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World Institute for Development
Economics Research

Research Paper No. 2006/102

Stock Market Development and Economic Growth

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September 2006

Abstract

Since the 1990s economists have devoted considerable attention to the study of the relationship between financial markets development and economic growth. In particular, the emergence of stock markets with economic development is an intriguing and interesting aspect of such a relationship, and yet relatively unexplored. This paper examines the most recent findings in the theoretical and empirical literature trying to determine the rationale behind the development of stock markets along the path of growth and the nature of the interrelationship between real and financial variables.

Keywords: financial markets development, economic growth, economic development, stock markets development

JEL classification: O16, O40, G10

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This study has been prepared within UNU-WIDER's research on Globalization, Finance and Growth, linked to the project on Financial Sector Development for Growth and Poverty Reduction.

UNU-WIDER gratefully acknowledges the financial contributions to the research programme by the governments of Denmark (Royal Ministry of Foreign Affairs), Finland (Ministry for Foreign Affairs), Norway (Royal Ministry of Foreign Affairs), Sweden (Swedish International Development Cooperation Agency—Sida) and the United Kingdom (Department for International Development).

ISSN 1810-2611 ISBN 92-9190-886-X (internet version)

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1 Introduction

In the wake of substantial empirical evidence, recent decades have seen economists devoting considerable attention to the study of the interrelationship between financial variables and the processes of real resource allocation. These studies have directed their efforts towards challenging the idea of an existing dichotomy between the real and financial worlds, which has long been assumed by a large part of the literature and which has found strong theoretical support in the Modigliani and Miller theorem.

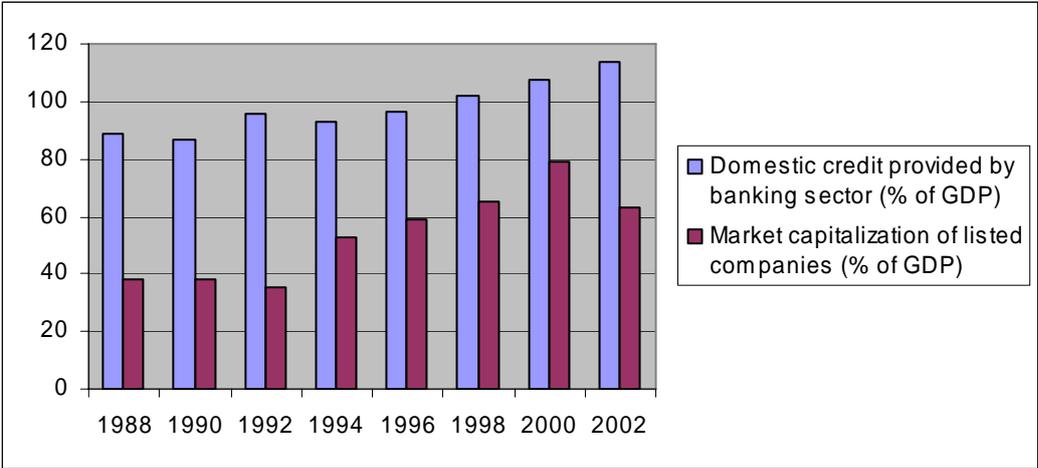
Indeed, the real world seems to depict a quite different state of affairs. As the data show, the structure of financial markets, far from being stable and static, moves along with economic growth and capital accumulation in many economies. Furthermore, the co-movements of financial markets and economic systems appear to display significant regularities. At low stages of economic development, when economies are relatively poor, financial systems are very rudimentary: financial intermediation is scarce and financial instruments are very simple and basic. At these stages stock markets are completely absent. As economies develop, financial intermediation grows, more complex and articulated financial instruments appear in the market, and stock markets emerge. These represent very general regularities and describe in broad terms the development of financial markets and the interrelationship of financial development and capital accumulation. However, the data also provide other more specific features of the co-movements between financial and real variables. These features might differ from county to country and from period to period, but they still say a lot about the relevance of financial variables in the process of real resource allocation.

Until now, the literature has mainly focused on the role of financial intermediation in the process of economic growth and capital accumulation. Indeed, many studies have analyzed the channels through which banks and other financial intermediaries may help to increase, for example, the saving rate or the average productivity of capital and, in turn, growth. Recently, however, a new wave of interest on a specific aspect of financial market development has occupied economists' investigative activity. This is the role played by stock market development in the process of economic development.

The renewed interest, which is predominantly theoretical, stems from the fact that despite the large body of empirical evidence, many questions remain unanswered. Why do stock markets develop relatively late in the process of economic development? Why do firms change corporate financing decisions, preferring debt over equity in richer countries? Is it economic development that engineers transformations in financial systems and determines the emergence of stock markets, or, rather, is it stock market development that spurs economic growth? These, together with other questions, have been extensively analyzed by a large number of recent theoretical and empirical studies.

Significantly, the evolution of financial markets does not appear to be a straightforward and linear phenomenon. A complex bundle of connections between the relevant variables makes it difficult to uncover, and replicate through modelling, the real dynamics of the economic systems. Among these empirical facts, one surfaces as a particularly interesting one. The emergence and expansion of stock markets does not usually give rise to the simple substitution of financial intermediation with equity financing in the economy. Rather, the expansion of stock markets always appears to be followed by an initial expansion of debt and bank financing, to such an extent that the equity/debt ratio in the economy first decreases and only increases with further economic development. Figure 1 provides a description of the evolution of financial markets in a sample of countries including advanced OECD economies and some major emerging markets.

Figure 1: Domestic credit provided by bank sector and stock market capitalization



Source: World Bank Economic Indicators 2004.

Note: The data are annual averages of the values in the following sample countries: Australia, Belgium, Canada, France, Germany, Greece, Ireland, Italy, Japan, Norway, Portugal, Spain, United Kingdom, United States, Rep. Korea, China, Malaysia, India, Argentina, Brazil, Mexico, South Africa, Turkey, Russian Federation.

Although the objective of previous studies has been generally the same, the methodological approach has not. In fact, in order to explain the emergence and evolution of stock markets, and to take account of the impact of such modifications in financial markets on economic development, the literature has followed different routes. Despite the differences, these studies can be clustered into two major groups. The first group deals with the emergence of stock markets as a pure macroeconomic phenomenon. For these studies the modifications in financial systems are the result of changing costs associated with different financial institutions. The second group is more interested in analysing the corporate financing decisions of individual firms. These studies try to verify how firms’ financing choices change with capital accumulation. We will refer to the approach followed by the first group as the ‘institutional approach’ and to the second as the ‘instrumental approach’.

Our main objective is to critically examine the current state of the theoretical literature which, although substantial, has left space for further investigation. The aim is to organize and manage the main results of these studies in order to shed light on the issue of stock market development and economic growth and to open new avenues for a different approach to the empirical evidence. And it is from the empirical evidence that it is necessary to start in order to understand the evolution of the theoretical literature.

2 Empirical evidence

A large body of empirical studies clearly shows that the development of stock markets is strongly and positively correlated with the level of economic development and capital accumulation. This is a solid and uncontroversial result, and it appears to be true across time and for many countries. Indeed, the data confirm that as economies develop equity markets tend to expand both in terms of the number of listed companies and in terms of market capitalization (Atje and Jovanovich 1993; Demirgüç-Kunt and Levine 1996a, 1996b; Demirguc-Kunt and Maksimovic 1996; Korajczyk 1996; Levine and Zervos 1996, 1998). This result, however, does not suggest a direct and monotonic expansion of the share of equity markets in the financial system. In reality, the expansion of equity markets always appears to be preceded and accompanied by the general expansion of the overall financial system. And to a careful observer, far from being a simple and straightforward fact, the co-evolution of real and financial variables is a complex and multifaceted phenomenon. Indeed, the expansion of stock markets generally follows the development of commercial banks and other financial intermediaries which, in many cases, continues as equity markets expand. This process produces an apparently puzzling situation: an expanding equity market together with a financial system persistently dominated by banks and their financial products. Even if the evidence often appears to be bewildering, and in many circumstances difficult to interpret, some simple general stylized facts about the relationship between financial development and economic growth can be drawn from the empirical literature (De Gregorio and Guidotti 1995; King and Levine 1993a, 1993b; Levine and Renelt 1992; Roubini and Sala-i-Martin 1991). These facts are summarized in the following points:

- In the early stages of economic development, financial markets are very thin and very rudimentary. During these stages, financial markets are dominated by banks, or similar types of financial intermediaries. Stock markets are completely absent or, if they exist in any form, their size is negligible.
- As capital accumulates financial intermediaries develop, the number of financial instruments increases, as does the level of sophistication and complexity of financial contracts and the flow of resources and funds accruing to the financial market increases its size. Stock markets start developing both in terms of the number of listed firms and market capitalization.
- As the economy continues to grow, equity markets develop further and so do banks and other financial intermediaries.

- Stock markets appear to develop in a non-monotonic ways. In economies where stock markets are relatively small, capital accumulation seems to be followed by a relative increase in banks' share in the financial system. In economies where the stock market has already reached a reasonable size, further development of the market causes an increase in the equity markets' share. In other words, evidence shows that the equity/debt ratio first decreases and, only with further development of the stock market, increases.

The co-evolution of equity markets and capital accumulation is only one aspect of the more general interrelationship between economic growth and the expansion of the financial system. Since the seminal contributions by Goldsmith (1969) and McKinnon (1973), economists have devoted considerable attention to the study of the role played by financial intermediation in the process of real resource allocation and capital accumulation. Only very recently have economists specifically focused their attention on the role of stock markets in the process of economic development. Interestingly, these recent studies have not only revealed novel theoretical and empirical aspects of the channels of interaction between real and financial variables, they have also been able to shed light on individual firms' optimal financial choice in connection with economic development.

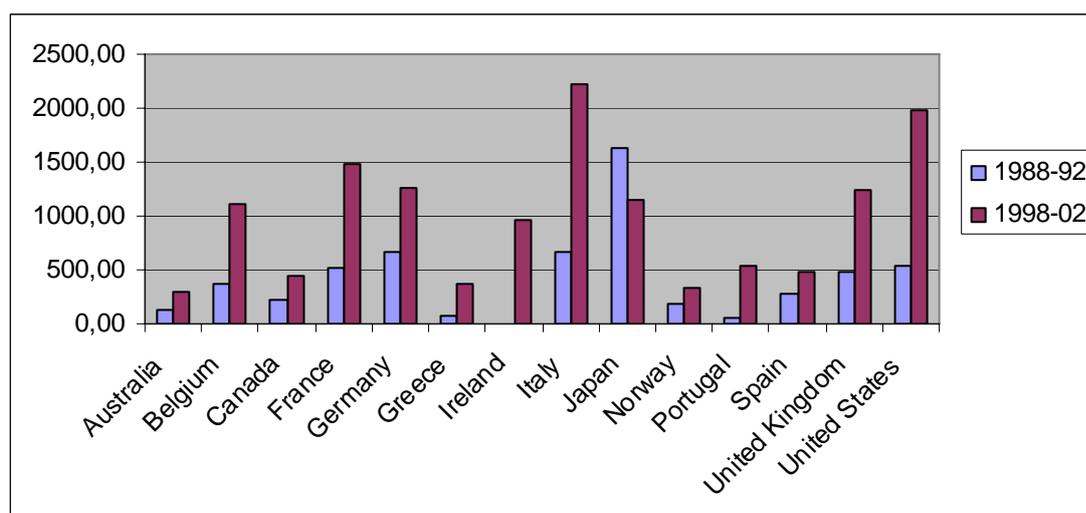
Before turning to a synthetic description of these studies, it is necessary to agree, at the onset, on a definition of equity markets' development, and to specify a measure of such development. In doing so, it is useful to observe that the development of a stock market can be identified by means of quantitative or qualitative measurements or by a combination of the two. Different routes can be pursued. The primary route to follow in order to assess the expansion of a stock market is to look at changes in its dimension. A simple measure of a stock market's size is the total value of all the shares in the market at each point in time (market capitalization) or the average of this value over a period. Market size is important because the level of savings mobilization and risk diversification depend strongly on this indicator. Of course, a measure of a stock market's size needs to take into account the dimension of the economic system overall. For this reason, the typical measurement employed in empirical analyses is the ratio of market capitalization to gross domestic product (GDP) (market capitalization/GDP). Stock market size can also be measured by the number of listed companies in the stock exchange in each period. Although market size is an important indicator of stock market development, this measurement by itself does not capture all the relevant features of a financial markets' development. Indeed, a developed market is also an efficient and liquid market in which financial funds can be mobilized at low cost and can move easily from one investment to the other. These qualitative features of market development can be captured by indicators such as the volume of shares traded in each period and the degree of concentration. While the former of these indices measures the level of liquidity in the market, the latter takes into account the level of risk diversification. Finally, in order to capture the main features of financial market development, one cannot fail to take into account the institutional and regulatory framework which

represents the basic organization of the market. It is useful to provide a brief and schematic description of such indicators:

- **Market capitalization ratio:** this is calculated by dividing the value of listed companies (market capitalization) by GDP. It gives a measure of the size of the stock market relative to the size of the economy. It is a good measure of the relative size of the stock market in the economy.
- **Number of listed companies:** this specifies the number of all companies listed in the country's stock exchange at any point in time. This indicator is also a measure of stock market size.
- **Total value traded:** this gives the total value of shares traded during the period. Total value traded divided by GDP gives a measure of the liquidity in the market. Market liquidity measures how easily securities can be bought and sold. This indicator complements the market capitalization ratio and signals whether market size is matched by trading activity.
- **Turnover ratio** is the total value of shares traded during the period divided by the average market capitalization for the period. Average market capitalization is calculated as the average of the end-of-period values for the current period and the previous period.
- **Institutional and regulatory framework:** the degree of development of a market is strongly influenced by the regulatory system. Differences in regulatory systems, for example, are often used to explain the great differences in equity market development between countries such as the UK, the USA, and Canada on one side and Japan, Germany, France, and Italy on the other, despite their similar level of economic development.
- **Concentration:** the degree of market concentration is important to show how well a market really works. A very high degree of concentration signals a heavy and illiquid market. In such circumstances, the benefits of risk diversification in markets are very low. A measure of concentration could be provided, for example, by the average size of firms listed in the stock market (see Figure 2).

Tables 1a and 1b describe some of these indicators of stock market development for two groups of countries: a sample of advanced OECD countries and some major emerging economies. Significantly, for almost all of these countries, the market capitalization ratio and the number of listed firms show that the size of stock markets has increased over time. Furthermore, as witnessed by the total stock traded over GDP indicator, stock markets have been increasingly active, showing an increase in the level of liquidity in recent decades. Through these and other indicators, empirical studies have provided hard evidence of the co-evolution of stock market development and economic growth and highlighted the most relevant features of this interrelationship.

Figure 2: Average firm size listed on the stock market



Source: World Bank Economic Indicators 2004.

Note: The average firm size in the reference period is calculated on the basis of the average market capitalization and the average number of listed firms over the same period.

Table 1a: Stock market development indicators: sample of advanced OECD countries

	Market capitalization of listed companies (% of GDP)			Number of listed domestic companies			Total value of stocks traded (% of GDP)		
	1988-92	1993-97	1998-02	1988-92	1993-97	1998-02	1998-02	1993-97	1998-02
Australia	44.99	68.59	96.90	1143	1157	1280	14.13	30.50	57.36
Belgium	36.40	42.05	75.34	181	149	163	4.03	7.59	18.84
Canada	46.52	69.89	102.66	1128	1226	1862	14.07	35.42	64.34
France	28.51	37.75	87.51	646	550	810	9.12	21.27	64.99
Germany	21.48	27.38	55.85	549	580	880	29.55	23.69	54.02
Greece	11.60	18.04	91.98	128	205	307	2.06	7.44	66.16
Ireland		49.32	71.54		80	74		16.15	33.20
Italy	14.63	20.17	53.88	220	233	277	3.31	10.27	50.76
Japan	105.39	66.39	67.68	2056	2269	2595	55.78	24.78	41.02
Norway	18.99	32.28	37.31	118	151	193	9.46	16.64	31.03
Portugal	13.49	21.62	49.63	181	171	106	3.02	8.29	34.07
Spain	24.39	36.00	76.17	410	372	1333	7.80	30.74	143.43
United Kingdom	91.74	131.27	164.21	1853	2024	1912	40.39	48.90	121.74
United States	62.70	98.07	146.77	6689	7988	7133	34.31	77.43	242.59

Source: World Bank Economic Indicators 2004.

Note: The data are author's calculation of averages over five year periods.

Table 1b: Stock market development indicators: sample of major emerging countries

	Market capitalization of listed companies (% of GDP)			Number of listed domestic companies			Total value of stocks traded, (% of GDP)		
	1988-92	1993-97	1998-02	1988-92	1993-97	1998-02	1998-02	1993-97	1998-02
Korea, Rep.	43.62	32.30	55.90	667	730	1228	37.71	48.07	162.31
China	2.46	12.06	38.54	33	416	1056	2.11	21.53	39.88
Malaysia	111.42	248.99	143.10	292	549	791	21.66	162.22	44.06
India	14.83	34.87	29.56	3204	4983	5821	6.85	17.24	50.06
Argentina	5.46	16.85	55.11	178	154	116	2.59	5.92	2.60
Brazil	9.00	27.57	33.00	579	545	458	3.76	16.79	15.08
Mexico	19.92	36.76	22.37	202	194	179	6.58	14.65	6.84
South Africa	123.16	161.71	148.44	721	639	584	6.54	16.35	59.30
Turkey	7.39	19.74	32.93	98	204	295	3.12	22.00	52.12
Russian Federation	0.05	9.03	23.96	20	115	225		1.24	6.19

Source: World Bank Economic Indicators 2004.

Note: The data are the author's calculation of averages over five year periods.

By studying a relatively large set of 40 countries in the period 1979-88, and focusing on the dynamics of market size, Atje and Jovanovich (1993) have found a strong positive correlation between the level of financial development and stock market development and economic growth. In a more recent study, Levine and Zervos (1998) obtain similar results on a larger set of observations. They sample 47 countries from 1976 to 1993, and find that stock market liquidity measured as the value of stock traded relative to the size of the market and the size of the economy is strongly and positively correlated to the rate of economic growth. They also observe that the level of banking development, measured as the ratio of bank loans to the private sector to GDP, is positively correlated with the level of economic growth. The significance of stock market development in the process of economic growth is also confirmed by Beck and Levine (2001) who, by applying novel econometric procedures, test for the independent impact of banks and stock markets on growth. Again, Beck and Levine find that the expansion of both banks and stock markets significantly affects growth.

As already outlined, beyond this apparently clear and general result, the dynamic interaction between financial and real variables is an articulated and multifaceted phenomenon which can differ greatly from country to country. In order to get an idea of these differences in the evolution of the financial systems, it is useful to mention the contraposition between the so-called bank-based financial system predominant in continental Europe and Japan, and the so-called market-based system predominant in the Anglo-Saxon countries. In the former countries, in which the banking sector strongly dominates the financial sector, economic growth and capital accumulation have

involved a significantly less perceptible development of equity markets despite these countries displaying similar levels of capital accumulation to Anglo-Saxon countries.

Although the dynamic patterns of financial systems can differ greatly from country to country, some general stylized facts about the development of equity markets can be drawn from the literature. As outlined by Demirgüç-Kunt and Maksimovic (1996), stock markets do not develop in a monotonic way, neither, as one might wrongly deduce, does the development of equity markets directly crowd out the banking sector and other financial intermediaries. Rather, the dynamics of equity markets seem to depend on the level of economic development and on the level of the stock market development itself. In specific terms, when economies have thin and underdeveloped stock markets, capital accumulation leads to an increase in the share in the economy of debt and bank financing. As economies grow and stock markets develop more, further development of stock markets leads to a relative increase of equity financing in the economy. In other words, given that stock market development depends on growth, the bank debt/equity ratio in the economy tends to increase at low levels of capital accumulation and to decrease only when stock markets have reached a reasonable size.

Demirgüç-Kunt and Maksimovic provide an explanation for this finding based on the effect of equity market development on the cost of access to credit. The idea is that in the initial stages of economic development, the expansion of stock markets increases both the opportunity for risk sharing and the flow of information in the market. These, in turn, allow firms to access bank loans more easily and cheaply and to increase the level of leverage. However, as stock markets develop further, issuing equity becomes more convenient because of the falling costs of going public, and firms substitute equity for debt. In line with these ideas, Pagano (1993) shows more formally that because of trading externalities in the market and the strategic behaviour of listing companies, the size of the stock market is crucial in explaining its own development. Indeed, a firm that goes public increases the risk sharing opportunities for investors through portfolio diversification.

The idea is simple. Assume a situation where borrowing constraints and lack of liquidity force entrepreneurs to go public. The price they get from floatation depends on the behaviour of other entrepreneurs and on the size of stock market. Indeed, if few entrepreneurs decide to list their companies, the gains from portfolio diversification are low and few investors will demand shares in the market. As a consequence, the share price will be kept low, and so will the return on floatation. Therefore, the return on floatation for each entrepreneur strategically depends on what all other entrepreneurs do. If many entrepreneurs decide to go public, the return on floatation will be higher and equity issue will be relatively more convenient. A thicker equity market makes equity issue less costly. Extending this idea into a dynamic framework, one could infer that strategic complementarities in the stock market could well explain the non-monotonic behaviour of the debt/equity ratio along the path of capital accumulation.

Volatility of stock prices is another empirical aspect of stock market development which has received considerable attention in the literature. By itself, volatility of stock returns is not an indicator of stock market development. However, high levels of volatility, by affecting average portfolio risk, can significantly affect the return on investment and growth. There are a variety of channels through which high volatility can have a negative impact on investment and growth:

- It may cause great instability of the financial system as a whole.
- It can decrease the supply of financial funds, and raise the cost of access to capital by discouraging savings from risk averse individuals.
- To the extent that equity markets help to channel resources towards the most profitable investment through price signalling, highly volatile stock prices cause misallocation of resources because prices do not correctly indicate return on investments.

These arguments would suggest that high volatility should negatively affect growth and capital accumulation. Along this line of reasoning, Singh (1997) sustains that because of high volatility, the large expansion of stock markets in developing countries, far from helping industrialization and fostering capital accumulation, can hamper economic growth. Indeed, according to Singh, the expansion of stock markets in developing countries since the beginning of the 1980s has not been caused by the endogenous evolution of financial systems, as described above, but by means of ad hoc governmental programmes of privatization and financial liberalization. This financial 'de-repression', as denoted by Singh, however, has occurred without a change in the regulatory system or infrastructure, which remain inadequate to support well functioning equity markets. The result is very volatile stock markets that are unable to carry out the roles they play in advanced economies such as monitoring, screening, and information gathering—which is how they enhance growth.

Although the arguments on the potential negative impact of volatility on growth appear to be very convincing, Levine and Zervos (1998) do not find any significant relationship between volatility and growth in the sample countries over the period considered. They measure volatility as a 12-month rolling standard deviation estimate on stock returns and regress this estimate on the rate of growth and obtain no significant results.

Open economies with deeply integrated financial markets can benefit from cross-border capital flows and from larger flows of financial resources pouring into the market. As theory suggests, international financial integration, by bringing about a greater degree of portfolio and risk diversification, may boost the propensity to save and invest and, through this channel, can foster growth (Obstfeld 1994; Devereaux and Smith 1994). In other words, internationally integrated financial markets can potentially be associated with higher rates of growth and capital accumulation. There is no doubt that financial globalization can benefit stock markets more than other financial institutions because the former can mobilize financial resources at low cost. One can therefore argue that

although financial globalization is not a direct indicator of stock market development, the international integration of financial markets would increasingly be expected to be accompanied by expanding stock markets and higher rates of economic growth. Following these theoretical suppositions, Korajczyk (1996) investigates whether internationally integrated stock markets are positively correlated with capital accumulation and economic growth. In order to measure international market integration Korajczyk adopts an International Arbitrage Pricing Model for 24 national markets. This gives a benchmark equilibrium model which gives stock returns in hypothetical fully integrated markets. Deviation of effective stock returns from these benchmark values gives a measure of the distance of these economies from full integration. In line with the theory, Korajczyk finds that market segmentation is higher for developing than for developed countries. Moreover, market integration tends to increase as capital accumulates, showing a positive correlation between stock market integration and economic growth.

3 Theoretical issues

Despite this overwhelming empirical evidence, a number of questions remain unanswered. Why do stock markets develop later than other financial institutions in the process of capital accumulation? How can the apparent complementarity between the equity market and the banking sector be explained? Why do some countries have overdeveloped stock markets while others have very thin stock markets (notwithstanding their level of economic development)? Finally, is it the development of stock markets that spurs economic growth, or is it the process of capital accumulation and growth that transforms the financial system and causes the development of stock markets? These are among the questions that a growing body of theoretical studies has recently tried to answer. It is clear that in order to address these issues, it is first necessary to understand the exact role of the stock market in the process of real resource allocation and how the financing decisions of firms affect investments. Second, it is necessary to determine the possible channels of interaction between real and financial variables.

The literature on this issue can be categorized as having followed two main routes: the institutional approach and the instrumental approach. The institutional approach focuses on the macroeconomic role of stock markets. By identifying and understanding the working of stock markets, and the main differences between the functioning of financial intermediaries, it is possible to understand why equity markets emerge at the advanced stage of economic development and the correlation of stock market development with the evolution of the banking system. The instrumental approach focuses, instead, on the microeconomic aspect of the optimal financial choice of the firm. It typically studies the differences between equity financing and debt financing and how corporate finance affects the investment decisions of firms. The objective of these studies is to understand why, depending on the level of capital accumulation in the economy, firms change their

preferred source of external funds and switch from debt financing to equity issue. These analyses, in turn, also need to explain the reverse causal relationship and to establish how the above changes in the financial system affect the process of economic growth.

3.1 Institutional approach

Modern financial systems pivot on two main financial institutions: one is commercial banks, the other is stock markets. Although these institutions have the same ultimate aim, which is conveying financial funds from lenders to final borrowers, they do so through very different channels, and play very different roles. Understanding these different roles can help us to shed light on the mechanisms through which financial variables can influence resource allocation and, in turn, economic growth. Indeed, as the theory has exhaustively established, the functioning of financial markets can determine the flow of resources channelled to investment as well as the optimal choice of the type of investments and projects to be financed.

In order to understand the process through which financial intermediation emerges and changes along the path of capital accumulation and, most importantly for our purposes, in order to understand why as capital accumulates, banks and financial intermediation are substituted with stock markets, it is necessary to focus on the specific functioning of these institutions and to look for the main differences which might influence the process of economic growth.

For a long time the literature has thoroughly studied the functional activities of financial intermediaries. Despite this, only recently have economists focused specifically on the role of financial intermediation in the process of economic development.¹ The results of these studies are quite clear. Banks and other financial intermediaries can influence the process of resource allocation and investments through the following channels:

- Financial intermediaries free resources in the economy by reducing transaction costs through the economies of scale involved in their activity. Moreover, they supply specific services, such as brokerage, which reduce frictions and let financial flows move more easily and at lower cost through the system.
- Banks and financial intermediaries bring about significant improvements in risk diversification by supplying a wide array of financial assets with very specific features. This should increase the propensity of risk averse agents to save and invest.
- One of the main functions of financial intermediaries is the maturity transformation of financial assets. The consequent increase in the array of

¹ Battacharia and Thakor (1993) develop a broad survey on the most relevant studies on financial intermediation. Levine (1997) presents a large survey on the latest literature on financial intermediation and economic growth.

financial assets stimulates the supply of financial funds and of savings and investments.

- Banks collect and produce a large amount of information. This reduces the intensity of information asymmetry between lenders and borrowers and improves the allocation of resources.
- Banks facilitate long-term relationships and commitments. Long-term relationships are very important, particularly when firms have no established long-term track records and reputation problems are, therefore, severe. Under these circumstances, long-term relationships may decrease the amount of credit rationing which otherwise would be very high given the reputation problems.

While progress in the literature on financial intermediation and economic growth has been quite substantial, the literature on the specific role of stock markets in the process of economic development is still quite thin and many aspects of this matter remain to be explored. Despite this, a number of interesting features of the interrelationship between equity market development and growth have been already disclosed. Stock markets can support resource allocation and spur growth through very different channels. Below we try to summarize the results:

- **Reduction in transaction costs and liquidity costs.** By reducing transaction costs and liquidity costs, stock markets can positively affect the average productivity of capital (Levine 1991; Bencivenga et al. 1996).
- **Resource pooling and saving mobilization.** By pooling resources on larger projects which would otherwise have difficulty accessing finance, stock markets can mobilize savings and spur the rate of investment (Greenwood and Smith 1997).
- **Acquisition of information about firms.** By promoting the acquisition of information about firms, stock markets may promote and improve resource allocation and the average productivity of capital (Grossman and Stiglitz 1980; Kyle 1984; Allen 1993; Holmstrom and Tirole 1993).
- **Corporate control.** By exerting a continuous and strict control over the management of firms, stock markets positively affect firms' investment decisions and the average return on investments (Diamond and Verrecchia 1982; Jensen and Murphy 1990; Laffont and Tirole 1988; Scharfstein 1988).
- **Risk diversification.** By improving risk diversification through internationally integrated stock markets and increasing the array of possible investments, stock markets can augment the rate of saving and the rate of investment (Saint-Paul 1992; Devereux and Smith 1994; Obstfeld 1994).

The duration of investment projects—in conjunction with the expected rate of return and the relevant risk—is a very important variable for investors. Investors, who strictly prefer shorter-term assets, might find investments with particularly long maturities unattractive. Moreover, disrupting an investment project before it has reached maturity

can be very costly in terms of missed profit and lower rates of return. Following this line of arguments, Levine (1991) builds a theoretical model which shows that by reducing these liquidation costs, and increasing the average productivity of capital and the rate of savings, stock markets can foster capital accumulation and growth. In fact, by their nature equity markets make it possible to transfer the ownership of investment projects that are already running before their final realization and without disrupting physical production. This feature of stock markets has two effects: (a) it attracts more resources into long-term investments from investors who would not have committed their finances for long periods of time; (b) it reduces the loss of resources which would have occurred with disruption of physical production. Both these effects will spur growth. The first does this by increasing the saving rate, the second by reducing actual resources lost by the premature liquidation of investments.

Following Levine, Bencivenga et al. (1996) maintain that equity markets can increase the average productivity of capital and, in turn, positively affect growth by decreasing liquidity costs. The idea is that projects which require longer periods of time to complete are usually also investments with a higher expected return. These projects, however, will not be taken on by investors who do not want to tie up their financial resources for a long time. Therefore, assets with long maturities will never be demanded, unless these can be liquidated easily and at low cost. Again, equity markets make these projects attractive to investors by allowing the trading of all or part of project's ownership at any time. The channels of interaction between stock markets and capital accumulation and growth are quite clear. As equity markets develop, longer maturity projects with higher rates of return become more attractive, the average productivity of capital increases, and so does the rate of growth.

In a framework where agents face liquidity and productivity shocks, financial markets can help to reallocate resources towards the most productive investments by reducing idiosyncratic risks. Indeed, by considering an economy in which both banks and stock markets coexist, Greenwood and Smith (1997) show that financial markets, by decreasing liquidity risk, increase savings and pool resources towards larger, more productive projects. The average productivity of investment increases and so does the rate of growth. However, while equity markets always increase the growth rate relative to the case of autarky, equity markets increase the growth rate relative to banks only if agents are relatively risk averse.

For Allen (1993) the emergence of equities primarily depends on the degree of complexity of the production structure, and on information gathering costs. One of the advantages of stock markets is that they allow for efficient risk sharing by providing incentives for investors to search for information. The basic idea is well known in the literature. Grossman (1976, 1978), Grossman and Stiglitz (1980), and Diamond and Verrecchia (1982) build theoretical models in which stock markets efficiently cluster together very different investors' information. Stock prices, therefore tend, in efficient

markets, to reflect the true valuation of underlying investment projects and constitute a clear signal for the actual rates of return on capital. As a consequence, stock prices are an efficient instrument for correct resource allocation. It is for this reason that they can boost economic development and growth. It is clear that where the production system is more complex, as Allen outlines, the process of information acquisition is more difficult and the working of equity markets in the process of capital accumulation will be more effective. Although, at first sight, this explanation appears to be fully satisfactory, two questions remain. What is the difference between equity markets and banks given that banks also help in providing information through monitoring and screening? And, why do stock markets appear only at an advanced stage of economic development, and only in some countries and not in others?

The answers to these two questions are to be found in the processes of information transfer between firms' management and the market, and in the possibility of identifying optimal investment strategies. In the presence of very simple productive systems, when optimal investment opportunities and management policies can be easily identified—for example, because these policies are limited in their number or because the feasible options do not change very rapidly over time—the banking system can gather enough information for optimal resource allocation. A typical example of a productive system in which simple production processes prevail is one dominated by the agriculture sector. Determination of optimal investment opportunities and control of management strategies are not difficult to carry out in such a framework. However, as the number of firms' investment opportunities increases, and the production processes become more and more difficult to control (not only by external observers, but also by firms' management), continuous monitoring becomes essential for the efficient allocation of resources. Stock markets, under such circumstances, become the best instrument for optimal investment control and risk diversification. Stock markets are more costly for the system overall than banks. However, they become more convenient when the production system becomes more complex. Banks and financial intermediaries in general do not allow for continuous monitoring. This explains why banks prevail in economies with simpler production structures, for example economies dominated by the agricultural sector, and stock markets become increasingly important as economies grow and display more articulated and complex productive systems.

One final observation on the market structure is necessary. The hypothesis of complete and efficient markets throws up some theoretical puzzles over the existence of incentives for information production. As pointed out by Grossman and Stiglitz (1980), if markets are complete and perfect, then prices will reflect all available information in the market. Therefore, given that collecting information is costly, nobody will have any incentive to collect information and monitor firms. This paradox is solved by Grossman and Stiglitz by assuming incomplete markets and by assuming variables which are unobservable to participants.

Another channel through which stock markets can positively affect growth is the continuous monitoring on firms' management which greatly improves resource allocation. Indeed, continuous monitoring and control can provide the most effective incentives for managers to choose investment projects which maximize firms' market value and, therefore, increase the average return on capital and investment. The interests of firms' management do not coincide with the interest of firms' shareholders and owners and, as a consequence, managers' decisions might be in contrast with firms' interest and profitability. Such a potential conflict of interests generates a typical agency problem which can be solved by means of credible threats and incentive-compatible contracts. Incentives for managers to act in the best interests of firms come from two main sources: one is the threat of possible takeover, the other is the introduction of effective incentive-compatible payment schemes.

Quotation in the stock market might potentially force managers to try to maximize the value of the firm, since publicly quoted firms which perform poorly may become the target of possible takeovers which, usually, entail the removal of the management. This threat can be sufficient for managers to act in the interest of the firm (Laffont and Tirole 1988; Sharfestein 1988, Stein 1988). From a different perspective, but with similar effects, the continuous monitoring of firms' performance following quotation on the stock market makes it possible to build optimal compensation schemes which can force managers to put in high levels of effort and take the best resource allocation decisions (Diamond and Verrecchia 1982; Jensen and Murphy 1990).

Despite the success of the above arguments in clearly highlighting the benefits of the stock markets and providing a satisfactory description of the channels through which quotation on the stock market can affect investment decisions and the growth rate of the economy, some interesting questions remain unanswered. If the continuous monitoring from stock markets is so valuable, why don't all firms decide that being publicly quoted is best? The answer to this question is essentially that monitoring is costly for firms (Holmstrom and Tirole 1993). As Holmstrom and Tirole argue, monitoring is valuable because it gives speculators information advantages which can be turned into profits. The higher the value of the information, the higher the value of monitoring will be. However, information advantages are strictly linked to the share price. Only if the actual share price is far from the fair value, and someone knows it, is there the possibility of profit. Information and monitoring costs result in a lower share price and a loss for the owner.

Finally, another channel through which stock markets may positively affect capital accumulation and economic growth is the improvement of risk diversification through international financially integrated markets. Indeed, as shown by Obstfeld (1994), an increase in the degree of international integration of stock markets reduces the level of average investment risk through diversification and leads to a shift in the global portfolio from safe low-yield projects to riskier high-yields projects. This shift induces

an increase in capital productivity and in the saving rates, both of which should boost growth. However, it is also necessary to recognize that portfolio diversification, depending on agents' degree of risk aversion, can decrease the level of savings and negatively affect growth (Devereux and Smith 1994).

3.2 Instrumental approach

The most recent literature on stock markets development and economic growth has shifted the focus from the role of markets and institutions to the nature of the underlying financial contracts. The objective of this literature is to explain the emergence and evolution of stock markets by analysing how capital accumulation affects firms' optimal financing choice and, in turn, how firms' corporate financing decisions affect investments and capital accumulation. Evidently, this kind of analysis needs to investigate in detail the main features of the optimal financial contracts available to firms: costs, benefits, and possible impacts on the production process. Although intuitively straightforward and apparently simple, this type of investigation faces theoretical obstacles. In a standard Arrow–Debreu framework, in which markets are perfect, agents are fully informed and there are no transaction costs, the Modigliani–Miller theorem holds and the value of a firm is unaffected by how that firm is financed. In this framework, whether the firm issues equity or takes on debt in order to raise money is completely irrelevant to the firm's investment decisions as well as to its market valuation. Under these conditions, a firm's financial capital structure is completely irrelevant for real resource allocation. As a consequence, the frictionless Arrow–Debreu setup needs to be modified in order to develop a theory which can explain the connections between financial and real variables. Economists have modified this framework in different ways, for example by introducing different kinds of market frictions, such as liquidity costs and transaction costs, or by assuming imperfect information between borrowers and lenders. Thus, the arguments are that financial markets can affect growth through the reduction of liquidity risks, or because they can increase the flow of savings and channel such resources towards more productive alternatives (Greenwood and Jovanovich 1990; Levine 1991; Bencivenga and Smith 1991; Saint-Paul 1992; Blackburn and Hung 1998; among others).²

Similar arguments have been put forward to explain the dynamic role of stock markets in the process of real resource allocation. However, only recent developments in the literature on optimal financial contracts under information asymmetry have provided significant insights for new avenues of investigation on the co-evolution of equity market development and economic growth. These recent studies on stock market development integrate microeconomic models of optimal financial contracts under information asymmetry into dynamic general equilibrium models.

² Levine (1997) and Becsi and Wang (1997) provide a very broad review of this literature.

In the presence of information asymmetries between lenders (typically households) and borrowers (typically firms) different informational problems might arise and the exchange of resources can become costly, sometimes to such an extent as to prevent capital markets from functioning at all. For example, problems of adverse selection might arise when firms have the possibility of hiding their expected profits or their level of efficiency. Problems of moral hazard might arise because of the incentive for firms to misreport the actual return on their investments. These informational problems generate agency costs, and the financial contract is the result of agents' attempts to reduce these costs. The financial contract, as well as the financial market, is, therefore, endogenously determined. The link between growth and finance arises because growth can affect the level of agency costs and hence financial arrangements, while the structure of the credit market affects growth because it determines the amount of resources invested and the allocation of capital.

The optimal financial contract, depending on the nature of information asymmetries and on agents' endowments, might display very different features. Typically, financial contracts take only two forms: one is equity, the other debt. The differences between the two are quite sharp. Equity entails a repayment which depends on firm's profits (or losses) and, in specific terms, it entails a repayment which is directly proportional to firm's investment returns. While debt involves a fixed, pre-determined repayment which does not depend on firm's profits, up to the point that profit is enough to repay the lender what has been contractually promised. Therefore, while debt involves bankruptcy, equity does not. Despite these clear differences, the literature on corporate finance has found it difficult to justify the issue of equity even in a framework with information asymmetries. In fact, debt always dominates equity repayment. Intuitively, if the firm-borrower has private information of very high rates of return on the project in need of external finance, it is not going to choose a repayment which involves sharing proportionally the return on those projects with others (equity repayment). If debt is available, the firm is always going to choose this form of repayment even in the presence of very high bankruptcy costs. Indeed, the issue of equity very often involves sending negative signals to the market (Leland and Pyle 1977; Myers and Majluf 1984) and results in a negative appraisal of the firm. Equity is treated as a residual alternative and as a suboptimal choice compared with debt.

The most recent studies have moved away towards a different approach which essentially hinges on a very simple consideration. Equity and debt involve very different financial costs and the issue of only equity, of only debt, or of a combination of the two, is simply the result of a firm's optimal investment decision which is taken in order to minimize those financial costs. As can be easily understand, these studies on a firm's optimal financial structure are strictly related to the literature on Initial Public Offerings (IPOs). The decision to go public and to issue shares is a complex one and it depends on institutional factors as well as on the economic environment. In practice the decision to enter the stock market involves the comparison of a wide array of costs and benefits.

Pagano et al. (1998) provide detailed empirical analysis of the major determinants of IPOs. Using a large database of Italian firms, they find that ultimately three major factors determine the decision of a firm to go public: (a) the stock market valuation of other firms in the same industry; (b) the company's size; and (c) the destination of the raised funds, that is, how firms employ these resources.

Very simple and intuitive reasons lie behind these results. The higher the valuation of firms in a given sector, the more probable it is that a firm operating in the same sector will go public. This finding confirms the arguments of Pagano (1993) that the issue of new equity is essentially a matter of strategic complementarities in the market, and the optimal solution to problems of information asymmetries. The probability of going public is also positively affected by a company's size. The larger the firm, the more convenient quotation on the stock market will be. This evidence seems to confirm the existence of fixed costs of listing and of economies of scale. Finally, the results of this study suggest that firms do not usually issue equity to finance expansionary investments but rather to repay outstanding debt or to reduce negative financial positions. Interestingly, Pagano et al. (1998) also find support for the existence of a kind of complementarity between equity and debt. Indeed, they find that going public enables companies to borrow more cheaply: equity reduces the cost of debt. Although Pagano et al. do not explicitly consider the impact of IPOs on capital accumulation, their results provide very interesting insights into the issue.

Recent studies explain the emergence of equity markets by analysing the optimal financial contract under information asymmetry and by investigating the changes involved because of capital accumulation. Information asymmetries can strongly modify agents' incentives and, therefore, contractual agreements between borrowers and lenders. A typical incentive problem, for example, arises when lenders are unable to observe directly the outcomes of the projects to be financed and, therefore, face moral hazard problems. The implication of such problems is that lenders must monitor, or verify, the claims of borrowers about projects' returns. However, since verification is costly, lenders find it optimal to verify only in a limited set of possible contingent states. Typically, the optimal solution to a standard costly state verification (CSV) problem, under the assumption that agents are risk neutral and monitoring costs do not depend on project returns, is always a debt contract. In other words, the loan repayment is predetermined and independent of the actual outcome of the investment (Townsend 1979; Diamond 1984; Gale and Hellwig 1985; Williamson 1986, 1987a, 1987b). The reason being that debt, which involves a fixed repayment, does not require costly monitoring providing that the contractual repayment is honoured. This would not be feasible if the loan repayment were a function of the project's return, like for example equity, and monitoring would be required in all states.

Boyd and Smith (1996, 1998) modify the standard CSV framework in order to provide an account of why equity might dominate debt at least in some circumstances. In Boyd

and Smith, borrowers have access to two alternative projects for producing capital. The first project has a higher expected return which is known to the lender. The actual return on the project, however, is unobservable to outsiders. If the lender wants to verify the result of production, they must incur a cost which is decreasing in the price of capital (the interest rate). The second project has a lower expected return, but the actual return on this project is costlessly observable to lender. Interestingly, Boyd and Smith show that the way the lender optimally finances the two projects are different. In specific terms, while the unobservable project is optimally financed through a debt contract, the observable project is optimally financed through equity issue. The dependence of the equity-debt choice on growth is easily explained. For a low level of capital accumulation, when the interest rate is high, monitoring costs are relatively low. As a consequence, agents tend to use the unobservable technology. This, in turn, implies that debt finance is more widespread than equity finance. As capital accumulates, and the price of capital decreases, monitoring costs increase, and the unobservable technology becomes less and less profitable. As a result, equity finance will make up a larger share of the economy. This process explains the emergence of stock markets at later stages of economic development.

Although the positive correlation between stock market development and economic growth has been established empirically, the causal relationship between these variables is still an obscure point. Is it stock market development that spurs economic growth, or is it capital accumulation that drives the emergence and the development of equity markets? Blackburn et al. (2005) provide an account of the possible two-way linkages between stock market development and economic growth, and an alternative interpretation of the development of equity markets. To these authors, the emergence of equity contracts is the result of lenders' attempts to solve multiple enforcement problems when a firm's choice of investment project and level of effort devoted to that project are private information. Capital accumulation can influence the development of equity markets because it can affect the degree of control that the lender has over these choices. The analysis is based on a principal-agent framework in which the borrower-firm (the agent) has access to an array of different projects, each with an expected return that depends on the risk of the project itself and on the amount of effort that the borrower exerts. The lender (principal), who has the task of designing the optimal financial contract, cannot directly control the firm's effort, but has the option to either impose their own choice of project at a cost, or to leave this choice up to the borrower. The optimal financial contracts under these two alternative scenarios are not the same. When the lender chooses the project, the optimal financial contract is typically a debt contract. When the firm chooses the project, the optimal financial contract is a mixture of debt and equity. The reason for this is that when the choice of project is imposed by the lender, a fixed repayment (debt contract) is sufficient to induce the optimal level of effort by the firm. By contrast, when the choice of project is left up to the borrower, a fixed repayment is not enough to induce the best level of effort, nor the best choice of

project; in this case part of the payment must be a function of the actual return (equity payment) in order to induce the borrower to exert the optimal effort.

The optimal choice of contract depends essentially on the cost to the lender of taking charge of project selection. In Blackburn et al. (2005) this cost is represented by the wage that the lender is forgoing by not supplying their labour in the market, and by instead spending their time selecting and imposing the project choice on the borrower. At low levels of capital accumulation, when the return to labour is relatively low, and the wage rate is also low, this cost is low and the debt contract dominates. As the economy develops, and the wage rate prevailing in the market goes up, the cost of imposing the project choice increases until it eventually becomes optimal for the lender not to interfere directly in this choice; then the financial contract will involve both debt and equity. When equity markets appear, the economy jumps from a low capital accumulation path to a high capital accumulation path so that growth is temporarily stimulated. The reason being that fewer resources are wasted in the economy for project selection. This could explain the positive impact of stock market development on growth.

The role of information asymmetries in financial contract design is extremely important not only in qualitative but also in quantitative terms. Recently, Bolton and Frexias (2000) have argued that when firms have superior information about the returns on their investments, the costs associated with the optimal security used to finance those investments depend on the degree of informational asymmetry. This is simply because lenders, who cannot a priori observe project returns, take an average of all possible outcomes. As in a typical lemon market, owners of projects with high returns will be penalized since their projects will be valued at a lower average price. This is referred to as the dilution cost of asymmetric information. Under such circumstances, Bolton and Frexias (2000) show that firms' optimal capital structure consists of two main forms of securities: equity and/or debt. The type of security issued depends on the level of dilution costs, together with the level of bankruptcy costs associated with the loss of future income following the borrower's inability to repay debt.

In a dynamic context, the level of information asymmetry does not stay fixed, but changes over time. It is commonly argued, for example, that in many countries the level of information available in the market increases considerably with the introduction of new communication technologies and the diffusion of many sources of information. It is therefore possible, in the wake of Bolton and Frexias' arguments, to imagine that economic growth and capital accumulation, by bringing about an improvement in the level of information diffusion, engender a modification in financial securities' costs and spur the development of equity financing. Following this line of argument, the emergence and growth of stock markets can be seen as the result of a reduction in the severity of information problems.

This idea can be modelled in a simple way (see Capasso 2004). Assume that different types of firms have access to different sets of projects with different expected returns. Assume also that the return on all, or some, of these projects depends on specific market conditions. The market value of a project reflects the level of information available in the market. Under the assumption that the same project yields different returns to different firms (for example, because some firms are more efficient than others), the value attached by the market to a project will depend on which type of firms find it optimal to carry out that project. If a project is run only by high productivity firms, then the market value will be high. On the other hand, if the project is run by less efficient firms, then its value will be lower, or 'diluted'. This dilution cost is one of the factors which can determine the optimal choice of one form of security over another. If lenders know which firms prefer to operate which project, then the set of projects undertaken will signal precisely the nature and the type of firms in the market. If, on the other hand, some firms have access to common projects, then the type of firms in the market can be inferred only probabilistically by observing the projects. The higher the number of firms accessing the same sets of projects, the lower the probability of correctly inferring a firms' type will be. Now, if the set of 'common projects' undertaken becomes smaller for some reason (for example, because some of these projects become economically inefficient), then the signal from the market becomes stronger and the possibility of inferring a firm's type becomes higher. The link with growth arises from the fact that capital accumulation reduces the incentive of some low productivity firms to operate projects that are typical of more efficient firms. Thus, capital accumulation leads to an improvement in the 'visibility' of more efficient firms, it decreases the cost of equity issue, and it causes an expansion of stock markets.

4 Conclusions

The positive correlation between stock market development and economic growth is a well known empirical fact. Stock markets appear to emerge and develop only when economies reach a reasonable size, and the level of capital accumulation is high. Notwithstanding such uncontroversial empirical evidence, the causal relationship remains a debated issue in the literature. Is it stock markets that boost growth, for example by reducing liquidity and monitoring costs, or is it capital accumulation that induces a modification in the financial system which causes the emergence of equity financing, for example by engendering modifications in the optimal financial contract? In recent years, a growing body of theoretical literature has attempted to provide satisfactory answers to this question. These efforts have given rise to distinct methodological approaches which have highlighted both the macroeconomic and institutional aspects of the phenomenon, and its microeconomic roots.

On the one hand, this large body of investigation has disclosed many interesting features of financial market development and provided new insights on the effects of financial variables on economic growth, on the other hand, it has raised further questions opening

new avenues for further research. In particular, the recent work, by focusing on individual firms' optimal financing choice and on the optimal financial contract, have transferred issues of corporate finance from a purely microeconomic level of discussion to a macroeconomic one and have raised innovative and exciting questions which deserve to be dealt with. One of these is the role played by information dynamics and information technology diffusion on firms' financing choice and, in turn, on financial market development and economic growth.

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