FINANCIAL CONTRACTIBILITY AND ASSETS' HARDNESS:

INDUSTRIAL COMPOSITION AND GROWTH*

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One salient characteristic of poorly developed capital markets is the excessive weight they give to the availability of hard assets in the allocation of financial funds. Where external finance contractibility is poor, higher proportions of assets that more easily remain with investors if the relationship breaks down are used in order to sustain external finance. Consistent with this view, I show that industries whose assets are relatively less tangible perform worse in terms of growth and contribution to GDP in countries with poorly developed financial systems. The impact is larger the more dependent an industry is on external finance. The effect is important (comparable to more traditional determinants of specialization and growth), and robust. Firm-level evidence also confirms finance as the link: leverage is less sensitive to tangibility in better-working capital markets.

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I. INTRODUCTION

One key insight of the incomplete contracts view is that the existence of physical, nonhuman assets is critical in holding a relationship together (Williamson [1985, 1998], Hart [1995]). These influence the parties' relative position in renegotiation through the threat of parting when contracts are incomplete. The same can be thought of the entrepreneur-financier relationship (Hart and Moore [1994]) and be extended to distinguish assets in general in terms of their ability to sustain external financing. One can think of hard assets as those that would more easily shift to the investor's control when this is set to happen or the relationship breaks down, and soft assets as those that do not do this so easily. Real estate, machinery, and the plant –tangible assets- are almost certainly harder than other more intangibles assets the firm may have (such as goodwill, R&D, the human capital associated, organizational capital, and even accounts receivables, cash, inventory or related investments). The higher the proportion of hard assets the entrepreneur brings to the relationship, the higher the effective protection the outside investor has, and the more likely the relationship will be stable and become feasible in the first place.

This paper shows that one important characteristic of poorly developed capital markets is the excessive weight they give to the availability of hard assets in the allocation of financial funds. In the context of agency and limited contractibility that characterizes the financier-entrepreneur relationship the kind of assets a firm has is key in ensuring that the financier is protected and is, therefore, willing to provide funds in the first place. Where external finance contractibility is poor and outside financiers are weakly protected vis-à-vis the insiders –be because investors rights are unprotected, the monitoring or screening technologies are less productive, or more generally because property rights are poorly defined or enforced, all these typical characteristics of underdeveloped financial systems-, external finance demands a higher proportion of tangible assets. Harder, tangible assets provide the security the environment does not. The degree of external finance contractibility and the availability of hard assets are substitutes in the sustainability of external financing. Of course, the substitution does not come for free, especially given that not all activities or technologies are equally endowed in hard assets. Allocation inefficiencies are likely to arise. In particular, where contractibility is poor, investment could be biased towards industries naturally more endowed in hard assets.

The approach proposed consists in showing that industries that involve naturally little tangible assets show worse economic outcomes –in terms of relative size and growth rates- where financial development is poor. This relative to industries more generously endowed in those kinds of assets, or relative to what they would have achieved in a more developed financial context. The median tangibility of assets -that is net property, plant and equipment over total assets- for each industry from data for publicly listed, U.S.-based companies measures the relative availability of hard assets. Bank credit to the private sector measures external finance contractibility or financial development. Variation on these two indicators provides identification for the empirical test based on a generalization of the difference-in-differences methodology. A panel containing data for 28 manufacturing industrial segments in several countries is used. The results are as expected. The effects are large, comparable with more traditional explanations of industrial composition and growth. After controlling for other potential determinants, the share of total manufacturing value added that comes from sectors with lower than median tangibility would be around one third higher if a country's financial system were in the highest quartile of development instead of in the lowest quartile. Relative to tangible sectors (in the fourth quartile), intangible industries (first quartile) grow around 1.1% faster under a developed financial system (fourth quartile) than in a less developed one (first quartile). Both for industrial composition and growth the magnitude and significance of the estimated effect appears to be larger for industries more dependent on external finance, linking the effects described above directly to the differential access to external finance. Moreover, using firm-level data, one finds that the traditional positive effect of tangibility on leverage is larger the lower the level of financial development the firm faces. The results are robust to different measures of the key concepts, to a number of omitted variables explanations, and to reverse causality.

The case that financial development matters for growth has been much strengthened in recent years. Direct evidence on mechanisms through which finance matters, however, is still weak. This paper aims at providing one such channel, while extending the evidence on the effects of the degree of capital markets development on aggregate economic outcomes to industrial composition. It also advances in characterizing what poor financial development means. Importantly, the empirical approach underscores a source of exogenous variation for financing constraints –the tangibility of assets- that should prove useful for future empirical work in financial economics. More broadly, the paper provides micro evidence of the

large effect institutions –in particular, the ability to write enforceable contracts and the protection of rights- have on economic outcomes. It does this by demonstrating how the use of a –theoretically and empirically sound- substitute to good institutions in the financial area appears to be more widespread where these institutions are thought to be worse.

The paper relates closely to a number of literatures. The introduction focuses on the issues concerning the real effects of financial development and corporate governance reform, while the conclusion integrates the paper in a broader context. The literature relating to the links between a country's degree of financial development and its per capita income level and rate of growth is large and long dating. The debate has also been heated; not only on the reason why finance would matter (Bagehot [1873] and Hicks [1969]'s capital accumulation versus Schumpeter [1912]'s allocation views), but also on whether it matters significantly or not (Robinson [1952] and Lucas [1988] on the negative side versus Bagehot and Schumpeter on the positive one). The existence of a correlation was long ago documented (Cameron et. al. [1967], Goldsmith [1969], and McKinnon [1973]), however correlation does not imply causality. Most recently King and Levine [1993] showed that financial development and growth are not just contemporaneously correlated, but the first anticipates the second in a cross-section of countries. The size of the effect was shown to be large: a one standard deviation higher level of financial development –as proxy primarily by measures related to the size of the banking sector and the stock market relative to the economy- implies around one percentage point higher growth rates over long periods of time. Advances have been made on addressing the potential endogeneity of the size of the financial system to future growth prospects (Levine and Zervos [1998], and Beck, Levine and Loayza [2000]). The use of legal origins and financier's rights as instruments has been critical. The latest research has focused on identifying more direct channels or mechanisms through which finance affects growth. This has been pursued in the cross-country growth regressions setting (Beck et al. [2000]), using micro data (Rajan and Zingales [1998], Wurgler [2000], and Love [2000]), and through the natural-experiment approach (Jayaratne and Strahan [1996]).

Rajan and Zingales [1998], in particular, present evidence showing that sectors that are relatively more in need of external finance grow disproportionably faster in countries with more developed financial markets. This paper is particularly useful since it escapes the usual critiques to the cross-country

regressions approach (Mankiw [1995]) and provides evidence of a detailed mechanism through which finance matters for aggregate outcomes.

Together these and other papers have made a strong case for financial development exerting a causal and large effect on growth. The issue is far from settled, though. It is problematic to rely so much on legal origins as instruments for financial development –as in the case of cross-country growth regressions studies- when we are not really sure why they appear to be correlated with the degree of capital markets sophistication and investors' rights protection. Unfortunately, evidence coming from natural policy experiments is always subject to criticism in terms of the endogeneity of adoption, and the extent to which one can extrapolate the results. In terms of micro studies, the fact that most recent empirical research on the effects of financial development hinges on the external finance dependence variable constructed by Rajan and Zingales [1998] proves the importance of their methodological contribution. Indeed, we also follow their lead in this paper. However, in terms of proving the role of finance, this constitutes its main weakness. A different approach –one that does not rely exclusively on this variable- is needed to solidify previous results. Ideally, the approach would also be consistent with that measure to validate it. This paper provides such independent approach.

A parallel, influential strand in the literature provides evidence linking the legal environment to corporate behavior, and to the degree of development of financial markets. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (henceforth LLSV) [1998] show that legal protection of outside investors varies widely across countries and that this is related to the origins of the legal system. In particular, countries with French legal origin seem to provide the worst protection, while those with common-law the best. Furthermore, better protection has been found to be associated with larger and broader capital markets (LLSV [1997]), higher corporate valuations (LLSV [1999]), higher dividend payouts and sensitivity to investment opportunities (LLSV [2000b]), more extensive use of external finance for growing firms (Demirguc-Kunt and Maksimovic [1998]), and even lower exposure of valuation to financial crisis (Johnson et. al. [1999]).

This literature has highlighted the critical role that limiting the agency problem plays in determining the access to external finance (Jensen and Meckling [1976]). In this context the incomplete contracts framework becomes especially relevant (Williamson [1985, 1988], Grossman and Hart [1986],

Hart and Moore [1990], Hart [1995]). The view of securities shifts from them being merely collections of cash flows (Modigliani and Miller [1958]) to being basically characterized by the rights they allocate to their holders. These rights in the end pertain to the possibility of effectively shifting control over the assets. It is this prospect what ultimately provides a reason for insiders or debtors to honor investors' claims. The environment in which the entrepreneur-financier relationship takes place importantly influences the actual extent of these rights. The work by LLSV focuses on how well the rights of outside investors are *legally* protected –by the rules themselves and their enforcement-. They argue that when the legal system does not protect outside investors, corporate governance and external finance do not work well. Legal protection can be thought of making the expropriation technology less efficient (LLSV [2000]). Although the law appears to be critical, it is not the only way in which outside investors can protect themselves or the only variable that affects the efficiency of the expropriation technology. Also, just limiting the supply of external finance is not the only possible way-out when the legal environment does not provide enough protection or importantly limits contractibility. This paper shows another possibility.

In the next section the idea that motivates the empirical work is discussed and a stylized model developed. The measurement of the key concepts is pondered. Section III explains the empirical approach and describes the data. Section IV contains the basic results in terms of industrial specialization and growth. This is followed by more direct, firm-level evidence linking the results to the firm's differential access to external finance. Section VI concludes.

II. MOTIVATION AND MEASUREMENT

Consider an entrepreneur that has initial wealth or internal funds A and is considering undertaking a project requiring a fixed investment I that yields the same income $R \geq I$ in every state of the world. The entrepreneur has only one project that cannot be traded. When $I \geq A$ the entrepreneur must raise external funds in the amount I-A to implement the positive net present value project. For notational simplicity we assume that there is no time discounting. Both potential investors and the borrower are risk-neutral, and the latter is protected by limited liability. Investors behave competitively so that they earn zero profit in expectation. Investment consists of transforming the funds into assets with character $0 \leq t \leq 1$. This is verifiable[1]. t is given by the technology of the project and any substitution causes income to become zero.

This parameter will relate to the outcome for the investor in the case the relationship breaks down. Taking the perspective of the investor I call t the assets' hardness, and later identify it with tangibility.

Think of two periods. At t_0 the external finance contract is signed and the investment is made. The contract specifies that, in return for the funds, the entrepreneur will carry out the project and make a payment *P* to the investor. Since the entrepreneur gets the whole expected net present value of the project, he is always (weakly) better off maximizing the chance that the project goes ahead. Given his initial wealth this implies the maximization of his external finance capacity. This is achieved by pledging all the income to the investor, that is *P*=*R*. At t_1 the project is completed, income accrues, assets wear-off, and payments are made. There is uncertainty about the enforceability of the contract, which is resolved after the investment is made but before the project is completed (say at $t_{1/2}$). With probability $0 \leq k \leq 1$ all conditions are enforceable: the entrepreneur completes the project and makes the agreed payment. However, with probability (1-*k*) the commitment of the entrepreneur to the project cannot be enforced. I call *k* the degree of financial contractibility or investors' protection, and later identify it with the level of development of financial markets. The project yields nothing if not completed. The financier can complete it by herself (without the entrepreneur) but to do so she needs to reinvest in restoring the assets that are lost when the entrepreneur leaves. These soft assets add-up to a share (1- t) of the original investment. This would leave the investor with *R*-(1- t)*I* upon completion. Without loss of generality, suppose also that the entrepreneur has all the (ex-post) bargaining power, so that this is exactly the outcome for the investor in a renegotiation. One can think of soft assets as being specific to the entrepreneur and inalienable such as human capital, or just with a value contingent on the entrepreneur staying such as organizational capital, cumulated learning by doing, outstanding contracts, or clients. One need not necessarily assume that the entrepreneur misappropriates, or even keeps them at all. Hard assets are simply those that more easily remain with investors when the relationship breaks down.

Zero expected profit for the investors implies that the entrepreneur's external finance capacity is given by:

$$D = R - (1-k)(1-t)I \qquad (1)$$

The interesting case is when the project's income alone is not enough to ensure complete external funding. It is easy to see that *ceteris paribus* borrowing capacity is increasing in both the degree of contractibility or

protection and the assets' hardness. By reducing the agency costs associated with the external finance relationship, both raise the amount financiers are willing to provide. Notice also that the dependence of borrowing capacity on the quality of the assets is greater the lower contractibility is. Contractibility is all the more important for projects involving softer assets because it is in those that financiers fare particularly poorly in the event that assets become critical in determining their payoff:

$$\frac{d^2D/I}{d\tau dk} < 0 \qquad (2)$$

Now consider a measure 1/I continuum of entrepreneurs with the same class of projects indexed by the hardness of the assets they involve (τ). Their initial wealth is uniformingly distributed with support [$\underline{A}$, I+$\underline{A}$]. Total investment (I^T) in this kind of projects or sector is, then, given by:

$$I^T = \min\{1-\underline{p}+r-(1-k)(1-\tau);1\} \qquad (3)$$

where $\underline{p}$ =1-$\underline{A}$/I measures the share of investment needs that cannot be financed with internal funds (i.e. external finance dependence), and r=R/I the project's profitability. Since the net present value is positive, the first best here amounts to getting each entrepreneur to carry out his project, that is I^T =1. Notice that when there is full contractibility (k=1), or assets are perfectly protective of investors (τ =1), the first best is achieved regardless of the amount of internal funds available and the profitability of the project. In general, however, under-investment will result. In what follows I focus on the intermediate case where 0<$\underline{A}$<I-D, meaning that some but not all entrepreneurs in the sector are credit constrained. The fact that the agency issue cannot be solved completely –either contractually or through the use of hard assets- means that the amount of assets allocated to each sector will depend on the availability of internal funds. If one assumes these to be scarce relative to the investment needs, then too little amounts of resources will be allocated to the productive sector and too much will go unused. Now observe that whenever contractibility is incomplete, the assets' differential hardness introduces an additional distortion. For any given level of dependence on external finance, relatively more funds are channeled to sectors that involve harder assets, despite the fact that we have assumed the projects to be otherwise identical.

It is clear from (3) that investment is increasing in the degree of contractibility and asset hardness, and decreasing in external finance dependence: $d\ln I^T/dk > 0$, $d\ln I^T/d\tau > 0$, and $d\ln I^T/d\underline{p} < 0$. The first

two limit the agency costs associated with the external finance relationship, while the availability of internal funds substitutes for external funding altogether. Moreover,

$$\frac{d^2 \ln I^T}{d\underline{p}dk} > 0 \tag{4}$$

$$\frac{d^2 \ln I^T}{dtdk} < 0 \tag{5}$$

$$\frac{d^3 \ln I^T}{d\underline{p}dkdt} < 0 \tag{6}$$

That is, the poorer the contractibility the more harmful becomes being more dependent on external finance (4), and relying on softer assets (5). The reason being simply that –by increasing the external finance capacity- higher contractibility gradually allows projects to be financed and carried out despite being more dependent on external funding and involving softer assets. Then, reducing the agency costs of external finance further by having harder assets or relying more on internal funding, has an impact over a smaller share of the projects or entrepreneurs when contractibility is relatively high. In addition to this diminishing returns effect, when contractibility is high the odds that the assets' quality will come into play in determining the payment to outside investors are small, and therefore an increase in their hardness yields modest improvements in the access to external finance. This is the manifestation of the fact that, for a given level of external funds raised, the protection to the financier can be achieved through either improved contractibility or the use of assets that more easily remain with investors if the relationship breaks down. That is, the hardness of the underlying assets and the level of financial contractibility are substitutes in sustaining external finance relationships. Finally, while relying on harder assets is more useful where contractibility is poor, this is especially so the lower the share of investment needs that can be financed with internal funds is (6), again a diminishing return feature.

More generally, with few or no modifications, equation (1) can be shown to accommodate a number of financial frictions that link borrowing capacity to the quality of assets in the way implied by the expression in (2). One can think of the agency issue in the provision of external finance to be primarily related to the possibility that the borrower may choose an action that is not optimal from the point of view of the project (such as exerting low effort, increasing its risk or favoring private benefits). In this hidden action or moral hazard context, *k* would refer to the ability of observing and/or making verifiable either the

action itself or the signals they imply and upon which the contract could be made contingent. This ability depends on, among others, the courts of law's willingness or capacity to enforce (complex) contracts, and the costs of acquiring relevant information. In a more general setting, in which investors instead of being passive can invest in improving their control over borrowers' actions, *k* may be seen as an index of the degree of monitoring carried out. If the critical issue were one of asymmetric information about the quality of projects, or the excellence or probity of entrepreneurs, then *k* would be the ex-post probability of the desired feature, and could be related to the financial system's ability to screen-out these differences. Here the quality of information, and the existence of historical records on borrowers' behavior –for instance- would take center stage.

The general ability of the environment in supporting external finance relationships or the level of financial contractibility is measured as each country's degree of financial development, computed as the relative size of the financial sector in the economy. Direct measures are hard to find. Moreover, using this measure of financial development has advantages over employing more specific variables previously shown to be correlated with it or to be related to the ability to raise external finance. In particular, it is objective, inclusive, and outcome-based. It does not reflect opinions nor is biased because of researchers' beliefs on what particular agency issue matters most. It is also dynamic: although it may not reflect exactly what we would like at any point in time, long-term variations are not meaningless. Measures of financial development are also available for a larger number of countries, and since they are cardinal -and not just ordinal- there is more ample cross-country variation useful for identification purposes, and the interpretation of the results is natural. Finally, recalling that one needs an index of the environment's capacity of supporting external finance relationships, a measure of the relative *size* of the financial system that operates under this environment is precisely what one *should* use. Other more direct but limited measures of contractibility and protection are also used to show that the results are indeed related to the concepts explained above.

Unlike contractibility, which relates to the environment where the relationship takes place, t is a project (or sector)-specific characteristic. It could be termed the ability of assets to serve the role of securing access to external finance under an incomplete contractual setting. More generally, it indexes the (inverse of the) degree of exposure of a given sector to the agency issue. The level of tangibility -that is net

property, plant and equipment over total assets- seems to be a reasonable proxy for this. Tangibility has been consistently shown to be positively associated to firms' leverage using U.S. data and has become a standard variable in the finance literature[2]. As documented by Rajan and Zingales [1995], this is mostly the case in other wealthy countries as well. Moreover, when particular assets explicitly back external finance contracts (i.e. they are explicitly pledged or collateralized), they usually coincide with tangible ones. And within those assets explicitly collateralized, tangibles also typically command better terms for the debtor[3].

On theoretical grounds, tangible assets also share many of the characteristics associated with improved outcomes for investors when contracts turn out to be unenforceable or ask for the distribution of the assets. This is especially so when referring to long term external financing. Unlike other assets, such as accounts receivables and inventories, which are continuously converted into other –potentially softer- assets during the normal course of operations, tangibles better allow to curb the transformation risk without excessively limiting the entrepreneur's flexibility or incurring high monitoring costs (Myers and Rajan [1998]). Land, structures and most equipment are typically less specific to the firm or the industry, and therefore can command higher salvage or liquidation values (Williamson [1988], Shleifer and Vishny [1992]). Tangibles also depreciate more slowly, allowing investors to keep the ability to extract repayment and facilitate funds at a longer term (Hart and Moore [1994]). If one takes the expropriation view of the agency problem to the limit, then tangible assets are also typically more difficult to physically move and conceal. Their being missing is easier to determine and verify ex-post, and their recovery more plausible given their higher durability and that the recording of their transfer in public records is more commonly required. Given our empirical approach, we do not need to pin-down exactly the capacity of a firm's assets to sustain external financing but only to devise a measure positively correlated with it to generate an index. If one thinks that an important share of a firm's value is related to the human capital associated with it, its organizational structure, cumulated learning by doing, and so on, it is difficult to argue that these assets would remain more easily in the investor's side than tangibles would.

The recent literature on corporate governance reform has put great emphasis on the role legal rules (and their enforcement) play in determining the ability of firms to raise external finance (LLSV [2000], for instance). Legal protection of investors or creditors may mean the legal recognition and enforcement of external finance contracts (i.e. the ability to reduce agency costs either directly through legally sanctioned

and enforced pecuniary and non-pecuniary punishment for breach, or indirectly by improving the verifiability of the signals or actions the contracts are contingent on). But it has also been referred to the narrower issue of how the law (both the rules and their enforcement) strikes the balance between the rights of investors vis-à-vis insiders over the underlying assets whence the contract is breached or calls for the distribution of the assets. The first concept is precisely what is meant by contractibility in this paper. However, the second interpretation can be quite different in terms of predictions and policy implications under some circumstances.

Above it was implicitly assumed that if the entrepreneur leaves the project, the underlying assets (at least part of them) accrue in principle to the investor, and then their quality determines how they fare. Under the first concept of legal protection, access to external finance improves as protection increases because assets become less important. It is for this reason that the assets' character matters less. However, under the second interpretation assets would become more important as contractibility improves, while the relevance of their hardness would depend on the bias protection has. Under this view contractibility is extremely limited, so that borrowers only repay because financiers can make the threat of seizing the assets. These will, then, matter more for getting access to external finance when the threat is more credible, that is when investors' protection is higher. Access to external funds improves because assets are more important. If higher protection is associated with increased protection of hard assets vis-à-vis soft ones (hard-assets biased), then one would expect relying on hard assets to be more important where protection is higher, and not where is lower as in our setting. It is more natural to think that hard assets are similarly well protected everywhere, and that differences in investors' protection arise primarily with respect to softer ones, which would be true if the costs of providing assets protection were increasing in their softness. But if this is the case, the distinction between the two concepts of protection becomes conceptually more subtle, and its relevance in terms of policy, unclear[4]. One could also take the implementation in this paper as a test of these two views. The results favor the first –financial contractibility- interpretation.

III. METHODOLOGY AND DATA ISSUES

The methodology proposed consists in exploiting simultaneously cross-industry variation on assets' hardness and external finance dependence, and cross-country variation in contractibility. The key industry characteristic is the level of tangibility as a proxy for each industry's natural availability of assets

that serve well at protecting outside investors in an incomplete contracting setting. The basic country characteristic is the level of financial development as a proxy for the degree of external finance contractibility in each country. In the context of a generalized difference-in-differences approach, exogenous industry-country variation on these two indicators provides identification to assess the differential impact of contractibility or financial development on industries highly and poorly endowed in hard assets. The outcome (i.e. dependent variable) is measured as the share of an industry's value added in the country's gross domestic product, and as the real growth rate in an industry's value added over time. These variables are constructed essentially using data from UNIDO's Indstat-3 [2001] database, which provides a panel with data for as much as 28 manufacturing industries in each of several countries.

Each industry's tangibility level is calculated as the median tangibility of all U.S.-based active companies in the industry contained in Compustat's Annual Industrial files in the 1986-1995 period. Tangibility is defined as net property, plant and equipment divided by book value of assets. Since the definition of industry segments is different in Compustat and Indstat, the former classification is matched to the latter's ISIC-3 28 segments. If there is any endogenous response of a firm's tangibility level to financial development, this is likely to be minor in respect to these relatively large, public firms facing one of the most advanced and sophisticated capital markets. The tangibility index is based on the U.S. instead of constructing one for each country also because of data availability. Conveniently this shields against endogeneity issues at a country level. Using data for a period of 10 years smooths the measure. The important proportion that the U.S. represents in the world's total manufacturing activity also makes the index relevant –i.e. it is the manner in which a large proportion of manufactures is actually produced-. In this way one hopes to have identified the technical component –common to the industry in every country- of an industry's tangibility.

The measure is presented in Table I. Highly tangible industries include petroleum refineries, paper and products, iron and steel, and industrial chemicals. The industries with the lowest level of tangibility are pottery, china and earthenware, leather products, footwear except rubber or plastic, and wearing apparel. An industry's tangibility is very stable over time (the correlation between the measure for 1986-1995 and the one for 1976-1985 and 1966-1975 is above 0.85), and across countries (based on the limited data we have, the correlation with the measure for Japan, Germany and the U.K. is around 0.74, while the

correlation with a group of other countries in the sample is 0.71). It is also not importantly correlated with other variables that might be relevant in explaining access to external finance (such as external finance dependence, Tobin's Q, and profitability). Moreover, the aggregation in industries seems granted given the very high correlation of tangibility across firms within the same industrial segment. All these argue in favor of the assumption that tangibility has a large technological component, and therefore the constructed variable is a good instrument for ranking the industries' relative availability of tangible assets in *every* country. Tangibility is also measured in terms of the market value of assets and in terms of sales to check the robustness of the results. Since the U.S. is used as the benchmark, the analysis and the inferences drawn are made excluding the United States from the sample.

Inspection of average balance sheets reveals that for industries with tangibility above the median, the share of tangible to total book assets is around 50%, while this is just one third for low tangibility industries. The bulk of the difference in tangibility is accounted by intangibles and current assets, in approximately the same proportion[5].

Various measures of financial development have been used in the literature before. Credit to the Private Sector by Deposit Money Banks (a.k.a. Private Credit) to GDP will serve as the basic measure here for various reasons that make it more appropriate in the particular setting. First, by being an asset-side balance sheet figure it focuses on the use of funds instead of the total availability of them. Second, it excludes the quantity of money in circulation and the credit issued by the Central Bank, both difficult to interpret as measuring financial development or contractibility in a monotonic way. Third, it isolates credit issued to the private sector from that to the government and public enterprises, which may have additional implicit guarantees. Among others, it has the drawback of being circumscribed to the banking sector alone. This may be inappropriate given the important degree of substitutability of the services provided and functions performed by other non-bank financial institutions respect to those of banks. However, the high correlation between stock market and bank-based measures of financial development assures that this is not a major problem in practice. Moreover, since the data used are not limited to publicly listed companies but –in principle- include all companies in the manufacturing sector, banks are probably orders of magnitude more relevant than the stock market as a source of external finance. Private credit over GDP has been used extensively before. Along the way additional variables to proxy for external finance contractibility or

overall financiers' protection will be introduced. All these are taken from Beck, Demirguc-Kunt, and Levine [1999].

Following Rajan and Zingales [1998] in assuming that there is a technological component to an industry's external finance dependence ($\underline{p}$) that allows generating a ranking that will be maintained across countries, their variable is used. The indicator aggregates of the ratio of capital expenditures minus cash flow from operations to capital expenditures of firms for each industry[6]. Again, the data used to generate the ranking come from U.S., publicly listed companies. Under the assumption that these firms face relatively minor constraints to accessing external finance, their investment and the amount of external finance they raise equal the desired quantities.

Do industries that are poorly endowed in tangible assets represent a disproportionately lower share of GDP relative to more tangible industries in countries where the financial system is less developed? Is the same true for industries more dependent on external finance? In order test this the industry's value added share in the country's GDP is regressed on the interaction between industry tangibility and country financial development, the interaction of external finance dependence and financial development, and other control variables. The specification is as follows:

$$Shareva_{i,j} = a_0 + a_1 \cdot FinDev_i \cdot Tang_j + a_2 \cdot FinDev_i \cdot ExtFinDep_j + \sum_k a_k \cdot X_{k,i} \cdot Y_{k,j} + \sum_l a_l \cdot X_{l,i} + \sum_m a_m \cdot Y_{m,j} + e_{i,j} \quad (7)$$

where $_i$ denotes countries and $_j$ stands for industries. *Shareva* is the mean share of the industry's value added in the country's total manufacturing value added in the 1986-1995 period (computed from the Indstat database) multiplied by the mean share of manufacturing in GDP during those years (taken from World Development Indicators [2001]). *FinDev* is the level of financial development of the country where the industry is located; *Tang* is the degree of tangibility of the industry, and *ExtFinDep* its dependence on external finance. *X* represents country-specific variables, while *Y* stands for industry-specific ones. By including both country and industry fixed effects one focus on the within country, between industries (or within industries, between countries) variation of the data. The error term ε is allowed to be heteroskedastic, and robust standard errors are reported. All control variables are averages over available data for the years 1986 through 1995. The framework in section 2 implies that the estimated coefficient for

the interaction between tangibility and financial development (α_1) is negative (see (5)), and that of the external finance dependence-financial development one (α_2) is positive (see (4)). This means that *ceteris paribus* higher levels of financial development are associated with higher shares of low tangibility industries relative to high tangibility ones, as well as higher shares of those more dependent on external finance relative to the less so.

In explaining industrial composition one cares about controlling for industry, country, and industry-country characteristics that may affect the patterns of specialization. Differences across countries, which are common across industries, and industry differences common across countries are taken care of when using country and industry fixed effects. However, countries vary in terms of the relative availability of different resources, and industries vary in terms of the intensity with which each is used. The interaction of these can potentially determine industrial composition. Data availability allows the definition of four different resources: physical capital, human capital, natural resources, and raw labor. I normalize by labor force -or population, depending on the original definition of the variable-, and focus the attention on the first three factors. The sign of the coefficient for the interaction between a factor's abundance in a country and the intensity with which it is used by an industry should be positive. If so, a given industry would be relatively larger in countries that are relatively more abundant in the factor that is used more intensively in that industry.

Each country's resources availability is measured as the logarithm of physical capital per worker, the logarithm of the average number of years of formal education in the population, and the logarithm of natural resources per capita. The first is based on aggregate investment series and comes from the Global Development Network Growth Database, compiled and updated from the original sources by Easterly and Sewadeh. The education variable comes from Barro and Lee [2000] and corresponds to the average figure for 1985, 1990, and 1995. The indicator for natural resources is taken from World Bank's Expanding the Measure of Wealth publication, and includes minerals and fossil fuels, timber, non-timber forest benefits, cropland, and pastureland, net of what is labeled as protected areas. Each industry's factor utilization intensity is measured with investment intensity, a wage-based index of human capital intensity, and a dummy variable for natural resources intensity. Investment intensity corresponds to the median of the gross fixed capital formation to value added ratio in the U.S. for the 1986-1995 period in each industry. The

index for human capital intensity is the median from 1986 to 1995 of the industry's mean wage over that of the whole manufacturing sector in the U.S. Both are computed from UNIDO's dataset. Natural Resources Intensity is a dummy variable that takes a value of 1 for the following industries (and 0 otherwise): Wood products, except furniture; Paper and products; Petroleum refineries; Misc. petroleum and coal products; other non-metallic mineral products; Iron and steel; and Non-ferrous metals.

If firms are affected primarily by the degree of financial contractibility of the country where they are located -as implicitly shown by the related literature cited above- and this cannot be rapidly changed, then this can give rise to comparative advantages. Just as countries may specialize in the sectors that use more intensively relatively abundant factors, they might do so in the sectors that are more naturally endowed in the kind of assets that serve better for allowing external finance relationships when the environment does not provide enough security.

In terms of growth, the test involves showing that industries that are poorly endowed in tangible assets grow disproportionately slower relative to more tangible industries in countries where the financial system is less developed. Also, that the same is true for industries more dependent on external finance. Industry growth is explained with the interaction between industry tangibility and financial development, the interaction of external finance dependence and financial development, and other control variables. The specification is as follows:

$$Growth_{i,j} = b_0 + b_1 \cdot FinDev_i \cdot Tang_j + b_2 \cdot FinDev_i \cdot ExtFinDep_j + b_3 Shareva(0)_{i,j} + \sum_l b_l \cdot X_{l,i} + \sum_m b_m \cdot Y_{m,j} + e_{i,j} \quad (8)$$

Growth corresponds to the real growth rate in value added between 1985 and 1995. It is constructed deflating Indstat's change in local currency value added figures by each country's producer prices index from IMF's International Financial Statistics [2001]. The value for all country variables corresponds to that of 1985 (i.e. the initial year). *Shareva(0)* is the initial share of the industry in the total manufacturing value added of the country where it is located. Again, both industry and country fixed effects are included, and the error term ε is allowed to be heteroskedastic. The estimated coefficient for the interaction between tangibility and financial development (β_1) is expected to be negative (see (5)), and that of the external finance dependence-financial development (β_2) to be positive (see (4)). A negative coefficient for the initial share in total value added (β_3) implies conditional convergence.

For the estimation of (7) there are 1743 observations corresponding to 69 countries. The panel is unbalanced due to the fact that not every industry has data in each country. Data for all the 28 industries are available in 41 countries, and for 25 or more industries in 56. No industry has data from less than 53 countries. For (8) 919 observations corresponding to 37 countries are available. Data for all the 28 industries are available in 16 countries, and for 25 or more industries in 28. 25 industries have data from more than 30 countries[7].

IV. RESULTS

A first look at the data suggests that tangibility when associated with financial development may go far in explaining industrial specialization and growth. Table II shows the differential performance of high and low (above and below the median) tangibility industries in countries with high and low (above and below the median) financial development. This is based on the residual contribution to GDP and the residual real growth rate after accounting for country and industry fixed effects, and in the case of growth also the initial share in total manufacturing value added. For clarity of exposition, the size of industries is expressed relative to the sample average industry contribution to GDP (0.71%), while the average industry growth (4.7%) is added to the residual growth rates. Highly tangible industries are relatively larger and grow relatively faster than less tangible ones in countries with low financial development. In countries with larger capital markets, the picture is exactly the opposite: low tangibility industries are larger and grow faster than more tangible ones. The difference-in-differences shown are both statistically significant at a level of 10%[8].

Figures I and II anticipate the economic significance of the effect on the aggregate composition of production. In Figure I industries are sorted by the tangibility index and plotted against the cumulative share in total manufacturing value added for three representative countries: the United Kingdom (one of the countries with the highest figure for Bank Credit to the Private Sector, 98.1%), Thailand (one of the most financially-developed emerging economies, 60.8%), and Peru (among the least financially-developed countries, 5.8%). While lower-than-median-tangibility industries represent altogether 54% of the total manufacturing value added in the United Kingdom, they do 41% in Thailand, and only 33% in Peru. Figure II plots the aggregate level of tangibility of the manufacturing sector (constructed as the weighted average using the shares in the total manufacturing sector's value added as weights) against the level of financial

development for all the countries for which there are data in all the 28 industries. There is a strong and significantly negative relationship[9]. Countries not very dissimilar in terms of endowments and degree of development (such as Argentina and Turkey compared to Portugal and Malaysia), present large differences in the tangibility of their manufacturing sector correlated with their degree of financial development in the way predicted.

A. Basic Results

The regression setting allows to generalize the results of the simple difference in differences exercise of Table II by controlling for country and industry differences, and also for other effects that potentially explain the within variation of the data. Furthermore, it does not rely on defining groups based on the variables of interest but makes use of their whole variation, obtaining estimates for marginal changes. The key prediction is tested by looking at the sign of the coefficient of the interaction term between tangibility and financial development. This sign has the same interpretation as that of the simple difference in differences figure. It answers the question: *ceteris paribus,* what is the effect of a change in financial development on the size and growth rate of tangible industries relative to intangible ones?, or what is the effect of a change in tangibility on the size and growth rate of an industry under high financial development relative to the same under a less financially-developed setting? If the sign of the coefficient for the interaction is negative, then an increase (reduction) in the level of financial development is associated with a reduction (increase) in the size and growth rate of tangible relative to intangible industries. In other words, an increase (reduction) in tangibility reduces (increases) the size and growth rate of an industry located in a highly financially developed country in comparison to the same industry in a less financially developed one.

Table III presents the basic results of the paper on the composition of the manufacturing sector or specialization (Panel A), and industrial growth (Panel B). Begin with the results in the first column, panel A for industrial composition. The coefficient of the interaction between external finance dependence and financial development is significantly positive. This is in line with what was expected from (4), and with the results Rajan and Zingales [1998] obtained for growth[10]. It suggests that industries that are more dependent on external finance represent a disproportionately lower share of GDP relative to less dependent industries in countries where the financial system is less developed. The coefficient of the interaction

between tangibility and financial development is significantly negative. Consistent with the main hypothesis (see 5), this means that industries that are poorly endowed in tangible assets represent a disproportionately lower share of GDP relative to more tangible industries in countries where the financial system is less developed. Both estimates are highly significant (with p-values well below 1%). The coefficients of the variables included to control for the effect of resources intensity of use and availability also have the expected (positive) sign: industries that use intensively the resources that are abundant in the economy are relatively larger than those that do not.

In terms of the growth regressions (first column, Panel B), the results also accord with the hypothesis. As expected from (4) and (5) the coefficient of external finance dependence financial development interaction is significantly positive, while the one of the tangibility financial development one is significantly negative. Again, the estimates are highly significant. The magnitude of the effect associated with external finance dependence is not significantly different to the one reported by Rajan and Zingales [1998].

Therefore, the hypothesis on the signs of the coefficients associated with industry tangibility and financial development -that constitutes the basic test- is not rejected by the data. Turn now to the relevance and plausibility of the effects identified, based on the characteristics of each sample. Define high (low) financial development as that of a country located in the first (fourth) quartile of private credit to GDP. Similarly, high and low tangibility are defined as the level of an industry located in the first and fourth quartile of tangibility, respectively. The results imply that, relative to a highly tangible industry, a less tangible one accounts for a share of GDP 0.17 percentage points larger when located in a country with high financial development instead of a low one. This differential effect amounts to around one fourth the average industry size in the sample. The cumulative effect is considerable; lower than median tangibility industries together would represent a share of manufacturing value added 34% higher (corresponding, on average, to around 7 percentage points of GDP) if located in a highly developed financial system instead of in a poorly developed one. Similarly, relative to a high tangibility industry, a low tangibility one grows 1.1 percentage points faster per annum if located in a high versus a low financial development context. This differential effect is about one fourth the average industry growth rate in the sample.

The absolute size of the effect identified is, thus, economically relevant. How does it compare to the effect of more traditional variables associated with either industrial composition? It corresponds to around twice the differential effect the availability of physical capital has on relatively high physical-capital-intensive industries versus low physical-capital-intensive ones.

B. Further Results and Robustness

Taking the regressions in column one as the benchmark, the result is checked for robustness to the measure of financial development. These not only include relative size variables such as the stock market total capitalization or liquid liabilities over GDP, but also the ratio of value traded in the stock market to GDP, thought to be more particularly related to the depth or efficiency with which a financial system operates. Also, variables not related just to the banking system are used. The following three columns in Table III replicate the benchmark regressions for industrial composition and growth. The results accord with what was expected: the choice of financial development indicator does not change the qualitative results. In fact, the coefficient of the financial development-tangibility interaction is always of the expected sign, and remains significant. The implied sizes of the effect are not statistically different than those of the benchmark regressions except when both stock market variables are used in the composition regression and when the stock market value traded variable is used for growth[11]. In these cases the effect is smaller[12].

The last two columns in Table III check for the robustness of our measure of tangibility, now expressing the book value of net property, plant and equipment first over the market value of assets, and then over total sales[13]. We use the market value of assets –computed as book value of assets minus book value of equity plus market value of equity- to take into account all the low tangibility assets that are imperfectly or just not included in accounting books, such as the ability to seize growth opportunities, the value of relationships, strategic position, etc. It is implicitly assumed that tangible assets are more easily reproducible and therefore do not convey a larger value premium in the market. Sales is used as a different measure of the value involved in the relationship in each industry, less subject to accounting differences and market miss-valuation issues. The correlation between these new variables and the one based on book value of assets is above 0.9 in both cases. This constitutes additional evidence in favor of the concept being a meaningful way to sort industries by. The regression coefficients are again highly significant and negative

as expected. The implied effects are not statistically different than that of our benchmark regression at conventional levels.

Do these results have really something to do with differential access to external finance, or is it something else? The results were shown to be robust to different measures of financial development and tangibility, however one could argue that all these could just be proxies for other country or industry characteristics. The same aspects of a country's environment and of an industry's assets that make external finance relationships easier to sustain, most probably also facilitate any trade relationship. In a deeper sense, the results above constitute more generally evidence of the importance of institutions or contractibility for industrial composition and growth. This is interesting, however the focus in this paper is on identifying the firms' financing possibilities as a channel for this. One way to test whether this is due to finance or just something else is to compare the estimated effect between industries that are more dependent on external finance and industries that are less so. If the hypothesis is correct, then we should expect the coefficient of the financial development-tangibility interaction to be more negative for those industries that are more dependent on external funding (see (6)). To implement a test on this I split the sample in two according to whether the observations correspond to an industry that is above or below the external dependence median. The first two columns of Table IV present the results. In both composition and growth the point estimate of the coefficient associated to the sample more dependent on external finance is more negative and more significant. For specialization it is statistically larger (in absolute terms) at a 10% confidence level[14]. The same general conclusion is obtained if one forces the coefficients of the other explanatory variables to be the same in both samples.

In the following two columns of Table IV evidence supporting that the results are indeed related to the degree of protection outside investors enjoy or the degree of contractibility of external finance is provided. To show this a two-stage least squares regressions is ran. In the first stage financial development is explained with measures of the effective rights creditors enjoy -taken from the extension by Galindo and Micco (1999) of LLSV (1998)'s variable multiplied by the rule of law index from Kaufmann et.al.(1999)-, and the quality of accounting standards in each country (from Rajan and Zingales (1998)) (an all the other regressors). The accounting variable is thought to be a proxy of the quality of the information available to external investors and therefore the costs of monitoring and screening. The second stage corresponds to the

benchmark specification now using the predicted values from the first stage. Therefore, just the variation in the degree of financial development that is explained by these environment variables is used. The coefficient of the tangibility financial development interaction term is in each case negative –though not significantly so in the growth regressions-, while the implied effects are not statistically different from the benchmarks at conventional levels. The interpretation is as follows: in order to sustain external finance relationships, harder assets can indeed substitute effective legal protection to outside creditors, and the quality of information available. The result concerning creditors rights argues in favor of that variable being a proxy not just for the balance of rights over the distribution of the assets but for the more general concept of protection to financiers.

Is it likely that these results are driven by reverse causality? After all, this is a major cause of concern in the related literature. It might be that the degree of financial development –through a demand argument- is determined by the composition and relative expected growth performance of the different sectors. In particular, in countries where –for other reasons- production and growth is concentrated in industries with either little need for external funds or that rely on hard assets, financial markets would not be as necessary. First, the analysis controlled for the traditional determinants of industrial composition and growth (through the resource availability intensity of use interactions in the composition regressions, and the initial size in the growth ones). Second, the data used corresponds just to the manufacturing sector that is only a fraction of the economy. It is unlikely that the fact that a low tangibility industry that represents more or less around half a percentage point of GDP can have a major impact in the degree of development of the financial market. In other words, the effect found is large but implausible enough to have a sizable impact on the size of the financial system; the variation in aggregate tangibility across countries is simply too small compared to the variation in the relative size of the financial sectors (see Figure II). Then, given that the results are based on industry as opposed to country-level data the reverse causality issue is at least limited. Still, in the last column of Table IV financial development is instrumented with each country's legal origin, a characteristic largely predetermined but previously shown to be correlated with the size and functioning of capital markets (La Porta et.al. [1997, 1998]). In both cases, the coefficient of the key interaction variable is still negative, significant, and not statistically different from that of the benchmark regression.

Different measures of financial development and tangibility have been used and the results found to be robustly consistent with the basic hypothesis. Controls were included to ensure that the differential size and growth performance of industries across countries was not driven by omitted variable bias. However, the different measures of capital markets development and tangibility are not uncorrelated, and one can never be entirely certain to have sufficiently controlled for other effects in the data. To come up with an omitted variable explanation for the results identified above one needs simultaneously an omitted variable strongly correlated with tangibility and an omitted variable strongly correlated with financial development. Furthermore, the alternative has to speak to both industrial composition and growth, and be also consistent with the sign of the external finance dependence interaction. Still, some possibilities are checked in Table V.

Begin with industrial structure in the upper panel. First, tangibility may be negatively correlated with volatility, and poor financial markets may not provide sufficient insurance commanding more volatile industries to be relatively smaller. An index for industry technological volatility is created by computing the standard deviation over the absolute value of the mean annual growth rate in value added using the Indstat data for the U.S. This variable is added interacted with financial development in the benchmark specification. Interestingly this insurance channel is indeed present: we get a significantly positive coefficient for this new interaction, meaning that more volatile industries fare better in more developed financial markets. However, it is independent from ours: the coefficient of the tangibility interaction is virtually unchanged[15]. Second, it might be that tangible industries are more amenable to get direct or indirect public sector support or involvement. If these political pressures are better resolved in richer countries, the positive correlation between wealth and financial development might explain the results. In column two, half the observations in the sample are kept: those corresponding to industries that in each country employ a share of total manufacturing employment below the sample median (1.96%). If the degree of political pressure or public sector involvement is increasing in the share of employment each industry accounts for, the story would imply that there should be no significant effect of the financial development tangibility interaction in this restricted sample. The estimated coefficient, however, is still significantly negative and not significantly different from the benchmark.

Factor endowments are not the only potential determinant of industrial structure. For instance, while sophisticated in terms of the production side, neoclassical trade models generally assume identical homothetic preferences on the demand side. By using country fixed effects we have allowed the manufacturing sector to be of different size with respect to the economy. However, it is possible for differences in preferences to affect also the composition of manufactures. One possibility is that the level of tangibility across industries is correlated with the income elasticity of demand for the goods produced by the sector. Since the degree of financial development is correlated with income per capita, this might explain the results. When one excludes the observations corresponding to countries below the lower and above higher quartile of per capita GDP (at PPP) –and therefore limit the extent of preferences' differences in terms of income-, one still gets a point estimate for the tangibility financial development interaction that -although not significant at conventional levels- is negative, and not significantly different to that of our benchmark regression (see column three). Finally, the neoclassical model is not the only theory of specialization. The most prominent alternative is based on industry-level economies of scale (Helpman [1984], Helpman and Krugman [1985]). The fourth column of the upper panel of Table V uses the data corresponding just to the countries with total GDP above the median, assumed to have sufficient internal market size to allow significant production in all industries. The coefficient of the interaction is again significantly negative and not statistically different from the benchmark result.

What about alternative explanations for the growth results? First, it might be the case that an industry's growth opportunities are negatively correlated with its tangibility and access to external finance is more tightly linked to growth opportunities the more developed the financial system is. In a manner analogous to the way tangibility was constructed from Compustat's U.S.-based firms, Tobin's Q concept is used to proxy growth opportunities with the ratio of market to book value of assets (that is, book value of assets minus book value of common equity plus market value of common equity all over book value of assets). The correlation with the industry tangibility variable is negative but low: –0.136. When one adds the financial development growth opportunities interaction to the regression it has no significant effect on industry growth, while the coefficient for the tangibility financial development interaction remains virtually unchanged. Second, it may be the case that more technologically advanced industries that –for many other reasons- tend to be located in more developed countries are also less tangible. At least within the

manufacturing sector, it is not at all clear that less tangible industries are more technologically advanced (see Table I). It is difficult to come up with an operational definition of technological advancement at the industry level. However, if one thinks that those industries require a higher human capital input, once we include a human capital intensity financial development interaction and a human capital availability tangibility interaction, the size of the interaction of interest should diminish significantly. This is not the case, as seen in column two of the lower panel of Table V. Third, it may be that financial development proxies for initial per capita GDP or initial gross domestic investment, and wealthier countries or those that invest more do so on the same kind of low tangibility industries because tangibility is correlated with some other omitted industry variable. One story could be that as technologies mature, industries using those migrate from developed to less-developed countries, and more tangible industries use more mature technologies. Columns three and four dispose of this possibility.

The results for growth are also robust to the inclusion of the interaction between the initial relative size of the industry with both tangibility and initial financial development. The results for industrial composition are robust to the inclusion of the industry's growth opportunities financial development interaction, and to the technological advancement issue. Though not reported here, the results are also robust to the inclusion of tangibility interacting with every other country-level explanatory variable, and to the inclusion of financial development interacting with every other industry-level variable. This argues against biases introduced by specification issues.

The variables used above are fairly standard in their corresponding literatures; the datasets are all publicly available and have not been (to our knowledge) heavily attacked in terms of quality; and the observations were selected solely on the basis of data availability. Still, it may be that, within the sample, a few countries or industries are largely driving the results. This is not the case. The sample used has already changed across the specifications due to different availability of the variables included, keeping the results mostly unaltered. Though not reported here, the basic results are also robust to changes in the sample countries (in terms of the level of financial development) and industries (in terms of tangibility and to the exclusion of certain industries –in particular food, other manufactured products, sectors specified as "other", and petroleum refineries-), the time span and period used, and the level of aggregation of the

manufacturing sector (28 ISIC-3 or 79 ISIC-4 industries[16]). The same is true if one allows the disturbances to be not just heteroskedastic but also clustered across industries or countries.

V. FIRM-LEVEL EVIDENCE

One would like to have even more direct evidence that the effect identified works through the financing possibilities of the firms. This is difficult to show since there are little firm-level data, especially for countries with poor financial development. Worldscope compiles data for large, publicly traded companies for several countries. These are used to assess whether individual firms' leverage levels behave consistently with the hypothesis. This implies that the positive response of leverage to changes in tangibility should be larger the lower the level of financial development or contractibility (see (2)). The data are strongly biased against finding any effect. It comprises only large, publicly traded companies in each country, arguably the ones less financially constrained, less affected by the *local* environment, with lower monitoring and screening costs, and with better substitutes to tangibility.

Several factors have been used to explain leverage before. Studies have focused almost invariably on samples comprising only rich, highly financially developed countries. The tangibility of a firm's assets - as a measure of the availability of easily *collateralizable* assets- shows up generally with significantly positive coefficients and a large effect. The market to book value of assets ratio (a measure of Tobin's Q), assumed to be a proxy for growth opportunities, appears with a negative coefficient, consistent with firms expecting high future growth giving preference to equity finance over debt finance to avoid passing up investment opportunities (Myers [1977]). Although there are reasons to think that the size of a firm has an ambiguous effect on leverage, it usually turns up to be positive and significant, and is therefore interpreted as a proxy for the inverse of the probability of bankruptcy. The effect of profitability is also ambiguous, but in general shows up negative, which is consistent with Myers and Majluf [1984].

In order to test the prediction one can regress leverage on tangibility, Tobin's Q, the logarithm of sales, profitability, and the interaction between tangibility and financial development. One focuses on the within variation of the data by including both country and industry fixed effects. The tangibility coefficient is expected to be positive, while the interaction coefficient to be negative so that, after controlling for the other variables, the positive effect of tangibility on leverage is larger the lower the level of financial development. That is, the availability of hard assets has a larger impact when financial contractibility or

creditors' protection are poorer. Long term external financing is thought to be more in line with the large, long lasting real effects identified in the previous section, so I focus on long-term debt. Results are presented using both the book and market value of assets. Further tests are conducted to check the robustness of the results using the market measure to limit the exposure to differences in accounting practices across countries that are probably more acute for the assets side of the balance sheet[17], and to identify the differential effect of tangibility on leverage beyond its potential effect through market valuation.

Long-term book leverage is simply long term debt over the book value of assets, long-term market leverage is long term debt over book value of assets minus book value of equity plus market value of equity, tangibility is measured as net property and equipment over total book value of assets, Tobin's Q as total assets less book value of equity plus market value of equity all divided by total assets, log(sales) as the natural logarithm of total sales in thousands U.S. dollars, and profitability as operating income over total book assets. All these firm-level variables are taken from Worldscope's July 2000 CD-ROM and correspond to the latest fiscal-year-end data available for each company at that date (mostly 1999). Only firms in the manufacturing sector are included, while the 14 observations that present a profitability ratio smaller than –1 are discarded. To avoid endogeneity issues and to smooth out short-term fluctuations, financial development is measured as credit to the private sector by deposit money banks to GDP, averaged over available data for the 1995-1999 period. This is taken from World Development Indicators [2001][18]. Equation (9) summarizes the approach:

$$\begin{aligned} Leverage_{j,i,k} &= b_0 + b_1 \cdot Tang_{j,i,k} + b_2 \cdot FinDev_i \cdot Tang_{j,i,k} \\ &+ b_3 \cdot Q_{j,i,k} + b_4 \cdot \ln(sales)_{j,i,k} + b_5 \cdot \Pr ofit_{j,i,k} + \sum_l b_l \cdot X_{l,i} + \sum_m b_m \cdot Y_{m,k} + e_{i,j,k} \end{aligned} \qquad (9)$$

where $_j$ stands for individual firms, $_i$ denotes countries, and $_k$ industries, X are country indicators, and Y industry indicators. Again, the error term ε is allowed to be heteroskedastic, and robust standard errors are reported. The estimate of β_1 is expected to be positive, while that of β_2 to be negative.

Table VI presents the results. The benchmark regression (that in column one) includes 6215 firms located in 53 different countries, with a median number of 62 firms per country[19]. The coefficients are estimated using both industry (at the 3-digit USSIC code level) and country fixed effects. In the first column –which explains long-term market leverage- one sees that the traditional results obtain: each

coefficient has the usual sign, all are highly significant, and their size is approximately in line with previous results. In particular, the coefficient of tangibility is large and very significant. The significantly negative coefficient of the financial development tangibility interaction confirms the hypothesis: the positive effect of tangibility on leverage is larger the less developed the financial system is. The magnitude is important: a marginal increase in tangibility would increase the firm's long-term leverage by 33% more if it were to be located in a country in the fourth quartile instead of in the first quartile of financial development. Similar results are obtained when computing leverage over the book value of assets (see column 2).

In the 2-stage least squares approach of columns three and four I use exclusively the variation in the index of financial development that can be explained with either the index of effective creditors rights or that of accounting standards. Again, a significantly negative coefficient for the financial development tangibility term is obtained in both cases. The implied effect is now twice as large as before (around 66%). The interpretation is that both the protection of creditors' rights and the quality of information are indeed behind the fact that leverage appears more sensitive to tangibility the lower the degree of financial development.

In the last two columns leverage is explained with the traditional variables separately for firms located in countries with a ratio of bank credit to the private sector above and below the sample median. The overall picture suggests that the determinants of leverage are common across different environments, giving some assurance that the effect identified is not the result of the correlation of tangibility with other traditional firm-level variables. Again, the point estimates of tangibility indicate that its effect is much larger in countries with poorly developed financial systems.

The qualitative results –and for the most part also the quantitative ones- in this section are also robust to other measures of financial development and tangibility, and to the sample countries and industries used.

VI. CONCLUDING REMARKS

I advanced in characterizing what poor financial development means and what are its consequences beyond the understandable limitation in the availability of external finance. This paper reinforces the literature on the effects of financial development for growth and corporate behavior, and extends them to industrial composition, by providing a specific mechanism through which the degree of

capital markets' development affects real outcomes. The relationship between the degree of contractibility or investors' protection and the hardness of firms' assets is not any mechanism, however. It is one that is consistent with –though without necessarily implying it- the evidence on the legal determinants of finance, and one that has played a significant role in theories of the firm, industrial organization, financial structure, business cycles, and financial crisis, among others. It provides evidence that is consistent with the effect of finance –and more generally, institutions- on aggregate outcomes working through the allocation of resources, and not just via their accumulation[20]. The evidence presented here supports paying attention to the role and differential significance of the character of assets under diverse institutional settings for understanding a number of issues. The empirical approach has also underscored a source of exogenous variation for financing constraints that should prove useful in addressing empirical issues in the finance literature –where its lack has caused much trouble[21]–.

Further research along these lines may shed light on a number of corporate finance issues. For instance, internal capital markets could serve as a vehicle to enhance access to external finance through the pooling of assets with different hardness. The seemingly higher incidence of business conglomerates in countries with poorer financial development would be consistent with this. This view may also give a different interpretation for the correlation between legal origins and the breadth and depth of financial markets, and more general aggregate outcomes. It may be that common law tradition protects relatively more activities intensive in non-tangible assets than in tangible ones with respect to civil law, as casual evidence seems to indicate. This could be rooted in the fact that the English monarchy probably derived a higher proportion of its wealth from intangibles –such as the sale of import and commercialization monopolies- than land-rich French rulers, and therefore sought to protect them relatively more. It is easy to imagine how this story could accommodate differences between legal systems so persistent in time[22]. This explanation would also be consistent with the null correlation between legal origins and financial development in the past (Rajan and Zingales [2001]) if economic activity then was characterized by a higher level of tangibility than today (agriculture and early manufactures then versus services and knowledge-intensive sectors today)[23].

One can extract important policy implications for the corporate governance reform debate. Improving the balance of rights that investors have vis-à-vis insiders when financial contracts are breached

or call for the distribution of the assets can bias the allocation of resources towards the sectors that use more intensively the assets with enhanced protection. In improving the ability to sign, monitor, and enforce contracts, however, there is no down side since this increases overall investment and also improves the allocation. If countries with low indices of creditors rights can only achieve the former but not the latter, the cross-country correlation between financial development and creditors' protection does not directly imply that increased protection is the optimal policy. In terms of the political economy of reform, one can predict conflict to arise between sectors more intensive in hard assets and sectors less so, not only on the need for reform, but also on the specific measures proposed.

The results presented do not relate solely to finance, however. Broader evidence on the large effect institutions -the ability to contract and the protection of rights, in particular- have on economic outcomes is provided. This is difficult to demonstrate in a macro context given the important multicollinearity in the cross-country data, and the potential endogeneity of institutions. Very recently, Acemoglu et al. [2001, 2002] have used historical determinants of institutional differences for identification and verified that these explain a large fraction of the cross-country differences in economic performance. Here I approach the issue from a micro standpoint by showing how the use of a -theoretically and empirically sound- substitute to good institutions in a particular area appears to be more widespread where these institutions are thought to be worse. The effects are sizeable enough to show up also at the macro level. This approach may prove useful to disaggregate and the further explore the details of the role of other institutions on economic outcomes.

The magnitude of the results presented above calls for further exploring the idea in our understanding of broader economic issues. On international trade the institutional environment –through finance in this case- was shown to be a source of specialization similar in magnitude to the relative endowment of factors. This would call for revisiting the way we model trade patterns. Kletzer and Bardhan [1987], and Helpman and Grossman [1999, 2002] address some of these issues. On development economics and growth, the dissimilar hardness of human capital, physical capital, and natural resources, and between different technologies may contribute to the explanation of cross-country differences in factor accumulation and total factor productivity, the composition of economic activity, and technology adoption. We can also learn more about the role of finance and the contractual environment in the transition towards

industrialization first, then to a services economy, and finally to an information or knowledge-based one. On macroeconomics and international finance, there is the need to assess the empirical relevance of distinguishing -as a reading of Caballero and Krishnamurthy [2000] may suggest- between the differential collateral-value assets have for locals and foreigners in our understanding of international financial crisis and the nature of capital flows. On industrial organization, the role of an industry's assets and a country's institutions on the size and likelihood of barriers to entry should be further explored.

Underlying assets take a central role in the credit channel theories of the business cycle (Bernanke and Gertler [1989, 1990], Kiyotaki and Moore [1997]). Through their effect on the value of the assets underlying the credit relationship shocks can persist, amplify, and spread out. The results in this paper – particularly the size of the effects- in their selves provide independent evidence in favor of the likelihood of these theories being an important piece in explaining business fluctuations. Moreover, one can expand these theories to extract new testable implications both for different sectors of a given economy and across different economies. The methodology used provides an identification strategy useful to further test and explore in more detail the origins and implications of the credit channel view of the business cycle. Braun and Larraín (2002) address this topic with favorable, consistent results.

This paper also adds to the scarce empirical evidence consistent with the incomplete contracts framework (Rajan and Zingales [1998], Baker and Hubbard [2000, 2002], Kaplan and Stromberg [2001], Kumar, Rajan and Zingales [2001]). It provides direct supporting evidence for one of the theory's main propositions: controlling for the degree of incomplete contractibility the assets underlying a relationship -and their character- are critical for it to be sustainable.

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TABLES AND FIGURES

Table I Industry Variables

Industry	Tangibility	Physical Capital Intensity	Natural Resources Intensity	Human Capital Intensity	External Finance Dependence	Market Tangibility	Sales Tangibility	Q	Volatility
Beverages	0.2794	0.0620	0	1.1345	0.0772	0.2043	0.2566	1.3639	0.5516
Fabricated metal products	0.2812	0.0531	0	0.9144	0.2371	0.2369	0.2162	1.1853	1.1017
Food products	0.3777	0.0616	0	0.8117	0.1368	0.2293	0.2508	1.6897	0.3807
Footwear, except rubber or plastic	0.1167	0.0181	0	0.5328	-0.0779	0.0978	0.0758	1.1907	2.7916
Furniture, except metal	0.2630	0.0390	0	0.6984	0.2357	0.2127	0.1814	1.3346	0.9760
Glass and products	0.3313	0.0899	0	1.0121	0.5285	0.2478	0.2731	1.2800	1.0952
Industrial chemicals	0.4116	0.1237	0	1.4080	0.2050	0.2278	0.3959	1.5900	1.5228
Iron and steel	0.4581	0.1017	1	1.2510	0.0871	0.3478	0.3806	1.1764	2.7818
Leather products	0.0906	0.0324	0	0.6869	-0.1400	0.0682	0.0465	1.0705	5.9822
Machinery, electric	0.2133	0.0765	0	1.0636	0.7675	0.1471	0.1820	1.3950	1.8167
Machinery, except electrical	0.1825	0.0582	0	1.1187	0.4453	0.1337	0.1557	1.3896	1.4893
Misc. petroleum and coal products	0.3038	0.0741	1	1.1531	0.3341	0.2044	0.2456	1.4606	1.5871
Non-ferrous metals	0.3832	0.1012	1	1.0982	0.0055	0.2983	0.3781	1.1951	1.9756
Other chemicals	0.1973	0.0597	0	1.2089	0.2187	0.0764	0.3337	2.4008	0.3799
Other manufactured products	0.1882	0.0393	0	0.7553	0.4702	0.1317	0.1345	1.3171	1.2146
Other non-metallic mineral products	0.4200	0.0684	1	0.9522	0.0620	0.3547	0.3801	1.1646	1.3524
Paper and products	0.5579	0.1315	1	1.1392	0.1756	0.3473	0.4808	1.2782	1.4131
Petroleum refineries	0.6708	0.1955	1	1.6558	0.0420	0.5262	0.6783	1.2537	2.0629
Plastic products	0.3448	0.0883	0	0.8274	1.1401	0.2583	0.2345	1.1915	0.9237
Pottery, china, earthenware	0.0745	0.0546	0	0.8041	-0.1459	0.0815	0.0480	1.0061	1.8528
Printing and publishing	0.3007	0.0515	0	0.9339	0.2038	0.1531	0.2423	1.7366	1.0430
Professional & scientific equipment	0.1511	0.0525	0	1.2341	0.9610	0.0839	0.1609	1.7210	2.3772
Rubber products	0.3790	0.0656	0	0.9854	0.2265	0.2379	0.2870	1.4077	0.7759
Textiles	0.3730	0.0726	0	0.6881	0.4005	0.3020	0.2531	1.1562	1.4237
Tobacco	0.2208	0.0181	0	1.3539	-0.4512	0.0681	0.2164	2.2938	1.3542
Transport equipment	0.2548	0.0714	0	1.3221	0.3069	0.2089	0.1791	1.2440	0.9242
Wearing apparel, except footwear	0.1317	0.0189	0	0.5017	0.0286	0.1015	0.0766	1.3538	2.0325
Wood products, except furniture	0.3796	0.0653	1	0.7409	0.2840	0.3086	0.2465	1.1183	1.5600

Table II Effect of Financial Development and Tangibility on Actual Industry Size and Growth Rate

The table is constructed based on the residuals of the share of industries' value added in GDP and real growth rates obtained after regressing these on industry and country dummies, and in the case of growth also the initial share in total manufacturing value added. In panel A the residuals are presented in terms of the contribution to GDP of the average industry in the sample (0.7%). In panel B the average industry growth rate in the sample (4.7%) is added to the residuals. The four cells present the average figures depending on whether they correspond to industries located in countries with a value of bank credit to the private sector over GDP above or below the median, and industries with tangibility above or below the median. The number of observations used to compute these averages in each case is reported below.

A. Industry Relative Size

		Country Financial Development		Difference
		High	Low	
Industry Tangibility	High	95.9% 466	104.6% 415	-8.7%
	Low	104.2% 461	95.2% 401	8.9%
Difference		-8.3%	9.4%	-17.7%

B. Industry Growth

		Country Initial Financial Development		Difference
		High	Low	
Industry Tangibility	High	4.4% 248	5.2% 205	-0.8%
	Low	5.1% 253	4.3% 213	0.8%
Difference		-0.7%	0.9%	-1.5%

Table III Industrial Composition and Growth Basic Results

The specification in Panel A corresponds to that in (7). The dependent variable is the mean share of each ISIC-3 industry of the total manufacturing value added in each country computed from Unido's Indstat-ISIC-3 (2001) database multiplied by the share of manufacturing value added in GDP from World Development Indicators (2001), both averaged over the 1986-1995 period. The specification in Panel B corresponds to that in (8). The dependent variable is the real (deflated using IFS producer price index) annual compounded value added growth rate of each ISIC-3 industry computed from Unido's Indstat-ISIC-3 (2001) database in the 1986-1995 period. The independent variables are defined in the text. Columns one through four use Book Tangibility and vary the definition of Financial Development. Columns five and six use Credit to the Private Sector by Deposit Money Banks and vary the definition of Tangibility. Industry and country fixed effects are included in all regressions, coefficients not reported. Heteroskedasticity robust standard errors are reported below the coefficients. Significance (p-value): * 10%, ** 5%, *** 1%.

A. Industrial Composition

Variable	Bank Credit to the Private Sector		Liquid Liabilities		Stock Market Capitalization		Stock Market Value Traded		Market Tangibility		Sales Tangibility	
ln(Physical Capital per worker) x Industry Physical Capital Intensity	0.0121 0.0050	**	0.0112 0.0051	**	0.0008 0.0064		0.0005 0.0065		0.0103 0.0050	**	0.0114 0.0049	**
ln(Natural Resources per capita) x Industry Natural Resources Intensity	0.0011 0.0004	**	0.0007 0.0004		0.0009 0.0005	*	0.0010 0.0005	*	0.0011 0.0004	**	0.0010 0.0004	**
ln(Schooling Years) x Industry Human Capital Intensity	0.0022 0.0015		0.0021 0.0015		0.0011 0.0022		0.0020 0.0021		0.0017 0.0015		0.0031 0.0015	
Financial Development x Industry External Finance Dependence	0.0106 0.0017	***	0.0087 0.0020	***	0.0078 0.0047	***	0.0242 0.0055	***	0.0110 0.0017	***	0.0100 0.0017	***
Financial Development x Industry Tangibility	**-0.0247** **0.0067**	***	**-0.0201** **0.0064**	***	**-0.0103** **0.0047**	**	**-0.0289** **0.0104**	***	**-0.0243** **0.0084**	***	**-0.0253** **0.0072**	***
R-squared = Number of obs =	0.4826 1743		0.4802 1743		0.4523 1424		0.4633 1452		0.4804 1743		0.4824 1743	

B. Industry Growth

Variable	Bank Credit to the Private Sector		Liquid Liabilities		Stock Market Capitalization		Stock Market Value Traded		Market Tangibility		Sales Tangibility	
Initial Share of Industry of Total Manufacturing Value Added	-0.3708 0.0639	***	-0.3569 0.0651	***	-0.3661 0.0632	***	-0.2448 0.0752	***	-0.3707 0.0640	***	-0.3690 0.0644	***
Initial Financial Development x Industry External Finance Dependence	0.0895 0.0327	***	0.0232 0.0272		0.0348 0.0234		-0.0685 0.0732		0.0923 0.0325	***	0.0841 0.0330	**
Initial Financial Development x Industry Tangibility	**-0.1900** **0.0327**	***	**-0.0884** **0.0490**	*	**-0.0985** **0.0528**	*	**-0.1643** **0.1079**	**	**-0.2306** **0.0869**	***	**-0.1949** **0.0669**	***
R-squared = Number of obs =	0.4587 919		0.4502 919	`	0.5133 778		0.5476 785		0.4582 919		0.4587 919	

Table IV Further Tests

The basic specifications correspond to those of the first column of Table III. In the first two columns the sample is split in two according to whether the observations correspond to industries with External Finance Dependence above (high) or below (low) the median. In the last three columns Bank Credit to the Private Sector over GDP is instrumented respectively with an index of effective creditors rights, the number of accounting standards, and the legal origin. Industry and country fixed effects are included in all regressions, coefficients not reported. Heteroskedasticity robust standard errors are reported below the coefficients. Significance (p-value): * 10%, ** 5%, *** 1%.

A. Industrial Composition

Variable	High External Finance Dependence		Low External Finance Dependence		2SLS Creditors Rights		2SLS Accounting		IV Legal Origin	
ln(Physical Capital per worker) x Industry Physical Capital Intensity	0.0145 0.0089		0.0189 0.0056	***	0.0084 0.0106		-0.0019 0.0129		0.0132 0.0068	*
ln(Natural Resources per capita) x Industry Natural Resources Intensity	0.0011 0.0005	**	0.0008 0.0007		0.0014 0.0005	***	0.0013 0.0006	***	0.0015 0.0005	***
ln(Schooling Years) x Industry Human Capital Intensity	0.0073 0.0023	***	-0.0018 0.0022		0.0008 0.0023		-0.0024 0.0035		0.0020 0.0016	
Financial Development x Industry External Finance Dependence	0.0012 0.0025		0.0095 0.0063		0.0167 0.0038	***	0.0182 0.0038	***	0.0192 0.0052	***
Financial Development x Industry Tangibility	**-0.0481** **0.0129**	***	**-0.0180** **0.0091**	**	**-0.0406** **0.0130**	***	**-0.0398** **0.0171**	**	**-0.0381** **0.0134**	***
R-squared = Number of obs =	0.4888 854		0.5206 889		0.5157 1265		0.5341 844		0.4824 1387	

B. Industry Growth

Variable	High External Finance Dependence		Low External Finance Dependence		2SLS Creditors Rights		2SLS Accounting		IV Legal Origin	
Initial Share of Industry of Total Manufacturing Value Added	-0.3098 0.0956	***	-0.4588 0.0857	***	-0.2681 0.0593	***	-0.3105 0.0754	***	-0.3771 0.0644	***
Initial Financial Development x Industry External Finance Dependence	0.0482 0.0342		-0.0398 0.1189		0.0509 0.0526		0.1674 0.1238		0.1257 0.0538	**
Initial Financial Development x Industry Tangibility	**-0.1957** **0.1532**		**-0.1017** **0.0916**		**-0.1647** **0.1266**		**-0.2558** **0.2636**		**-0.1726** **0.1001**	*
R-squared = Number of obs =	0.4973 456		0.5018 463		0.4685 815		0.6027 641		0.4577 919	

Table V Robustness

The basic specifications correspond to those of the first column of Table III. In the first column of Panel A and all the columns of Panel B we add the interactions indicated in each case. In the second column of Panel A we drop the observations corresponding to industries representing more than 1.96% of the country's total manufacturing employment (the sample median). In the third column of Panel A we drop the observations corresponding to industries located in countries in the first and fourth quartile of per capita GDP. In the fourth column we use only those observations corresponding to industries located in countries above the median of total GDP. Industry and country fixed effects are included in all regressions, coefficients not reported. Heteroskedasticity robust standard errors are reported below the coefficients. Significance (p-value): * 10%, ** 5%, *** 1%.

A. Industrial Composition

Variable	Industry Volatility		Low Political Pressure		Intermediate Level of per capita GDP		Large Market Size	
ln(Physical Capital per worker) x Industry Physical Capital Intensity	0.0107 0.0051	**	0.0165 0.0064	***	0.0231 0.0144		-0.0130 0.0090	
ln(Natural Resources per capita) x Industry Natural Resources Intensity	0.0010 0.0004	**	0.0003 0.0004		0.0008 0.0008		0.0016 0.0005	***
ln(Schooling Years) x Industry Human Capital Intensity	0.0025 0.0015	*	-0.0014 0.0013		0.0011 0.0037		-0.0003 0.0030	
Financial Development x Industry External Finance Dependence	0.0116 0.0019	***	0.0025 0.0011	**	0.0076 0.0042	*	0.0109 0.0020	***
Financial Development x Industry Volatility	0.0013 0.0006	**						
Financial Development x Industry Tangibility	**-0.0215** **0.0073**	***	**-0.0203** **0.0096**	**	**-0.0151** **0.0117**		**-0.0157** **0.0073**	**
R-squared = Number of obs =	0.4837 1743		0.4404 872		0.492 871		0.5397 927	

B. Industry Growth

Variable	Growth Opportunities		Technological Advancement		Initial per capita GDP		Initial Investment Rate	
Initial Share of Industry of Total Manufacturing Value Added	-0.3713 0.0638	***	-0.3559 0.0644	***	-0.3692 0.0639	***	-0.3749 0.0643	***
Initial Financial Development x Industry External Finance Dependence	0.0866 0.0323	***	0.0899 0.0328	***	0.0894 0.0328	***	0.0894 0.0326	***
Initial Financial Development x Industry Q	-0.0297 0.0333							
Initial Financial Development x Industry Human Capital Intensity			0.0202 0.0400					
ln(Initial Schooling Years) x Industry Tangibility			-0.0247 0.0553					
ln(Initial per capita GDP) x Industry Tangibility					0.0073 0.0282			
Initial Investment Rate x Industry Tangibility							-0.3207 0.3588	
Initial Financial Development x Industry Tangibility	**-0.1992** **0.0661**	***	**-0.2074** **0.0771**	***	**-0.2008** **0.0701**	***	**-0.1617** **0.0676**	**
R-squared = Number of obs =	0.4594 919		0.462 904		0.4588 919		0.4596 919	

Table VI Firm Leverage Evidence

The specification corresponds to that in (9). In columns one, three, four, five, and six the dependent variable is firms' long-term market leverage, that is, long-term debt over book value of assets less book value of equity plus market value of equity. In column two the dependent variable is long-term debt over book value of assets. In the third and fourth columns Bank Credit to the Private Sector over GDP is instrumented respectively with an index of effective creditors rights and the number of accounting standards. In column five (six) only observations corresponding to firms located in countries with a ratio of private credit to GDP above (below) the sample median are included. Industry and country fixed effects are included in all regressions, coefficients not reported. Heteroskedasticity robust standard errors are reported below the coefficients. Significance (p-value): * 10%, ** 5%, *** 1%.

Variable	Long Term Market Leverage		Long Term Book Leverage		2SLS Creditors Rights		2SLS Accounting		High Financial Development		Low Financial Development	
Tangibility	**0.3378**	***	**0.2880**	***	**0.4623**	***	**0.4850**	***	**0.1941**	***	**0.3183**	***
	0.0299		**0.0313**		**0.0838**		**0.0810**		**0.0135**		**0.0314**	
Tobin's Q	-0.0051	***	0.0007		-0.0049	***	-0.0046	***	-0.0040	**	-0.0173	***
	0.0020		0.0025		0.0019		0.0019		0.0017		0.0041	
Ln(Sales)	0.0098	***	0.0127	***	0.0092	***	0.0087	***	0.0098	***	0.0121	***
	0.0010		0.0013		0.0010		0.0010		0.0010		0.0029	
Profitability	-0.1767	***	-0.1953	***	-0.1718	***	-0.1836	***	-0.1611	***	-0.1871	***
	0.0175		0.0296		0.0175		0.0188		0.0186		0.0463	
Financial Development x Tangibility	**-0.1075**	***	**-0.0801**	***	**-0.2211**	***	**-0.2301**	***				
	0.0236		**0.0286**		**0.0775**		**0.0729**					
R-squared =	0.3115		0.1899		0.3111		0.3208		0.2633		0.4521	
Number of obs =	6215		6215		5848		5548		4955		1260	

Figure I Manufacturing Sector Composition and Financial Development: 3 Cases

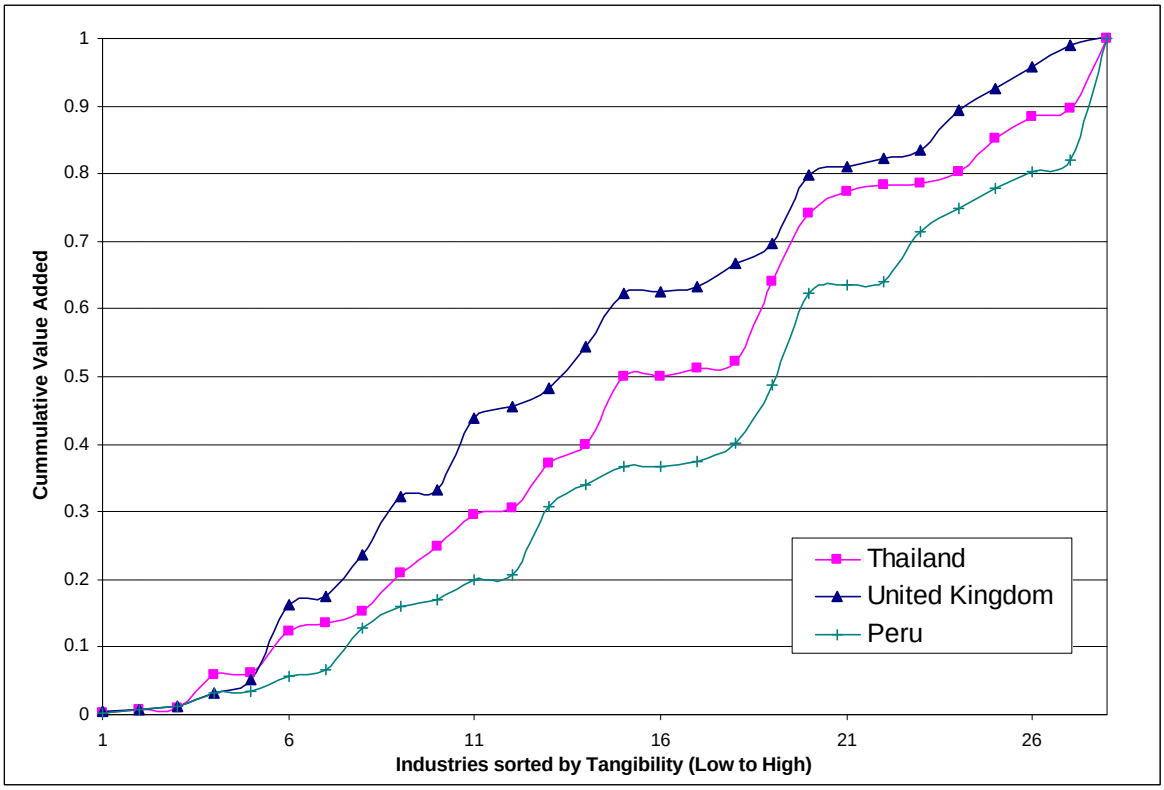
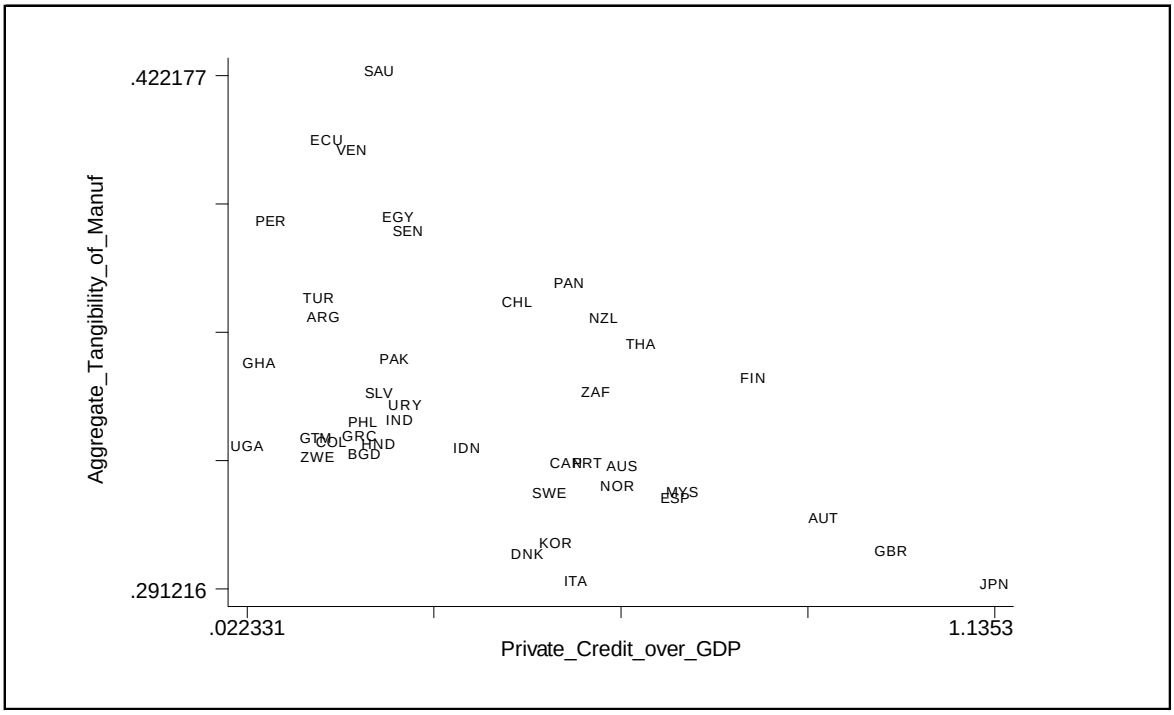


Figure II Aggregate Tangibility of the Manufacturing Sector and Financial Development



APPENDIX

Table A-I Average Balance Sheets

The table presents average balance sheets using the data of active U.S.-based companies in Compustat's Industrial database for the year 1995. The average is taken first within every industry and then across industries. The first column shows the overall average balance sheet, while columns two and three show the averages including just the firms in industries with book tangibility above and below the median, respectively.

	All Firms	High Tangibility Industries	Low Tangibility Industries	Difference Low v/s High Tangibility
ASSETS				
Cash and short-term investments	4.3%	3.6%	5.6%	2.0%
Receivables	15.5%	14.8%	16.8%	2.0%
Inventories	12.1%	10.8%	14.7%	3.9%
Current assets - other	3.0%	2.6%	3.9%	1.2%
Current assets - total	34.9%	31.8%	40.9%	9.1%
Net property, plant & equipment	**45.1%**	**51.0%**	**33.7%**	**-17.4%**
Investment and advances - equity	4.2%	5.3%	2.2%	-3.1%
Investment and advances - other	2.4%	2.0%	3.0%	1.0%
Intangibles	8.1%	5.3%	13.4%	8.1%
Assets - other	5.3%	4.5%	6.8%	2.3%
LIABILITIES				
Debt in current liabilities	3.9%	3.3%	4.9%	1.6%
Accounts payable	9.1%	9.1%	9.0%	-0.2%
Current liabilities - other	10.4%	9.1%	13.0%	3.8%
Current liabilities - total	23.4%	21.6%	26.9%	5.3%
Deferred taxes	4.5%	4.8%	3.8%	-1.0%
Long-term debt	26.1%	27.5%	23.3%	-4.2%
Liabilities - other	10.4%	10.7%	9.8%	-0.8%
Liabilities - total	64.3%	64.5%	63.8%	-0.7%
Common equity	34.5%	34.1%	35.4%	1.2%
Shareholders equity - total	35.7%	35.5%	36.2%	0.7%

Table A-II Industrial Composition Sample

Country	Number of Industries with Data	Country	Number of Industries with Data
Argentina	28	Korea, Rep.	28
Australia	28	Malawi	23
Austria	28	Malaysia	28
Bangladesh	28	Mauritius	27
Belgium	19	Mexico	26
Bolivia	27	Nepal	21
Botswana	18	Netherlands	27
Brazil	18	New Zealand	28
Burundi	27	Niger	7
Cameroon	25	Norway	28
Canada	28	Pakistan	28
Central African Republic	25	Panama	28
Chile	28	Papua New Guinea	25
China	27	Paraguay	9
Colombia	28	Peru	28
Congo, Rep.	16	Philippines	28
Costa Rica	27	Portugal	28
Denmark	28	Rwanda	7
Ecuador	28	Senegal	28
Egypt, Arab Rep.	28	Sierra Leone	14
El Salvador	28	South Africa	28
Finland	28	Spain	28
France	26	Sri Lanka	27
Ghana	28	Sweden	28
Greece	28	Thailand	28
Guatemala	28	Trinidad and Tobago	26
Haiti	12	Tunisia	22
Honduras	28	Turkey	28
India	28	Uganda	28
Indonesia	28	United Kingdom	28
Italy	28	Uruguay	28
Jamaica	14	Venezuela	28
Japan	28	Zambia	26
Jordan	28	Zimbabwe	28
Kenya	27		

Industry	Number of Countries with Data
Beverages	66
Fabricated metal products	65
Food products	69
Footwear, except rubber or plastic	57
Furniture, except metal	60
Glass and products	58
Industrial chemicals	69
Iron and steel	66
Leather products	60
Machinery, electric	60
Machinery, except electrical	59
Misc. petroleum and coal products	53
Non-ferrous metals	58
Other chemicals	60
Other manufactured products	64
Other non-metallic mineral products	61
Paper and products	68
Petroleum refineries	61
Plastic products	59
Pottery, china, earthenware	66
Printing and publishing	61
Professional & scientific equipment	59
Rubber products	61
Textiles	69
Tobacco	66
Transport equipment	59
Wearing apparel, except footwear	61
Wood products, except furniture	68

Variable	# of Obs.	Mean	Std. Dev.	Min	Max
Industry Value Added share of GDP	1743	0.0071292	0.0097662	-0.0042364	0.1152555
ln(Physical Capital per worker)	1743	9.346631	1.457672	5.784441	11.35078
Industry Physical Capital Intensity	1743	0.0697646	0.0369628	0.018056	0.1955499
ln(Natural Resources per capita)	1743	8.474001	0.8688306	6.733402	10.62474
Industry Natural Resources Intensity	1743	0.2495697	0.4328882	0	1
ln(Years of Education)	1743	1.649822	0.4967696	-0.2177415	2.434782
Industry Human Capital Intensity	1743	0.9993601	0.2723158	0.501737	1.65582
Credit to the Private Sector by Deposit Money Banks over GDP	1743	0.3552926	0.2617818	0.0223313	1.135299
Industry Tangibility	1743	0.3003901	0.1371717	0.074491	0.670836
Industry External Finance Dependence	1743	0.235937	0.3205729	-0.45116	1.140122
Liquid Liabilities over GDP	1743	0.4643626	0.2899575	0.0653742	1.810233
Stock Market Capitalization over GDP	1424	0.2726931	0.3156107	0.0075163	1.488477
Value Traded in the Stock Market over GDP	1452	0.0946794	0.1397575	0.0000884	0.6285858
Industry Market Tangibility	1743	0.2120837	0.1077033	0.0681114	0.5262105
Industry Sales Tangibility	1743	0.2513089	0.1345586	0.0465184	0.6783119
Effective Creditors Rights	1265	1.263956	0.8918789	0	3.704025
Accounting Standards	844	60.93009	13.08821	31	83
Industry Volatility	1743	1.585637	1.032271	0.3799427	5.982197
Real per capita GDP (PPP)	1743	5317.271	4848.975	483.1106	16802.84
GDP at Market Prices	1743	1.86E+11	4.74E+11	2.21E+08	3.44E+12

Table A-III Industry Growth Sample

Country	Number of Industries with Data
Austria	28
Belgium	19
Brazil	18
Canada	28
Chile	28
Colombia	28
Costa Rica	25
Egypt	27
El Salvador	23
Finland	22
Greece	28
Hungary	27
India	28
Indonesia	25
Ireland	27
Israel	25
Italy	27
Japan	28
Jordan	26
Korea, Republic of	28
Malaysia	28
Mexico	26
Morocco	15
Netherlands	25
New Zealand	10
Norway	22
Philippines	28
Poland	28
Singapore	26
South Africa	28
Spain	27
Sweden	28
Syrian Arab Republic	8
Trinidad and Tobago	21
United Kingdom	28
Uruguay	28
Venezuela	28

Industry	Number of Countries with Data
Beverages	36
Fabricated metal products	36
Food products	36
Footwear, except rubber or plastic	32
Furniture, except metal	34
Glass and products	30
Industrial chemicals	35
Iron and steel	32
Leather products	32
Machinery, electric	34
Machinery, except electrical	31
Misc. petroleum and coal products	20
Non-ferrous metals	28
Other chemicals	35
Other manufactured products	35
Other non-metallic mineral products	31
Paper and products	37
Petroleum refineries	30
Plastic products	31
Pottery, china, earthenware	31
Printing and publishing	36
Professional & scientific equipment	29
Rubber products	35
Textiles	36
Tobacco	32
Transport equipment	34
Wearing apparel, except footwear	35
Wood products, except furniture	36

Variable	# of Obs.	Mean	Std. Dev.	Min	Max
Real Annual Value Added Growth rate	919	0.0464355	0.0820564	-0.5366958	0.4162775
Initial Gross Domestic Investment over GDP	919	0.2213359	0.0571115	0.1084583	0.4252239
ln(Initial real GDP per capita)	919	8.587874	0.7169129	6.956545	9.654321
ln(Initial Years of Education)	904	1.802048	0.3586919	1.076367	2.436329
Credit to the Private Sector by Deposit Money Banks over GDP	919	0.3838245	0.2248483	0.0402176	0.9480075
Initial share of Industry Value Added in Manufacturing sector	919	0.0393275	0.0451555	0.0000612	0.324469
Industry Tangibility	919	0.2984304	0.135813	0.074491	0.670836
Industry External Finance Dependence	919	0.2385334	0.3165827	-0.45116	1.140122
Liquid Liabilities over GDP	919	0.5643524	0.2810393	0.1846706	1.559983
Stock Market Capitalization over GDP	778	2.27E-01	2.52E-01	1.14E-03	9.88E-01
Value Traded in the Stock Market over GDP	785	0.0447395	0.0573035	0.0000326	0.2456468
Industry Market Tangibility	919	0.2103925	0.1062702	0.0681114	0.5262105
Industry Sales Tangibility	919	0.2492407	0.1329339	0.0465184	0.6783119
Effective Creditors Rights	815	1.524874	1.036026	0	3.945047
Accounting Standards	641	62.17005	12.04227	31	83
Industry Q	919	1.394044	0.3253286	1.0061	2.400756

Table A-IV Firm Leverage Sample

Country	Number of Firms with Data	Country	Number of Firms with Data
Argentina	23	Malaysia	169
Australia	66	Mexico	48
Austria	57	Morocco	4
Belgium	55	Netherlands	94
Brazil	91	New Zealand	17
Canada	170	Norway	62
Chile	36	Pakistan	71
China	81	Peru	14
Colombia	14	Philippines	36
Czech Republic	33	Poland	39
Denmark	91	Portugal	37
Egypt, Arab Rep.	7	Russian Federation	4
Finland	77	Singapore	85
France	370	Slovak Republic	14
Germany	388	South Africa	146
Greece	87	Spain	59
Hong Kong, China	139	Sri Lanka	8
Hungary	17	Sweden	107
India	263	Switzerland	101
Indonesia	82	Taiwan, China	170
Ireland	22	Thailand	118
Israel	27	Turkey	55
Italy	107	United Kingdom	598
Japan	1,432	United States	223
Jordan	2	Venezuela, RB	10
Korea, Rep.	185	Zimbabwe	1
Luxembourg	3		

Variable	Obs	Mean	Std. Dev.	Min	Max
Long-term Debt over Market Value of Assets	6215	0.1232163	0.1328564	0	1.081359
Long-term Debt over Book Value of Assets	6215	0.1365413	0.1558573	0	4.741825
Firm Tangibility	6215	0.353188	0.1806679	0	0.9705176
Tobin's Q	6215	1.536826	2.213763	0.1342066	97.67947
ln(sales)	6215	12.25745	1.880546	1.098612	18.98916
Profitability	6215	0.0450283	0.1076884	-0.8831435	0.7831048
Credit to the Private Sector by Deposit Money Banks over GDP	6215	1.102636	0.4811467	0.0999008	1.69693
Effective Creditors Rights	5848	1.845994	1.038537	0	3.945047
Accounting Standards	5548	66.56002	7.557877	36	83

ENDNOTES

[1] i.e. contractible. In practice it is not uncommon to find that investors pay directly to the provider of the assets instead of letting the entrepreneur have the funds and buy them himself.
[2] See, for instance, Harris and Raviv [1991].
[3] The other two main classes of assets that are usually collateralized explicitly are the accounts receivables and inventories. In comparison to property, plant, and equipment debt based on those assets typically finances a smaller share of their value, for a shorter period of time, and command higher interest rates.
[4] This is not to say that the distinction is irrelevant. In terms of the allocation effect an improvement in contractibility and a soft-assets-biased increase in the protection balance of investors vis-à-vis borrowers' rights may be similar. However, it would be interesting to know whether the improvement in the access to external finance in better functioning capital markets is due to the fact that dependence on assets diminishes altogether or because the ability to sustain relationships based on softer assets is enhanced.
[5] These computations are available from the author upon request (see Appendix).
[6] The correlation between the index of external finance dependence and the index of tangibility is 0.009, not significantly different than zero. Rajan and Zingales [1998] do not report the external finance dependence figure for the industrial chemicals industry (ISIC 351). We construct it as the average of the two sub-sectors reported by them: synthetic resins (3513) with external finance dependence of 0.16 and basic industrial chemicals excluding fertilizers (3511), with an index of 0.25. The results are robust to the exclusion of this sector.
[7] The results are robust to restricting the samples to conform a balanced panel. The sample size for (7) is larger than for (8) because the computation of the growth rate requires data to be available simultaneously for two particular years (1985 and 1995). Summary statistics and additional sample description are available from the author upon request (see Appendix).
[8] The p-values for the hypothesis that each difference-in-differences is equal to zero are 6.3% and 6.8%, respectively.
[9] The simple correlation of -.058 is significantly negative (p-value 0.1%). This is not significantly different than the partial correlation obtained after controlling for the countries' availability of resources.
[10] Svalery and Vlachos [2001] and Beck [2001] obtain a similar result.
[11] The implied size of the effects in Table III expressed as a proportion of the benchmark (column one), and the p-values corresponding to the hypothesis that each coefficient is equal to that of our benchmark regression (in parentheses) are, from column two to the right: Specialization: 0.86 (54.8%), 0.28 (1.8%), 0.24 (1.1%), 0.71 (54.7%), and 0.79 (35.9%); Growth: 0.53 (17,2%), 0.39 (22.6%), 0.13 (1.9%), 0.88 (91.9%), and 0.78 (46.2%).
[12] This could mean that the underlying concept is measured with more noise than with banking variables (especially given the higher volatility of stock market measures) so that the attenuation bias is important. It is also possible that the marginal effect of having a more developed stock market in the outcomes of more and less tangible industries is actually smaller. Finally, the existence of an equity market may provide a –possibly limited- escape from the need to have hard assets to raise external finance. Although interesting, we do not explore the effect of the financial structure in this paper.
[13] Again, these are computed using data from publicly listed, U.S.-based companies over the 1985-1995 period.
[14] The p-values corresponding to the hypothesis that the coefficients are equal in each sample are: Specialization: 5.7%; Growth: 59.8%. In the following three columns of Table IV the size of the implied effect is directly comparable to our benchmarks. The p-values corresponding to the hypothesis that each coefficient is equal to that of our benchmark are: Specialization: 27.6%, 40.7%, and 37.1%; Growth: 85.9%, 80.8%, and 88.4%.
[15] The p-values corresponding to the hypothesis that each coefficient of our financial development tangibility interaction in Table V (from column one to the right) is equal to that of our benchmark are: Specialization: 74.4%, 70.5%, 47.5%, and 36.1%; Growth: 92.1%, 86.4%, 91.1%, and 76.3%.
[16] Data are available for a much larger number of countries using the ISIC-3 definition. This is why we use ISIC-3 instead of ISIC-4 in our analysis.
[17] In any case, since the test pertains to cross-country *differences* in the effect of tangibility on leverage, this should not be of great concern.
[18] The data for Taiwan are taken from Beck et al. [1999].
[19] Summary statistics and additional sample description are available from the author upon request (see Appendix).
[20] On this, see also Beck et al. [2000] and Acemoglu et al. [2001, 2002].
[21] Just consider, for instance, the literature related to Fazzari, Hubbard, and Petersen [1988]'s attempt at identifying firms' financing constraints.
[22] For more on these issues, see Glaeser and Shleifer [2001], and Rajan and Zingales [2001].
[23] The analysis by Hall [1999] supports this at least for the post-war period and contingent on the endogenous investment hypothesis.