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FINANCIAL DEVELOPMENT AND THE COMPOSITION OF INDUSTRIAL GROWTH

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ABSTRACT

We re-examine the role of financial market development in the intersectoral allocation of resources. Specifically, we propose the use of a new methodology that looks at the co-movement in growth rates across pairs of countries to examine the role of financial development in allowing firms to take advantage of growth opportunities. Our model begins with the assumption that there exist common global shocks to growth opportunities, and we hypothesize that countries should therefore have correlated patterns of growth if they are able to take advantage of these shocks. We find that countries have more highly correlated growth rates across sectors when both countries have well-developed financial markets; this is consistent with financial markets playing an important role in allowing firms to take advantage of global growth opportunities. We further observe that growth opportunities will be more similar for countries that are at similar levels of economic development. This allows for a further refinement of our initial test: the impact of financial development on country-pair co-movement is much stronger between country pairs at similar levels of economic development. Finally, we note that our results imply that private banking appears to play a particularly important role in resource allocation, as our results are particularly strong when financial development takes into account both the level and composition of financial market institutions.

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Economists have long claimed that financial market institutions perform an important function in the development process, particularly through their role in allocating resources to their most productive uses. This allocative role of financial institutions was recognized first by Schumpeter (1911), who conjectured that bankers help to identify entrepreneurs with good growth prospects, and therefore help to reallocate resources to their most productive uses. If this is the case, then well-developed financial institutions will be crucial to an efficient allocation of resources in response to shocks to growth opportunities. In light of this proposed function, a test of the role of financial development in the allocation of resources would involve examining whether financial development helps firms or industries to take advantage of growth opportunities in a timely manner. This is not straightforward, however, since growth opportunities are not generally observable to the econometrician. In this paper, we propose a new (indirect) test of the financial development – growth hypothesis that circumvents the need to measure these opportunities directly. Our approach utilizes a methodology that focuses on the *patterns* of growth, that is, the cross-sectional allocation of growth across industries. [1] Our primary variable of interest is the degree of co-movement in growth rates across industries in different countries, which we measure by the correlations in intra-industry growth rates across country pairs during the 1980s. This correlation will be high if two countries are growing (or declining) in similar industries during the same time period.

Our tests are based on the observation that if industries in a pair of countries have a relatively high rate of co-movement, it may be because they are both effectively responding to the *same* shock, or because they have shocks to growth opportunities that are relatively highly

[1] 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.

correlated. *If* financial development helps firms to take advantage of growth opportunities, then we may use the preceding observations to test the role of financial development in efficient resource allocation by examining whether co-movement is predicted by extent of financial development.

We focus first on the presence of global shocks that affect a given industry equally across *all* countries. Such opportunities could result as a consequence of technological innovations or global shifts in factor prices. These global shocks will create new opportunities for growth in some industries and will require reallocation of resources to these industries. If this reallocation process requires well-developed financial institutions, only countries with high levels of financial development will be able to respond to these new growth opportunities. As a result the patterns of growth will be more similar (i.e. we will observe a higher correlation) among countries with well-developed financial markets that are thus able to make this reallocation. This is our first main result – we find that the correlation in growth rates is higher for pairs of countries in which both countries have high levels of financial development, which allows them to respond to industry-specific global shocks.

Now, as mentioned above, country pairs may also have pair-specific growth shocks. If we were able to generate a proxy for pair-specific similarities in growth opportunities, it would generate an additional test of the role of finance: financial development should lead to more correlated patterns of growth rates for countries that have *more* similar growth opportunities. This requires a measure of similarities in growth opportunities across countries. We create a measure that is based on an intuitive idea that countries at similar levels of per-capita income will experience demand-driven similarities in industrial growth rates (see Chenery (1960), referred to below as the Chenery hypothesis). Dornbusch, Fisher, and Samuelson (1977) propose

a supply-side theory that generates the same empirical prediction. As an auxiliary result we find support for this hypothesis using our methodology –countries that are closer together in terms of income per capita experience higher correlations in intra-industry growth rates. This finding leads to our second identifying assumption – that growth opportunities are more similar in countries at similar levels of income per capita. In contrast to our first test, which assumes that shocks affect industries in the same way across all countries, this allows different groups of countries to receive different shocks. We argue below that this assumption represents a significant step forward relative to the previous work in this literature (specifically that of Rajan and Zingales (1998)). We find support for this more refined test of the financial development – growth hypothesis in the data: financial development leads to more correlated growth rates primarily for countries at similar levels of industrial development (and hence with similar growth opportunities). More precisely, we find that the interaction of level of financial development and the similarity in income levels has a significant effect on the correlation in industrial growth rates.

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, suggesting that both the level and composition of financial institution development are important. This paper also makes an important methodological contribution: the usefulness of our approach is not limited to the two tests that we propose, and other identifying assumptions are possible avenues for future exploration. In the concluding section we make several suggestions for future applications of our methodology.

Our work is closely related to that of Rajan and Zingales (1998), who also develop a test of the 'finance and growth' hypothesis. 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. Their findings parallel those described above; however, they make the strong assumption that some industries have an *inherent need* for outside financing, and that the level of outside financing of U.S. firms may be used as a proxy for this need in other countries. Our approach is less restrictive in a couple of ways: in a sense, their assumption of the constant industry-specific "external financing needs" is similar to our first assumption that global shocks to growth opportunities that are constant across all industries, in that both involve an industry characteristic that is constant across countries. However, in our test, we are never required to actually *measure* this characteristic, and therefore do not have to rely on the US data to generate any industry-specific measures. Furthermore, our second test offers a significant step forward, as it allows growth opportunities to depend on country-characteristics, thereby relaxing the assumption of uniform shocks across countries.

Our paper fits into the more general literature on the role of financial development in the growth process which 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. Unlike these previous papers we focus on the composition, rather than the average level, of growth. Our paper is also related to the strand of literature that focuses on disaggregating growth rates into country-, time-, and sector-specific components.[2] These papers look at the percent of the total variation in growth rates that each of

[2] 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), Costello (1997), Bayoumi and Prasad (1997) and more recently Loayza, Lopes and Ubide (2001).

the components can explain, rather than the underlying factors that cause these components to vary. Our focus is on understanding the underlying determinants of industry co-movement.[3]

The rest of this paper is organized as follows: in Section 1, we describe our methodology in greater detail. In Section 2 we describe our data. In section 3.1 we introduce our pairwise correlations methodology with a motivating application and show that the correlation is higher for countries that have similar levels of income. In Section 3.2, we present results supporting our first assumption of the common shocks to growth opportunities and in section 3.3 we examine the second assumption and test the interaction of the similarity in growth opportunities and financial development. We conclude in section 4.

I. Methodology

The difficulty in testing whether financial development helps the allocation of resources to sectors with good 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 will affect the relationship between actual (realized) growth and potential growth (i.e. growth opportunities). The test of whether financial development helps an economy to shift resources to those industries with good growth opportunities can be formally written as a

[3] 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.

relationship between actual (realized) growth, growth opportunities, denoted GO^* (the asterisk emphasizes that this variable is unobservable) and the level of financial development, FD:

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

where β is expected to be positive (i.e. financial development increases the alignment of actual growth with potential for growth – i.e. GO^*).[4] Because we cannot actually measure growth opportunities directly, we identify possible commonalities in the shocks to growth opportunities that will allow us to make inferences about co-movements in growth rates. If financial development plays the allocative role it has been ascribed, responses to any given shock will be greater in countries that are more financially developed. Industries in countries that lack financial markets will not respond to shocks to their growth opportunities but instead will grow in the industries with favorable "pre-existing conditions" – for example those that have plenty of cash on hand from the past profits or those supported by the government through protectionists policies. Here we offer tests based on two identifying assumptions; we emphasize again that our methodology is not limited to these two specific approaches, and in the conclusions we will discuss other potential applications of our methodology.

1. Global industry-specific shocks

We begin by assuming that there exist global industry-specific shocks to growth opportunities (due to technological shocks and/or shifts in factor prices, as noted in the introduction), i.e., some component of GO^*_{ic} is common across countries:

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

[4] 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).

If financial development helps industries to take advantage of these common shocks, this assumption implies that the co- movement of growth rates will be higher in countries with higher level of financial development. Intuitively, if one country in the pair is not at a high level of financial development, its patterns of development will be dominated by the random component to actual growth (e_{ic} in (1) above), and so will not be correlated with patterns of growth in the other country in the pair. By contrast, if both countries have well-developed financial institutions, growth will be dominated by GO^{*}_{ic}, and hence the countries will share a common component, η_i, to their patterns of growth.

As discussed above, our measure of co-movement is the correlation in industrial growth rates for any two pairs of countries. In other words, for any pair of countries c and d we take the growth rates for a set of industries (in our case we have 37 industries aggregated by the 3-digit SIC level) and calculate the correlation in the growth rates of these industries in the two countries over the same time horizon.[5] Our unit of observation is therefore a country-pair and the first test results in the following specification:

$$(3) \qquad \text{Corr}(\text{Growth}_{ic},\text{Growth}_{id}) = \alpha * f(\text{FD}_c, \text{FD}_d) + \varepsilon_{cd}$$

where $f(.)$ is a function of two countries' levels of financial development: If both countries have a high degree of financial development, the correlation in their growth rates 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 co-movement, as at least one country will not be responding to the common shock η_i. The function f(., .) that captures this intuition is one that will result in a high value *only* if both countries in a pair have high level of financial

[5] For the purposes of this paper we focus on the average growth rates for the decade of 1980's, so our correlation does not have a temporal dimension (as it is a correlation in average growth rates over that decade). We are currently working on extending this work to the temporal dimension.

development. This is best represented by a minimum metric, i.e. Min(FD_c, FD_d). We refer to this metric as a measure of *high development of both countries*. Based on the assumption of common industry-specific shocks, the financial development and growth hypothesis implies that α is positive.[6]

2. Differential growth opportunities and financial development

In this section, we relax the assumption that shocks to growth opportunities are common to all countries in our sample.[7] It is likely that industries in different groups of countries will have different growth opportunities. For example, some theories suggest that as technologies mature, industries using those technologies migrate from developed to developing economies (see Dornbush, Fisher and Samuelson (1977) also cited in RZ (1998)). This will result in growth opportunities that are similar for countries at similar levels of economic development. The same pattern is predicted by the early work of Chenery (1960), who also argued that countries at a similar level of development should grow in similar industries, though in his model this pattern is driven by differences in income-elasticities of demand. In terms of the pairwise correlations that we are studying here, these theories imply that the correlation will be higher for countries that are more similar in their levels of economic development. We use the absolute value of the difference between two countries' log GDP per capita as a measure of (dis)similarity in the levels of development for a pair of countries. We test this hypothesis by:

[6] It may seem unusual at first to treat a high FD country paired with a low FD country symmetrically with a low FD country paired with a low FD country, since in the former case, at least one country in the pair will indeed have a systematic component to its intersectoral allocation. Note, however, that this immediately will require us to provide some structure for global growth opportunities, rather than it as an unobserved, latent variable. We take the approach of trying to directly measure growth opportunities in a related paper. See Fisman and Love (2003).

[7] As we argued in the introduction, the limitation of our first assumption is similar to that of the methodology in Rajan and Zinzales (1998) which relies on the measure of the dependence on external finance constructed using the US data. The technological reasons that result in such an industry-level dependence are likely to be different in countries at different level of development.

(4) $$Corr(Growth_{ic},Growth_{id}) = \beta\ |\log(Income_c) - \log(Income_d)|\ + \varepsilon_{cd}$$

We predict a negative value for β, so that countries that are closer in their level of development (i.e. have smaller distance) have more correlated industrial growth rates. We find strong support for this hypothesis in section III.1.

This hypothesis facilitates our second test of the financial development – growth hypothesis, by providing an empirical validation for the assumption that growth opportunities for each industry i depend on the level of development of the country c:

(5) $$GO^*_{ic} = \eta_i\ \phi\ (Income_c)\ + \varepsilon_{ic}$$

This implies that countries at a similar level of development will have similar growth opportunities. The test of whether financial development helps industries to take advantage of their growth opportunities is now a test on the interaction of the "similarity in growth opportunities" (i.e. distance in the per capital income) and the minimum level of financial development in a pair:

(6) $$Corr(Growth_{ic},Growth_{id}) = \gamma\ *\ |\log(Income_c) - \log(Income_d)|\ *\ Min(FD_c,FD_d)\ + \varepsilon_{cd}$$

If our Finance and Development theory holds, firms in both countries will be able to take advantage of these similar opportunities (and hence generate a high correlation in growth rates), only if both countries are at a sufficiently high level of financial development. This implies that the interaction, γ, is expected to be negative. Once again, we underscore that if firms are unable to take advantage of growth opportunities, then similarity in log(GDP) should not be predictive of patterns of co-movement, since resource allocation will be dominated by the noise term, e_{ic}, in (1).

Finally, before continuing, we note that in our regressions, an econometric issue arises because of the use of pairwise correlations (i.e. we have what is called dyadic data). Since each country appears N – 1 times in the data, it is probably not appropriate to assume independence of the error terms in our models.[8] Techniques to deal with this issue have already been developed by social network researchers. Thus, in addition to reporting standard t-statistics, we utilize the non-parametric quadratic assignment procedure (QAP) to calculate significance levels (Baker and Hubert, 1981; Krackhardt, 1988).[9]

II. Data

For easy reference to earlier work our data are drawn primarily from Rajan and Zingales (1998) and described in detail in that paper. The main variable of interest is real growth in valued added, estimated for each of 37 industries in 42 countries (UNCTAD, 1999). To be consistent with previous work we use the total growth for these industries between 1980 and 1990. 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). The correlation will be high if two countries have been growing (or declining) in similar industries in the decade of 1980's. We have total of (42*41)/2 (i.e. 861) of such pairs. Table 2 shows the basic summary statistics and Figure 1 shows a histogram of the distribution of the correlations for all possible pairs of countries. The average number of industries used in calculating this correlation is 26 because not all industries are

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

[9] 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.

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.[10]

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 Table 1; in Table 2 we report the correlation matrix for the main country-level measures.

A. Measures of Financial Development

We consider a number of measures of financial development. First, to once again be consistent with previous work: 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), referred to henceforth as LLS, on the ownership of banks around the world. In their work, they look at the impact of government ownership of banks on the level of development, and find that concentration of banking assets in the hands of the government is negatively correlated with subsequent growth. They claim that

[10] Several examples of the similarities in the growth rates in these countries help to show that, indeed, the same sets of industries seem to be growing (and declining) in this group of similar countries: Plastic products, industry 356, has grown by about 7% in both the US and Canada and about 5% in the UK; Drugs, industry 3522, has been grew by 9.5% in Canada, 8% in the US and 6% in the UK. On the other side the Footwear, industry 324, has declined by about 5% in the US, 4% in Canada and 1.5% in the UK; and petroleum refineries, industry 353, have declined by about 3% in all three countries. Similar growth rates are also observed for Motor vehicles, Printing and Publishing, Food and Beverage and many other industries. There are of course dissimilarities as well, for example Tobacco has grown at 10% in the US and 0% in the UK – this could easily be incorporated by allowing for a noise term in the expression for GO^*.

may be because government bank ownership results in politically expedient, rather than economically efficient, resource allocation. Thus, resources may be diverted to industries with political clout rather than those with positive growth opportunities. 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 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. Collectively, this suggests that both *quality* and *quantity* of financial assets need to be considered.

We extract two variables from LLS paper: GOVPCT70 and GOVPCT95, which are the proportion of assets of a country's top ten banking institutions that were held by the public banks in 1970 and 1995 respectively. 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 measure of the concentration of government ownership (GOVPCT).[11] As our main measure of financial development 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.[12]

[11] 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.

[12] 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

III. Results

III.1 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. 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), and predict a negative value for β, so that countries that are closer in their levels of economic development 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%. To provide a visual illustration we present in Figure 2, 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 we present a similar graph, for all pairs of countries.

Table 3 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 hypothesis embodied in (4): 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

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Demirguc-Kunt and Levine (2001). As in the results reported below, no other alternative measure of stock market development produced significant results.

level. Its size implies that countries that are twice as close in per capita income (equal to one standard deviation; σ =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) – (9). Additional covariates include measures of: corruption (as a summary statistic of legal/institution distance), education (a proxy for human capital, which could be an important determinant of the industrial composition), accounting standards, population (to proxy for market size), legal origin (we add a dummy equal to one if two countries in a pair have the same legal origin), similarity in income distributions measured by the similarity in Gini coefficients, and two measures of trade: 'trade openness' that reflects similarity in the total level of trade (exports + imports) as a fraction of GDP, and a second that measures the total trade flows between two countries in a pair as a fraction 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 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.

III.2. Assumption 1 - Global Shocks to Growth Opportunities

In this section we test our primary hypothesis that well-developed financial markets are necessary to take advantage of growth opportunities. As discussed in section 1, our first approach is based on the assumption that there exist global shocks to growth opportunities in particular industries that are common across all countries. Since responses to global shocks require a high level of financial development, growth rates will move together only if *both* countries have high levels of financial development. We implement this idea by considering $\text{Min}(FD_i,FD_j)$ as a

regressor to explain correlations in growth rates. Given our results in section III.1., we augment the model given in (3) to also include a measure of the distance in income levels to make sure our measures of financial development are not picking up the effect of similarities in income levels.

These results are reported in Table 4, 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.[13] Finally, our preferred measure of financial development, Private Bank Credit is significant at 1%. Thus, if we accept the assumption that there is some component of growth opportunities that is common across countries, our results support 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. 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

[13] There are two extreme outliers in the Market Capitalization index: South Africa and Singapore; when we exclude them in model (3), the coefficient becomes weakly significant according to a standard t-test but not significant according to the QAP bootstrapped percentile method.

longer significant at conventional levels. 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.

III.3. A Further Test– Growth Opportunities as a Function of Level of Development

In our initial set of regressions (Table 4) 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 above, we described several theories that predict similar growth opportunities in countries at similar levels of per capita income. However, if our Finance and Development theory holds, firms will be able to take advantage of these similar opportunities only if a country is at a sufficiently high level of financial development; hence, a pair of countries at similar levels of development will only have highly correlated patterns of growth if they *also* have well-developed financial institutions to allow firms to take advantage of these opportunities. 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 the results of this interaction in Table 6. As predicted, the coefficient on this interaction term is negative and significant at 2% for our preferred measure of financial development, PRIVCRED. The result is robust to inclusion of other control variables, though its significance is affected marginally by the inclusion of trade-related variables.

As a final robustness test we look at the distance in financial development. There is no *a priori* reason to expect that the distance in financial development should matter for the co-movement in growth rates once we have controlled for the distance in income levels. In other words, we do not expect that pairs of countries that are both underdeveloped financially (i.e. have similar but low level of financial development) will exhibit a high correlation in their growth rates. However, if our (theoretically motivated) minimum measure is simply another proxy for 'level of development,' this should be better captured by the distance measure. We find in Table 6 that the inclusion of the distance in financial development is not significant, and does not affect the significance levels of our distance measure of income, or the minimum measure of financial development. This further reinforces the differences between the behavior of financial development and overall level of development in our regressions, and our tests of the role financial development in resource allocation.

IV. Concluding Remarks

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 allows for a 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 test the finance and growth hypothesis by looking at *commonalities* and *differences* in growth opportunities across countries. In our first set of results we assume that there is some component of growth opportunities that is common across all countries (commonalities). In later results we relax this assumption, to allow

for *systematic similarities* in growth opportunities, arguing that growth opportunities are more similar for countries at similar levels of economic development, as measured by per capita income. As an auxiliary result we also find support for the hypothesis that countries at a similar level of economic development have similar patterns of intersectoral allocation. This result supports our second assumption for identifying growth opportunities.

The second test offers an improvement over previous work, as it allows growth opportunities to depend on country-characteristics, i.e., countries at a similar level of development to have similar growth opportunities. Our methodology thus relaxes the need to assume constant growth opportunities and also does not have to rely on the US data to generate any industry-specific measures (since shocks to growth opportunities are latent in our models).

We find strong support for the allocative role of financial institutions: countries have correlated intersectoral growth rates only if *both* countries have well-developed financial markets. This is consistent with our model where only industries in countries with well-functioning financial systems can effectively respond to common shocks to their growth opportunities. Our results also suggest that private financial institutions are particularly important in facilitating resource allocation in response 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 domestic credit.

This methodology could potentially be extended to incorporate many other assumptions on the similarities in growth opportunities across groups of countries. One extension that we are currently investigating takes the changes in the price of oil as an indicator of global shocks that will generate similarities and differences in growth opportunities for different industries and groups of countries. Other extensions 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, financial liberalizations and business cycle 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.

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Table 1. Variable Definitions and Sources.

Variable	Description
<u>Industry-level variables.</u>	
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).
<u>Country-level variables:</u>	
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).
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.
Trade Openness	Ratio of exports and imports over GDP
<u>Measures calculated on pairs of countries:</u>	
Correlation	Correlation over all industries in Industry Growth (described above) for all pair of countries.
$\lvert X_c, X_d \rvert$	Absolute Distance in variable X for each pair of countries (c,d) defined as | X(c)-X(d) |. If X is the level of development, distance will be small if both countries are either similarly developed or similarly underdeveloped. It is a measure of similarity in the level of X.
Min (X_c, X_d)	Minimum value in variable X for each pair of countries (c,d) defined as Min(X(c),X(d)). Minimum is high only when both countries have high value of X.
Total Trade Flows	Total trade flows between two countries in a pair as a percent of the sum of the two countries' GDP
Same legal origin	Equals to one if both countries come from the same legal origin and zero otherwise.

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. 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 4. 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 5. Interaction Of Financial Development and Distance 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%]
Interactions :					
| 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 6. 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 (-9.6) [0%]	-0.074 (-9.6) [0%]	-0.074 (-9.1) [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

Figure 1. Distribution of the Correlation Coefficients

Corr($Growth_{ic}$,$Growth_{id}$)

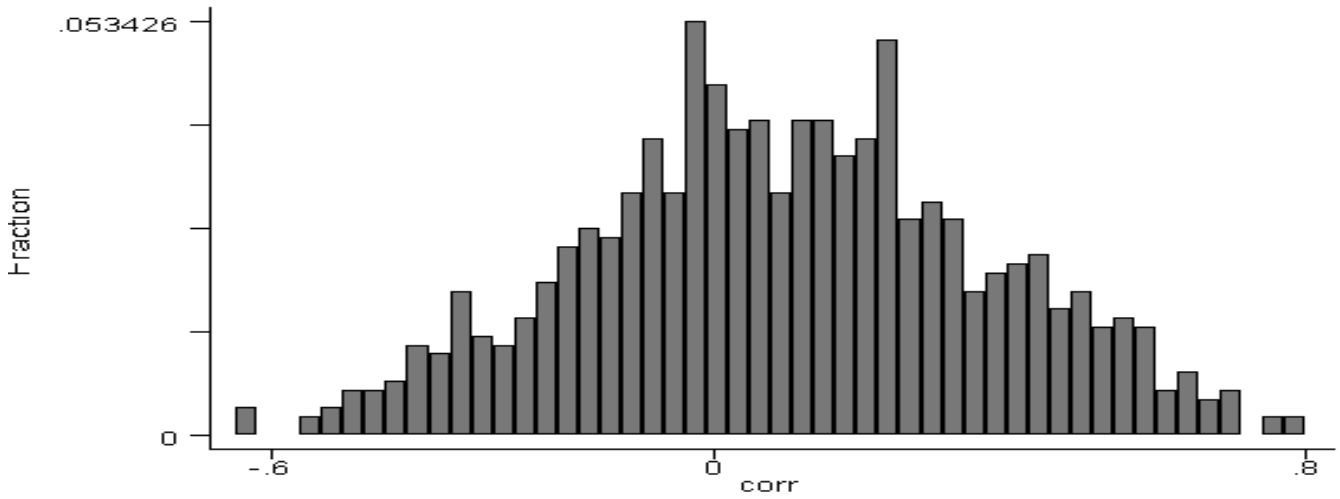
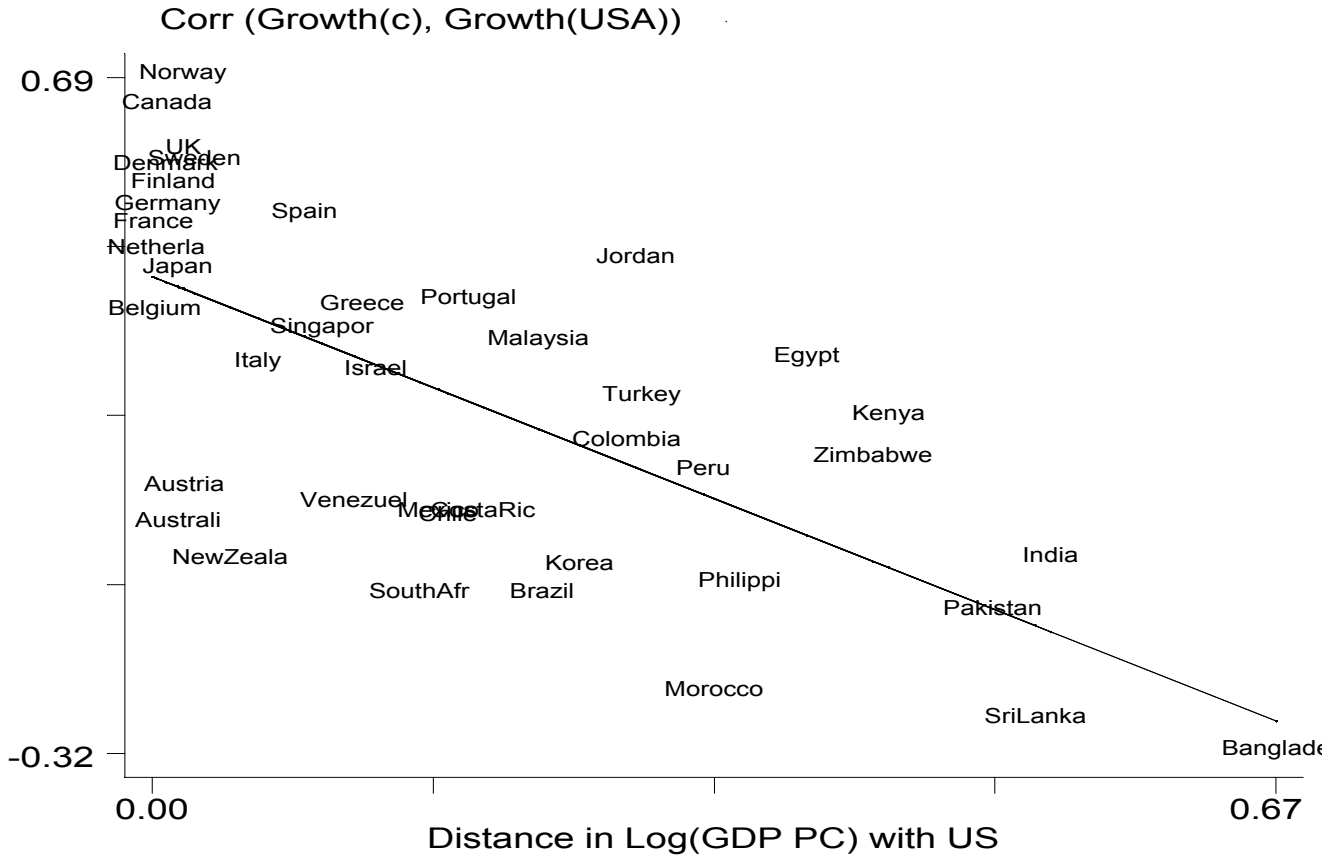


Figure 2. Distance in income levels and correlation of industrial growth patterns.

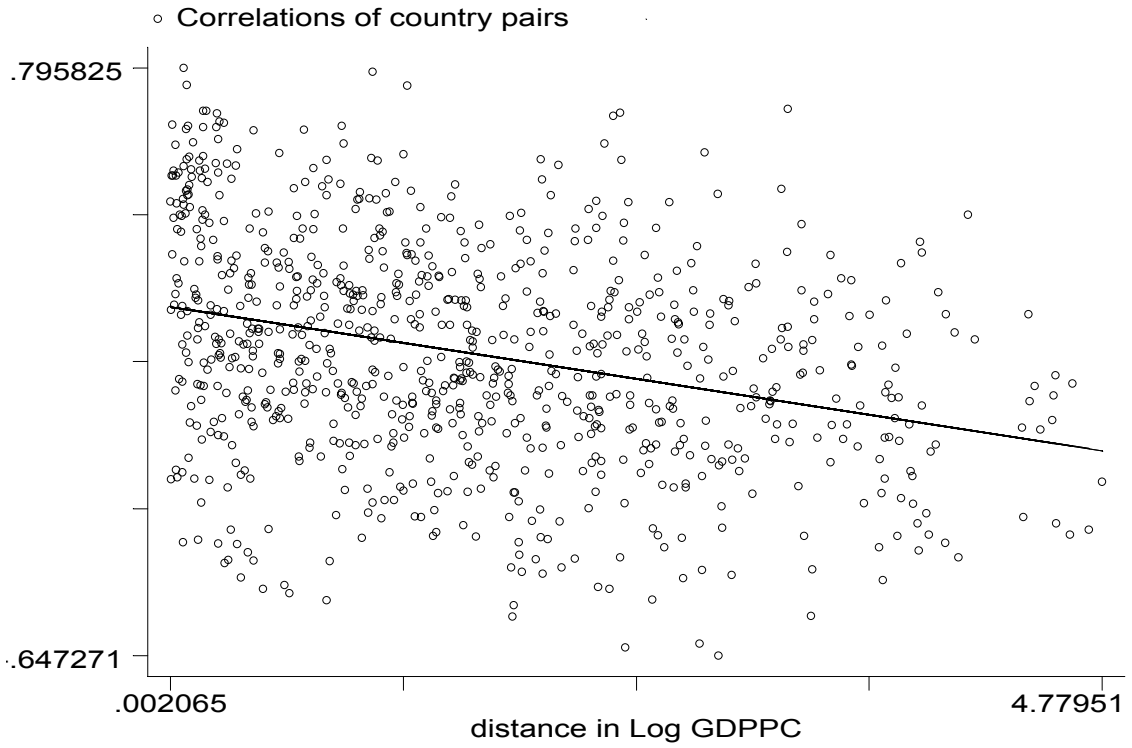
Panel A. Correlation with US



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

Figure 2. (continued)

Panel B. Correlation of industrial growth for country-pairs



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