Financial Markets and Technological Change: Patterns of Technological and Financial Decisions by Manufacturing Firms in Southern Europe

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ABSTRACT

In this paper we suggest that technological acquisition and innovation by firms involve new investment, and thus require a financial decision as well as a technological one. The level of analysis is the southern European countries and the impact of the European integration process on sectoral innovation and industrial restructuring processes. The paper suggests that technological development goes beyond incentives for technological investment projects. It depends on the quality of investment decisions and in the long run on the profitability of these projects. In consequence, as the structure and behaviour of the capital market strongly affects investment decisions, it will also affect technological development.

Keywords: Innovation; financial structure; investment decisions; Southern Europe; industrial restructuring
INTRODUCTION

The debate on the catching-up process of Southern European countries in the European economy has revolved around two different issues. The first one is income per capital convergence. This debate has focused on the contribution of trade and the impact of the flow of ‘ideas’ in the convergence of the European periphery. Another area of research has focused on pre-conditions for sustainable, innovation-driven growth in Southern European economies.¹ These research agendas have influenced the formulation of integration policy in the European Union. Macroeconomic and competition policies in these countries have been justified with arguments on the welfare implications of intra-EU trade and the negative impact of inflation on growth as the background. The same applies for the impact of the second set of issues on a different plane of policy considerations. In that case, the emphasis on the development of local technological capabilities resulted in the introduction of large-scale policy initiatives with grants and subsidies for innovation and generous allocation of resources for the development of technological infrastructure.

Until recently, these two issues have been examined in isolation. Implications of potential links have been considered only ex-post after the introduction of specific sets of policies. The most notable example is the case of stagnating government R&D spending as a result of the policy for the reduction of public deficits according to the Maastricht criteria. Only in the case of recent competition and deregulation policies, a clear argument was put forward for the links between regulated markets for non-tradable goods and services and the efficiency of product markets. In fact, it has been argued that the implementation of market deregulation policies will facilitate an improvement in productivity through the removal of barriers for the adoption of new innovation in production and more efficient organisational structures.²

¹ Leonardi (1996) presents a collection of papers in line with the first approach. Recent contributions, however, have suggested that differences in stocks of productive forces play an important role after all, despite earlier arguments in the convergence literature [Angel de la Fuente (2000)]. Proponents of the pre-conditions model have presented numerous descriptive accounts of existing gaps suggesting policy instruments to overcome structural weaknesses. For an attempt for a rigorous exposition of these ideas, see Vence-Deza and Metcalfe (1996).
² For further details on these views, see European Commission (1997).
This paper is an attempt to bring these two issues together in a coherent analytical framework.\(^3\) We have examined the process of sustainable development at the firm level through new technological investment and industrial restructuring. The level of analysis is the Southern European countries and the impact of the European integration process on sectoral industrial restructuring processes. After the entrance to the EU, Greece, Portugal and Spain opened their domestic markets to intra-EU trade and introduced deregulation in their capital markets. The improvement of macroeconomic conditions and access to new markets for capital have influenced investment patterns in the business sector. Interest rates for investment loans have declined considerably and new markets for capital have been developed. At the same time, competition for medium-technology manufacturing products has increased and demand for locally produced tradable good is competing with imports. A detailed analysis of investment in technological change at the sectoral level could throw some light to the funding requirements of investment projects at the firm level. It could also improve our understanding of the link of specific categories of technology investment to financial constraints and capital structure. This paper suggests that technological development goes beyond incentives for technological investment projects. It depends on the quality of investment decisions and in the long run on the profitability of these projects.\(^4\)

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\(^3\) This paper summarises the results of a major international research programme titled *Investing in Southern Europe: Technological and Financial Decisions in Manufacturing Firms in Southern Europe*, funded by the TSER Programme of the European Commission. The study was conducted at three levels. The first level consists in the establishment of a rigorous and practical methodology. This involved a comprehensive survey of the existing theoretical and methodological studies in the fields of technology transfer, innovation systems, corporate finance and banking practice. From this survey, a coherent analytical method was derived. The second level was that of the study of existing empirical material. Local teams provided a general assessment of financial and technological trends in their countries. They also provided a detailed investigation of three key industrial branches in each country (textiles, food processing and electrical equipment). The third level was that of the fieldwork for the three country case studies. These were carried out in Greece, Portugal and Spain. We surveyed 220 firms, using a standardised questionnaire to access the impact of investment decisions on individual firms technological learning, growth in productivity and corporate performance. All the background studies cited herein are available on request.

\(^4\) For a useful discussion on credit creation and regional economic development - relevant to the problems of Southern European economies, see Dow (1996).
FINANCIAL STRUCTURE, SME INVESTMENT AND TECHNOLOGICAL CHANGE

Technological change is the aggregate outcome of investment decisions at the firm level. In the case of SMEs, this process is driven by technological change external to individual firms. Corporate strategy at the firm level responds in different ways to these challenges. The final outcome depends on the accumulation and efficient application of capabilities and resources by firms. The innovation studies literature examines this process either with more emphasis on factors exogenous to the firm –i.e. technological trajectories- or pays more attention on endogenous factors with emphasis on knowledge accumulation and internal capabilities. An attempt to overcome this polarisation has been a more systemic approach on the interaction of firms with their institutional environment. The level of analysis is corporate strategies and the emphasis is on the efficient adjustment to exogenous technological change through an optimum allocation of resources and endogenous capabilities with additional contribution from collective efficiency benefits through the appropriation of technological externalities (Pavitt and Steinmueller, 1999).

Our study is in the same line of research. However, it takes a more selective approach on the level of analysis and in the development of research hypotheses. Instead of a “set of factors” framework that will extend to many different components of the institutional framework in which economic activity takes place, we focused on the impact of the structure of finance on investment decisions. Figure 1 presents the main building blocks of our argument. We have used an extended definition of the requirements of SME investment that includes the direct cost of new projects, other complementary investment in tangibles and intangibles and the requirements for working capital.

The conditions for successful manufacturing have changed considerably in recent years. The allocation of industrial investment in plant, equipment and intangibles is changing considerably and new products and processes encompass a greater number of different technologies. These trends involve different investment needs. The main distinction is between “core technological investment” (comprising the bulk of technological investment) and ‘complementary investment’ (which guarantees the efficiency of the “core investment” Another dimension is the distinction between tangible and intangible investment, with the understanding that the latter comprises the
bulk of technological investment. In a product-cycle model we can define technological investment in three different stages: R&D, production preparation, production launch.\textsuperscript{5}

For the analysis of the links between technological change and investment processes we have examined two sets of issues: the impact exercised on investment decisions by constraint markets for capital and the quality of investment decisions in an environment with asymmetrical information and knowledge gaps. It is thus necessary for us to consider three poles of decision-making - firms, banks and technology suppliers - and combine current research on both technological innovation and corporate finance, in the dynamic context of European institutional change. Technology acquisition requires finance because it is really about investment; but this is not merely a financial question because it involves the restructuring of ownership and control as the firm expands. In this context, therefore, we understand ‘capital markets’ to include bank lending, securities issues, unquoted equity participation and government funding schemes as well as domestic and international stock exchanges as such.

The decision to invest in new technologies is constrained by uncertainty and information costs. Uncertainty is particularly high when technologies are new and still changing rapidly and investments are considerable.\textsuperscript{6} The process of decision-making gives rise to propositions linking the nature and timing of adoption decisions to characteristics such as the size of the firm and the relative cost of investment. The assessment of investment in new technologies is concerned with changes in the economic significance of new investment over time and how these may be measured by process innovation and product efficiency or by a product’s market share. An investment decision can take place earlier and more quickly when net investment in new applications, at the sectoral level, is growing and technological change is less conditioned by replacement investment. However, high expectations of rapid technological change may very well delay the adoption of new technology. It may be rational to wait while new

\textsuperscript{5} Further information on these trends is available in OECD (1995) and Budworth (1996). The distinction between embodied and not embodied technology in capital goods is important from a policy perspective. When technology is embodied to capital, policies designed to increase capital spending will promote growth through investment and Total Factor Productivity increases. If technology is not significantly embodied in capital, then quite different policies related to the flow of ideas are likely to be more relevant.

\textsuperscript{6} The broad consensus of aggregate studies is that the link between investment and uncertainty is negative. Uncertainty leads to lower levels of investment (Carruth, et. al 2000)
technologies are still competing with each other and/or with old ones, when technology suppliers are still being formed and when the scale of investment is relatively high.

In a world with asymmetric information and weak legal enforcement, the relative importance of various types of financial intermediaries and the relative use of various financial instruments depends on the structure of the economy itself. To make this clear, consider the following example, which is a stylisation of Southern, European realities. Suppose there are two types of intermediaries, banks and firms, and two types of financial contracts, fully collateral bank loans and trade credit. Moreover, suppose that large firms qualify for both bank loans and trade credit, medium firms qualify only for trade credit, and small firms do not receive either. Then the financial structure of the economy is entirely determined by the size distribution of firms. This process gets reinforced if, to reduce their exposure to risk, investors are drawn toward operations with a rapid turnover like commerce, or to financial investments with a safe return.

Indeed, barriers to credit generate allocative inefficiencies and pull resources away from manufacturing. These problems are being generated because the investment projects that get financed may not be those with the highest return. This is true whenever there is not a perfect match between investment opportunities and the allocation of credit. If firms that have long been in existence find it easier to access credit while new firms cannot, certain firms will outlive their usefulness and competition through new firm entry will be thwarted. The sectoral allocation of investment is affected because lost investment opportunities and inefficient production choices reduce aggregate returns to industrial capital. As a result, funds are channelled to uses other than manufacturing -- commerce, government bonds, and capital flight.

The relationship between the size distribution of firms and the financial structure of the economy has an effect on economic performance. First, the size of the market for specialised financial services depends on the number of firms who would potentially qualify for such services. When domestic firms participate in international markets they obtain better financial opportunities. These firms are able to extend their liability maturity structure. On the other hand, the debt maturity for the average firm shortens when countries undertake financial liberalisation’s. This implies that firms that do not participate in international markets are likely increasing their short-term financing liabilities. The domestic financial sector plays an important
role. This sector needs to provide adequate financing to firms unable to obtain foreign funding. Policies that help to consolidate a mature domestic financial system indirectly favour the development of local firms through the provision of financial alternatives. This implication is confirmed by the fact that countries with deeper domestic financial markets are less affected by financial liberalisation policies. If only a few large firms exist that could take advantage of them, the market may be so small as to discourage the investment required to provide them. Such examples are: organised markets for equity and bonds, stock market operations brokering, underwriting services, the handling of letters of credit, the endorsement of bills and post-dated checks, credit reference services, futures markets in currency and commodities, the use of warehousing and transport documents as a basis for short-term credit, etc. The absence of many of these specialised services has been blamed for low firm profitability and for the resulting low levels of direct foreign investment (Schmukler and Vesperoni, 2000).

If the economy is affected by a large aggregate shock, like structural adjustment, the existence of barriers to credit slows economic response to changes in relative prices. Large established firms may survive thanks to better access to credit even though their profitability has eroded. But because barriers to credit stifle the emergence and growth of new firms, the new investment opportunities opened by macroeconomic adjustment are not fully taken advantage of. This effect is particularly noticeable in manufacturing exports. In addition, growth and development imply structural transformation and the emergence of new firms undertaking new economic activities. Adjustment to macroeconomic shocks similarly requires that certain economic activities and firms disappear and that others emerge in their place. Suppose that most firms start with little capital, an assumption largely true in the case of Southern Europe, and that corporate growth depends on their ability to accumulate retained earnings and to raise outside funds. If start-ups have no or little access to credit, the adjustment and growth processes are slowed. Short of changing the size distribution of firms directly, one can support growth and adjustment by lowering the boundaries that determine access to credit.

The financial structure is to some extent self-fulfilling. If certain categories of firms do not qualify for credit, they are more subject to shocks than if they did. As a result they are less able to face contractual obligations and are less reliable borrowers. The probability of repayment problem is thus positively related to access to credit in general. Those who try to lend to sharply credit constrained firms indeed encounter repayment problems, not just because some of the

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Company size significantly affects patterns of finance. The larger companies show a higher index of self-finance and the smaller companies show a precarious financial behaviour because
firms they face are intrinsically bad payers -- i.e., that are not profitable and poorly managed -- but also because many of them have insufficient access to credit. Expectations, and thus statistical discrimination become self-fulfilling as individual lenders’ experiences comfort them in their expectations of poor repayment performance.8 

If financial markets are underdeveloped, then people will choose poorly productive, but flexible technologies. Given these technologies, producers do not experience much risk, and hence there is little incentive to develop financial markets. Conversely, if financial markets are developed, technology will be more specialised and risky, thereby creating the need for financial (and assets) markets. A particular resource (capital) can be specialised into a narrow range of tasks without being harmed through the increase of risk because financial institutions are used in order to deal with it. Thus, financial markets contribute to growth by facilitating a greater division of labour. In the absence of financial markets, diversification is taking place at the firm level through technology “options”. Firms will choose technologies that are less risky, with many applications, but less productive. Firms are reluctant to engage in sophisticated technologies as long as they cannot share the risk they incur with financial markets. Indeed, there is a strategic complementarity between financial markets and technology, because both are instruments that can be used for diversification and technological upgrading.

The technological role, or involvement, of a bank in manufacturing investment projects is not so much because of their role in the financing of research activities or the direct promotion of industrial innovation but rather because of their direct and indirect influence in the conception, design and execution of investment projects. Any project initiated and financed by banks includes important technological elements: machinery has to be purchased from local and foreign suppliers, workers have to be trained and consulting and engineering firms have to be hired to prepare the project and supervise its implementation. The technology embodied in any project is composed both of hardware and software. In practice it is usually rather difficult to determine precisely what share of the total cost of a project is accounted for technology. Some projects furthermore are much more technology-intensive than others. In the same way, some

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8 Industries that are heavy users of external finance do not grow faster in an economy with either a market or bank based system but in countries with higher overall levels of financial development. In the case of SMEs, one of their main advantages is quick adaptation to the changing needs of the market. This process depends on financial flexibility and good working relationship with banks (Rivaud-Danset, 2001). It is the overall level of financial development and not specific structures of financial systems of the financial sector that allows new firms to overcome barriers to obtaining external finance (Beck and Levine, 2000).
projects can be technologically rather simple as far as the hardware is concerned and sophisticated as far as the assimilation of embodied knowledge is concerned.

The technological role of a bank should be viewed essentially as a process of interaction, operating through the project’s life, with the firm and other partners involved in the project. One should not overlook the basic conflict between the role of banks as financial intermediaries and their largely unrecognised role as institutions with accumulated knowledge on product markets and firms’ competencies. This conflict stems from the opposition between the necessary financial prudence of the banker and the inherent risks involved in technological innovation. The imperatives of financial prudence mean that when a bank is acting as a technological institution, it will tend to be rather conservative. When making a loan to an industrial firm for the purchase of new machinery, for example, it will usually feel more confident, and therefore more willing to lend money, if the supplier of that machinery is a well established foreign manufacturer rather than a smaller and less experienced local firm.

Every manufacturing project financed by a bank goes through a certain number of stages, beginning with the identification of the project, and ending with the economic evaluation carried out once the project has been completed. These various stages form what is called the project cycle and served in this paper as a toll for analysing the role of banks as technological institutions. The preparation stage involves not only the bank and the consulting firm(s) working on the technical and financial aspects of the project, but also the agents which will be executing the project and more widely, all those which are concerned in one way or another with the project. This preparatory phase may require detailed investigations, for example, local conditions for the feasibility of the project, and in some cases the generation of entirely new types of knowledge about certain aspects of the project. The appraisal stage, which accounts for the largest part of the bank’s staff working time spent on the project, is the exclusive responsibility of the bank and is the only stage in the project cycle where the bank is working essentially on its own. The next stage - negotiation - is very much a bilateral affair, involving the bank and the partners in the project. The final decision about the project, taken by the bank can be seen formally as the exclusive preserve of the bank, but is in fact largely conditioned by the results of its negotiation with the local partners. The implementation stage is essentially the responsibility of the borrower and not of the bank. Through its supervision role, the bank however is involved in that phase and the interactions with the various partners in the project at this stage are somewhat similar in their complexity to the interactions, which can be found at the
identification phase. The evaluation stage is formally the responsibility of the bank, in the sense that it makes its own assessment as to whether the project has achieved its objectives.

This brief sketch suggests that a bank’s role as a technological institution is conditioned to a large extent by the nature of its interactions with the numerous partners involved in the various stages of the project. When analysing the technological role of banks, we should keep in mind that the various stages in the project cycle do not have the same importance as far as technology is concerned. The appraisal phase, for example, might appear at first sight as the most important phase in this respect, since it often specifically includes a technical appraisal, in addition to the usual financial, economic and institutional assessment of the feasibility of the project. In fact, once a project has reached this stage, all the important technological decisions have already been made, and there is little scope for redesigning any of its main technical features.

In this section, I have argued that by focusing on investment decisions at the firm level we can identify some significant barriers to the introduction of technological change at the firm level. These barriers refer to credit constraints and knowledge gaps. I have also suggested that the interaction of these factors exercises significant influence on patterns of industrial organisation and corporate growth. This investment problem has severe consequences at a number of levels. First, these firms are responsible for the greater part of manufacturing employment and productive skills. If they cannot survive and develop, then the workforce becomes rapidly de-skilled and migrates. Second, a thriving regional economy requires a strong network of innovative manufacturing firms that will stimulate further investment in suppliers, services, transport etc. Third, national industrial strategies in Southern Europe are necessarily based on the reconversion of inefficient large-scale corporations (often in public ownership) in traditional industrial sectors and the promotion of dynamic and innovative firms in new sectors. To a great extent, such modernisation necessarily involves the transfer of technologies from advanced industrial centres, but its adsorption requires considerable managerial and financial resources, while subsequent corporate growth will require endogenous innovation.
The recent debate on technological accumulation and convergence in southern Europe depends heavily on the assumption that one of the main benefits of regional integration processes is the diffusion of knowledge. The diffusion process is being supported by competition policies. According to this approach, successful local agents (firms) respond to exogenous shifts of the technological frontier in the world economy with "best practise" corporate strategies. Virtuous cycles come next with the modernisation of the manufacturing base, significant improvement of corporate performance and competitiveness in export markets. The idea underlying this approach is that firms are competent enough to develop an efficient response to these challenges.

Another aspect of the increasing importance of the diffusion oriented policy initiatives in the European Union is the emphasis on horizontal technology policy instruments. Technology policy received strong support as one of the structural policies needed to improve the prospects of economic development in Southern Europe. Governments supported the development of local technological capabilities with programmes geared to technical assistance to local firms, incentives to FDIs, training, and the modernisation of infrastructure. Additional funds have been allocated through the EC Structural Funds for the Objective I Regions and from competitive RTD Framework Programmes. R&D efforts in Southern Europe have significantly progressed over the past decade thanks to support provided by EC programmes that have financed more than half of the cost of the R&D infrastructure. With the Third and Fourth Activities of the fourth Framework Programme and Structural Funds for the period 1994-1999 the European Community has given increasing emphasis to investment in training and research and technology development capabilities in the Less Favoured Regions with particular emphasis on the problems of local manufacturing firms.

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10 For a detailed presentation of this debate and extensive literature, see Bartzokas (1998).

11 For an evaluation of these policy trends that underlines the need for complementary policies, see Higgins, et. al (1999); see also Clarysse and Muldur (1999).
This process produced mixed results in different regions due to (a) differences in “demand pull” factors, (b) the lack of co-ordination of policies (human resources vs. education policies and/or research vs. on the job training), and (c) differences in the level of institutional efficiency in less developed regions. The countries in question have a growth trajectory that has been determined by the import of technology in various forms. It seems that the conditions under which the inflows of technology can be exploited have changed and there is increasing need to introduce matching efforts on the side of the recipient countries. We also found that macroeconomic policies and the timing of the adjustment processes at the national level exercised significant influence on corporate performance and innovation dynamics in these countries.

Our approach offers an additional hypothesis regarding the conditions for successful technological development. A central proposition of this study is that the process of European integration itself - expansion in the 1980s, free trade in 1992 and monetary unification in 1999 - all have major consequences for the macroeconomic context, institutional structure and capital market behaviour of Europe. These macro-financial changes have a determinate effect on the desire and ability of SMEs in Southern Europe to acquire technology, and thus can either support or undermine policies of technological development at the Community or the national level. This investment problem has severe consequences at a number of levels. First, these firms are responsible for the greater part of manufacturing employment and productive skills. If they cannot survive and develop, then the workforce becomes rapidly de-skilled and migrates. Second, a thriving regional economy requires a strong network of innovative manufacturing firms, which will stimulate further investment in suppliers, services, transport etc. Third, national industrial strategies in Southern Europe are necessarily based on the reconversion of inefficient large-scale corporations (often in public ownership) in traditional industrial sectors and the promotion of dynamic and innovative firms in new sectors. To a great extent, such modernisation necessarily involves the transfer of technologies from advanced industrial centres, but its adsorption requires considerable managerial and financial resources, while subsequent corporate growth will require endogenous innovation.

Because of the imperfect mastery of technology and the uncertainty about the intensity of future product demand investors prefer to hold liquid assets, which has negative implications on productivity. Furthermore, the critical issue in industrialising countries is not the production of machinery but the degree to which embodied technology is being adopted. In any case there is a drop in productivity during the period of learning. New technologies cannot be used as productively as old ones, unless the economy has accumulated a certain amount of production
experience. The risk of technological sophistication results in inefficient technological choices and limited specialisation: finally firms prefer less specialised and less productive technologies (Bartzokas, 2001).  

The examination of the obstacles to technological investment in the Spanish case study indicated that the lack of internal financial resources, although significant, is no more important than the concern with commercial, technical or human resources restrictions. On the other hand, access to external financial resources was not considered a significant obstacle for technological investment in general. The Spanish case study identified patterns of investment at the firm level, where financial decisions or EU applications for funding are not the condition but a consequence of investment decisions. Spanish SMEs played a leading role in the catching up process to EU levels of technological development, in sectors that are not characterised by radical innovations. The finance of restructuring, mainly based in tangible capital goods, was conditioned by collateral requirements. In this sense, public financial policy facilitated the guarantees that led to specific successful investment projects. We can conclude that SMEs’ technological and innovation decisions are more determined by corporate and business strategies than by access to external financial resources or to institutional co-operative information.

This does not imply that access to finance is un-restricted when it comes to innovation and technological change. Investment and competitiveness are not simple processes. There is a complex connection between investment in restructuring processes with the renovation of equipment, systems and distribution channels and innovation projects in a strict sense, that develop and/or introduce new products, processes or services. On the one hand, the modernisation investment process establishes the basic circumstances to compete and provides the conditions that make the innovation process possible. These circumstances can be summed up as financial resources and the productive and marketing environment for learning, developing and introducing innovation policies. On the other hand, innovation projects endow

12 For example, exchange rate policies have influenced corporate decisions on the speed of the modernisation of production processes and furthermore on the selection of suppliers of equipment and engineering services.

13 Fuentes and Tablas (2000) provides a comprehensive review of structural trends in the Spanish manufacturing industry and places investment decisions in the broader context of corporate strategies. Spain is a good reference point since its manufacturing firms have caught up with EU levels over the last two decades.
firms with a specific differentiation in products, processes or services that lead to competitive advantage.

Until recently, firms could survive just by modernising and, in some product markets, the obstacles that existed allowed backward firms to stay in the market. This is not sustainable in the long term, and firms require investment funding to modernise as well as innovation capability to compete. Nevertheless, the financial circumstances necessary for both processes are not always present. In large firms, modernisation funds are provided by the financial system, while innovation is often self-funded. Moreover, their growth, when there is a qualitative jump, is funded by the stock market. However, in the case of SMEs, the working of the market poses problems for the funding of modernisation and this makes the innovation process dependent on these difficulties and a downward spiralling effect is caused. Financial tools that provide resources for both processes are distinct but they reinforce each other in a positive or negative way. Without the modernisation process, innovation would not be possible, or the conditions that made innovation profitable would not be present. Without innovation, competitiveness is quickly eroded and the restructuring process itself is not sustainable.

It is difficult to differentiate between intention - demonstrated as sincere and comprehensive in interviews with Spanish firms and financial institutions- with real practice. However we can draw some conclusions from this. It should it be forgotten that the two different types of long term funding, self-generated resources and debt, have qualitative differences with reference to risk, their terms and relative volume. The integration of these variables creates a level of compromise with the business and a type of relationship with a qualitatively distinct nature. These are questions that require different treatment. In regard to the processes of investment finance with outside capital it is worthwhile noting four characteristics:

The first problem when dealing with SME debt in the medium to long term is that many companies find it difficult to get credit access because it is nearly impossible for them to meet the bank’s demanded guarantees. The difficulty is closely linked to firm size, age and credit terms. These factors are very much inter-related. The level of guarantees demanded by the banks affect objective and subjective factors that determine the risk level of a project. Firm size is related to both factors. The introduction of specialised mutual guarantees is a response to that in two ways. They facilitate interaction, through the promotion of specialisation on SMEs problems within the local environment. This allows them to increase their knowledge about the enterprise and its environment, and through the direct assessment to SMEs with the financial
project design. On the other hand, they operate directly in the size factor through the diversification of risk on reciprocal guarantees system. Guaranteed Credit activity is highly concentrated into two areas, the Comunidad Valenciana and the Elcargi situated in the País Vasco. The importance of the Guaranteed Credit in both cases is closely linked to the support of the local authorities. This indicates that a more aggressive support (not direct intervention) policy in other regions is very important. This shows that there is currently a territorial concentration of this activity due to the underdevelopment of the mutual guarantee system in Spain. There is a lot of growth potential for this activity over the next few years.

The second problem encountered is the terms of guarantees. Again, we have to distinguish between objective and subjective factors. In terms of subjective factors, those that affect risk perception can be significant such as the success of the growth of ICO financial credit lines for SMEs started in 1993 with the so-called “bank intermediation credit lines”. In fact, bank funding and enterprise habits have changed over the years with regard to the terms. Financial companies have been obliged to accept higher rates of risk because they are forced to compete in an increasingly competitive SME market due to the ICO financial credit lines. However, once they have entered the market, experience and learning have changed the risk perception over the last few years.

The third problem in SME funding is the volume of resources available. One of the general problems in SME funding is the difficulty of channelling funds towards enterprises because of the risks related to the size of the firm. This reason alone limits the supply of funds. Securitization aims to reduce credit risk and unlock financial companies’ own resources in order to increase the supply of funds for the SMEs. From the point of view of individual enterprises, the situation remains the same because access to credit is the same and has the same conditions. Taking this into account, the important thing is not the absolute quantity of resources mobilised but the effect created by the practices applied. At the margin of the increase of quantities assigned to each one of the tools mentioned, it is important to highlight the significance of three qualitative aspects: agent specialisation, the improvement of the process of learning, and, finally, the consolidation of the distinct agents and tools. In the first place, it is worth stressing that, as has been argued in other parts of the report, information and knowledge, as well as their correct management, have a central role in changing the subjective risk perception. In this field, specialisation is essential, as much as for the banking institutions as for venture capitalists and administrative agents. The need for a process of specialisation from distinct agents is essential in order to respond to the challenges of rapid technological change and globalisation.
In the second place, the process of learning by private and public agents in relation to the market and among themselves is an essential factor for the development of an adequate institutional framework. This means that the institutional framework cannot be imposed voluntarily, but is the fruit of a mature consensus between different agents. This does not imply that the process does not require stimulus that is the responsibility of the administration, orientating intervention or presenting possibilities through a regulatory framework freely accepted by private agents. Finally, one of the factors of success for the modification of conditions of the working of financial markets is the articulation of the distinct public and private agents who intervene in the market to the point of constituting an articulated and coherent institutional framework. This synergetic effect could operate through multiple relationships. All these examples show the way in which the institutional framework changes the broad conditions of market operations and increases the impact of financial incentives and other interventions supporting technological development and industrial restructuring.

Indeed, there is increasing evidence (at the empirical level from the practise of regional development and theoretically in the fields of asymmetric information and endogenous growth) that firms in southern Europe have special difficulties in achieving socially desirable levels of investment. The effectiveness of policy instruments such as tax incentives, skills training and infrastructure provision is limited by the lack of understanding of how firms actually make investment decisions. Investment decisions involve a combination of financial, technological and human resources; of which finance and technology is scarce in poorer regions and must be accessed through Europe-wide markets.14

The Greek case study examined the relationship between sources and availability of finance on the one hand, and economic performance at the firm level on the other (in particular innovation-related investment).15 We have placed our analysis against the background of a rapidly changing economic environment, which is speeding up restructuring among producers and financial institutions. One interesting finding in the Greek case study is that the prevailing corporate strategy remains in many respects traditional and low-risk oriented. This applies for products

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15 Detailed review of the Greek financial system, local technological capabilities and presentation of the research findings of field work is provided in the background reports: The Dynamics of Financing and Innovation in the Greek Economy: Continuity and Change, Giannitsis, et. al (1998) and Lyberaki and Mylonas (2000).
and markets, technology and the treatment of labour costs as primary targets for improving efficiency. Maintaining markets and products remains a more attractive option than creating new or improving products, or than expanding in more demanding new markets. As far as its main sources of finance are concerned, personal funds remain very important, although easier access to bank credit (of both short- and long-term nature) has gone hand in hand with the decline in the cost of capital. This development should be partly seen as a result of the restructuring and liberalisation of the financial system itself, and partly as a by-product of the improvement of the macroeconomic performance of the Greek economy over the past few years. Albeit the modernisation drive of the financial system, the new tools of financing technology related investment (venture capital companies and business angels) remain marginal (at best) or irrelevant for the firms of our sample.

It looks as if innovation takes the shape of abrupt leaps into altogether new manufacturing processes with the wholesale introduction of new production lines. This is suggestive of a process lacking the checks and balances of incremental change and gradual improvement (the latter presupposing deeper knowledge and understanding of products and processes). Innovative investment is seen more as an internal process, rather than an interactive/creative one. Indicative in this respect is the prevalence of the view that a major obstacle to further investment is the lack of demand. Besides the problems of restricted technological capabilities, it appears that there also exist severe information problems concerning the investment incentives legislation (as reported in the interviews with banks).

The Greek financial system has been going through radical structural change over the 1990s. This change has not essentially affected the predominance of the Banks as the main financial institutions, but has triggered a process of internal differentiation of activities inside the Banks themselves. Other non-banking institutions remain few and far between, and their role is still rather marginal. Crucial in this light is the small number and weak role of venture capital firms, which normally provide seed capital and start-up capital. Interestingly, even the few venture capital firms that already exist, are primarily outward oriented (80% of the total of venture capital funding). The Stock Exchange has offered a source of finance (in the form of public equity) for a small number of firms that were in a position to enjoy access to it. The dominant source of external finance however by and large remains the banking system (as well as what is often called “trade credit” extended to and from suppliers and customers). In view of the fact that cash-flow criteria still dominate the banks’ decision to supply credit to the firms, and also taking into consideration the weaknesses of the banking system to assess the risks and potential
benefits involved in particular technology-related investment projects, we could suggest that at least some promising investment plans will remain poorly funded. This is arguably more of a problem the smaller and the younger the firm applying for a loan.

In the Greek case, the bulk of SME non-private financing comes in the form of bank loans. Banks do consider SME lending to constitute an important part of their asset portfolio, but they do not feel that they have to make any special effort to attract SME customers because the latter have nowhere else to go. Banks evaluate loan applications according to the standard commercial (but not developmental) criteria (liquidity, financial ratios, collateral and the like). Interestingly, the length of the relations with a customer does not enter in the evaluation process (contrary to what seems to be happening in the rest of the world). Nor does exporting activity appear to be capable of relaxing the strict financial criteria.

The hesitant and traditional attitude to development strategies is not solely confined to the entrepreneurs but extends also to the banks (the suppliers of credit). It could be argued that the weak innovation related entrepreneurship of the owners/managers of the firms is matched by a similar (traditional and risk-averting) attitude on the part of the existing financial institutions. What is probably even more striking is the stated reluctance of bankers to finance R&D projects even when backed by partnerships with an established research institute. Implicit in the answers provided both by the Banks and the firms is the acknowledgement of the fact that the Banks lack the necessary capacity to evaluate an investment project in its own right. Banks apply stricter criteria for technology-based investments; they have greater difficulty in financing process innovation, technology development and intangible technology. They prefer a situation in which SMEs come forward with concrete and completely budgeted projects rather than with a variety of options. The widely diffused notion concerning best practice and rewarding investment financing decisions underlies what we perceive to be the prevailing strategies of firms and financial institutions, and it should come as no surprise that there appear to exist some strong similarities. As is always the case with complementarities, they can have either a virtuous or a vicious circle effect. In the cases drawn from our sample, defensive and risk-averting attitudes are threatening to maintain innovative performance at a low level within the latter pattern of corporate strategy.

Because liquidity risk is positively related to firm size and because barriers to credit increase the risk of doing business, entrepreneurs unable to self-insure against large risks will prefer to remain small and to diversify their activities in whatever way they can. For instance they may
start a new firm instead of expanding the one they currently operate. Barriers to credit also affect technology choices. If access to credit is partly determined by the collateral value of the investment, purchases of land, buildings, and vehicles are facilitated while the building up of stocks, wage fund, and credit to customers are not. This may result in the adoption by large firms of capital-intensive methods of production and in an emphasis on production instead of marketing and product improvement, even though labour intensive methods may be more efficient and an improvement in marketing much needed. Moreover, in areas of fast changing technologies, small firms and start-ups may be unable afford the best available technique of production. Risk also makes firms reluctant to experiment with unknown. They may reduce risk by opting for a flexible organisation of their business. For instance, investors may prefer multi-purpose technologies that can easily be affected to new tasks, even if it means bypassing state of the art specialised equipment. They may avoid investments in equipment and technology not because they could not get a bank to finance it but because rigid loan repayment obligations would put the firm at risk. In all these cases, some of the gains from specialisation and learning by doing are not captured and the size distribution of firms remains inefficient.

Taking into account our company survey and the interviews with bank executives in Portugal, there appears to be a “differentiated attachment” between firms and banks. The two partners don’t ascribe the relationship the same value: “firms value the relationship more than banks”.

In fact, firms show a strong commitment to their banks, and have a perception (probably, not fully justified) of reciprocity. Usually companies would not break a long established relationship with their bank, provided that interest rate differentials fall in an acceptable range. Banks, however, do not decide primarily on the basis of the relationship and firms’ characteristics and may often better conditions to new clients in order to attract them. It is possible, however, that in a context of increasing access to external sources of finance, Portuguese banks would increase their attachment to (some) relationships in order to prevent competition (Simoes, 2000).

The existence of “market failures” in financial markets – and particularly with regard to SMEs and to innovative investments – provides a rationale for public policies in this regard. It is

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16 Simoes (2000) provides additional information on the technological characteristics of the Portuguese manufacturing industry and an interesting presentation of different views on technological investment by the various actors involved in investment financing processes.

17 An interesting Portuguese initiative is the PME Excelência (PME Excelência) programme. The PME Excelência is an initiative launched by IAPMEI (together with Banco Nacional Ultramarino) in 1992 for manufacturing SMEs and later extended to other activities and other banking institutions.
widely acknowledge that such policies should no longer be aimed at direct intervention, such as credit and interest rate controls, having in mind the globalisation of capital markets and the creation of EMU. But there is still much room, especially in Portugal, to introduce more transparency in the market, namely through the improvement of environmental conditions.

The strengthening and the dynamics of the Portuguese “national system of innovation financing” requires, therefore, actions – one might even say, concerted actions – from the three main organisational players: banks, companies (in our case, SMEs) and public bodies. In this vein, bank executives were asked to provide their opinion concerning the most appropriate actions to be taken by the different players. Respondents were given, for each player, a closed list of improvement measures. Somewhat surprisingly, what we found was a focus of bank executives in a small number of options in each case. It would appear as if focussing on a limited set of issues might solve problems, as we will see below.

In this regard, the most critical theme seems to be accounting transparency. In fact, all our interlocutors ranked “improving accounting standards” in the two top levels of the scale used (very or quite important). Two other factors scored as important by all banks, but with less emphasis, were the involvement of more experienced entrepreneurs in the projects and the existence of a longer relationship with the bank beforehand. Having in mind the ranking of lending criteria presented above, these aspects are less relevant, since banks’ main focus is on financial analysis. Nevertheless, the rationale for looking for improvements in these areas is easily understandable. Banks complain about the lack of strategic and managerial capabilities of Portuguese entrepreneurs. So the involvement of experienced managers would increase the probability of project success. With regard to the advantage of long-established relationships, this is obvious: banks would know the company and its management better, and this would therefore improve risk assessment procedures.

It appears that bank managers know the issues, and that banks have been exploring the possibilities to be more efficient in delivering their services and closer to firms. Past experiences are incorporated in today’s behaviours. The waves of bad debts, which occurred since the early

*Excelência* was much appreciated by banks since it takes a cooperative, and not an adversarial, perspective, and its success requiring the involvement of all the partners in the SME lending process. They reconcile the requests of SMEs for lower interest rates and non-discrimination of well performing SMEs with banks priority to transparent information and good managerial capacities. Bank executives recognise that the initiative is adding pressure on banks since other firms, with good performance, want to profit from similar opportunities (Simoes, 2000).
1980’s led banks to become more cautious when granting loans. There is, however, some room for improvement, the more so as the process is of a permanent moving nature. Solutions depend simultaneously of past trajectories, competitive pressures and visions of future. We may suggest that, in the present wave of mergers and acquisitions, being closer to firms is an asset that differentiates Portuguese from foreign banks. But larger firms business is still more appealing than SMEs one, and supporting innovation for its own sake is not banks business.

As indicated above, the view of banking sector executives on government incentives provided to companies is very cautious. In some instances incentives turned out to be negative, since they somewhat “vitiated” the investment decision process, “going from the incentive backwards to the project” and not the opposite; another negative consequence was the creation of subsidy-dependence situations. With regard to the way that incentives should be tailored there were two different views: (1) tax incentives are more effective than financial ones, since they lead to healthier company behaviours, and (2) financial incentives at zero interest rate are a useful option but the ideal would be to introduce a build-in mechanism which would provide a posteriori incentives as a “premium” for good performance. These should not be so much aimed at encouraging and providing funds for investment, but rather as the additional benefit to be granted to those which were able to launch profitable projects.

It would appear that “market failure” in commercial finance for manufacturing firms modernisation in Southern Europe arises because banks lack adequate information about, and insufficient capacity to monitor, borrowers of this kind. In addition, the uncertainty inherent in new technologies (which, unlike risk, cannot be insured against) means that even for larger client firms, banks tend to prefer existing (imported) process technologies or product franchises, which have been “proven” in another market. In addition, the deregulation of the banking system seems to have led to a search for short-term yields and liquidity, and a weaker relationship with (and thus less information about) clients. The form of corporate finance involved thus conditions the type of technology chosen and the success in developing it.

The Greek case study examined the adjustment of Greek SMEs in the context of significant changes in the macroeconomic environment. Indeed, these favourable changes in the external environment have been supported further with the introduction of policy instruments for the exploitation of technological externalities and corporate strategies. Policy failed to produce significant collective efficiency benefits due to inherited weaknesses in the implementation processes of support programmes and low-risk corporate strategies. Manufacturing investment
in Portugal was based on investment subsidies. In addition, the improvement of macroeconomic conditions has eased access to finance. The Portuguese case study has questioned the quality of investment decisions undertaken by firms in the three selected sectors. One of the results of our case study is that firms have conditioned the sustainability of their investment projects on the implicit assumption that further subsidies will become available through subsequent Government programmes. External constraints have exercised an impact also. According to Portuguese companies, the lack of skills scored very high in the problems that have thwarted the development of Portuguese manufacturing firms in recent years. In the Spanish case an extensive series of programmes supporting industrial adjustment to new market conditions, including credit subsidies tailored to firms’ needs implemented at the central and at the regional level, was implemented. Attempts to utilise these policy instruments and related institutions for the support of corporate strategies aiming at innovation driven growth has been confronted with many problems.
CONCLUSIONS AND POLICY IMPLICATIONS

The competitiveness of firms is increasingly based on their innovative capabilities, through the development, absorption and upgrading of new solutions – not only on the technological domain, but also in the marketing and organisational fields. In Southern European countries, public authorities do not seem to have fully acknowledged the challenges of innovation, focussing more on relatively uncoordinated science and technology, and industrial policies than betting on an integrated innovation policy approach. In spite of this, several actions have been launched with an aim to support the strengthening of firms’ capabilities, especially on what technological issues are concerned. Either in the context of Community Support Frameworks or on a purely domestic basis, several policy instruments – such as financial incentives, tax holidays, training support and infrastructure provision – have been launched to achieve those objectives. However, their effectiveness has been limited by a lack of understanding of how firms are managed and actually make their investment decisions.

It has been seen in this paper how technology innovation and financing interact, and how this interaction changes in the context of different corporate strategies. The effect of policy has been considered in terms not only of the type of firm to benefit, but also the type of investment being implicitly targeted and how this might be affected by policy. Policies have been considered which impact both on the availability of (public and private) equity, and that of bank finance. Four breakpoints in SME financing have been highlighted - firstly, where the firm needs support to ensure its continuing survival; secondly, where young product innovators are seeking private equity finance for an expansionary technology acquisition; thirdly, where a more established firm seeks long-term debt for a range of expansionary technology projects; and fourthly, where a firm is seeking private or public equity to finance technology investments to strengthen and consolidate their successful market position (Cobham, 1999).

The different implications of these scenarios are important. In the first case, policy of giving tax breaks to early stage private equity investors would directly allow many more firms to survive the breakpoint, while policy focussed on banking efficiency would be much less effective. In the second case however, government guarantees to banks making subsidised loans would not only be preferred by those firms currently making use of private equity investment, but also encourage others who might otherwise have not crossed the breakpoint because of their
preference for bank finance. Thus, focussing on private equity investment with policy will be to target the high-risk, high-return set of firms from which the most successful SMEs will be distilled, while to target the SME-bank relationship will have a much wider effect on the general population of firms. More interestingly, the first would encourage firms to follow their more innovative strategies and conduct R&D into new products especially, while the second enhances the relative frequency of the exclusive ‘buy’ strategy. Using tax policy to encourage (non-venture capitalist) private equity investors might be a more neutral intervention, although it will lean toward the higher innovation outcome.

Clearly, the effect of focussing policy on each of these will be very different. The choice between targeting the first and last might be considered as one between ‘breadline’ and ‘headline’ SMEs - the former group are important to the economy in terms primarily of their role as employment providers, and policy will aim to generate sufficient (low level) finance to prevent mortality, while the latter are the success stories which may encourage investment throughout the SME sector and thus improvements in the economy through superior production and innovation. There may be internal organisation problems to be overcome in making financing attractive to SME owner/managers at the first breakpoint, while at the fourth no such obstacles will exist.

To focus policy on the second or third of the breakpoints in SMEs financing involves a more subtle choice of emphasis - between risk-sharing and repayment finance markets, between earlier and later stage SME development, and between the more likely technology acquisition strategies of exclusive ‘buy’ or comprehensive ‘make and buy.’ Policy for the second breakpoint must address the apparent absence of business angel networks in southern Europe, and the effects of the tax system on incentives for private equity investments. The technological capabilities being encouraged here may be the most productive set for improving the innovation performance of the economy. Policy for the third breakpoint will instead target banking structures and efficiency, and can be expected to have more of an impact on the extent of R&D and internal innovation by SMEs. Again, firms in each case may decide against pursuing further financing (and growth) for internal reasons.

Our main finding in this paper is that technological acquisition, R&D and innovation in both products and processes by firms all involve investment decisions, and thus require a financial decision as well as a technological one. In consequence, as the structure and behaviour of the capital market strongly affects investment decisions, it will also affect technological
development. Specifically, the macroeconomic changes and new market structures arising from European integration have a determinate effect on the investment decisions of the small and medium enterprises (SMEs) in the manufacturing sectors of the Southern European economies that are the subject of this study.

The key distortion in the story of SMEs’ technology and investment may be the role of their owner/managers, in particular at the four breakpoints outlined above. For this reason, analysis at the firm level of choices between equity and bank finance is crucial to understanding the potential of policy options. What is required is an attempt to model the decisions of the SME - the underlying preferences as well as the outcomes which seem primarily the result of financing availability - and thus gain the understanding necessary to mediate on the question of policy in equity or bank finance structures. The effects of encouraging different types of technology investment at the expense of others must also be taken into account, and the robustness of the results on SME technology and investments that have been utilised here must be further established.

To conclude then, in a macroeconomic context, financial development appears to be important for growth and productivity increase. However, it remains an open question whether (and under what conditions) the bank-based or the stock exchange-based financial system is more conducive to growth. In a microeconomic context, internally generated funds (the cheapest source of acquisition) are conducive to investment in the quantitative sense, but it remains questionable whether (and to what extent) they promote qualitative investment. When capital is relatively scarce a relationship-based system (banks) will have a similar effect as internal funds (and internal capital markets): it will alleviate financial pressure and enhance investment, thus spurring economic growth. In such a context, market-based systems are incapable of reducing agency costs and generating the appropriate level of investment. However, when investment opportunities are relatively few, then a market-based system can “guide” and “dictate” the most appropriate investment decisions as well as alleviating misallocation problems stemming from free cash flow. As far as high-tech investment decisions are concerned, capital market imperfections and the necessity to promote extensive flows of information and knowledge sharing, it seems that one needs to envisage a combination of the two pure forms of financial systems. This combination can acquire the form of venture capital as a financing tool, which combines characteristics of both relationship-based and arm’s length financial systems. While clearly it is a variant of relationship-based financing, it nevertheless depends strongly on a well-functioning arm’s length financial system.
Several programmes have been designed to reduce the financial constraints faced by firms – namely SMEs –, and to provide them with additional funds to launch more innovative projects. In many instances, such programmes together with the decline in interest rates spurred investments and contributed to the upgrading of firms productive structures, at least on what fixed capital is concerned. But the financial restriction still holds. The relationship between SMEs and the banking system is not an easy one: in general, banks are being more interested in reducing their risks to a minimum than with the development of firms initiatives; on the other hand, banks refer that SME do not present investment proposals attractive enough, while their accounts are not transparent to enable an accurate assessment of risks. Nevertheless, having in mind the financial structure of SMEs and their difficulties in competitive markets, there is a clear need for policies that will overcome information problems in technological investment project cycles.
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Figure 1: Investment and Technological Change

Investment and Technological Change
- Cost of new investment
- Adjustment costs (complementary investment and learning)
- Working capital

Financial Resources: Constraint markets
- Information asymmetries
- Financial Structure
- Corporate finance
- Incentives structure

Investment Capabilities: Knowledge gaps
- Technological Capabilities
- Corporate strategy
- Sectoral characteristics

- Capital Structure
- Industrial Organisation
- Corporate Performance