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Finance and growth: a macroeconomic assessment of the evidence from a European angle

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EUROPEAN CENTRAL BANK

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WORKING PAPER SERIES

NO 787 / JULY 2007

FINANCE AND GROWTH

**A MACROECONOMIC
ASSESSMENT OF THE
EVIDENCE FROM A
EUROPEAN ANGLE**

by Elias Papaioannou



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by Elias Papaioannou ²



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ABSTRACT

This paper reviews the literature on the finance-growth nexus within a neoclassical growth framework, placing an emphasis on the policy implications in the current European environment, that has placed financial reforms high on the policy Agenda. While more research is needed to establish causality and verify the theoretical channels linking access to finance and growth, firm-level, industry-level, macro, and country-specific studies all tend to show a significant correlation between financial efficiency and economic performance. The empirical evidence hint that in underdeveloped and emerging countries financial development fosters aggregate growth mainly by lowering the cost of capital, while in advanced economies by raising total-factor-productivity.

JEL classifications: G00, O00

Keywords: Finance; Financial Institutions; Development; Growth Decomposition; Financial Intermediation; Europe; Productivity.

Non-technical summary

This paper reviews the empirical literature on the finance-growth nexus placing an emphasis on the policy implications of this work in the current European environment that has placed financial sector reform high on the policy agenda. The review also focuses on the key issue of causality between financial efficiency and growth, employing a relatively standard growth accounting framework

First I present a simple growth accounting framework that decomposes aggregate growth into capital deepening, human capital accumulation and total-factor-productivity growth. This appears useful in discuss recent empirical research that investigates the effect of efficient financial intermediation (financial development/modernization) on aggregate economic performance. It also helps interpret the results of the finance literature within a well-understood conceptual framework.

Second, the survey summarizes the evidence from the cross-country work that investigates the conditional correlation between various proxy measures of financial development and growth. This strand of research suggests that growth and finance correlate significantly both across countries and over time. In addition financial sector reforms tend to be followed by higher investment and growth.

Third, the survey discusses recent studies that employing a more micro perspective use industry-level data across countries. These studies are becoming increasingly popular, because they enable a closer study of the theoretical channels on how financial development affects aggregate growth. Using industry-level data also assuage (though not fully resolve) some important limitations of standard cross-country growth regressions (such as multicollinearity; reverse causation). This work shows that financial development exerts a disproportionately positive effect on external-finance dependent sectors and industries that face good growth opportunities (due to some technological advances for example).

Fourth, the review summarizes event studies that quantify the effects of banking deregulation in the United States and some other developed countries. These

studies make a crucial step in the causality-front. In addition this work is quite useful in understanding exactly how the finance-growth link operates.

Overall the evidence hints that financial development fosters growth both through a spur in investment and an efficiency/productivity channel. The empirical results also hint that the former capital accumulation channel is particularly important for underdeveloped and emerging countries, while the latter productivity channel is mostly relevant for advanced countries. However more work is needed to push on causality and identify exactly through which mechanisms efficient financial intermediaries contribute to economic growth.

1 Introduction

Recent research has provided compelling evidence that financial development exerts a significantly positive effect on economic growth. Ross Levine (2005) provides a thorough review of both the theoretical and empirical work linking the depth and breadth of capital markets to economic performance.¹ The current study aims to be complementary to Levine's extensive review. It does so by trying to place the recent empirical evidence in a growth accounting macro framework.² Not only this appears quite useful in understanding how the finance-growth nexus works in a standard neoclassical model frame, but also helps to reveal the theoretical channels on how finance contributes to economic performance. Starting from a general macro structure also helps us to discuss issues related to causality, which is of course key for both research and policy. In addition the current study assesses the evidence from a European standpoint, exploring how financial sector reforms which are an important component of the Lisbon agenda, can contribute to EU productivity growth.³

The survey starts by laying down a growth accounting framework that helps to understand the main channels of financial development's effect on aggregate growth. Starting from a neoclassical production function aggregate country-level growth is decomposed in capital deepening (investment), human capital accumulation (education) and total-factor-productivity (the Solow residual, which measures how effectively physical capital and labour is employed in production). The growth decomposition enables us to study the distinct effects of financial markets efficiency on the three main components of aggregate growth. This framework is also useful in understanding whether financial development speeds up convergence to steady-state growth or whether it promotes long-run growth.

Second, the survey summarizes the evidence from the cross-country empirical work. This work, which was initiated with the King and Levine (1993) study, investigates the correlation between various indicators of financial development and aggregate country-level growth rates over the past decades. The overall message of this work is that various indicators of financial development explain a significant part of the overall variation in growth rates. Recently, however, the cross-country growth regressions have been criticized, mainly because the results appear quite sensitive to small model permutations (e.g. Levine and Renelt, 1992; Sala-i-Martin, 1997; Sala-i-Martin, Doppelhofer, and Miller, 2005; Ciccone and Jarocinski, 2006). Thus, in this Section, I also discuss before-after event studies that quantify the growth and investment effects of financial liberalization policies. Although these studies focus mainly (though not exclusively) in developing countries, they push forward on the causality front by quantifying the macroeconomic effects of discrete policy changes, controlling for unobserved country heterogeneity and common global trends.

¹ See Levine (2003, 1997) for shorter reviews.

² Therefore the current study does not cover in detail the work that links financial modernization with risk sharing, output volatility or international specialization. In addition the current review does not go over micro firm level studies that assess the effect of well-developed financial markets in relaxing firm's financial constraints.

³ Of course the current review also covers the last two years of research on the field.

In Section 3, I discuss work that takes a more micro perspective using industry-level data. Following the influential study of Rajan and Zingales (1998) cross-country industry-level studies have become popular, mainly because they assuage many of the limitations of cross-country work (such as omitted variables, reverse causation and multi-collinearity). These studies also enable a closer study of the theoretical channels on how financial development affects aggregate growth.

In Section 4, I review event studies that quantify the effects of banking deregulation and access to finance mainly in the United States, but also in some other developed countries, such as France and Italy. These studies fit in a recent trend in development economics to exploit quasi-natural (policy) experiments to move on causal inference. Besides providing more accurate estimates, this strand of the finance and growth literature is also the most relevant for the ongoing process of EU financial integration.

Section 5 summarizes.

2 Theoretical Channels in a Growth Accounting Framework

2.1 Growth Accounting

Following Francesco Caselli's (2005) recent study on development accounting, growth accounting asks "*how much of the variation in income growth can be attributed to differences in (physical and human) capital accumulation, and how much due to changes in the efficiency with which capital is used.*" Growth accounting provides thus a useful analytical tool to assess how various factors, such as government policies, institutions, natural resources, and to our context financial intermediation affect the main sources of economic growth (e.g. Barro, and Barro and Sala-i-Martin, 1995). For example, do financial development fosters growth, by mitigating capital market frictions and fostering investment in education, as in Galor and Zeira's (1993) model? Or the effect of financial development work primarily by lowering the cost of capital and thus spurring investment, as in most neoclassical theories? Or do efficient financial intermediaries spur growth through productivity, for example by channelling resources quickly to the most productive entrepreneurs, firms, and sectors?

Growth accounting starts with specifying a general country level (neoclassical) aggregate production function (e.g. Mankiw, Romer, and Weil, 1992):

$$(1) \quad Y_{i,t} = AK^\alpha(Lh)^{1-\alpha}.$$

This simple production function relates aggregate country (i) output Y in period (year) t to the aggregate capital stock K , the labor-force L , which in the above specification is adjusted for the average human capital of workers (h), and the level of technology A (which in (1) enters in a "Hicks-neutral" way). α and $1 - \alpha$ measure the share of capital and quality adjusted labor in the

aggregate economy (under constant returns to scale the shares sum up to one). We can express the production function in per worker terms (intensive form):

$$(2) \quad y = Ak^\alpha h^{1-\alpha}.$$

Differentiating (2) over time we get:

$$(3) \quad \dot{y}/y = \alpha\dot{k}/k + (1 - \alpha)\dot{h}/h + \dot{A}/A.$$

Equation (3) partitions output growth per worker into three parts: The first term in the right-hand-side captures capital deepening (investment), the second term human capital accumulation (education) and the third term total-factor-productivity, which measures how efficient capital and labor are employed in the production.

From our standpoint two issues need to be emphasized: First, in this framework technical change is measured as a residual (the so-called Solow residual) and thus includes all factors not related to education or physical capital investment. Second, in almost all theories education and investment are endogenous factors, and thus equation (3) represents just an analytical device to decompose the sources of growth than a structural estimation that links growth to its deep fundamental determinants.

2.2 Placing Theory in Growth Accounting

It is useful to categorize theoretical work on how financial intermediation fosters growth into this framework.⁴

In standard neoclassical theories investment-savings is the engine of growth. In these models there are no capital market frictions and thus financial intermediation is not explicitly modelled. However these models assume that savings translate directly to investment and thus one could argue that finance affects growth primarily through capital deepening (investment).

A different class of theoretical models argues that financial development may foster growth by raising human capital accumulation. In Galor and Zeira (1993) model income inequality and credit market frictions impede growth, since not all individuals can invest in education. They argue thus that financial intermediation can spur growth (and eventually decrease inequality) by fostering human capital accumulation.

⁴This Sub-Section does not intend to cover the vast theoretical literature on the impact of financial intermediation on growth. It just covers some theoretical work to illustrate how the growth accounting framework can help move from theory to estimation.

Most theories on financial intermediation and growth stress the beneficial effects of well-developed capital markets for innovation and productivity. For example Joseph Schumpeter (1911) argued that financial intermediaries promote growth by selecting entrepreneurs with most innovative and productive projects. In the same vein Walter Bagehot (1873) emphasized the importance of banks and capital markets during the Industrial Revolution in the United Kingdom in channelling funds in sectors with high innovation and high growth prospects.⁵

A *a priori* financial modernization effect on productivity looks as the most relevant channel for Western European and other developed countries, which are capital abundant. In contrast the capital deepening channel appears mostly relevant for emerging and underdeveloped economies that lack capital to finance investment projects and education.

It should be stressed, however, that not all theoretical work can fit easily in the simplified growth accounting framework, since many models yield an effect of financial intermediaries in both productivity and (human and physical) accumulation. Take for example the important contribution of Acemoglu and Zilibotti (1997). They build an endogenous growth model, where capital is scarce, investment projects have an indivisible part (for example because of minimum size requirements or start-up costs), and agents dislike risk model. Under these weak (and realistic) assumptions Acemoglu and Zilibotti show that financial underdevelopment will yield both slower physical capital accumulation and lower productivity, because agents will prefer investing in low risk low return projects rather than undertake the most profitable opportunities.

2.3 Estimation

Building on (3) and (1), most empirical cross-country growth analyses of the effect of financial development on growth estimate variants of the following regression equation.

$$(4) \quad \Delta \ln y_{i,t} = \beta \ln y_{i,t-1} + \gamma \Delta \ln h_{i,t} + X' \Phi + \lambda F D_{i,t} + \varepsilon_{i,t}$$

The dependent variable is per capita GDP growth rate. The set of explanatory variables usually includes:

- The initial log level of income ($\ln y_{i,t-1}$). The standard prediction of neoclassical models is that growth rates will be higher the further away a country is from its steady state. If the country is far away (poor), then the return to capital will be higher, and consequently through enhanced capital accumulation, there is going to be higher growth. [Alternatively one could replace in the estimation equation the convergence term with physical capital accumulation $\Delta \ln K_{i,t}$ (e.g. Benhabib and Spiegel, 2000)]. In line with the neoclassical prediction most

⁵See Greenwood and Jovanovic (1990) and Acemoglu, Aghion and Zilibotti (2006) for recent reformulations of these arguments.

studies yield a significantly negative β coefficient on the convergence term, once other factors that drive growth, are accounted for.

- A proxy variable of human capital accumulation, such as changes in schooling or education enrolment rates (probably adjusted for the quality of education).
- The set of explanatory variables (X') also includes other controls, such as institutional quality, geography, government policies, trade openness, human capital level, that aim to account for cross-country differences in productivity.
- The focus of the analysis is on the coefficient (λ) on a proxy measure of financial development (FD).

The literature started estimating variants of equation (4) using cross-sectional approaches, averaging growth rates, financial development proxies and the other controls over the 1960-1990 period. Since growth rates are quite volatile research wanted to first identify the long-run effects of financial development departing from short-term business cycle fluctuations. Second, the literature used panel techniques using averaged data over ten or five-year periods. The main merit of this work is that it can account for unobserved time-invariant country effects and common global (or regional) trends. This is done by modelling the error in (4) as having a country time-invariant and a general period component, i.e. $\varepsilon_{i,t} \equiv \eta_i + \vartheta_t + \nu_{i,t}$. Third, recent studies employ dynamic panel techniques working with annual frequency data. The main benefit of these studies is that by properly modelling growth dynamics, one can estimate both the short and the long run effects of financial development on growth.⁶

3 Cross Country Studies

3.1 Overall country-level effect of finance on growth

Studying the long-run cross-country correlation between financial development and aggregate growth was the first step in the empirical work. [Table I summarizes the main cross-country growth studies.]

3.1.1 Cross-Sectional Evidence

In an early contribution King and Levine (1993) employed Robert Barro's (1991) cross-country cross-sectional regression framework (equation (4)) to investigate the effect of various proxies of financial development in explaining variation in cross-country growth rates. Given (theoretical and conceptual) difficulties in measuring properly capital markets breath and depth King and Levine

⁶Durlauf, Johnson and Temple (2005), Temple (1999), and Dulauf and Quah (1999) provide eloquent reviews of the cross-country growth literature, addressing the main merits and disadvantages of the employed techniques. Hauk and Wacziarg (2004) use Monte Carlo simulations to compare the efficiency of the various estimation techniques.



employ four different measures of financial development (FD in (4)): (i) Financial system's liquid liabilities as a share to GDP; (ii) Commercial bank credit plus central bank's assets to GDP; (iii) Credit to the private sector relative to GDP; and (iv) The ratio of claims to non-financial private sector to aggregate domestic credit. King and Levine use averaged data from 77 industrial, developing and underdeveloped countries in the period 1960-1989. Their first set of results is that there is a significantly positive correlation between all four proxy measures of financial development and economic growth. This result appears robust to different controlling sets and model perturbations. Yet this correlation does not establish causality, because capital markets may increase lending and expand credit in periods of fast growth. Thus King and Levine also use initial values of the financial development proxies in a *post hoc, ergo propter hoc* approach. Due to data unavailability on the financial development indicators in the early sixties, these models were performed to a sub-set of 57 countries. The evidence reveals that initial levels of financial development can explain a significant part of sub-sequent growth (around 60% of the overall variation).

Using different proxy measures of financial development and working in different samples, subsequent studies have likewise produced similar results, strengthening the robustness of finance-growth nexus in a wide cross-section of countries. Quantitatively, the long-run effect of financial development appears large. For example the estimates imply that if Belgium (which had an average private credit to GDP ratio of 25%) were to reach the level of financial development of the Netherlands (with a private credit to GDP ratio of 85%) annual growth would increase by 3 percent. However recent work provides more conservative estimates of around 0.5 to 1 percent (e.g. Favara, 2003).

The next step was to follow the growth decomposition approach summarized in Section 1 and break down overall growth in investment, human capital accumulation and total-factor-productivity (TFP) growth. The cross-country growth decomposition studies hint that financial development fosters growth mainly by increasing TFP and to some lesser extent by fostering investment in physical and human capital (King and Levine, 1993; Levine *et al.*, 2000b; Benhabib and Spiegel, 2000).

Subsequent work investigates which features of the financial system are key for fostering growth. Levine and Zervos (1998) examine whether banking sector or capital market development contribute the most. They do so by augmenting otherwise prototypical growth regressions (4) with proxy measures of banking and equity markets development. The cross-section growth regressions hint that both banking sector development and stock market liquidity have independent positive effects on economic growth. These results are also related to a distinct (theoretical and empirical) literature on whether a bank-based or a market-based system is the most efficient (see Levine, 2002, and Tadesse, 2003 for some new insights). These results suggest that the type of the financial system is of secondary importance in the development path. These results add to other empirical work (e.g. Beck and Levine, 2002) that supports the middle-ground "*financial functions view*". What is key for growth is the existence of liquid and efficient financial intermediaries, irrespective of whether there are equity markets or banks. In addition, the Levine and Zervos findings hint that equity

markets and banks exert complementary services to the economy. From a European standpoint this evidence is important, since it shows that both the Continental European paradigm of bank-based finance and the British system of arm's length finance can stimulate growth.

La Porta, Lopez-de-Silanes, and Shleifer (2002) move away from size measures of financial depth and explore the effect of a particular aspect of the financial system, state ownership of the banking sector, in economic growth. Their cross-country regressions (equation (4)) show that state ownership and control of the banking sector in the late-sixties early-seventies is associated with slower subsequent growth. The authors also decompose aggregate growth and explore the effect of state ownership in subsequent capital accumulation (and savings) and productivity growth. State ownership of banks has a small and usually insignificant effect on future investment, but a large impact on future productivity growth. This result appears very robust; quite importantly it retains significance even when the authors control for the initial size of the capital markets and other institutional quality controls. The La Porta *et al.* (2002) evidence are supportive to so-called political "public-choice" theories of state control, according to which state intervention to credit leads to resource misallocation. Their results contradict "*development*" theories of state ownership that emphasize the positive effect that government can have in banking, for example by mitigating negative externalities, encouraging risk-taking investment, financing strategic sectors, etc.⁷

In a recent paper Aghion, Howitt and Mayer-Foulkes (2005) investigate whether financial development increases steady-state growth rates (as the cross-country work suggests) or whether it speeds up convergence to the technological frontier. The authors estimate otherwise standard cross-country growth and productivity regressions (of the form of (4)), augmented however with an interaction term between initial distance to the technological frontier [the ratio of domestic GDP to the US GDP] i.e. augmenting (4) with an interaction between $FD * (y_{i,t-1}/y_{us,t-1})$. Using various techniques (OLS; IV with legal origin; and dynamic panel methods) they show that the coefficient on the finance-initial relative GDP interaction is highly negative and significant. In addition the coefficients on initial relative GDP (which aims to capture for the well-documented conditional convergence effect) and financial development are positive, although not always statistically significant. These results show that financial development is highly beneficial for converging to the technological frontier. The results imply that countries above some critical level of financial development should converge in growth rates and that in such countries finance has a positive but eventually vanishing effect on steady-state GDP.⁸

⁷See also Sapienza (2004), Dinc (2006), and Papaioannou (2005) for further evidence supporting public-choice political theories. Using detailed individual loan contracts from Italy, Sapienza (2004) shows that the lending behavior of state-owned banks is affected by the electoral results of the party affiliated with the bank. Analogously Dinc (2006) shows that political motivations rather than profit-maximization drive the lending practices of state-owned banks in many developing countries. Papaioannou (2005) presents panel evidence that in countries where the state controls a significant part of the banking sector there is less international bank lending.

⁸Building on Schumpeterian growth models of technological innovation (see Aghion and Howitt, 2006, for a review), recent work by Philippe Aghion and Peter Howitt has employed the cross-country growth regression framework to identify specific channels how financial development influences growth. This work uncovers interesting interactions between financial development and macroeconomic factors in explaining country growth rates. This work is summarized by Philippe Aghion in another chapter and thus not covered here.

3.1.2 Caveats

It is, however, quite hard to establish causality with cross-country cross-sectional regressions, for a number of reasons:

First, it is almost impossible to account for all possible factors that may foster growth. This is because we have reliable data for a maximum of a hundred countries, while there are more than fifty variables that one could reasonably argue that they exert an effect on growth. In addition countries that perform well tend to have not only well-developed financial systems, but also educated work-force, are politically stable, have uncorrupted government, score high in institutional quality indicators, etc. Multicollinearity among the regressors thus makes it very hard to isolate the effect of the various independent variables on economic growth (e.g. Mankiw, 1995). It comes thus as no surprise that only a few variables emphasized as significant growth determinants have been found to be robust to alternative conditioning variables (e.g. Levine and Renelt, 1992; Sala-i-Martin, 1997; Sala-i-Martin *et al.*, 2005). Moreover even small model permutations (for example using GDP data from different sources or using updated series) yield sizable differences in both the statistical and economic significance of the estimates (Ciccone and Jarocinski, 2006).⁹

Second, the effect of financial development may be quite heterogeneous across countries. For example Aghion *et al.* (2005) have shown that efficient financial intermediaries are more useful in countries that are far from the technological frontier. In addition one could argue that financial development may be more growth enhancing in human capital rich countries or when the country is open to international trade. The cross-country work imposes a same slope for financial development across all countries and years. It has been long argued in the empirical growth literature that this might yield distortions in the estimates, because the effect of finance may not be homogenous across regions and countries (see for a discussion on the work on parameter heterogeneity in growth regressions, Durlauf, Johnson and Temple, 2005 and Durlauf and Quah, 1999).

A third drawback is potential reverse causation. Financial development can be both the cause and the consequence of economic growth. Thus the significant association between financial modernization and growth may be driven by economic growth fostering bank or stock market development. Thus although using initial values of financial development is a significant step towards causality, there are still non-negligible endogeneity concerns. The employed financial development proxies, such as market capitalization, may increase in anticipation of future productivity growth.

Third, there are non-trivial data issues. The employed financial development proxies, (mainly private domestic credit to GDP and market capitalization and turnover as a share to GDP), are rather coarse and not theory-driven proxies of financial intermediaries' efficiency. Ideally one would want to use indicators that follow closely the theoretical channels on how finance contribute to growth (i.e. using financial accessibility indicators). It is unclear how measurement error will affect the estimates. On the one hand if there are no systematic biases in the measurement of capital

⁹Quite surprisingly financial development is missing from the studies on the robust determinants of growth.

markets and banking sector size as well as the other controls such noise should make empirical researchers not detect a significant correlation. Attenuation bias, although not desirable, would imply that the estimates of these studies were conservative. Measurement error however may yield inflated estimates on financial development proxies, if the other controls are also contaminated with error.¹⁰

Fourth these studies pool all countries (industrial, emerging and underdeveloped) in the estimation. Although this is the most efficient way to estimate the empirical model, parameter heterogeneity is non-negligible concern. For example employing dynamic panel techniques designed to account for parameter heterogeneity, Favara (2003) provides compelling evidence of sizable differences in the effects of financial development on growth. To a great extent the finance-growth nexus is driven by the huge variation in economic performance and financial development between the developed and the developing world (and also among under-developed countries). Although many studies exclude for robustness African countries from the estimation, the finance-growth correlation turns weaker (and not seldom statistically insignificant) in the more homogeneous but much smaller group of high-income (or OECD) countries. It is often hard to say whether the statistical insignificance results from the low number of observations available for these countries or from the absence of effects by crude indicators of financial development in them.

3.1.3 Instrumental Variables, Time-Series and Panel Studies

Recent research has tried to address these caveats and push for the causal interpretation of the finance-growth association.

At the empirical side, the literature has employed panel techniques that enable researchers to control for time-invariant unobserved country characteristics that may be the deep determinants of both long-term growth and financial development (e.g. efficiency of the legal system or trust).¹¹ Fixed-effect panel techniques examine the effect of increases in bank credit or market turnover on economic growth. Thus these studies are less prone to endogeneity concerns. Employing various panel techniques Levine *et al.* (2000a,b), Benhabib and Spiegel (2000) and Beck and Levine (2004), among others, show that improvements in financial liquidity are followed by higher growth.¹²

To account for parameter heterogeneity Loyaza and Ranciere (2006) employ the dynamic panel

¹⁰To see this clearly assume a standard growth regression with only two regressors, finance and human capital, proxied by education. If human capital is measured with error (because human capital is not only education, but also on the job-training, quality, etc.), while financial development is not, because the two variables are positively correlated, the coefficient on financial development will capture (part of the effect) of the mis-measured human capital proxy (see Mankiw, 1995 and Krueger and Lindahl, 2001, for a more elaborate discussion).

¹¹Most panel studies on finance and growth have employed the GMM dynamic panel techniques developed by Arellano and Bond (1991), Blundel and Bond (1998) and Arellano and Bover (1995). See Bond, Hoeffler and Temple (2001) for a discussion of these methods in empirical cross-country work on growth.

¹²A problem with the dynamic panel techniques is that they are quite sensitive to even small model permutations (see Hauk and Wacziarg, 2004 for general assessment of panel techniques in the context of growth econometrics. Favara, 2003, indeed shows that the evidence from the dynamic panel techniques are sensitive.)

pooled mean group estimator, developed by Pesaran and Smith (1995) and Pesaran, Shin and Smith (1999). Besides general fixed-effects (that control for time-invariant unobservable characteristics), this technique allows for short-run heterogeneous country effects, while it constraints the long-run effect of the regressors to be equal across the panel. The main benefit of using this technique is that it allows for financial development to have differential effects across countries. The main result of the paper is that although there exists a significantly positive long-run relationship between financial development and growth, in the short-run this relationship turns negative for many countries. This finding adds to the cross-country results on a significantly positive long-run effect of financial intermediation on growth, but at the same time shows that fast-expanding credit can lead to financial crises and slower growth.¹³

Time-series studies have studied the finance-growth relationship mainly employing Granger-causality tests in a vector autoregression framework (e.g. Arestis and Demetriades, 1997). This work shows that the finance growth relationship is driven by both factors affecting each other. Thus although these studies do show that financial intermediaries development contributes to growth, they illustrate the issue of reverse causation. From a European standpoint quite important is the work of Rousseau and Wachtel (1998), who, using data from five industrial countries (namely the U.S., the U.K., Canada, Norway and Sweden) over the 1870-1929, show that the finance-growth nexus is mainly driven by financial intermediation variables affecting growth.

To further address endogeneity and measurement error the literature has also searched for exogenous variation (instruments) in financial development. Building on the law and finance literature (La Porta *et al.*, 1997, 1998, 1999), Levine *et al.* (2000a,b) use the family of a country's legal system to extract the exogenous (historically predetermined) component of financial development on growth.¹⁴ They, as well as subsequent instrumental variables (IV) studies, show that the finance-growth nexus retains statistical significance. The IV studies further alleviate (although do not minimize) concerns that financial liquidity may simply reflect anticipated future growth or may be the consequence of overall economic performance.¹⁵

To address measurement error the World Bank, the OECD and the ECB are currently constructing detailed indicators of the efficiency of the banking system, the liquidity of capital markets and the regulatory and legal environment for a large sample of countries. This work also builds on the work of Beck, Demirguc-Kunt and Levine (2000) on the construction of the Financial Sector Database. It also follows the influential work of La Porta *et al.* (1997, 1998, 1999) and Djankov *et al.* (2003, forthcoming), who have constructed cross-country indicators that measure corporate governance practices and the overall efficiency of the legal system. Employing detailed indicators

¹³The main problem of this work is that the efficiency of employed dynamic panel technique depends crucially in having a long time span (to properly model the short and the long-run effects). In addition this approach is quite sensitive to outliers and small model permutations (see Favara, 2003).

¹⁴See Beck and Levine (2005) for a review of the law and finance literature.

¹⁵The main problem of these IV approach is that legal origin may affect economic growth through other channels, for example via regulation. In this case the IV estimates, which are typically higher than the OLS coefficients, will be the upper bound of the true effect of financial development (see Acemoglu and Johnson, 2006).

of financial system's functions is key for the identification of the theoretical functions of financial intermediation. For example equity market features, such as venture capital (VC) and private equity investment may be more important for productivity and innovation, while bank-financing may be more important for capital accumulation, especially in early stages of development. In addition specialized financing products (such as standardized student loans that are quite common in the U.S.) may be important for human capital accumulation.

3.2 Event studies of the effects of financial liberalization

A somewhat distinct cross-country work quantifies the growth effects of financial liberalization policies mainly in emerging economies. Peter Blair Henry (2003) and Bekaert, Harvey and Lundblad (2003) provides brief summaries of this work. These event studies address some important limitations of the purely cross-country work (discussed above), such as omitted variables and unobserved country heterogeneity. This is because these studies compare the evolution of growth and investment in countries before and after financial sector reforms. Although these studies might not look particularly relevant in assessing the productivity and growth differences among developed countries, such as the US, the UK or euro area countries, they are particularly relevant for the new EU member countries that are expected to join the monetary union in the future. This work strengthens the robustness of the cross-country finance-growth correlation and most importantly push forward on the causality front.

Bekaert, Harvey and Lundblad (2001, 2005) study almost all countries that removed capital account restrictions in the period 1980-2000 (including many current EMU members and other high-income countries). They show that (controlling for country fixed-effects and general time trends) these policies resulted in an overall increase of the annual per capita GDP growth of approximately half to one percent. The authors also perform two important checks to advocate the causal interpretation of their results. First, they show that this effect is robust to controlling for other reforms (such as privatization, trade liberalization, product market deregulation) that usually coincide with financial reforms. This gives more confidence that the estimates are not capturing other liberalization policies that are typically in the same policy agenda. Second, they control in their empirical model for future country-level growth opportunities, using the country's industrial mix. This test is also important, because countries may liberalize their financial system when growth prospects for their products are favorable.¹⁶

Although these studies do not decompose growth (into productivity, physical and human capital accumulation), parallel work by Henry (2000, 2001, 2003) on 12 Latin American and East Asian countries that liberalized their financial system in the eighties suggests that this growth effect stemmed mainly from increased investment (rather than TFP growth). Specifically both the macro (Henry, 2000, 2001) and the firm-level studies (Chari and Henry, 2004a) show that liberalizations

¹⁶Bekaert et al. (2001, forthcoming) also provide some (weaker) evidence that financial reforms have a larger impact when countries have an educated workforce and proper legal system enforcement of investor rights.

yield an overall fall in the cost of capital. The consensus in the academic research community seems to be that this fall was on average around 100 basis points. Yet there is a wide range of estimates from 20 to 200 basis points on stock returns around liberalization episodes. Firms with good growth prospects and firms that foreign investors can easily invest in (e.g. as they are quoted on the stock market) experience the highest stock returns and invest the most after the reforms. Using detailed firm-level data from 28 (mainly developing) countries that liberalized their capital markets in the last decade Mitton (2006) finds that stocks that are open to foreign investors experience higher sales growth, greater investment, greater profitability, greater efficiency, and lower leverage. The increase in sales growth and in the proxy of labour productivity is estimated to be around 1.5 to 2.0 percent.

The application of these figures to the EU has to be considered cautiously, as at least most old member states have conducted such liberalizations already a long time ago. Yet these studies suggest that new member states and accession countries may benefit significantly from liberalized financial systems that are integrated with world financial markets, e.g. by speeding up their convergence in income levels to the levels observed for old EU member countries.

3.3 Summary Cross-Country Regression Evidence

The main result of the cross-country work is that many (though rather coarse) proxies of both banking and securities market development (such as bank credit to GDP or stock-market liquidity) are positively correlated with overall per capita output growth. In spite of the general drawbacks of cross-sectional studies this result appears quite robust (see however Favara (2003) for a more critical appraisal). Instrumental variable studies and dynamic panel approaches have further strengthened the finance-growth nexus, while event studies of financial liberalization policies mainly in emerging economies have pushed ahead on the causality front.

4 Industry-level Analyses

The literature has recently been moving away from purely cross-country to within-country cross-industry approaches. These studies were developed to assuage some of the limitations of the cross-country models, such as omitted variable, reverse causality and multi-collinearity (Rajan and Zingales, 1998). In addition this more micro approach enables researchers to shed light on the theoretical mechanisms of how finance contributes to economic growth. They are thus becoming increasingly popular in other fields of development economics.¹⁷ [Table II summarizes the main industry-level studies.]

¹⁷For example Perotti and Volpin (2004), Fisman and Sarria-Allende (2004), Klapper, Laeven and Rajan (forthcoming), Ciccone and Papaioannou (Forthcoming) use this method to assess the effect of product market regulation on entry. Ciccone and Papaioannou (2005) employ this approach to explore the impact of human capital on growth, while Acemoglu, Johnson and Mitton (2005) to study the effect of contractual institutions on vertical integration.

4.1 Financial development and industry reliance on external finance

In a highly influential paper Rajan and Zingales (1998) proposed a cross-industry cross-country approach that addresses many of the limitations of the purely cross country work (discussed in section 2). Specifically Rajan and Zingales scrutinized that if better developed financial intermediaries help overcome market frictions that drive a wedge between the prices of external and internal finance, then industries that are naturally heavy users of external finance should benefit disproportionately more from financial development compared to other industries. Rajan and Zingales proposed a two-step approach. First, using US financial statement data, the authors construct an industry-level measure of reliance on external finance. Second, using cross-country industry data they test whether sectors that rely more on external finance tend to grow faster. Using data for 41 countries and 36 manufacturing industries in the eighties Rajan and Zingales find strong evidence in favour of this hypothesis.

Besides being closer in theory the appealing feature of the Rajan and Zingales approach is that it controls for both country and industry fixed-effects. Country fixed-effects assuage critique that other than finance country-level features, such as human capital, institutional quality, trust are driving the results. Industry-fixed effects account for differences in overall productivity across sectors.¹⁸

Subsequent studies confirmed the stronger positive effect of financial development for the growth of industries that depend relatively more on external finance. For example, Claessens and Laeven (2003) show that the differential effect of financial development on sectors that rely on external finance is robust to accounting for the effect of sound property rights institutions on intangible-intensive sectors. Braun (2003) shows that financial development is particularly useful for intangible-intensive and R&D-intensive sectors. Guiso, Jappelli, Padula and Pagano (2005) also show the disproportional impact that financial development exerts on the growth of industries which are more dependent on external finance in a much larger sample of 65 countries (that also covers the 1980-1995 period). Guiso *et al.* also perform two simulations to quantify the potential effect of financial development in the EU. First they assess what would be the growth effect (at the industry and the country level) if the EU was to reach the level of financial development (defined as the sum of domestic credit and stock market capitalization over GDP) of the US and/or the level of the Netherlands (the country with the highest measure of financial development in the EU). Second, acknowledging that financial development is itself promoted by well-protected investor rights and an efficient legal system, they simulate what would be the country/industry effects if institutional reforms were to improve on a similar scale. Their simulations provide three insights:

¹⁸Rajan and Zingales also include in their empirical model the initial share of the industry to total manufacturing value added. This variable controls for international specialization; for example financially developed countries may specialize in capital - intensive sectors that require a lot of external finance. For studies linking financial development and the pattern of international trade, see Beck (2002), Levchenko (2004) and Manova (2006).

- Averaging across all countries and sectors, the overall effect on annual value added growth if the EU were to reach the US level of financial development is 0.7 percent for overall and 0.9 percent for manufacturing growth.
- Countries that score lower in the measures of financial development would be the biggest gainers (growth effects exceeding one percentage point). This group includes Greece, Ireland, Portugal, Spain, Italy, Belgium, Denmark and to a somewhat lesser extent Germany.
- Industries that depend on external finance (such as pharmaceuticals or professional equipment) would experience the highest increase in value added.

This evidence are further supported by the recent work of De Serres *et al.* (2006). Using data that cover OECD economies in the nineties De Serres *et al.* likewise show that external finance sectors grow faster in financially developed countries. The authors also investigate exactly which features of the financial system are the most important. Their regressions show that state ownership of banks and entry barriers to banking appear to be the most significant impediments to growth and entry.

4.2 Financial development, capital reallocation and sector growth opportunities

Recent work has also linked financial development with the ability of industries and countries to exploit global growth opportunities. The main hypothesis, which dates back to Walter Bagehot (1873) and Joseph Schumpeter (1911) is that efficient financial institutions speed capital reallocation to sectors that are anticipated to grow faster and thus face better investment prospects (see Rajan and Zingales, 2003, for modern exposition).

Fisman and Love (2004a) employ Rajan and Zingales (1998) cross-country cross-industry framework to test whether financial development exerts a disproportional impact in industries that face good growth prospects. After proxying global sector growth opportunities with sales growth in the US, Fisman and Love show that financially developed countries experience faster value added growth in the sectors which grow faster in the US. Using a somewhat different approach Fisman and Love (2004b) find that industry value added growth patterns are more closely correlated for country pairs with similar levels of financial development.

Ciccone and Papaioannou (2006) build a multi-sector world equilibrium model that formalizes the Schumpeterian capital reallocation hypothesis. In response to sector-specific global technological, relative price and demand shocks industries have to adjust their optimal investment. Countries with relatively frictionless financial markets sectors that face high demand or experience technical progress are able to attract the necessary capital. However in financially underdeveloped countries capital moves only slowly to sectors with high prospects. Using industry-level data from 28 manufacturing industries in a wide cross-section of 67 countries in the eighties, Ciccone and Papaioannou (2006) show that in financially underdeveloped countries there is a wide wedge between actual and optimal-target capital investment. This suggests that finance fosters productivity by

swiftly re-allocating resources to sectors with good global investment prospects. Besides various other sensitivity checks, the authors also show that the economic importance of the capital reallocation hypothesis increases when they account for measurement error in future sector opportunities.

4.2.1 Alternative approaches using industry data

Wurgler (2000) also studies the effect of financial markets size in allocating capital to sectors with good prospects. His analysis also proceeds in two steps. First, using manufacturing data in 65 non-socialist countries over the period 1963 – 1995, he constructs country-level indicators of the responsiveness of sectoral investment to value added growth. He does so by regressing country-by-country industry investment growth on value added growth. Neglecting issues of endogeneity and data quality and under the assumption that current output growth is proxy for future productivity, Wurgler's idea is that investment should be more responsive to output in financially advanced countries. Second, Wurgler examines whether, conditional on various other country characteristics, countries with larger capital markets display greater investment responsiveness to value added growth. Although this approach requires many a priori restrictive assumptions, it has become quite influential because it is quite intuitive (see also Almeida and Wolfenzon, 2005). If well-developed financial systems foster aggregate productivity, then in financially advanced countries investment should be more correlated with output. The cross-country regressions show that financial development can explain a significant part of the variation in the investment-output elasticity.¹⁹

Bekaert, Harvey, Lundblad and Siegel (forthcoming) also examine the role of financial development and market integration in enabling countries to exploit growth opportunities. Country growth opportunities are estimated by combining the country's pattern of industrial specialization with indicators of global industry growth opportunities (proxied by average price-earnings ratios across countries). Their dynamic cross-country panel regressions reveal four main results:

- First, industry global market opportunities weighted by domestic country-industry output mix predict growth in both developed and emerging countries.
- Second, the authors find that in countries that are financially “open” (integrated) to foreign investment, firms manage to better exploit the available (global) growth opportunities.
- Third, they find some evidence (albeit weaker) that countries with more liquid financial markets gain more from positive global shocks to the industries they specialize in.

¹⁹Building on Wurgler's approach in ongoing work Ciccone and Papaioannou (2007b) use updated data (that span the period 1963–2002) and construct county-level investment-output elasticity measures that isolate the intersectoral investment responsiveness. The authors then show that investment in expanding industries is greater in countries with larger capital markets. This continues to be the case when one focuses on increases in capital market size due to lower government bank ownership, stricter insider-trading legislation, and more efficient legal systems. These results are robust to alternative estimation techniques, outliers, and additional controls. Quite interestingly from a European standpoint the strong correlation between capital markets size and the intersectoral investment responsiveness is also present even in the group of high income countries.

- Fourth, the authors also document that the global opportunities-growth link is particularly strong in countries that are financially integrated in the global markets (as indicated by the amount of cross-border capital flows) and have efficient legal institutions (measured by well protected shareholder and creditor rights; fast resolution of corporate disputes in courts; sound property rights protection).

The Bekaert *et al.* study is particularly relevant for ongoing process of European financial integration, both among the current EMU members, but also with regards to the new accession countries, since it emphasizes the importance of financial openness. Their results are also theoretically plausible, since even if a country does not have the most well-developed financial intermediaries, if it is open to international investment, then it will be able to attract the necessary capital to finance sectors with positive prospects.

4.3 Financial development and entry

Rajan and Zingales (1998) also delve deeper into the components of growth, decomposing the overall growth effect into growth in new firms (establishments) and growth in the average firm size. This is particularly interesting since most theories suggest that financial development fosters growth by relaxing mainly small and new firms' constraints (since established firms have internal cash to finance investment and also easier access to bank and market based finance). The results suggest that the differential impact of financial development for growth of external finance dependent sectors works primarily through entry of new firms and to a lesser extent through an increase in average firm size.²⁰ From a European viewpoint de Serres *et al.* (2006) find similar evidence in a sample of (mainly developed) 25 OECD economies. Klapper, Laeven and Rajan (forthcoming) also find a strong differential effect of financial development in entry in external-finance-dependent sectors using a panel of 20 European (advanced and transition) countries in the late nineties.

Beck, Demirguc-Kunt, Laeven, Levine (2004) also employ a cross-country cross-industry approach to explore the effect of financial intermediation efficiency on entry. The authors first construct an industry-level size variable that measures the industrial reliance on small firms. Sector size is defined as the ratio of firms with less than 20, 10 or 5 employees in the US in the early nineties. Second the authors examine whether in financially developed countries industries with a high share of small firms grow on average faster. The results confirm this hypothesis.

4.4 Summary Industry-level work

The cross-country cross-industry work has strengthened the financial development-growth nexus from both a technical and a conceptual standpoint. At the empirical side these studies alleviate

²⁰Since a distinct literature (e.g. Aghion *et al.*, 2006) has shown that there exists a significant correlation between entry and productivity, these results point out that financial development has a particularly sizable effect for productivity.

endogeneity and reverse causation concerns and thus make an important step on causality. At the theoretical side these studies are better suited to identify the channels of how financial markets foster aggregate growth.

These studies are particularly important for the ongoing process of European financial integration, since they show that further improving financial services can have a direct effect on productivity. Efficient financial markets help to move economic activity to the sectors that face positive global growth opportunities. In addition these studies clearly show a strong differential effect of financial modernization for the growth of small and medium sized enterprises, which are very important in most European countries.

5 Country-specific case studies

Following a recent trend in developing economics, research on finance and growth has tried to use policy changes in a quasi-natural experiment framework that establishes causality. Besides the econometric benefits, the use of micro-level (industry and firm) data is quite informative in exploring how financial sector reforms affect economic performance.

5.1 U.S. based evidence on banking deregulation

A quite important strand of the finance and growth literature quantifies the effect of banking sector reforms, notably the removal of branching restrictions in the United States. Philip Strahan (2003) provides a brief summary of this work. Focusing in a single country gives more confidence that the finance-growth correlation is not driven by the difficulty to control for country characteristics, such as social capital, law, property right protection, regulation, etc. This strand of the finance and growth literature is also relevant for the ongoing European financial integration debate. Retail banking is still among the least integrated parts of the European financial system (e.g. Hartmann *et al.*, 2003, 2005; Baele *et al.*, 2004; ECB MB, 2005; Cappiello *et al.* 2006). In addition, these studies investigate the growth effects of financial reforms in a developed country, which is quite similar to the ones of the euro area (in terms of human capital, institutions, etc.).

In the United States between 1970 and 1994, 38 states removed regulatory restrictions on branching. In addition in the period 1978 to 1992 almost all states removed restrictions on intrastate bank ownership. Table 3 summarizes the main studies that explore differences in the timing of implementation across US states and assess the effect on financial system performance as well as state growth, productivity, and entrepreneurship.

Jayaratne and Strahan (1996) exploit differences in the *timing* of these bank reforms to assess their impact on growth. Controlling for state and year unobserved characteristics and trends, their estimates imply that state banking deregulation was associated with a 0.6 to 1.2 percent increase in real per capita state growth. The evidence also implies that the gains on growth emerged from

enhanced productivity (“quality of banking”) rather than from increased investment. The authors also show that the share of non-performing loans and write-offs dropped significantly after the reforms (approximately -0.3% to -0.6%). Jayaratne and Strahan (1998) show that banking reforms resulted in a fall of non-interest costs, wages, and loan losses. These efficiency gains translated into lower loan prices. Stiroh and Strahan (2003) argue that the spur in bank acquisitions (the annual acquisition rate rose by 1.6 percent after the approval of laws allowing inter-state banking) and other forms of consolidation enabled banks to seize scale economies and specialization benefits.

Black and Strahan (2002) provide further evidence that deregulation enhanced competition, which in turn fostered entrepreneurship (new firm incorporations and growth in the number of establishments). They estimate that new firm incorporations increased by 4 to 8 percent per year after deregulation. Cetorelli and Strahan (2006) show that reforms fostered productivity growth of small and medium sized firms.

Kroszner and Strahan (1999) show that liberalization was mainly driven by political local factors rather by efficiency consideration. Thus, these results are not prone to critique that states removed restrictions in banking when economic conditions were favorable or in anticipation of future growth.

Not only is this work particularly relevant for the ongoing banking and financial system integration that takes place in the EU, but the results also indicate that finance contributes to growth by enhancing productivity.

5.2 Case-study evidence from EU countries

5.2.1 France

The growth and productivity enhancing effects of banking deregulation are also found in a recent study that quantifies the effect of French banking reforms in 1985. Using detailed firm and industry-level data for the period 1978 to 1999 that cover all sectors of the French economy, Bertrand, Schoar, and Tesmar (forthcoming) provide a thorough before-after analysis of the effects of banking deregulation. French reforms differed from the US deregulation described before. The deregulation package in France involved four major reforms: (i) Elimination of subsidized loans; (ii) Elimination of the “encadrement du credit”, which imposed monthly ceilings on credit growth for each bank; (iii) Unification of banking regulation in a comprehensive Banking Act; (iv) Some privatization.

The authors document that controlling for business cycle effects, industry-specific trends and unobserved characteristics, the reforms had two main effects:

- A major restructuring and increased firm-level productivity (proxied by firm return on assets) mainly of bank dependent sectors.
- Increased entry and exit in bank and finance-dependent industries. In addition, after the reforms, worse performing firms experienced a higher likelihood to exit the market, suggesting enhanced competition in the product markets.

5.2.2 Italy

The most likely causal effect of financial development on growth and productivity is further strengthened by a detailed study on the effects of firms' access to finance and growth across Italian regions. Guiso, Sapienza, and Zingales (2004) investigate the effects of differences in local financial markets across Italian regions. This study further strengthens the hypothesis that financial development is a key determinant of entrepreneurship, innovation and productivity growth. It does so by providing compelling micro-level evidence that even within an integrated and relatively developed financial system, differences in firms' access to finance do matter.

First, using survey data on firms' access to finance and credit rationing the authors construct a regional index of financial constraints. Second, they run cross-region and cross-firm regressions analyzing the effect of financial development at the regional level on various aspects of firm and regional growth. Their results can be summarized as follows:

- The likelihood for an entrepreneur to raise capital for financing a start-up is 5.6 percent higher if he moves from the least financially developed region (Calabria) to the most financially developed one (Marche).
- Entry of new firms is much higher in financially developed regions. Quantitatively the ratio of new firms to population is 25 percent higher in the most financially developed provinces than in the least financially developed ones.
- Local financial development fosters competition in product markets. The estimates suggest that firms operating in the most developed regions have on average a 1.3 percentage point lower mark-up compared to firms in the least financially developed provinces.
- In financially developed regions firms experience faster sales growth. The estimates imply that, conditioning on various firm and region characteristics, a firm operating in the least financially developed region grows by 5.7 percent less than a similar firm in the most financially developed region.
- At the provincial level financial development is associated with higher growth rates. The regressions suggest that in the most financially developed region, annual per capita domestic product grows by approximately one percent more than in the least financially developed one.

These results seem to be robust to a number of sensitivity checks and most importantly are not driven by north-south differences.

5.3 Summary country-specific studies

The case-specific evidence from the United States and the two European countries provides compelling evidence that financial development contributes to growth in industrial countries by increasing firms' efficiency, enhancing entrepreneurship, fostering competition and thus accelerating productivity growth. Similar results are also provided by Haber's (2005) detailed analysis of the role of financial markets in the industrialization of the U.S. as compared to Mexico in the nineteenth century. Banerjee (2004) and Banerjee and Duflo (2005) summarize similar case-specific evidence from the developing world. These micro studies give also more confidence to the conclusion that the association between financial development and growth found in cross-country studies represents something more than a simple correlation. The quite detailed analyses of the French, Italian and US banking reforms provide direct further evidence on the "Schumpeterian hypothesis" that reforms leading to financial development can foster productivity growth through creative destruction.

6 Conclusion

This study reviews the empirical literature on the finance-growth nexus within a neoclassical growth framework, placing an emphasis on the policy implications of this work in the current European environment, that has placed financial reforms high on the policy Agenda.

The paper started by laying down a neoclassical growth framework to discuss the empirical work linking financial intermediation to economic growth. Decomposing aggregate growth into investment, human capital accumulation and total-factor-productivity growth appears useful to understand the theoretical channels on how financial development fosters growth. Then the paper discusses the recent empirical research. Besides reviewing the main contributions of this work, the current study also pays a special focus on the key issue of causality. Over the past years the empirical literature has employed genuine and intuitive approaches to push on causality. For example a growing number of studies is using industry and firm level approaches, which address many of the general econometric shortcomings of the cross-country work. In addition employing a more micro approach sheds light into the theoretical mechanisms of how finance fosters aggregate growth. The literature has also increasing exploiting policy changes in a (quasi) natural experiment framework. These studies make crucial advancements on causal inference and also yield valuable insights on how finance contributes to economic performance.

The main results of the fast growing body of research on finance and growth can be summarized as follows:

1. In spite of the limitations of the cross-country growth regression framework there appears to be a relatively strong correlation between financial development and economic growth. Although this correlation appears quite robust, it is quite hard to push on causality with

such a cross-country approach. Before-after event studies that assess the growth effects of financial liberalization policies reveal that such reforms are followed by higher growth. This work pushes forward on the causality front, since it accounts for country - unobservable characteristics, parallel reforms (such as privatization, trade openness) and also for future country-level opportunities.

2. Cross-country cross-industry (and even cross-time) studies reveal that financial development exerts a disproportionately positive impact on sectors that are external-finance-hungry, face good future opportunities, or are populated mainly by small firms. This work assuages many (though not all) of the shortcomings of the purely cross-country work and also enable the identification of the theoretical channels on how finance contributes to growth.
3. Novel event studies, that assess the effects of banking deregulation in the U.S. or other countries, provide strong evidence that such policies exert a significant effect on growth. Studying policy reforms in a before-after experiment setting or investigating the impact of local financing conditions using micro data gives confidence that the finance-growth nexus represents something more than a simple correlation.

From a growth decomposition standpoint the evidence point out that financial development fosters aggregate growth through a cost of capital fall - investment and a resource reallocation-capital efficiency TFP channel. The empirical evidence shows that the first capital accumulation channel is mainly present in the developing world, while the productivity channel is mostly important for industrial countries.

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Table I: Overview of main cross-country studies of finance and growth

Study	Dep. Variable(s)	Sample	Technique	Results
King and Levine (1993)	GDP p.c. growth; Physical capital growth; TFP growth.	77 countries; 1960-1989.	OLS; cross section.	Initial and contemporaneous values of various proxies of financial development are positively correlated with overall, capital and TFP growth.
Levine and Zervos (1998)	GDP p.c. growth; Investment; Savings; TFP growth..	40-44 countries; 1976-1993.	OLS; cross section.	Initial values of bank credit to GDP and stock-market liquidity are both significant determinants of overall, physical capital and productivity growth.
Beck, Levine and Loyaza (2000a; b)	GDP p.c. growth; Physical capital growth; TFP growth; Savings rate.	63-77 countries; 1960-1995.	OLS and IV; cross section.	All finance proxies (private credit, bank credit, liquid liabilities, market turnover), in both OLS and IV are positively correlated with GDP and productivity growth. The finance-investment (savings) link is less robust.
Benhabib and Spiegel (2000)	GDP p.c. growth; Investment; Human capital accumulation; TFP growth	90 countries; 1965-1985.	OLS and IV; cross-section; Panel.	Various measures of financial intermediaries' liquidity (e.g. private and bank credit to GDP) are robustly correlated with overall and TFP growth. Bank credit is also positively correlated with human capital (schooling) accumulation.
Beck and Levine (2004)	GDP p.c. growth.	40 countries; 1976-1998.	Dynamic Panel.	In most models both bank and capital markets development proxies are positively correlated with overall GDP p.c. growth.

Notes: In "IV" models the exogenous (historically determined) component of financial development is extracted by instrumenting the finance proxy with legal origin variables. Following La Porta *et al.* (1998, 1999) the law and finance literature has shown that in countries with either common law or German originated or Scandinavian civil law system investors (shareholders and creditors) have superior protection and thus the financial system is more developed. "Panel" models enable to control for unobserved time-invariant country heterogeneity (e.g. social capital; rule of law) by exploring the correlation between changes in financial development and output.

Table II: Overview of main cross-industry cross-country studies of finance and growth

Study	Dep. Variable(s)	Sample	Results
Rajan and Zingales (1998)	Value added growth; Entry; average firm size.	42 countries; 1980-1989;	In financially developed countries, sectors that for inherent technological needs depend more on external finance grow faster. There is also higher entry in external-finance-dependent sectors
Guiso, Japelli, Padula and Pagano (2004)	Value added growth; Output growth.	36 manufact. industries; 65 countries; 1981-1990;	In financially developed countries, sectors that for inherent technological needs depend more on external finance experience faster value added and output growth.
Fisman and Love (2004)	Value added growth; Share of industry in total manufacturing.	36 manufact industries; 42 countries; 1980-1989;	In financially developed countries, sectors that for have good opportunities (measured by US sales growth) grow faster. Financially developed countries specialize in sectors that for technological reasons depend more on external finance.
Ciccone and Papaioanou (2006)	Value added growth.	67 countries; 1980-89; 28 manufact. sectors	In financially developed countries there is a small wedge between realized and optimal (target) investment.
Beck, Demirguk-Kunt, Laeven and Levine (2005)	Value added growth.	42 countries; 1980-1989 & 1980-1999; 36 manufact industries.	In financially developed countries, sectors that for inherent technological reasons have a large portion of small and medium sized enterprises grow faster.
Bekaert, Harvey, Lundblad and Siegel (forthcoming)	Country-level growth.	50 countries; 1980-2000	Industry-level global opportunities weighted by country-industry output mix predict growth. Financially integrated open to foreign investment countries exploit better global growth opportunities.
Wurgler (2000)	Investment growth	65 countries; 1963-95 28 manufact. industries	In financially developed countries and in countries with a non-state controlled banking system the elasticity of industry value added growth to investment growth is higher.

Notes: The Table reports the main cross-industry cross-country studies that assess the effect of financial development on sectoral growth.

Table III: Overview of main studies on banking system deregulation in the United States

Study	Dep. Variable(s)	Results
Jayaranate and Strahan (1996; 1998)	Gross State Product (GSP) Growth; Banking efficiency	State banking deregulation was associated with a 0.6 to 1.2 percent increase in real GSP growth. The share of non-performing loans and loan write-offs dropped significantly after the reforms (-0.3% to -0.6%).
Stiroh and Strahan (2003)	Bank system competition; Banking merger and acquisition activity	State banking systems became more competitive following deregulation. Annual acquisition rate rose by 1.64% after the passage of laws allowing inter-state banking (compared with a mean rate of 2.8%). Significant consolidation, especially in small banks. No significant increase in bank acquisitions following branching deregulation. Banks expand by purchasing branches of existing banks rather than by acquiring all of the branches.
Black and Strahan (2002)	Banking competition; Entrepreneurship (Entry)	New incorporations (entry) increased following deregulation by approx. 4%-8%. The effect of bank sector consolidation on the new firm incorporation is significantly negative. The effects of branching deregulation occurred, in part, because of changes in market structure such as declines in the share of small banks and changes in local market concentration.
Cetorelli and Strahan (2004)	Entrepreneurship (entry) small and medium sized firms.	Deregulation had a zero effect in states that already had a competitive banking sectors, but banking reform had a large impact in states with highly concentrated banking systems (like Alaska, Mississippi and Oregon) the effect of deregulation was very strong. Bank competition (which followed bank deregulation) is particularly beneficial for entry of small and medium sized firms. Deregulation fostered entry in sectors that for technological reasons depend more on external (and bank) finance.

Notes: The Table reports the summary of results on research assessing the impact of banking sector deregulation across US States.

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