scale in collecting information about more traditional investments when technologies are well understood. According to Boyd and Smith (1998), the relative significance of equity markets and debt varies with stages of economic development. In developed economies, monitoring is expensive relative to capital costs so technologies that involve relatively low monitoring costs are preferred. These are associated with equity markets rather than debt so, as economies grow, equity market activity increases relative to debt.

The second set of theories relates to renegotiation. In Dewatripont and Maskin (1995), decentralized financial systems with many small banks impose tighter budget constraints than centralized systems with a small number of banks. Multi-bank systems are therefore better at imposing hard budget constraints on inefficient

projects but display short-term behaviour in their failure to sustain efficient long-term projects. The Dewatripont-Maskin model suggests that financial systems with many small banks foster industries with short-term projects whereas industries with longer-term investments fare better in systems with a few large banks. In Huang and Xu (1999), multi-bank/dispersed creditor systems are associated with research and development (R&D) intensive industries, particularly when companies are young and uncertainty is high. On the other hand, single bank/concentrated creditor systems favour industries with lower uncertainty and imitative investments. As in Gerschenkron (1962), there is also an association with stages of development: single bank/concentrated creditor systems finance early phases of development when investment takes the form of imitation but multi-bank/dispersed creditor systems finance more advanced stages of development.

The third set of theories concerns corporate governance and commitment. Stiglitz (1985), Shleifer and Vishny (1986), and Huddart (1993) argue that concentrated ownership is required to provide shareholders with adequate incentives to engage in active corporate governance. Corporate governance is therefore more effective under concentrated rather than dispersed ownership systems. But Allen and Gale (2000) note that active corporate governance by large shareholders can also create interference in activities that are best delegated to managers, and Shleifer and Vishny (1997) and La Porta et al. (1999) argue that they are associated with more conflicts with minority investors. According to Burkhart, Gromb, and Panunzi (1997), ownership concentration can be used to determine the commitment of investors to preserving incentives that encourage managerial investment. Dispersed shareholders can more credibly commit than concentrated owners not to interfere in the running of firms. Dispersed ownership is therefore suited to activities that require investments by outside investors, management, and other stakeholders, and concentrated ownership to internally funded activities requiring active corporate governance.

In all of the above models, financial and ownership systems are associated with different *types* of corporate activities and investments. Information theories point to the relevance of information flows. Specifically, securities markets allow for diverse views amongst investors about, for example, new technologies, while more traditional investments benefit from the economies of monitoring banks can provide. The renegotiation literature emphasizes the concentration of credit markets in that fragmented banking systems and credit markets are associated with high-risk R&D investments, and concentrated credit markets are associated with long-term investments in more mature industries. The governance/commitment literature emphasizes ownership concentration in that dispersed ownership systems are associated with activities that require participation by outside investors, managers, and other stakeholders, and concentrated ownership systems are associated with internally funded activities requiring active corporate governance. Both information and renegotiation theories suggest that these relations are sensitive to stages of

economic development with bank finance and concentrated banking being more suited to economies at earlier stages of development.

A few examples illustrate these relations. The first is the nature of patenting activity in Germany and the US. Germany has significantly lower accounting disclosure than the US but much higher levels of ownership concentration. On the basis of the above theories, the German financial system would therefore be predicted to be more closely associated with mature, internally funded industries and the US with high technology, external-finance dependent industries. When industries are ranked by the intensity of patent registrations, patenting intensity in Germany (relative to a 12-country average) is almost inversely related to that of the US. Information technology, semi-conductors, and biotechnology, for example, are in the top six (of 30) industries by patent registrations for the US and in the bottom four for Germany. Germany's patent specialization is highest in civil engineering and transport equipment, which are in the bottom three industries in the US.[1]

A second example, drawing on data from our study, is the comparative growth of industries in two Nordic countries, Denmark and Finland. Accounting standards in Denmark are below the average of the advanced countries in our study, while Finland's are above average. This is attributable to less disclosure of shareholder information in Denmark than in Finland (CIFAR, 1993). Bank and ownership concentration are similar in the two countries. On the basis of the above theories, we would therefore predict higher growth of equity dependent industries in Finland than in Denmark. The four industries with the highest equity dependence in our study are instruments, electrical machinery, plastics and non-electrical machinery. In Finland, growth in all of these industries increased during the 1980s and rose again sharply in electrical machinery during the 1990s. In contrast, Denmark's growth declined in these four industries during both the 1980s and 1990s. Consistent with the theoretical predictions, equity dependent industries grew faster through a period of technological shocks in the country with the better accounting disclosure.

Traditional theories of comparative advantage would emphasize the natural resource endowment of Finland relative to Denmark as a source of advantage in resource intensive industries, such as wood products and furniture. In fact, over the period of our study, the relative growth of these industries accelerated markedly in Denmark relative to Finland. Over this period measures of the financial structure of the two countries appear to be more relevant to the comparative performance of their industries than are the underlying resource endowments. These examples illustrate the associations that can exist between financial systems and economic activities in different countries. Systematic empirical analyses are required to substantiate or refute them.

The existing empirical literature addresses related but distinct issues. One body of literature uses cross-country data to evaluate the hypothesis that bank and

[1] Patent specialization indices for 30 industries are calculated from patents registered at the European Patent Office (Hall and Soskice, 2001). The correlation between the German and US indices is -0.78.

stock market development have independent effects on growth. Levine and Zervos (1998) is the benchmark study. They report that both the size of the banking sector and the extent of stock market activity (measured by the ratio of value of shares traded to either market capitalization or GDP) are related to future economic growth. Levine and Zervos use a conventional cross-country growth regression methodology. This is subject to the objection that the unobserved heterogeneity of countries could be correlated with financial development and growth, thereby complicating interpretation of the coefficient on financial development.

A second approach is to use panel data sets and to employ dynamic techniques to eliminate biases due to country fixed effects. Beck, Levine, and Loayza (2000) confirm the positive impact of banking sector development on growth in a dynamic panel analysis of data on financial intermediary credits to the private sector (as a percentage of GDP) in 77 countries over the period 1960 to 1995. Rousseau and Wachtel (2000) use dynamic panel techniques on 47 countries over the period 1980 to 1995 and find a positive influence of both stock market activity (per capita value traded) and banking sector development (per capita liquid liabilities (M3)) on growth. Demirgüç-Kunt and Maksimovic (1998) report results consistent with these using a sample of large firms from 40 countries.

Rajan and Zingales (1998) examine the channel through which financial development influences growth. They control for country (and industry) fixed effects using industry-level data and test whether the growth of industries dependent on external finance is particularly strongly related to financial development. They assess the influence of "accounting standards" as well as the size of banking sectors and stock markets. Their results support the view that the quality of financial development, as measured by accounting standards, fosters growth in industries that are dependent on external finance. Cetorelli and Gambera (2001) perform a similar analysis to Rajan and Zingales with the modification that they test for the role of the structure, rather than size, of the banking system in providing finance for industries especially dependent on external finance. They find that industries dependent on external finance grow faster in the presence of a concentrated banking system.

A series of recent papers addresses the question of whether the balance of financial institutions (i.e., bank or market-based), in an economy affects its aggregate growth or growth in industries particularly dependent on external finance. Levine (2002), Beck and Levine (2002), Demirgüç-Kunt and Maksimovic (2002) and Beck, Demirgüç-Kunt, Levine and Maksimovic (2001) and report that overall financial development and the efficiency of the legal system rather than financial structure influence growth.

This paper differs in three key respects from the existing empirical literature. First, it examines the interrelation between the structure of countries' financial systems, the characteristics of industries, and growth and investment of industries in different countries. We do this by performing cross-sectional regressions of growth and investment of industries in particular countries on the institutions of the countries

and the characteristics of the industries. The above theories suggest that the institutional structures that are most relevant are information disclosure, the size and concentration of credit markets, and ownership concentration. The relevant institution-related characteristics of industries are their reliance on market and bank sources of finance and inputs from other stakeholders.

The second respect in which the paper differs from the existing empirical literature is in distinguishing between fixed investment and R&D. We examine whether the interaction between country financial institutions and industry characteristics is related to levels of fixed capital formation and R&D expenditure as well as to the growth of output. The theories suggest that some institutions are particularly relevant for intangible investments and others for tangible ones. Finally, it differs from the existing empirical literature by taking a set of advanced economies as its base-line sample. This reflects the theoretical insights that the financial institutions appropriate for different industries may differ according to the stage of development.

The paper reports a strong relation between the structure of countries' financial systems, the characteristics of industries, and the growth and investment of industries in different countries. There is a particularly strong relation between the structures of countries' financial systems and the growth of industries that are dependent on external equity and skilled labour. As predicted by theory, relations with industries that are dependent on bank finance are more in evidence in countries at earlier stages in their development. The relations with investment are much more pronounced for R&D than for fixed capital, suggesting that financial systems in developed economies are primarily associated with patterns of R&D rather than fixed investment.

The paper is organized as follows. Section 2 describes the hypotheses that the paper tests. Section 3 details the data that are employed while Section 4 describes the methodology that has been used. Section 5 reports the regression results and Section 6 summarizes their implications.

2. Hypotheses

This paper examines how the interaction between the structure of countries' financial systems and the characteristics of industries relates to the growth and investment of different industries in different countries. Since institutional factors may affect the type as well as the scale of investment, we distinguish in the investment equations between fixed investment and research and development (R&D).

The theories discussed in Section 1 refer to the relevance of information disclosure, bank concentration, and ownership concentration to the provision of market sources of finance, bank finance, and investments by other stakeholders. The paper reports the results of estimating equations for growth ($Growth_{ik}$), fixed

investment (as a share of value added) (FI_{ik}), and research and development (as a share of value added) ($R\&D_{ik}$) in industry i in country k. In each equation, the dependent variable is regressed on a set of terms that interact country structure variables (proxies for information disclosure ($disclosure_k$), bank concentration ($bankconc_k$), and ownership concentration ($ownconc_k$) in country k) with industry characteristic variables (proxies for equity-finance dependence ($equity_i$), bank-finance dependence ($bank_i$), and dependence on inputs by other stakeholders ($other_i$) in industry i). In each equation, there is also a full set of country and industry dummies. In the growth equation, there is an additional term (the initial share of industry i in output of country k ($share_{ik}$)) to control for regression to the mean, which is discussed in Section 3.

The three equations are as follows:

$$\begin{aligned} Growth_{ik} = {} & \gamma_1(disclosure_k*equity_i) + \gamma_2(disclosure_k*bank_i) + \gamma_3(disclosure_k*other_i) \\ & + \gamma_4(bankconc_k*equity_i) + \gamma_5(bankconc_k*bank_i) + \gamma_6(bankconc_k*other_i) \\ & + \gamma_7(ownconc_k*equity_i) + \gamma_8(ownconc_k*bank_i) + \gamma_9(ownconc_k*other_i) \\ & + \gamma_{10}\, share_{ik} + \text{country dummies} + \text{industry dummies} + \varepsilon_{ik} \end{aligned} \quad (1)$$

$$\begin{aligned} FI_{ik} = {} & \varphi_1(disclosure_k*equity_i) + \varphi_2(disclosure_k*bank_i) + \varphi_3(disclosure_k*other_i) \\ & + \varphi_4(bankconc_k*equity_i) + \varphi_5(bankconc_k*bank_i) + \varphi_6(bankconc_k*other_i) \\ & + \varphi_7(ownconc_k*equity_i) + \varphi_8(ownconc_k*bank_i) + \varphi_9(ownconc_k*other_i \\ & + \text{country dummies} + \text{industry dummies} + \varepsilon_{ik} \end{aligned} \quad (2)$$

$$\begin{aligned} R\&D_{ik} = {} & \rho_1(disclosure_k*equity_i) + \rho_2(disclosure_k*bank_i) + \rho_3(disclosure_k*other_i) \\ & + \rho_4(bankconc_k*equity_i) + \rho_5(bankconc_k*bank_i) + \rho_6(bankconc_k*other_i) \\ & + \rho_7(ownconc_k*equity_i) + \rho_8(ownconc_k*bank_i) + \rho_9(ownconc_k*other_i) \\ & + \text{country dummies} + \text{industry dummies} + \varepsilon_{ik} \end{aligned} \quad (3)$$

If information disclosure were critical to the provision of market finance then we would expect industries that are dependent on external market sources to grow rapidly in countries with good information disclosure. Furthermore, if market sources are associated with the financing of new technology, then the interaction of information disclosure and external market dependence should be more evident in the R&D than the fixed investment equation. Since capital is scarce in developing countries, monitoring costs are low relative to the cost of capital (Boyd and Smith, 1998). Therefore in developing countries, forms of finance that are intensive in monitoring (bank finance) are preferred. This suggests that developed and developing countries should not be pooled. We summarize how the theoretical predictions would be reflected in the regression coefficients as

H1: The coefficients on the interaction between the proxy for information disclosure (accounting standards) and equity dependence are positive in the growth and investment equations (i.e,. $\gamma_1 > 0$, $\varphi_1 > 0$, *and* $\rho_1 > 0$*) and more significant in the*

R&D than in the fixed investment equation. The coefficients on the interactive terms with bank dependency (γ_2, γ_5, γ_8) will be more significant in developing than developed countries.

If dispersed banking systems facilitate the imposition of hard budget constraints in developed countries, then we would expect industries that are dependent on bank finance to grow more rapidly and invest more in countries with dispersed banking systems. This will be more evident in innovative R&D investments than in imitative fixed investment. Bank-dependent industries at earlier stages of development benefit from the longer-term investments that concentrated banking systems provide to more imitative industries. A second hypothesis is postulated that states

H2: The coefficients on the interaction between bank concentration and bank finance dependence are negative in the growth and investment equations in developed countries (i.e., $\gamma_5 < 0$, $\varphi_5 < 0$, and $\rho_5 < 0$) *and more significant in the R&D than in the fixed investment equation. Conversely, for developing countries, the sign on interaction term between bank concentration and bank dependence is reversed (i.e.,* $\gamma_5 > 0$).

If dispersed owners can offer more credible commitments to outside stakeholders and concentrated shareholders provide better governance of internally financed activities, then we would expect industries that are dependent on external sources of finance and other stakeholders to grow more rapidly in countries with dispersed ownership.

H3: The coefficients on the interaction terms with ownership concentration are negative in the growth and investment equations (i.e., $\gamma_7 < 0$, $\gamma_8 < 0$, $\gamma_9 < 0$, $\varphi_7 < 0$, $\varphi_8 < 0$, $\varphi_9 < 0$, and $\rho_7 < 0$, $\rho_8 < 0$, $\rho_9 < 0$).

Finally, the first two hypotheses predict a closer association between the type of financial system and R&D than between financial system and fixed investment.

H4: The interaction of country structures and industry characteristics is more closely associated with cross-industry, cross-country variation in R&D than in fixed investment.

3. Data

Data were collected on growth in constant price value added in 27, predominantly three-digit SIC, manufacturing industries in 18 countries over the period 1970 to 1995. The base sample of countries used for this paper is the 14 OECD countries for which growth, fixed investment and standardized R&D data are available on a consistent cross-country basis from the OECD's Structural Analysis Industrial (STAN) Database (1997) Analytical Business Enterprise Research and Development (ANBERD) Database (1998). Appendix A provides more detail. An alternative source of data used in previous work (e.g., Rajan and Zingales, 1998; and Cetorelli and Gambera, 2001) is the Industrial Statistics Yearbook of the United Nations (UN) Statistical Division. The country coverage of the UN data is greater than that of the OECD, but since this study is focused on developed economies, it is not disadvantaged by the exclusion of developing country data. More significantly, there are fewer measurement problems with the OECD data. Also, value-added at constant prices, fixed investment, and research and development data are available from the OECD but not the UN. In addition, the OECD data are available for 25 years as compared with a decade for the UN data.

3.1. Growth.

Table 1 records the annual average growth rates of manufacturing industry in the 14 countries over the period from 1970 to 1995. Italy, Japan, and Finland have the highest growth rates while Germany, Norway, and the UK have the lowest. Since the focus of the paper is on interrelationships between country and industry characteristics, an initial question is the extent to which relative growth rates of manufacturing industry across countries are attributable to initial industrial allocations as against countrywide differences in subsequent growth rates. Table 1 addresses this by decomposing deviations of country growth rates from world averages into three components. The first is a *share effect*, the contribution of deviations of initial shares in different industries from world averages in 1970, assuming that industries grew at the world average over the period. If the share effect is important, it means that high growth countries benefited from high initial shares in industries that grew relatively fast (and conversely for low growth countries). The second is a *growth effect*. This is the contribution of deviations of growth rates of industries in a particular country from world average growth rates for those industries assuming initial shares are equal to world averages. If the growth effect is important, it means that good performance in manufacturing reflects a superior performance across industries rather than an

advantageous initial distribution of industries. The third component captures the possibility that growth in some countries is higher because they do particularly well in the industries in which they have large initial shares. This is an *interactive effect*, which takes into account the interaction of deviations of initial shares and industry growth rates from world averages.

Table 1 records that variation in country growth is nearly entirely attributable to the growth effect. This is confirmed by an analysis of variance in which -9.9% of country growth variation is attributable to the share effect, 118.3% to the growth effect, and -8.4% to the interactive effect. The first and last of these imply that there is regression to the mean in that high share industries have below average growth rates. These observations justify (a) focusing the subsequent analysis on cross-country variations in industry growth rates rather than initial shares and (b) inclusion of initial shares of industries in the growth regressions to account for regression to the mean.

3.2. Fixed investment and R&D

An advantage of the OECD dataset is that data are available on fixed investment and (for a subset of industries) on research and development expenditure as well as growth. This allows us to test the hypotheses of an influence of financial institutions and governance structures on types of investment. Data were collected on gross fixed investment for 27 manufacturing industries over the period 1970 to 1990 and on R&D expenditure for 15 manufacturing industries over the period 1973 to 1994. The time periods and industries were dictated by data availability from the OECD. In addition, the petrol refinery industry was excluded throughout because of price index number problems.

Table 2 reports the average ratio of fixed investment to value added and R&D to value added for the 14 countries. The rankings of the two are markedly different. While Spain has the lowest ratio of both, the UK and US have some of the highest R&D but the lowest fixed investment ratios. Panel B of Table 2 records the correlation between growth, R&D, and fixed investment across the industries and countries in this study for which data on all three were available. It records that industry growth across countries is more closely correlated with R&D than with fixed investment. The result is that the correlation coefficient with R&D is 0.508 as against 0.010 with fixed investment.

3.3. Country structures

The paper takes advantage of new datasets on institutions in a large number of countries. We focus on three country structural features that relate most closely to the hypotheses in Section 2. These include information disclosure rules as measured by accounting standards, the concentration of the banking sector as measured by market

share data, and the concentration of ownership as measured by the control of voting rights.

The Center for International Financial Analysis and Research (CIFAR) creates an index of actual accounting practices and choice of policies regarding disclosure as revealed in the annual reports of individual firms in each of the countries in this study. The first comprehensive survey was undertaken in 1990 and the results, which are reported in Rajan and Zingales (1998) and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997), are used in this study. On the basis of extensive testing, Hope (2001 p.12) concludes that "the validity of the CIFAR data is satisfactory" and that the individual firm-level accounting disclosures in the CIFAR sample are positively related to the accuracy of analysts' earnings forecasts of those firms. In line with previous literature, we use the term accounting standards to refer to this measure of disclosure. Concentration of the banking system is taken from Cetorelli and Gambera (2001). They construct measures of bank concentration defined as the sum of the market shares of the three and five largest banks averaged over the period for which data are available (1989 to 1996) using the IBCA BankScope 1997 CD as the underlying data source. We use the market share of the five largest banks.[2] Our main measure of ownership concentration comes from La Porta et al. (1998). They record the proportion of the 20 largest listed firms in different countries that are widely held, which means they have no chain of control by an ultimate owner of greater than 10% of voting rights.

Table 3 records that in our core sample of 14 advanced countries accounting standards are highest in Sweden and the UK and lowest in Spain. CIFAR (1993, p. 21) conclude that:

> The form and contents of annual reports published by industrial companies from different countries vary widely. … Surprisingly, despite being highly industrialized with developed capital markets, Austria, Belgium, Denmark, Spain, Japan, Germany, the Netherlands and Italy have below-average disclosure practices [in a sample of 40 countries].

Several factors contribute to the substantial variations in accounting standards across advanced countries.[3] Ball, Kothari, and Robin (2000) characterize the reporting of accounting income by its timeliness (responsiveness of current period accounting to current period economic income) and conservatism (extent to which accounting income asymmetrically incorporates economic losses relative to gains).

[2] The results are similar using the three-bank measure. We only report results for the five-bank measure.

[3] In a sample of 35 countries, the standard deviation of accounting standards was 0.132. In the 19 developed countries in the sample, the standard deviation was 0.079.

They find that accounting information is both more timely and conservative in common than in civil law systems. This accords with the observation in Table 3 that in general accounting standards are higher in common law than in civil law countries. They attribute the timeliness of common law systems to their greater reliance on public disclosure of information and their conservatism to the stronger requirement for disclosure of economic losses than in civil law systems.

Table 3 records some variation in accounting standards within common law countries but less than between common and civil law countries. Ball, Kothari, and Robin (2000) also report variations within common and civil law systems. In particular, they note variations in the degree of regulation of accounting systems. The UK is the least regulated of the common law systems, the US the most regulated, and Australia and Canada are somewhere in between. Accounting practice is influenced by enforcement as well as by rules. Expected benefits of shareholder litigation are lower in the UK than in Australia, Canada, and the US due to smaller punitive damages, the absence of class suits, and the allocation of defendant costs in part to plaintiffs. Notwithstanding the greater amount of regulation and litigation in the US, Table 3 records that accounting standards are higher in the UK than in the US. This illustrates that good accounting practice can be encouraged by emphasizing form over substance, namely fairness (the presentation of "true and fair" views) rather than detailed rules (Nobes and Parker, 2000).

Within civil law systems, accounting income is dictated to varying degrees by taxable income. For example, in Germany, Choi and Mueller (1992) report that "the dominance of tax accounting rules means that there is literally no difference between financial statements prepared for tax purposes and financial statements published in financial reports" (p. 96). This implies that German accounting measures are dominated by tax considerations rather than economic performance and is reflected in a low level of accounting standards in Germany in Table 3.

Bank concentration is highest in Finland and Sweden and lowest in the US and Japan.[4] With growing levels of international capital mobility, it might be thought that national measures of bank concentration would be of little relevance because of cross-border borrowing and the impact of international competition and deregulation on domestic lending behaviour. However, on the first point, in a sample of nine European Union countries, the Bank for International Settlements reports that the share of cross-border loans to non-banks as a percentage of total loans to non-banks ranged from only 1.6% for Spain to 9.9% for the UK in the late 1990s (White, 1998). The same study shows that the arrangers of syndicated loans tend to have the same

[4] In a sample of 41 countries, the standard deviation in five-bank concentration levels was 0.182. In 18 developed countries, the standard deviation was 0.227, implying that the variation in bank concentration is higher in developed than in developing countries (see Cetorelli and Gambera, 2001).

nationality as the borrowing firm, regardless of the currency in which the loan is being made. Regarding the impact of international competition and deregulation, in a detailed analysis of bank deregulation in the US, Jayaratne and Strahan (1996) find that the effect of deregulation on growth is confined to the states in which deregulation occurred, which suggests that even within the US, banking practices are geographically distinct.

Concentration of corporate ownership is much lower in the UK and US than elsewhere. Australia, Canada, and Japan have intermediate levels of concentration and Continental Europe has high levels of concentration.

Table 3 reports that the concentration of the banking system is positively correlated with both accounting standards and ownership concentration and that accounting standards are negatively correlated with ownership concentration. There is a *negative* correlation between accounting standards and growth (-0.336) but a positive correlation between accounting standards and both fixed investment and, in particular, R&D share. Bank concentration is also negatively correlated with growth but there is little correlation between ownership concentration and growth. Ownership concentration is positively correlated with investment but the correlation is much lower with R&D. Overall, correlations of growth and investment with country structures are quite low.

In addition to the three institutional structures described above, we use a set of alternative country structures. Most of these measures are reported elsewhere in the literature and the sources are described in Appendix A.

3.4. Industry characteristics

As proxies for the dependence of industries on securities markets, banks and investments by other stakeholders, we use industry measures of external equity financing, bank financing, and skill levels. We proceed by developing the approach taken by Rajan and Zingales (1998) of using the US as the most highly developed and liberal financial market in the world in which firms are likely to face the least constraints to raising equity finance. New equity funding levels of US industries therefore most closely approximate the underlying requirements of firms operating in those industries. Since Japan has the highest ratio of bank credit to GDP of the OECD countries in this study and an unusually high level of bank financing of industry (see, for example, Corbett and Jenkinson, 1997), we use the dependence of Japanese industries on bank finance to measure this industry characteristic. The same logic leads to the choice of Germany as the source of the third industry characteristic, skill dependence. Germany has an exceptionally high level of investment in skills and training. In a comparison of the levels of qualifications of workers in five OECD countries (France, Germany, Japan, US, and UK), Germany has the lowest share of

workers without qualifications (beyond compulsory schooling) in 13 of 17 manufacturing industries (see Machin and Van Reenen, 1998).

We therefore measure the dependence on equity finance in the US, on bank loans in Japan, and on skills in Germany. As we shall see, this approach has the advantage of both preserving degrees of freedom and allowing potential endogeneity of industry characteristics to be readily corrected.

Using data from Rajan and Zingales (1998), equity financing is measured as the ratio of the net amount of equity issues to capital expenditures by US firms during the 1980s. Although we usually use the equity financing measure, we also refer to external financing as the fraction of US capital expenditure that was not financed with cash flow from operations. Data were also available on external dependence by industry in Canada. The correlation between external dependence in Canada and the US is 0.76.

We construct our own measure of bank dependence using industry data on bank finance in Japan from the Japanese Ministry of Finance. Bank financing ratios are constructed from sources and uses of funds in company accounts of 20,000 listed and unlisted Japanese firms using the methodology set out in Mayer (1988 and 1990). These papers discuss the advantages of using flow rather than stock data for the equity and bank dependence series. The main measure that we use is the ratio of bank loans to physical investment (net of depreciation) averaged over the period 1981 to 1990. We also refer to a second measure that considers the ratio of bank loans to gross external financing (total investment including investment in financial assets minus retentions).[5]

Oulton (1996) reports skill levels of the German workforce in 1987. The proportion of the workforce with high, upper intermediate, lower intermediate and without vocational qualifications is reported for 26 manufacturing sectors. We confirm that the ranking of industries by level of qualifications of workers is very similar across countries using data (for the UK and Germany) from Oulton and (less disaggregated industry data for five countries) from Machin and Van Reenen (1998). The correlation across the 26 industries for the share of workers with qualifications in the UK and Germany is 0.80. For the five countries, the mean of the pair-wise correlation coefficients between the rankings of industries according to the share of workers with qualifications is 0.83.

Table 4 shows the three industry variables, which are equity financing, bank financing, and skill levels. Electrical machinery has a high level of equity financing in the US and is skill-intensive in Germany, but has only a modest level of bank

[5] There is no other source of data on the dependence of companies on bank finance by industry and it is not therefore possible to check the correlation of industry dependence on bank finance in Japan with other countries.

financing in Japan. Clothing has one of the highest levels of bank financing in Japan, but raises no equity in the US and is not skill-intensive in Germany. Skill levels are high in shipbuilding, which is an industry that raises little equity in the US and reduced outstanding stocks of bank debt in Japan during the 1980s. The correlation between equity and bank finance is 0.073, between skills and bank financing is –0.455, and between skills and equity financing is 0.172. There is a clear positive correlation between equity dependence and both growth and R&D (but not with investment). A similar although less pronounced pattern is apparent for skill dependence. The positive correlation between bank finance and growth is similar to that for skill dependence but there is little correlation between bank finance and either fixed investment or R&D.

The above suggests that (a) a stronger relation of both growth and R&D is observed with industry than country variables, (b) the relation is weaker with bank finance than the other two industry characteristics, and (c) the relation between fixed investment and industry variables is weaker than that of growth and R&D. Table 5 confirms the first two of these observations in an ordinary least squares (OLS) regression of average growth in the 14 OECD countries and 27 industries over the period 1970 to 1995 on the three country structures and three industry characteristics. The equation is:

$$Growth_{ik} = \alpha_1 disclosure_k + \alpha_2 bankconc_k + \alpha_3 ownconc_k + \beta_1 equity_i + \beta_2 bank_i + \beta_3 other_i + \gamma share_{ik} + \varepsilon_{ik} \quad (4)$$

Table 5 records that the industry variables are much more important than the country variables. Growth is higher in industries that are skill, equity, or bank-finance dependent. There is no systematic relationship between growth and accounting standards or concentration of either the banking system or corporate sector.

When interactive terms between the country structures and industry characteristics are added to the regression in Table 5, both the country and industry variables become insignificant and the interactive terms are jointly significant ($F(9, 351) = 1.66$ [0.098]). The equation is:

$$Growth_{ik} = \alpha_1 disclosure_k + \alpha_2 bankconc_k + \alpha_3 ownconc_k + \beta_1 equity_i + \beta_2 bank_i + \beta_3 other_i + \gamma_1 (disclosure_k * equity_i) + \gamma_2 (disclosure_k * bank_i) + \gamma_3 (disclosure_k * other_i) + \gamma_4 (bankconc_k * equity_i) + \gamma_5 (bankconc_k * bank_i) + \gamma_6 (bankconc_k * other_i) + \gamma_7 (ownconc_k * equity_i) + \gamma_8 (ownconc_k * bank_i) + \gamma_9 (ownconc_k * skill_i) + \gamma_{10} share_{ik} + \varepsilon_{ik} \quad (5)$$

This provides some initial indication that there is a relation between the growth of different industries in different countries and the interaction of country structures with industry characteristics. The remainder of the paper is devoted to a detailed analysis of this issue.

4. Methodology

We examine the impact of country structures and industry characteristics in separate equations for growth, fixed investment, and R&D shares of industries in particular countries. In the growth regression, we also include the initial shares of industries in value added to control for regression to the mean, which Table 1 suggests was present. We regress each of the dependent variables on the interaction of country structures and industry characteristics and a full set of industry and country dummies. This specification therefore controls for the large number of factors that affect the average rate of growth and level of investment in different industries and countries, and focuses on the determinants of abnormal growth and investment relative to industry and country averages. The growth, fixed investment, and R&D equations are as described in Eq. 1, 2, and 3 in Section 2.

The results reported in this paper are cross-sections relating to average growth and investment over the period 1970 to 1995. They provide evidence on long-run relations between country structures, industry characteristics, growth, and investment. While time series of the independent variables are not available, the dependent variables (growth, fixed investment, and R&D) are measured annually, and we perform tests of the stability of the results by repeating the regressions on subperiods. We also ran robustness regressions to test for the effect of outliers. The procedure weights observations by their absolute residuals and regresses them again using these weights. It continues to iterate in this way until the maximum change in weights falls below a certain tolerance. The results using these robust regressions were similar to those obtained using OLS.

The absence of time series information on the independent variables means that panel data estimation cannot be undertaken and that lagged values of the country and industry variables are not available for use as instruments. We address potential endogeneity issues in two ways. First, if there is feedback from growth and investment to industry characteristics then it will be primarily restricted to the three countries (Germany, Japan, and the US) in which these variables are measured. We therefore exclude from the sample the three countries from which the industry variables have been derived. We can have reasonable confidence that the dependence of industries in the US on equity finance will not have been influenced by the relative growth of industries in *other* countries.

Second, we use an instrumental variables approach to address the endogeneity of the country structures. The country variables are the level of accounting standards, the concentration of the banking industry, and the concentration of the ownership of non financial private companies. Following previous literatures, three sets of instruments are used for the country structures including (a) the origin of the legal

system (defined by dummy variables for English, French, German and Scandinavian legal origin), (b) the rule of law and (c) population (Rajan and Zingales, 1998, Cetorelli and Gambera, 2001). La Porta et al. (1997) argue that legal systems have a long history and have shaped the development of accompanying institutions. Legal structures (such as the origin of legal systems and the rule of law) can therefore be treated as exogenous variables in analyses of financial systems. In the presence of economies of scale in financial institutions and systems, the size of a country, as measured by its population, will affect its financial structure.

We use the instruments to construct interacted terms with each of the industry characteristics. If the instruments are only weakly correlated with the endogenous variables, the use of instrumental variables estimation may be invalid (Bound, Jaeger, and Baker, 1997). We therefore regress each endogenous country variable on the instrument set. We find that population is negatively correlated with the concentration of the banking system, that English and Scandinavian legal origin are positively associated with accounting standards, as is population and the rule of law and that there is a negative correlation between ownership concentration and English legal origin. These results suggest that our instruments are indeed correlated with the endogenous country structures (see Appendix B). The regressions of the endogenous variable have been reported since the instruments for the country variables are used to construct interacted terms with the industry variables. The results of the first stage regression in the two-stage least squares estimation are not therefore informative about the correlation between instruments and country variables.

Our strategy is to estimate the above regressions with OLS and then with two-stage least squares (2SLS) using the instrument set described above. We implement two diagnostic tests. First, we test to see whether endogeneity is present. The Durbin-Wu-Hausman (DWH) test includes the residuals from the regression of each endogenous variable on the exogenous variables (including the instruments) in an OLS regression. If the included residuals are jointly significant, then endogeneity is present (Davidson and MacKinnon, 1993). Second, we report the Sargan statistic from the overidentification test to check the validity of the instruments. This tests the joint hypothesis that the instruments are valid (i.e., uncorrelated with the error) and that the instruments should not themselves have been included in the regression (Davidson and MacKinnon, 1993).

5. Results

In Section 5.1 we report the results of the regressions described in the previous section using the country and industry variables discussed in Section 3 and the full period for which data are available. In Section 5.2, we describe results using

alternative country and industry variables. In Section 5.3, we discuss the results for two subperiods and in Section 5.4, we consider the relations for a set of four countries that are at an earlier stage of development than the other countries in the sample.

5.1 Estimation of growth, fixed investment, and R&D equations

Table 6 reports results of regressions on growth, fixed investment, and research and development. Since the DWH tests suggest that endogeneity is present, we report results for these equations using two-stage least squares estimation. While the DWH test is passed for the fixed investment equation, for consistency, we report the two-stage least squares results for all three equations. These pass the overidentification test, confirming the validity of the instrument set. We describe the three sets of regressions in turn.

5.1.1. Growth

Column 1 of Table 6 is consistent with the decomposition of growth analysis in Table 1 since the coefficient on the initial share of each industry in a country is strongly significant and negative in the growth regression. This implies regression to the mean in the sense that industries with high initial shares of total output in particular countries have below average growth (relative to the country in question and the world average for that industry). The size of the effect is large. A 1% higher initial share of an industry in a country is associated with a 0.239% lower annual average growth rate of that industry.

Five of the interaction terms between country structures and industry characteristics are significant at better than the 10% level in the growth regression. The set of interaction terms is highly significant (see Table 6). Two of the three variables that interact with accounting standards are significant. Greater disclosure is associated with faster growth of skill intensive and equity financed industries. These variables are economically as well as statistically significant. For example, the interactive term between accounting standards and skills (disclosure*other) has a range of 0.035 from Spain (the country with the lowest accounting standards) to Sweden (the country with the highest accounting standards) in non electrical machinery (the industry with the second highest skill level in Germany). Shifting from the country with the lowest to the highest accounting standards is therefore associated with an increase in annual growth in non electrical machinery of $0.439 \times 0.035 = 1.54\%$.

Conversely, the share of skilled workers in Germany is at its lowest level in leather products and footwear. The range of the interactive variable in these industries is 0.038. An increase in accounting standards from Spain to Sweden is therefore associated with a decline in the growth rate in these industries of $0.439 \times 0.038 = 1.67\%$ (relative to the country and industry means). The range of the

interactive variable is much lower in industries close to mean skill levels in Germany (e.g., iron and steel) where this variable therefore has little relation to growth rates. This variable illustrates the nature of the interactive relation between country structures and industry characteristics on abnormal growth rates in different industries. A similar effect applies to all the variables.

In addition to information disclosure, column 1 of Table 5 records that concentration of ownership is also related to the growth of equity-dependent and skill-intensive industries. Higher ownership concentration is associated with faster growth of both types of industry. In contrast, higher levels of bank concentration are associated with lower growth of equity-dependent industries.

We return to an interpretation of these results in the context of the hypotheses of Section 2 below. Before that, we report the equivalent regression results for fixed investment and R&D.

5.1.2. Fixed investment

In marked contrast to the growth equation reported above and the R&D equation reported below, column 2 of Table 6 records that there is no relation of fixed investment with the interaction of country structures and industry characteristics. The nine interaction terms are jointly insignificant and their inclusion raises the equation R-squared by less than 1% in relation to a regression with just country and industry dummies (R-squared = 0.6021).

5.1.3. Research and development

Column 3 of Table 6 records that the results of the R&D regression are similar to those of the growth regression. Since R&D data are only available for 15 as compared with 27 industries for output and fixed investment, we report results using the 14 as against the 11-country sample. The results are similar for the 11-country sample but the estimates are less precise. The interaction terms are jointly significant at the 1% level. There is a positive relationship between R&D and the interaction of accounting standards with both equity and skills dependence. There is a positive relationship between R&D and the interaction of ownership concentration with equity dependence. Also, as in the growth regression, there is a negative relation of R&D with the interaction of bank concentration and equity dependence. Unlike growth, there is a negative relationship between R&D and the interaction of bank concentration with skill dependence.

We examine the relationship between growth, R&D, and fixed investment further by regressing growth on the predicted values from the fixed investment and R&D equations. While the predicted values from the fixed investment equation are insignificant, those from the R&D regression are highly significant (compare rows (1)

and (2) in Table 7). When the predicted values from both the fixed investment and R&D regressions are included (row (3) of Table 7), the coefficient on R&D remains virtually unchanged.

5.2. Alternative country and industry variables

We evaluate a large number of alternative country and industry variables and describe them in Appendix A.

5.2.1. Country structure variables

We examine the effect of replacing accounting standards with (a) the size of stock markets by using the ratio of market capitalization to GDP ratios, (b) the liquidity of stock markets by using the value of shares traded divided by market capitalization, (c) the number of initial public offerings (IPOs) in different countries, and (d) two measures of the legal rights of investors, including anti-director rights and creditor rights. There is no evidence of a significant relationship between growth or R&D and interactive terms involving the size or liquidity of stock markets or the measure of creditor rights. However, there is evidence of a positive relation between growth and the number of IPOs in equity dependent industries. In the R&D regression, the number of IPOs and the measure of anti-director rights are important for both equity- and skill-dependent industries.

We replace concentration of the banking sector with (a) the size of banking systems by measuring both by bank credit to the private sector and total bank credit to GDP ratios, (b) bank ownership of corporate equity, and (c) government ownership of banks. In the growth regression, the interaction between bank ownership of corporate equity and equity dependence is negative (mirroring the result for the interaction of bank concentration with equity dependence). In the R&D regression, bank ownership of corporate equity is not significant but there is a positive relation of the size of the banking system to R&D in skill-dependent industries. This indicates the relevance of banking systems to the financing of skill intensive R&D. Government ownership of banks is not significant for R&D but is weakly positive when interacted with equity dependence in the growth regression.

We replace the ownership concentration variable (as measured by voting control) by a second measure of the structure of ownership. This is the median ownership of the three largest privately owned non financial domestic firms. We also examine the role of pyramidal ownership (where a publicly traded company lies in the chain of control between the firm and its ultimate owner). The median structure and pyramidal ownership measures gave similar results in the growth regressions to the voting control measure reported above. Using the voting control measure, there is a

positive interaction with both equity and skill dependent industries. The interaction is stronger with equity dependence for the median measure of ownership structure and with skill dependence for the pyramid measure. The weak positive relationship of R&D with the interaction between ownership concentration and equity dependence is not found with the median or pyramid measures of ownership concentration.

5.2.2.Industry characteristics

Results are little affected by the precise definition of market finance. Replacing new equity by external finance in the US, we still find positive interactions with accounting standards and ownership concentration and a negative interaction with bank concentration in the growth and R&D equations.

To date, bank finance in Japan has been measured as the ratio of bank finance to net physical investment. Since retained earnings are the dominant source of finance in most industries, bank finance measured relative to external (rather than) total finance could be more appropriate. Results are little affected by this change.

The definition of skills used above is the proportion of the work force with any skills (i.e. one minus the proportion without qualifications). If this is replaced with the proportion of the workforce with the highest level of skills, then the interaction between both accounting standards and skills is similar but somewhat weaker than with the broader skills measure. The interaction with accounting standards is highly significant in the R&D regression when the highest skill level is used.

To summarize, the results reported in Section 5.1 are robust to alternative definitions of industry characteristics. The results are sensitive to the definitions of country structures but the variables that theory suggests are most relevant (namely information disclosure, bank concentration, and ownership concentration) are the ones that appear most significant in practice. Only the measure of initial public offerings and anti-director rights appear to be as important as accounting standards for R&D in skill- and equity-dependent industries.

5.3. Time-varying effects

As noted above, while time series are not available for most of the independent variables, they are for the dependent variables. We perform tests of stability of the coefficients by splitting the sample into two periods, 1970 to 1980 and 1980 to 1995, and allowing the second-period coefficients (including the constant) to differ from the first. Most of the coefficients in the second period are not significantly different from the first, suggesting that a majority of the relations are stable. The two exceptions are the interaction of skill dependence with ownership

concentration, which declines in magnitude in the second period, and the interaction of skill dependence with accounting standards, which increases in magnitude in the second period. This suggests that the relevance of ownership concentration to skill-dependent industries declined from the 1970s to the 1990s in relation to that of information disclosure. Splitting the sample into finer subperiods of five yearly intervals confirms the declining significance of the interaction of skill dependence with ownership concentration in later periods.

5.4. Stages of economic development

It is suggested in the introduction and in the hypotheses that relations between growth and financial institutions differ between developing and developed countries. In particular, the hypotheses suggest the significance of bank dependence of industries is greater in developing countries. Although a study of developing countries cannot be readily undertaken within the context of an OECD data set, data are available in the OECD's STAN data set for four countries at an earlier stage of development. These four countries (Korea, Mexico, Portugal, and Greece) had GDP per capita in 1970 in the range $2,200 to $6,300 as compared with a range of $7,300 to $15,000 for the countries in the base sample in 1970. The four countries are referred to as low GDP per-capita countries.

The correlations between the country and industry variables and growth for the four low GDP per-capita countries are interesting. In contrast to the advanced OECD countries, there is a *positive* correlation between accounting standards and growth (0.476) and a very high *negative* correlation between ownership concentration and growth (-0.954). Bank concentration is also negatively correlated with growth (-0.854). For the low GDP per-capita countries, the correlation between growth and bank dependence is higher (0.557) than for the other industry characteristics (0.272 for equity dependence and –0.062 for skill dependence) and higher than in the advanced countries (see Table 4).

Table 8 reports the results of an OLS regression on the four low GDP per-capita countries. There are an insufficient number of countries to perform instrumental variable regressions. The results are quite different from the main sample results. Both bank concentration and accounting standards are associated with higher growth of bank dependent industries and lower growth of skill dependent industries in the low GDP but not the main sample. A Chow test confirms the hypothesis of a significant difference between the regression coefficients in the two samples ($F(12, 329) = 4.60$ [0.000]). This test suggests that we cannot pool the two samples of low and high GDP per-capita countries from the OECD data set.

The most striking result is that financial institutions are more important for bank-dependent industries in the lower GDP per-capita countries than in the advanced

OECD countries. Support for this came from looking at alternative measures of financial development of both stock markets and banking systems. These were interacted with the industry variables. In developed countries, neither the size (or liquidity) of the stock market, nor the number of IPOs is relevant for bank-dependent industries. In contrast, in the low GDP per-capita countries, there is a negative relationship of growth in bank-dependent industries with these stock market variables and a positive relation with the size and concentration of banking systems.

6. Implications for the hypotheses on financial systems and governance arrangements

Table 9 summarizes the results reported in Table 6 for the estimated coefficients of the matrix of interaction terms between country structures and industry characteristics in the growth and R&D equations. None of the coefficients in the fixed investment equation are significant.

Table 9 – Summary of signs of regression coefficients: Advanced OECD countries

This table reports the signs of the estimated coefficients on the interaction terms between country structures and industry characteristics reported in Table 6. + means positive and significant; - negative and significant, and 0 means insignificant.

		Industry characteristic		
Growth		Equity dependence	Bank finance dependence	Skill dependence
Country structure	Accounting standards	+	0	+
	Bank concentration	-	0	0
	Ownership concentration	+	0	+
R&D				
Country structure	Accounting standards	+	0	+
	Bank concentration	-	0	-
	Ownership concentration	+	0	0

A clear relationship between both growth and R&D and the interaction of country structures and industry characteristics emerges. Accounting disclosure is associated with faster growth of industries that are equity and skill dependent. A larger share of output is devoted to R&D in these types of industries in countries with more information disclosure. There is a more pronounced relation of growth and R&D to information disclosure than to the size of financial markets measured in relation to either stock markets or banking systems. This points to the importance of

information theories in explaining the link between finance and growth and to their relevance in R&D rather than fixed investment.

Concentration of the banking system is associated with slower growth and lower R&D shares in equity dependent industries and of R&D shares in skill dependent industries. Ownership concentration is associated with higher growth and R&D in equity dependent industries and faster growth of skill dependent industries. There is evidence that the relation between ownership concentration and growth of skill dependent industries is declining over time. Accounting disclosure, on the other hand, appears to be becoming more important in skill-dependent industries.

We also find preliminary evidence that the above results are sensitive to stages of economic development. In particular, the role of institutions appears different for industries dependent on bank finance in developing than in developed countries. In countries at earlier stages of economic development, information disclosure and bank concentration are positively related to growth of bank-dependent industries.

The results are consistent with the first hypothesis of Section 2. The coefficient on the interaction between accounting standards and equity dependence is positive in the growth and R&D equation and it is insignificant in the fixed investment equation. The results are also consistent with the second hypothesis in that lower bank concentration is associated with faster growth of externally financed industries in advanced countries. Lower bank concentration is also associated with higher R&D shares but not higher fixed investment shares of externally (equity) financed industries. For countries at earlier stages of development, as predicted by H2, the converse result is found. High bank concentration is associated with faster growth of bank-dependent industries for such countries.

In contrast, the third hypothesis, H3, which is based on the ability of dispersed shareholders to provide credible commitments to outside investors and other stake-holders, is rejected. Concentrated, rather than dispersed, ownership is associated with faster growth of equity and skill dependent industries and with higher R&D shares of equity-dependent industries. These results suggest that it is concentrated (rather than dispersed) shareholders who provide commitments to external investors and stakeholders.

This finding can be illustrated by the cases of Sweden and the UK. Both countries have high levels of accounting disclosure and high levels of bank concentration but levels of ownership concentration are much higher in Sweden than in the UK. On the basis of the H3, we would expect this to be reflected in differences in the relative growth of industries that differ in their equity and skill dependence. Plastic products and electrical machinery both have high equity dependence. Yet, plastic products has lower levels of skill dependence than electrical machinery. Contrary to theoretical predictions, but consistent with the above positive coefficients

on the interactive terms of ownership concentration with equity and skill dependent industries, the growth of electrical products relative to plastics is higher in Sweden than in the UK. Our interpretation is that, unlike concentrated shareholders in Sweden, dispersed anonymous shareholders in the UK may be unable to commit to other stakeholders (in this case, to skilled workers). This hinders the relative growth of skill-dependent industries in the UK as compared with Sweden.

H4 receives strong confirmation. The interaction between country financial and ownership structures and industry characteristics is important for R&D but not for fixed investment. In general, there is a close correspondence between the determinants of R&D and of growth.

Rajan and Zingales (2001) attempt to provide a theoretical explanation for this result. They argue that the key difference between fixed investment and R&D is that the former is collateralizable whereas the latter frequently is not. Furthermore, Rajan and Zingales (p.471) claim that:

> typically, equity-financed industries tend to have few hard assets, and substantial intangible assets such as growth opportunities. In economies with underdeveloped financial markets and institutions, collateral is essential to obtain outside financing. Thus we would expect industries that would optimally use few hard assets if financing was easy to come by, to use more of them in countries with underdeveloped financial systems. Thus the finding that as accounting standards and credit markets develop, equity-financed industries tend to use less fixed capital. In other words, the intangible assets that they typically possess in abundance become easier to finance, and they do not have to distort asset holdings towards fixed capital.

In sum, there is a strong relationship of financial systems with growth and R&D, which differs by characteristics of industries and stages of economic development. No such relationship is found for fixed investment. In advanced countries, information disclosure is associated with higher growth and R&D of equity financed and skill-intensive industries. There is also a faster growth of equity financed and skill-intensive industries in the presence of high ownership concentration. In advanced countries there is higher growth and R&D of equity financed industries in the presence of dispersed banking systems. By contrast with the advanced countries, there appears to be a relation between financial systems and the bank dependency of industries in lower GDP per-capita countries. In particular, a more concentrated banking system is positively related with growth in bank-dependent industries.

7. Conclusions

This paper provides a first examination of the association between the structure of financial systems and the types of activities in which different countries are engaged. There are three sets of theories in the literature that point to such a relation. Information theories suggest that securities markets allow for diverse views amongst investors (about, for example, new technologies) while banks provide the economies of monitoring required by more traditional investments. The renegotiation literature argues that fragmented banking systems and credit markets are associated with high-risk R&D investments, and concentrated credit markets are associated with long-term investments in more mature industries. The governance/commitment literature predicts that dispersed ownership systems are associated with activities that require participation by outside investors, managers, and other stakeholders, and concentrated ownership with internally funded activities that require active corporate governance.

Three sets of country structures are relevant to testing these theories including information disclosure, concentration of banking systems and concentration of ownership. Three sets of industry characteristics including equity dependence, bank dependence, and dependence on other stakeholders are proxied by dependence on skilled labour. The paper uses a data set that is particularly well suited to testing the relation of these to the growth and investment of different industries in advanced economies. It reports a strong relation of information disclosure, fragmentation of banking systems, and concentration of ownership with the growth of equity financed and skill-intensive industries. Consistent with information and renegotiation theories, the growth of equity dependent industries is particularly high in advanced countries with good information disclosure and dispersed banking systems.

Additional support for the information and renegotiation theories comes from two sources. Firstly, the link between institutional structure and cross-industry growth for advanced countries is more closely associated with investment in R&D than with investment in fixed capital. Second, the relations are quite different for countries at earlier stages of development. In particular, for the low GDP per-capita countries, there is a positive relation between banking concentration and the growth of bank-dependent industries.

In contrast to the support provided by our results for the information and renegotiation theories, the key predictions of the corporate governance theories are rejected. Industries that are dependent on external sources of finance and other stakeholders grow more rapidly in countries with concentrated ownership. Concentrated rather than dispersed owners appear to offer the commitment sought by outside investors and stakeholders.

The paper provides initial evidence that there is a link between financial systems and types of activities in advanced economies. Future work could focus on investigating the role of other country structures (such as tax systems) and alternative measures of industry characteristics, in particular in relation to bank borrowing. If our findings are borne out by future work, they suggest that policies concerning the

structure of financial and corporate systems may need to be sensitive to countries' industrial composition and stages of economic development. For example, the relevance of ownership concentration and the concentration of banking systems could be quite different for countries in early and late stages of development. Even within advanced economies, information disclosure, dispersed banking systems, and concentrated ownership could benefit the industries in which some (but not necessarily all) such economies are specialized.

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Table 1 Decomposition of annual growth rates of manufacturing industry of 14 OECD countries, 1970 to 1995

The table reports the annual average compound growth rates of manufacturing industry in column 1. In column 2 we show the difference between the country growth rate and the average of the 14 countries, and in columns 3, 4, and 5 this is decomposed into share, growth and interactive effects. These are the first, second and third terms respectively of the right hand side of the equation:

$$\Sigma_i\{a_{ik}g_{ik} - a_{i\text{-}}g_{i\text{-}}\} = \Sigma_i\{a_{ik} - a_{i\text{-}}\}g_{i\text{-}} + \Sigma_i a_{i\text{-}}\{g_{ik} - g_{i\text{-}}\} + \Sigma_i\{a_{ik} - a_{i\text{-}}\}\{g_{ik} - g_{i\text{-}}\}$$

where a_{ik} is the share of industry i in country k's total manufacturing in 1970, g_{ik} is the growth rate of industry i in country k over the period 1970 to 1995, and subscript underscore denotes the average across all countries. *Source*: OECD, Structural Analysis Industrial (STAN) Database and own calculations.

	(1)	(2)	(3)	(4)	(5)
Country	**Growth Rate**	**Difference from Average**	**Share Effect**	**Growth Effect**	**Interactive Effect**
Italy	0.030	0.010	-0.005	0.015	-0.001
Japan	0.027	0.006	0.000	0.011	-0.005
Finland	0.027	0.006	-0.001	0.011	-0.003
Spain	0.026	0.005	-0.001	0.010	-0.004
US	0.023	0.003	0.002	0.005	-0.004
Canada	0.023	0.002	0.001	0.007	-0.005
Australia	0.017	-0.003	0.000	-0.001	-0.002
Netherlands	0.016	-0.004	0.002	-0.006	0.000
France	0.016	-0.004	-0.001	-0.002	-0.001
Denmark	0.015	-0.005	0.000	-0.003	-0.002
Sweden	0.012	-0.009	0.000	-0.008	-0.001
Germany	0.010	-0.011	0.003	-0.012	-0.002
Norway	0.006	-0.014	-0.001	-0.011	-0.002
UK	0.004	-0.017	0.001	-0.016	-0.002

Table 2: Average ratio of fixed investment to value added, 1970-1990 and R&D to value added, 1973 to 1994

This table reports the average ratio of investment (gross domestic fixed investment) to value added in manufacturing industries in column 1 and the average ratio of R&D to value added in manufacturing in column 2. Countries are ranked from highest to lowest.

Source: OECD Structural Analysis Industrial (STAN) Database for fixed investment and value added, and OECD Analytical Business Enterprise Research and Development (ANBERD) Database for R&D

Fixed Investment / Value Added 1970-90		**R&D/ Value Added 1973-94**	
	(1)		(2)
Finland	0.198	US	0.079
Japan	0.194	Sweden	0.071
Norway	0.189	UK	0.055
Italy	0.174	Japan	0.054
Netherlands	0.169	Germany	0.052
Canada	0.162	Netherlands	0.051
Sweden	0.159	France	0.051
Denmark	0.153	Norway	0.038
France	0.148	Finland	0.033
Australia	0.131	Denmark	0.031
UK	0.124	Canada	0.027
Germany	0.121	Italy	0.021
US	0.113	Australia	0.020
Spain	0.077	Spain	0.010
Correlation matrix (156 observations)			
	Growth	Fixed Investment	R&D
Growth	1	0.0996	0.5080
Fixed Investment		1	-0.0065

Table 3: Country structures

Column 1 is the number of accounting standards on a scale from 0 to 90 reported in Rajan and Zingales (1998) from a survey conducted by the Center for International Financial Analysis and Research normalized to lie in the range 0 to 1 by dividing by 90. Column 2 is the average over the period 1989 to 1996 of the market share of the five largest banks, reported in Cetorelli and Gambera (2000). Column 3, shows 1 minus percentage of widely held firms of the 20 largest publicly traded firms in 1995, reported in La Porta et al. (1998).

	(1)	**(2)**	**(3)**
Country	**Accounting Standards**	**Bank Concentration**	**Ownership Concentration**
Australia	0.833	0.80	0.45
Canada	0.822	0.84	0.50
Denmark	0.689	0.82	0.90
Finland	0.856	0.98	0.85
France	0.767	0.44	0.70
Germany	0.689	0.39	0.65
Italy	0.689	0.38	0.85
Japan	0.722	0.32	0.50
Netherlands	0.711	0.88	0.70
Norway	0.822	0.74	0.95
Spain	0.567	0.50	0.85
Sweden	0.922	0.94	1.00
UK	0.867	0.65	0.10
US	0.789	0.20	0.20
Mean	0.768	0.634	0.657

Correlation matrix (14 countries)

	Accounting standards	Bank concentration	Growth	Fixed Investment	R&D
Accounting standards	1		-0.3360	0.2445	0.4900
Bank concentration	0.4752	1	-0.2425	0.1425	0.0278
Ownership concentration	-0.2032	0.3450	0.0769	0.3869	0.1089

Table 4: Industry characteristics

This table records three industry variables used in the regression analyses. Column 1 is the fraction of capital expenditure financed with net equity by US firms during the 1980s as reported in Rajan and Zingales (1998). Column 2 is the average proportion of net physical investment financed by bank loans in Japan over the period 1981 to 1990. The source of these data is the Japanese Ministry of Finance (N/A = not available). Column 3 is one minus the proportion of employees reported by Oulton (1996) as having no skill qualifications in different German industries in 1987.

	(1)	**(2)**	**(3)**
Industry	**Equity Dependence (US)**	**Bank Dependence (Japan)**	**Skill Levels (Germany)**
Food	0	0.52	0.658
Beverages	0	0.52	0.745
Tobacco	-0.08	0.52	0.619
Textiles	0.01	0.86	0.593
Clothing	0	1.49	0.646
Leather & Leather Products	0	N/A	0.586
Footwear	0.04	N/A	0.586
Wood Products	0.04	1.78	0.724
Furniture & Fixtures	0.01	N/A	0.724
Paper & Products	0.02	0.68	0.628
Printing & Publishing	0.03	0.80	0.771
Industrial Chemicals	0.07	0.04	0.758
Other Chemicals	0.02	0.04	0.758
Petroleum & Coal Products	0.06	N/A	0.769
Rubber Products	0.11	N/A	0.641
Plastic Products, nec.	0.26	N/A	0.641
Pottery, China etc.	0.11	0.63	0.623
Glass & Products	0.02	0.63	0.623
Non-Metallic Products, nec.	0.01	0.63	0.707
Iron & Steel	0.01	-1.01	0.691
Non-Ferrous Metals	0.02	0.11	0.655
Metal Products	0.02	1.03	0.703
Non-Electrical Machinery	0.11	0.81	0.791
Electrical Machinery	0.36	0.37	0.732
Shipbuilding & Repairing	0.02	-3.41	0.843
Motor Vehicles	0.01	0.39	0.723
Instruments	0.62	0.72	0.737
Mean	0.07	0.39	0.692

Correlation matrix (27 industries; 21 industries for correlations with bank finance; 15 industries for correlations with R and D; 14 industries for correlations with R&D and bank finance; correlations for growth, fixed investment, and R&D relate to the 14 OECD countries)

	Equity dependence	Bank finance	Growth	Fixed Investment	R&D
Equity dependence	1		0.5577	-0.0451	0.6214
Bank finance	0.0734	1	0.2914	-0.1874	0.0034
Skills	0.1717	-0.4551	0.2813	0.1384	0.3472

Table 5: Growth regression with country and industry variables

This table reports an OLS regression of annual average growth over the period 1970 to 1995 in 14 OECD countries and 27 industries on initial value added shares of industries at the start of the period (initial shares), three country structures (accounting standards (disclosure), bank concentration (bankconc), and ownership concentration (ownconc)) and three industry characteristics (equity dependence (equity), bank dependence (bank), and skill dependence (other)). A constant and zero-one dummy variables relating to industries and countries with missing independent variables have been included but are not reported. Huber-corrected t-statistics are shown in brackets.

* = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level. The p-values of the F-tests are shown in square brackets.

Initial shares	-0.0350 (-1.04)
Country variables:	
Accounting standards (disclosure)	-0.0244 (-1.25)
Bank concentration (bankconc)	-0.0066 (-0.98)
Ownership concentration (ownconc)	0.0041 (0.69)
Industry variables:	
Equity dependence (equity)	0.0707 (6.16) ***
Bank finance dependence (bank)	0.0059 (2.26) **
Skill dependence (other)	0.0905 (4.47) ***
Country and industry dummies	NO
Number of observations	369
F-test on equation	12.20 [0.000]
R^2	0.2476

Table 6: Growth, fixed investment, and R&D regressions

The table reports the results of two-stage least square regressions of annual average growth rates in column 2, of the share of fixed investment in value added in column 3, and of the share of research and development in value added in column 3. The country and industry pools are defined in the Appendix A. There are ten independent variables including initial value added shares of industries at the start of the period (share) and nine interactive terms between three country structure variables (accounting standards (disclosure), bank concentration (bankconc), and concentration of ownership (ownconc)) and three industry characteristics (external equity finance in the US (equity), external bank finance in Japan (bank), and the proportion of workers with any skill training in Germany (other)). A constant and a zero-one dummy variable relating to industries and countries with missing independent variables have been included but are not reported below. Huber-corrected t-statistics are shown in brackets.

* = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level. The instruments for all country variables used to construct the interactive terms are population, rule of law, and dummy variables for legal origin.

	(1)	(2)	(3)
Dependent variable:	Growth	Fixed Investment	R&D
Initial shares	-0.2388 (-4.53)***	-	-
Disclosure*equity	0.3465 (3.68)***	-0.1448 (-0.35)	1.4767 (2.43)**
Disclosure*bank	-0.0105 (-0.34)	0.0171 (0.31)	-0.0550 (-1.33)
Disclosure*other	0.4387 (1.74)*	0.8248 (0.79)	0.4797 (2.04)**
Bankconc*equity	-0.1277 (-2.60)***	-0.2546 (-1.27)	-0.2402 (-1.91)*
Bankconc*bank	-0.0104 (-1.06)	-0.0352 (-0.91)	0.0069 (0.58)
Bankconc*other	0.1129 (0.92)	0.3702 (0.65)	-0.3712 (-1.77)*
Ownconc*equity	0.1013 (3.19) ***	-0.0805 (-0.94)	0.2781 (1.81)*
Ownconc*bank	-0.0007 (-0.09)	0.0194 (1.43)	-0.0083 (-1.33)
Ownconc*other	0.1656 (2.04) **	0.2317 (0.68)	0.0095 (0.08)
Country and industry dummies	YES	YES	YES
Number of obs.	290	250	171
F-test on equation	14.73 [.000]	16.93 [.000]	19.12 [.000]
R^2	0.6836	0.6111	0.7280
F-test on sign. of interaction terms	F(9, 243)= 4.14 [0.0001]	F(9, 204)= 1.26 [0.2590]	F(9, 136) = 2.91 [.0035]
DWH test	1.97 [.0435]	1.29 [.2448]	3.05 [.0025]
Sargan test	χ^2 (3) = 5.404 [.1445]	χ^2 (3) = 5.857 [.1188]	χ^2 (6)= 1.891 [.9294]

Table 7: Regression of growth on predicted values of fixed investment and R&D

The table reports the results of a regression of annual average growth on the predicted values from the fixed investment and R&D regressions. The predicted values come from the regression of the average fixed investment and R&D shares on the nine interaction terms plus country and industry dummies, estimated by 2SLS. The equations in this table are estimated by OLS on a sample that is common to the two regressions. Huber-corrected t-statistics are shown in brackets.
* = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level.

	Initial share	Predicted value of fixed investment	Predicted value of R&D	Number of obs.	R^2	F [p-value]
(1)	-0.0981 (-3.26)***	0.0229 (0.64)	-	156	0.0675	6.68 [.002]
(2)	-0.0393 (-1.65)	-	0.2832 (5.79)***	156	0.2935	21.51 [.000]
(3)	-0.0312 (-1.29)	0.0445 (1.50)	0.2876 (5.81)***	156	0.3009	14.49 [.000]

Table 8: Growth regression: Low GDP per-capita sample of OECD countries

This table reports the results of an OLS regression of annual average growth over the period 1970 to 1995 in four low GDP per-capita countries on the independent variables described in Table 6. A constant and a zero-one dummy variable relating to industries and countries with missing independent variables have been included but are not reported. Huber-corrected t-statistics are shown in brackets.
* = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level.

Initial share	-0.3679 (-3.14)***
Disclosure*equity	-0.2966 (-0.22)
Disclosure*bank	0.4757 (1.80)*
Disclosure*other	-5.925 (-2.14)**
Bankconc*equity	-0.4137 (-1.12)
Bankconc*bank	0.1350 (1.92)*
Bankconc*other	-1.3903 (-1.90)*
Ownconc*equity	0.0349 (0.15)
Ownconc*bank	-0.0353 (-0.76)
Ownconc*other	0.3605 (0.80)

Country and industry dummies	YES
Number of observations	101
F-test on equation	133.84 [.0000]
R^2	0.8979
F-test on significance of interaction terms	3.40 [.0019]

Appendix A. Data[6]

In all OECD data used in this study, Germany refers to West Germany, even for the years after reunification.

A1. Activity measures

Growth rates:

Calculated using constant price value added data by country and industry from OECD, Structural Analysis Industrial (STAN) Database 1997.

Fixed investment share:

Calculated using gross fixed investment (GFI) and value added data by country and industry from OECD, STAN 1997.

R&D share:

Calculated using R&D expenditure from OECD, Analytical Business Enterprise Research and Development (ANBERD) Database, 1998 and value added from OECD, STAN 1997, both by country and industry.

For Germany data stops in 1993; averages refer to 1973 to 1993.

A2. Industry variables

(1) Equity finance and external finance in the USA in the 1980s*:*

Table 1, Rajan and Zingales (1998). The series for equity dependence was reported in earlier versions of Rajan and Zingales (1998), but not in the published version.

(2) Bank finance in Japan by industry:

Japan, Ministry of Finance 1981 to 1990 (Unpublished data provided by Jenny Corbett, Nissan Institute, Oxford University.) Our measures are flow measures derived from the sources and uses of funds constructed from the aggregate balance sheet data compiled by the Ministry of Finance.

Banknpi = bank loans / net physical investment

Bankinv = bank loans / (net investment - net retentions)

To correct for fluctuations in and possible time discrepancies between investment and loans received, the 1981 to 1990 sum of each term in the above equation was determined before the division.

(3) Employment broken down by category of skill and by industry in Germany:

Oulton (1996). Total employment in the industry is broken down into four skill categories: workers with no skills, low skilled, medium, and highly skilled.

A3. Country variables

(1) Ownership concentration:

1. Ownership concentration

This is a measure of voting control defined as one minus the mean of the percentage of the 20 largest listed firms widely held (i.e., in which there is not a chain of control from an ultimate owner of at least 10% of voting rights), Table 3B from La Porta et al. (1999). Affiliates of foreign-owned firms with at least 50% of votes directly controlled by a single foreign owner are excluded. Data is from 1995 to 1996.

2. Median ownership concentration

Median ownership of the three largest shareholders in the ten largest non financial privately-owned domestic firms; Table 10 from La Porta et al. (1998).

3. Pyramid

Mean of percentage of pyramids and not widely held 20 largest listed firms, Table 4 from La Porta et al. (1999). We changed the missing value for the UK into a zero.

(2) Bank concentration:

The measure of bank concentration is the sum of the market shares of the five largest banks averaged over the period for which data are available (1989 to 1996) and uses the IBCA BankScope 1997 CD as the underlying data source (Cetorelli and Gambera, 2001).

[4] Detailed information on data cleaning and adjustments to the data is available in a data appendix from the authors.

(3) Accounting standards:
Table 2, Rajan and Zingales (1998) and La Porta et al. (1997).
(4) Origin of Legal System, Creditor Rights, Anti-director Rights:
Table 2, La Porta et al,.(1997).
(5) Bank ownership of equity:[7]
Percentage of equity held by banks = Market value of equity held by banks / Market value of equity held by the private domestic sector
Data on the market value of equity held by banks as a proportion of the market value of equity held by the domestic private sector averaged over the period 1980 to 1990 were collected from individual central banks. Where these were not available then OECD Financial Statistics were used to construct this variable. Details are available in the detailed data appendix from the authors.

Table 10 Equity owned by banks

This shows the proportion of total equity market capitalization in different countries held by banks. (N/A = not available).

Country	Equity Owned by Banks
Australia	0.042
Canada	0.080
Denmark	n.a.
Finland	0.150
France	0.064
Germany	0.136
Italy	0.057
Japan	0.232
Netherlands	0.053
Norway	0.082
Spain	0.095
Sweden	0.000
UK	0.017
US	0.004
Mean	0.078

(6) *Credit / GDP*
IMF, International Financial Statistics, lines 32d and 99b. 1980 to 1990 average.
(7) Private credit/GDP
Value of credits by financial intermediaries to the private sector / GDP, 1960s average; 1970s average. Beck, Demirgüç-Kunt, and Levine (1999).
(8) Government-owned banks (before privatisation waves)
Share of assets of top ten banks owned by government, 1985. La Porta, Lopez-de-Silanes, Shleifer (2002).
(9) Market capitalization / GDP
Market capitalization in US$ is from Emerging Stock Markets Factbook 1992, IFC, p. 52-53. Exchange rate and GDP are from International Financial Statistics, lines ae and 99b. 1982 to 1991 average.
(10) Value traded / Market capitalization
Market capitalization and Value traded in US$ for 1980 to 1990 is from Emerging Stock Markets Factbook, IFC, 1990 and 1995 editions.
(11) Initial public offerings (IPO)

[7] We are grateful to the staff of the many central banks who helped us collect these data.

The number of domestic IPOs in 1996 is from the Federation Internationale des Bourses de Valeurs website: http://www.fibv.com/stata.htm, 1997 Annual Statistics, 1.1 Equity market: Number of newly listed companies.

(12) Population

Population in 1973 is from Maddison, A., 1995, Monitoring the World Economy 1820-1992, OECD Development Center Studies, OECD, Paris.

A4. Definition of pools used in regressions

Table 11 Definition of pools

This table reports the sample period, number of countries and number and identity of industries in each regression pool.

	Period	No. of countries	No. of industries
Growth	1970-95	14, 11, 4 OECD countries	27
Fixed investment	1970-90	14, 11 OECD countries	27
R&D	1973-94	14,11 OECD countries	15

Industry pool for growth and investment regressions		Industry pool for research and development regressions	
Industry	ISIC	Industry	ISIC
Food	3,110+3,120	Food, Beverages and Tobacco	3,100
Beverages	3,130		
Tobacco	3,140		
Textiles	3,210	Textiles, Clothing , Leather & Footwear	3,200
Clothing	3,220		
Leather &Products	3,230		
Footwear	3,240		
Wood Products	3,310	Wood Products, Furnitures & Fixtures	3,300
Furnitures & Fixtures	3,320		
Paper & Products	3,410	Paper & Products, Printing & Publish	3,400
Printing & Publishing	3,420		
Industrial Chemicals	3,510	Chemicals	3,510+3,520
Other Chemicals	3,520		
Petroleum & Coal Products	3,540		
Rubber Products	3,550	Rubber Products and Plastic Products	3,550+3,560
Plastic Products, nec	3,560		
Pottery, China etc	3,610	Non-Metallic Products	3,600
Glass & Products	3,620		
Non-Metal Products, nec	3,690		
Iron & Steel	3,710	Iron & Steel	3,710
Non-Ferrous Metals	3,720	Non-Ferrous Metals	3,720
Metal Products	3,810	Metal Products	3,810
Non-Electrical Machinery	3,820	Non-Electrical Machinery	3,820
Electrical Machinery	3,830	Electrical Machinery	3,830
Shipbuilding & Repairing	3,841	Shipbuilding & Repairing	3,841
Motor Vehicles	3,843	Motor Vehicles	3,843
Instruments	3,850	Instruments	3,850

Appendix B. : Regressions on instrumental variables

Table 12. Regressions of endogenous variables on the instrument set

This table reports three OLS regressions of the endogenous variables on the instrument set. The omitted category in the legal origin dummies is 'French'. In the 11-country sample, there are no instances of German legal origin. Huber-corrected t-statistics are shown in brackets.

* = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level

	(1)	(2)	(3)
	Accounting standards	Bank concentration	Ownership concentration
English legal origin	0.1148 (6.69) ***	0.1129 (1.14)	-0.4289 (-2.88) **
Scandinavian legal origin	0.1577 (2.69) **	0.0536 (0.41)	0.0415 (0.24)
Rule of law	1.054 (11.99) ***	0.7923 (1.84)	-0.5039 (-1.01)
Population	0.000004 (8.73) ***	-0.000005 (-2.13) *	-0.000005 (-1.74)
Number of observations	11	11	11
F-test on equation	54.30 [0.0001]	20.17 [0.0013]	7.85 [0.0145]
R^2	0.7348	0.8249	0.8619