Finance, Investment and Growth

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Abstract

This paper evaluates the relations between industrial activity and the structure of financial systems, corporate sectors and legal arrangements in different countries. Using data from 20 OECD countries in 27 industries over the period 1970 to 1995, we evaluate whether there is a link between industry activity and a combination of country structures and industry characteristics. We find significant interrelations between the two both in terms of industry growth rates and investment shares. The relations are sensitive to countries' stages of economic development: for example, the link between concentration of ownership and economic activity is of opposite sign in low and high income countries. There is strong evidence that the relations between financial structure and economic activity come through expenditures on R&D rather than fixed capital formation.

Key words: financial systems, ownership, legal form, growth, investment

JEL classification: E2, G3, O4

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A Non-Technical Summary

There has been much discussion over a long period of time about the relationship between financial systems and economic performance. The relative performance of bank and stock market oriented financial systems has been discussed for the best part of a century and the problems associated with corporations being widely held by a large number of dispersed shareholders has been debated since the 1930's. More recently, attention has turned to the role of different legal and regulatory structures in promoting economic growth.

Despite the length and intensity of the debates, we still know very little about the way in which financial, corporate and legal structures bear on economic performance. There have been several studies that have looked at and found strong relations between financial and economic development. But they are open to a number of criticisms. Firstly, since they are concerned with growth at the national level, they suffer from small numbers of observations. Secondly, they can only provide limited control for the range of other factors, such as savings rates and non-financial endowments, which may influence economic performance. Thirdly, they have been restricted to assessments of whether there is a link between financial and economic development. They do not therefore address the range of other questions that lie at the heart of debates about financial systems.

A central issue is whether stock markets or banks are more appropriate for promoting economic development and, more subtly, whether different types of financial systems promote different types of activity. For example, it has been suggested that stock markets might be better at supporting new, risky activities (in, for example, high technology industries) where individuals legitimately hold diverse views about future prospects and stock markets perform a valuable function in aggregating these views. On the other hand, the monitoring of more routine activities, for example, investment in plant and machinery may be better delegated to a financial institution which can reduce costs of monitoring. Similarly, corporate sectors with concentrated ownership may overcome free rider problems of corporate control in some industries but exacerbate problems of private benefits of control in others.

While existing studies have focused on aggregate effects of financial development on economic performance, this paper examines the relationship of the structure of countries' financial systems, corporate sectors and legal systems to levels of activity in individual industries. We exploit the emergence of a new class of statistics that provides measures of the structure of financial, corporate and legal systems in a large number of countries. These have opened up the possibility of, for the first time, undertaking serious analysis of the relation between finance, corporate and legal governance and economic performance.

We map these large data banks on country structures to the characteristics of a wide variety of manufacturing industries in an attempt to establish whether there is an inter-relation between the two. Specifically, we are interested in whether country structures (financial, corporate and legal forms) and characteristics of industries (dependence on external finance and investments in skills and training) are related to levels of activity

(growth rates and levels of investment) of these industries in different countries. For example, do bank oriented financial systems promote the growth of bank dependent industries? Do ownership concentrations encourage investment in skill intensive industries? Are stock market oriented countries associated with investments in R&D?

We perform this analysis by collecting data on growth, fixed capital formation and expenditures on R&D in 27 manufacturing industries in 20 OECD countries over 25 years from 1970 to 1995. We collect data on country structures and industry characteristics. There are three types of country structure variables. The first is measures of the size of stock markets, banking systems and ownership concentration. The second is information disclosure (accounting standards), bank relations (as measured by bank ownership of corporate equity) and the nature of concentrated ownership (specifically pyramid structures). The third is indicators of legal form – creditor rights, anti-director rights and the origins of legal systems (civil versus common law systems).

The industry characteristics are the extent to which industries are dependent on bank finance, equity finance and investment in skills. This requires an assessment of the countries in which institutional arrangements are most conducive to their provision. We measure the reliance of different industries on bank finance in Japan, market finance in the US, and skills in Germany.

All the variables are demeaned relative to industry and/or country means. The equations therefore estimate the relation of three measures of activity (growth, share of fixed capital formation in value added and share of R&D in value added) to the interaction of the country and industry variables controlling for both country and industry specific effects. We find that there is a strong relation of the country-industry inter-relations to two of three measures of activity - growth and R&D – but only a weak relation to the third - fixed capital formation. In addition, the relations of growth and R&D to the country-industry inter-actions are very similar. This suggests that (a) the financial and corporate structures of countries bear more directly on R&D activity than on fixed capital formation and (b) their influence on growth comes via R&D rather capital formation, at least in OECD countries.

There is evidence of a relationship between market features (in particular disclosure of information) and activities in market financed industries. However, there is no support for the view that activities in bank financed industries are positively related to the bank orientation of a country's financial system; indeed, if anything, the performance of these industries is more closely associated with information disclosure. In addition, there is no relation of concentration of ownership to growth or investment in industries with high skill or high financing requirements.

We perform several tests of robustness of these results. In addition, we are concerned with the endogeneity of the independent variables – the possibility that activities may cause rather than be caused by country structures and industry characteristics. It is, for example, frequently suggested that financial development is derivative in a Coasian sense that financial institutions emerge to meet economic requirements rather than determine economic performance. For the most part, the results are quite robust to different specifications; however, there is one respect in which they are sensitive. We split the sample into two groups - countries that had high GDP per capita at the

start of the period and those that had low GDP per capita. The idea was to examine (a) the Gerschenkron thesis that banks play a particularly important role in the early stages of development of a country and (b) the view that the agency problems associated with high concentration of ownership are particularly acute in less developed economic systems.

We find support for both these views. Whereas there is no clear association of banking and ownership structures with economic activity in the sample as a whole, there is in the two sub-samples. In particular, there is a positive relation in the less developed countries between activity in bank financed industries and the bank orientation of the countries and a negative relation between concentration of ownership and activity in high skill and external financed industries. In more developed countries, the relations are precisely reversed.

The conclusion of the article is that financial, corporate and legal structures do bear an important relation to industrial characteristics, that their effects on activity come primarily through R&D rather than fixed capital formation and that the relations are sensitive to different stages of economic development.

If these observations are correct, they imply that countries' policies towards the structure of financial and corporate systems should be sensitive to their industrial composition and stages of economic development. While liberalisation, through, for example, greater information disclosure requirements may be appropriate in developed countries, policies in less developed countries may be better directed towards the development of banking systems and the control of abuses associated with concentrations of ownership.

1 Introduction

Over the last decade, several studies have documented significant differences in the organization of financial markets and corporate sectors across countries. These differences relate in particular to the structure of financial systems and the role of banks, the ownership and control of corporations, and financial regulation and corporate law.

Comparative studies of financial systems have a long history. In 1910, L. Joseph asserted that the funding of industry by banks in Britain compared unfavourably with that in the US and Continental Europe. The role of French, German and Italian banks in promoting industrial growth at the end of the last century has been emphasized in particular by Cameron (1961 and 1967) and Gerschenkron (1962). The involvement of banks in the post WWII Japanese economy has been documented *inter alia* Hoshi, Kashyap and Scharfstein (1990, 1991) and Miyajima (1995).

These studies point to the close connections that exist between banks and industry in Germany and Japan. In Germany, these relations include bank ownership of corporate equity, positions on the supervisory board of firms and proxy voting on behalf of individual investors; in Japan, they are associated with exchange of personnel, bank ownership of corporate equity, provision of rescue finance and the holding of compensating balances. These bank-firm links are viewed as encouraging the provision of more bank finance, particularly during periods of financial distress, on better terms than exist elsewhere.

But these assertions have not gone unchallenged. Edwards and Fischer (1994) and Edwards and Ogilvie (1996) note that banks have provided less finance for industry in Germany than in the UK and German banks have only been able to exert modest control through proxy votes and supervisory board positions. Edwards and Nibler (1998) find that there is no positive effect of bank ownership of equity on the profitability of large German firms. In Japan, Kang and Stulz (1997) record that bank dependent firms were more seriously affected by the stock market declines of 1990 to 1993, suffering larger wealth losses and investing less than other firms. Weinstein and Yafeh (1998) record that close bank-firm ties increase availability of capital to Japanese firms but do not lead to higher profitability or growth because of the market power that banks can exert.

More recently attention has focused on differences in ownership and control (Becht (1998) and La Porta, Lopez-de-Silanes and Shleifer (1998)). In the UK and the US, a

high proportion of the largest companies are listed on stock markets and have ownership dispersed amongst a large number of institutional and individual investors. On the Continent in Europe, most companies are private and ownership of listed companies is highly concentrated. Ownership is frequently in the hands of families; corporate holdings in the form of pyramids are commonplace; there are cross-shareholdings and complex webs of corporate shareholdings; and in some countries, there is significant bank ownership of shares.

La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) have documented the significant differences that exist in corporate law and regulation across countries. They distinguish between countries having common law systems as exist, for example, in the UK and US, and civil law, for example, the French system. These systems are associated with different degrees of protection of minority shareholders, creditors versus debtors and directors versus investors. The differences are in turn associated with the development and depth of financial markets. In particular, minority protection is greater and financial markets better developed under common than civil law systems.

Despite the considerable volume of research on international variations in financial markets, we still know very little about the impact of these differences on the performance of firms and economies. There have been several studies pointing to the importance of financial systems in economic development. King and Levine (1993) have documented a relation between the size of financial sectors, as measured for example, by the ratio of monetary assets to GDP and the growth of economies. Levine and Zervos (1998) report that both stock market liquidity and banking sector development (measured by bank credit to GDP ratios) are correlated with economic growth, capital accumulation and productivity growth. However, such studies encounter two types of problems. Firstly, sample sizes are restricted to the small number of countries for which data are available. Secondly, it is very hard to control for the numerous other factors that might be contributing to international differences in growth rates. In particular, attempts to obtain reasonable sample sizes mean that countries with different characteristics and at different stages of their development have to be compared.

Rajan and Zingales (1998) attempt to overcome this problem by comparing growth rates of different industries across countries. This has the advantage that sample sizes are much larger and, since growth rates relative to industry and country averages are being measured, there are good controls for other factors that might influence comparative growth rates. Rajan and Zingales report an interrelation between industry

growth rates and the product of a measure of the dependence on external finance of different industries (measured in the US) and the development of different countries' financial systems (in particular, as measured by the number of accounting standards). Industries dependent on external finance (in the US) grow faster in other countries that have a highly developed financial system as measured by accounting standards. They argue that this points to an impact of financial development on economic growth. Financial development relaxes constraints on the expansion of industries dependent on external finance and thereby raises aggregate economic growth.

There is an alternative view suggested by the debates summarized above, and that is that different financial systems might be suited to different types of activities and different stages of development of firms and economies. Gerschenkron (1962) argues that the initial stages of economic development can be promoted by banking systems and controlled capital markets. Subsequent economic progress may benefit from more liberal securities markets. Allen (1993) argues that banks may overcome free rider problems of monitoring but that stock markets might be better at aggregating diverse views about new technologies. This suggests that bank oriented systems may be better suited to traditional manufacturing industries and stock market economies to the promotion of high technology industries.

Similarly, the literature has pointed to a trade-off between the benefits of having concentrated or dispersed shareholdings. Concentrated ownership overcomes free rider problems of corporate control (Shleifer and Vishny (1986)) and markets in partial share blocks may be more efficient than full tender offers (Grossman and Hart (1980) and Burkhart, Gromb and Panunzi (1998)). However, they create private benefits of control problems (Shleifer and Vishny (1997) and takeover markets may be more efficient at correcting managerial failure (Scharfstein (1988)). Banks may therefore be beneficial in the early stages of development and banks and concentrated ownership in industries in which close monitoring and control are required. Stock markets and dispersed ownership may be preferred in more mature economies or in industries in which there is considerable technological uncertainty.

This paper is concerned with the interrelation between the financial and legal structure of economies, the characteristics of industries and the activities of different industries in different countries. In particular, it addresses the question of whether there is a matching between different financial systems with different types of corporate activities or whether the two are unrelated. We examine this by evaluating how different country structures (financial, corporate and legal systems) interact with different industry characteristics (such as external financing and skill requirements) to

influence activities in particular industries in particular countries.

The level of activity in an industry is evaluated in relation to its growth rate over a 25 year period from 1970 to 1995 and by shares of investment (as a fraction of value added) in fixed capital formation and R&D. These are measured relative to world averages for their industries and relative to averages in their countries. We therefore introduce the controls described in the Rajan and Zingales paper into an evaluation of the comparative financial systems, comparative corporate governance and comparative legal systems debates.

Section 2 of the paper describes the hypotheses that the paper tests and the methodology that it employs. Section 3 describes the data. Section 4 reports the results of the regression analyses for the determinants of growth, capital expenditure and R&D. Section 5 summarizes the implications of the results for hypotheses described in section 2 and section 6 concludes the article.

2 Theory and Methodology

2.1 Theory

This paper is concerned with the interrelationship between the structure of countries corporate and financial systems, the characteristics of different industries and activities of industries in different countries. Examples of country structure that are used in this paper are the size of the banking sector, the size of securities markets, and the degree of concentration of ownership. Examples of industry characteristics are the extent to which industries are reliant on external financing from banks and equity markets and the skill level of workers in different industries. Activity levels are measured by growth rates and shares of value added devoted to fixed capital formation and R&D expenditure in different industries in different countries.

The first hypothesis considers whether there is an interrelation between financial and corporate systems, characteristics of industries and economic activity.

Hypothesis 1: Industrial activity is systematically related to the interaction between the characteristics of industries and the financial and corporate structure of countries.

If industries depend to differing extents on external finance and skills and if financial and corporate structures differ in their capacity to meet these needs, then we would

expect to observe industries performing relatively well in the presence of the country characteristics that match their needs. A rejection of hypothesis 1 does not rule out an effect of financial development on economic activity but only on its industrial composition. The second hypothesis explores the interrelation between financial systems and industrial characteristics further:

Hypothesis 2: Levels of activity in industries that are dependent on securities markets are highest in countries with well developed securities markets and levels of activity in industries that are dependent on banking sectors are highest in bank based systems.

Hypothesis 2 introduces the possibility not only of an effect of financial development on industrial composition of economic activity but an effect that depends on the balance between securities markets and banks. Perhaps the clearest example of this is the provision of finance. If hypothesis 2 holds then industries dependent on bank finance can be expected to grow fastest in bank oriented systems and industries reliant on market finance will grow fastest in market systems. In addition, Allen (1993) argues that traditional investments in plant and equipment and human capital benefit from the close monitoring and screening banks are able to provide. In contrast, newer and more speculative investments in, for example, R&D require the aggregation of diverse expectations performed by securities markets. We therefore examine:

Hypothesis 3: Bank based systems are associated with high rates of growth and fixed capital formation shares in industries that are reliant on bank finance and investment in human skills. Market based systems are associated with high rates of growth and R&D shares in industries reliant on market finance.

Rejection of hypothesis 3 does not rule out different financial systems having different effects on economic activity: it is, for example, quite consistent with stock markets having a stronger or weaker relation to economic activity than banks. However, rejection of hypothesis 3 is not consistent with stock markets having a systematically different relation from banks to activity in industries with particular characteristics.

The fourth hypothesis examines the influence of concentration of ownership. According to Shleifer and Vishny (1986) agency problems created by free riding in corporate control are most pronounced in countries in which corporate ownership is dispersed. Industries which require large amounts of external financing (from either banks or securities markets) and have high skill requirements are particularly prone to agency problems created by asymmetries of information between investors and firms.

They are therefore most likely to benefit from the intensive monitoring and control which a concentrated owner can perform.

Hypothesis 4: Industries that are heavily dependent on external finance and investment in skills display higher growth and investment shares in countries in which there are high levels of concentration of ownership.

However, there is a counter-argument that ownership concentrations exacerbate conflicts between private and public benefits of control and between minority and majority shareholders (Shleifer and Vishny (1997)). This suggests that there may be no relationship along the lines described in hypothesis 4 or that it might even be of the opposite sign. This is most likely to be the case in countries in their initial stages of development where systems of financial and corporate control are less well developed. In the absence of well developed institutional arrangements, Gerschenkron attributes a particularly important role to banks in the early stages of development.

Hypothesis 5: Industries that are heavily dependent on external finance and investment in skills display higher growth and investment shares in developing countries with well developed banking systems and low levels of concentration of ownership.

2.2 Methodology

We define:
Y = k×i matrix of i industrial growth rates and investment shares in k countries
X = s×k matrix of s country structural features in k countries
Z = c×i matrix of c industry characteristics in i industries.

We estimate **B**, the s×c matrix which relates country structural characteristics and industry financing variables to industry growth rates in particular countries in the equation

$$\mathbf{Y} = \mathbf{X'BZ} + \boldsymbol{\varepsilon}$$

where $\boldsymbol{\varepsilon}$ is the error term in the regression.

Specifically, we use three different variables for the activity measure, **Y**. These are

the growth rate of output, fixed capital formation share (GDFCF/ value added) and R&D share (R&D expenditure/ value added) in 20 OECD countries (k = 20) (14 in the R&D share regressions) in 27 3-digit SIC industries (i = 27) (15 in the R&D regressions) over the period 1970 to 1995 (1970 to 1990 in the investment regressions and 1973 to 1994 in the R&D regressions). **Z**, the industry characteristics, are measures of market sources of financing, bank financing, and investment in skills (c=3).

X, the country structural features, are measured in three ways. Firstly, we use data on the size of securities markets (ratios of market capitalization to GDP), size of banking systems (bank credit to GDP ratios) and concentration of ownership. Secondly, we look at influences on financial systems and corporate sectors, namely information disclosure as measured by accounting standards, bank-firm relations as measured by bank ownership of corporate equity and corporate structures as measured by pyramid ownership. Finally, we look at various legal factors, namely anti-director rights, creditor rights and the origins of legal systems.

Define y_{ik} as the dependent variable in industry i in country k, y_{i-} as its average across countries, y_{-k} as its average across industries and y_{--} as its average across countries and industries. Define x_k as the country variables, z_i as the industry variables, x_- as the averages of the country variables across all countries, z_- as the averages of the industry variables across all industries and a and b as parameters. Then if

$$y_{ik} = a_i + a_k + b_i z_i + b_k x_k + b_{ik} z_i x_k + \varepsilon_{ik}$$

$$y_{ik} - y_{-k} - y_{i-} + y_{--} = b_{ik}(z_i - z_-)(x_k - x_-) + \varepsilon_{ik}$$

We therefore construct the demeaned dependent variables, demeaned relative to both country and industry averages, and demeaned industry and country variables, demeaned relative to their all industry and worldwide averages respectively. We estimate the relative growth, fixed capital formation and R&D shares of industries in particular countries in relation to the interaction of country structures relative to their worldwide average with industry characteristics relative to their averages across all industries.

Rejection of hypothesis 1 (a relation between industrial activity and the interaction of country structures and industry characteristics) implies $b_{ik} = 0$, $\forall$ i, k.

Rejection of hypothesis 2 (a differential relation of securities markets and banks with industrial activity) would be evidenced by similar values (or at least signs) for b_{i1} and b_{i2} $\forall$ i, where k = 1 and 2 for securities markets and banking systems measures respectively.

Rejection of hypothesis 3, a positive association between activity (particularly fixed capital formation) in banking systems and bank financed and skill based industries, and between activity (particularly R&D) in market based systems and market financed industries, would come from $b_{22} \leq 0$ and $b_{32} \leq 0$ (particularly in fixed capital formation) and $b_{11} \leq 0$, $b_{31} \leq 0$ (particularly in R&D), where i = 1 relates to securities market financing, i = 2 to bank financing and i = 3 to skill levels in industries.

Rejection of hypothesis 4 (a positive association between concentration of ownership and activity in high external finance and high skills industries) would be evidenced by $b_{13} \leq 0$, $b_{23} \leq 0$ and $b_{33} \leq 0$.

Rejection of hypothesis 5 (a positive association in developing countries between banking systems and activity in high external finance and high skills industries and a negative association with concentration of ownership) implies $b_{12} \leq 0$, $b_{22} \leq 0$ and $b_{32} \leq 0$, and $b_{13} \geq 0$, $b_{23} \geq 0$ and $b_{33} \geq 0$ in developing countries.

The signs of coefficients in the B matrix predicted by hypotheses 3 and 4 can be summarized as:

Figure 1 – Signs of Coefficients in Matrix B Predicted by Hypotheses 3 and 4

	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	> 0 (H3)		> 0 (H4)
	2 (bank finance)		> 0 (H3)	> 0 (H4)
	3 (skills)	> 0 (H3)	> 0 (H3)	> 0 (H4)

The advantage of the demeaning approach is that it allows attention to be focused on the relationship between growth (or investment) and the interaction of country structure and industry characteristics. While problems of omitted variables can never be eliminated entirely, by demeaning data relative to country and industry averages

we are able to provide a control for other factors that may affect growth and investment.

However, it is important to appreciate what this study does and does not do. It provides an evaluation of how country structures and industry characteristics interact in affecting performance in particular industries and countries relative to average performance in those countries and industries. It does not address the larger question of whether there are factors that influence overall performance of countries or industries. To take one example, this analysis establishes whether high levels of bank ownership of corporate equity promote growth of industries in which there are high levels of bank finance. It does not determine whether high levels of bank ownership give rise to high levels of growth in all industries in those countries. The reason why we do not even to attempt to perform this test is that the problems of providing adequate controls for all the other factors that may influence growth of a country or industry are formidable. In addition, insufficient countries are available to provide reliable estimates of these effects.

There are a number of issues that this estimation raises. We have already mentioned the problem of omitted variables. We attempt to overcome this by examining the influence of a range of variables in addition to those referred to above on performance. However, there are obvious limitations to such an exercise.

Secondly, it is questionable whether the country structure and industry characteristic variables can be really treated as exogenous. The structure of countries and the characteristics of industries may be a product of rather than a cause of the performance of different industries and countries. For example, whether a country has high levels of concentration of ownership may reflect rather than cause the growth rates of its industries.

There are two senses in which this may be troublesome. Firstly, in interpreting the results there is a strong temptation to impute causation to, in particular, the country structures, for example, to suggest that growth in industry i in country k was above or below average because of a high or low level of bank ownership or information disclosure. We wish to make clear that we are not attempting to infer such causation. Whether a structural feature caused or was caused by activity in an industry in a country is highly debatable. The hypothesis that we are testing is the more basic one that there is an interrelation between country structures, industry characteristics and activity in industries in particular countries.

However, this interpretation does not avoid the econometric problems that endogeneity creates. We use a number of techniques to address this. Firstly, it has been argued by La Porta et al (1997) that legal factors (such as creditor and shareholder rights and the origins of legal systems) are more fundamental than some of the country structural variables described above. We exploit this assertion in two ways: firstly by replacing some of the country characteristics with legal factors and, secondly, by instrumenting our country structure variables with legal factors. In particular, the claim of exogeneity seems to be most convincing in the case of the origin of legal systems, which is used as an instrument for the country structural variables.

Secondly, as is discussed in the next section, data from three countries (Germany, Japan and the US) are used to identify the three industry structure variables. Problems of endogeneity are likely to be most acute in relation to these three countries in so far as feedback from performance to structure is most likely to come from performance in those countries. We therefore report below the results of omitting these three countries from the analysis.

3 Data

3.1 Output and growth

Data were collected on growth in constant price value added in 27, predominantly 3-digit SIC, manufacturing industries in 20 OECD countries over the period 1970 to 1995. The data came from OECD DSTI (STAN) 1997.[1]

Table 1 records the annual average growth rates of the 20 OECD countries over the period 1970 to 1995. South Korea has an appreciably higher growth rate than other countries. Portugal has the next highest growth rate. The table decomposes 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 1980, assuming that industries grow at the world average over the period. The second is a "growth effect", the contribution of deviations from world average growth rates assuming initial shares are equal to world

[1] See the data appendix. An alternative source of data is the Industrial Statistics Yearbook of the United Nations Statistical Division. The country coverage of the UN data is greater than that of the OECD. However, the control problems of the regressions are probably exacerbated by the inclusion of developing as well as developed countries and a comparison of the two sources suggested that there were fewer statistical problems with the OECD data. In particular, there is no constant price value added series in the UN data.

averages. The third is an "interactive effect", the interaction of deviations of initial shares and industry growth rates from world averages. The first captures the extent to which deviations from world average growth rates are attributable to high initial shares in industries that experienced high or low growth globally; the second records country specific deviations from world average growth rates independent of initial industry allocations; and the third captures interactions between initial shares and country specific growth rates.

The table records that the country variation is nearly entirely attributable to the growth effect. This is confirmed by an analysis of variance: -8.0% of country growth variation is attributable to the share effect, 131.6% to the growth effect and –23.8% to the interactive effect; the last of these implies that there is significant regression to the mean – high share industries have below average growth rates.

3.2 Fixed capital formation and R&D

Data were collected on gross fixed capital formation for 27 manufacturing industries in 20 OECD countries over the period 1970 to 1990 and on R&D expenditure for 15 manufacturing industries in 14 OECD countries over the period 1973 to 1994.[2] Table 2 reports the average ratio of fixed capital formation to value added in manufacturing over the period 1970 to 1990 in 20 OECD countries and the average ratio of R&D to value added over the period 1973 to 1994 in 14 OECD countries. The rankings of the two are markedly different. While Spain has the lowest ratio of both, the UK and USA have some of the highest R&D ratios but the lowest fixed capital formation ratios.

Tables 3 presents disaggregated data for growth, fixed capital formation and R&D to value added ratios for all OECD countries and for Germany, Japan, UK and US. It records the three industries with the highest growth and shares in the OECD as a whole and in the four countries individually. The rankings of the highest growth, highest fixed capital formation share and highest R&D share industries is quite different, across the OECD as a whole and within individual countries. There is considerable cross-country variation in relative industry performance. Only one of the three fastest growing industries in Japan (electrical machinery, professional goods and motor vehicles) was amongst the three fastest growing industries in the OECD as a whole (electrical machinery, other chemicals and plastic products). The fastest growing industry in Japan (electrical machinery) grew at nearly twice the rate of the

[2] The time periods and industries were dictated by data availability from the OECD. In addition, petrol refineries were excluded throughout because of price index number problems.

fastest growing industry in the US (plastic products) which in turn grew considerably faster than the fastest growing industries in Germany and the UK. The fixed capital formation share of the highest capital expenditure industry in Japan (petrol and coal products) was more than twice that of the highest capital expenditure industry in any of Germany, the UK and US. On the other hand, the R&D share of the highest R&D industry in the US was much greater than that of the highest R&D industry in Germany and Japan. This suggests that there is considerable variation in the nature of both industry growth and investment activity across countries.

3.3 Industry characteristics

We focus on three characteristics of industries: the extent to which they are reliant on market sources of finance, bank finance and a skilled labour force. Establishing the significance of these inputs to the activities of different industries is complicated by the constraints under which firms in these industries may be operating. There may be legal, regulatory, institutional and cultural considerations which limit their availability or raise their price. The approach which we have taken mirrors that in Rajan and Zingales (1998) who argue that since the US has one of the most highly developed and liberal financial markets in the world, US firms are likely to face the least constraints in raising external finance. External funding levels of US industries will therefore most closely approximate the requirements of firms operating in those industries.

We similarly constructed our three industry variables by using the countries in which conventional wisdom suggests that they are least likely to be constrained and therefore a close reflection of the underlying characteristics. Stylized descriptions treat the US as the archetypal market based financial system, Japan as a bank based system and Germany as a country in which investments in skills and training is promoted. We therefore measured cross-industry variations in external market based sources of finance in the US, bank finance in Japan and investment in skills in Germany.

Using data from Rajan and Zingales (1998), external financing was measured as the fraction of capital expenditure not financed with cash flow from operations by US firms during the 1980's. Equity financing was measured as the ratio of the net amount of equity issues to capital expenditures. Industry data on bank finance in Japan was obtained from the Japanese Ministry of Finance. Bank financing ratios were constructed as the ratio of bank loans to gross external financing (total investment including investment in financial assets minus retentions) and as the ratio

of bank loans to physical investment (net of depreciation) averaged over the period 1981 to 1990. Most of the results reported below refer to the latter definition of bank financing. Oulton (1996) reports skill levels of the German workforce in 1987. The proportion of the workforce with high, upper intermediate, lower intermediate and no vocational qualifications is reported for 30 manufacturing sectors.[3]

Table 4 shows three of the industry variables: equity financing, bank financing and skill levels. Electrical machinery has a high level of equity financing in the US but a modest level of bank financing in Japan. Clothing has one of the highest levels of bank financing in Japan but raised no equity in the US. Skill levels are high in ship-building, an industry which raises little equity in the US and ran down outstanding stocks of bank debt during the 1980's. Skill levels are low in textiles, an industry which was heavily dependent on bank finance in Japan but raised little external equity finance in the US. In professional goods, levels of equity finance, bank finance and skills are all above their means. 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.

3.4 Country structures

Five structural features which apparently display considerable variation across countries are the degree of concentration of ownership, information disclosure rules, relations between banks and industry, the sizes of stock markets and banking systems. In two papers, La Porta et al report data on ownership concentration in a large number of countries. La Porta et al (1997) report data on the median ownership of the three largest shareholders in the 10 largest non-financial privately owned domestic firms. La Porta et al (1998, table 3b) report the mean percentage of the 20 largest firms which were widely held in the sense of having no shareholder with more than 10% voting control. La Porta et al (1998, table 4) report a third measure of ownership structure: the mean percentage of the 20 largest firms which were not widely held and had control exercised through a pyramid of at least one publicly traded company. Most of the results relate to the second measure of ownership concentration.

Financial disclosure is commonly associated with accounting standards. The Center for International Financial Analysis and Research creates an index of accounting disclosure on a scale from 0 to 90 based on the annual reports of at least three firms in

[3] The four definitions are 'high' = Hochschulabschluss; Fachhochschulabschluss, 'upper intermediate' = Meister/Techniker gleichwertig Fachschulabschluss, 'lower intermediate' = Lehr-/Anlernausbildung gleichwertig Berufs-Fachschulabschluss; berufliches Praktikum, and 'no qualifications'.

each country. 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), have been used in this study.

There is no single source of information on bank ownership of corporate equity. Data on the market value of equity held by banks as a proportion of the market value of equity held by the private domestic sector averaged over the period 1980 to 1990 were collected from individual central banks; where this was not available then OECD Financial Statistics were used.

The size of stock markets was measured by the average ratio of market capitalization to GDP over the period 1982 to 1991 as reported by the IFC Emerging Stock Market Factbook. The size of banking systems was measured by the average ratio of bank credit to GDP over the period 1980 to 1990 as reported by IMF International Financial Statistics.

Table 5 records that concentration of 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. Finland, Germany and Japan have particularly high levels of bank ownership of corporate equity and also have large banking systems. France has a large banking system but little bank ownership of corporate equity. Sweden and New Zealand have no bank ownership of corporate equity and small banking systems. There is little bank ownership in the US but above average amount of bank lending. Accounting disclosure is low in Austria, Greece and Spain. These countries also have small stock markets. The UK has high accounting disclosures and a large stock market but Sweden has high accounting standards but only a modest sized stock market. The correlation between accounting standards and the size of stock markets is 0.472, between bank ownership of corporate equity and the size of banking systems is 0.657, between ownership concentration and bank ownership of equity is 0.126 and between accounting standards and ownership concentration is –0.391.

La Porta et al (1997) (table 2) also report a number of legal characteristics of countries which have been used in this study, in particular creditor rights, anti-director rights and the origin of legal systems. The last variable has been used as an instrument for the other country characteristics in the regressions reported below.

4 Regression results

4.1 Growth

Table 6 reports the results of a regression of value added growth across 27 mainly 3-digit SIC industries in 20 OECD countries over the period 1970 to 1995. The independent variables are the initial shares of industries at the start of the period, nine interactive terms constructed from the three industry characteristics variables bank finance, equity finance and skills, and the three country structural variables accounting standards, bank credit to GDP ratios and concentration of ownership. All variables have been demeaned as described above. A dummy variable (which has not been reported) was also included to account for observations where bank finance in Japan was not available. The standard errors are all Huber-corrected.

Six variables are significant at better than the 10% level in the growth regression. Initial shares are strongly negative implying 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% increase in the initial share of an industry in a country is associated with 0.250% lower annual average growth rate of that industry.

Two of the three variables which interact with accounting standards are significant. Greater disclosure is associated with faster growth in skill intensive and equity financed industries but with lower growth in industries that make little use of skilled labour and little equity financing. Again the economic significance of these variables is quite appreciable. The interactive term between accounting standards and skills (acc*allskill) has a range of 0.035 in the non-electrical machinery (the industry with the second highest skill level in Germany). Shifting from the country with the lowest (Spain) to the highest (Sweden) accounting standards is therefore associated with an increase in annual growth in non-electrical machinery of $0.408 \times 0.035 = 1.4$ percent. Conversely skill levels in Germany are at their lowest in leather products and footwear. The range of the interactive variable in these industries is 0.037. An increase in accounting standards from Spain to Sweden is therefore associated with a *decline* in growth rate in these industries of $0.408 \times 0.037 = 1.5$ percent. The range of the interactive variable is much lower in industries close to mean skill levels in Germany, eg 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 growth rates in different industries; a similar effect applies to all the variables.

There is a positive relation between growth and the interaction of the size of banking systems with equity financing and skill levels of industries. There is a negative relation between growth and the interaction of size of banking systems and bank financing of industries. No significant relation with the concentration variables is observed. Separate regressions on the three sub-periods, 1970 to 1980, 1980 to 1990 and 1990 to 1995, reveal that the interactive effect of accounting with skills is strongest in the early periods and with equity finance in the later periods. Interactive effects with size of banking systems are most in evidence in the 1980s.

4.2 R&D and fixed capital formation

Table 6 also reports results of regressions with the same set of independent variables but with R&D and fixed capital formation (both as a ratios of value added) as dependent variables. Table 6 reveals similar results for R&D to those reported above for growth. There is a positive relation between accounting standards and growth rates in skill intensive and equity financed industries. In addition to a negative relation between the size of banking systems and R&D in bank financed industries, there is also a significant negative relation with accounting standards. These results are particularly strongly observed in the last sub-period between 1990 and 1994. Again the magnitude of the effects is large: shifting from the lowest to the highest accounting standard country is associated with a $0.470 \times 0.090 = 4.2$ percent increase in the ratio of R&D to value added in electrical machinery (the industry with a high equity dependence) through the equity finance interaction term. On the other hand, the same variation in accounting standards is associated with a $0.470 \times 0.043 = 2.0$ percent decline in the ratio of R&D to value added in food (an industry which raised no external equity finance in the US) through the same term.

While the 'determinants' of growth and R&D are similar, the 'determinants' of fixed capital formation are quite different. Accounting standards and concentration of ownership are associated with large ratios of fixed capital formation to value added in low equity industries. This is observed in both of the sub-periods.

Accounting standards do not therefore appear to promote growth through fixed capital formation but rather through R&D. In addition, while the interactive terms explain a substantial fraction of R&D to value added and value added growth (R^2 of 17.4% and 14.2% respectively), they explain very little of the cross industry/country variations in fixed capital formation (R^2 of 2.3%). The interaction of country structures and industry characteristics is therefore related to growth and R&D but not to fixed capital formation.

4.3 Alternative variable definitions

We have examined the robustness of the results to several different definitions of both country and industry variables.

4.3.1 Country structure variables

As noted above, La Porta et al record a number of different measures of ownership concentration. Neither the earlier La Porta et al (1997) measure of concentration nor the pyramiding measures were more significant in the growth, fixed capital formation or R&D equations than the one reported above. The signs of the coefficients on the interactive term between pyramiding and the industry variables in the growth regression are summarized in table 7.

The significance of bank firm relations was assessed by replacing the size of banking systems (bank credit to GDP ratios) with bank ownership of corporate equity. The results are very similar to those shown in table 6 and the signs of the coefficients on the interactive term between bank ownership and the industry variables in the growth regression are summarized in table 7. There is a significantly negative effect of the interactive variable bank ownership with bank finance and a positive effect of the interactive variable bank ownership with equity finance in the growth regression. There is no significant bank ownership variable in the fixed capital formation or R&D regressions.

Replacing accounting standards with the size of stock markets (as measured by the ratio of market capitalization to GDP ratios), the fixed capital formation equation is similar to that in table 6 with a significant negative term in the interaction of market capitalization and new equity finance. However, all the interactive terms in market capitalization are insignificant in the growth regression and only an interactive term with skills is positively significant at the 10% level in the R&D regression. This again points to the close relation of determinants of growth and R&D in OECD countries and the fact that accounting standards are more relevant than market capitalization to both.

4.3.2 Industry characteristic variables

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 in the growth equation (table 7), a positive interaction with accounting standards in the R&D equation and a negative interaction with accounting standards in the investment equation. However, the relationships are in general weaker suggesting that the interaction of the structure of capital markets with growth and investment primarily comes through new equity finance.

The definition of skills used above is the proportion of the work force with any skills (i.e. one minus the proportion with no skills). Replacing this with the proportion of the workforce with lower and upper intermediate skill levels, the positive interaction between accounting and skills in the growth regressions is still observed. Indeed there is a positive interaction between all three country variables and skill-intensity. However, the interaction with accounting standards is only significant in the R&D regressions when skills in the higher levels are included. In fact, there is a striking increase in the significance of the term in the R&D regression as the skill variable is raised from lower to higher levels. R&D shares are therefore closely associated with the interaction of accounting standards with high skill levels.

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, it might be thought more appropriate to measure bank finance in relation to external rather than total finance. Results in the R&D and investment equation are little affected by this change; in particular, in the R&D equation, both accounting standards and the size of banking systems continue to display a strong negative inter-relation with bank finance. In the growth equation, as table 7 records, the interaction of the size of banking systems with this definition of bank finance is no longer significantly negative.

In addition to the above, we ran robustness tests which weight 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 very similar to those reported in table 6.

To summarize, many of the results reported in table 6 are robust to different definitions of country and industry variables. Different definitions of ownership concentration and country measures of banking systems yield similar results. However, market capitalization does not appear to interact in the same way with equity finance and skill-dependence as do accounting standards in the growth and R&D regressions. The relationship between accounting standards and growth and

R&D primarily comes through equity rather than other funding requirements of industries.

4.4 Exogeneity tests

The main issue raised by the above analysis is whether the independent variables can be treated as exogenous. The fact that they are not measured prior to the dates over which growth, fixed capital formation and R&D are measured exacerbates this concern. But even if they were then the question of whether country structures and industry characteristics could be treated as exogenous would arise.

La Porta et al (1997) argue that legal and regulatory factors are more fundamental characteristics of countries than ownership. In most countries, legal systems have a long history and have shaped the development of accompanying institutions. We have responded to this suggestion in two ways. Firstly, we have used a number of legal measures in place of the country variables previously described. Secondly, we have used the legal variables as instruments.

Three sets of legal variables have been taken from La Porta et al (1997), creditor rights, anti-director rights and the origin of legal systems. An index of creditor rights was constructed by marking out of 4 whether (a) a country imposes restrictions (eg creditors' consent) on companies' abilities to file for reorganization, (b) there is no automatic stay on assets once a reorganization petition has been approved, (c) the debtor does not retain control of its property during reorganization and (d) secured creditors are ranked first in the distribution of proceeds from sale of assets.

Substituting creditor rights for accounting standards, creditor rights performs less well in both the growth and R&D equations. However, in fixed capital formation, the creditor rights term interacts positively with the industry skill variable implying that stronger creditor rights are associated with higher investment in skill intensive industries.

La Porta et al (1997) define an index of anti-director rights as a mark out of five on whether (a) the country allows shareholders to mail their proxy votes, (b) shareholders are not required to deposit their shares prior to the General Meeting, (c) cumulative voting is allowed, (d) there is an oppressed minorities mechanism and (e) the minimum share capital which is required to call an Extraordinary General Meeting is less than 10%.

Replacing accounting standards in the interactive variables by anti-director rights, little influence of anti-director rights on growth is found. However, the interaction of anti-director rights with equity finance enters strongly in the R&D equation. Anti-director rights may therefore be a better proxy than accounting standards for the factors that are relevant to shareholders' investment in R&D expenditures.

La Porta et al (1977) characterize countries' legal systems as being of English, French, German and Scandinavian origin. They argue that common law countries (English) protect both shareholders and creditors the most, French civil law countries the least and German and Scandinavian civil law countries somewhere in the middle. We constructed a variable which was 1 for French, 2 for Scandinavian, 3 for German and 4 for English law countries. A positive influence of investor protection (a higher score on this index) is found in both growth and R&D regressions. In the case of growth it is associated with skill-intensive industries and in the case of R&D with equity financed industries.

These results reinforce those of the previous section in suggesting that investor protection promotes growth in external finance- and skill-intensive industries through R&D expenditure. Creditor protection may also play a role in promoting capital expenditure in skill-intensive industries.

An alternative approach to the endogeneity problem is to instrument the variables used in the main regressions. The origin of the legal system is the one variable that could be genuinely argued to be exogenous. We instrumented all three country variables using the origin of the legal system interacted with the appropriate industry characteristic variable. Column 2 of table 8 reports that the results are similar to those of table 6 except that there is now more evidence of a significantly positive relationship of growth with the interaction of ownership concentration with equity finance and skills.

As a further test of exogeneity we omitted the three countries which were used to construct the industry characteristic variables: Germany, Japan and the US. While growth, fixed capital formation and R&D of these three countries might affect financing differences and skill levels in industries in these three countries, it is less plausible to argue that they are influenced by growth, fixed capital formation and R&D in other countries. Column 3 of table 8 reproduces the growth regression dropping Germany, Japan and the US. The main results reported above are invariant to omission of these three countries: there is still a strong positive relation of growth with the interaction of accounting standards and both equity finance and skills, a

negative interaction of the size of banking systems with bank financing and a positive interaction with equity financing.

4.5 Stages of economic development

We have examined the relationship of the above results to stage of economic development by splitting the sample into countries which had low and high GDP per capita at the start of the period.[4] Five countries had GDP per capita in 1970 in the range $2,200 to $7,300: Greece, Korea, Mexico, Portugal and Spain. These are referred to as low GDP per capita countries. The remainder had GDP per capita in the range $9,100 to $15,000.

Table 9 describes the results of estimating the equation referred to in column 2 of table 6 on the two samples of countries. It shows that the relations with the accounting standards variables are similar in the two groups but the relations with the size of banking systems and especially with ownership concentrations are very different. Nearly all of the variables are of opposite sign and most significantly so. The absence of significant coefficients on ownership concentration variables in column 2 of table 6 masks the fact that there are significant relations in both more and less developed countries but those relations are of opposite sign. In the high GDP per capita countries there is a positive relation with the interactive terms in concentration and both equity finance and skills, implying that high levels of concentration are associated with high growth in equity financed and skill-intensive industries. In the low GDP per capita countries these relations are significantly negative.

A notable feature of table 9 is the high degree of explanatory power associated with the equation for low GDP per capita countries in comparison with that for high GDP per countries. This is mirrored in a difference in explanatory power of the fixed capital formation equation between the two samples of countries: 2.1% in the high and 16.4% in the low GDP per capita sample. In the high GDP per capita sample the only significant variable in the investment equation is the negative interactive term between ownership concentration and equity finance. In the low GDP per capita sample, there are significant positive interactive terms of both size of banking system and ownership concentration with bank finance.

[4] By restricting the sample to OECD countries, we ensure that the data is of higher quality and achieve a greater degree of comparability between countries in the study. However, we can then only perform a limited analysis of the influence of economic development on the relation between country structures and industrial activity. A fuller analysis requires a more extensive data set drawn from, for example, the UN source referred to above.

5 Implications for the hypotheses on financial systems and governance arrangements

Figure 2 summarizes the results for the estimated coefficients of the matrix **B** in the growth, R&D and fixed capital formation equations. It synthesizes the signs of coefficients suggested by the regressions reported in tables 6, 7 and 8 and the robust regressions:

Figure 2 – Summary of Signs of Regression Coefficients

Growth	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	+	+	0
	2 (bank finance)	0	-	0
	3 (skills)	+	0	0

R&D	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	+	0	0
	2 (bank finance)	-	-	0
	3 (skills)	+	0	0

FCF	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	-	0	-
	2 (bank finance)	0	0	0
	3 (skills)	0	0	0

The first hypothesis addressed the broad question of whether there is an interaction between the structure of countries financial and corporate sectors, the characteristics of industries and activity in those industries in different countries (rejection implies b_{ik}

= 0, $\forall$ i, k). We find strong support for this hypothesis. There are significant relations of both industrial growth and shares of R&D expenditure with several of the interactive terms and there is a high degree of explanatory power of, in particular, R&D. In contrast, the model has little explanatory power in relation to fixed capital formation.

The second hypothesis addressed the question of whether there is a difference in the nature of the interaction with industrial activity between banking and stock market systems. Rejection of this hypothesis would be evidenced by similar signs for b_{i1} and b_{i2} $\forall$ i. We have used several measures of market and banking systems: accounting standards, stock market capitalization and anti-director rights in relation to the operation of markets; bank credit to GDP ratios, bank ownership of corporate equity and creditor rights in relation to banks. We find very different influences of the market and banking measures. For example, there is a significantly negative term in the interaction of size of banking systems and bank finance in the growth equation in table 6 but an insignificant term in the interaction of accounting standards and bank finance. The market measures bear a much stronger relation to R&D than the banking measures.

The third hypothesis concerns the specific association of different types of systems with industrial activity, namely banking systems with bank financed and high skill industries, in particular in fixed capital formation, and market systems with equity financed industries, in particular in R&D. Rejection would come from $b_{22} \leq 0$ and $b_{32} \leq 0$ (particularly in fixed capital formation) and $b_{11} \leq 0$, $b_{31} \leq 0$ (particularly in R&D). We find no support for the first part of this hypothesis: the interactive term in the size of banking systems and bank finance is significantly negative in the growth equation in table 6; the interactive term between size of banking systems and skills is just significantly positive in the growth equation of table 6 but not significant in the third column of table 8 when Germany, Japan and the USA are eliminated; and the interactive terms with the size of banking systems are insignificant in the fixed capital formation regression. If anything, there is a positive association of size of banking systems with growth of equity rather than bank financed industries.

In contrast, there is considerable support for the second part of the hypothesis: the interactive terms of accounting standards with equity finance and with skill-intensity are significantly positive in the growth equation. The effect appears to come through R&D expenditure rather than fixed capital formation. Anti-director rights and stronger investor protection as signified by legal codes are also associated with high R&D expenditures in market financed industries.

The fourth hypothesis concerns the effect of ownership concentration and suggests that ownership concentrations may be of particular assistance in overcoming agency problems where external finance and skills are important. Rejection of this hypothesis would be evidenced by $b_{13} \leq 0$, $b_{23} \leq 0$ and $b_{33} \leq 0$. We find very little evidence of an overall relation of growth or R&D with interactive terms involving ownership concentration. Ownership concentration is weakly associated with higher fixed capital formation in bank financed industries but strongly associated with lower fixed capital formation in equity financed industries.

One possible reason for failing to find positive benefits of ownership concentrations is that they are offset by private costs of control. The fifth hypothesis suggested that these are particularly likely to afflict countries in their early stages of development where agency problems of ownership concentration are most acute. Rejection would imply $b_{13} \geq 0$, $b_{23} \geq 0$ and $b_{33} \geq 0$ in low GDP per capita countries. We find strong support for this proposition as shown in figures 3 and 4 which summarize the differences in results for high and low GDP per capita countries respectively for growth and fixed capital formation.

Figure 3 – High GDP per Capita Countries

Growth	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	+	+	+
	2 (bank finance)	0	0	0
	3 (skills)	0	0	+

FCF	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	0	0	-
	2 (bank finance)	0	0	0
	3 (skills)	0	0	0

Figure 4 – Low GDP per Capita Countries

Growth	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	+	0	-
	2 (bank finance)	0	+	+
	3 (skills)	0	-	-

FCF	country (k)			
industry (i)		1(securities markets)	2 (banks)	3 (ownership)
	1 (market finance)	0	0	0
	2 (bank finance)	0	+	+
	3 (skills)	0	0	0

We find that interactive terms between ownership concentration and both equity financed and skill intensive industries are negative in low GDP per capita growth regressions but positive in high GDP per capita regressions. There is also support for the second part of the hypothesis that banking systems are particularly relevant to the financing of firms in the early stage of economic development (rejection would imply $b_{12} \leq 0$, $b_{22} \leq 0$ and $b_{32} \leq 0$). We find that the interactive term between size of banking systems and bank finance is positive in low growth countries. The difference in significance of the size of banking systems and ownership concentration is particularly noticeable in the fixed capital formation regression: the interactive terms of both of these variables with bank financed industries are positively significant and the overall explanatory power of fixed capital formation is much greater in low than high GDP countries.

In sum, there is a strong relationship of financial systems with economic activity which differs by type of financial system, characteristics of industries and type of activity. Market based systems are associated with growth of equity financed and skill-intensive activities. The effect comes through R&D rather than fixed capital formation and is particularly in evidence in high GDP per capita countries. Banking systems are associated with higher growth in bank dependent industries in low but not high GDP per capita countries. There is evidence that high levels of concentration of ownership overcome agency problems in certain types of industries in high GDP countries; but these same industries - equity dependent and skill-intensive ones - may

be adversely affected by highly concentrated ownership in less developed countries where its detrimental effects are not adequately controlled.

6 Conclusions

The objective of this paper is to use information that is becoming available on differences in corporate and financial systems to examine their effect on industrial activity. We have used a different approach from the existing literature to examine the interaction of these country structures with industry characteristics on growth, fixed capital formation and R&D. We have argued that this provides both larger data sets and better controls than traditional international comparisons permit.

We were concerned with four sets of relations. The first came from bank-firm relations, which have received a great deal of prominence in the comparative systems literature. The second was the development of securities markets. The third was concentration of ownership where there are conflicting views as to whether this resolves or creates agency problems. The final relation was with legal systems, which it has recently been suggested, might be fundamental to the operation of financial systems and corporate sectors.

We find support for the second and fourth of these relations. There is a strong relation of market systems and legal protection of investors with growth of equity financed and skill-intensive industries. In our full sample, we find no evidence for a role of bank-firm relations, and if anything, evidence that supports the view that concentration of ownership exacerbates agency problems. But the most striking result concerns not the nature of these relations but their form. It might have been expected at the outset that it would be hardest to establish relations between country structure, industry characteristics and R&D expenditure and comparatively easy to find relations with fixed capital formation since the former are intangible and the latter tangible. In fact we find just the converse. We can explain a significant amount of cross industry and country variation in R&D expenditure and very little of fixed capital formation. Why is that?

Before we hazard an answer, we reiterate the caveats made above. There may be some obvious variables that have been omitted from the analysis that would render financial systems and corporate structures important in explaining capital expenditure. Still more seriously, the nature of the analysis means that we cannot interpret the absence of a relation as meaning that country structures do not affect overall differences in investment across countries. Close relations between banks and

industry may have significantly increased growth in countries with high bank ownership. We cannot reject that hypothesis. All we can say is that they do not appear to have promoted comparatively higher growth in bank financed industries.

But the results may also be telling us that the relations of industrial growth to financial and corporate systems are sensitive to stages of economic development. In high GDP per capita countries, growth is promoted through efficiently operating financial systems encouraging expenditure on R&D rather than fixed capital formation and through concentrations of ownership diminishing agency problems in high equity finance and skill-intensive industries. In contrast, in lower GDP per capita countries, banking systems are important in promoting bank financed industries and high levels of concentration of ownership can detrimentally affect the growth of skill-intensive and equity financed industries.

If these results are valid then they suggest that policies concerning the structure of financial and corporate systems should be sensitive to different stages of economic development. In the early stages of development, policy may be best focused on the establishment of efficient banking systems and the control of ownership concentrations but at later stages they should be directed towards market liberalization and the establishment of more effective forms of corporate control.

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Table 1: Average and Decomposition of Annual Growth Rates of Manufacturing Industry of 20 OECD Countries, 1970 to 1995

The table reports the annual average compound growth rates of manufacturing industry over the period 1970 to 1995 for 20 OECD countries in column 2. In column 3 the difference between the country growth rate and the average of the 20 countries is shown, which in columns 4, 5 and 6 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:

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

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 – denotes the average across all countries.

Source: OECD, Structural Analysis Industrial (STAN) Database and own calculations.

Country	Growth Rate	Difference from Average	Share Effect	Growth Effect	Interactive Effect
South Korea	0.104	0.077	-0.006	0.108	-0.026
Portugal	0.034	0.006	-0.004	0.009	0.002
Mexico	0.032	0.005	-0.001	0.007	-0.001
Italy	0.030	0.002	-0.004	0.008	-0.002
Japan	0.027	-0.001	0.001	0.003	-0.004
Finland	0.027	-0.001	0.000	0.002	-0.003
Austria	0.026	-0.001	0.001	0.001	-0.003
Spain	0.026	-0.002	0.000	0.002	-0.004
USA	0.023	-0.005	0.002	-0.002	-0.005
Canada	0.023	-0.005	0.002	-0.001	-0.005
Belgium	0.020	-0.008	0.003	-0.006	-0.005
Greece	0.018	-0.009	-0.005	-0.007	0.003
Australia	0.017	-0.010	0.001	-0.010	-0.002
Netherlands	0.016	-0.011	0.002	-0.013	0.000
France	0.016	-0.011	0.000	-0.010	-0.002
Denmark	0.015	-0.012	0.001	-0.010	-0.002
Sweden	0.012	-0.016	0.001	-0.016	-0.001
Germany	0.010	-0.018	0.003	-0.020	-0.001
Norway	0.006	-0.021	0.001	-0.020	-0.002
UK	0.004	-0.024	0.002	-0.023	-0.002

Table 2: Average Ratio of Fixed Capital Formation to Value Added, 1970-1990 and R&D to Value Added, 1970 to 1994

This table reports the average ratio of investment (gross domestic fixed capital formation) to value added in manufacturing industries in 20 OECD countries in columns 1 and 2 and the average ratio of R&D to value added in manufacturing in 14 OECD countries in columns 3 and 4.
Source: OECD Structural Analysis Industrial (STAN) Database for fixed capital formation and value added, and OECD Analytical BERD (ANBERD) Database for R&D

Fixed Capital Formation/ Value Added 1970-90		**R&D/ Value Added 1973-94**	
Portugal	0.262	USA	0.079
South Korea	0.257	Sweden	0.071
Greece	0.200	UK	0.055
Finland	0.198	Japan	0.054
Japan	0.194	Germany	0.052
Norway	0.189	Netherlands	0.051
Italy	0.174	France	0.051
Netherlands	0.169	Norway	0.038
Belgium	0.168	Finland	0.033
New Zealand	0.162	Denmark	0.031
Canada	0.162	Canada	0.027
Sweden	0.159	Italy	0.021
Denmark	0.153	Australia	0.020
France	0.148	Spain	0.010
Austria	0.148		
Australia	0.131		
UK	0.124		
Germany	0.121		
USA	0.113		
Spain	0.077		

Table 3: Fixed Capital Formation/ Value Added Ratios and Research and Development/Value Added Ratios in Selected Industries in All and Four Individual OECD Countries

Panel A in the table reports the annual average growth rate of output in the three industries with the highest growth rates in the 20 OECD countries and individually in four countries (Germany, Japan the UK and US) over the period 1970-1995. Panel B in the table reports the average ratio of investment (gross domestic fixed capital formation) to value added in the three industries with the highest ratio in the 20 OECD countries and individually in the same four countries over the period 1970-1990. Panel C reports the average ratio of research and development to value added in the three industries with the highest ratio in 14 OECD countries and individually in the same four countriesover the period 1973-1994. In each case, the industry definitions are described in the data appendix. Source: OECD Structural Analysis Industrial (STAN) Database

All Countries		**Germany**		**Japan**		**UK**		**US**	
Panel A: Growth									
Electr. Machin.	0.0602	Plastic Product	0.0513	Electr. Machin.	0.1415	Other Chem.	0.0459	Plastic Product	0.0744
Other Chem.	0.0491	Electr. Machin.	0.0358	Profess. Goods	0.0586	Plastic Product	0.0406	Electr. Machin.	0.0619
Plastic Product	0.0480	Non-ferrous Metals	0.0334	Motor Vehicle	0.0542	Electr. Machin.	0.0396	Non-electr. Machin.	0.0493
Panel B: Fixed capital formation/Value Added									
Indust. Chem.	0.3087	Profess. Goods	0.1819	Petrol & Coal	0.5173	Indust. Chem.	0.2226	Indust. Chem.	0.2494
Iron & Steel	0.2761	Indust. Chem.	0.1813	Tobac.	0.4492	Glass & Product	0.2199	Paper & Product	0.1845
Paper & Product	0.2559	Motor Vehicle	0.1676	Indust. Chem.	0.3796	Non-metallic	0.2048	Plastic Product	0.1574
Panel C: Research and Development/Value Added									
Electr. Machin.	0.1351	Electr. Machin.	0.1257	Chem.	0.1178	Electr. Machin.	0.1557	Electr. Machin.	0.1781
Chem.	0.0867	Non-electr.	0.0649	Electr. Machin.	0.1122	Non-electr.	0.0565	Motor Vehicle	0.1470
Profess. Goods	0.0841	Profess. Goods	0.0352	Profess. Goods	0.0991	Profess. Goods	0.0491	Profess. Goods	0.1244

Table 4: Industry Characteristics

This table records three industry variables used in the regression analyses. Column 2 is the fraction of capital expenditure financed with net equity by US firms during the 1980's as reported in Rajan and Zingales (1998). Column 3 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 4 is one minus the proportion of employees reported by Oulton (1996) as having no skill qualifications in different German industries in 1987.

Industry	**US Equity Dependence**	**Japanese Bank/Net Physical Investment**	**German Skill Levels**
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 &Products	0	na	0.586
Footwear	0.04	na	0.586
Wood Products	0.04	1.78	0.724
Furnitures & Fixtures	0.01	na	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	na	0.769
Rubber Products	0.11	na	0.641
Plastic Products, nec	0.26	na	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
Professional Goods	0.62	0.72	0.737
Mean	0.07	0.39	0.692

Correlation matrix

	Equity dependence	Bank finance	Skills
Equity dependence	1.000		
Bank finance	0.0734	1.000	
Skills	0.1717	-0.4551	1.000

Table 5: Country Variables

Column 2 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 3 is the proportion of total equity market capitalization in different countries held by banks. No single source of data is available for this series. Where possible, it was collected directly from Central Banks as detailed in the data appendix, otherwise the source was OECD Financial Statistics (n.a. = not available). Column 4, shows 1 minus percentage of widely held of the 20 largest publicly traded firms in1995, reported in La Porta et al (1998). Column 5 is market capitalization (reported in the IFC Emerging Stock Market Factbook 1992) to GDP ratios averaged over the period 1982 to 1991. Column 5 are bank credit (reported in IMF International Financial Statistics) to GDP ratios averaged over the period 1980 to 1990.

Country	**Accounting Standards**	**Equity Owned by Banks**	**Ownership Concentration**	**Market Capitalization/ GDP**	**Credit/GDP**
Australia	0.833	0.042	0.45	0.472	0.357
Austria	0.600	n.a.	0.95	0.078	0.828
Belgium	0.678	0.057	1.00	0.267	0.298
Canada	0.822	0.080	0.50	0.444	0.471
Denmark	0.689	n.a.	0.90	0.231	0.477
Finland	0.856	0.150	0.85	0.152	0.653
France	0.767	0.064	0.70	0.187	0.817
Germany	0.689	0.136	0.65	0.201	0.856
Greece	0.611	n.a.	0.95	0.074	0.314
Italy	0.689	0.057	0.85	0.125	0.520
Japan	0.722	0.232	0.50	0.853	1.018
Mexico	0.667	n.a.	1.00	0.093	0.128
Netherlands	0.711	0.053	0.70	0.401	0.709
New Zealand	0.778	0.000	0.95	0.386	0.284
Norway	0.822	0.082	0.95	0.142	0.473
Portugal	0.711	n.a.	1.00	0.085	0.562
South Korea	0.689	n.a.	0.60	0.253	0.483
Spain	0.567	0.095	0.85	0.179	0.684
Sweden	0.922	0.000	1.00	0.395	0.456
UK	0.867	0.017	0.10	0.751	0.422
USA	0.789	0.004	0.20	0.563	0.687
Mean	0.737	0.071	0.745	0.301	0.547

Correlation matrix

	Accounting standards	Bank equity	Ownership concentration	Market cap/GDP	Credit/GDP
Accounting standards	1.000				
Bank equity	-0.3279	1.000			
Ownership concentration	-0.3909	0.1257	1.000		
Market cap/GDP	0.4720	0.0578	-0.7888	1.000	
Credit/GDP	-0.1068	0.6566	-0.2272	0.2338	1.000

Table 6 Regression of Growth, Fixed Capital Formation and R&D on Interaction of Country Structure and Industry Characteristic Variables

The table reports the results of regressions of annual average growth rates in column 2, of the share of fixed capital formation 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 data appendix. There are ten demeaned independent variables: initial value added shares of industries at the start of the period (initial shares) and nine interactive terms between three country structure variables (bank credit/GDP ratios (credit), accounting standards (acc) and concentration of ownership (own)) and three industry characteristics (external bank finance in Japan (bank), proportion of workers with any skill training in Germany (allskill) and external equity finance in the US (equity)). A constant, and 0,1 dummy variables 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.

Variables	**Growth 1970-1995**	**Fixed capital formation 1970-1990**	**R&D 1973-1994**
initial shares	-0.2502 (6.04) ***		
acc*equity	0.2416 (3.05) ***	-0.3096 (2.07) **	0.4700 (1.90) *
acc*bank	-0.0074 (0.37)	0.0588 (1.28)	-0.0670 (2.77) ***
acc*allskill	0.4084 (2.88) ***	-0.1880 (0.40)	0.8873 (3.17) ***
credit*equity	0.0787 (2.20) **	0.0056 (0.06)	-0.0008 (0.01)
credit*bank	-0.0131 (2.25) **	0.0338 (1.62)	-0.0198 (2.20) **
credit*allskill	0.1086 (1.75) *	-0.1162 (0.41)	0.1810 (1.37)
own*equity	0.0167 (0.71)	-0.1773 (3.34) ***	0.1056 (1.29)
own*bank	-0.0009 (0.16)	0.0182 (1.66) *	0.0005 (0.07)
own*allskill	0.0716 (1.36)	0.0945 (0.66)	-0.1017 (1.09)
Observations	522	462	171
R^2	0.1418	0.0230	0.1745

Table 7. Signs on Interactive Terms in Growth Regression Using Alternative Independent Variable Definitions

This table reports the signs on the interactive terms of regressions on annual average growth rates over the period 1970 to 1995 using alternative variable definitions from those shown in table 6 for both country structure and industry characteristic variables. The outcomes of using different industry variables are shown in the rows, where each row R1 to R3 represents a separate equation in which an alternative industry variable has been used. The outcomes of using different country variables are shown in the columns, where each column C1 to C3 represents a separate equation in which an alternative country variable has been used. For ease of comparison, the results from table 6 are reproduced in the lower right hand quadrant of this table. The entries refer to the signs in the growth regressions. + = positive sign significant at 10% level, ++ = positive sign significant at 5% level, +++ = a positive sign significant at 1% level, - = negative sign significant at 10% level, -- = negative sign significant at 5% level, --- = negative sign significant at 1% level, 0 = insignificant coefficient.

Industry Variables	**Country Variables**					
	New Variables			**Existing Variables**		
New Variables	Market cap./ GDP (C1)	Bank own. of equity (C2)	Pyramid (C3)	Acc. stand	Bank credit / GDP	Own conc.
External finance (R1)				+++	0	0
Bank/ ext. finance (R2)				0	0	0
Lower & upper intermediate skills (R3)				+++	+	+
Existing Variables						
Equity finance	0	+	0	+++	++	0
Bank finance	0	--	0	0	--	0
Skills	0	0	0	+++	+	0

Table 8 Exogeneity Tests on Growth Regression, 1970 to 1995

Column 2 reports the regression described in column 2 of table 6, using origins of legal systems as an instrumental variable for all the country structure variables. Column 3 reproduces column 2 of table 6 excluding the three countries used in the country structure variables (Germany, Japan and the USA). Huber-corrected t-statistics are shown in brackets. * = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level.

Variables	Instrumental variable regression	Excluding Germany, Japan and USA
initial shares	-0.2737 (5.74) ***	-0.2311 (5.32) ***
acc*equity	0.2906 (2.56) **	0.2422 (3.04) ***
acc*bank	-0.0398 (1.17)	-0.0068 (0.33)
acc*allskill	0.8157 (3.13) ***	0.4094 (2.85) ***
credit*equity	0.1729 (2.03) **	0.0646 (1.72) *
credit*bank	-0.0351 (2.21) **	-0.0141 (1.67) *
credit*allskill	0.2521 (1.81) *	0.1121 (1.42)
own*equity	0.0450 (1.77) *	0.0217 (0.80)
own*bank	-0.0055 (0.66)	0.0029 (0.48)
own*allskill	0.1310 (2.06) **	0.0903 (1.45)
Observations	522	443
R^2	0.0460	0.1322

Table 9 Regression of Growth on Split Sample

The table reports the regression described in column 2 of table 6 splitting the sample into the 5 countries with the lowest GDP per capita in 1970 (Korea, Mexico, Spain, Portugal and Greece) and the remaining 15 countries.
Huber-corrected t-statistics are shown in brackets. * = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level.

Variables	High GDP per capita countries	Low GDP per capita countries
initial shares	-0.2648 (6.06) ***	-0.3442 (4.85) ***
acc*equity	0.2178 (2.33) **	0.6552 (2.72) ***
acc*bank	0.0020 (0.09)	0.0173 (0.37)
acc*allskill	0.1795 (0.84)	-0.7654 (1.55)
credit*equity	0.0758 (1.81) *	0.0655 (0.83)
credit*bank	-0.0192 (1.39)	0.0205 (1.67) *
credit*allskill	0.0373 (0.39)	-0.2281 (1.87) *
own*equity	0.0357 (1.72) *	-0.2203 (2.10) **
own*bank	-0.0027 (0.40)	0.0522 (1.80) *
own*allskill	0.1171 (2.33) **	-0.4689 (2.16) **
Observations	394	128
R^2	0.1383	0.3312

Data Appendix[5]

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

1. Activity Measures

Growth rates:
Calculated using constant price value added data by country and industry from OECD, DSTI(STAN) 1997.

Fixed capital formation share:
Calculated using gross fixed capital formation (GFCF) and value added data by country and industry from OECD, DSTI(STAN) 1997.
For Portugal data for 3-digit industries starts in 1971; averages refer to 1971-1990.

R&D share:
Calculated using R&D expenditure from OECD, DSTI(ANBERD), 1998 and value added from OECD, DSTI(STAN) 1997, both by country and industry.
For Germany data stops in 1993; averages refer to 1973-1993.

2. Industry Variables

(1) Equity Finance and External Finance in the USA in the 1980s: Table 1, Rajan and Zingales (1998)

(2) Bank finance in Japan by industry : Japan, Ministry of Finance 1981-1990

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 1981-1990 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.

3. Country Variables:

(1) Ownership concentration:

1.) Ownconc.
One minus the mean of the percentage of the 20 largest firms widely held (i.e. less than 10% control), Table 3B , La Porta et al (1998)

2.) Ownermed
Median ownership of the three largest shareholders in the 10 largest non-financial privately-owned domestic firms; Table 10, La Porta et al.(1996) [NBER paper 5661]

3.) Pyramid

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

Mean of percentage of pyramids and not widely held 20 largest firms, Table 4, La Porta et al (1998). We changed the missing value for the UK into a zero.

(2) Creditor Rights, Anti-director Rights, Origin of Legal System: Table 2, La Porta et al.(1997)

(3) Accounting Standards: Table 2, Rajan and Zingales (1998) and Laporta et al (1997)

(4) Bank ownership of equity:[6]

$$\text{Percentage of equity held by banks} = \frac{\text{Market value of equity held by banks}}{\text{Market value of equity held by the private domestic sector}}$$

Where the source shown is the OECD Financial Statistics, the measure used was the average value of shares held by domestic monetary institutions (excluding central banks) divided by the sum of shares held by financial institutions (excluding central banks), shares held by non-financial enterprises and shares held by other sectors (including individuals) reported in OECD Financial Statistics II.

Australia: 1988-1990 average; Reserve Bank of Australia, Australian Financial Accounts Catalogue number 5232.0
Belgium: 1980-1990 average; National Bank of Belgium
Canada: 1981-1990 average; Bank of Canada
Finland: 1986-1990 average; Bank of Finland
France: 1980-1990 average; OECD Financial Statistics II
Germany: 1980-1990 average; Deutsche Bundesbank, and Deutsche Bundesbank Financial Accounts 1990 to 1996, X. Special Tables 6
Italy: 1985-1988 average; Banca d'Italia
Japan: 1980-1990 average; Tokyo Stock Exchange
Netherlands: 1980-1990 average; Bolt, W. and M. Peeters, "Corporate Governance in the Netherlands", in *Corporate Governance, Financial Markets and Global Convergence, Financial and Monetary Policy Studies*, v.33, May 1997, p. 97 (underlying data supplied by authors)
New Zealand: 1980-1990 average; Reserve Bank of New Zealand
Norway: 1980-1990 average; Norges Bank
Spain: 1980-1990 average; Banco de Espana
Sweden: 1983-1990 average; OECD Financial Statistics II
UK: 1991; UK Financial Statistics 1997, Table 9.2A
USA: 1980-1990 average; OECD Financial Statistics II

(*5) Credit / GDP*

IMF, International Financial Statistics, lines 32d and 99b. 1980-1990 average.

(6) 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. 1982-1991 average.

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

4. Definition of Pools used in Regressions

	Period	No. of countries	No. of industries
Growth	1970-80 1980-90 1990-95 1970-95	20 OECD countries (exc. NZ)	27
Fixed capital formation	1970-79 1980-90 1970-90	20 OECD countries (exc. Mexico)	27
R&D	1973-79 1980-90 1991-94 1973-94	14 OECD countries (exc. Belgium, Austria, NZ, Portugal, Greece, Korea, Mexico)	15

Industry pool for growth and investment regressions		Industry pool for research and development regressions	
Industry	ISIC	Industry	ISIC
Food	3110+3120	Food, Beverages and Tobacco	3100
Beverages	3130		
Tobacco	3140		
Textiles	3210	Textiles, Clothing , Leather & Footwear	3200
Clothing	3220		
Leather &Products	3230		
Footwear	3240		
Wood Products	3310	Wood Products, Furnitures & Fixtures	3300
Furnitures & Fixtures	3320		
Paper & Products	3410	Paper & Products, Printing & Publishing	3400
Printing & Publishing	3420		
Industrial Chemicals	3510	Chemicals	3510+3520
Other Chemicals	3520		
Petroleum & Coal Products	3540		
Rubber Products	3550	Rubber Products and Plastic Products	3550+3560
Plastic Products, nec	3560		
Pottery, China etc	3610	Non-Metallic Products	3600
Glass & Products	3620		
Non-Metallic Products, nec	3690		
Iron & Steel	3710	Iron & Steel	3710
Non-Ferrous Metals	3720	Non-Ferrous Metals	3720
Metal Products	3810	Metal Products	3810
Non-Electrical Machinery	3820	Non-Electrical Machinery	3820
Electrical Machinery	3830	Electrical Machinery	3830
Shipbuilding & Repairing	3841	Shipbuilding & Repairing	3841
Motor Vehicles	3843	Motor Vehicles	3843
Professional Goods	3850	Professional Goods	3850