Patterns of Industrial Development Revisited:

The Role of Finance[*]

Raymond Fisman, *Columbia Business School*

Inessa Love, *World Bank DECRG*

First Draft: December 2001

Current Version: August 2002

Abstract:

We re-examine the role of financial market development in the intersectoral allocation of resources. First, we characterize the assumptions underlying previous work in this area, in particular, that of Rajan and Zingales (1998). We show that they are implicitly testing whether financial intermediaries allow firms to better respond to global shocks to growth opportunities. We then propose an alternative test that more efficiently tests this hypothesis, using statistical techniques developed in the social networks literature. Specifically, we find that countries have more highly correlated growth rates across sectors when *both* countries have well-developed financial markets, suggesting that financial markets play an important role in allowing firms to take advantage of global growth opportunities. These results are particularly strong when financial development takes into account both the *level* and *composition* of financial development: private banking appears to play a particularly important role in resource allocation. Our technique allows us to further distinguish between this 'growth opportunities' hypothesis and the related 'finance and external dependence' hypothesis, which would imply that countries with similar levels of financial development should specialize in similar sectors. We do not find evidence in support of this alternative view of finance and development.

[*] Fisman: Meyer Feldberg Associate Professor, Economics and Finance, 614 Uris Hall, Columbia University, 3022 Broadway, New York, NY, 10027. Phone: (212) 854-9157. Fax: (212) 316-9219. Email: rf250@columbia.edu. Love: Economist, World Bank, 1818 Hst NW, Washington DC, 20433. Phone: (202) 458-0590. Fax: (202) 522-1155. Email: ilove@worldbank.org.

We thank Raghuram Rajan and Luigi Zingales, as well as Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer, for kindly allowing us the use of their data. We are also extremely grateful to Bill Simpson for providing his QAP Stata subroutine. Finally, we thank Thorsten Beck, Asli Demirgüç-Kunt, Ann Harrison, Charles Himmelberg, Andrei Kirilenko, Luc Laeven, Sendhil Mullainathan, Jan Rivkin, Tarun Khanna and Luigi Zingales for extremely helpful conversations and advice.

Understanding the determinants of industrial patterns of growth is one of the fundamental issues in economic development, and economics generally. While an entire literature has arisen to examine the determinants of the *level* of economic growth,[1] relatively little time has been spent in understanding the sectoral *composition* of growth. To the extent that the efficient allocation of resources across sectors is important for the ultimate goal of promoting development, the forces that drive industrial patterns of growth may be a very important intermediating factor in driving overall economic growth. Hence, understanding these patterns is important for both the theory and practice of economics.

Earlier work in development economics, primarily by Hollis Chenery, did examine the allocation of resources across sectors in countries at different stages of economic development.[2] Chenery's basic hypothesis was that countries at similar levels of economic development should have similar patterns of intersectoral allocation. More recently, Rajan and Zingales (1998) have revisited the topic of intersectoral allocation, focusing on the role of finance. The idea, that financial institutions play an important role in the resource allocation process, dates back to at least Schumpeter (1911), who conjectured that banks help to identify entrepreneurs with good growth prospects, and therefore help to reallocate resources to their most productive uses. Therefore, well-developed financial institutions will be crucial to an efficient allocation of resources, in response to growth opportunities. The difficulty in testing this hypothesis is that growth opportunities are not generally observable to the econometrician: a firm (or industry, or country) may not be growing because there are no growth opportunities, or because there are opportunities, but no financing to allocate resources to them.

---

[1] See Barro (1997) for a comprehensive review of the literature.
[2] See Chenery (1960) and Chenery and Taylor (1968); Chenery and Syrquin (1989) provides a summary and restatement of this work

In this paper, we present an indirect approach to testing this hypothesis that circumvents the need to measure these opportunities directly. More precisely, we assume that there exist industry-specific global shocks to growth opportunities, either due to demand shocks or changes in factor prices. While we never observe these shocks, we claim that they create *similarities* in growth opportunities across countries. The 'finance and growth opportunities' hypothesis described above implies that in order to respond to these shocks, a country must have well-developed financial markets; therefore, we should observe correlated patterns of intra-industry growth rates among countries with well-developed financial markets, as they respond to these (unobserved) shocks.

To preview our methodology and results: we consider the correlations in intra-industry growth rates across country pairs during the 1980s.[3] Our identifying assumption is that global shocks to growth opportunities should result in a correlation across countries in sectoral growth rates, as resources are reallocated from lower growth opportunity industries to higher growth opportunity industries. However, if this reallocation process requires well-developed financial institutions, then a pair of countries will only have correlated growth rates if they *both* have well-developed financial markets. We find evidence in support of this 'finance and growth opportunities' hypothesis.

Furthermore, we consider a hypothesis closely related to that of Chenery's, namely that countries at similar levels of per capita income should have correlated patterns of industrial growth. We find very strong support for this hypothesis in the data. This implies that growth opportunities may be more similar in countries at similar levels of development, and suggests an additional test of our 'finance and growth opportunities' hypothesis: To the extent that financial

[3] A similar approach utilizing pairwise correlations has been utilized in the past by sociologists examining social networks, and more recently, has been applied to the field of corporate strategy. In particular, Khanna and Rivkin (2001) use this approach to look at the related topic of patterns of profitability across countries.

institutions allow firms to take advantage of these opportunities, financial development should lead to more correlated growth rates for countries at more similar levels of industrial development (and hence with similar growth opportunities across industries). We also find support for this additional hypothesis in the data.

To summarize, while we never actually observe growth opportunities, we are able to test the finance and growth hypothesis by looking at *commonalities* and *differences* in growth opportunities. We find support for the finance and growth hypothesis, primarily when the level of financial development is measured as domestic credit provided by private sector banking institutions.

Our work is closely related to that of Rajan and Zingales (1998),[4] who also develop a test for the 'finance and growth' hypothesis described above. They deal with the non-observability of growth opportunities by assuming that there are certain industries that are 'financially dependent,' and hence have a greater need for outside financing. They find that financially dependent firms grow relatively quickly in countries with well-developed financial markets. This suggests that poor financial markets may distort the growth process, causing 'too few' resources to be allocated to industries that are dependent on outside financing. However, they make the strong assumption that some industries have an inherent need for outside financing that is constant across countries, and that the level of outside financing of U.S. firms could be used as a proxy for this need in other countries.

Another contribution of our paper is to clarify the theoretical underpinnings of RZ's approach, and to show that it is, effectively, a special case of our framework. RZ argue that there exist industries that, due to high upfront capital costs or long gestation periods have an inherent need for outside financing. Countries with poorly developed financial markets will not

[4] Henceforth referred to as RZ.

be able to take advantage of opportunities in 'financially dependent' industries, implying that these countries will devote resources to industries with a low level of financial dependence. We argue that this assumption leads to the hypothesis that countries with similar levels of financial development grow in similar industries, which we refer to as the 'finance and external dependence hypothesis.' This yields a different prediction from our previous hypothesis on the correlation of intra-industry growth across countries. We show that RZ's methodology cannot differentiate between these separate hypotheses, i.e. the 'finance and growth opportunities' hypothesis described above, and the 'finance and external dependence' hypothesis implied by the financial dependence assumption, while our more general approach does allow for a more refined test. We reject the 'financial dependence' hypothesis in favor of the 'growth opportunities' hypothesis.

While our work is tied most closely that of Rajan and Zingales (1998), this paper fits into the more general literature on the role of financial development in the growth process. This literature began with Goldsmith (1969), and has been followed by the empirical work of King and Levine (1993), and more recently by Demirguc-Kunt and Maksimovic (1998), Wurgler (2000), Love (2002) and others.

Our paper is also related to the strand of literature that focuses on disaggregating growth rates into country-, time-, and sector-specific components.[5] These papers look at the percent of the total variation in growth rates that each of the components can explain, rather than the

[5] The identification of components in these studies is based on the temporal dimension in growth rates. By estimating the error-components models, the country- and industry- fixed effects, which are referred to as long-run trends, are identified, along with the short-term deviations from these trends. See for example, Stockman (1988) and Costello (1997) use variance-decomposition to investigate the sources of disturbances to the growth rates. The former studies 7 European countries and the US and finds that both industry and country-specific shocks have similar effects and the latter studies 5 major industries in 6 OECD countries and finds that the short-run productivity growth has strong country-specific component and little industry-specific component. Bayoumi and Prasad (1997) study co-movement in sectoral growth at 1-digit level across eight US regions and eight European countries and find that both areas have similar aggregate disturbances. Loayza, Lopes and Ubide (2001) add a study of developing countries to the literature and find significant co-movement in East Asia and Europe but not in Latin America.

underlying factors that cause these components to vary. Our focus is on understanding the underlying determinants of industry co-movement.[6]

The rest of this paper is organized as follows: in Section 1, we describe our theoretical framework and methodology in greater detail. In Section 2 we describe our data. In section 3.1 we show the results in support of our argument that dependence on external finance may be proxying for growth opportunities in the work of RZ. In section 3.2 we introduce our pairwise comparison methodology with a motivating application, and present our basic results on similarity in income and similarity in subsequent growth. In Section 3.3, we examine the role of financial development in mediating a country's ability to take advantage of common shocks to growth opportunities. In section 3.4 we consider an alternative theory of finance and sectoral allocation, and test for its validity. Finally, we conclude in section 4.

1. Financial Development and Growth: Theory

There has been extensive theoretical work on the effects of financial development on real economic activity. The primary function of financial systems, according to this literature, is to facilitate the allocation of resources across space and time in an uncertain environment (Merton and Bodie, 1995). In performing this function, financial institutions play an important role in identifying investment opportunities, mobilizing savings, facilitating trading and diversification of risk and improving corporate governance mechanisms (Levine, 1997). This allocative role of financial institutions was recognized by Schumpeter (1911), who conjectured that banks help to

[6] A few other distinctions are noteworthy. Since we are using a correlation coefficient as a measure of co-movement, the country-level components are differenced out, i.e. our correlation measure is not affected by average country-level growth rates. Similarly, we abstract from the temporal dimension by using average growth rates for the decade of 1980-1990. Finally, unlike previous papers that studied aggregate sectors (primary, manufacturing, agriculture), we focus on 37 disaggregated industries within the manufacturing sector.

identify entrepreneurs with good growth prospects, and therefore help to reallocate resources to their most productive uses.

The difficulty in testing whether financial development helps the allocation of resources to the best growth opportunities, as noted in the introduction, is that growth opportunities are not generally observable to the econometrician: a firm (or industry, or country) may be not growing because there are no growth opportunities, or because there are opportunities, but no financing to allocate resources to them. In the latter case, the availability of financing, i.e., "financing constraints," will affect the relationship between actual (realized) growth and potential growth (i.e. growth opportunities). More formally, we write the relationship between potential growth opportunities GO^* and actual growth as a function of the degree of financing constraints, which we denote FC^* (note that the asterisk emphasizes that these variables are unobservable). For simplicity of exposition, we assume that the degree of financing constraints is measured as a percent of desired external financing that the firm can actually raise in the financial markets. Thus, actual growth will be a function of growth opportunities (i.e. the potential increase in production or value added) times the percent of desired financing the firm was able to obtain:

$$\text{(1)} \qquad \text{Actual Growth}_{ic} = \beta GO^*_{ic} * FC^*_{ic}.$$

The subscripts above emphasize that for each firm or industry i, in a country c, growth opportunities will be industry and country specific (the time dimension is suppressed for the notational simplicity). The hypothesis that financial development loosens financing constraints, and therefore allows firms or industries to invest according to their growth opportunities, implies that $FC^*_{ic} = f(FD_c) + \varepsilon_{ic}$, where $f'()>0$, in other words, in countries with higher FD firms are able to obtain a larger portion of their optimal (desired) level of financing. Thus, the test of whether financial development improves the allocation of capital will be a test whether financial development reduces the financing constraints and therefore allows firms or industries to invest according to their growth opportunities. Substituting for FC in (1), and assuming for simplicity a linear relationship between FC and financial development, we may rewrite (1) as:

$$(2) \qquad \text{(Actual) Growth}_{ic} = \beta GO^{*}_{ic} * FD_c + e_{ic}$$

The obvious problem in testing the above relationship is the need to measure GO^{*}, which are unobservable. Because we cannot actually measure growth opportunities directly, our approach will be to assume that there exist global industry-specific shocks to growth opportunities, i.e., some component of GO^{*}_{ic} is common across countries:

$$(3) \qquad GO^{*}_{ic} = \eta_i + \varepsilon_{ic}$$

Combining (2) and (3), we obtain a general expression for the correlation of growth in industry i in countries c and d:

$$(4) \qquad \text{Corr}(\text{Growth}_{ic}, \text{Growth}_{id}) = \alpha * f(FD_c, FD_d) + \varepsilon_{cd}$$

where $f(.)$ is a transformation of (FD_c, FD_d), or some other pair of country-level characteristics, (X_c, X_d) into a scalar. Intuitively, if both countries have a high degree of financial development, this correlation should be high, as both countries in a pair take advantage of η_i. However, if either member of the pair is *not* financially developed, there will be little comovement, as at least one country will not be responding to η_i. In the next section, we discuss possible definitions of f(.), including one that captures the above intuition.

Minimum vs. Distance measures

We focus on two ways of defining the function f(.) in equation (4) that aggregate the information on country-level variables for two countries. As suggested above, for testing our model it will be important to have a measure of whether both countries in a pair are at a high level of financial development. Thus, we need a metric that takes on a high value only when both countries have a high level of X. This is best represented by a minimum metric, i.e. $Min(X_c, X_d)$. We refer to this metric as a measure of *high development of both countries*. It will also be useful to have a measure of the absolute distance between two indicators, *Distance* = $| X_c - X_d |$. This metric will be smaller for countries that are more similar to each other in their levels of the variable X in question. For example, two countries that have high income levels will have a small distance, as well as two countries that both have low levels of income; we therefore refer to this metric as a measure of *similarity* between two countries.

Figure 1 illustrates the distinction between these two measures. For example, if the coefficient α in (4) is negative, it implies that for the distance measure the correlation is high in two quadrants (Low/Low and High/High). For the Minimum measure, if α is positive this implies that the correlation will be high only in the High/High quadrant.

An important benefit of our pairwise comparison methodology, in addition to utilizing all the data available, is the ability to distinguish between these two different metrics. For example, the two hypotheses we are interested in are: first, whether countries with high financial development are growing in similar industries (i.e. minimum measure) and second, whether countries that have a similar level of financial development are growing in similar industries (i.e. distance measure). We will see below that in the framework of Rajan and Zingales (1998), it is impossible to distinguish between these two hypotheses.

Comparison with Earlier Work: Analysis of the Model of Rajan and Zingales

A recent paper by Rajan and Zingales (1998) has developed an alternative approach to testing whether financial development has an effect on the allocation of resources. We now consider carefully the theoretical underpinnings of their model, and how it relates to our approach. Rajan and Zingales hypothesize that some industries have an inherent need for outside financing due to a "technological" demand for external financing, these industries are referred to as "financially dependent". If financial development reduces the cost of external finance, such industries will have a relative advantage in countries with well-developed financial markets. RZ implement this model using the following functional form:

$$(5) \qquad Growth_{ic} = c*(FD_c)*EXTFIN_{USi} + \varepsilon_{ic}$$

where $EXTFIN_{USi}$ is industry i's need for outside financing, which was measured using the US data (we have emphasized this assumption by adding the subscript US; note that their model also includes industry and country dummies which we omit for simplicity of notation).

To understand how this model relates to the model given in (1) we need to distinguish between the desired amount of external finance, which we will refer to as $Need^*$ (where the asterisk again indicates that this desired level is unobservable to the econometrician) and the actual level of external finance, which is the EXTFIN measure used by RZ. If the firm is financially constrained it will only be able to obtain some percent of its desired external financing, so that:

(6) $$\text{EXTFIN}_{ic} = \text{Need}^*_{ic} * \text{FC}^*_{ic} + \varepsilon_{ic}$$

The final issue is to understand what is meant by Need^*. We argue that outside financing requirements are driven, at least in part, by growth prospects. RZ define EXTFIN as the gap between cash flows and investment for firms in the United States: industries with large values of EXTFIN will be those with high expected future demand, and hence a need to invest in capacity expansion beyond that which can be financed with current cash flow. Hence, industries that require outside financing are likely to be growing industries. Therefore we argue that there exists a relationship between desired external finance and growth prospects, given by:

(7) $$\text{Need}^*_{ic} = \alpha * g_i(\text{GO}^*_{ic}) + \varepsilon_{ic}$$

We provide a simple model to illustrate this relationship in the Appendix. The function $g_i(.)$ transforms growth opportunities into the desired level of investment, which depends on the functional form of the firm's production function. The function $g_i()$ is allowed to be industry-specific to account for industry-differences in upfront costs, gestation periods and other "technological differences" that would affect the demand for external finance, as argued by RZ. In other words, our model in (7) incorporates the "industry-specificity" assumption of RZ, while emphasizing that the main driving force for the differences in external financing requirements is the presence of growth opportunities. Substituting (7) into (6) we obtain:

$$(8) \qquad EXTFIN_{ic} = \alpha * g_i (GO^*_{ic}) * FC^*_{ic},$$

Thus, the actual amount of external finance is a function of (unobserved) growth opportunities and the degree of financing constraints. RZ argue that since US financial markets are well developed, the fraction of desired finance that (large publicly-traded) firms are able to obtain is close to one, i.e. $FC^*_{iUS}=1$, which allows them to use actual external finance (EXTFIN) for these firms as a substitute for desired external finance ($Need^*$). Maintaining this assumption, and substituting (8) into (5), we find that the RZ model can be written as:

$$(9) \qquad Growth_{ic} = c * g_i (GO^*_{USi}) * FD_c + \varepsilon_{ic}$$

Note that this model is almost identical to the model in (2) except that growth opportunities are given by growth opportunities in the US. By comparing (1) and (8) we observe that both actual growth and the actual usage of external finance are functions of growth opportunities and financing constraints. Therefore, under the assumption that FC*=1 for U.S. firms, both can be used as proxies for growth opportunities. To test for this possibility, we re-estimate model (5), using actual growth in the US, $Growth_{USi}$ instead of EXTFIN, i.e.:

$$(10) \qquad Growth_{ic} = c * Growth_{USi} * FD_c + \varepsilon_{ic}$$

We find (see section 3.1) that statistically, using actual U.S. growth outperforms the EXTFIN measure in the above regression, i.e. when both interactions are included simultaneously only the interaction with actual growth remains significant. One implication of this finding is that actual growth is a less noisy measure of growth opportunities than the EXTFIN measure.[7] Thus, we claim that RZ are indeed testing model (2), but they use EXTFIN measured in the US as a proxy for growth opportunities. We further claim that actual sales growth in the US is another (and statistically better) measure of growth opportunities in the US.

A natural question then arises as to whether growth opportunities for an industry i in the US are a reasonable proxy for the growth opportunities in the same industry in a country c. This will be true if there exist industry-specific global shocks to growth opportunities, as formally described in (3). This observation leads us to uncover another important implicit assumption in the RZ model.[8] That is, to the extent that actual growth in the US is a proxy for common global shocks, given by η_i, the RZ model is a valid test of model (2).[9]

The preceding discussion suggests that RZ are effectively testing whether rapidly growing industries in the U.S. during the 1980's are also growing faster in countries with more developed financial markets. In other words, we argue that they compare growth in each country c to growth in the US. We argue below that models (5) or (10) are not the best way to utilize all the data available in the RZ dataset, and that their approach is a special case of the more general framework given by (4). To see this, note that (10) can be rewritten as:

[7] One possible reason why actual growth is less noisy proxy for the growth opportunities becomes clear after comparing equations (2) and (8) – while actual growth is a linear function of growth opportunities, EXTFIN is a non-linear function which depends on the functional form of the inverse of the production function (i.e. transforming growth into investment), which is likely to introduce extra noise in this measure.

[8] Note that if the assumption of dependence on external finance is taken literally (i.e. the same industry is equally dependent on external finance in all countries at all times), it would imply that countries with a high level of financial development should specialize in "high dependence" industries (i.e. these industries will be relatively more developed in high FD countries), while countries with a low level of financial development should specialize in "low dependence" industries. This is an interesting hypothesis, but testing it would require looking at industry composition (rather than growth, as in RZ) as a function of financial development. To make the link between "financial dependence" and growth they implicitly assume that there are common shocks to some industries and therefore the shocks to "high dependence" industries will translate into higher growth for these industries in countries with a high level of financial development.

[9] This is plausible assumption, to the extent that the US may be considered to be a world leader in technology, and furthermore, that some of these "shocks" may originate in the US and spread to the rest of the world.

(11) $\text{Growth}_{ic} = \gamma_c*\text{Growth}_{USi} + \varepsilon_{ic}$, where $\gamma_c = c*FD_c$

Thus, the coefficient γ_c is a function of financial development in country c. Note that (11) is in fact a bivariate regression of Growth_{ic} on Growth_{USi} and the coefficient γ, estimated by OLS, is given by:

(12) $\gamma_c = \text{cov}(\text{Growth}_{ic}, \text{Growth}_{USi})/ \sigma^2$

where σ^2 is the variance of Growth_{Usi}, Equations (11) and (12) therefore imply that an alternative way of writing the model in (10) is:

(13) $\text{cov}(\text{Growth}_{ic}, \text{Growth}_{Usi}) = c*FD_c$

In this formulation, the covariance between the growth rates in country c and US growth rates is a function of the level of financial development in country c. It is now clear that, under this set of assumptions, there is no reason to limit the comparison to the U.S.: Our formulation in (4) is a generalization of (13), which includes pairwise comparisons across *all* country-pairs, rather than limiting the analysis to pairwise comparisons with the U.S. only.

To summarize this section, we argue that the external financial dependence measure of RZ is a proxy for growth opportunities in the US, and that *actual* growth is another alternative measure of these growth opportunities. We start in section 3.1 with presenting this result. Next, we argue that the implicit driving force of the RZ model is the existence of global shocks to these growth opportunities. If this is the case, we may more effectively analyze whether financial development allows firms to take advantage of growth opportunities by looking at the correlation of industry growth rates for *all* country pairs, rather than using the US as a benchmark. This is the extended model that we implement in Section 3 below.

2. Data

Our data are drawn primarily from Rajan and Zingales (1998), and described in detail in that paper. For our comparison with their work, the main outcome variable is real growth in valued added, estimated for each of 37 industries in 42 countries (UNCTAD, 1999). We supplement the RZ data with actual real sales growth in the US, USGrowth, which we calculate using all firms from Compustat (the same sample used by RZ to calculate EXTFIN).

To study the co-movement in growth rates across countries we calculate the correlation of industry growth rates for each pair of countries (c,d). We have total of (42*41)/2 of such pairs. Table 2 shows the basic summary statistics. The average number of industries used in calculating this correlation is 26 because not all industries are available for all countries. The correlations range from –0.65 to 0.8 with an average of 0.096. While the average level of correlation is quite low, among more similar countries, it is considerably higher. For example, the average rate of correlation between the United States and all other countries is 0.025; however, the correlation is 0.65 with Canada and 0.58 with the United Kingdom. To give the reader a sense of the distribution of these correlations, Figure 2 shows a histogram of their distribution.

We calculate the distance and minimum metrics as discussed above for our country-level variables of interest, which include the level of income per capita, several measures of financial development as discussed below, and a number of controls. A complete list of the variables used in this paper with the original sources is given in the Table 1. Table 2 reports the correlation matrix for the main country-level measures.

Measures of Financial Development

We consider a number of measures of financial development. As a first cut, we simply reuse the measures of financial development from RZ. As our main measures we use the two components of FD separately: DOMCRED (total domestic credit deflated by GDP) and MCAP (stock market capitalization deflated by GDP). Furthermore, we take advantage of new data collected by La Porta, Lopez de Silanes, and Shleifer (2001),[10] on the ownership of banks around the world. In their work, they look at the impact of government ownership on the level of development, and find that concentration of banking assets in the hands of the government is negatively correlated with subsequent growth. Their analyses examine the level of growth; however, their theories have further implications for resource allocation. In particular, they claim that government bank ownership may result in politically expedient, rather than economically efficient, allocation of resources. Thus, resources may be diverted to industries with political clout rather than those with positive growth opportunities.[11] This suggests that both *quality* and *quantity* of financial assets need to be considered. Barth, Caprio and Levine (2000) make similar arguments in claiming that greater state ownership of banks is associated with more poorly developed banks and non-bank financial institutions. This is also consistent with evidence from case studies: for example Clarke and Cull (1999) find that public banks in Argentina divert a much larger

---

[10] Referred to henceforth as LLS

[11] One possibility, which we are currently looking into, is that government-run banks may be more likely to allocate resources to industries with *past* high levels of cash flow, which therefore have funds with which to bribe government officials. This would be tricky, because past cash flows are obviously correlated with future growth opportunities.

proportion of resources to primary production and government services than do private banks, and that public banks also have higher percentage of non-performing loans.

We define a variable, GOVPCT70, which gives the proportion of assets of a country's top ten banking institutions that were held by the public banks in 1970 (see LLS, 2001 for a more detailed definition). We similarly define GOVPCT95. Since we are interested primarily in government ownership of banks during the 1980's, we take a simple average of these two numbers as our main measure of the concentration of government ownership (GOVPCT).[12] As our main measure of banking assets, we define:

PRIVCRED = (1 – GOVPCT)*DOMCRED

This gives an estimate of the ratio of total privately provided credit to GDP, and incorporates both elements of banking asset quantity as well as quality.[13]

3. Results

Before presenting our main results, we begin in Section 3.1 by briefly presenting a set of regressions based on an augmented model of RZ. This will serve as motivation for the more

[12] Not surprisingly, the correlation of GOVPCT70 and GOVPCT95 is fairly high ($\rho = 0.77$). Since most banking privatizations took place during the '80s and '90s, GOVPCT70 perhaps deserves more weight. None of our regressions change substantially if we use GOVPCT70 in place of GOVPCT.

[13] We also experimented with other measures of financial development. Instead of total domestic credit we have used private credit, which is credit provided by depositary institutions to the private sector. We have similarly looked at the product of private credit with percent of privately owned banks. Both measures produced virtually identical results to the ones reported below. As alternative measures of stock market development we used turnover (value traded over market capitalization), value traded over GDP and new equity issuance over GDP, obtained from Demirguc-Kunt and Levine (2001). As in the results reported below, no other alternative measure of stock market development produced significant results.

general approach utilized in Sections 3.2 – 3.4, and will further highlight the connection between the our approach and previous work.

3.1. Augmented RZ model

In this section we proceed to examine whether RZ's measure of external financing might be simply proxying for growth opportunities in the United States. As discussed above we use the actual sales growth rate in the US, USGrowth. The correlation of USgrowth and EXTFIN is 0.69, (significant at 1%) which is in line with our hypothesis that they are both related to growth opportunities.

As a preliminary step, we replicate the basic result of RZ in Table 3, column (1); here, EXTFIN is the RZ measure of external financing, and FD is their standard measure of financial development: the sum of total domestic credit and stock market capitalization, deflated by GDP. We reproduce the large and statistically significant coefficient on the interaction term $FD_c*EXTFIN_i$, suggesting that firms in industries that require external financing grow relatively faster in countries at higher levels of financial development.[14] Next, in model (2), we substitute our measure of growth $USGrowth_i$ for EXTFIN and find a significantly positive coefficient. Finally, when we include both measures in the regression in column (3), we find that the coefficient on $FD_c*EXTFIN_i$ is no longer significant, and is 'dominated' by the heretofore omitted variable $FD_c*USGrowth_i$. This provides support for our argument in section 1 that

[14] We note that RZ and others have used accounting standards as an instrument for financial development. We do not follow this approach for several reasons. Most importantly, recent work in the accounting literature has brought into question the legitimacy of using accounting as an instrument (see Francis et al, 2001). Furthermore, we find that the significance of the accounting interaction term is highly dependent on the inclusion/exclusion of the bottom tail of the distribution. Finally, when we implement our more general 2-step technique, we do not find differences in accounting standards to have any explanatory power.

EXTFIN may be proxying for growth opportunities in the US, and that actual US growth is a (statistically) better proxy for these opportunities.

3.2 Pairwise Correlations and similarity in Level of Development

We start our pairwise analysis with the hypothesis that countries at similar levels of per capita income will have similar patterns of industrial growth. This hypothesis is closely related to the one formalized by Chenery (1960), described in the introduction.[15] We begin with this hypothesis in order to (a) illustrate our methodology in an intuitive setting; and (b) set the stage for a further test of the role of financial institutions in the resource allocation process.

To test this 'modified Chenery hypothesis' we use the model given in (4), substituting $f(X_c, X_d) = |\log(Income_c) - \log(Income_d)|$. We predict a negative value for α, so that countries that are closer in development, as measured by per capita income, have more correlated industrial growth rates. In Table 2, we observe that the co-movement in industry growth (i.e. our correlation measure) and distance in GDP are negatively correlated with coefficient of –0.3, significant at 1% (Panel B). Graphically, we illustrate this relationship in two ways. As a first step, we show in Figure 3, Panel A the relationship between distance in income and correlation in growth rates for each country paired with the United States. The data show a strong negative correlation: the regression coefficient is –0.99 with a t-statistic of -6.7 and R2 of 0.46. In Panel B, Figure 3 we presents a similar graph, for all pairs of countries.

[15] The theory linking patterns of growth to income levels is straightforward: on the demand side, different industries will have differential elasticities with respect to per capita income, because of differences in income elasticities of demand across goods. Taking into account backward linkages, different intermediate goods will also be required at different stages of development, further reinforcing the differential elasticities across sectors. There are also supply side stories that could generate this relationship. Suppose that countries and industries are governed by a standard AK technology, but that countries differ in terms of their A's, depending on their factor endowments. Imagine furthermore that there is a technological shock where countries are differentially affected in terms of their abilities to take advantage of the innovation; this will affect countries more similarly if they have similar factor endowments, and hence a more similar distribution of A's.

Finally, before continuing, we note that in our regressions, an econometric issue arises, because of the use of dyadic data: because each country appears N – 1 times in the data, it is probably not appropriate to assume independence of the error terms in equation (13).[16] Techniques to deal with this issue have already been developed by social network researchers. In particular, we utilize the non-parametric quadratic assignment procedure (QAP) to calculate significance (Baker and Hubert, 1981; Krackhardt, 1988).[17]

Table 4 shows our main results on the relationship between similarity in income and correlations in industry growth rates for all pairs of countries. We find strong support for the modified Chenery hypothesis: countries that are closer in per capita income have industry growth patterns that are more highly correlated. Using the QAP method for calculating standard errors, we find that the coefficient on $|\log(\text{Income}_c) - \log(\text{Income}_d)|$ is significant at the one percent level. Its size implies that countries that are twice as close in per capita income (equal to one standard deviation; $\sigma = 1.13$) will have a correlation of industry growth rates that is higher by 0.10. We add various other measures of development distance metrics as regressors in models (2) – (7). Additional covariates include measures of: corruption (as a summary statistic of legal/institution distance), education, accounting standards, population (to proxy for market size), legal origin, similarity in income distributions measured by the similarity in Gini coefficients, and two measures of trade. These trade measures include one ('trade openness') that reflects similarity in the total level of trade (exports + imports) as percent of GDP, and a second that

[16] For example, if ε_{cd} and ε_{de} are both large, our priors would be that ε_{ce} would be large as well.

[17] QAP is in essence a Bootstrap procedure which preserves interdependencies between rows and columns. Repeating this procedure N times generates a distribution of coefficients under the null of no relationship. The reported percentiles correspond to the place of the actual coefficient in this sampling distribution. The percentiles below 2.5% and above 97.5% represent significance at 5% level. The results reported in the paper used 1000 repetitions. We thank Bill Simpson for kindly providing us with his STATA routines to implement the QAP. Note that QAP uniformly increases standard errors reported in this paper. All t-statistics are much higher using the usual robust standard errors.

measures the total trade flows between two countries in a pair as a percent of the sum of the two countries' GDP. We find that only |Gini Coefficient| and the trade measures are significant at the five percent level or greater, using the QAP bootstrapped standard errors. The most important result of this table is that the significance of |GDP| is unaffected by the inclusion of these covariates.

3.3 Financial Development and Correlated Patterns of Growth

In this section we test our primary hypothesis that well-developed financial markets are necessary to take advantage of growth opportunities. As was discussed in section 1 we assume that there exist global shocks to growth opportunities in particular industries that are common across all countries. Since responses to a global shock are dependent on a high level of financial development, growth rates will move together only if *both* countries have high levels of financial development. Intuitively, if one of the countries in a pair does not have well-developed financial institutions, its growth rate will be randomly distributed, i.e., dictated by the error term ε_{ic}.[18] We implement this idea by considering $Min(FD_i,FD_j)$ as a regressor to explain correlations in growth rates.

We test this hypothesis by estimating a model that incorporates both a distance measure of per capita income (as suggested by our regressions in the previous section), as well as a minimum measure of financial development:

$$Corr(Growth_{ic},Growth_{id}) = \alpha + \beta_1 * |\log(Income_c) - \log(Income_d)| +$$

[18] In other words, without the developed financial markets only firms/industries that do not need external finance will be growing. These firms will be either ones generating high cash flows (relative to their investment needs) or those that have an access to insider equity (for example family owned firms that do not rely on formal financial markets for their "external" financing requirements).

$$\beta_2 * \min(FD_c, FD_d) + \varepsilon_{cd}$$

These results are reported in Table 5, utilizing various measures of financial development. We find that when FD is measured as Domestic Credit, its coefficient is significant at 2% (using QAP percentiles). However if FD is measured as market capitalization, β_2 is no longer significant.[19] Finally, our measure of Private Bank Credit is significant at 1%. Thus, if we accept that there is some component of growth opportunities that is common across countries, our results provide support for the hypothesis that well-developed financial institutions (at least in the form of private sector banking institutions) allow firms to better take advantage of these opportunities.

This baseline specification suffers from a potential omitted variable bias: it may be that $\text{Min}(FD_c,FD_d)$ is simply picking up the fact that growth rates are only correlated if both countries are rich, i.e., growth opportunities are more correlated in generally well-developed countries, but not in underdeveloped countries.[20] One way of examining this possibility is to include $\text{Min}(\log(\text{Income}_c),\log(\text{Income}_d))$ as an independent variable. We add this variable in model (5) and find that it takes a significantly positive coefficient, indicating that pairs of well-developed countries have higher co-movement in industrial growth patterns. We then add this measure along with our two measures of FD that were significant on their own - DOMCRED and PRIVCRED. They both remain significant (although the coefficient on min(DOMCRED) is now significant at 6%, while min(PRIVCRED) remains significant at 1%). However Min(GDP) is no

[19] There are two extreme outliers in the Market Capitalization index: South Africa and Singapore; when we exclude them in the model (3), the coefficient becomes weakly significant according to the t-test but not significant according to the QAP bootstrapped percentile method. We have also experimented with different measures of stock market development which included turnover and value trade to GDP which were not significant.

[20] This would simply reflect a different functional form for the Income-Growth Pattern relationship. To rephrase Tolstoy, All well-functioning economies are alike; every dysfunctional economy is dysfunction in its own way.

longer significant at conventional levels.[21] Finally, in columns (6) and (7) we add the two measures of trade flows as potential omitted variables that are correlated with both financial development and the comovement in growth rates, and find that the coefficient on Min(FD) remains significant. Thus, we find support for our theory of Finance and Development, which does not seem to be explained by a simple omitted variable problem.

Interactions of Growth Opportunities and Financial Development

In our initial set of regressions (Table 5) we assumed that there was some component of growth opportunities that was common across all countries (commonalities). In our final set of regressions below, we will take advantage of a model that suggests *systematic similarities* in growth opportunities, and use this to look for systematic similarities in growth patterns in countries that are financially well-developed. In particular, recall that our revised statement of Chenery's hypothesis posits that the reason that countries at similar levels of per capita income have more similar patterns of industrial development is that they have more similar demand structures. Essentially, this says that growth opportunities should be more similar in countries that are closer together in terms of per capita income. However, if our Finance and Development theory holds, firms will be able to take advantage of the similar opportunities, only if a country is at a sufficiently high level of financial development. This implies that the interaction, $\text{Min}(\text{PRIVCRED}_c,\text{PRIVCRED}_d)*|\log(\text{Income}_c) - \log(\text{Income}_d)|$, should be negative. We report

[21] It is important to recognize the alternative hypothesis that could produce the results discussed above. Imagine that the ratio of the variance of the global shocks relative to the country-specific shocks is systematically related to the country's level of development. That is, if countries with low level of development have high variance of the country-specific shocks relative to the global shocks, we will not observe any strong response of growth to the global shocks (i.e. growth will respond to country-specific shocks). However, by including the minimum level of income (a measure of the overall development) we control for such systematic differences, if they exist and still find that our result on financial development to be robust.

the results of this interaction in Table 7. As predicted, the coefficient on this interaction term is negative and significant at 5% for our preferred measure of financial development, PRIVCRED.

To summarize, we report evidence that is supportive of the Finance and Development view of resource allocation; we also find that private banking assets are particularly important in this regard. It is worth emphasizing at this point how we have identified this effect, since we never actually observe industry growth opportunities directly. In our initial set of regressions (Table 5) we assume that there is some component of growth opportunities that was common across all countries (commonalities). In the final set of results we assume that there are *systematic similarities* in growth opportunities and that these growth opportunities are correlated with similarity in development, as measured by per capita income.

3.4 Similarity in Financial Development and External Dependence

In this section, we consider an alternative hypothesis on the relationship between financial development and growth, as suggested by RZ. While RZ emphasize that differences in external financing needs may be driven by global shocks to demand, as is our focus, they also discuss the possibility that certain industries have an inherent need for outside financing, for technological reasons. This may be justified on the basis of differential needs for financing at different points in an industry's life cycle, and also differences in initial project scale requirements and gestation periods

According to this alternative 'financial dependence' hypothesis, there are global shocks to growth in different industries; if these shocks are to industries with high outside financing needs, these industries will grow only in countries with strong financial institutions. This implies that countries with well-developed financial markets will grow relatively more in industries with high financial dependence; symmetrically, countries with underdeveloped financial markets will grow relatively more in low financial dependence industries.[22] In our formulation, this hypothesis suggests that *similarity* in financial development should be predictive of sectoral correlation: high FD countries should specialize in industries with high external dependence, while low FD countries should grow in industries with low external dependence, i.e.,

$$Corr(Growth_{ic},Growth_{id}) = \alpha + \beta_1 * |FD_c - FD_d| + \varepsilon_{cd}$$

When we run these regressions with the same controls as in Table 7, none of the various measures of financial development yields a statistically significant coefficient. We therefore do not find evidence in support of this 'financial dependence' view of finance and development.

This section further highlights the advantage of our methodology: we argue that the RZ model given in (3) cannot differentiate between the 'financial dependence' view, just described, and the 'growth opportunities' view that is the main focus of our paper. To further illustrate this point, we repeat our basic regressions on the correlation of growth rates, limiting country-pair comparisons only to those involving the United States, i.e., a total of 42 observations. Table 8 shows that both $Min(FD_c,FD_{US})$ and $|FD_c - FD_{US}|$ yield qualitatively very similar results when the sample is limited to U.S. pairwise comparisons, in sharp contrast to the differences that emerge when we utilize the full sample, in which case only the $Min(FD_c,FD_{US})$ measure is significant, as in our previous results. This is not surprising since, given that the U.S. is a high FD country, $Min(FD_c,FD_{US}) \approx \alpha + \beta * |FD_c - FD_{US}|$. In the context of our methodology, these

[22] This implication follows only if one assumes that the external financing needs are the same (at least relatively if not in levels) for industries in all countries during the time period in this study. In other words, this assumption required to produce this implication is that industries that have low dependence on external finance are the same in all countries.

regressions are the closest analog to those of RZ. Thus, an additional advantage of our methodology is that by making the full set of pairwise comparisons, we are able to differentiate among alternative development metrics, i.e. similarity in development vs. high level of development in both countries.

4. Conclusions and Implications

In this paper, we extend the literature on finance and development, by presenting a heretofore unutilized technique for examining the intersectoral allocation of resources across countries. We argue that this technique is both more efficient in its use of available data, and also allows for the more refined testing of hypotheses than previous methods that have been utilized in research in finance. Furthermore, our approach does not require that we actually observe growth opportunities: we are able to identify the finance and growth hypothesis by looking at *commonalities* and *differences* in growth opportunities across countries.

In terms of our results, we find strong support for the 'finance and growth opportunities' view of financial institutions: countries have correlated intersectoral growth rates only if *both* countries have well-developed financial markets. The high correlation results because only industries in countries with well-functioning financial systems can effectively respond to common shocks to their growth opportunities, which reinforces the role of financial development in channeling the resources to their most productive uses. By contrast, we do not find support for the 'external dependence' view of financial institutions, according to which some industries have an inherent need for outside financing, and that countries with well-developed financial markets are better positioned to take advantage of opportunities *in these markets*. This is an important finding, as the results of RZ have at times been misinterpreted to imply that a country should *choose* to specialize in particular industries, depending on its level of financial development. We also find evidence that suggests that private financial institutions are better able to respond to growth opportunities, as we find that measures of financial development that reflect the presence of private sector banking institutions perform better than previously used measures of total credit.

While our results are quite robust statistically, we are currently investigating several avenues of further research that will allow us to examine these ideas using microdata. In particular, by looking at resource allocations before and after banking privatizations, we hope to provide more direct evidence on the role of private sector banking institutions. Also, by examining the investment patterns of multinational vs. domestic firms, we hope to further understand the role of *local* financing constraints as a potential impediment to the allocation of capital to high growth areas.

Finally, we are also working on several extensions that will take advantage of the temporal dimension of our data, by looking at how correlations change over time, to examine the impact of increased globalization, and business cycles effects on intra-industry growth. It may also be possible to study regional co-movement (using concordance coefficients instead of correlations), to further understand the allocative effects of economic integration.

References

Barro, R., 1997, *Determinants of Economic Growth*, MIT Press, Cambridge, MA.

Baker F.B. and L.J. Hubert, 1981, "The Analysis of Social Interaction Data, Sociological Methods and Research," vol 9, pp. 339-361.

Barth, James, Gerard Caprio and Ross Levine, 2000, "Banking Systems Around the Globe: Do Regulations and Ownership Affect Performance and Stability?", World Bank Policy Research Paper 2325.

Bayoumi, T. and E.Prasad, 1997, Currency Unions, Economic Fluctuations and Adjustment: Some New Empirical Evidence, IMF Staff papers, vol.44(1), pp.37-58.

Chenery, Hollis, 1960, Patterns of Industrial Growth, American Economic Review, Vol. 50 (4), pp. 624-654.

Chenery, Hollis and Lance Taylor, 1968, Development Patterns: Among Countries and Over Time, The Review of Economics and Statistics, vol. 50 (4), pp. 391-416.

Clark, George and Robert Cull, 1999, Why Privatize? The Case of Argentina's Public Provincial Banks, *World Development*, Vol.27, No. 5 pp.865-886.

Costello, D., 1993, A Cross-Country, Cross-Industry Comparison of the Behavior of the Solow Residuals, Journal of Political Economy, vol. 101, pp.207-22.

Demirguc-Kunt, A. and V. Maksimovic, 1998, "Law, Finance and Firm growth," Journal of Finance, 53(6) pp. 2107-31.

Demirgüç-Kunt and Ross Levine, 2001, Financial Structure and Economic Growth : a Cross-country Comparison of Banks, Markets, and Development, Cambridge, Mass. : MIT Press, c2001.

Francis Jere, Inder Khurana and Raynolde Pereira, 2001, Investor Protection Laws, Accounting and Auditing Around the World, Mimeo, University of Missouri-Columbia.

Goldsmith, Raymond, 1969, Financial Structure and Development, New Haven, CT, Yale U. Press, 1969.

Khanna, Tarun and Jan Rivkin, 2001, The Structure of Profitability Around the World, Mimeo, Harvard University.

King, R.G. and R. Levine, 1993, "Finance and Growth: Schumpeter Might be Right," Quarterly Journal of Economics, 108(3), pp. 717-37.

Krackhardt D., 1988, Predicting with Networks: Nonparametric Multiple Regression Analysis with Dyadic Data, Social Networks, vol. 10, pp. 359-381.

La Porta, Lopez de Silanes, and Shleifer, 2001, Government Ownership of Banks, Mimeo, Harvard University.

Loayza, N., H. Lopes and A.Ubide, 2001, Comovements and Sectoral Interdependence: Evidence for Latin America, East Asia and Europe, IMF Staff Papers, vol.48, no.2.

Levine, Ross, 1997, Financial Development and Economic Growth, Journal of Economic Literature, vol 35, pp. 688-726.

Love, I., 2001, Financial Development and Financing Constraints: International Evidence form the Structural Investment Model, World Bank Working Paper 2694.

Merton, Robert and Zvi Bodie, 1995, A Conceptual Framework for analyzing the Financial Environment in The global Financial System: A Functional Perspective Eds. Dwight Crane et al. Boston, MA, Harvard Business School Press, 1995.

Stockman, A., 1988, Sectoral and National Aggregate Disturbances to Industrial Output in Seven European Countries, Journal of Monetary Economics, vol. 21, pp.123-53.

Rajan, R., and L. Zingales, 1998, Financial Dependence and Growth, *American Economic Review* 88(3), 559-86.

Wurgler, J., 2000, “Financial Markets and Allocation of Capital,” Journal of Financial Economics, 58(1-2), pp. 187-214.

Figure 1: Minimum vs. Distance Measures.

Panel A: Minimum Measure, with α>0

Country B

Country A

	Low FD	High FD
Low FD	Low ρ	Low ρ
High FD	Low ρ	High ρ

Panel B: Distance Measure, with α<0

Country B

Country A

	Low FD	High FD
Low FD	High ρ	Low ρ
High FD	Low ρ	High ρ

Please see equation (13) in the text for a definition of α, and an explanation of the figures.

Figure 2. Distribution of the Correlation Coefficients

Corr(Growth$_{ic}$,Growth$_{id}$)

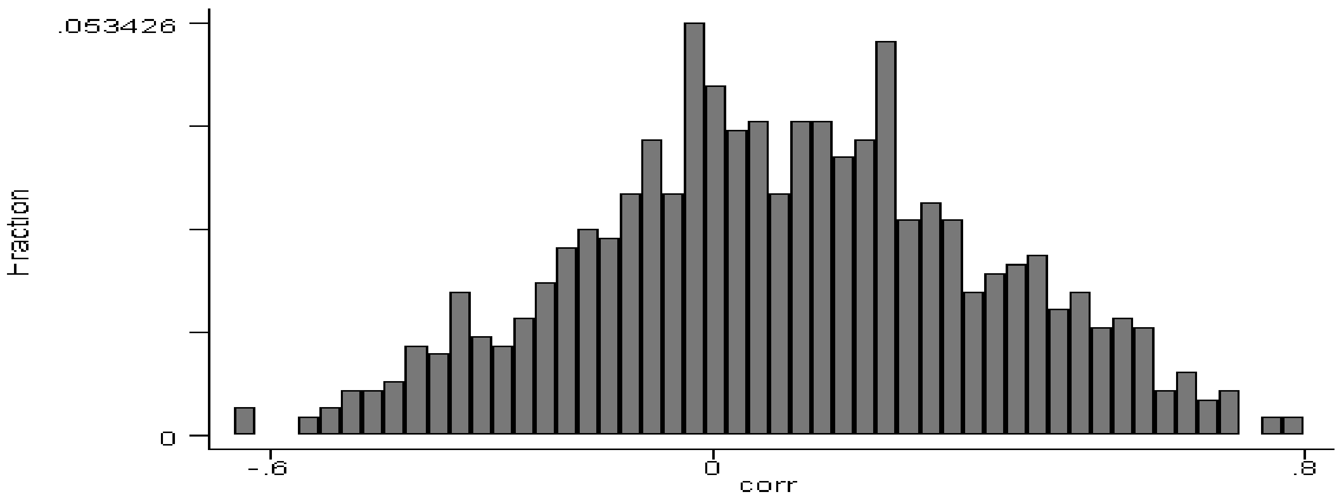
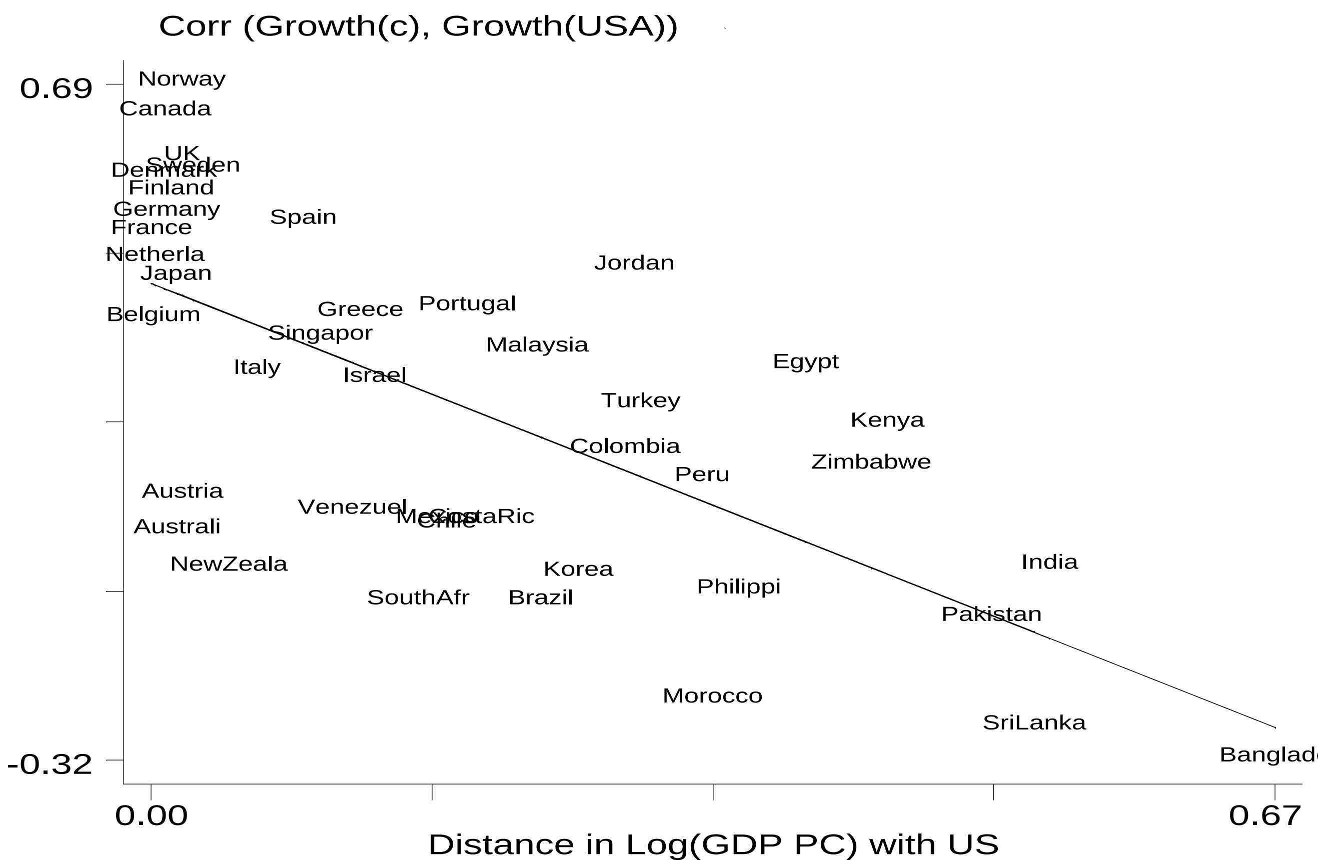


Figure 3. Distance in income levels and correlation of industrial growth patterns.

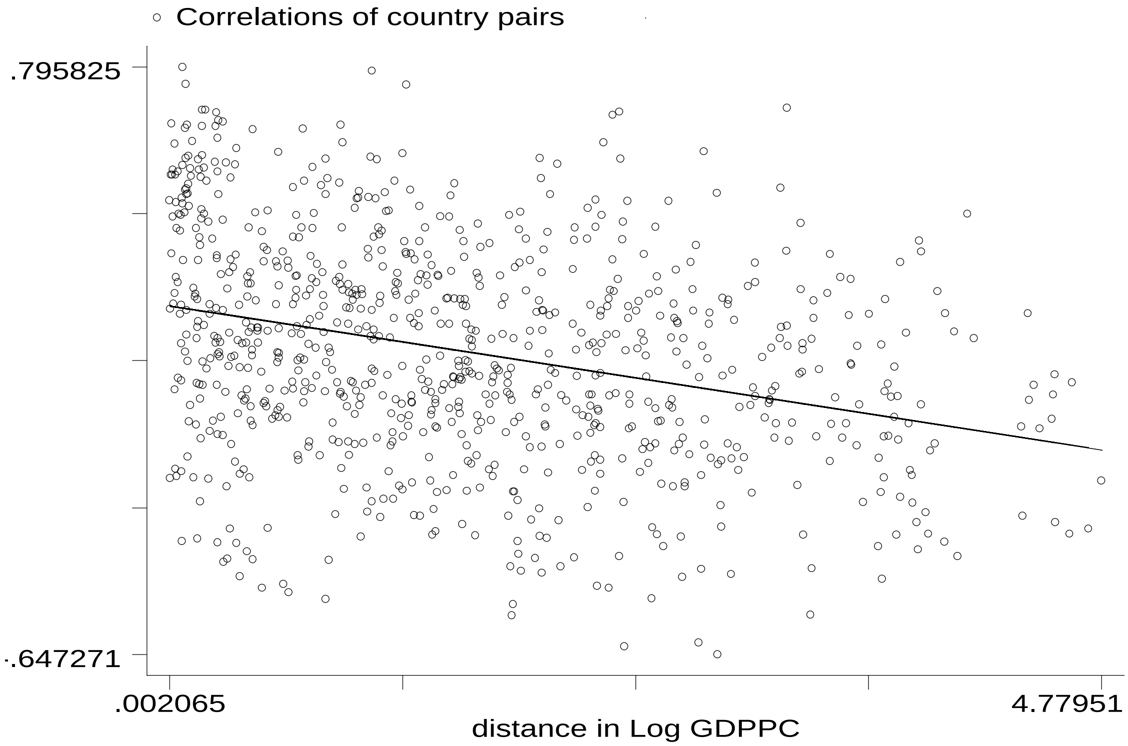
Panel A. Correlation with US



Notes: the regression coefficient is –0.99 with t-statistic of -6.7 and R2 of 0.46

Figure 3. (continued)

Panel B. Correlation of industrial growth for country-pairs



Note: The regression line corresponds to the Model 1 in Table 3.

Table 1. Variable Definitions and Sources.

Abbreviation	Description
Industry-level variables.	
EXTFIN	Dependence on external financing, industry-level median of the ratio of capital expenditures minus cash flow over capital expenditures (the numerator and denominator are summed over all years for each firm before dividing) for US. This variable measures the portion of capital expenditures not financed by internally generated cash. From Rajan and Zingales (1998).
USGrowth	Growth in real sales, industry-level median of firm average growth rages over 1980-1990 for US firms, from Compustat.
Industry growth	Annual compounded growth rate in real value added estimated for the period 1980-1990 for each ISIC industry in each country From Rajan and Zingales (1998).
Country-level variables:	
Domestic credit	Ratio of domestic credit held by monetary authorities and depositary institutions (excluding interbank deposits) scaled by GDP for 1980. Original source is International Financial Statistics (IFS).
Market cap.	Ratio of stock market capitalization to GDP in 1980. IFS.
Log GDP PC	Log of GDP per capita in US dollars in 1980. IFS
Private Bank Credit	Domestic Credit provided by non-governmental financial institutions, calculated using average percent of assets held by private banks over 1970 and 1995 from La Porta et al. (2001)
Legal origin	Dummies for English, French, German or Scandinavian origin of the legal system. La Porta et al. (1996). Variable "same legal origin" equals to one if both countries come from the same legal origin and zero otherwise.
Accounting Standards	Amount of disclosure of company's annual reports in each countries. La Porta et al.(1996)
Education	Percentage of population receiving secondary school education, 1980. From Rajan and Zingales (1998)
Corruption	ICRG Measure of corruption; higher number indicates lower corruption.
Measures calculated on pairs of countries:	
Correlation	Correlation over all industries in Industry Growth (described above) for all pair of countries.
| X |	Absolute Distance in variable X for each pair of countries (i,j) defined as | X(i)-X(j) |
Min (X)	Minimum value in variable X for each pair of countries (i,j) defined as Min(X(i),X(j))

Table 2. Descriptive Statistics and Correlations

See Table 1 for Variable Definitions and Sources. All variables are calculated for each pair of countries using formulas given in Table 1. Numbers in [ ] in the first row show the number of Industries used in calculating the correlation for each pair of countries.

Panel A. Descriptive Statistics

	N obs.	Min	Mean	Median	Max	Std.
Correlation	861	-0.647 [6]	0.096 [26]	0.092 [27]	0.796 [37]	.27 [9]
| Log GDP PC |	861	0.002	1.537	1.354	4.780	1.13
| Domestic Credit |	861	0.001	0.260	0.216	0.841	0.19
| Market Capitalization |	861	0.000	0.281	0.144	1.624	0.36
| Private Bank Credit |	861	0.000	0.237	0.197	0.964	0.19
Min (Log GDP PC)	861	4.793	7.137	7.047	9.505	1.24
Min (Domestic Credit)	861	0.162	0.395	0.378	0.990	0.15
Min (Market Capitalization)	861	0.000	0.080	0.052	1.203	0.11
Min (Private Bank Credit)	861	0.005	0.182	0.137	0.771	0.14

Panel B. Correlations

	Correlation	| GDPPC|	| Dom. | | Credit|	| Market| | Cap. |	| Private | | Bank | | Credit |	Min (GDP PC)	Min (Dom. Credit)	Min (Market Cap.)
| GDP PC |	-0.31* (0)							
| Domestic Credit |	-0.06 (0.08)	0.04 (022)						
| Market Capitalization|	0.05 0.15	-0.08* 0.01	-0.08* 0.02					
| Private Bank Credit |	-0.08* (0.01)	0.26* (0)	0.41* (0)	-0.03 (0.32)				
Min (GDP PC)	0.32* (0)	-0.71* (0)	0.05 (0.15)	0.08* (0.01)	-0.08* (0)			
Min (Dom. Credit)	0.22* (0)	-0.15* (0)	-0.26* (0)	-0.12* (0)	0.06 (0.8)	0.35* (0)		
Min (Market Capitalization)	0.05 (0.11)	-0.17* (0)	-0.08* (0)	0.12* (0)	-0.09* (0.001)	0.27* (0)	0.08* (0.02)	
Min (Private Bank Credit)	0.31* (0)	-0.35* (0)	-0.03 (0.36)	0.11* (0)	-0.24* (0)	0.61* (0)	0.52* (0)	0.43* (0)

Table 3. Industry Growth and Financial Dependence Revisited

Dependent variable is real growth in value added for each industry in each country. Fraction is fraction of industry Value Added in total manufacturing in 1980, EXTFIN is industry median financial dependence, both from RZ. USGrowth is real sales growth in US, industry median of firm averages over 1980-1989 from Compustat. FD is the sum of domestic credit and market capitalization scaled by GDP for 1980. All models include country and industry dummies. Standard errors appear in parentheses, and are adjusted for heteroskedasticity. Significance levels ***, ** and * correspond to 1%, 5% and 10% respectively.

	(1)	(2)	(3)
Fraction	-0.91***	-0.91***	-0.91***
	(0.25)	(0.25)	(0.25)
EXTFIN*FD	0.069***		0.019
	(0.023)		(0.025)
USGrowth*FD		0.99***	0.84**
		(0.33)	(0.39)
N Obs	1217	1217	1217
R^2	0.29	0.29	0.29

Table 4. Co-movement in Growth rates and Distance in Income

Dependent variable is Correlation in Growth rates across all industries for each pair of countries. Constant is included in all regressions (not reported). T-statistics are in () and Bootstrapped Percentile (using QAP Procedure described in text) in [], percentiles below 2.5% or above 97.5% represent significance at 5% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Distance in:									
| Log GDP PC |	-0.074 (-9.65) [0%]	-0.06 (-5.5) [0%]	-0.07 (-5.8) [0%]	-0.07 (-8.9) [0%]	-0.079 (-9.2) [0%]	-0.067 (-8.9) [0%]	-0.075 (-9.7) [0%]	-0.075 (-9.9) [0%]	-0.063 (7.8) [0%]
| Corruption |		-0.02 (-2.8) [4.9%]							
| Accounting Standards |			0.004 (0.5) [59%]						
| Log of Population |				0.002 (0.3) [54%]					
| Education |					0.009 (2.3) [92%]				
| Gini Coefficient |						-0.004 (-4) [2%]			
Same Legal Origin							-0.009 (-0.5) [36%]		
| Trade Openness|								-0.022 (3.5) [9.9%]	
Total Trade Flows									9.85 (3.1) [100%]
N Obs	861	861	561	820	820	861	861	861	820
R^2	0.094	0.10	0.06	0.085	0.092	0.11	0.095	0.10	0.11

Table 5. Co-movement in Growth rates and Level of Financial Development

Dependent variable is Correlation in Growth rates across all industries for each pair of countries. Model 3 excludes South Africa and Singapore which are outliers on Market Capitalization. Constant is included in all regressions (not reported). T-statistics are in () and Bootstrapped Percentile (using QAP Procedure described in text) in [], percentiles below 2.5% or above 97.5% represent significance at 5% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
| Log GDP PC |	-0.067 (-8.8) [0%]	-0.074 (-9.5) [0%]	-0.074 (-9.5) [0%]	-0.055 (-6.8) [0%]	-0.038 (-3.5) [2.5%]	-0.045 (-4.1) [0.8%]	-0.048 (-4.3) [0.7%]	-0.054 (-6.5) [0%]	-0.049 (-6.06) [0%]
Min (Domestic Credit)	0.31 (5.5) [99%]					0.25 (4.4) [97%]			
Min (Market Cap.)		0.004 (0.03) [56%]	0.11 (2.1) [77%]						
Min (Private Bank Credit)				0.44 (7.3) [99.8%]			0.40 (5.6) [99%]	0.45 (7.5) [99.8%]	0.36 (5.53) [99.4%]
Min (Log GDP PC)					0.044 (4.3)[99%]	0.029 (2.7) [91%]	0.01 (0.9) [64%]		
| Trade Openness |								-0.024 (-3.76) [6.4%]	
Trade Flows									7.71 (2.92) [99.8%]
N Obs	861	861	780	861	861	861	861	861	820
R^2	0.13	0.095	0.11	0.14	0.12	0.13	0.14	0.15	0.14

Table 6. Interaction Of Financial Development and Minimum in GNP PC

Dependent variable is Correlation in Growth rates across all industries for each pair of countries. Constant is included in all regressions. T-statistics are in () and Bootstrapped Percentile (using QAP Procedure described in text) in [], percentiles below 2.5% or above 97.5% represent significance at 5% level.

	(1)	(2)	(3)	(4)	(5)
| Log GDP PC |	-0.023 (-1.2) [27%]	-0.077 (-7.9) [0%]	-0.026 (-2.5) [10%]	-0.028 (-2.71) [9%]	-0.029 (2.75) [8.5%]
Min (Domestic Credit)	0.47 (4.7) [99.7%]				
Min (Market Capitalization)		-0.07 (-0.3) [38%]			
Min (Private Bank Credit)			0.7 (7.9) [100%]	0.71 (7.9) [100%]	0.59 (6.24) [99.5%]
<u>Interactions :</u>					
| Log GDP PC | * Min(Domestic Credit)	-0.11 (2.2) [7.9%]				
| Log GDP PC | * Min(Market Cap.)		0.059 (0.6) [66%]			
| Log GDP PC | * Min(Private Bank Credit)			-0.19 (4.1) [2.2%]	-0.18 (3.99) [3%]	-0.15 (3.06) [5.9%]
| Trade Openness |				-0.024 (3.67) [7%]	
Total Trade Flows					6.84 (3.13) [99.7%]
N Obs	861	861	861	861	820
R^2	0.13	0.095	0.15	0.17	0.14

Table 7. Co-movement in Growth rates and Distance in Financial Development

Dependent variable is Correlation in Growth rates across all industries for each pair of countries. Constant is included in all regressions (not reported). T-statistics are in () and Bootstrapped Percentile (using QAP Procedure described in text) in [], percentiles below 2.5% or above 97.5% represent significance at 5% level.

	(1)	(2)	(3)
| Log GDP PC |	-0.074	-0.074	-0.074
	(-9.6)	(-9.6)	(-9.1)
	[0%]	[0%]	[0%]
| Domestic Credit |	-0.065		
	(1.4)		
	[19%]		
| Market Capitalization |		0.02	
		(0.7)	
		[61%]	
| Private Bank Credit |			-0.006
			(0.1)
			[45%]
N Obs	861	861	861
R^2	0.096	0.096	0.095

Table 8. Minimum vs. Distance – all pairs vs. pairs with US

	US only		Full Sample	
	Min(FD)	|FD|	Min(FD	|FD|
Coefficient	0.47 (0.12)	-0.50 (0.15)	0.22 (0.037)	-0.026 (0.026)
N obs	41	41	861	861
R2	0.23	0.23	0.001	0.04

Appendix A. Simple model of Growth and External Financing.

Consider a standard model of profit maximization:

$$\max_{K} \; \Pi(K) - rK$$

Where K is the capital stock, which is the only input into the production function $\Pi(K)$, r is the interest (or leasing) rate, there is no depreciation and price of output is normalized to one. Assume simple Cobb-Douglas production function: $\Pi(K) = \theta K^{\alpha}$ with decreasing returns to scale, so that $\alpha<1$. Here, an increase in the "technology" parameter θ is equivalent to an increase in growth opportunities.

We then have the FOC:

$$r = \alpha\theta K^{\alpha-1} = \alpha\,\Pi(K)/K$$

This is familiar relationship that equates marginal cost of capital to its marginal benefits. We further assume that initially, the firm is operating at the optimal capital stock, and that there are no barriers to entry. Thus, profits are zero, and:

$$K^{*} = \left(\frac{\alpha\theta}{r}\right)^{\frac{1}{1-\alpha}}$$

In this model, new growth opportunities are equivalent to increase in parameter θ. The increase in desired capital stock (i.e. the level of investment) will then be given by:

$$\frac{\partial K^{*}}{\partial \theta} = \left(\frac{1}{1-\alpha}\right)\frac{1}{\theta}K^{*}$$

We can rewrite the revenue function at the optimal capital stock as

$$\Pi(K^{*}) = \frac{r}{\alpha}K^{*}$$

Cash Flow (revenue minus interest expenses) will then be given by:

$$CF(K^{*}) = \Pi(K^{*}) - rK^{*} = \frac{r}{\alpha}K^{*} - rK^{*} = rK^{*}\left(\frac{1-\alpha}{\alpha}\right)$$

It is easy to see that if $\alpha > \frac{r}{1+r}$, which represent reasonable parameter values,[23]

$r\frac{1-\alpha}{\alpha} < 1$, and hence $\frac{\partial CF(K^*)}{\partial \theta} = r\frac{1-\alpha}{\alpha}\frac{\partial K^*}{\partial \theta} < \frac{\partial K^*}{\partial \theta}$

That is, an increase in cash flows will be less than the desired investment and therefore will require external financing. The amount of external financing required is directly proportional to the growth in capital stock :

$$EXTFIN = \frac{\partial K^*}{\partial \theta} - \frac{\partial CF(K^*)}{\partial \theta} = (1 - r\frac{1-\alpha}{\alpha})\frac{\partial K^*}{\partial \theta}$$

Since in this simple model new investment is proportional to growth (i.e. increase in the capital stock), it follows immediately that EXTFIN = c*GROWTH.

[23] It is reasonable to assume the curvature parameter α to be above 0.5; and the interest rate well below this level.