UNIVERSIDADE DO ALGARVE

FACULDADE DE ECONOMIA

TECHNOLOGY-RELATED STRATEGIES IN LABOUR – INTENSIVE INDUSTRIES IN SOUTHERN EUROPE: CONSEQUENCES FOR LOCAL EMPLOYMENT

Tese para a obtenção do grau de doutor no ramo de Economia,
especialidade de Economia Regional e Urbana

MARISA ISABEL SILVA CESÁRIO

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Ao meu pai...

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ABBREVIATIONS LIST

CAD	Computer-Aided Design
CAM	Computer-Aided Manufacturing
DB17	NACE Subsection for Manufacture of textiles and textile products: Manufacture of textiles
DB18	NACE Subsection for Manufacture of textiles and textile products: Manufacture of wearing apparel; dressing and dyeing of fur
DC19	NACE Subsection for Manufacture of leather and leather products: Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
ERDF	European Regional Development Fund
EU	European Union
GDP	Gross Domestic Product
GREMI	Groupe de Recherche Européen sur les Milieux Innovateurs
ICT	Information and Communication Technologies
NACE	Nomenclature of Economic Activities
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
PPS	Purchasing Power Standards
QPS	Quotient of Production Specialisation
R&D	Research and Development
SME	Small and Medium Size Enterprise
SWOT	Strengths, Weaknesses, Threats and Opportunities
TCL	Textile, Clothing and Leather sectors
UK	United Kingdom
WTO	World Trade Organisation

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ABSTRACT

The present research aims to better understand the entrepreneurial behaviours of small firms within a globalising Europe. A special attention is due to the links between economic agents and their surrounding environments, admitting a two-way flow of influences between both: environmental conditions influence the performance of small firms as much as their behaviour promotes long term impacts on local settings.

Empirically, the analysis is based on a questionnaire application to a sample of 167 small and medium sized firms from textile, clothing and leather (TCL) sectors, and belonging to the following European Southern areas: North (Portugal), Valencia (Spain), Macedonia (Greece) and South Italy (Italy).

The selection of these regions was made considering their economic vulnerability, based on three major criteria: EU objective 1 status, being outside large urban centres and with an economic tissue based on labour-intensive firms.

A common questionnaire was applied in each region, allowing a cross-country analysis among regions whose economic dependence to labour intensive sectors, particularly vulnerable to the low-wage competition arriving from Asian competitors, is a common threat.

The tendency has been the employment decline in these industries with the increasing relocation of manufacturing jobs in low-cost areas. Only successful firms, the ones with higher technological capabilities, are able to develop the proper investments in innovation and technology and create employment. In theses cases, people employed are more flexible and higher skilled, hence able to work in the several complementary areas of the textiles and fashion value-chain, such as design, marketing, management or sales.

Key Words: labour-intensive industries, technology-related strategies, employment, globalisation, delocalisation.

RESUMO

A presente investigação tem como principal objectivo compreender as estratégias empresariais das pequenas empresas no actual contexto de globalização na Europa. A ênfase é colocada nas relações desenvolvidas entre os agentes económicos e o ambiente institucional envolvente, admitindo que ambos se influenciam: as condições do meio promovem o desempenho dos agentes, do mesmo modo que as suas acções provocam impactos locais de longo prazo.

Empiricamente, a análise baseia-se na aplicação de um questionário a uma amostra de 167 pequenas e médias empresas dos sectores dos têxteis, vestuário e calçado, localizadas nas seguintes regiões sul Europeias: Norte (Portugal), Valência (Espanha), Macedónia (Grécia) e Sul de Itália.

A selecção destas regiões foi feita considerando a sua vulnerabilidade económica, tendo esta por base três critérios fundamentais: cumprir o estatuto Objectivo 1 da UE, localizar-se fora de centros urbanos de grande escala e com um tecido económico com predominância de indústrias de trabalho-intensivo.

O mesmo questionário foi aplicado em cada uma das regiões seleccionadas, permitindo realizar uma análise *cross-country* entre diferentes regiões do sul da Europa cuja dependência económica a sectores de trabalho-intensivo, particularmente sensíveis à concorrência proveniente das economias asiáticas, é uma ameaça comum.

A tendência, face à crescente deslocalização da produção para economias de baixo-custo, tem sido a contínua redução dos postos de trabalho nestas regiões. Apenas as empresas com maior aptidão tecnológica têm vindo a ser capazes de desenvolver os investimentos apropriados em inovação e tecnologia de modo a criar emprego. Nestes casos, a mão-de-obra empregada é necessariamente mais flexível e mais qualificada e com capacidade para exercer funções nas várias áreas complementares da cadeia de valor desta indústria, que vão desde o sector têxtil ao sector da moda, tais como o design, o marketing, a gestão ou as vendas.

Palavras - chave: indústrias trabalho - intensivo, estratégias tecnológicas, emprego, globalização, deslocalização.

Chapter 1 - General Introduction

1.1 Labour-intensive industries in Southern Europe

The importance of the textile, clothing and leather (TCL) sectors in Europe is recognisable. A predominantly small and medium sized enterprise (SME)-based industry with a annual turnover of more than 230 billion Euros produced in around 273.000 enterprises, these sectors employ more than 3 million people in the EU27[1].

The liberalisation process following the signature of the World Trade Organisation (WTO) Agreement, has increased import penetration in these sectors, with the EU industry experiencing serious difficulties in competing with foreign operators working with lower labour costs and less stringent social and environmental regulations.

This new economic conditions have been forcing a restructuring in these industries. While many companies disappear, others attempt at concentrating their activities, with a dual purpose: concentration allows better market control, as well as cheaper outsourcing of components to remote competitive specialized suppliers.

In comparison with the Northern European countries, in Southern Europe the system is less concentrated and firms present lower employment productivity levels.

[1] Source: Eurostat Summary Indicators (2005); NACE: DB17, DB18 and DC19.

Therefore, for Europe, the increasing job loss in labour-intensive industries constitutes a several issue in the present socio-economic scenario, but the extent of resulting consequences for the vulnerable European Southern regions should be carefully investigated. Such regions do not have easy alternatives for the expected trend.

1.2 Perspectives and policy issues

In October 2003, the EU Commission adopted the communication *The future of the textiles and clothing sector in the enlarged EU* (COM, 2003). This communication takes into account the specific characteristics of the overall context of the textiles and clothing sector while ensuring the best possible framework conditions for all related businesses in the EU.

Later, the main message of the EU communication on *Textiles and clothing after 2005* (COM, 2004)) was that the sector in Europe needs to increase its competitiveness by concentrating on its strengths. The sectoral consequence of this call is the need to identify positive aspects, opportunities, costs and particular skills within the sector. Political actors and firm leaders were responsible to make this possible. An EU high level group for textiles and clothing was set-up early in 2004.

Notwithstanding the political concern and general supports for the sector, a lack of new and specific regional or associative initiatives can be pointed out. So, the success factor depends essentially on how European industries

individually active will strategically adjust to the few opportunities and many challenges brought by the new economic perspectives.

The impact of new technologies, the changes in consumer behaviour as well as the challenges of globalization can be considered as the most important drivers of change in European labour-intensive sectors, such as these ones.

Firstly, the rapid development in information and communication technologies (ICT), together with the development of new materials and new production technologies, demand for new skills combinations able to introduce new techniques in design and management.

Secondly, as individualization and customization increases, diversified and multiple consumer patterns bring new opportunities for firm's marketing strategies.

Thirdly, in what concerns the globalization phenomena, and particularly for the labour-intensive sectors, it is expected that the sourcing of low value-adding activities will increasingly go to low-cost countries. Notwithstanding, aggressive retail strategies prevail in the western world with the emergence of new markets. This challenges companies to think globally in a market perspective.

Finally, as the pressure on EU countries increases with low-skill jobs moving away, EU politicians should be aware of the need to increase innovation and flexibility of the labour market. The introduction of regional-specific features among the European territory could bring some positive impacts on the global consumption.

In contrast with the more price-competitive and scale advantageous industries of northern Europe, the low cost countries in the south have a customised fashion-oriented industry, which is less vertically concentrated and less oriented to outsourcing in low-cost countries. It is important to investigate the overall production conditions of such enterprises in order to know whether or not they can profit from novel and creative extensions at the end of the value chain, thus improving job creation and turnover.

1.3 Aims of the study and questions addressed

The understanding of firms' decision-making process is a major issue, especially when recognising that in vulnerable regions, with economic tissues based in labour-intensive industries and limited labour-force mobility, regional employment and income perspectives are very dependent on firm's capacity to react to new challenges (Clark and Tracey, 2004).

The present research aims to better understand the entrepreneurial behaviours of small firms from TCL sectors within a globalising Europe giving a special attention to the links between economic agents and their surrounding environments. The study admits a two-way flow of cause-effect relations between the environmental conditions, which influence the performance of small firms, and their behaviour, promoting long term impacts on local settings.

Thus, the work addresses five major questions:

Q1. What are the imminent opportunities brought by the new economical international order for the TCL sectors of Southern European and, in

such context, what is the role of urban economic agglomerations? Answers to both questions can be found in chapter three.

Q2. Recognising the need for technological adjustments in these sectors, what are the determinants for firms' new technological choices? Chapter four analyses the statistical significance of a list of proposed determinants.

Q3. How do those technological adjustments impact on local employment structures, namely regarding employment levels and skills? The response is given in chapter five.

Q4. What are (if any) the regional-effects on entrepreneurial behaviours. The detected results are presented in chapter six.

Q5. What are the adequate policy measures in face of similar backgrounds of labour-intensive dependent regions, constrained by the actual international economic context? Chapter seven brings up the set of necessary issues.

For the empirical analysis, the primary data resulted from a questionnaire application to a sample of 167 small-and-medium sized firms from TCL sectors. The following European Southern regions were observed: North (Portugal), Valencia (Spain), Macedonia (Greece) and South Italy (Italy). The used secondary data was obtained from Eurostat databases.

The selection of these regions was made by considering their economic vulnerability, based on three criteria: having held the EU objective 1 status, being

outside large centres of urban economic development and having an economic tissue based on labour-intensive firms.

A common questionnaire was applied in each region, allowing a cross-country analysis among regions whose economic dependence to labour intensive sectors, particularly sensitive to the low-wage competition arriving from Asian competitors, is a common threat.

1.4 Set up of the thesis

The work starts by providing the theoretical tools able to support the questions addressed, in a separated revision of literature. Then, each chapter develops an independent discussion centred on the addressed questions as earlier pointed out. All chapters are interrelated in a sequential methodology.

The revision of literature (**chapter 2)** initiates by the focus on the theoretical background manly driven by the concepts of industrial districts, innovative milieu and territorial production systems. These concepts, related to spatial economics, link to contemporary approaches: collective learning, path dependence, networking, untraded interdependencies or associational behaviours, all of them helpful tools to set the argument that regional environments play a role in economic agents behaviours.

The importance of geographic proximity within the challenges imposed by economic globalisation is then addressed.

The discussion is completed by emphasising the cognitive capacity of agents to change place-specific conditions. Rejecting the idea that agents are

totally chained to their historical and geographical conditions, the agent-centred approach relies on the cognitive capacity of agents to react and treats institutions as resource endowments.

The second half of the literature revision deals specifically with the impact of firms' technological adjustment processes on regional employment structures. After recognising the existence of a two way flow of influences between agents and environmental settings, the effects of technical change on employment and labour skills are reviewed.

Further, the study proceeds with the empirical developments aiming to answer the proposed questions:

- The analysis of the competitive positioning of the sectors in the selected regions;
- The analysis of how a set of environmental variables affect the adoption of new technologies by the sample firms;
- The study of the impact of those technological strategies on regional employment structures;
- The analysis of the regional effects on those strategies, specifically observing how those options vary from region to region.

In order to better clarify the methodological framework, figure 1.1 is presented. It illustrates cause-effect interrelationships that link the different chapters of this thesis.

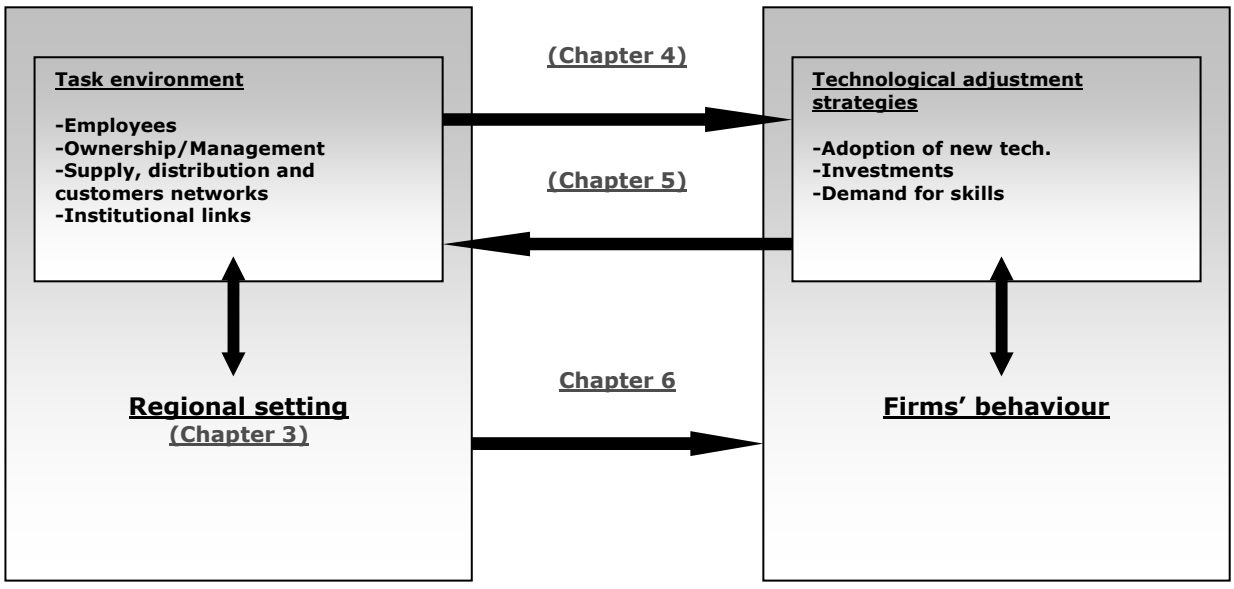
After a diagnosis of the regional setting, where the challenges and opportunities for those sectors inside the chosen vulnerable regions are discussed

and the importance of technological change is confirmed (**chapter 3**), the attention is put on the analysis of the factors that better explain different behaviours towards technological change by the sampled firms (**chapter 4**). Those factors belong to a set of environmental conditions labelled as Task Environment and include information on firms' employees, type of ownership and management, supply, distribution and customers' networks and institutional links.

A following step includes the analysis of how the entrepreneurial behaviours shape the surrounding environment. Recognising the complexity of the wide range of effects possible to be considered, the study focus only on the impacts on employment levels and skills resultant from firms' technology adjustments processes (**chapter 5**).

Finally, and in order to accomplish the whole set of casual effects, the regional effects are identified through the examination whether the entrepreneurial behaviours, presented in the previous chapters, differed statistically (or not) across regions (**chapter 6)**.

Figure 1.1
Methodological Framework - general



Source: Author's elaboration

1.5 Added value of this research

Theoretically, the present research uses the reasoning from Regional Analysts and Economic Geographers to build an own argument that a two-way relationship exist between economic agents and their frameworks of action.

The built methodological agenda, allows to empirically test such argument for the specific case of southern European SMEs from labour-intensive sectors. Particular attention is given to the influence of environmental variables related to firms' human capital and networking aptitudes on firms' technology-related strategies, followed by the consequent impact of such strategies on firms' workforce.

Although it is possible to find several empirical exercises with similar purposes, the present study adds value to the already established argument in the sense that:

- it allows an infrequent, cross-country research analysis at the firm level, as an alternative to other country studies just using secondary databases;
- it deals specifically with southern Europe regions (not very often subject of attention), with similar features in what concerns their economic tissues;
- it considers specifically the textiles, clothes and leather sectors, instead of manufacturing as a whole, as it usually happens, allowing specific conclusions for industries that are of utmost importance in the present international context.

Chapter 2 - Revision of Literature

2.1 Introduction

The following literature revision has three main objectives. The first one is to show the importance of the thematic dealing with the relationship between economic agents and their surrounding environments. The second objective is to supply the theoretical tools allowing the construction of the main research hypothesis: it is believed that not only environmental conditions influence the performance of economic agents, also the way economic agents behave and respond to their changing conditions, has an impact on local settings[2]. Lastly, this revision also aims to contribute with an adequate integration of the expected results in the related state of the art.

2.2 Agents and environments: a two-way flow of influences

Do firms and economic agents, in general, have the capacity to influence their settings as their actions may be encouraged or disencouraged by the environmental conditions?

In order to duly answer to this question it should be considered that the assumption of location as an endogenous variable is relatively recent.

[2] Somewhere else (Cesário, 2002, 2003 and Cesário and Vaz, 2003), the dependence between local conditions and firm's performance was proven evident, namely for SMEs, a firm segment particularly dependent on its external settings.

2.2.1 The discovery of economic space

The neoclassical theoretical assumptions regarding high levels of factor mobility, spatial and economic convergence and low transaction costs enhancing efficient allocation of capital and labour between regions (namely in Europe) have been surpassed by the endogenous growth theories and, more recently, by the new economic geography models (Gardiner, Martin and Tyler, 2004).

Endogenous growth theory or new growth theory was developed in the 1980s as a response to a criticism towards the neo-classical growth model. While, in the neoclassical growth models, the long-run rate of growth is exogenously determined, for the defenders of endogenous growth, arguments related to proactive action should be considered. In other words, growth is determined outside of the neoclassical model, generally by an assumed rate of technological progress and labour force growth. Not explaining the origin of growth, this model sounds unrealistic. Endogenous growth theorists tried to overcome this restriction by endogenizing the rate of technological progress. The crucial importance put in the production of new technologies and human capital, brings to firms and individuals an incentive to invent by exploiting advantages over competitors. A virtuous cycle arises through spillover mechanisms among economic agents.

Benko (1999) points out as one of the main failings of endogenous growth models the incapacity to explain non-convergence. Non-convergence has been detected in Europe in the southern European regions after the application of regional development funds (*e.g.* ERDF) for the last 30 years. As explained by Landabaso (1997) the success of any strategy of regional development depends on the capacity of the locals to absorb changes. The boundary between the policy

measures for regional development and the real opportunities for transformation is limited. The many restrictions that are due to stakeholders often characterise regional reduced capacities and tenuous potential.

Not unrelated to the endogenous growth models, the new economic geography attribute regional differences in growth to localised increasing returns arising from the spatial agglomeration of specialised economic activities and the external economies and endogenous effects that such localised specialisation may generate. Krugman (1991a, 1991b) suggests that such effects are labour market pooling, technological spillovers and access to intermediate inputs.

Although largely neglected by mainstream economics until recently, the research on economic geography, or the study of where and why economic activity takes place, has drastically increased. As believed, the oblivion of space in economics was not because the disinterest in the subject, rather it was mainly attributed to the difficulties in the application of modelling techniques:

> *'Their new willingness to work on economic geography comes from their sense that new tools…have removed crucial technical barriers and transformed a once inhospitable field into fertile ground for theorists.' (Fujita, Krugman and Venables, 1999: 2)*

Krugman's geographical economics is firmly rooted in his contributions to the 'new trade theory'. Contrary to the assumptions of perfect competition and constant returns to scale, that underpin the basic Ricardian theory of comparative advantage and trade, the new trade theory states that specialisation and trade are driven by increasing returns and economies of scale, rather by the capitalisation on inherent differences in national factor endowments. Also, according to this

new view, specialisation is to some extend a historical accident: once a pattern of specialisation is established there is a strong tendency toward 'path dependence'[3] as that pattern gets 'locked in' by the cumulative gains from trade (history matters, using Krugman's words). These developments facilitated the 'marriage' between trade theory and location theory. Krugman's geographical economics is a hybrid of the two: the interaction of external economies of scale with transport costs is the key to his explanation of regional industrial concentration and the formation of regional 'centres' and 'peripheries'. Fujita, Krugman and Venables (1999) gave a major contribute to the theory of economic geography by synthesising the three-way interaction among increasing returns, transportations costs and the mobility of productive factors. Further important and complementary contributions were offered by Brackman, Garretesen and Marrewijk (2001) and Fujita and Thisse (2002).

This debate was amplified to strategic organization by the contributions of the Californian scholars, arguing that internal economies of scale and scope have been underestimated because of their major role in surpassing market uncertainty due to technological change. The response has been the horizontal and vertical disintegration, or an externalisation of production, enabling a greater flexibility towards the market changing conditions. In this view, agglomeration is a strategy since it facilitates transactional interactions and increase opportunities for matching needs and capabilities (Storper and Harrison, 1991; Scott and Storper, 1992). Yet, such transactions tend to fail in the absence of the appropriate

[3] This concept will be developed further.

institutions (Storper, 1995). Going beyond the initial Williamsonian framework[4], the authors argue that the nexus of transactions and their economic performance are themselves outcomes of broader institutional environments, and themselves generators of future choices for pathways of development (Storper, 1995)[5]. This line of reasoning, now well established in the literature on innovation in evolutionary economics, rejects the traditional notion of 'induced' innovation and focuses attention on the institutions which deliver up resources crucial to learning and interaction (Storper, 1996).

A core problem discussed by the Californian scholars is the long-standing tension between the geographical concentration of activity and specialization of regional economies and the spreading out of activity into wider geographical spaces, both of which are occurring in the current wave of globalization (Storper, 1999, 2000). The increasing importance of geographical proximity is, in such context, an important matter. In spite of increasing global flows of ideas, capital, goods and labour, this current of though confirmed that proximity in the creation of economically-useful knowledge appears to be even more important than before (Scott *et al.*, 2001; Scott and Storper, 2003; Sonn and Storper, 2008). The concept of city-regions is used to explain the significance of the geographical concentration of activities, acting as key motors of the functioning of urban and regional economies (Scott *et al.*, 2001).

[4] The new institutional economics started with Coase's article 'The nature of the firm' (1937). This mainstream was reintroduced by Williamson (1985, 1995) that adopted the transaction costs perspective for purposes of examining hierarchies and markets as alternative modes of governance.

[5] In deeply assessing Paul Krugman's contributions, Martin and Sunley (1996), pointed out the differences between Krugman's geographical economics and the new industrial approaches from the Californian school, namely regarding the treatment of industrial and market structure, the arguments on externalities and the analysis of nonmarket transactions and relations (what Storper (1995) would latter identify as 'untraded interdependencies').

The role of regions in relationship to the global economy is still an open field of observation (Storper, 2009). As European integration proceeds and trade and factor flows increase, the role of locations have growing significance. While neoclassical models predict accelerating convergence, empirical evidence favours the arguments of those who believe in the tendency to spatial agglomeration and specialisation, leading to core-periphery *equilibrium/disequilibrium* and persistent regional differences in productivity.

2.2.2 From Industrial Districts to concepts of networking and untraded interdependencies

Some successful examples constitute useful evidence for the ongoing debate**.** The cases of Emilia Romana, Toscana, Japan, South California, Silicon Valley, Rt128/495 (Boston) or Oxfordshire (UK) are cases of endogenous growth based on localised spin-offs, networks and technological spillovers.

The debate (improved by Benko and Lipietz, 1994) continually produces a large list of concepts that reflect contrasting but complementary approaches to the thematic of regional/local clustering. The revision of some ideas fits in this context: from Marshall's industrial districts (and its Italian re-interpretation), through innovative milieu and the broader concept of territorial production system, to notions of collective learning, path dependence, regional untraded interdependencies and networks.

The marshallian approach to the concept of industrial district (Marshall, 1930) was essentially based on a pattern of organisation in which a group of

specialised small firms were geographically clustered, thus promoting a widely distribution of capabilities and the minimisation of transaction costs through the exploitation of agglomeration scales (Bellandi, 1989; Becattini, 1990). More recently, the term was re-interpreted in the context of the Third Italy and greater stress was put on the importance of inter-coordination and interdependencies among the specialised small firms belonging to the District (Asheim, 2000; Becattini and Rullani, 1995; Brusco, 1989, Garafoli, 1991a, 1991b).

The term innovative milieu was adopted by the GREMI[6] group (Aydalot, 1986; Peyrache – Gadeau, 1999) to describe the complex network of mainly informal social relationships on a limited geographical area, with a strong sense of internal belonging enhancing the local innovative capability through synergetic and collective learning processes (Camagni, 1991, 1995; Camagni and Maillat, 1999; Crevoisier, 2004).

The authors explain that not all milieus are innovative. Only the ones that combine a strong logic of interaction with a strong learning dynamic can be worthy of such label. If neither each occur, then no milieu and no innovation emerge. If weak interaction and strong learning dynamic combine, then innovation can take place but no milieu exists (like in recent technopolis areas). On the contrary, strong interaction logic combined with fragile learning dynamics leads to a potential innovative milieu (industrial districts are mentioned as an example) (Maillat, 1995).

[6] Le Groupe de Recherche Européen sur les Milieux Innovateurs.

The concept of territorial production system is often used embracing these and other approaches (Courlet, 1999; Grosjean and Crevosier, 2000; Maillat 1991, 1996; Maillat and Kebir, 1999). Storper and Harrison (1991) define it as being composed by an input-output structure (a set of production units linked together), a structure of governance (authority and power) and a territoriality (whether dispersed or concentrated).

The concept of collective learning appears as a main distinctive element between such ambiguous ideas. Capello (1999a, 1999b) explained that learning is collective if it is *cumulative* (persisting over time) and *interactive* (transferred among agents on the basis of synergies and interactive processes). The author uses this concept to explain how the different agglomeration models interact by listing the various preconditions for the different stages of development. Geographical proximity, as a starting point, can lead to specialised areas with inter SME linkages and stable labour markets for the required skills. In such cases, the emergence of industrial districts may take place when cultural and organisational proximity develops over time. But the concept of milieu can be introduced only when this setting is accompanied by strong and stable innovative synergies among local actors and labour force. In this case a local environment characterised by the presence of collective learning, may be called innovative milieu.

Some authors remembered that the positive effects produced in these specialised territorial agglomerations are not guaranteed in the long run, as the continuous accumulation of knowledge could lock-in firms into non-competitive technological trajectories (Keeble and Wilkinson, 1999). If such happens, path dependencies are occurring. When a firm or group of local firms keep having

increasing returns to scale from their production processes, a dependency to that particular accumulation path takes place, leading to what the author calls, the lock-in process. Rooted on the evolutionary model of growth of Nelson and Winter (1982), the concept was latter developed by Dosi *et al.* (1988), Arthur (1994) or Dosi (1997)[7]. The focus was put on the dynamics of markets under increasing returns in a path dependence situation, in particular the role of positive feedbacks in locking in a single dominant product, technology or company.

Nonetheless, some authors alert to the fact that, in the limit, firms are so closely tight to their accumulation processes that risk becoming vulnerable to unexpected changes in market conditions. The capacity to rapidly adapt to different but successful competing models may then, be compromised.

In order to avoid firm's lock in into obsolete technological trajectories, a critical issue is the continuous capacity to learn. This is a very common tendency, particularly in peripheral areas or labour-intensive industries. The scholars argue in favour of continuous learning, but do the firms have the capacity to continuous learn?

Camagni (1991, 1995) refers to the concept of networking as the channel trough which this risk of rigidity may be overcame. By accessing to other markets, assets and technologies, firms free themselves from the limits of local and internal competences and gain control over the technological trajectories of his competitors. Morgan (1996) defends the importance of interactive learning among business networks as the most effective and credible way for knowledge

[7] Based on the same considerations, Antonelli (1997) applied the *percolation* methodology to the study of dynamic processes in economics, based upon the basic assumption that the behaviour of each agent is strictly determined by his/her local context of action.

acquisition. The increasing emergence of collaboration phenomena testifies his argument.

According to Somorrostro (2004) it makes sense that firms engage in alliances structures with the purpose of obtaining, exploring and developing resources and skills. Gulati, Noria and Zaheer (2000) argue that a firms' network can create inimitable and non-substitutable value just as any inimitable resource by itself.

Hotz-Hart (2000) argues that, besides the access to resources and skills, networks of interaction also improve firm's response capacity to changing competitive circumstances, allow reducing risks, information and transaction costs and allow developing trust and social cohesion, hence facilitating problem-solving. Capello and Nijkamp (1995, 1997) remembered that not only firms individually benefit from the advantages of network belonging. According to the authors, network externalities have a measurable effect on the performance of firms and, via multiplicative effects, on the performance of regions.

The key-terms propensity, power and persistent were used by Harrigan and Newman (1990) as demanded features of co-operating partners. But Taylor (1995) also mentions the different levels of power in the organisations. He explains how these interactions develop if agents control resources (specially rare or vital ones) and cooperation tends to more unbalanced relations. Such power asymmetry has an impact on the environmental contexts and industrialization patterns. Storper and Harrison (1991) refer to *core and ring* as different governance structures and Vaz (2009) points out its dynamic natures.

The term 'untraded interdependencies' was used by Storper (1995) to define regionalized relationships that extend beyond traditional customer/supplier links (also referred as input-output linkages or traded interdependencies) and embrace formal and informal collaborative and information networks. Inspired in evolutionary economics this argument states that technological change is path dependent because it involves interdependencies between choices made over time. These choices have a spatial dimension, and though direct input-output relations may play a role, when organisations travel along a technological trajectory they have interdependencies that are *untraded* and include labour markets, conventions, common languages and rules. Those links are said to be in the basis of the ongoing resurgence of different patterns of regional growth, even facing globalisation and economic integration. With a similar view but a different conceptualisation, Cooke and Morgan (1998) reefer to a collective social order that induces firms to collaborate and display *'associational behaviours'*.

Although in the presence of such a wide range of theoretical conceptualisation, some common insight can be drawn: regional settings can provide an essential level of economic coordination and be a major source of region-specific material and non-material assets that could contribute to improve firm's performance (network collaborations, *untraded* interdependencies or *associational* behaviours are concepts supporting this idea).

2.2.3 The importance of geographic proximity in the global economy

Economic globalisation is leading firms to face an increasingly openness to rival producers, whatever their original location of production. Not only firms but also industries and regions are now much more vulnerable to price and quality competition.

For an in deep view of the argument, Camagni (2002) suggests that regions compete on the basis of absolute competitive advantages, arising when a region possess superior technological, social, infrastructural or institutional assets, which are external to firms but of their benefit. The author assumes that territories compete with one another and both attractiveness and local competitiveness depend on similar common factors, beyond physical conditions and with relational capital and learning capacity as territorial tools. Although recognising that individual companies are the ones that compete in the market, the author recalls the effects of the context upon leaders, largely responsible for decision-making processes, which based on socialised practices can overcome uncertain economic conditions (Camagni, 2002).

The importance of geographic proximity as a mediating factor in this process is also stressed by Bramanti (1999) who assumes the role of space and territory in creating competitiveness and better economic performance through the interaction of innovation processes, learning mechanisms, governance structures and networking relationships. All of them assume that the geographic space is a determinant variable.

Notwithstanding the former views, the notion that 'geography is dead' is claimed by some theorists. They argue that the globalisation process and the development of ICTs (Information and Communication Technologies) do not allow anymore distance to be an impediment to the acquisition and diffusion of knowledge.

For example, Maskell and Malmberg (1999) and Maskell *et al.* (1998) used the term 'ubiquitification' as the outcome of the ongoing globalization process and meaning the process whereby former tacit knowledge gradually becomes codified. As they explain, in open markets and when knowledge of new technologies and new organisational designs become globally available, firms in low-cost areas may become more competitive.

Nevertheless, the authors also recognise that no firm can build competitiveness on ubiquities alone. Most firms learn from close interaction with suppliers, customers and competitors and knowledge processes are deeply rooted in local resources, institutions, social and cultural structures (localised capabilities). When considering innovative activities, for instance, the importance of geographic proximity promoting interaction, has been defended by authors like Gambardella and Malerba (1999), Arndt and Sternberg (2000), Cassiman and Veugelers (2002) and more recently Asheim (2004). Inter-firm linkages, in the form of regional networks, are proven to be important prerequisites for successful innovation activities in firms. Similar approaches can also be found in Malmberg and Maskell (1997), Kirat and Lung (1999) or Vaz, Cesário and Fernandes (2006), who propose that the capacity of a firm to innovate is a complex attribute whose determinants change within different local contexts.

The dead of geography' thesis is difficult to sustain, since it wrongly assumes that the rapid diffusion of information and codified knowledge means the rapid diffusion of understating, which is a very fuzzy argument (Morgan, 2004). Although organisational proximity is important, it does not substitute the appealing direct face-to-face communication. Another aspect is that, some types of knowledge are more mobile than others. While analytical knowledge, which results from the application of scientific laws, has a relatively constant meaning by location, the same is not true for the synthetic or symbolic knowledge[8], whose meaning is substantially variable (Gertler, 2008).

This is why, as explained by Scott *et al.* (2001) and Scott and Storper (2003), unlike the idea that globalization means the diffusion and spreading of economic activities, this phenomena has been accompanied by the affirmation of agglomerative tendencies as sources of economic growth. According to the authors, the most remarkable agglomeration forms are the, so called, 'city-regions', that act as locomotives of national economies as sites of dense interrelated economic activities with high levels of productivity and innovative potential. This is happening both in developed countries, where metropolitan areas are growing faster than others, as well as in the less-developed ones, where the effects of agglomeration on productivity are evident. These results support the idea that globalization and its consequent market opening and technological progress tended to reinforce urbanization, not the contrary. Both large-scale agglomeration and regional economic specialisation are persistent and growing

[8] By synthetic knowledge Gertler (2008) mean the application or combination of existing knowledge, mainly through interactive learning with customers and suppliers; symbolic knowledge means creating meaning trough highly context-specific learning-by-doing processes.

phenomena. The authors present three main explanations: first, the geographic proximity eases the dynamics of backward and forward inter-linkage of firms; second, it allows the formation of dense local labour markets around multiple workplaces and third, it facilitates the emergence of localised relational assets promoting learning and innovation effects. The reasons for location proximity go beyond transactional efficiencies, and include various kinds of externalities, such as knowledge spillovers and dependence on human relations, rules and customs that enable firms to coordinate under conditions of uncertainty. [These remarks on the new global geometry, will be of use in order to better understand the question addressed in **chapter 3:** what are the imminent opportunities and challenges brought by the new economical conditions for the TCL sectors?]

This is even truer when considering the specific case of small firms. Contrarily to big firms, SMEs interact intensely with the territory in which they locate, as a signal of their embeddedness. The particular tight links they develop with the external environment also reduce uncertainty risks. In general, SMEs do not only locate nearby the residence of their owners but also the geographical and sociological proximities constitute their main sources of assets and information (Julien, 1995; Vaz, 2006). This fact determines the perspectives and strategic choices of the firms, because most of the market perception arises from the inputs that the territorial institutional context supplies. Growth determinants as competition capability, political understanding and knowledge of consumption behaviour do result from the external environment of the firm. Not surprising that the attributes of such environments become, therefore, a crucial factor for the development of different entrepreneurship profiles. [How firms' behaviours vary

within different territorial environments is the question addressed in **chapter 6**, were the regional-effects on entrepreneurial behaviours are empirically tested.]

Nevertheless, such external links by themselves are not sufficient to produce technological learning. Cohen and Levinthal (1990) argue that the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. The authors label this capability as a firm's *absorptive capacity*. A similar idea is given by Julien *et al*. (1999) arguing that the main factor distinguishing SMEs using new technologies from those continuing to use traditional equipment are management quality and the organisation's ability to obtain and process technological information. The author define *technological scanning* as an activity through which the external information needed for technological change is gathered, analysed and disseminated in the firm.

Thus, internal factors dealing with human capital and networking aptitudes within the firm are also important variables (Cesário and Vaz, 2008). Entrepreneurs may develop different abilities allowing different entrepreneurial strategies, namely regarding technological adjustments. [This question is addressed in **chapter 4**, through the analysis of how a set of variables from firms' task environment affects the adoption of new technologies.]

In agreement with the later considerations, the theoretical assumption that regional settings can shape small firms' behaviour is evident. Still, do small firms have the capacity to influence their settings? Empirical surveys often mention the importance of entrepreneurship in helping peripheral areas (such as in Bennetworth, 2004), or the role of innovation in small firms to the

competitiveness of rural environments (North and Smallbone, 2000). The following section helps setting an own argument.

2.2.4 The agent-centred perspective on regional competitiveness

Also pointing out the insufficiencies of neoclassical models Clark and Tracey (2004) reject the idea that economic agent's options are completely bounded by their regional settings. The agent-centred perspective (as labelled by the authors) assumes that agents or firms' strategic choices are not tightly dependent and derived from their contexts, but can be developed either through interaction or complete independent from those settings. Although not ignoring social, political and economic structures, as framing variables, the authors clearly reject that economic agents are chained to their historical or geographical conditions as they have the cognitive capacity to interact with them. One important presumption of this approach is the rejection of rational maximising behaviour theories. Facing the need of generalising and summing up individual behaviours, economic theory tends to marginalize the scope and nature of human decision-making process. The assumption of rationality means that all people choose the optimal according to their goals. To suppose otherwise is to suppose irrationality or, at least, inconsistency. The need to better understand empirically how and why people make their decisions, led to the acceptance of the fallibility of rationality[9].

[9] According to Herbert Simon (1955) an 'economic man', as postulated by the traditional economic theory, is assumed to have clear knowledge of the relevant aspects of his environment and a well-organised and stable system of preferences. For the alternative courses of action available, he is able to choose the one that will permit him to reach the highest attainable point on his preference scale. This concept was a matter of drastic

At the end, this approach is all about recognising the importance of humans' cognitive skills. Although also recognising the influence of institutions on agent's choices, as the institutional-centred approach, the big difference between both is that the agent-centred model treats institutions only as resource endowments, so different regions, with different institutional settings, have different resource endowments affecting agent's decision-making and regional competitiveness (Clark and Tracey, 2004).

Accepting that different territories may provide different competitive conditions and following the arguments of the agent-centred perspective, agents should have the cognitive capacity to move from their inherited institutional contexts when these ones are not providing favourable conditions[10]. Hence, *'...the concept of embeddedness may neglect the capacity of agents to understand the world of which they are part'* (*ib.*), as it implies that firms are passive in terms of their choices. As seen by Granovetter (1985) the argument of embeddedness applied to economic behaviour means that agents and institutions are so constrained by ongoing social relations that to consider them as independent is a serious misunderstanding (Granovetter, 1985: 482). Although recognising the

revision. In substitution, he suggests a 'choosing organism' of limited knowledge and ability, placed in an environment with which he interacts. The author use the concept of 'bounded rationality', explaining that rationality is bounded when there are failures in knowing all the alternatives, uncertainty about relevant exogenous events and inability to calculate consequences (Simon, 1979: 502). In order to characterise the mechanisms of choice under conditions of bounded rationality, he uses the concepts of search and satisficing: 'If the alternatives for choice are not given initially to the decision maker, then he must search for them…As soon as he discovered an alternative for choice meeting his level of aspiration, he would terminate the search and choose that alternative.'

[10] Keeble's (1997) exercise on British regions allowed confirming the arguments that small firms, in less endowed regions such as the peripheral ones, may actively try to overcome environmental constraints by conscious strategies, perhaps involving greater R&D efforts.

importance of the concept, the agent-centred perspective rejects such constraint in agents' capacity.

Another important input from this approach regards the concept of inheritance. Contrarily to Arthur's assumption that social capital results from the positive feedback generated by the region-industry specific path accumulation process, Clark and Tracey (2004) explain that national and regional institutions and practices can be inherited rather than simply accumulated in a growth and development process.

While recognising the utility of the embeddedness and path dependence concepts, but avoiding their fatalistic nature, the present work is sympathetic with the agent-centred approach as it admits the possibility of the interaction between agent's cognitive capacities and their place-specific inheritances and endowments (namely in what concerns local employment structures).

The capacity of agents to strategically adapt to European integration and globalisation is very much the result of that interaction. Given the importance of technological changes in this context, and having in mind the vulnerability of labour-markets in regions highly dependent on such sectors, the next section continues providing an overview on a set of empirical exercises analysing the impacts on employment deriving from firms' technological adjustment processes.

2.3 Firm behaviour and regional employment structures

Social and institutional aspects impose the assumption that labour markets are not 'perfect': the new Keynesian economics recognizes that local labour

markets are different from other markets focusing on spatial disparities in unemployment, wages or job conditions to create local adjustments in demand and supply, while technological shocks are being processed in an unstable equilibrium (Martin, 2000).[11]

After recognising the existence of a two way flow of influences between agents and environmental settings, elsewhere argued, this section deals specifically with the impact on regional employment structures deriving from firms' technological adjustment processes.

2.3.1 The impact of firms' technological adjustments on employment

Due to the fact that capital and labour may be considered substitutable production factors, the effects of technical change on employment have increasingly interested researchers. More even since unemployment is the greatest economic problem faced by developed countries and firm leaders bet on equipment to increase profit on their companies.

[11] With regard to labour force adjustments, the work of Greenwald and Stiglitz represent an important theoretical reference. In 1989 the authors argue that, risk-averse firms tend to prefer changes in employment than changes in wages or hours. They explain that there is greater uncertainty associated with wage/hours decisions than with employment decisions. While changes in wages/hours affect all workers in unpredictable ways and generate uncertainty about profits (namely trough changes in turnover derived from people quitting, changes in workers' effort, etc) in contrast, changes in employment seem to minimize the resulting uncertainties. Later (Greenwald and Stiglitz, 1990), the authors developed their argument by examining the implications of imperfect information for firm behaviour, namely firm adjustment behaviour in the labour market. Again they conclude that, firm output and investment spending (with the inevitable consequences on employment) respond directly to changes in firm wealth as well as to environmental uncertainty. A more in-depth advance concerning labour-market adjustments is given in Greenwald and Stiglitz (1995). According to the model developed, firms may be in one of three regimes: hiring, firing or doing neither. Over the course of a business cycle, they tend to move from the hiring regime to the intermediate regime (where firms rely primarily on hours and wages adjustments) to the layoff regime. This happens because, as firms' net worth decreases, their risk aversion becomes higher. Since wages/hours reductions are the adjustment variables associated to greatest uncertainty, firms will prefer to engage in layoffs. The authors explain that the sequence of observed adjustments should be the sequence of hiring reductions, followed by hours' reduction, and only after an interval, layoffs.

For the public in general, and although recognising that innovation is a major driving force behind job creation, the concerns about the future of work as the diffusion of information technology proceeds, are permanent.

Chennells and Van Reenen (2002) survey the data on the effects of technical change on skills, wages and employment by examining the micro-econometric evidence at industry and firm level. The results from different countries are widely variable. Overall, the authors found consistently evidence for positive effects of proxies for product innovations on the growth of employment.

An example (Van Reenen, 1997) was found in the British firm-level panel data on innovative activity. The study identified the effects of technical change on jobs and confirmed the positive association between proxies for technical change and employment.[12]

Also, similar results were obtained by Enfort, Gollac and Kramarz (1999) when studying the effects of new technologies on employment in French firms or by Blanchflower and Burgess (1998) who concluded that the introduction of new technology in UK and Australian plants was more associated to job growth rather than to job decline.

Smonly (1998) used micro-data from West German manufacturing firms to estimate a model on the impact of innovations upon the output, capacity utilisation, employment and prices. The conclusions were that firms which

[12] Other important remarks were: a) the greater is the sensitivity of consumers to price changes the more likely it is that an innovation will raise employment; b) the easier it is to substitute capital for labour the more likely it is there will be positive employment effects from technical change and c) if the firm has some degree of market power not all of the reduction in cost will be passed on in the form of lower prices. This will blunt the output expansion effect and make positive employment effects less likely.

implemented product innovations increase prices, exhibit a higher utilization and grow faster. Product innovations also affect positively the grow and volatility of employment, being this volatility higher with the lower price elasticity of demand, which favours employment adjustments against price adjustments to technical change[13]. Regarding process innovations, the results also indicate positive effects on output and employment, but not conclusive effects on prices and sales. The results point towards that both types of innovation generate positive effects on employment but do not indicate which effect is stronger.

Greenan and Guellec (2000) enriched the debate by explaining why product innovation produces lower effects than process innovation. Using French data, the authors found that innovating firms and sectors in general create more jobs than others and that process innovation, in particular, is more about job creation than product innovation. This is explained with the fact that product innovation creates more uncertainty than process innovation, as the reaction of consumers to a new product is highly unsure. Employment decisions are consequently affected, accordingly to the authors.

Different results come out when considering organisational innovations. Osterman (2000) found that measures of new organizational practices are associated with higher layoff rates of production workers, even within firms that have been experiencing net employment gains. A confirmation on these results was obtained by Black, Lynch and Krivelyova (2004) when examining the relationship between what the authors called 'High Performance Workplace Practices' and employment changes: 'Some practices, such as self-managed

[13] Similar relations were found in Van Reennen's (1997) model.

teams, are associated with greater employment reductions, whereas other practices, such as the percentage of workers involved in job rotation, are associated with lower employment reductions' (Black, Lynch and Krivelyova, 2004). The work also suggests that there are significant differences between unionized and nonunionized employers in the impact of organizational change.

The use of R&D measures as proxies of innovation, generate negative correlations: Brouwer, Kleinknecht and Reijnen (1993) used R&D data from Dutch manufacturing firms to analyse the influence of innovation on growth rates of employment. They conclude that the growth of the R&D intensity of firms has a slightly negative impact on employment, whereas firms with a high share of product-related R&D experienced an above average growth of employment. The same was the case with Klette and Førre (1998), for Norwegian manufacturing plants, were no positive relationship between net job creation and the R&D-intensity of a firm were found.

These results clearly indicate that the effects of innovation depend critically on the type of innovations being produced. While technological advances more product and process oriented are generally associated with job growth, even if with different intensities, organisational changes and R&D intensity produce frequently negative impacts in the growth rates of employment.

2.3.2 The impact of firms' technological adjustments on labour skills

The idea that technology could lead to a *de-skilling* of workers, with mass production factories symbolising the destruction of skilled artisans, is being

contested by recent economic debates, focusing on whether modern technologies are generally biased towards more skilled workers.

Berman *et al.* (1994) investigated the shift in the demand from unskilled toward skilled labour in US manufacturing over the 1980's. The authors conclude that this shift is mostly due to technological adjustments (e.g. investment in computers and in R&D) rather than shifts in product demand due to trade competition. Very similar results were obtained by Hansson (2000) for Swedish manufacturing firms.

Also Doms, Dunne and Troske (1997) found evidence of skill bias when examining the relation between technological advances and the demand for work. Also using computer investment as a measure of technology use, the authors found a positive association between this indicator and the growth of skilled workers during the period of observation.

Autor, Katz and Krueger (1998) corroborated the importance of technical change (especially computer use) in accounting for the increase in the proportion of skilled workers. The analysis of US industries indicates that the rate of skill upgrading has been greater in more computer-intensive industries.

Machin and Van Reenen (1998) compared the U.S. results in terms of changing skills structures with six other OECD countries (Denmark, France, Germany, Japan, Sweden and the UK). Using R&D intensity as a measure of technical change, the results indicate a significant association between this measure and the demand for skilled workers across the different countries.

Also using R&D intensity as well as technological capital intensity, Aguirregabiria and Alonso-Borrega (2001) analysed a panel of Spanish manufacturing firms and conclude that the decision of adopting new technologies is countercyclical and has a much strong effect on the occupational structure of the workforce than the accumulation of technological capital by old innovative firms.

Considering organisational changes, Caroli and Van Reenen (2001) examined a panel of British and French establishments and found that organisational change reduces the demand for unskilled workers as well as leads to greater productivity increases in establishments with larger initial skill endowments.

Independently of the measure of technology used, there is considerable empirical evidence supporting the idea that technological related strategies favours the increase in the demand for more skilled labour.

2.4 Final Remarks

Against the theoretical trend defending the idea that agents simply respond to their environmental conditions, with little or no capacity for strategic choice, the agent-centred approach consider agent-environment interaction as a two-way flow of influences: the behaviour of agents can influence their context, such as environmental conditions can enable or disencourage action.

Vaz *et al.* (2006) and Vaz and Cesário (2008) confirmed that such interactions may have positive effects that go beyond the firms themselves, and

influence the broader socio-economic context in which they operate. Using data for a set of European regions (INNOVALOC, 2000) the authors conclude that a two-way flow is established for which regional or local characteristics influence innovation in small firms while the regional economic development is affected by the innovative behaviour of the firms themselves.

In the case of lagging regions, technological change can only be discussed in a context of interface between institutional interaction and historical local development. The main reason for this is the strong role that SMEs play in their socio-economical structures. Therefore, the dynamics of local development in such areas are closely related to entrepreneurial strategic choices and vice-versa, small firms have their roots deep within the environmental local conditions (*id.*).

Local settings influence firms' choices, as their strategic options are encouraged or inhibited by their contexts. Although is very difficult for small firms (for instance) to control those contexts, is also argued that firms' strategic decisions can '...shape the boundaries of its environments...' since decisions with regard to location, markets explored, customers pursued, technology adopted or training provided can, in fact, manipulate aspects of the environmental settings (Clark and Tracey, 2004) .

It is recognised that firms have the capacity to strategically respond and adjust to new economic conditions, namely trough technological adjustments, with the consequent influences on regional employment and income perspectives.

The observation of several empirical exercises suggests that technology is, on average, biased towards more highly skilled labour. The evidence on the

effects of technology on total employment is more mixed. While measures related to product and process innovations revealed positive associations, R&D-based measures and organisational innovations revealed to be negative correlated with employment (Chennells and Van Reennen, 2002). [These results will be used as reference when developing the question addressed in **chapter 5,** were the impacts on local employment structures, namely regarding employment levels and skills, driven from technology-related strategies are empirically tested.]

Chapter 3 - The challenges of the global economy for the competitive positioning of textiles, clothes and leather sectors from European southern regions

3.1 Introduction

The objective of this chapter is to debate the imminent opportunities and challenges brought by the new industrial model to the TCL sectors, emphasising the importance of the technological adjustment processes these sectors ought to accomplish.

The new global economy is forcing labour-intensive firms to deal with increasing competition and increasing outsourcing. Disinvestment and delocalisation may take place with direct impact on regional job loss. Employment alternatives are demanded in a new scenario involving optimistic prospects for such industries: which are then the opportunities brought by the new industrial model to small firms from TCL sectors located across Europe? And which is the role of urban economic agglomerations able to supply these sectors with other attributes rather than low labour prices or scale economies?

After a discussion on the concept of regional economic vulnerability, the following Southern European regions were considered as being economically vulnerable and worthy of closer attention: North (Portugal), Valencia (Spain), Central Macedonia, Eastern Macedonia and Thrace and Western Macedonia (Greece), Abruzzo, Molise, Campania and Puglia (Italy).

For the purposes of this investigation the data analysis refers the competitive positioning of TCL sectors concluding in the particular importance that the proximity to urban centres may have to firm performance in such regions.

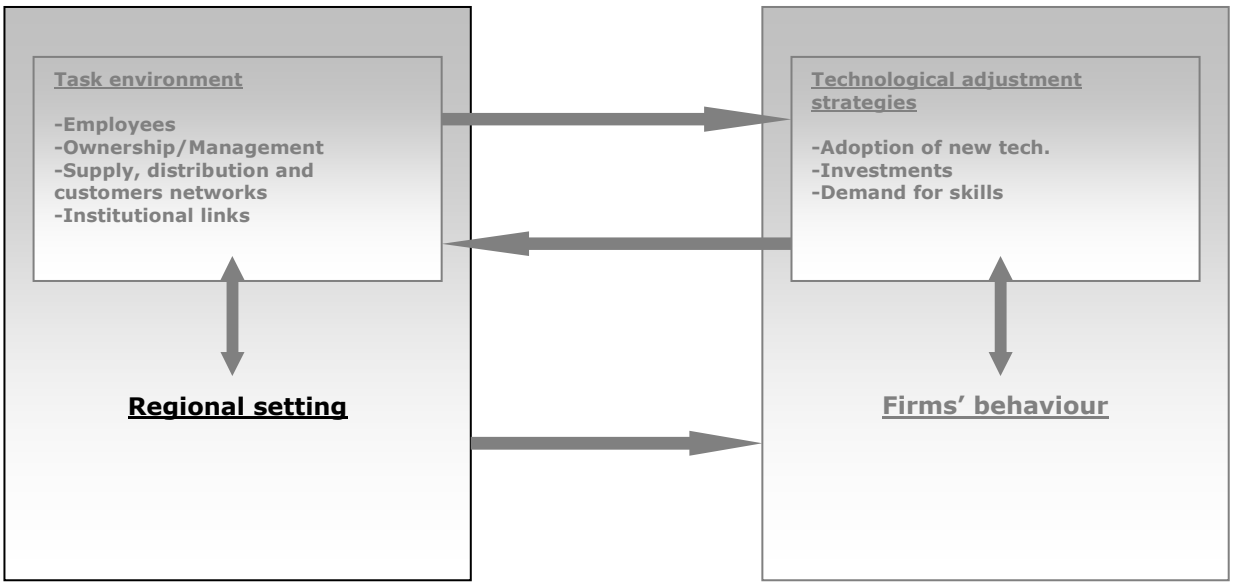
3.2 Conceptual framework and questions addressed

This chapter is part of the extensive methodology, presented in chapter 1, which establishes the main causal factors behind firms' adjustment process of TCL sectors, relating their technological strategies to local employment (in terms of employment levels and qualifications). It is expected to confirm the premises presented in chapter 2, asserting that those adjustment processes are regionally-based.

Prior to the cause-effect analysis, chapter 3 will focus on the characterisation of the regional settings, through the examination of the competitive positioning of the studied sectors in the new global economy, emphasising the importance of the technological adjustment processes analysis foreseen for the following chapters. Figure 3.1 reviews the methodological framework.

TCL sectors have been chosen as a good example for this study because of two main reasons: firstly, these sectors account for 2.5% of total industry and services' employment in the EU-27 zone; secondly, most of the related companies are particularly vulnerable to the low-wage competition arriving from Asian competitors, so they serve as case-studies for firms' reactive capacity to new challenges.

Figure 3.1
Methodological Framework – chapter 3



Source: Author's elaboration

Manufacturing activities, like TCL, that are very susceptible to offshoring to low-wage countries, rely on low level of territorialisation and low level of transaction costs (Storper, 1999, 2000). This situation allows low-wage product competition and, when measured in terms of its impact on labour markets in the developed countries, it creates low-wage competition for about 5% of the workforce in the developed countries (Revenga, 1992).

The European Commission (COM, 2003 and 2004) examined the competitiveness of the European textile and clothing (T/C) industry, on a basis of productivity growth, labour costs, product quality and international trade performance.

Although not including the leather industry, the similarity between these three industries, allows to extend the analytical exercise to this sector.

The reports confirm that Southern countries such as Portugal, Greece, Italy and Spain are relatively more specialised and economically dependent from T/C, than other European regions.

The report also highlights the relevance of import penetration in these sectors. Imports are significantly higher than for manufacturing as a whole, and in particularly in the clothing sector where the EU industry has experienced serious difficulties in competing with foreign operators, in general working with lower labour costs and less stringent social and environmental regulations (COM, 2003).

Let us pay some detailed attention to the growth in clothing imports, as it is a result of two major factors that should be carefully analysed.

For one hand, a lot of this import growth is the result of the liberalisation process following the signature of the WTO Agreement on Textiles and Clothing. China, India, Pakistan, Indonesia, Bangladesh and, to a lesser extent, Sri Lanka, Vietnam and Cambodia have been the main winners of the opening of the EU market (COM, 2003).

But, in the other hand, this import growth is also caused by the outsourcing of labour intensive European clothing manufacturing to outside the EU, searching for low production costs.

In summary, the present scenario for labour-intensive TCL firms may be characterised by a decreasing number of manufacturing firms that operate regionally, consequently decreasing regional investments and causing higher regional unemployment rates. How can their geographical position help to

overcome the present difficulties? In order to better investigate the problem, our driving questions are:

Q1.1: Are there any opportunities brought by the new industrial model that may help small firms from TCL sectors, located in Southern Europe, to surmount the restrictions of a globalised context?

Q1.2: What is the role of urban agglomerations under the framing of such a model?

3.3 Methods

3.3.1 Regional Selection

Within the context of a cross-regional broader analysis[14], the following Nuts 2 regions were selected for this study: North (Portugal), Valencia (Spain), Central Macedonia, Eastern Macedonia and Thrace and Western Macedonia (Greece), Abruzzo, Molise, Campania and Puglia (Italy).

The selection was made considering the economic vulnerability of the regions and the choice was made based on three major criteria (Clark *et al.*, 2004): having the EU objective 1 status, being outside large urban centres and sustaining an economic tissue based on labour-intensive firms.

[14] These research is developed from the insights of The European project **RASTEI** – Regional Adjustment Strategies to Technological Change in the Context of European Integration, aiming to study how local adjustment strategies designed to enhance productivity utilising technological change in labour-intensive industries has affected, and will affect in the future, European non-metropolitan regions in terms of their employment potential (RASTEI, 2002).

a) Regional specialisation

Considering the set of 75 Nuts 2 regions from European Southern countries[15] (Portugal, Spain, France, Italy and Greece) a cluster analysis has been used in order to detect the level of economic specialisation in TCL sectors in such regions.

The selected variables used to run the statistical procedure (all regarding the year 2005) were:

- **SLU** - share in total manufacturing of local units from NACE 17, 18, 19;
- **SGI** - share in total manufacturing of gross investment in tangible goods in NACE 17, 18, 19;
- **SPE** - share in total manufacturing of persons employed in NACE 17, 18, 19;
- **PRI -** share of primary employment in total employment;
- **SEC -** share of secondary employment in total employment;
- **TER -** share of tertiary employment in total employment

Agglomerative hierarchical clustering[16] was used to find similar groups of regions. The distance between two regions (i and j) was calculated using the Square Euclidean Distance, defined as the sum of the squares of the differences between corresponding values for all the considered variables ($v = 1,2,\ldots, p$):

[15] Only southern countries were considered given the concern in analyzing peripheral areas.
[16] Agglomerative hierarchical clustering starts with each region as a single cluster, then, in each successive iteration, it merges two clusters together until all regions are in one big cluster.

$$d_{ij}^2 = \sum_{v=1}^{p} (X_{iv} - X_{jv})^2$$

The aggregation criteria used was the Average Linkage between Groups, which defines the distance between two clusters as the distance between their average values (the *centroids*). The Dendogram (in annex 3.1) was used to validate the results and to determine the appropriate number of clusters.

The 75 regions ended by being grouped as described in table 3.1 (see descriptive statistics for each cluster in annex 3.1):

- a first group is composed by 20 regions, with a high level of specialisation on the sectors considered and an economic structure with a superior weight of primary and industrial activities and a lower weight of services;
- a second group is composed by 51 regions, with a minor representation of the TCL sectors and an economic structure emphasising the services activities;
- a third group is composed by two Italian regions, Toscana and Marche, presenting a superior specialisation on the sectors considered, greater than the first group, and an economic structure with an high level of industry and services and a poorly represented primary sector.

Besides these three groups, the regions of North Portugal and Dytiki Makedonia (Western Macedonia) placed as outliers in the analysis and forming isolated clusters due to their extremely high level of specialisation on Nace 17, 18

and 19. Curiously, when comparing with cluster 3, these regions present an economic tissue with higher weight of agriculture and lower weight of services.

Table 3.1
Cluster Analysis

	Cluster 1 (20 regions)	Cluster 2 (51 regions)	Cluster 3 (2 regions)	Cluster 4 (1 region)	Cluster 5 (1 region)
Nuts II	Piemonte, Emilia-Romagna, Thessalia, Dytiki Ellada, Castilla-la Mancha, Galicia, Cataluña, Illes Balears, Lombardia, **Comunidad Valenciana, Abruzzo, Anatoliki Makedonia, Molise, Puglia,** Veneto, Umbria, **Campania,** Attiki Centro, **Kentriki Makedonia**	Centre, Bretagne, Cantabria, Haute-Normandie, Bourgogne, Principado de Asturias, Friuli-Venezia, Comunidad Foral, Canarias, Liguria, Provence-Alpes, Valle d'Aosta, Provincia Auton, Pais Vasco, Franche-Comté, Île de France, Algarve, Corse, Andalucia, Pays de la Loir, Calabria, Champagne-Arden, Kriti, Limousin, Provincia Auton, Notio Aigaio, Midi-Pyrénées, Comunidad de Madrid, Lisboa, Aragón, Extremadura, Rhône-Alpes, Sterea Ellada, Auvergne, La Rioja, Voreio Aigaio, Peloponnisos, Castilla y León, Alentejo, Poitou-Charente, Sardegna, Picardie, Alsace, Basilicata, Lazio, Ipeiros, Ionia Nisia, Languedoc-Rousson, Sicilia, Aquitaine, Lorraine	Toscana, Marche	North Portugal	Dytiki Macedonia
Mean values					
SLU	0,15	0,06	0,33	0,34	0,64
SGI	0,07	0,02	0,16	0,27	0,41
SPE	5,07	1,32	10,23	15,83	20,23
PRI	0,09	0,07	0,04	0,13	0,17
SEC	0,30	0,25	0,35	0,40	0,32
TER	0,62	0,67	0,61	0,48	0,51

Source: Author's elaboration

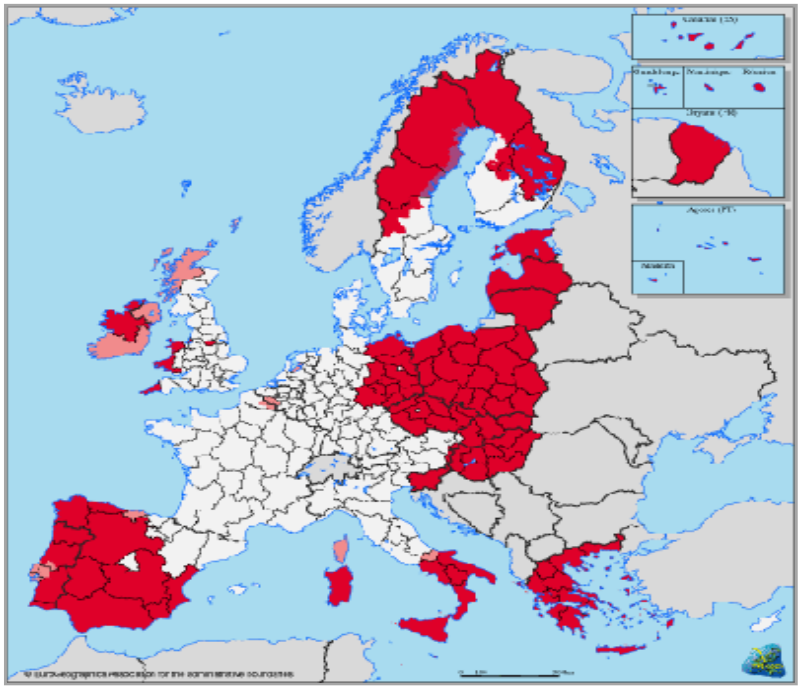
All the selected regions belong to the first cluster. The regions of North (Portugal) and Western Macedonia (Greece) were added to the group due to their particularly interesting features regarding the TCL sectors.

The Italian regions of Toscana and Marche, although also with high levels of specialisation on the TCL sectors, were excluded as we are particularly interested in analysing vulnerable regions.

b) EU Objective 1 status

For the 2000-2006 period, the EU Objective 1 promoted the development and structural adjustment of regions whose development was lagging behind. The regions eligible for EU Objective 1 were those regions where the per capita GDP was at or below 75% of the Community average. Figure 3.2a) shows the eligible regions under this objective.

Figure 3.2a)
EU Objective 1 eligible regions (2000-2006)

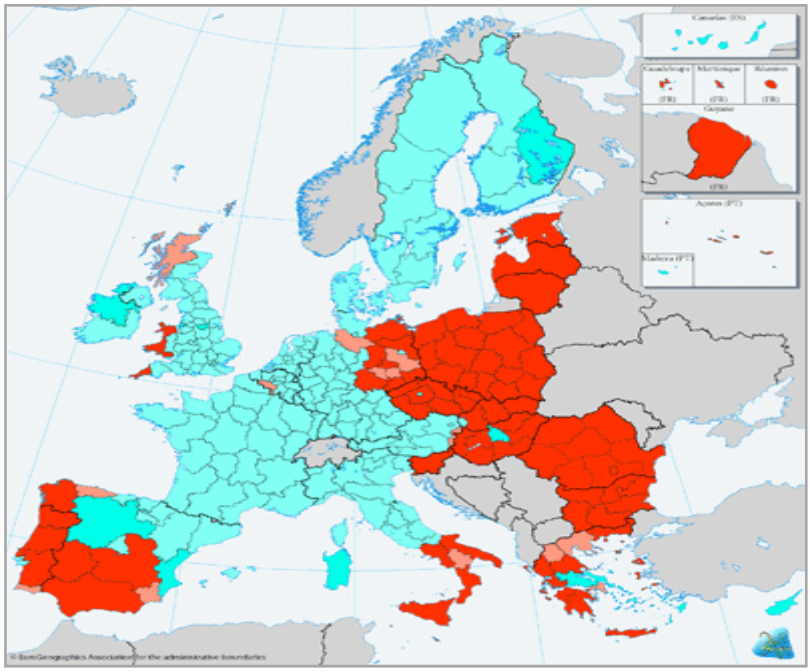


Source: Eurostat

Regions eligible under Objective 1
Transitional support under Objective 1

Similarly, for the 2007-2013 period the EU Convergence Objective promotes factors leading to real convergence for the least-developed Member States and regions. In EU27, this objective concerns regions with a per capita GDP at less than 75 % of the Community average, and – on a phasing-out basis – regions with a GDP only slightly above the threshold, due to the statistical effect of the larger EU (figure 3.2b).

Figure 3.2b)
Eligible areas under the EU Convergence Objective (2007-2013)



Source: Eurostat

Convergence Regions
Phasing-out Regions

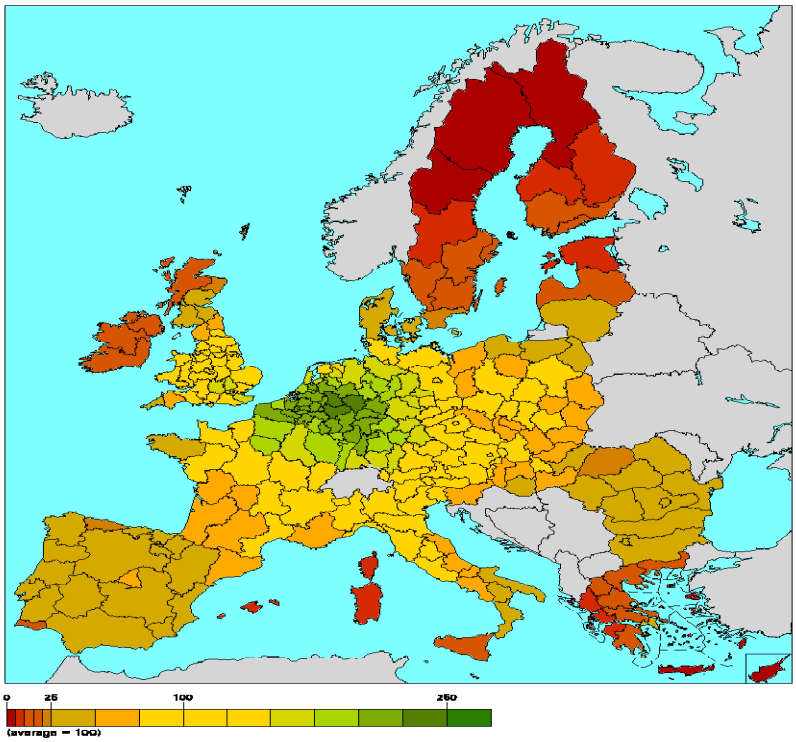
Having the EU objective 1 as reference (Figure 3.2a), all the selected regions fulfilled this condition. Only the Italian region of Abruzzo was not eligible under the objective 1 status in the 2000-2006 period. Nevertheless, this region registered, in 2005, a GDP per head as a percentage of EU-27 of 85.4%, a value

relatively close to the upper limit of the criterion (while Toscana and Marche registered 114,3% and 104.6% respectively) (Eurostat data).

c) Being outside large centres of urban economic development

Using gravitacional models, Schürmann and Talaat (2000) constructed a peripherality index for the European NUTS 2 regions. The authors used population densities to simulate traffic volumes and congestion in urban areas, assuming that if the population density exceeds a certain threshold, the speeds travelled by cars will decrease.

Figure 3.3
Peripherality with respect to population by car (NUTS 2*)*



This index has been considered for the present analysis, as it represent the perspective of firms and consumers with respect to how many opportunities such

as clients, markets or tourist facilities can be reached. Regions with a below-average index (=100) are considered to be peripheral. All the selected regions yield peripherality indices between 25 and 75, with the exception of the Greek Macedonia presenting lower values (Figure 3.3).

3.3.2 Regional economic characterisation

As illustrated in Figure 3.4, the nine Nuts II regions selected form four contiguous areas of Southern Europe, belonging to the four EU countries with the lowest GDP per inhabitant in Western Europe in 2005 (see table 3.2).

Figure 3.4
Geographical distribution of the studied regions

Source: Author's elaboration

Table 3.2
National disparities in GDP, labour productivity and unemployment in the UE: 2005

Member-States	GDP per capita in PPP	Labour Productivity per person employed	Unemployment rate %
EU-27	100.0	100.0	8.9
New Member States	58.7	:	:
Austria	124.4	115.1	5.2
Belgium	119.8	129.8	8.5
Bulgaria	34.5	33.6	10.1
Denmark	123.7	106.7	4.8
Finland	114.2	110.6	8.4
France	110.6	122.2	9.3
Germany	116.8	109.4	10.7
Greece	**91.8**	**98.8**	**9.9**
Ireland	144.1	134.3	4.4
Italy	**104.9**	**111.0**	**7.7**
Luxembourg	254.5	169.5	4.6
Netherlands	130.8	114.0	4.7
Portugal	**77.0**	**70.2**	**7.7**
Romania	35.0	36.0	7.2
Spain	**102.0**	**101.2**	**9.2**
Sweden	120.3	111.5	7.6
United Kingdom	121.9	112.5	4.8

(:) Not available
Source: EUROSTAT data

The North Portugal region (**1**) is bounded to the north and east by Spain and to the west by the Atlantic Ocean. The main urban centre is Oporto, the second largest city after the capital (Lisbon).

A Mediterranean region, the Commune of Valencia (**2**) is situated on the eastern seaboard of the Iberian Peninsula. The region is composed of three provinces, Alicante, Castellon de la Plana and Valencia.

Abruzzo, Molise, Campania and Puglia form a contiguous area in South Italy (**3**). Abruzzo is subdivided into four provinces - L'Aquila, Teramo, Pescara and Chieti. The region is situated at the centre of the Italian peninsula facing the Adriatic. Molise is the smallest region in southern Italy, and the youngest region in the country as a whole. The main centres of the region's economy are the coastal area at Termoli, Campobasso and Isernia. Below is Campania, a region

divided in five provinces: Naples, Benevento, Avellino, Caserta and Salerno. Over half of the population is resident in the province of Naples, where there is a population density of 2 626 inhabitants per km2. Situated at the south-eastern tip of the Italian peninsula, Puglia is divided into five provinces: Bari (the region's capital), Foggia, Taranto, Brindisi and Lecce.

Eastern, Central and Western Macedonia form, what was called, the Greek Macedonia (**4**). Estern Macedonia and Thrace is an important link between Europe and Asia and the most populated urban centre in the region is Kavala. Central Macedonia is a crossroads for trade with the Balkan countries and Eastern Europe. The regional capital is Thessaloniki, Greece's second largest city. Western Macedonia occupies a geographically isolated position in the north-western part of Greece. The regional capital is the town of Kozani.

Using Eurostat statistical databases, a more in-depth analysis on the selected regions is given in the following tables, allowing a better understanding of their economic background.

Regarding the regional economic structures (table 3.3) all regions present a very similar decomposition of employment by economic activity. The services sector, although accounting for the higher share of employment (around 60-70%) is still bellow the EU-27average, with exception made for the Italian region of Campania due to the importance of tourism in Naples. The secondary sector accounts for an important share of employment (15-20%) in almost regions, with the exception of Campania, for the same reason pointed before, and Eastern Macedonia and Thrace, due to the higher dependence on the primary sector of this region (26% of employment). Also worthy of attention is the superior weight of

industrial employment, along with the inferior weight of tertiary employment in the North Portuguese region. Finally, the primary sector is the one presenting more uneven percentages among the set. While the Spanish and Italian regions account for lower proportions, similar to the EU-27average, the Portuguese and the Greek regions present upper levels of rurality.

Table 3.3
Employment by economic activity: 2005

Nuts II	Agriculture, Hunting, Forestry and Fishing	Total Industry (excluding construction)	Construction	Services
EU (27)	6%	20%	8%	66%
Greece	12%	14%	8%	65%
Eastern Macedonia and Thrace	26%	15%	6%	53%
Central Macedonia	13%	18%	7%	62%
Western Macedonia	17%	22%	10%	51%
Spain	5%	17%	12%	65%
Valencia	4%	21%	13%	62%
Italy	4%	22%	8%	65%
Abruzzo	4%	22%	9%	65%
Molise	6%	20%	11%	62%
Campania	5%	14%	10%	71%
Puglia	9%	17%	10%	64%
Portugal	12%	20%	11%	58%
North Portugal	13%	28%	11%	48%

Source: EUROSTAT data

When looking to the economic performance of these regions (table 3.4), a common tendency is the low rate of growth of the GDP per capita in the 2001-2005 period. For the year 2005, only the Greek regions were able to overcome the 12% growth rate of regional product, registered by the EU-27. With the exception of Abruzzo, the stagnated GDPs are accompanied by unemployment rates above the

European levels. Valencia registers the higher per capita GDP from the group, but still under the EU-27 average.

Although these numbers point towards somewhat different economical maturity positions among the regions, the economic vulnerability of the set is confirmed in three common features: a) this set of regions is lagging behind the EU-27 average in terms GDP per capita; b) their heavy industrial tissues are mainly composed by labour-intensive activities, the ones most affected by low-wage competition and c) their common peripheral geographic location constitutes an economic restraint.

Table 3.4
Regional indicators: GDP and unemployment rate: 2005

Nuts II	GDP per head PPP	GDP per head in PPS, growth rate 2001-2005	Unemployment rate %
EU (27)	100.0	0,12	8,9
Eastern Macedonia and Thrace	62.3	0,13	11.1
Central Macedonia	73.9	0,17	18.0
Western Macedonia	75.9	0,21	9.5
Valencia	94.1	0,12	8.8
Abruzzo	85.4	-0,05	7.9
Molise	75.9	0,02	10.1
Campania	67.0	0,02	14.9
Puglia	67.6	0,00	14.6
North Portugal	61.0	0,06	8.8

Source: EUROSTAT data.

3.3.3 Indicators of competitive positioning of labour-intensive sectors

In order to analyse the competitive positioning of the labour-intensive sectors from textile, clothes and leather (NACE 17, 18 and 19) located in the studied areas, data available at nuts 3 level, from the Eurostat statistical databases, was used. The following information was worked out: regional specialisation; evolution of the number of local units; evolution of investment and growth rate of employment.

i) regional specialisation on TCL sectors

Although the regional selection made in section 3.3.1 guaranties that this set of regions is characterised by a high level of specialisation on TCL sectors, a more in-depth analysis is now developed in order to assess to what extend this regions are economically dependent on these sectors.

Along with the proportion of persons employed, the Quotient of Production Specialisation (QPS) was used. The quotient is given by the following equation:

$$QPS = \frac{A_{ir}}{A_{in}} \Big/ \frac{A_r}{A_n}$$, where:

A_i = Employment in sectors NACE 17, 18 and 19;
A = Overall Employment (all NACE sectors);
r = the Region;
n = EU-27.

If *QPS>1*, the proportion of employment in sectors NACE 17, 18, 19 is more relevant in the region r than it is in the EU-27. This means that that sector is

relatively more important in that region, therefore a higher QPS means a higher level of industrial specialisation.

The results presented in table 3.5 point towards the dependence of these regions on the labour-intensive industries under analysis. Western Macedonia, Abruzzo and North Portugal are the regions with higher proportions of employed persons in textile, wearing and leather, from the total regional number of persons employed. These regions are also the ones with higher QPS values.

Table 3.5
Number of persons employed and QPS regional values: 2005

Nuts II	Persons employed (NACE 17, 18, 19 as a % of Total Employment)	Quotient of Production Specialisation (NACE 17, 18, 19)
EU (27)	%	1,00
Greece	1,372%	0,91
Eastern Macedonia and Thrace	1,652%	1,10
Central Macedonia	2,463%	1,63
Western Macedonia	6,552%	4,35
Spain	1,274%	0,84
Valencia	2,959%	1,96
Italy	2,937%	1,95
Abruzzo	4,080%	2,71
Molise	2,493%	1,65
Campania	2,036%	1,35
Puglia	2,980%	1,98
Portugal	3,922%	2,60
North Portugal	9,265%	6,15

Source: EUROSTAT data

For a more accurate comparison national data is also provided. As expected, the selected regions are, frequently, more specialised on TCL sectors than the country as a whole.

ii) evolution of the number of local units

Another important indicator when assessing the competitive positioning of these industries is the evolution of the number of local units[17] in the recent years.

Table 3.6 shows the number of local units in TCL manufacturing between 2002 and 2005. This data, together with the one provided in tables 3.7 and 3.8 indicates that the considered regions are replacing the old manufacturing units by whole sale and retail international networks.

Table 3.6
Evolution of the number of local units in TCL manufacturing: 2002-2005

Nuts II	Number of local units 2002 (NACE 17,18, 19)	Number of local units 2005 (NACE 17,18, 19	Growth rate 2002-2005
Greece	18908	17696	-0,06
Eastern Macedonia and Thrace	349	328	-0,06
Central Macedonia	5334	4965	-0,07
Western Macedonia	3049	2810	-0,08
Spain	32193	28357	-0,12
Valencia	6875	6293	-0,08
Italy	101418	87291	-0,14
Abruzzo	2385	2338	-0,02
Molise	291*	239*	-0,18
Campania	7782	6586	-0,15
Puglia	6815	5547	-0,19
Portugal	20202	23043	0,14
North Portugal	15615	16038	0,03

Source: EUROSTAT data (thousands)
(*) Only NACE 17+18, since NACE 19 was not available for 2002

[17] The local unit is an enterprise or part thereof (e.g. a workshop, factory, warehouse, office, mine or depot) situated in a geographically identified place. At or from this place economic activity is carried out, for which one or more persons work (even if only part-time) for one and the same enterprise (Eurostat, 2006).

For the 2002-2005 time period only the North region didn't registered a decrease in the number of manufacturing units operating locally (table 3.6). Nevertheless, the 3% growth rate in this region is not significant when compared with the evolution of the number of wholesale units. In fact, all the selected regions registered an increase in the number of the local units in wholesale of household goods (table 3.7). Western Macedonia and North regions almost duplicated the number of such firms, with growth rates of 80% and 90% respectively.

Table 3.7
Evolution of the number of local units in Wholesale of household goods*: 2002-2005

Nuts II	Number of local units 2002 (NACE 514)	Number of local units 2005 (NACE 514)	Growth rate 2002-2005
Greece	15224	19693	0,29
Eastern Macedonia and Thrace	421	557	0,32
Central Macedonia	3211	3957	0,23
Western Macedonia	342	615	0,80
Spain	45919	52392	0,14
Valencia	5531	7397	0,34
Italy	68306	71229	0,04
Abruzzo	1457	2231	0,53
Molise	114	132	0,16
Campania	7048	9382	0,33
Puglia	3078	3574	0,16
Portugal	13033	25287	0,94
North Portugal	5194	9865	0,90

Source: EUROSTAT data (thousands)
NACE G514 - Wholesale of household goods include: textile; clothing; footwear; electrical household appliances; china and glassware; perfumes and cosmetic; pharmaceutical goods

When observing the evolution of the number of retail firms in the same period (table 3.8), growth rates are again positive even if less accentuated.

Exception made for the negative rates of Italian regions due to the strong presence of an already well established retail network in the fashion industry.

Wholesale units are increasing faster than retail stores because manufacturing units, that are being relocated abroad, issue their products to these regions through local wholesales that operate as distributors to the retail sales units. The role of the major international retail networks is increasingly important in this context. With their large number of sales outlets (sometimes established in several countries), governed by a search for low production costs, they are tending to replace traditional manufacturers and to issue their own articles with their own logo, manufactured by subcontractors located outside of the EU (Perivoliotis, 2004).

Table 3.8
Evolution of the number of local units in Retail sale in specialized stores*: 2002-2005

Nuts II	Number of local units 2002 (NACE 524)	Number of local units 2005 (NACE 524)	Growth rate 2002-2005
Greece	89530	98505	0,10
Anatoliki Makedonia, Thraki	4493	4972	0,11
Kentriki Makedonia	14829	16187	0,09
Dytiki Makedonia	2426	2660	0,10
Spain	317365	345521	0,09
Comunidad Valenciana	33695	36037	0,07
Italy	409497	401288	-0,02
Abruzzo	9324	9136	-0,02
Molise	2393	2304	-0,04
Campania	44717	45151	0,01
Puglia	29276	31057	0,06
Portugal	75048	112137	0,49
North Portugal	25830	38975	0,51

Source: EUROSTAT data (thousands)
G524 - Other retail sale of new goods in specialized stores include: textile; clothing; footwear and leather; furniture; electrical household appliances; hardware, paints and glass; books

Although the available data at Nuts 3 level include other products besides textiles, clothes and leather, the information is still interesting as it allows revealing the changes in the industrial pattern of a set of regions, highly economic dependent on the aforementioned labour-intensive sectors, as a result of growing outsourcing activities to low-cost countries.

This generalised trend decreases the number of manufacturing firms operating regionally, with an impact on investment reduction and increase in unemployment rates.

iii) evolution of investment

The decreasing number of firms registered in most regions, was followed by a negative growth rate of gross investment in tangible goods. As shown in table 3.9, the evolution of this variable between 2001 and 2005 registered a significant fall, which in the case of the textiles in Molise reached the 95%.

Exceptions occurred only for the clothes sector in Central Macedonia and the textiles sector in Campania, with increases of 33.3 and 70.7% respectively. These exceptions may be explained by sporadic investments made in these regions during 2005.

Also, when analysing the evolution of the investment by person employed in the same period (table 3.10), growth rates are again negative.

Table 3.9
Growth rate of the gross investment in tangible goods: 2001-2005

Nuts II	Growth rate of Gross investment in tangible goods 2001 - 2005 NACE 17	Growth rate of Gross investment in tangible goods 2001 - 2005 NACE 18	Growth rate of Gross investment in tangible goods 2001 - 2005 NACE 19
Greece	-0,35	0,48	0,87
Eastern Macedonia and Thrace	-0,64	-0,43	:
Central Macedonia	-0,51	0,33	:
Western Macedonia	:	:	:
Spain	-0,49	-0,18	-0,44
Valencia	-0,59	-0,71	:
Italy	-0,44	-0,25	-0,21
Abruzzo	-0,72	-0,79	:
Molise	-0,95	-0,58	:
Campania	0,71	-0,75	-0,26
Puglia	-0,74	-0,64	:
Portugal	-0,28	-0,22	:
North Portugal	-0,31	-0,22	-0,21

Source: EUROSTAT data
(:) Not available

Table 3.10
Growth rate of the investment by person employed: 2001-2005

Nuts II	Growth rate of Investment by person employed NACE 17	Growth rate of Investment by person employed NACE 18	Growth rate of Investment by person employed NACE 19
Greece	-0,41	-0,35	-0,03
Eastern Macedonia and Thrace	-0,67	-0,28	5,17
Central Macedonia	-0,50	-0,25	:
Western Macedonia	:	:	:
Spain	-0,35	0,15	-0,30
Valencia	-0,51	-0,50	:
Italy	-0,32	-0,08	-0,06
Abruzzo	-0,67	-0,76	:
Molise	-0,93	-0,42	:
Campania	0,87	-0,73	-0,09
Puglia	-0,71	-0,48	:
Portugal	-0,13	-0,21	:
North Portugal	-0,15	-0,20	0,00

Source: EUROSTAT data (thousands)
(:) Not available

Between 2001 and 2005, almost all regions, regardless the NACE sector, registered a decrease on the level of investment by person employed. This indicates that, the investment fall overcame the decrease in regional employment in this period. A positive growth rate was registered only in the leather sector from Eastern Macedonia and the textiles sector in Campania. While this later result is due to the positive growth rate in investment in Campania, as prior illustrated, the result in the Greek region should be analysed together with the evolution of the employment presented in the next section. In fact, the leather sector in Eastern Macedonia was the one registering the highest employment decrease in 2005, which explains the positive result in investment by person employed in this period (table 3.11).

iv) growth rate of employment

This sequence of economic indicators converges to a decrease on the growth rates of employment. In 2005, all regions registered negative growth rates of employment across sectors (table 3.11), thereby fully justifying the multiple concerns addressed by researchers and policy makers. Still significant differences may be found amongst regions such as the employment drops above the 30% in the leather firms from Eastern and Western Macedonia and in textiles firms also from Western Macedonia.

Ultimately, this last indicator summarises the economical background of these regions. The significant job loss registered is the direct result of firm's disinvestment, bankrupting and delocalisation, in regions whose economic tissues are not able to provide employment alternatives.

Table 3.11
Growth rate of employment (%): 2005

Nuts II	Growth rate of employment NACE 17	Growth rate of employment NACE 18	Growth rate of employment NACE 19
Greece	-21.6	-5.8	-20.7
Eastern Macedonia and Thrace	-12.0	-12.6	-34.9
Central Macedonia	-19.2	-4.9	-23.0
Western Macedonia	-33.6	-3.7	-32.1
Spain	-3.1	-6.5	-5.7
Valencia	-1.0	-22.7	:
Italy	-6.9	-4.8	-6.2
Abruzzo	-3.4	-8.3	-8.4
Molise	-13.1	-0.8	:
Campania	-10.7	-11.5	-12.4
Puglia	-8.2	-8.9	-11.6
Portugal	-0.6	-6.2	:
North Portugal	-2.1	-4.7	-5.8

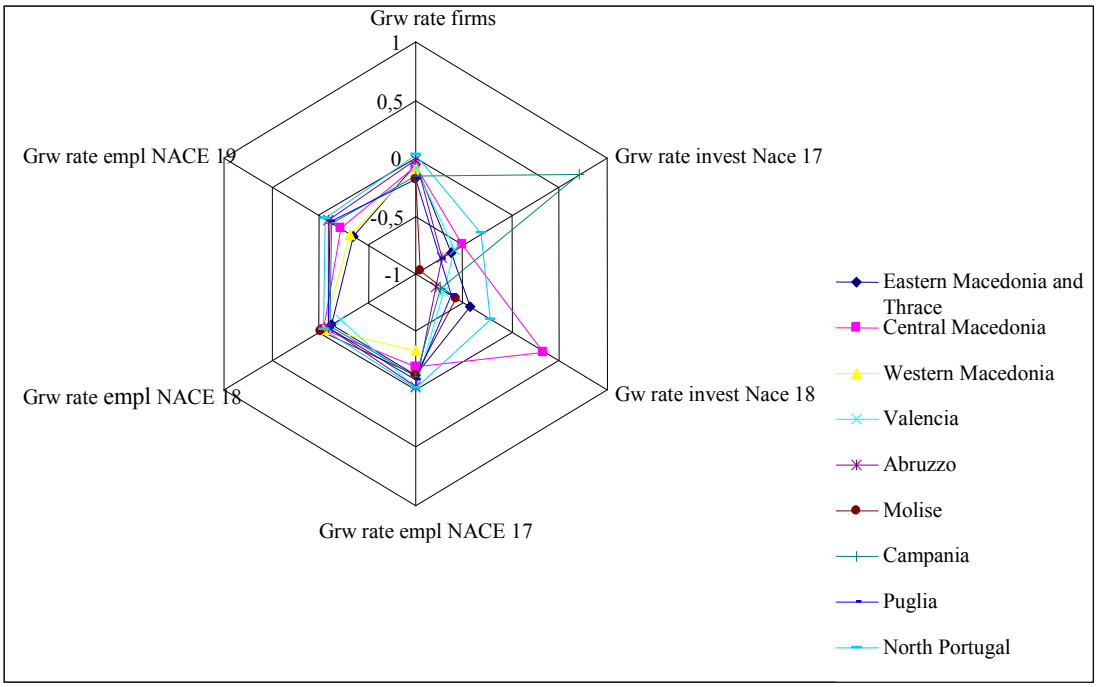
Source: EUROSTAT data
(:) Not available

These indicators can be easier interpreted when using a multicriteria approach summarising the regional behaviours.

v) A multicriteria approach

In order to better analyse the vast amount of statistical information formerly presented, figure 3.5 presents a summarised comparison among the regions.

Figure 3.5
Indicators of regional competitive positioning for TCL sectors



Source: Author's elaboration

This spider graph can be used to better understand the weaknesses and the challenges faced by regions whose economic dependence on labour-intensive sectors was confirmed.

Not only regional economic structures were not able to attract new investments, also the decreasing number of firms in most regions, indicate the sectorial vulnerability. More important, the negative evolution of the investment by person employed indicates that the existing firms are not keeping ongoing as a result of a better competitive position; they are just surviving and overcoming their economic weakness.

The increasing unemployment rates in these sectors, with the social and economic consequences for these regions as a whole, resumes the lack of competitiveness of TCL sectors in southern European regions.

Nevertheless, these weaknesses should be analysed in a global perspective. Along with their vulnerability to low-wage competition, these sectors are also strongly characterised by their susceptibility to take shape in network forms of organisation. By clustering together, these firms are allowed to be part of dense agglomerations of capital and labour and to increasingly be involved in international subcontracting and production sharing arrangements. The recent improvements in communications didn't weaken the propensity of these industries to group together in geographic space.

> *'No matter what level of development may be, and no matter whether employment is increasing or decreasing, the clothing, footwear and furniture industries in any country tend to be heavily concentrated in specialised industrial districts.' (Scott, 2006: 1522)*

For some industrial agglomerations this geometry allows to contest international markets, but also facilitates the shift of intra-industry blocks of work from more to less developed countries (Scott, 2006). Although delocalisation is a common threat, industrial agglomerations in low-cost countries are related to inferior working conditions, while in the more economically advanced countries, the expansion of more skilled forms of work in the more fashion-intensive production centres, could compensate the further job loss.

Less but more qualified jobs is the scenario suggested by regional analysts to the future of TCL sectors. One new important condition of success to be

analysed is, therefore, regions' proximity to urban economic centres: agglomeration and scope economies are becoming an important condition in the success of TCL sectors and their vulnerable regions.

3.4 The proximity to urban centres

In order to analyse the proximity to urban centres, data from Eurostat Urban Audit was used. The Urban Audit collects information from National (or Regional) Statistical Offices for 284 cities and 336 variables, structured in different statistical fields. Table 3.12 summarises those key economic indicators selected for the most relevant urban areas belonging to each one of the studied regions. The selection of these areas was made having the Urban Audit as reference but crossing with the map visualisation of the regions, in order to assure that no important city is missing.

Using the average growth rate of employment among NACE 17, 18 and 19 as an indicator of the performance of these sectors[18], a significant linear correlation of 0.762 (p = 0.017) is found between this indicator and the number of urban areas registered, as shown in table 3.13 and picture 3.6. To note that, when considering the all sub sectors of manufacturing, the results indicate an absence of correlation between these two variables, meaning that this dependence is a particular feature of TCL sectors.

[18] TCL firms may benefit from the proximity to an urban centre from a neighbour region. This cross influence of urban areas from contiguous regions is, in this case, expectable, but not possible to assess in this analysis which represents a restraint.

Table 3.12
Economic Indicators for urban areas

Nuts II	Urban Areas	Resident Population (1999-2002)	Population Density (1999-2002)	Unemployment Rate (1999-2002)	Employment Rate (1999-2002)	GDP per head (1999-2002)
Eastern Macedonia	Kavala	63572	568.6	12.1	51.7	:
Central Macedonia	Thessaloniki	385406	21060.4	11.1	51.7	:
Western Macedonia	-	-	-	-	-	-
Valencia	Valencia	738441	5489.9	14.2	57.7	19840
	Alicante	293629	:	:	:	:
Abruzzo	l'Aquila	68503	146.7	10.2	56.4	13903
	Pescara	116286	3420.2	12.2	51.4	15231
Molise	Campobasso	50762	906.5	15.2	51.0	13706
Campania	Napoli	1004500	8585.5	31.8	35.3	11338
	Caserta	75208	1392.7	18.5	45.6	11334
Puglia	Bari	316532	2728.7	19.2	44.3	12620
	Taranto	202033	926.8	22.3	39.3	12253
	Foggia	154970	:	:	:	:
Norte	Oporto	263131	6337.5	9.3	64.0	13254
	Braga	164192	896.3	6.2	68.5	9752
	Aveiro	73335	366.9	4.8	70.5	11644

Source: EUROSTAT – Urban Audit
(:) Not available

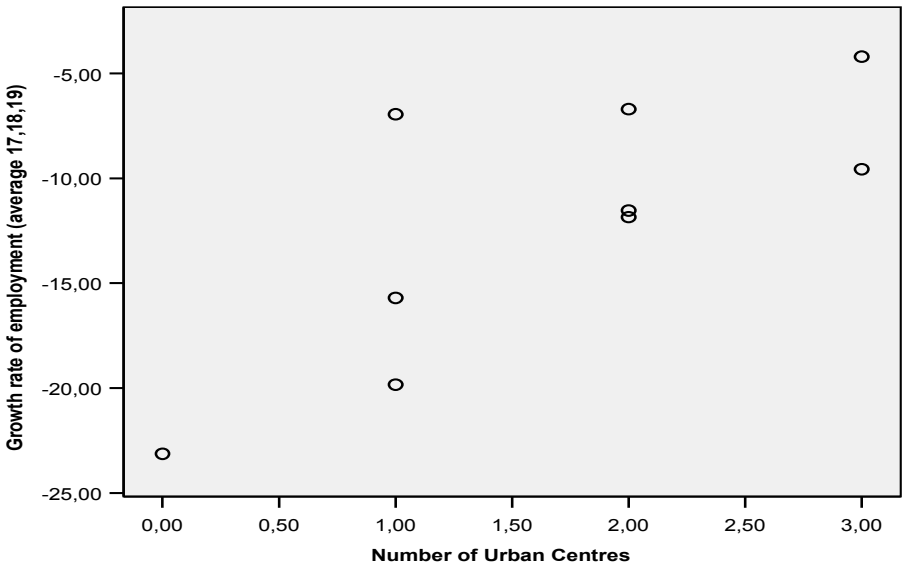
Table 3.13
Correlation between growth rate of employment and the number of urban centres within the region

		Growth rate of employment (average NACE 17,18,19 - 2005)	Growth rate of employment (all manufacturing - 2005)	Number of Urban Centres
Growth rate of employment (average 17,18,19 - 2005)	Pearson Correlation	1	-,127	**,762(*)**
	Sig. (2-tailed)		,745	,017
	N	9	9	9
Growth rate of employment (all manufacturing - 2005)	Pearson Correlation	-,127	1	,319
	Sig. (2-tailed)	,745		,403
	N	9	9	9
Number of Urban Centres	Pearson Correlation	**,762(*)**	,319	1
	Sig. (2-tailed)	,017	,403	
	N	9	9	9

Source: Author's elaboration based on Eurostat data
* Correlation is significant at the 0.05 level (2-tailed)

These outcomes permit to confirm the positive influence of urban economic centres inside the regions, acting as a locomotive for firms' stability and good performance, in agreement with Scott *et al.* (2001) and Scott and Storper (2003). Consequently, less job loss occur when in presence of a higher number of urban centres inside the same regional boundaries, or, in other terms, the fragilities of TCL sectors may be reduced when firms belong to networking forms of dense economic agglomeration (Scott, 2006).

Figure 3.6
Growth rate of employment and the number of urban centres



The diagnostic results presented above, as well as the European Commission recommendations for the sectors, will be used to compose the final remarks on the issue.

3.5 Discussion

The COM (2003) report states that a substantial adjustment process has taken place in TCL sectors, with the increasing adoption of new technologies at a fast pace, both with regard to information and communication technologies as well as to new production techniques (COM, 2003).

The presented data summarises the economical background of a set of European southern regions with similar economic tissues. As observed, the new global economy is getting firms to face two different phenomena: increasing competition, as a result of the liberalisation process, and increasing outsourcing, in search of lower production costs. The result is, as observed, the employment decline in regions highly economically dependent on these activities.

Nevertheless, this diagnostic should also be understood as a signal for the future of the industry.

For one side, with the increasing delocalisation come possible solutions from changes in the management culture and the opportunities presented by new electronically-based technologies. There may be significant increases in the numbers of people employed in positions such as managers, designers, technicians and administrators in sales and marketing. In terms of employment qualification, this means greater needs for mobility, flexibility and language competence of personnel in the European textile/clothing/leather industry. These sectors should be therefore a priority from regional universities in order to reshape employment to highly-skilled and more stable and better paid jobs, also in complementary areas.

For the other side, the increasing exposure to competition from a large number of low-labour cost countries should be transformed in an opportunity for the industry. Despite the huge labour cost differences between those countries and Europe, the European TCL industry remains competitive due to higher productivity levels. While value added remains quite stable, the employment in the industry is suffering increasing declines, thus leading to productivity increases (COM, 2003). Portugal, Italy and Greece are typical representatives of this pattern.

Given the restraints in winning through price competition, the quality argument appears as a strong weapon for the European industry. A comparison of export and import values for a range of relatively homogeneous products shows that European products generally have a positive quality mark-up (COM, 2003). This emphasizes the strategic importance of increased market access to emerging economies where a middle class is growing and creating an expanding quality-conscious market, where the EU has the highest competitive advantages.

In answering **Q1.1**, it can be stated that the industry capacity to struggle in such competitive environment is found in the promotion of its added value through innovation, quality, creativity, design and fashion. All these requirements involve investments in research, innovation and new technologies. But this scenario also indicates that the sectors can find remedies in employment qualification and better co-ordination in the numerous activities in this area ranging from product design, fashion industry to distribution networks.

This idea is stressed in the list of recommendations from the High Level Group for the European textiles and clothing sectors (EC, 2006). Among others,

the following fit in this discussion**:** to increase synergies - moving forward from mere supplier-customer relationships to more organic links (both horizontally and vertically), able to create critical mass and exploit standardisation opportunities, that should lead to reductions in costs, enhancement of quality and reduction of technological and commercial risks; and to improve skills and training - the clothing technology breakthrough forces the raise of employment qualification, so a better match between supply and demand and the development of common qualification standards are also recommended by the EC.

Thus, the role of cities as economic centres is again emphasised. In answering **Q1.2**, it results from the analysis that the proximity to urban agglomerations of capital, labour and improved facilities is an important driver for the performance of these industries, allowing them to increasingly be involved in formal cooperation networks. Also, the presence of universities, research centres and training organizations, with strong potential in the development of high standard research and design for textile and leather products constitute a main competitive advantage. For each one of the regions mentioned, a close analysis of its historical research potential on the textile-clothes-fashion chain comprises an interesting field for future research.

These final remarks can be summarized in the following SWOT (Strengths, Weaknesses, Threats and Opportunities) – analysis (table 3.14).

Recognised the importance of technological adjustment processes for the competitive survival of these industries, **Chapter 4** analyses the factors that better explain different behaviours towards technological change by a sample of firms from textiles, clothes and leather sectors located on the group of regions

considered. Those factors belong to a set of environmental conditions and include information on firms' employees, type of ownership and management, supply/distribution/customers' networks and institutional links. The purpose is to better understand the technological adjustment process in such sectors as a means to suggest the better way to improve it.

Table 3.14
TCL sectors from Southern Europe - SWOT analysis

Strengths	***Weaknesses***
- positive quality mark-up of EU products; - propensity to cluster together benefiting from agglomeration and scope economies.	- high vulnerability to low-wage competition leading to bankruptcies, disinvestment and job losses.
Threats	***Opportunities***
- increasing competition (liberalisation process); - increasing delocalisation (in search for lower labour-costs).	- design, fashion and distribution leadership; - employment qualification in other than manufacturing activities (management, design, sales and marketing); - higher productivity levels from a reduced workforce; - high added value and quality exports; - enhanced infrastructures, production and distribution networks.

Source: Author's elaboration based on EC (2006)

Chapter 4 - Factors affecting the adoption of new technologies by labour-intensive firms

4.1 Introduction

The previous chapter supported the idea that textile, clothes and leather (TCL) sectors' capacity to face the new global economy challenges is found in its strengths of innovation, quality and creativity, via technological adjustment processes.

The main objective of the present chapter is to show how a set of environmental variables affect the probability of adoption of new technologies by small firms. We distinguished between the firms' indirect or general environment and the firms' task environment that includes customers, suppliers, competitors, industry associations, universities training agencies, and so on.

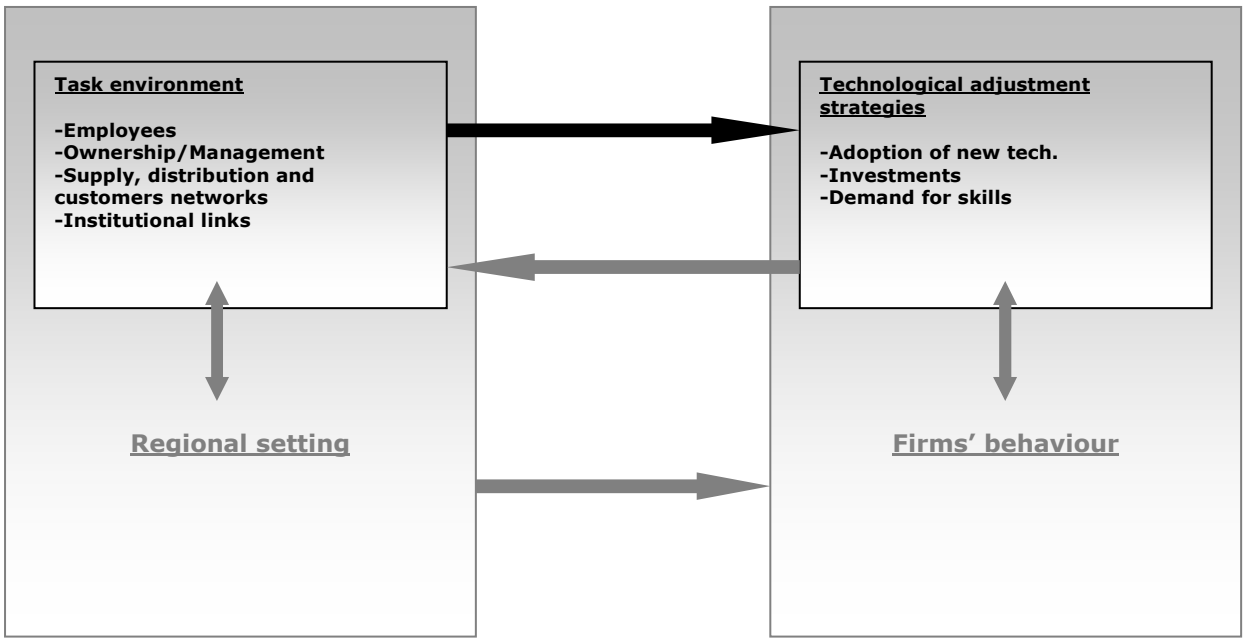
Empirically, the analysis is based on a questionnaire application to a sample of 167 small - and medium-sized firms, from TCL industries, and belonging to the studied southern European areas: North (Portugal), Valencia (Spain), Macedonia (Greece) and South Italy (Italy).

In this empirical exercise, the following variables were considered as possible factors affecting the firms' adoption of new technologies: employees, type of ownership and management, supply/distribution/customers' networks and institutional links. A binary logistic regression was computed to detect, among the significant predictors, those ones that generate higher effects on the probability of adoption of new technologies by the sample of firms.

4.2 Conceptual framework and research hypotheses

After the regional and sectoral diagnosis previously discussed in chapter three, the present chapter addresses the question **Q2**: what are the determinants of firms' technological choices? The previously established conceptual framework continues to be used as reference (the black arrow in figure 4.1 indicates the flow of influences to be searched).

Figure 4.1
Methodological Framework – chapter 4



Source: Author's elaboration

We rely on Hall (1987), who distinguishes between general environments and specific (or task) environments. Firms' general environments include technological, legal, economic, demographic and cultural conditions and the second includes customers, suppliers, competitors, industry associations, universities, and so on. While firms can hardly influence the first, task

environments correspond to the firms' decisional space, allowing different strategic options, particularly those that concern technology.

While **chapter three** allowed an analysis of the regional settings for TCL firms located in the selected regions, **chapter four** focus on firms' decisional space.

The literature review suggested that regional settings can provide an essential level of economic coordination and be a major source of region-specific material and non-material assets (network collaborations, *untraded* interdependencies or *associational* behaviours are concepts supporting this idea).

When referring to technological trajectories, Dosi (1988) mentions the importance of both the *public elements of knowledge*, as *untraded interdependencies* between sectors, technologies and firms that represent a structured set of technological externalities for individual companies, but also the importance of the *local and firm-specific* technological competences.

As mentioned by Pavitt (quoted in Dosi, 1988), textile, clothing and leather sectors belong to what he called the *supplier-dominated* group of sectors, where:

> *'...innovations are mainly process innovation: innovative opportunities are generally embodied in new varieties of capital equipment and intermediate inputs, originated by firms whose principal activity is outside these sectors themselves. Thus the process of innovation is primarily a process of diffusion of best-practice capital-goods and of innovative intermediate inputs…The knowledge base of innovation in these sectors mainly relates to incremental improvements in the equipment produced elsewhere, to its efficient use and to organisational innovations. Appropriability of firm-specific technological capabilities is rather low and firms are typically not very big…'*

In the previous approach we note two major ideas: the importance of the contacts developed within firms along the productive chain, as important sources of technological knowledge, and the importance of efficiency and organisational innovations, where employees and managers play an essential role.

Malecki and Poehling (1999) suggest that the 'personality' of the small firm reflects the personality of its owner/manager. With regard to the search of external information, the authors classify this personality as extrovert or introvert type, distinguishing between different abilities to obtain technical and engineering information[19].

In agreement with these considerations, and in order to answer **Q2**, the following research hypotheses are proposed:

H1: The origin of the firms' employees is a significant predictor of the adoption of new technologies.

H2: The upgrading of skills of employees is a significant predictor of the adoption of new technologies.

H3: The type of ownership is a significant predictor of the adoption of new technologies.

H4: The type of management is a significant predictor of the adoption of new technologies.

The review of literature also suggests the importance of supply, distribution and customer links, recognising that small firms frequently form component parts of extended networks with different possible geographies

[19] A more in-depth discussion around ownership and management issues is given by Westhead *et al.* (2002).

(local, regional, national, EU, and international). By accessing other markets, assets and technologies, the firms release themselves from the limits of local and internal competences and gain control over the technological trajectories of their competitors (Camagni, 1991, 1995).

H5: The scope and geography of firms' networks are significant predictors of the adoption of new technologies.

The informal contacts that occur inside firms, or between them and other surrounding agents, are also seen in the literature as important sources of technological knowledge. The term 'untraded interdependencies' was used by Storper (1995) to define regionalized relationships which extend beyond traditional customer/supplier links (also referred as input-output linkages or traded interdependencies) and embrace formal and informal collaborative and information networks. With a similar view but a different conceptualisation, Cooke and Morgan (1998) refer to a collective social order that induces firms to collaborate and display *'associational behaviours'*. The interactive learning among business networks is argued to be the most effective and credible way for knowledge acquisition (Morgan, 1996). In agreement with these concepts, the following research hypothesis is also proposed:

H6: The nature of institutional links is a significant predictor of the adoption of new technologies.

The following statistical exercise aims to test these hypotheses.

4.3 Method

4.3.1 Sampling

Empirically, the analysis is based on the application of a questionnaire to a sample of 167 small-and medium-sized firms from the clothing, textile and leather sectors belonging to the following southern European areas: North (Portugal), Valencia (Spain), Macedonia (Greece) and South Italy (Italy). See chapter 3 for a discussion on the challenges and opportunities for these sectors in face of the new global economical conditions.

A common questionnaire was applied in each area, allowing a cross-country analysis among a set of regions whose economic dependence on labour intensive sectors, particularly sensitive to low-wage competition, was debated in the previous chapter. Appendices 1 and 2 give, respectively, the questionnaire and the design and sampling procedures. Tables 4.1 and 4.2 summarise the sample distribution.

Around 74% of sample firms are from the textiles and clothing industry. A fewer proportion (26%) corresponds to the footwear and leather industry.

Table 4.1
Sample distribution by region and sector

	Footwear and Leather Products	Textiles and clothes	Total
Norte, Portugal	14	52	**66**
Macedonia, Greece	14	36	**50**
South Italy	-	24	**24**
Valencia, Spain	15	12	**27**
Total	**43**	**124**	**167**

Source: Author's elaboration

In terms of distribution by size, most of the studied firms (44%) have between 10 and 50 employees.

Table 4.2
Sample distribution by sector and firm size

Number of Employees	Footwear and Leather Products	Textiles and clothes	Total
Less than 10	11	31	**42**
10 – 49	16	58	**74**
More than 50	14	37	**51**
Total	**41**	**126**	**167**

Source: Author's elaboration

4.3.2 Statistical data and methodology

Based on the previous discussion, the following variables (listed in table 4.3) are used as predictors of the probability of adoption on new technologies by firms: employment sources (EMPLS); type of ownership (OWNE); type of management (MANG); supply, distribution and customers networks (NETS, NETD, NTEC); institutional links (LINK) and skills' upgrading of employees (SKILL).

The variable **EMPLS** distinguishes among four different sources of employment: family members, local community, people from outside the region and parent firm (four different binary variables are considered).

Regarding the type of ownership (**OWNE)** firms may be owned by one person, a partnership, family owned or a limited company. According to the type of ownership, different management situations are possible.

Table 4.3
Description of database variables

Question	Variable	Description	Codification
		Predictor variables	
	EMPLS	**Employment Sources**	
Q8a)	EMPLSa)	Family members	1=yes; 0=no
Q8b)	EMPLSb)	Local community	1=yes; 0=no
Q8c)	EMPLSc)	People from outside the region	1=yes; 0=no
Q8d)	EMPLSd)	Parent firm	1=yes; 0=no
Q10	**OWNE**	**Type of Ownership**	1 = Owned by one person; 2 = A partnership; 3 = Family Owned; 4 = A limited company (reference category)
Q11	**MANG**	**Type of Management**	1 = The owner-manager; 2 = Other family personnel; 3 = External manager (reference category)
	NET	**Supply, distribution and customers networks**	
Q15a)	NETSa)	Suppliers: associated local firms	1=yes; 0=no
Q15b)	NETSb)	Suppliers: other local/regional firms	1=yes; 0=no
Q15c)	NETSc)	Suppliers: national firms	1=yes; 0=no
Q15d)	NETSd)	Suppliers: EU firms	1=yes; 0=no
Q15e)	NETSe)	Suppliers: international firms	1=yes; 0=no
Q17a)	NETDa)	Distributors: associated local firms	1=yes; 0=no
Q17b)	NETDb)	Distributors: other local/regional firms	1=yes; 0=no
Q17c)	NETDc)	Distributors: national firms	1=yes; 0=no
Q17d)	NETDd)	Distributors: EU firms	1=yes; 0=no
Q17e)	NETDe)	Distributors: international	1=yes; 0=no
Q19a)	NETCa)	Customers: local/regional market	1=yes; 0=no
Q19b)	NETCb)	Customers: national market	1=yes; 0=no
Q19c)	NETCc)	Customers: EU market	1=yes; 0=no
Q19d)	NETCd)	Customers: international market	1=yes; 0=no
	LINK	**Institutional links**	
Q37a)	LINKa)	Internal personnel	1=yes; 0=no
Q37b)	LINKb)	Customers	1=yes; 0=no
Q37c)	LINKc)	Suppliers	1=yes; 0=no
Q37d)	LINKd)	Industry associations	1=yes; 0=no
Q37e)	LINKe)	Universities and/or colleges	1=yes; 0=no
Q43rec	**SKILL**	**Skills' upgrading of employees**	1=yes; 0=no
		Dependent variable	
Q35rec	**TECH**	**Adoption of technological changes**	1=yes; 0=no

Source: Author's elaboration

The variable **MANG** aggregates the following options regarding the firm's manager: owner-manager, other family personnel or external manager.

The variable **NET** includes supply (NETS), distribution (NETD) and customer (NETC) links. The first two distinguish among five different possible network geographies: associated local firms, other local/regional firms, national firms, EU firms and international firms. Firms' sales destination may be: local/regional markets, national markets, EU markets or international markets.

The variable **LINK** is used to identify the contacts (mostly informal) used as sources of technological knowledge by sample firms and differentiates among internal personnel, customers, suppliers, industry associations and universities/colleges.

Finally, sample firms were also examined with respect to the upgrading of their employees' skills. The variable **SKILL** is measured by a binary scale (1 = yes; 0 = no).

The adoption of new technologies by the sample firms – **TECH**, also measured by a binary scale (1 = yes; 0 = no) was used as a dependent variable.

To obtain observable measures of technology (Chennells and Van Reenen, 2002) we distinguish between three types of measures: inputs into the knowledge production function, outputs from the knowledge production function and subsequent diffusion of these outputs around the economy. Inputs are generally measured by R&D activities. Although R&D expenditure has the advantage of being measured in a reasonably standard way, it has a disadvantage related to spillovers. A firm might invest significantly in R&D without receiving any benefit from it, either in the form of innovation for the firm or in the form of the ability to learn from other firms' innovations. Patents, on the

other hand, are a widely available and standard way of measuring the outputs of knowledge. However, a large number patents appear to be of very low value, and there is no obvious method of measuring them when this factor is taken into account. According to the authors, diffusion measures seem to be closely related to what is usually thought of as technology. Examples of diffusion measures proposed by Chennells and Van Reenen (2002) are: the use of computers in a firm (word processors, mainframes); the production-based technologies (lasers, robots, CAD, CAM); the weight of usage (the proportion of people using the computer), and so on.

Based on these ideas, and having in mind that the sample is composed by small-and medium-sized firms from low-tech sectors and located in vulnerable European regions (where R&D departments and patents are remote realities) the following technology measures were considered in the present survey:

(a) inventory control (e.g. PC, software, etc.)

(b) production process technology (e.g. CAM)

(c) product design technology (e.g. CAD)

(d) marketing technology (e.g. internet, websites, etc)

(e) e-mail/ website/ internet

(f) business to business electronic networks

The firm was considered to have adopted new technologies if, at least two of the previous technologies were adopted in the past three years. This criterion was considered to be of good sense taking into account the possible

combinations of answers given by the firms.

The quantitative contribution of each of the previous predictors was compared using a binomial logistic regression model[20] as given by the following equation:

$$\text{logit}(TECH) = \alpha + \beta_r EMPLS_r + \gamma SKILL + \delta OWNE + \varepsilon MANG + \zeta_r NET_r + \eta_r LINK_r ,$$

(4.1) where r stands for the option of the corresponding question, when variables are subdivided in different yes/no options, each one corresponding to a binary variable itself (see table 4.3).

For the binomial logistic regression, the predicted dependent variable is a function of the probability that a particular subject will be in one of two categories. In this case, the probability that sample firms adopted new technologies in the past three years (TECH=1). The logistic regression will predict the logit, that is, the natural log of the odds, given by $\ln\{P(TECH=1)/[1-P(TECH=1)]\}$. The results for the set of recommended procedures and statistical tests developed in order to assure the adequacy of the model are subsequently presented.

[20] Binomial (or binary) logistic regression is a form of regression which is used when the dependent is a dichotomy and the independents are of any type. Using SPSS, the model is constructed by iterative maximum likelihood estimation (MLE). The program starts with arbitrary values of the regression coefficients and constructs an initial model for predicting the observed data. It will then evaluate errors in such predictions and change the regression coefficients so as to make the likelihood of the observed data greater under the new model. This procedure is repeated until the model converges, that is, until the differences between the newest model and the previous model are minor (Menard, 1995).

4.4 Results

Before running the logistic regression, a characterisation of the sample is provided in table 4.4.

Table 4.4
Characteristics of the sample

Variables	Distribution of answers
Predictor variables	
Employment Sources	
Family members	58.1% yes; 41.9% no
Local community	91% yes; 9% no
People from outside the region	24% yes; 76% no
Parent firm	1.8% yes; 98.2% no
Type of Ownership	7.8% Owned by one person; 44.3% A partnership; 39.5% Family Owned; 6.6% A limited company
Type of Management	83.4% The owner-manager; 10.4% Other family personnel; 6.1% External manager
Supply, distribution and customers networks	
Suppliers: associated local firms	29.3% yes; 70.7% no
Suppliers: other local/regional firms	67.5% yes; 32.5% no
Suppliers: national firms	78.4% yes; 21.6% no
Suppliers: EU firms	62.3% yes; 37.7% no
Suppliers: international firms	24.0% yes; 76.0% no
Distributors: associated local firms	17.0% yes; 83.0% no
Distributors: other local/regional firms	40.5% yes; 59.5% no
Distributors: national firms	56.2% yes; 43.8% no
Distributors: EU firms	49.7% yes; 50.3% no
Distributors: international	18.3% yes; 81.7% no
Customers: local/regional market	57.5% yes; 42.5% no
Customers: national market	73.1% yes; 26.9% no
Customers: EU market	65.9% yes; 34.1% no
Customers: international market	27.5% yes; 72.5% no
Institutional links	
Internal personnel	63.5% yes; 36.5% no
Customers	46.7% yes; 53.3% no
Suppliers	50.9% yes; 49.1% no
Industry associations	23.4% yes; 76.6% no
Universities and/or colleges	14.4% yes; 85.6% no
Skills' upgrading of employees	75.9% yes; 24.1% no
Dependent variable	
Adoption of technological changes	61.7% yes; 38.3% no

Source: Author's elaboration

We are dealing with a group of small firms (44% have between 10 and 50 employees) where employees are mainly from local community (91%) and very often family members (58.1%).

The ownership and management structures also reflect the familiar nature of these firms, with a considerable proportion of partnerships (44.3%) and family owned units (39.5%), mainly managed by the owners (83.4%).

Considering the geography of the networks used by these firms, there is a predominance of the national level for both the use of suppliers (78.5%), distributors (56.2%) and customers (73.1%), although local/regional and European levels are also present.

An important feature of the sample is that the contacts with external agents, such as industry associations and universities/colleges, as potential sources of technological knowledge, are minor. These firms use mostly their internal personnel (63%), their suppliers (50.9%) and customers (46.7%) for that purpose. The importance of human resources is also reflected in the high proportion of firms that upgraded their workforce skills (75.9%).

From the set of 167 firms, 103 (61.7%) answered that new technologies were adopted in the past three years, while the remaining 64 (38.3%) gave a negative answer. The logistic regression model (equation 4.1) allows to identify which variables produce higher effects on the probabilities of adoption of new technologies in such firms.

According to Menard (1995) the first and most important assumption in logistic regression is that the model is correctly specified. One crucial

component of correct specification is the correct functional form of the model. Logistic regression does not require linear relationships between the independent factors or covariates and the dependent – as does OLS regression – but it does assume a linear relationship between the independents and the log odds (logit) of the dependent. When the assumption of linearity in the logit is violated, then logistic regression will underestimate the degree of relationship of the independents to the dependent and will lack power (generating Type II errors, assuming that there is no relationship when there actually is). To assess linearity, as suggested by Menard (1995) the proposed model was compared with a larger model, including the square and cubic values of the original independent variables[21]. The coefficients associated with these variables are jointly non-statistically significant (*p=0.531*), that is, there is no evidence of nonlinearity between the logit of the dependent variable and the set of independent variables.

Another issue to avoid is multicollinearity among variables. High multicollinearity is a problem as it affects the reliability of the coefficients. In this case, the highest correlation registered among two independent variables was 0.633, which does not represent a problem.

Following these procedures, the logistic regression results are presented. These results include statistics for: the goodness-of-fit of the model (chi-square statistics), the estimated parameters, and the predictive capacity of the model (annex 4.1 provides detailed information).

[21] Only for the categorical variables, as the square and cubic value of a dummy variable is the dummy variable itself.

The model's goodness-of-fit was assessed using the Omnibus test of model coefficients – the null hypothesis that the coefficients of the variables are all jointly equal to zero was rejected (p = 0.000) – and the Hosmer and Lemeshow test – the null hypothesis that the model adjusts well to the data is not rejected (p = 0.574).

Table 4.5 lists the b coefficients, the Wald statistic and its significance, and the odds ratio, for the final independent variables in the model. The Nagelkerke R-square is also presented. Logit coefficients (logits), also called unstandardized *logistic regression coefficients*, are interpreted as the expected change in the propensity (log odds) to adopt new technologies for a unit change in the associated explanatory variable, holding all the other variables constant. Logit coefficients are easier to interpret when converted to an odds ratio using the exponential function. The odds ratios are simply measures of effect size and will be used to comment on their relative sizes when comparing independent variables effects.

The Wald statistic is used to test the significance of individual logistic regression coefficients for each independent variable (that is, to test the null hypothesis in the logistic regression that a particular logit (effect) coefficient is zero).

Of the list of independents initially considered, the following ones are statistically significant: type of ownership (OWNE), suppliers – international firms (NETSe), customers – international market (NETCd), sources of technological knowledge – internal personnel (LINKa), sources of technological knowledge – suppliers (LINKc) and employees' skills upgrading (SKILL). All the

others are not.

Table 4.5
Results of the estimation of a logistic regression model with the final independent variables

Predictors	B	S.E.	Wald $\chi 2$	p-value	EXP(B)
OWNE - Type of Ownership			16,902	,001	
OWNE(1) – owned by one person (dummy)	-1,338	1,352	,980	,322	,262
OWNE(2) – a partnership (dummy)	,335	1,182	,080	,777	1,398
OWNE(3) – family owned (dummy)	-2,270	1,202	3,565	,059	,103
NET - Supply, distribution and customers networks					
NETSe) – suppliers: international firms	1,883	,693	7,393	,007	6,573
NETCd)– customers: international market	1,687	,610	7,646	,006	5,402
LINK - Institutional links					
LINKa)– internal personnel	1,081	,499	4,692	,030	2,947
LINKc) – suppliers	1,926	,573	11,303	,001	6,860
SKILL - Skills upgrading of employees	2,751	,616	19,923	,000	15,663
Constant	-3,201	1,359	5,552	,018	,041

Source: Author's elaboration
Nagelkerke R^2=0.601

As stated earlier, the analysis of the odds rations allows comparing the effect size of each one of the independents on the odds of the dependent. In other words, among the significant predictors earlier identified, it is possible to identify which ones produce bigger positive (odds ratios > 1) or negative (odds ratios < 1) effects on the odds of adoption of new technologies.

For instance, the odds of a firm in a partnership to adopt new technologies are 1.398 times the odds of a limited company[22], while the odds of

[22] When the independent variable is categorical, the odds ratios need to be interpreted in terms of the left-out reference category, which in this case is the option: *limited company*.

a firm owned by one person or a family owned firm to adopt new technologies are 0.262 and 0.103 times, respectively, the odds of a limited company. The odds of a firm using international firms as suppliers and customers are 6.573 and 5.402 times, respectively the odds of a firm not using these networks. On the other hand, the odds of firms using internal personnel and suppliers as sources of technological knowledge are 2.947 and 6.860 times, respectively, the odds of firms not using these sources. Finally, the odds to adopt new technologies by firms upgrading employees' skills are 15.663 times the odds of firms not doing it.

From the 84 firms that adopted new technologies, 90.5% were correctly predicted (*sensitivity*), while from the 63 firms that did not adopt new technologies, 77.8% were correctly predicted (*specificity*)[23]. The overall percent of correctly predicted cases is 85% which is very reasonable. See annex 4.1 for detailed information.

4.5 Discussion

The process of economic globalisation has brought peripheral regions into the centre of rapid technological and economic change. A great deal of research has focused on the factors behind the technological change in central European regions (some of them previously mentioned in section 2.3). In this work, however, the concern was engaged to Southern European regions, with

[23] Sensitivity and specificity are statistical measures of the performance of a binary classification test. Sensitivity measures the proportion of actual positives which are correctly identified as such and Specificity measures the proportion of negatives which are correctly identified.

labour-intensive industries vulnerable to low-wage competition from within and without Europe (RASTEI, 2002).

The main goal was to identify the factors affecting the adoption of new technologies by such industries, considering technological adjustments as the needed way for the promotion of productivity and local development in vulnerable areas. The adoption of new technologies in the past three years by the sample firms, measured by a binary scale (1 = yes; 0 = no) was used as a dependent variable. The variables Employment Sources (EMPLS); Skills upgrading of employees (SKILL); Ownership (OWNE); Management (MANG); Supply, distribution and customers networks (NETS, NETD, NETC) and Institutional links (LINK) were used as explanatory variables as given by equation 4.1:

$$\mathrm{logit}(TECH) = \alpha + \beta_r EMPLS_r + \gamma SKILL + \delta OWNE + \varepsilon MANG + \zeta_r NET_r + \eta_r LINK_r .$$

When considering the capacity of these predictors (all of them related to the firms' task environment or, as also labelled, the firms' decisional space) to influence technological behaviours, some conclusions can be drawn.

In order to test research hypothesis H1, H2, H3, H4, H5 and H6, the likelihood of the model with all the independent variables was compared with the likelihood of the model without the variables implicated in each research hypothesis.

In testing the first research hypothesis, H1, that the origin of firms' employees is a significant predictor of technological behaviour, the null hypothesis is $H_{01} : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$. In this case, H_{01} was not rejected

(p=0.899), meaning that the origin of employees (family members, local community or outsiders) is not a significant predictor.

With respect to the second hypothesis, H2, that the employees' skills upgrading is a significant predictor, the null hypothesis ($H_{02}: \gamma = 0$) was rejected (p=0.000) indicating the importance of employment qualification, as one basic condition for the industry capacity to survive in the present competitive environment.

In the third research hypothesis (H3), which states that the type of ownership is a significant predictor, the null hypothesis ($H_{03}: \delta = 0$) was rejected (p = 0.002), meaning statistical evidence in favour of H3. The individual parameter results (in table 4.5) demonstrate that the category 'a partnership' produces the higher positive effect on the probability of adoption of new technologies when compared with the other categories, indicating that the responsibility towards the partners (not necessarily family members) increases the pressure for better results and necessary changes.

Regarding the fourth research hypothesis, H4, that the type of management is a significant predictor, there is statistical evidence in favour of $H_{04}: \varepsilon = 0$ (p=0.472), leading to the rejection of H4.

Concerning the fifth research hypothesis, H5, that the scope and geography of the firms' networks are significant predictors, the test was performed for the three network' scopes considered: supply, distribution and customer networks, therefore testing separately three null hypotheses:

$H_{05S}, H_{05D}, H_{05C}$. For the first case, H_{05S}, the likelihood of the model with all the independent variables was compared with the likelihood of the model without the variables NETr, considering r=1...5, that is, variables NETSa, NETSb, NETSc, NETSd and NETSe. For the second case, H_{05D}, the variables dropped were NETr, with r=6...10, that is, the variables NETDa, NETDb, NETDc, NETDd and NETDe. Finally, for the last case, H_{05C}, the restricted model dropped the variables NETr, with r=10...14, that is the variables NETCa, NETCb, NETCc and NETCd.

The null hypothesis $H_{05s}: \zeta_1 = \zeta_2 = \zeta_3 = \zeta_4 = \zeta_5 = 0$, was rejected ($p$=0.016), confirming the importance of the relationships with suppliers as a way of creating critical mass and exploit standardisation opportunities in the TCL sectors.

The null hypothesis $H_{05D}: \zeta_6 = \zeta_7 = \zeta_8 = \zeta_9 = \zeta_{10} = 0$, was not rejected ($p$=0.454), meaning that the use of different geographically located distributors is not a significant predictor.

Regarding the null hypothesis $H_{05C}: \zeta_{11} = \zeta_{12} = \zeta_{13} = \zeta_{14} = 0$, the result for the qui-square statistic with 4 degrees of freedom, means barely the rejection of this null hypothesis (p=0.062), indicating that the variables related with different geographically located customers are jointly nonstatistically significant. Nevertheless, considering such a small p-value, and taking into account the individual parameter result (table 4.5) for the use of international customers (p=0.006), this variable should not be ignored when drawing conclusions.

Indeed, the individual parameter results demonstrate that, in both situations, suppliers and customers networks, the contacts with international firms (networks' geography) were the ones with statistical significance, producing positive effects on the odds of the adoption of new technologies by the sample firms. The importance of exploring international and quality conscious markets is corroborated by these results.

Finally, considering the sixth research hypothesis, H6, that the nature of institutional links is a significant predictor, the null hypothesis $H_{06} : \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = 0$ was rejected (p=0.000). Individual parameter results confirm the importance of the use of internal personnel (p = 0.030) and suppliers (p= 0.001) as sources of technological knowledge. These results validate again the importance of employment qualification and skills but also suggest that the technological adjustment process in TCL sectors is substantially driven by supplier demanding mechanisms.

So, in answering **Q2**, and also considering the different effect sizes produced by each one of the significant predictors (given by the individual parameter estimates, correspondent Wald statistics and odds ratios – table 4.5), it may be concluded that the adoption of new technologies is a process:

- developed internally, depending largely on the skills of workforce;
- supplier dominated, in the sense that the ideas, suggestions and/or impositions of suppliers (even more if international) play an important role in the technological process;

- motivated by the international market, as the importance of international customers is also present for firms engaged in technological changes.

The results of this analysis should provide rich insights for decision makers at national and European levels. As observed, technological adjustments in labour-intensive firms from Southern Europe, are fragile processes depending on several factors that may ease indirectly labour policy effectiveness.

Chapter 5 - The impacts on employment levels and skills resultant from technology-related strategies

5.1 Introduction

The previous chapter described the process of adoption of new technologies, in what concerns the task environment related factors. This chapter intends to examine how do the adoption of new technologies affects the structure of the workforce at the firm-level in TCL sectors in Southern Europe.

The previous observation of several empirical exercises suggests that technology is, on average, biased towards skilled labour. Also, the evidence on the effects of technology on total employment mainly indicates that a positive association exist (Chennells and Van Reennen, 2002).

In order to empirically test these associations in clothes, textile and leather sectors, the questionnaire application to the previous sample of 167 small-and-medium sized firms is used.

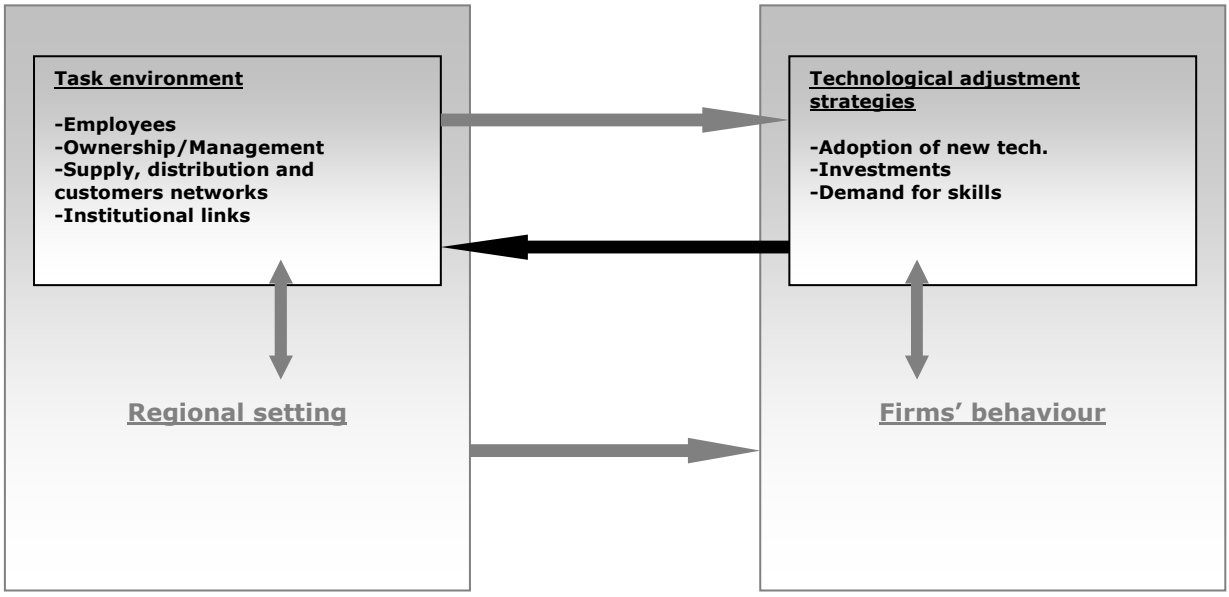
Using statistical procedures, the relevance of several predictor variables to the variation of firms' employment and needed skills is evaluated. Those predictors are related to firms' technological strategies, and include information on the adoption (or not) of new technologies; the type of technologies adopted (if adopted); the type of investments made and the variation in firms' sales.

5.2 Conceptual framework and research hypotheses

After analysing the factors that better explain different behaviours towards technological change, the question addressed in this chapter is **Q3**: How do those technological adjustments impact on local employment structures, namely regarding employment levels **(Q3.1)** and skills **(Q3.2)**?

The previously established conceptual framework is once again used as reference (the black arrow in figure 5.1 indicates the flow of influences under investigation).

Figure 5.1
Methodological Framework – chapter 5



Source: Author's elaboration

To address this question two major forces are being considered: the consequences on the variation of firms' employment and the consequences on the variation of firms' need for adequately skilled employees.

The literature revision suggests that there is consistently positive association between proxies for technical change and employment, as in the empirical surveys developed by Chennells and Van Reenen (2002); Van Reenen (1997); Enfort, Gollac and Kramarz (1999) or Blanchflower and Burgess (1998) and that the type of technological advances (product, process or organisational innovations) matters in this process, as shown in Smonly (1998), Greenan and Guellec (2000) or Osterman (2000).

The empirical evidence on the impacts on the workforce's skills is even more conclusive. Independently of the measure of technology used, there is considerable empirical evidence supporting the idea that technological related strategies favours the increase in the demand for more skilled labour, such as in Berman *et al.* (1994); Hansson (2000); Doms, Dunne and Troske (1997); Autor, Katz and Krueger (1998); Machin and Van Reenen (1998); Aguirregabiria and Alonso-Borrega (2001) or Caroli and Van Reenen (2001).

In agreement with this theoretical and empirical framing, and in order to answer **Q3**, the following research hypotheses are considered:

> *H1: The adoption of new technologies affects the employment at the firm-level in TCL sectors.*
>
> *H2: The type of technologies adopted affects the employment at the firm-level in TCL sectors.*
>
> *H3: The adoption of new technologies affects the demand for skilled labour at the firm-level in TCL sectors.*
>
> *H4: The type of technologies adopted affects the demand for skilled labour at the firm-level in TCL sectors.*

These hypotheses are tested in the following section, using both dependent variables (employment variation and variation on the demand for skilled labour).

5.3 Method

5.3.1 Sampling

The sampling procedures were already presented in section 4.3.1 and are explained in detail in appendices 1 (questionnaire) and 2 (design and sampling procedures).

5.3.2 Statistical data and methodology

5.3.2.1 The impact of technology-related strategies on firms' employment

In order to empirically test the impact of technology-related strategies on firms' employment (**Q3.1**), the following predictor variables (listed in table 5.1) are considered: variation in sales; investments; variation in the need for adequately skilled employees; adoption of new technologies and their type.

The dependent variable **△EMPL** stands for the variation in firms' employment and distinguishes among three levels: employment has decreased, remained about the same or increased, over the past three years.

Careful was taken when considering the proxies for technological adjustment strategies.

Table 5.1
Description of database variables: dependent △EMPL

Question	Variable	Description	Codification
		Predictor variables	
Q21	**△SAL**	**Variation in sales**	1 = decreased; 2 = remained about the same; 3 = increased (reference category)
	INV	**Investments**	
Q26a)	INVa)	a) New plant and equipment	1=yes; 0=no
Q26b)	INVb)	b) Information technology	1=yes; 0=no
Q26c)	INVc)	c) Purchase of patents and licensing	1=yes; 0=no
Q26d)	INVd)	d) Development of existing products	1=yes; 0=no
Q26e)	INVe)	e) Development of new products	1=yes; 0=no
Q39	**△NSKILL**	**Variation in the need for adequately skilled employees**	1 = decreased; 2 = remained about the same; 3 = increased (reference category)
Q35rec	**TECH**	**Adoption of new technologies**	1=yes; 0=no
	ATECH	**Type of Adopted Technologies**	
Q35a)	ATECHa)	a) Inventory control (e.g. PCs, software etc.)	1=yes; 0=no
Q35b)	ATECHb)	b) Production process technology (e.g. CAM)	1=yes; 0=no
Q35c)	ATECHc)	c) Product design technology (e.g. CAD)	1=yes; 0=no
Q35d)	ATECHd)	d) Marketing technology (e.g. internet, web sites, etc.)	1=yes; 0=no
Q35e)	ATECHe)	e) E-mail / Web site/ Internet	1=yes; 0=no
Q35f)	ATECHf)	g) Business to business electronic networks	1=yes; 0=no
		Dependent variable	
Q40	**△EMPL**	**Variation in firms' employment**	1 = decreased; 2 = remained about the same; 3 = increased (reference category)

Source: Author's elaboration

In fact, when analysing the impacts of technical change on employment a wide diversity of variables can be found:

- technical changes in general: Blanchflower and Burgess (1998), Van Reenen (1991);
- product or process innovations: Greenen and Guellec (1997), Smonly (1998);

- organisational innovations: Osterman (2000), Black *et al.* (2004);
- computer use: Enfort *et al.* (1999) ;
- R&D intensity: Brouwer *et al.* (1993), Klette and Førre (1998).

This diversity clearly indicates the complexity around the assessment of technological strategies in firms. Dealing with small and medium sized firms from textiles, clothes and leather sectors, where innovative activities are embodied in new varieties of capital equipment and intermediate inputs (as discussed in chapter four), the variables selected as indicators of technological strategies intend to reflect this reality.

Firstly, it is expected that the variation in firms' employment depend on the adoption or not of new technologies as well as on the type of technologies adopted.

Variable **ATECH** distinguishes among six different types of new technologies: inventory control (e.g. PCs, software etc.); production process technology (e.g. CAM); product design technology (e.g. CAD); marketing technology (e.g. internet, web sites etc); e-mail/ web site/ internet; business to business electronic networks. Six binary variables are considered.

Variable **TECH** is similar to the previous but has a yes/no possibility standing directly for the adoption or not of new technologies by the sample firms (see chapter four for a detailed description of this variable).

Although the established research hypothesis only point out this two variables, and because it is recognised that in such low-tech sectors technology-related strategies are very often difficult to assess by direct inquiring and

observation (as there are not R&D departments, R&D personnel, patents registration or other type of direct measures of innovative activity), additional variables are included in the proposed regression.

Variable **INV**, for instance, is used to identify the different investments made by firms, admitting the possibility that technological progresses can be sometimes easier to identify (even for respondents) through the direct observation of investments made. This variable differentiates among the following investments: new plant and equipment; information technology; purchase of patents and licensing; development of existing products; development of new products.

Variable △**NSKILL** stands for the variation in firms' need for adequately skilled employees and it is included as it comprises complementary valid information on firms' technological activities. Three levels are considered: the need for adequately skilled employees has decreased, remained about the same or increased, over the past three years.

Finally, variable △**SAL** stands for the variation in firms' sales and also distinguishes among three levels: sales has decreased, remained about the same or increased, over the past three years. This variable allows identifying possible impacts on employment variation driven by market expansion/recession.

5.3.2.2 The impact of technology-related strategies on firms' demand for skills

It is also believed that technology-related strategies impact on firms' demand for skills (**Q3.2**). The empirical evidence in this case shows again a diversity of possible indicators used as proxies for technological changes:

- technical changes: Doms *et al.* (1997) ;
- computer use : Autor *et al.* (1998), Caroli and Van Reenen (2001);
- R&D intensity/expenditure: Berman *et al.* (1994), Machin and Van Reenen (1998), Hansson (2000), Aguirregabiria and Alonso-Borrega (2001).

Accordingly to these arguments, and in order to empirically analyse this association, the following predictor variables (listed in table 5.2) are considered: adoption of new technologies; type of technologies adopted; variation in firms' employment and investments.

Although all the included variables were already described, further comments are proper in this case.

As pointed out in the research hypothesis' description, it is expected that both the adoption of new technologies (**TECH**) as well as the type of technologies adopted (**ATECH**) acts on the demand for skilled labour. Following the same argument, also the investments made by firms were included in the analysis (**INV**). The variation on employment (**△EMPL**) was now included as a predictor in order to better understand the variation in the needed skills. Is that variation in

the line with an increase of personnel or represents a replacement of *less-skilled* for *more-skilled* employees?

Table 5.2
Description of database variables: dependent △NSKILL

Question	Variable	Description	Codification
		Predictor variables	
Q35rec	**TECH**	**Adoption of new technologies**	1=yes; 0=no
	ATECH	**Type of Adopted Technologies**	
Q35a)	ATECHa)	a) Inventory control (e.g. PCs, software etc.)	1=yes; 0=no
Q35b)	ATECHb)	b) Production process technology (e.g. CAM)	1=yes; 0=no
Q35c)	ATECHc)	c) Product design technology (e.g. CAD)	1=yes; 0=no
Q35d)	ATECHd)	d) Marketing technology (e.g. internet, web sites, etc.)	1=yes; 0=no
Q35e)	ATECHe)	e) E-mail/ Web site/ Internet	1=yes; 0=no
Q35f)	ATECHf)	f) Business to business electronic networks	1=yes; 0=no
Q39	**△EMPL**	**Variation in firms' employment**	1 = decreased; 2 = remained about the same; 3 = increased (reference category)
	INV	**Investments**	
Q26a)	INVa)	a) New plant and equipment	1=yes; 0=no
Q26b)	INVb)	b) Information technology	1=yes; 0=no
Q26c)	INVc)	c) Purchase of patents and licensing	1=yes; 0=no
Q26d)	INVd)	d) Development of existing products	1=yes; 0=no
Q26e)	INVe)	e) Development of new products	1=yes; 0=no
		Dependent variable	
Q40	**△NSKILL**	**Variation in the need for adequately skilled employees**	1 = decreased; 2 = remained about the same; 3 = increased (reference category)

Source: Author's elaboration

5.3.2.3 The models

Given the ordinal nature of the dependents, the ordinal regression model was selected to build the following equations:

$$\ln(\theta_j) = \alpha_j - (\beta \Delta SAL + \gamma_r INV_r + \delta \Delta NSKILL + \varepsilon TECH + \zeta_r ATECH_r) \quad (5.1)$$

$$\ln(\theta_j) = \alpha_j - (\beta TECH + \gamma_r ATECH_r + \delta \Delta EMPL + \varepsilon_r INV_r) \quad (5.2)$$

With $\theta_j = \text{prob}(\text{score} \leq j)/(1 - \text{prob}(\text{score} \leq j))$, where *j* goes from 1 to the number of categories minus 1 and *r* for the option of the corresponding question, when variables are subdivided in different yes/no options, each one corresponding to a binary variable itself (according to tables 5.1 and 5.2).

This procedure allows evaluating the importance of various predictor variables in cases where the dependent variable is ordinal. In ordinal logistic regression, the event of interest is observing a particular *score or less* (cumulative probabilities). That is why there is a minus sign before the coefficients, so that larger coefficients indicate an association with larger scores, which in this case means smaller cumulative probabilities for lower scores.

For example, for the variation in employment, the following odds are modelled:

$\theta_1 = \text{prob}(\text{score} = 1)/\text{prob}(\text{score} > 1)$, $\theta_2 = \text{prob}(\text{score} = 1 \text{or} 2)/\text{prob}(\text{score} > 2)$, where a score equal to 1, 2 or 3 means that the employment has decreased, remained about the same or increased over the past three years.

5.4 Results

Before running the ordinal regressions, a characterisation of the sample is provided in table 5.3.

Table 5.3
Characteristics of the sample

Variable	Distribution of answers
Variation in sales	46.1% decreased; 14.5% remained the same; 39.4% increased
Investments	
a) New plant and equipment	61.1% yes; 38.9% no
b) Information technology	51.5% yes; 48.5% no
c) Purchase of patents and licensing	12.0% yes; 88.0% no
d) Development of existing products	55.1% yes; 44.9% no
e) Development of new products	46.1% yes; 53.9% no
Variation in the need for adequately skilled employees	12.7% decreased; 43.4% remained the same; 44.0% increased
Adoption of new technologies	61.7% yes; 38.3% no
Type of Adopted Technologies	
a) Inventory control (e.g. PCs, software etc.)	58.4% yes; 41.6% no
b) Production process technology (e.g. CAM)	33.5% yes; 66.5% no
c) Product design technology (e.g. CAD)	33.5% yes; 66.5% no
d) Marketing technology (e.g. internet, web sites, etc.)	39.8% yes; 60.2% no
e) E-mail / Web site/ Internet	59.3% yes; 40.7% no
f) Business to business electronic networks	9.0% yes; 91.0% no
Variation in firms' employment	28.3% decreased; 36.7% remained the same; 34.9% increased

Source: Author's elaboration

We are dealing with a group of small firms particularly vulnerable to the low-wage competition arriving from Asian competitors. That vulnerability is visible in the considerable proportion of firms registering a sales decrease (46.1%). As a way of reacting to the adverse market conditions, a major proportion of firms confirmed the adoption of new technologies (61.7%), being those mainly associated with internet tools and inventory control, that is, mostly organisational-related. The efforts of investment made by these firms also reveal that preoccupation, being mostly in new plant and equipment (61.1%) and in the development of new products (55.1%). Variations in the employment levels of these firms are quite divided among the sample, while the need for skilled

employees hardly ever decreased. The ordinal regressions given by equations 5.1 and 5.2 allow to explain these variations.

For an adequate use of ordinal regression, some attention must be taken about the model assumptions.

A first assumption is that the model does not support multiple dependents. Ordinal regression is used with one ordinal dependent (response) variable, where the independents may be categorical or continuous.

Also, and as in other chi-square tests, there should be an adequate cell count. A rule of thumb is that 80% of cells should have a count of 5 or more, and no cells should have a zero count. This situation is confirmed in both cases.

In ordinal regression there will be multiple regression equations, one for each level of the ordinal dependent except the highest. The regression lines are assumed to be parallel for each level of the dependent, indicating that the independents have the same relationship to the *link function*[24]. This means that ordinal regression requires assuming that the effect of the independents is the same for each level of the dependent. If an independent is the variation of sales, for example, then the effect on the dependent for a change in this variable should be the same whether the difference is between score 1 to score 2, or from score 2 to score 3. Violation of this assumption can render the use of ordinal regression inappropriate since estimates may be seriously biased. The 'test of parallel lines assumption' was performed in order to test this critical assumption.

[24] The link function specifies what transformation is applied to the dependent variable (that is, to the cumulative probabilities of the ordinal categories). *Complementary log-log* was used in the present regression as it is recommended when higher categories of the response variable are more probable than lower categories.

The null hypothesis that the parameters are the same across response categories was not rejected when △EMPL is the dependent variable (p=0.553), the same not happening when △NSKILL is the response variable (p=0.02). See outputs in annex 5.1.

This means that the assumption is violated for the second proposed model (equation 5.2) thus the ordinal regression for this response variable should be abandoned[25]. Alternatively, and in order to overcome this constrain, the χ^2 independence test and the *Cramer's V* correlation coefficient will be used to observe possible correlations among the mentioned variables, so conclusions can be found taking into account the previously established research hypothesis.

Following these procedures, the ordinal regression results are presented for the model in equation 5.1 (see detailed outputs in annex 5.1). These results include statistics for: the goodness of fit of the model; the estimated parameters and the predictive capacity of the model.

The goodness-of-fit of the model was assessed both performing the *likelihood ratio test* – the null hypothesis that all predictors' coefficients are jointly equal to zero was rejected (p=0.000) as well as the *chi-square goodness of fit test* – the null hypothesis of a well-fitting model was not rejected (p= 0.099 for the Pearson chi-square and p=0.621 for the deviance chi-square).

Table 5.4 list the parameter estimates, the Wald statistic, its significance as well as the results for the Nagelkerke R-square.

[25] The exclusion of some of the response variables revealed to be inefficient to solve this constrain. The alternative use of a Multinomial Regression was also unproductive.

Table 5.4
Results of the estimation of an Ordinal Regression Model: dependent △EMPL

Predictors	Estimate	S.E.	Wald $\chi 2$	p-value
INVa=0 - New plant and equipment	**-0,923**	0,259	12,687	**0,000**
INVb=0 - Information technology	-0,220	0,279	0,625	0,429
INVc=0 - Purchase of patents and licensing	0,188	0,348	0,294	0,588
INVd=0 - Development of existing products	-0,177	0,265	0,444	0,505
INVe=0 - Development of new products	**-0,623**	0,261	5,706	**0,017**
ATECHa=0 - Inventory control	0,292	0,305	0,922	0,337
ATECHb=0 - Production process technology	0,379	0,289	1,712	0,191
ATECHc=0 - Product design technology	0,241	0,284	0,722	0,395
ATECHd=0 - Marketing technology	0,265	0,305	0,755	0,385
ATECHe=0 - E-mail/Web site/ internet	**-0,579**	0,302	3,662	**0,056**
ATECHf=0 - Business to business electronic networks	0,263	0,452	0,340	0,560
TECH=0 - Adoption of new technologies	-0,663	0,404	2,689	0,101
△NSKILL=1 - need for adequately skills has decreased	**-1,786**	0,367	23,743	**0,000**
△NSKILL=2 - need for adequately skills has remained the same	**-0,773**	0,268	8,299	**0,004**
△SAL=1 - sales have decreased	-0,025	0,247	0,010	0,920
△SAL=2 - sale have remained the same	0,239	0,336	0,506	0,477

Source: Author's elaboration
Nagelkerke R^2=0.437

As in other types of categorical analysis, parameter estimates are presented for all but the reference level of any given factor. A positive parameter estimate means that, for that value of the independent variable, the likelihood of higher scores on the ordinal dependent variable increase.

The Wald statistic is used to test the significance of individual logistic regression coefficients for each independent variable (that is, to test the null hypothesis that a particular coefficient is zero).

From the list of predictors initially considered, the following are statistically significant: Investment in new plant and equipment (INVa),

Investment in the development of new products (INVe), Adoption of new technologies: email/web site/internet (ATECHe) and the Need for adequately skilled employees (△NSKILL).

For dichotomous variables, like INVa, where level 0 is estimated and level 1 is the reference category, a negative coefficient (-0.923) means that the category coded 0 is more likely to have lower scores on the ordinal dependent (here, variation in employment). This means that firms investing in new plant and equipment (INVa=1) are more likely to increase employment than the others.

The same happens with the investment in the development of new products and the use of internet tools, although in these cases the effects are slightly weaker (-0.623 and -0.579 respectively).

The stronger relation is found with the need for adequately skilled employees (-1.786). Firms decreasing the demand for skilled employees are less likely to be increasing employment in general.

The model achieves a reasonable predictive capacity. It correctly classifies 63% of the cases in the first category, 50.8% in the second and 62.9% of the cases in the third (see the *confusion matrix* in annex 5.1).

These results will be discussed in the next section.

Given the impossibility of running ordinal (or even multinomial) regression for equation 5.2, the results for the χ^2 statistics are given in table 5.5 in order to observe possible associations between the variable △NSKILL and the several predictors.

The chi-square statistic (χ^2) tests the hypothesis that the row and column variables in a cross tabulation are independent. A low significance value (p<0.01) indicates that there is a relationship between the two variables. Nevertheless, χ^2 only indicates if there is a significant relationship between variables or not, but when variables are not independent, it does not indicate the strength or direction of the relationship. The analysis of residuals and the Cramer's V statistic is used to give additional information.

Cramer's V is used as post-test to determine strengths of association after chi-square has determined significance. It is calculated by first calculating chi-square, then using the following calculation: $V = \sqrt{\chi^2 / nm}$, where n is the sample size and m is the smaller of (rows-1) or (columns-1). Cramer's V varies between 0 and 1. Values close to 0 indicates little association between variables, while values close to 1 indicate stronger association.

The analysis of adjusted residuals allows to identify which table cells are responsible for the non independence of data and in what direction. Because adjusted residuals are normal distributed, it is possible to detect the statistically significant values: $residual > |1.96|$ assuming $\alpha = 0.05$.

Table 5.5 summarises lists the χ^2 , the Cramer's V and their significances.

The correct application of this analysis requires a correct cell count. The rule of thumb that 80% of cells should have a count of 5 or more and no cells should have a zero count is used as reference (see outputs in annex 5.2).

Table 5.5
χ^2 Statistics results
(Testing H_0 : variables are independent from △NSKILL)

Variable	χ^2	V	Level of significance
INVa=0 - New plant and equipment	17,834	**0,328**	**0,000**
INVb=0 - Information technology	16,561	**0,316**	**0,000**
INVc=0 - Purchase of patents and licensing	0,195	0,034	0,907
INVd=0 - Development of existing products	3,707	0,149	0,157
INVe=0 - Development of new products	19,546	**0,343**	**0,000**
ATECHa=0 - Inventory control	15,731	**0,309**	**0,000**
ATECHb=0 - Production process technology	15,847	**0,309**	**0,000**
ATECHc=0 - Product design technology	7,849	0,217	0,020
ATECHd=0 - Marketing technology	25,566	**0,394**	**0,000**
ATECHe=0 - Email/Web site/Internet	22,554	**0,369**	**0,000**
ATECHf=0 - Business to business electronic networks	5,776	0,187	0,056
TECH - Adoption of new technologies	28,992	**0,418**	**0,000**
△EMPL – Variation in employment has decreased	63,761	**0,438**	**0,000**

Source: Author's elaboration

The chi-square results allow identifying variables associated with changes in the need for adequately skilled employees. The observation of Cramer's V allows determining the strengths of that association, while the adjusted residuals (in annex 5.2) give the direction.

From the list of variables considered, the following show the higher statistically significant associations with the variation in the demand for adequately needed skills:

- ✓ employment variation ($V_{EMPL} = 0.438$);
- ✓ adoption of new technologies ($V_{TECH} = 0.418$).
- ✓ type of new technologies adopted: marketing technologies ($V_{ATECHd} = 0.394$), e-mail, website, internet ($V_{ATECHe} = 0.369$), inventory

control ($V_{ATECHa} = 0.309$) and production process technologies ($V_{ATECHb} = 0.309$)

- ✓ investments in the development of new products ($V_{INVe} = 0.343$), in new plant and equipment ($V_{INVa} = 0.328$) and investments in information technology ($V_{INVb} = 0.316$);

The observation of adjusted residuals indicates that, all the aforementioned associations are positive, that is, higher scores in the variable NSKILL are associated with higher scores in the predictors. Further comments and analysis are given in the next discussion section.

5.5 Discussion

The present context of economic globalisation provides economic agents a new scenario, full of challenges and opportunities. In labour-intensive firms, such as textiles, clothes and leather sectors (TCL), regional employment structures and income perspectives are very dependent on firms' capacity to react to these new economic conditions.

The liberalisation process, and the consequent increasing exposure to competition, as well as the increasing delocalisation of labour intensive European TCL production to outside the EU, cause these sectors to face increasing imports and increasing unemployment.

As observed in the third chapter, the industry capacity to struggle in such competitive environment is found in its strengths of innovation. This is only

possible through technological adjustment strategies, in order to increase quality, creativity, design and fashion.

Thus, the main goal of this chapter is to analyse how these strategies impact on regional labour structures, both in terms of employment as well as in terms of the demand for more skilled employees: are these strategies contributing to unemployment and deskilling or, instead, are they part of possible solutions coming from less but more qualified jobs in more technological advanced sectors, as recommended by the European Commission (COM, 2003 and COM, 2004)?

As seen, the literature revision suggests that technical change is positively associated with employment growth. Also, there is empirical evidence that technological related strategies favour the increase in the demand for more skilled labour.

The impacts of several technological strategies on the variation of employment (△EMPL) were analysed using an ordinal regression, as following:

$$\ln(\theta_j) = \alpha_j - (\beta \Delta SAL + \gamma_r INV_r + \delta \Delta NSKILL + \varepsilon TECH + \zeta_r ATECH_r) \qquad (5.1),$$

where the variation in sales (△SAL), the investments made (INV), the demand for skilled employees (△NSKILL), the adoption or not of new technologies (TECH) and the type of technologies adopted (ATECH), were used as explanatory variables.

In testing the first research hypothesis (H1), that the adoption of new technologies affects the employment at the firm-level in TCL sectors, the null hypothesis ($H_{01} : \varepsilon = 0$) was not rejected (p=0.101), meaning that the variable TECH is not statistically significant. This first result confirms the difficulty in the

selection of indicators of technical change. The uncertainty associated with the question: '*Did the firm adopted new technologies in the past three years?'* may well explain this outcome. From the 167 inquired firms, 61.7% gave a positive answer to this question. That is why the model proposed included the investments in fact made by firms, in order to avoid ambiguity. Complementarily, the 5 null hypotheses $H_{01'}: \gamma_r = 0$ were also tested, with r=1...5. From the observed significance levels in table 5.4, it is possible to reject $H_{01'}: \gamma_1 = 0$ and $H_{01'}: \gamma_5 = 0$, confirming the importance of the independent variables INVa - investment in new plant and equipment (*p*=0.000) and INVe – investment in the development of new products (*p*=0.017).

The coefficient parameters associated with these variables indicate that firms investing in new plant and equipment, and firms investing in the development of new products are more likely to present increasing employment than the others.

Although not directly related to H1, complementary information is given by the observation of the independent variables △NSKILL and △SAL. The null hypothesis $H_0: \delta = 0$ was rejected (*p*=0.000 and *p*=0.004 for the first and second levels of the variable), with the coefficient parameters indicating that firms increasing the demand for more skilled employees are more likely to be increasing employment. Finally, the variation in firms' sales (△SAL) was not a significant predictor ($H_0: \beta = 0$ was not rejected) in explaining the variation in firms' employment (*p*=0.920 and *p*=0.477 for the first and second levels of the variable).

These results (that allow to answer **Q3.1)** corroborate the vast empirical evidence in other regions and support the recommendations made by the EU for TCL sectors to introduce high quality and creativity patterns, only achievable through investments in technology and innovation, in order to achieve competitiveness and employment growth.

The resulting constraints of the present financial crisis in access to credit may cause additional difficulties to firms. The role of public agents to financially support a carefully selected sort of investments, is a way of contradict the serious unemployment tendencies presently affecting European economies, in particularly in these sectors.

Following, and regarding the second research hypothesis (H2), that the type of technologies adopted also affects the employment levels, the results are less conclusive. From the 6 null hypotheses ($H_{02}: \zeta_r = 0$, with r=1...6) only $H_{02}: \zeta_5 = 0$, which is related to the independent variable ATECHe - use of internet tools, was barely not rejected (p=0.056).

These results are not strong enough to confirm that the effects of technological advances on employment depend on the type of innovations being produced: more product, process or organisational oriented.

Regarding the impacts of technological changes on the workforce skills, and given the impossibility of running ordinal regression (as in the previous analysis), the associations between the variable △NSKILL and the several proposed predictors were observed.

In testing H3, that the adoption of new technologies affects the demand for skilled labour in TCL sectors, the null hypothesis H_{03}, that the variables NSKILL and TECH are independent was rejected (p=0.000), meaning that there is a positive association between the demand for more skilled labour and the adoption of new technologies.

Complementarily, it was also possible to confirm positive associations between the need for more adequately skilled employees and investments in the development of new products (p=0.000), in new plant and equipment (p=0.000) and investments in information technology (p=0.000), rejecting the null hypothesis of independence between such variables.

Finally, in testing H4, the null hypotheses H_{04r}, that the variables NSKILL and ATECHr, with r=1...6, are independent were rejected for ATECHd (p=0.000), ATECHe (p=0.000), ATECHa (p=0.000) and ATECHb (p=0.000). The results indicate stronger positive associations between the demand for skills and more organisational oriented technological strategies, such as the use of internet tools (web site, internet, email) or the introduction of marketing and inventory control technologies. Weaker associations were found with more process oriented technological adoptions.

In answering **Q3.2** and also considering the strong association registered between the employment variation and the variation in the demand for skills one can conclude that, when firms in these sectors hire, they look for adequate qualifications, in particular regarding the ability to work with internet and marketing technology tools.

These results have implications for the long-term development of vulnerable Southern European regions in what concerns the demand for labour. They put an emphasis on the quality of the labour-force concluding that:

1) The employment growth in these sectors, or at least the prevention of job decline, is only possible through investments in innovation and creativity, and for that, adequately skilled employees are needed.

2) Technological advances are, in general, skilled biased, namely regarding the ability to work with internet and marketing technology tools.

It may be expected, therefore, that TCL industry in Southern Europe, will present higher productivity from a much reduced workforce, if greater proportion of its turnover could be invested in labour qualification promoting the added value of a high quality and high fashion production (as suggested by the *EC, 2006).*

These results also raise awareness for the fact that, regions whose economic tissues are highly dependent on labour-intensive sectors, face increasing unemployment and income problems as the result of the ongoing globalization process. Given the strong commonalities between them, as TCL industries respond to global competition, there seems to be a regional concentration in Southern Europe of the negative effects coming from the barriers opening to countries with very different labour costs structures and social protection preoccupations, such as China, India and other Asian countries.

Policy makers, to whom this study is also addressed, should bare in mind that lifetime employment and income opportunities are changing in these regions, and economic integration is the driving force behind it. The implementation of international free-trade rules may create in the studied areas serious employment problems unless integrated state intervention occurs in order to promote the adequate adjustment strategies for TCL sectors in these regions.

Chapter 6 - The regional effects on entrepreneurial behaviours

6.1 Introduction

This chapter aims to consolidate the previous argument that, not only environmental conditions influence the performance of economic agents, also the way economic agents behave and respond to their changing conditions, has an impact on local settings.

While **chapter 5** examined how technological–related strategies impact on local employment structures, namely regarding employment level and skills, **chapter 4** allowed to analyse how a set of variables from firms' task environment influence firms' technological-related strategies.

As discussed in chapter 4, different entrepreneurial aptitudes may explain the construction of different entrepreneurial strategies, namely regarding technological adjustments. Internal factors linked to human capital and networking capabilities were analysed in what concerns their influence on firms' capacity to technological learning. Those factors were considered to be part of firms' task environment (or firms' decisional space).

In order to conclude the established argument, this chapter focus on the role of regional settings on the performance of firms, considering both their direct and indirect environments.

Assuming that regional settings can provide an essential level of economic coordination, that goes beyond firms' direct decisions, and be a major source of

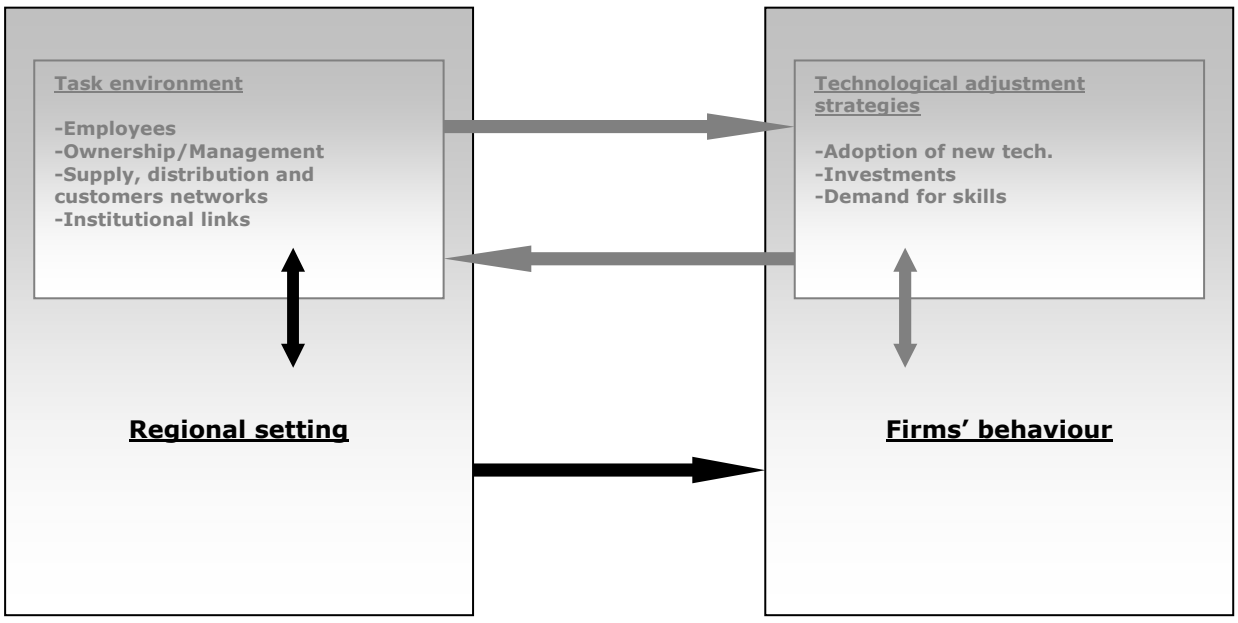
region-specific material and non-material assets, this chapter studies how firms' behaviours vary within different territorial settings.

Empirically, the regional-effects on entrepreneurial strategies are statistically tested using the previous sample of firms from clothes, textile and leather sectors, located in the selected Southern European regions.

6.2 Conceptual framework and research hypotheses

In order to accomplish the whole set of cause-effect relationships, described in the conceptual framework in figure 6.1, the present chapter addresses the question **Q4**: Which kind of socio-economic regional-effects may cause different entrepreneurial behaviours?

Figure 6.1
Methodological Framework – chapter 6



Source: Author's elaboration

The literature revision presented a list of different, but yet complementary, theoretical approaches regarding the role that regional settings play in economic agents' behaviours: collective learning, path dependence, networking, untraded interdependencies or associational behaviours, are helpful and illuminating concepts.

That role is even more evident when considering small firms, which interact intensely with the territory where are located. In this sense, it is argued that the perspectives and strategic choices of small firms are not independent from the inputs supplied by the territorial institutional contexts, being the attributes of such environments a crucial factor for the development of entrepreneurship.

In agreement, and using the list of variables already presented representing firms' networking capabilities, human capital' choices and technological-related strategies, the following research hypotheses are proposed so question **Q4** can be properly answered:

> *H1: The sources of employees vary within different territorial settings.*
>
> *H2: The skills' upgrading varies within different territorial settings.*
>
> *H3: The scope and geography of firms' networks vary within different territorial settings.*
>
> *H4: The nature of institutional links as sources of technological learning varies within different territorial settings.*
>
> *H5: The adoption of new technologies varies within different territorial settings.*

H6: The type of technologies adopted varies within different territorial settings.

H7: The type of investments made vary within different territorial settings.

H8: The demand for adequately skilled employees varies within different territorial settings.

H9: The employment growth varies within different territorial settings.

The following statistical exercise tests the regional-effects on these variables.

6.3 Method

6.3.1 Sampling

Both the survey instrument as well as the sampling exercise are presented in detail in appendices 1 (questionnaire) and 2 (design and sampling procedures).

6.3.2 Statistical data and methodology

In order to empirically test the regional-effects on firms' decisions, the results for the list of variables presented in table 6.1, are compared among the four Southern European areas already presented: North Portugal, Valencia, South Italy an Greek Macedonia.

Table 6.1
Description of database variables

Question	Variable	Description	Codification
		Predictor variables	
	EMPLS	**Employment Sources**	
Q8a)	EMPLSa)	Family members	1=yes; 0=no
Q8b)	EMPLSb)	Local community	1=yes; 0=no
Q8c)	EMPLSc)	People from outside the region	1=yes; 0=no
Q8d)	EMPLSd)	Parent firm	1=yes; 0=no
	NET	**Supply, distribution and customers networks**	
Q15a)	NETSa)	Suppliers: associated local firms	1=yes; 0=no
Q15b)	NETSb)	Suppliers: other local/regional firms	1=yes; 0=no
Q15c)	NETSc)	Suppliers: national firms	1=yes; 0=no
Q15d)	NETSd)	Suppliers: EU firms	1=yes; 0=no
Q15e)	NETSe)	Suppliers: international firms	1=yes; 0=no
Q17a)	NETDa)	Distributors: associated local firms	1=yes; 0=no
Q17b)	NETDb)	Distributors: other local/regional firms	1=yes; 0=no
Q17c)	NETDc)	Distributors: national firms	1=yes; 0=no
Q17d)	NETDd)	Distributors: EU firms	1=yes; 0=no
Q17e)	NETDe)	Distributors: international	1=yes; 0=no
Q19a)	NETCa)	Customers: local/regional market	1=yes; 0=no
Q19b)	NETCb)	Customers: national market	1=yes; 0=no
Q19c)	NETCc)	Customers: EU market	1=yes; 0=no
Q19d)	NETCd)	Customers: international market	1=yes; 0=no
	LINK	**Institutional links**	
Q37a)	LINKa)	Internal personnel	1=yes; 0=no
Q37b)	LINKb)	Customers	1=yes; 0=no
Q37c)	LINKc)	Suppliers	1=yes; 0=no
Q37d)	LINKd)	Industry associations	1=yes; 0=no
Q37e)	LINKe)	Universities and/or colleges	1=yes; 0=no
Q43rec	**SKILL**	**Skills' upgrading of employees**	1=yes; 0=no
	INV	**Investments**	
Q26a)	INVa)	a) New plant and equipment	1=yes; 0=no
Q26b)	INVb)	b) Information technology	1=yes; 0=no
Q26c)	INVc)	c) Purchase of patents and licensing	1=yes; 0=no
Q26d)	INVd)	d) Development of existing products	1=yes; 0=no
Q26e)	INVe)	e) Development of new products	1=yes; 0=no
Q39	**△NSKILL**	**Variation in the need for adequately skilled employees**	1=yes; 0=no
Q35rec	**TECH**	**Adoption of technological changes**	1=yes; 0=no
	ATECH	**Type of Adopted Technologies**	
Q35a)	ATECHa)	a) Inventory control (e.g. PCs, software etc.)	1=yes; 0=no
Q35b)	ATECHb)	b) Production process technology (e.g. CAM)	1=yes; 0=no
Q35c)	ATECHc)	c) Product design technology (e.g. CAD)	1=yes; 0=no
Q35d)	ATECHd)	d) Marketing technology (e.g. internet, web sites, etc.)	1=yes; 0=no
Q35e)	ATECHe)	e) E-mail / Web site/ Internet	1=yes; 0=no
Q35f)	ATECHf)	f) Business to business electronic networks	1=yes; 0=no
Q40	**△EMPL**	**Variation in firms' employment**	1 = decreased; 2 = remained about the same; 3 = increased (reference category)

Source: Author's elaboration

Although these four regions coincide with four different countries, the reference to regional-effects is still employed, as the broader European territory is being taken as unit. Country specificities, although not subject of closer attention, are not, nevertheless, being ignored.

Given the categorical nature of the database variables, association measures will be used in order to test if differences in entrepreneurial behaviours belonging to the different regions are statistically significant (or not).

6.4 Results

In order to detect regional effects on entrepreneurial behaviours, the database variables were cross tabulated with the regional area of the sampled firms. Cross tabulations are useful for summarizing categorical variables, such as the ones used in the present exercise (mostly nominal variables). As in the previous chapter, the chi-square statistic (χ^2) is used to test the hypothesis that the variables are independent. A low significance value (p<0.01) indicates that there is some relationship between the two variables. The analysis of residuals and the Cramer's V statistic is used to give additional information on the direction and strength of the relationship.

Table 6.2 summarises lists the χ^2, the Cramer's V and their significances. The rule of thumb that 80% of cells should have a count of 5 or more and no cells should have a zero count was used as reference (see outputs in annex 6.1).

The chi-square results allow identifying variables that are not independent from the location of firms. The observation of Cramer's V allows determining the

strengths of that association, while the adjusted residuals will be used to interpret the non independence of data.

Table 6.2
χ^2 Statistics results
(Testing H_0 : variables are independent from firm' location)

Variable	χ^2	V	Level of significance
Employment Sources - Family members	5.996	0.189	0.112
Employment Sources - Local community	5.098[a)]	0.175	0.165
Employment Sources - People from outside the region	40.498	**0.492**	**0.000**
Employment Sources - Parent firm	1.514 [a)]	0.095	0.679
Suppliers - associated local firms	9.189	0.235	0.027
Suppliers - other local/regional firms	23.062	**0.373**	**0.000**
Suppliers - national firms	15.451	**0.304**	**0.001**
Suppliers - EU firms	6.508	0.197	0.089
Suppliers - international firms	10.069	0.246	0.018
Distributors - associated local firms	14.090 [a)]	**0.303**	**0.003**
Distributors - other local/regional firms	4.344	0.168	0.227
Distributors - national firms	8.246	0.232	0.041
Distributors - EU firms	5.639	0.192	0.131
Distributors - international firms	7.128 [a)]	0.216	0.068
Customers - local/regional market	18.049	**0.329**	**0.000**
Customers - national market	10.278	0.248	0.016
Customers - EU market	3.875	0.152	0.275
Customers - international	9.069	0.233	0.028
Institutional links as sources of tech. learning - Internal personnel	10.475	0.250	0.015
Institutional links as sources of tech. learning - Customers	16.826	**0.317**	**0.001**
Institutional links as sources of tech. learning - Suppliers	7.661	0.214	0.054
Institutional links as sources of tech. learning - Industry associations	23.523	**0.375**	**0.000**
Institutional links as sources of tech. learning - Universities/Colleges	36.979 [a)]	**0.471**	**0.000**
Skills upgrading of employees	20.821	**0.354**	**0.000**
Investments - New plant and equipment	10.830	0.255	0.013
Investments - Information technology	7.408	0.211	0.060
Investments - Purchase of patents and licensing	7.749 [a)]	0.215	0.051
Investments - Development of existing products	13.498	**0.284**	**0.004**
Investments - Development of new products	20.740	**0.352**	**0.000**
Variation in the need for adequately skilled employees	39.392	**0.344**	**0.000**
Adoption of technological changes	15.597	**0.306**	**0.001**
Type of Adopted Technologies - Inventory control (e.g. PCs, software etc.)	16.756	**0.318**	**0.001**
Type of Adopted Technologies - Production process technology (e.g. CAM)	13.225	**0.281**	**0.004**
Type of Adopted Technologies - Product design technology (e.g. CAD)	7.460	0.211	0.059
Type of Adopted Technologies - Marketing technology (e.g. internet, websites)	20.458	**0.351**	**0.000**
Type of Adopted Technologies - E-mail / Web site/ Internet	24.724	**0.385**	**0.000**
Type of Adopted Technologies - Business to business electronic networks	7.174 [a)]	0.207	0.067
Variation in firms' employment	43.302	**0.361**	**0.000**

Source: Author's elaboration
a) Inadequate cell count: more 20% of cells have expected count less than 5
Levels of significance: **99%, *95%

6.5 Discussion

Having in mind the results presented in table 6.4 and regarding the proposed research hypothesis, the null hypothesis that those variables related to firms' networking capabilities, human capital' choices and technological-related strategies are independent from the region where firms are located, is rejected (p<0.01) at least for one of the variables' categories.

Besides the similarities among the areas and sectors considered, several regional effects were found among the entrepreneurial behaviours of the sampled firms. This can be attributed to local specificities and synergies driving competitive strategies of small firms. While some results are quite obvious, others are more important and interesting.

For example, the use of people from outside the region as a source of employment is regional specific, registering the higher level of association with the location of firms (V=0.492). By observing the adjusted residuals' values (table 3 from annex 6.1) it is possible to identify the source of this non independence: there is a positive significant difference for Valencia and a negative one for the Portuguese North region. In the sample, 70.4% of the Spanish firms employed people from outside the region, while only 9.1% of the Portuguese firms did it. Given that this difference can not be attributed to lower geographic distances among Spanish regions, this behaviour can be explained by regionally specific characteristics, such as the higher labour specialisation in the Portuguese region.

The second highest association comes from the development of institutional links with Universities/Colleges as sources of technological

learning[26](V=0.471). Also the links with industry associations are regional-specific, although in this case the association is weaker (V=0.375). This is also an interesting and important result, as it indicates firms' aptitudes to learn on the basis of synergies and interactions with local agents. It also indicates the capacity of such agents to interact with firms and respond to their needs. This learning process can be collective, using Capello's words (1999a, 1999b) if it is *cumulative* (persisting over time) and *interactive* (transferred among agents). In this case, regional differences are due to the positive results of Spanish firms, with high levels of interaction among the mentioned agents, and to the negative results of the Portuguese ones (tables 29 and 30 from annex 6.1).

Another regional dependent indicator (with V= 0.354) related to, not the capacity to learn, but to the awareness to engage in learning activities, is the skills' upgrading of employees. Again the same regional differences were found in this indicator regarding the Spanish firms - all the inquired firms responded positively to this question, and the Portuguese firms - only 60% of the samples firms upgraded its workforce skills, which represent a lower proportion when compared with the other regions (these results are available in table 31 from annex 6.1).

The use of local/regional firms as suppliers also varies among regions (V=0.373). This variable can be used as an indicator of the local network density of TCL industry. The presence of a dense production system, ranging from the upstream to the downstream production activities, is an important channel trough

[26] This variable is signed as having as inadequate cell count, considering the rule of thumb of 20% of cells with expected count less than 5. Given that this rule is being barely violated (25%) and considering the importance of the variable for the conclusions, the results are being considered for the analysis.

which firms can access to other markets, assets and technologies, and overcome the limits of internal competences. As Morgan (1996) argues, the importance of interactive learning among business networks is the most effective and credible way for knowledge acquisition. In this sample, regional differences come from the lower results of the Greek firms and the higher results of the Portuguese ones, with a large proportion of firms using local/regional suppliers (81.5%). Regarding the use of national suppliers, significant differences (with V=0.304) are also found among the group, with 100% of the Italian firms using national suppliers (see tables 6 and 7 from annex 6.1).

The use of local/regional firms as customers also significantly varies in the group (V=0.329), due to the lower proportion of Greek firms (38%) using the local/regional markets as their sales destination (table 15 from annex 6.1). These firms were also the ones that mostly registered the use of national and European customers as sources of technological learning, against the links with local/regional agents.

Another group of variables non independent from location is the type of technologies adopted by firms. The adoption of internet tools (V= 0.385), new marketing technologies (V=0.351) and inventory control tools (V=0.318) are all regional dependent. In this case, better results are found for the Spanish firms, while worse results are mostly found for the Greek firms (see adjusted residuals in tables 19, 22 and 23 from annex 6.1). The same result occurs for the adoption of new technologies, regardless the type (V=0.306), and for the investments made in the development of new products (V=0.352). The need for adequately skilled

employees is varying accordingly (V=0.344), with higher results being registered for the Spanish regions (tables 25, 36 and 37 from annex 6.1).

Finally, the variation in firms' employment also significantly varied among the group (V=0.361). While 48% of the Greek firms decreased their level of employment, 74% of the Spanish firms increased it (table 38 from annex 6.1).

These results should provide basic insights for future studies, where a closer analysis of these territories might allow a better understanding of the functioning of the local governance structures, whether formal or informal.

In answering **Q4**, the differences found can be summarised in the following regional profiles:

- TCL firms located in Valencia, Spain, registered higher aptitude to engage in learning activities, with good results at the technological adjustment capacity;
- TCL firms located in North Portugal, belong to a more closed, vertically concentrated and specialised industrial system;
- TCL firms located in Greek Macedonia revealed higher fragilities in terms of employment and investments in new products, but also reveal higher opening to external relationships;
- TCL firms located in South Italy registered positive results in terms of employment levels and technological advances, although not so good when compared with the Spanish region. The institutional links developed as sources of technological knowledge were also weaker in comparison with Valencia. The

industrial system is not as closed as the Portuguese one, being the national level preferred against the local/regional one.

It is also interesting to understand the behaviours that are not regional dependent. For example, the use of family members or local community' members as sources of employment is very similar among the set. Also, and given the common geographical position of the group, the use of European suppliers, distributors or customers does not vary significantly. The tendency to use suppliers as sources of technological knowledge is also a common feature of this group, given the supplier-dominated characteristics of TCL industries (as explained in chapter four).

Nevertheless, besides the strong commonalities among these four regional settings, in what concerns textiles, clothes and leather industries, there are still local/regional specificities that impact in the way firms respond to the new challenges coming from changing market conditions.

These results emphasize the role of national and European institutions in defining specific policy approaches to sectors dealing with increasing economic challenges, but mainly to regions sharing strong commonalities. As already mentioned, in contrast with the more price-competitive plants in the north, there is a more customised and fashion-oriented industry, less vertically concentrated and less oriented to sourcing in low-cost countries, in Southern Europe.

Chapter 7 - Conclusions

7.1 Final remarks on the questions addressed

The present research uses the theoretical arguments related with the interdependency relationship between the economic agents' behaviours and their external environment to better understand the way how the technological adjustment processes are developed in firms as well as how those processes influence local employment and income structures.

Within a global economy, and rejecting the 'geography is death' thesis, the localised capabilities (as labelled by Maskell and Malmberg, 1999) developed in the several forms of territorial agglomerations, are determinant assets for the promotion of firm and regional competitiveness. Different territories are characterised by different local resources endowments, institutional frameworks and social/cultural structures, promoting different levels of interaction between agents.

Also, the way economic agents take advantage of such local dynamics in order to learn and better react to the changing market conditions, is not innocuous for the territories themselves. Different absorptive capacities (as considered by Cohen and Levinthal, 1990) lead to different entrepreneurial strategies that produce important long term impacts on local settings. Decisions regarding the type and level of investments, particularly the technological ones, and the corresponding effects on labour demand are appropriate examples.

The thematic is even more important when dealing with less favoured regions, where income and employment perspectives are very much dependent from the entrepreneurial initiatives carried out by economic agents.

In the present research close attention was given to four Southern European regions, characterised by their specialisation on labour-intensive industries.

On the grounds of this research analysis it is argued that regional vulnerability is related to regional specialisation and peripherality. Small labour-intensive firms of peripheral regions have limited resources to access information and assess market conditions. The economic exposure of these industries to low-cost competition as well as their tendency to spatial agglomeration strengthens the interest in such analysis.

The regional/sectoral diagnostic made in chapter 3 confirmed that regional agglomerations of labour-intensive activities are likely to face prolonged recession as demand gradually declines and is captured by other competing regions. The new industrial model increases competition, as a result of the liberalisation process, and imposes outsourcing, in search of lower production costs. A resulting rising job loss is inevitable as the direct result of firm's disinvestment, bankruptcy and delocalisation, in regions whose economic tissues are not able to provide employment alternatives. But is such pathway unavoidable?

This research indicates that new dynamic competitive advantages emanate not from low-cost and low-wage production, but from the technological capacity

of firms to produce high-value-added goods (in terms of quality, creativity, design and fashion) even for textiles, clothes and leather (TCL) industries. Their economic performance depends on their technological capabilities, and those depend on local learning processes. Regional agglomerations of capital, labour and improved facilities revealed to be an important driver for these processes, allowing TCL firms to increasingly be involved in both vertical and horizontal networking systems.

In the end, the adjustment capacity of local agents to new production technologies is what determines whether regions or firms are producers of high value-added sophisticated goods and services or merely low-cost subcontractors.

The learning and technological capacity of TCL firms is largely influenced by the relationship patterns that producers develop with their suppliers and customers. Those are essential to information exchange in sectors where the process of innovation is primarily a process of diffusion of best-practice (Dosi, 1988). Firms committed with export-production suffer serious decline when their products are not of a specialised nature. Low-cost production indicates the use of unskilled labour and firm inadequacy to absorb and diffuse knowledge (Tsampra and Palaskas, 2002).

In the observed sample, the results confirmed that technological adjustment processes in TCL sectors from Southern regions are supplier-dominated, largely dependent on the qualifications of the workforce and motivated by the international market.

Besides the firm-specific technological competences, different technological trajectories may arise from different public elements of knowledge (Dosi, 1988). The role of regions in favouring the technological capabilities of firms is identified in the territorialised forms of untraded interdependencies and intangible synergies among agents (Storper, 1995) that form a collective social order that induces firms to collaborate and display associational behaviours (Cooke and Morgan, 1998).

Among the four regions observed, it was possible to identify several regional effects inducing the technological behaviours of the sampled firms. While firms from Valencia (Spain) registered higher aptitude to engage in learning activities, with correspondent results in the levels of technological capabilities, firms located in Macedonia (Greece) revealed fragilities that are compensated with an higher opening to external relationships, being the special strength of these regions their geographically and culturally location between Asia and Europe and its emphasis on traditional arts and craft textiles to a level that could even become an obstacle in a collaboration with more technologically developed countries (Perivoliotis, 2004).

Firms located in North (Portugal) belong to a more closed, vertically concentrated and specialised industrial system, while firms located in South Italy are less regionally concentrated and characterised by their creative power for new trends and styles, with a high quality image.

This research argues that different regional settings promote different levels of learning dynamics as much as those dynamics influence regional employment and income perspectives.

Technological investments allow raising quality and creativity patterns that are necessary for the industry survival given the present economic restraints. But those investments produce effects on the regional labour demand. In the sampled firms, the main effects of investment on the workforce are the demand for higher skilled employees but also the demand for more flexible temporary ones (descriptive statistics are available in annex 7.1).

From the empirical observation of the sample, it was also possible to detect that the investments in new plants and equipments as well as the investments in the development of new products are more related with employment increase than with employment decline. Such technological adjustments are preceded with the necessary upgrading of employment qualifications in management and marketing tools. These results corroborate the idea that the future of TCL sectors in Southern Europe requires higher quality standards, only possible trough technological advances and the correspondent employment qualification.

But not all firms have the capacity to carry out such investments. Difficulties in the access to credit and the uncertain of future benefits are factors that inhibited the adoption of new technologies in the observed group of firms. Technological and competitive adjustments are, therefore, made in a defensive way: firms respond to changes in sales by adapting production capacity to market demand, rather than reacting by upgrading their added value on the basis of their technological capabilities (annex 7.1).

The effects of the global economic stress that firms face in periods of economic crisis should also be pointed out. While technological advances are

encouraged by European policy-makers, the greater economic uncertainty during these period forces firm leaders to decide with precaution, both in terms of employment levels as well as regarding the type of innovation produced. Organisational rearrangements are less risky and may allow a cut in labour costs (Osterman, 2000 and Black *et al.*, 2004)

The tendency has been the employment decline in these industries with the increasing relocation of manufacturing jobs in low-cost areas. Only successful firms, the ones with higher technological capabilities, are able to develop the proper investments and create employment. In theses cases, people employed are more flexible and with higher language and technological skills, hence able to work in the several complementary areas of the textiles and fashion chain, such as design, marketing, management or sales.

The better understanding of the challenges and opportunities faced by small traditional TCL firms from peripheral regions, allows to remark the adequate role of public policymakers in this context.

7.2 Policy issues

In regional agglomerations vulnerable to technological change, skills shortages, competition from the developing world and unpredictable macroeconomic circumstances, local/regional institutions should be able to provide the support to the industry-specific type of technological capabilities firms need.

The modernization efforts in these industries are largely taking place in non-technological areas, involving a combination of incremental innovations (like technical textiles or multisectoral applications/products for protecting the environment) and the generalisation of CAD/CAM techniques to optimise issues of production and product development.

The awareness of public policy makers of the process of technological adjustment in these sectors is crucial in the course of outlining specific and more region/sector oriented policy approaches at national and European levels. As seen, we are dealing with a supplier dominated process, largely dependent on the skills of the workforce and encouraged by export-production. These issues need to be carefully analysed by policy makers as the effectiveness of political intervention depends on that awareness.

The type of investments more related to job growth were also identified together with the factors inhibiting technological advances. The present economical and financial international crisis may cause additional difficulties to firms as it worsens the difficulties in the access to credit and increases market uncertainty.

The analysis of the strategies implemented in successful companies across Europe enables to identify some success factors. The harder market conditions have brought a tremendous change in vision which increasingly constitutes a strong competitive advantage based on market oriented attitudes and less confrontational relationships in the value-chain.

Firms involved in brand and design strategies, for instance, draw their competitiveness from a strong market identity and are positioned in the high or medium-high price ranges. As delocalisation is urged by the need to increase margins, marketing and retailing are key aspects for these industries. But delocalisation pressures the development of networking strategies. Firms may follow partner strategies and position themselves as the industrial partner of their clients, selling components or finished products to be offered to the consumer, under their client's label. Firms may also develop industry-retail strategies, gradually integrating retailing activities as the delocalisation of production increases. Firms may as well work on a business to business basis with their customers, who have their own brands and stores. Such subcontracting strategies rely on flexibility, quick response and cost control so delocalisation is highly pressured in these cases due to the direct need of lower costs and local shortages in labour and capacity (EC, 2007).

But a large number of European small and medium size firms do not follow any of these dynamic and forward looking strategies. The reluctance to change together with the several factors inhibiting technological adjustment strategies prevent these companies to properly adapt to the new market conditions.

At the end, the role of public agents is identified in the support to initiatives allowing to enhance the overall competitiveness level of these industries through the maximisation of their added value. Delocalisation can be transformed in a positive strategic reality if firms are able to lower production costs and logistics in order to make the necessary investments in other areas.

The public financial support to these investments, tangible or intangible, should be carefully selected having in mind the specific characteristics of the technological processes in these industries: investments in research to enhance design capabilities, to build own brands and to improve management and marketing competences may be crucial in order to contradict the employment decline tendency.

The development of network relationships with equipment and material suppliers should also be strongly promoted. The identification of the forthcoming needs in terms of labour force qualifications to work with new equipment and/or materials, may allow to prepare in due time specific workforce training programs in the firms. These training programs should be, therefore, supported preferentially to other random initiatives.

For the other side, the consumer value of manufactured European production should be enhanced through ethical components or environmental and health issues, focusing consumers who are not primarily interested in the lowest possible price. This global ethical approach should be combined with the "made in" labelling notion, promoting regional artisan methods. Both require public financial support. Although not avoiding further delocalisation, these initiatives are easier implemented in geographic and cultural proximity between local agents, rather than through remote sourcing, thus promoting European manufacturers via the promotion of quality content exports within certificates of origin (EC, 2007).

Another important way of increasing added value is facilitating a better integration of fashion and design in the industrial value chains. All companies in these fields would gain competitiveness if design and creativity could be

enhanced and disseminated. But achieving this integration requires a special attention from educational systems. As it's expected that the required expertises of the labour force will change, these sectors should be therefore a priority for regional universities, whose *curricula* should be able to match the adequately needed labour skills. The existing fragmentation of skills between fashion and design, technical and managerial should be reduced so a young designer may become a successful entrepreneur. Financial support to such projects is also fundamental.

The desired restructuring in these industries, aiming at a more competitive distribution of work, involves major social implications in terms of job losses and requalification of workers. A large number of workers are becoming redundant in these industries. Because very often the workers' skills are not materialised by any academic degree, re-employability is rather low or inexistent. The issue of job development and losses should be addressed by public policymakers having in mind the geographical and sectoral differences among the European territory. Marketing, retailing or research are pointed as examples of activities that foster long term regional sustainability, competitiveness, profitability and capacity for employment in Southern European regions.

7.3 Orientations for further investigation

The results obtained in this research should provide basic insights for future studies, where a closer analysis of the selected territories might allow a better understanding of the functioning of the local governance structures,

assessing their capacity to promote the necessary synergies and interactions among local agents.

For example, differences were found between the Portuguese and Spanish firms regarding the levels of local learning dynamics. While the Spanish firms in the sample developed strong institutional links with Universities/Colleges and industry associations as sources of technological learning, a weaker result was registered by the Portuguese firms. The reason behind this higher/lower aptitude of firms to learn on the basis of close interaction with other agents is an important field for future observation. It is also important to understand the different propensity levels of these local stakeholders to interact with firms and respond to their needs. Different historical research potentials on the textile-fashion industry chain may explain different pathways in these two regions. This is also an interesting field for future research.

For the Portuguese region in particular, the identification of success networking strategies among the complete value chain of these sectors, comprises an important benchmarking exercise for the future of the industry.

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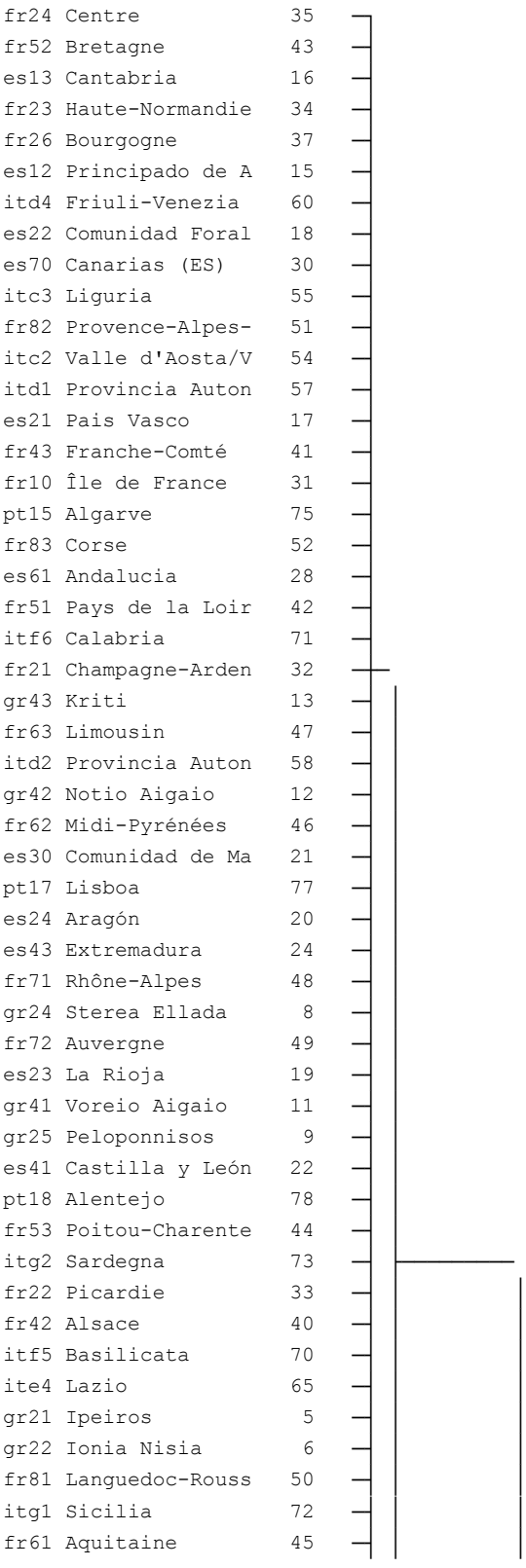
Annexes

Annex 3.1 – SPSS Outputs for Clusters Analysis

Figure 1
Hierarchical Clusters Analysis - Dendrogram using Average Linkage (Between Groups)



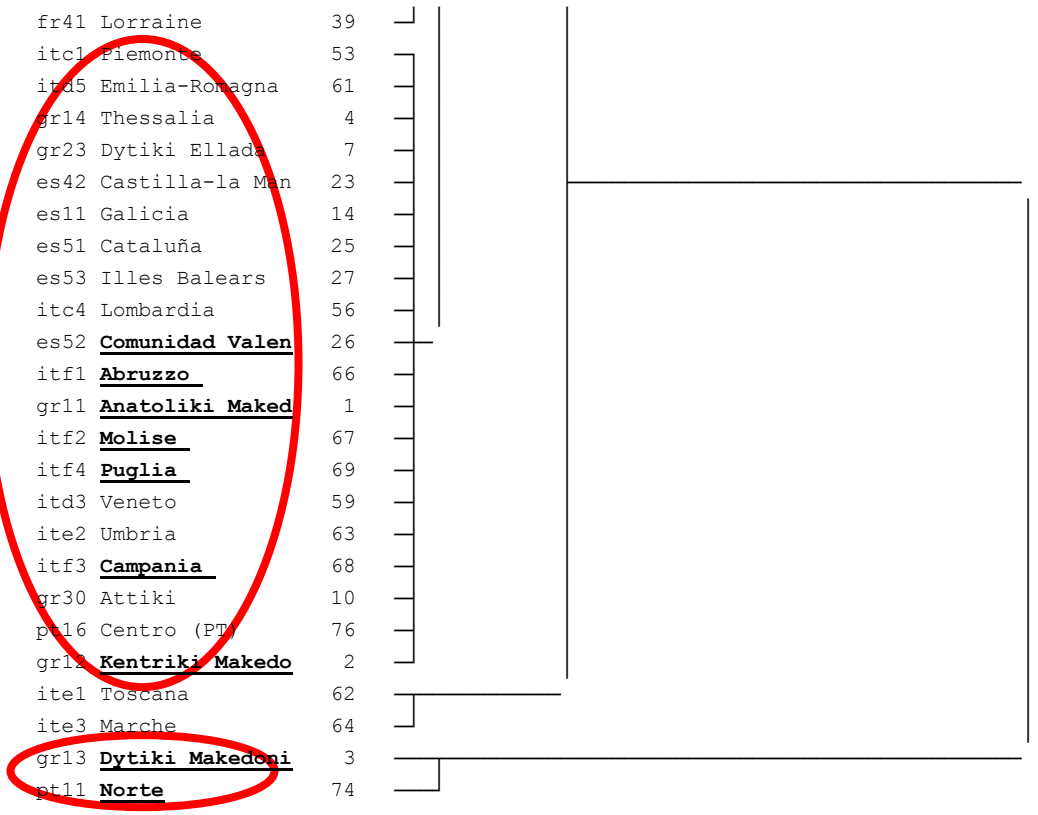


Table 1
Characterisation of Cluster 1

	N	Minimum	Maximum	Mean	Std. Deviation
NACE 17,18,19 - Share of local units in manufacturing total - 2005	20	,08	,27	,1486	,05242
NACE 17,18,19 - Share of Gross investment in tangible goods in manufacturing total - 2005	20	,01	,14	,0663	,03639
NACE 17,18,19 - Share of employment in manufacturing total - 2005	20	3,33	7,70	5,0700	1,32762
Share of primary employment in total employment - 2005	20	,01	,26	,0895	,08383
Share of secondary employment in total employment - 2005	20	,19	,39	,2957	,06170
Share of tertiary employment in total employment - 2005	20	,48	,76	,6148	,06812
Valid N (listwise)	20				

Table 2
Characterisation of Cluster 2

	N	Minimum	Maximum	Mean	Std. Deviation
NACE 17,18,19 - Share of local units in manufacturing total - 2005	51	,03	,17	,0605	,02551
NACE 17,18,19 - Share of Gross investment in tangible goods in manufacturing total - 2005	51	,00	,05	,0162	,01210
NACE 17,18,19 - Share of employment in manufacturing total - 2005	51	,00	2,40	1,3196	,62137
Share of primary employment in total employment - 2005	51	,00	,33	,0736	,06125
Share of secondary employment in total employment - 2005	51	,13	,40	,2519	,06170
Share of tertiary employment in total employment - 2005	51	,49	,84	,6735	,07339
Valid N (listwise)	51				

Table 3
Characterisation of Cluster 3

	N	Minimum	Maximum	Mean	Std. Deviation
NACE 17,18,19 - Share of local units in manufacturing total - 2005	2	,30	,36	,3273	,04228
NACE 17,18,19 - Share of Gross investment in tangible goods in manufacturing total - 2005	2	,11	,21	,1619	,07057
NACE 17,18,19 - Share of employment in manufacturing total - 2005	2	9,60	10,87	10,2334	,89569
Share of primary employment in total employment - 2005	2	,03	,04	,0367	,00262
Share of secondary employment in total employment - 2005	2	,31	,40	,3537	,06017
Share of tertiary employment in total employment - 2005	2	,57	,65	,6097	,05756
Valid N (listwise)	2				

Annex 4.1 – SPSS outputs for Logistic Regression (commented)

A. Analysis of linearity

The results of the inclusion of the square and cubic values in the model are given in the following table.

Table 1
Omnibus Tests of Model Coefficients - Block composed by quadratic and cubic effects

		Chi-square	df	Sig.
Step 1	Step	1,267	2	,531
	Block	1,267	2	,531
	Model	88,435	10	,000

B. Logistic regression outputs

The case processing table shows that 20 cases were classified as missing values, representing 12% of total sample.

Table 2
Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	147	88,0
	Missing Cases	20	12,0
	Total	167	100,0
Unselected Cases		0	,0
Total		167	100,0

a. If weight is in effect, see classification table for the total number of cases.

The categorical variables codings' table is SPSS's parameterization of the categorical independent variables: type of ownership and type of management. Note that parameter coefficients for the last category of such variables are 0's, indicating the last category is the omitted value for each set of dummy variables (in the first case, the omitted option is

A limited company and, in the second case, **External manager**). The parameter codings are the X values for the dummy variables. They are multiplied by the logit (effect) coefficients as part of obtaining the predicted values of the dependent, much as one would compute an OLS regression estimate.

Table 3
Categorical Variables Codings

		Frequency	Parameter coding		
			(1)	(2)	(3)
OWNERSHIP / MANAGMENT OF THE FIRM	OWNED BY ONE PERSON	13	1,000	,000	,000
	A PARTNERSHIP	72	,000	1,000	,000
	FAMILY OWNED	51	,000	,000	1,000
	A LIMITED COMPANY	11	,000	,000	,000
OWNED FIRM IS MANAGED BY	THE OWNER-MANAGER (PARTNER)	129	1,000	,000	
	THE FAMILY PERSONNEL (RELATED TO A PARTNER)	16	,000	1,000	
	EXTERNAL MANAGER	2	,000	,000	

Block 0: Beginning Block

SPSS prints the initial test for the model in which the coefficients for all the independent variables are 0. The finding of significance indicates this null model should be rejected.

Table 4
Iteration History[a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	200,775	,286
	2	200,775	,288
	3	200,775	,288

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 200,775

c. Estimation terminated at iteration number 3 because parameter estimates changed by less than ,001.

Table 5
Classification Table[a,b]

Observed			Predicted		
			Adoption of new technologies		Percentage Correct
			no	yes	
Step 0	Adoption of new technologies	no	0	63	,0
		yes	0	84	100,0
	Overall Percentage				57,1

a. Constant is included in the model.

b. The cut value is ,500

Table 6
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	,288	,167	2,979	1	,084	1,333

Block 1: Method = Forward Stepwise

The chi-square goodness-of-fit test tests the null hypothesis that the step is justified. Here the step is from the constant-only model to the all-independents model. When, as here, the step was to add a variable or variables, the inclusion is justified if the significance of the step is less than 0.05.

Table 7
Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	36,709	1	,000
	Block	36,709	1	,000
	Model	36,709	1	,000
Step 2	Step	13,426	1	,000
	Block	50,135	2	,000
	Model	50,135	2	,000
Step 3	Step	12,130	3	,007
	Block	62,265	5	,000
	Model	62,265	5	,000

Step 4	Step	12,116	1	,000
	Block	74,381	6	,000
	Model	74,381	6	,000
Step 5	Step	7,947	1	,005
	Block	82,329	7	,000
	Model	82,329	7	,000
Step 6	Step	4,839	1	,028
	Block	87,168	8	,000
	Model	87,168	8	,000

The Cox-Snell R^2 and Nagelkerke R^2 are attempts to provide a logistic analogy to R^2 in OLS regression. The Nagelkerke measure adapts the Cox-Snell measure so that it varies from 0 to 1, as does R^2 in OLS.

Table 8
Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	164,066[a]	,221	,297
2	150,640[b]	,289	,388
3	138,510[b]	,345	,464
4	126,394[b]	,397	,533
5	118,446[c]	,429	,576
6	113,607[c]	,447	,601

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

b. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

c. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

The Hosmer and Lemeshow Goodness-of-Fit Test divides subjects into deciles based on predicted probabilities, and then computes a chi-square from observed and expected frequencies. The p-value=0.574 here is computed from the chi-square distribution with 7 degrees of freedom and indicates that the logistic model adjusts well to the data.

Table 9
Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	,000	0	.
2	,296	2	,862
3	1,880	6	,930
4	19,322	7	,007
5	12,228	8	,141
6	5,707	7	,574

The classification table helps to assess the performance of the model by crosstabulating the observed response categories with the predicted response categories. From the 84 firms that adopted new technologies, 90.5% were correctly predicted (sensitivity), while from the 63 firms that didn't adopt new technologies, 77.8% were correctly predicted (specificity). The overall percent of correctly predicted cases (85%) is also a very good one.

Table 10
Classification Table[a]

			Predicted		
			Adoption of new technologies		Percentage Correct
	Observed		no	yes	
Step 1	Adoption of new technologies	no	33	30	52,4
		yes	7	77	91,7
	Overall Percentage				74,8
Step 2	Adoption of new technologies	no	33	30	52,4
		yes	7	77	91,7
	Overall Percentage				74,8
Step 3	Adoption of new technologies	no	48	15	76,2
		yes	18	66	78,6
	Overall Percentage				77,6
Step 4	Adoption of new technologies	no	44	19	69,8
		yes	7	77	91,7
	Overall Percentage				82,3
Step 5	Adoption of new technologies	no	50	13	79,4
		yes	15	69	82,1
	Overall Percentage				81,0
Step 6	Adoption of new technologies	no	49	14	77,8
		yes	8	76	90,5
	Overall Percentage				85,0

a. The cut value is ,500

Logit coefficients (logits), also called unstandardized *logistic regression coefficients* or *effect coefficients* or simply 'parameter estimates' in SPSS output, correspond to b coefficients in OLS regression. Both can be used to construct prediction equations and generate predicted values. The SPSS table below lists the b coefficients, the standard error of b, the Wald statistic and its significance, and the odds ratio (labelled Exp(b)).

For the dichotomous case, if the logit for a given independent variable is b_1, then a unit increase in the independent variable is associated with a b_1 change in the log odds of the dependent variable (the natural log of the probability that the dependent = 1 divided by the probability that the dependent = 0).

Odds ratio: an odds ratio refers to the odds that the dependent = 1 in binary logistic regression. The closer the odds ratio is to 1.0, the more the independent variable's categories are independent of the dependent variable, with 1.0 representing full statistical independence.

The Wald statistic is commonly used to test the significance of individual logistic regression coefficients for each independent variable (that is, to test the null hypothesis in logistic regression that a particular logit (effect) coefficient is zero).

Table 11
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	q43rec	2,493	,468	28,322	1	,000	12,100
	Constant	-1,551	,416	13,885	1	,000	,212
Step 2[b]	q15.e	1,823	,557	10,705	1	,001	6,193
	q43rec	2,675	,519	26,603	1	,000	14,509
	Constant	-2,089	,492	18,024	1	,000	,124
Step 3[c]	q10			10,916	3	,012	
	q10(1)	-1,150	1,152	,996	1	,318	,317
	q10(2)	,171	1,044	,027	1	,870	1,186
	q10(3)	-1,357	1,030	1,736	1	,188	,257
	q15.e	2,003	,618	10,512	1	,001	7,408
	q43rec	3,014	,560	29,019	1	,000	20,379
	Constant	-1,795	1,120	2,572	1	,109	,166
Step 4[d]	q10			14,844	3	,002	
	q10(1)	-1,686	1,246	1,829	1	,176	,185
	q10(2)	,137	1,107	,015	1	,901	1,147
	q10(3)	-1,935	1,110	3,040	1	,081	,144
	q15.e	2,058	,631	10,627	1	,001	7,833
	q37.c	1,626	,497	10,716	1	,001	5,085
	q43rec	2,921	,591	24,465	1	,000	18,563
	Constant	-2,214	1,204	3,379	1	,066	,109
Step 5[e]	q10			17,306	3	,001	
	q10(1)	-1,748	1,320	1,753	1	,185	,174
	q10(2)	,330	1,165	,080	1	,777	1,391
	q10(3)	-2,196	1,177	3,484	1	,062	,111
	q15.e	1,930	,679	8,068	1	,005	6,889
	q19.d	1,587	,593	7,162	1	,007	4,887
	q37.c	1,920	,552	12,092	1	,001	6,821
	q43rec	2,925	,604	23,424	1	,000	18,642
	Constant	-2,680	1,297	4,272	1	,039	,069
Step 6[f]	q10			16,902	3	,001	
	q10(1)	-1,338	1,352	,980	1	,322	,262
	q10(2)	,335	1,182	,080	1	,777	1,398
	q10(3)	-2,270	1,202	3,565	1	,059	,103
	q15.e	1,883	,693	7,393	1	,007	6,573
	q19.d	1,687	,610	7,646	1	,006	5,402
	q37.a	1,081	,499	4,692	1	,030	2,947
	q37.c	1,926	,573	11,303	1	,001	6,860
	q43rec	2,751	,616	19,923	1	,000	15,663
	Constant	-3,201	1,359	5,552	1	,018	,041

a. Variable(s) entered on step 1: q43rec.
b. Variable(s) entered on step 2: q15.e.
c. Variable(s) entered on step 3: q10.
d. Variable(s) entered on step 4: q37.c.
e. Variable(s) entered on step 5: q19.d.
f. Variable(s) entered on step 6: q37.a.

C. Testing Research Hypothesis

In order to test research hypothesis H1, H2, H3, H4, H5 and H6, the likelihood of the model with all the independent variables was compared with the likelihood of the model without the variables concerned in each research hypothesis.

Table 12
Testing H1: Omnibus Tests of Model Coefficients
Block composed by q8.a q8.b, q8.c q8.d

		Chi-square	df	Sig.
Step 1	Step	1,069	4	,899
	Block	1,069	4	,899
	Model	88,237	12	,000

Table 13
Testing H2: Omnibus Tests of Model Coefficients
Block composed by q43rec

		Chi-square	df	Sig.
Step 1	Step	26,577	1	,000
	Block	26,577	1	,000
	Model	87,168	8	,000

Table 14
Testing H3: Omnibus Tests of Model Coefficients
Block composed by q10

		Chi-square	df	Sig.
Step 1	Step	14,792	3	,002
	Block	14,792	3	,002
	Model	82,228	8	,000

Table 15
Testing H4: Omnibus Tests of Model Coefficients
Block composed by q11

		Chi-square	df	Sig.
Step 1	Step	1,501	2	,472
	Block	1,501	2	,472
	Model	114,335	30	,000

Table 16
Testing H5S: Omnibus Tests of Model Coefficients
Block composed by q15.a q15.b q15.c q15.d q15.e

		Chi-square	df	Sig.
Step 1	Step	14,008	5	,016
	Block	14,008	5	,016
	Model	118,525	12	,000

Table 17
Testing H5D: Omnibus Tests of Model Coefficients
Block composed by q17.a q17.b q17.c q17.d q17.e

		Chi-square	df	Sig.
Step 1	Step	4,698	5	,454
	Block	4,698	5	,454
	Model	127,856	16	,000

Table 18
Testing H5C: Omnibus Tests of Model Coefficients
Block composed by q19.a q19.b q19.c q19.d

		Chi-square	df	Sig.
Step 1	Step	8,971	4	,062
	Block	8,971	4	,062
	Model	131,627	16	,000

Table 19
Testing H6: Omnibus Tests of Model Coefficients
Block composed by q37.a q37.b q37.c q37.d q37.e

		Chi-square	df	Sig.
Step 1	Step	24,338	5	,000
	Block	24,338	5	,000
	Model	91,999	11	,000

Annex 5.1 – SPSS outputs for Ordinal Regression (commented)

Test of parallel lines assumption

This output prints a chi-squared score test of the parallel lines assumption, which is that the location parameters are equivalent across the levels of the dependent variable. The assumption is not violated if there is no significant difference between the model where the regression lines are constrained to be parallel for each level of the ordinal dependent (this is the -2LL for the 'Null Hypothesis') compared to the model where the regression lines are allowed to be estimated without a parallelism constraint (this is the -2LL for the 'General' model).

The assumption is met for the first model but it is violated for the second proposed model.

Table 1
Test of Parallel Lines: dependent variable △EMPL

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	263,272			
General	247,688	15,585	17	,553

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.
Link function: Complementary Log-log.

Table 2
Test of Parallel Lines: dependent variable △NSKILL

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	229,589			
General	193,867	35,722	15	,002

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.
Link function: Complementary Log-log.

Goodness of fit

Table below gives the *likelihood ratio test*, based on the difference between the researcher-specified model and the null (intercept-only) model. A well-fitting model is significant by this test.

Table 3
Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	342,660			
Final	263,272	79,387	17	,000

Link function: Complementary Log-log.

The chi-square goodness of fit uses chi-square methods to assess how much predicted cell frequencies differ from observed frequencies. Both Pearson chi-square and deviance chi-square coefficients are reported.

Table 4
Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	292,970	263	,099
Deviance	255,367	263	,621

Link function: Complementary Log-log.

SPSS outputs Cox and Snell's, Nagelkerke's, and McFadden's pseudo-R^2 statistics. All of these measures are analogies to R-squared in OLS regression, but none have the 'percent of variance explained' interpretation and should not be reported in those terms. Instead, all should be taken as additional measures of model effect size, with higher being better. Those in the table below represent good fit.

Table 5
Pseudo R-Square

Cox and Snell	,387
Nagelkerke	,437
McFadden	,224

Link function: Complementary Log-log.

Parameter estimates

In the output table below, the 'Threshold' rows contain the intercepts estimated for all but the highest level of the ordinal dependent variable. The 'Location' rows contain the parameter estimates for the independent variables. For each, the significance level by the Wald test is also printed. As in other types of categorical analysis, parameter estimates are presented for all but the reference level of any given factor.

Table 6
Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.
Threshold	[EMPLrec = 1]	-2,239	,541	17,110	1	,000
	[EMPLrec = 2]	-,656	,510	1,654	1	,198
Location	[INVa=0]	-,923	,259	12,687	1	,000
	[INVa=1]	0(a)	.	.	0	.
	[INVb=0]	-,220	,279	,625	1	,429
	[INVb=1]	0(a)	.	.	0	.
	[INVc=0]	,188	,348	,294	1	,588
	[INVc=1]	0(a)	.	.	0	.
	[INVd=0]	-,177	,265	,444	1	,505
	[INVd=1]	0(a)	.	.	0	.
	[INVe=0]	-,623	,261	5,706	1	,017
	[INVe=1]	0(a)	.	.	0	.
	[ATECHa=0]	,292	,305	,922	1	,337
	[ATECHa=1]	0(a)	.	.	0	.
	[ATECHb=0]	,379	,289	1,712	1	,191
	[ATECHb=1]	0(a)	.	.	0	.
	[ATECHc=0]	,241	,284	,722	1	,395
	[ATECHc=1]	0(a)	.	.	0	.
	[ATECHd=0]	,265	,305	,755	1	,385
	[ATECHd=1]	0(a)	.	.	0	.
	[ATECHe=0]	-,579	,302	3,662	1	,056
	[ATECHe=1]	0(a)	.	.	0	.
	[ATECHf=0]	,263	,452	,340	1	,560
	[ATECHf=1]	0(a)	.	.	0	.
	[TECH=0]	-,663	,404	2,689	1	,101
	[TECH=1]	0(a)	.	.	0	.
	[NSKILL=1]	-1,786	,367	23,743	1	,000
	[NSKILL=2]	-,773	,268	8,299	1	,004
	[NSKILL=3]	0(a)	.	.	0	.
	[SALES=1]	-,025	,247	,010	1	,920
	[SALES=2]	,239	,336	,506	1	,477
	[SALES=3]	0(a)	.	.	0	.

Link function: Complementary Log-log.
a This parameter is set to zero because it is redundant.

A positive parameter estimate for a covariate means that as the values of the covariate increase, so does the likelihood of higher scores on the ordinal dependent variable.

Predictive Capacity

The Classification table below, also called Confusion Matrix, was constructed by cross-tabulating the predicted categories responses with the actual categories.

Table 7
Predicted Response Category * Actual Response Categories (Cross tabulation)

			employment variation			Total
			decreased	remained about the same	increased	
Predicted Response Category	decreased	Count	17	10	0	27
		% within Predicted Response Category	63,0%	37,0%	,0%	100,0%
		% within employment variation	37,8%	16,9%	,0%	16,7%
		% of Total	10,5%	6,2%	,0%	16,7%
	remained about the same	Count	18	33	14	65
		% within Predicted Response Category	27,7%	50,8%	21,5%	100,0%
		% within employment variation	40,0%	55,9%	24,1%	40,1%
		% of Total	11,1%	20,4%	8,6%	40,1%
	increased	Count	10	16	44	70
		% within Predicted Response Category	14,3%	22,9%	62,9%	100,0%
		% within employment variation	22,2%	27,1%	75,9%	43,2%
		% of Total	6,2%	9,9%	27,2%	43,2%
Total		Count	45	59	58	162
		% within Predicted Response Category	27,8%	36,4%	35,8%	100,0%
		% within employment variation	100,0%	100,0%	100,0%	100,0%
		% of Total	27,8%	36,4%	35,8%	100,0%

Annex 5.2 – SPSS results for χ^2 statistics

Table 1
Variation in the needed skills * adoption of new technologies

			Adoption of new technologies		
			no	yes	Total
variation in the needed skills	decreased	Count	12	9	21
		% within variation in the needed skills	57,1%	42,9%	100,0%
		Adjusted Residual	1,9	-1,9	
	remained about the same	Count	40	32	72
		% within variation in the needed skills	55,6%	44,4%	100,0%
		Adjusted Residual	4,1	-4,1	
	increased	Count	11	62	73
		% within variation in the needed skills	15,1%	84,9%	100,0%
		Adjusted Residual	-5,4	5,4	
Total		Count	63	103	166
		% within variation in the needed skills	38,0%	62,0%	100,0%

Table 2
Variation in the needed skills * technologies adopted: inventory control

			technologies adopted: inventory control		
			no	yes	Total
variation in the needed skills	decreased	Count	9	11	20
		% within variation in the needed skills	45,0%	55,0%	100,0%
		Adjusted Residual	,4	-,4	
	remained about the same	Count	41	31	72
		% within variation in the needed skills	56,9%	43,1%	100,0%
		Adjusted Residual	3,6	-3,6	
	increased	Count	18	55	73
		% within variation in the needed skills	24,7%	75,3%	100,0%
		Adjusted Residual	-3,8	3,8	
Total		Count	68	97	165
		% within variation in the needed skills	41,2%	58,8%	100,0%

Table 3
Variation in the needed skills * technologies adopted: production process technology

			technologies adopted: production process technology		
			no	yes	Total
variation in the needed skills	decreased	Count	14	7	21
		% within variation in the needed skills	66,7%	33,3%	100,0%
		Adjusted Residual	,0	,0	
	remained about the same	Count	59	13	72
		% within variation in the needed skills	81,9%	18,1%	100,0%
		Adjusted Residual	3,7	-3,7	
	increased	Count	37	36	73
		% within variation in the needed skills	50,7%	49,3%	100,0%
		Adjusted Residual	-3,8	3,8	
Total		Count	110	56	166
		% within variation in the needed skills	66,3%	33,7%	100,0%

Table 4
Variation in the needed skills * technologies adopted: product design technology

			technologies adopted: product design technology		
			no	yes	Total
variation in the needed skills	decreased	Count	15	6	21
		% within variation in the needed skills	71,4%	28,6%	100,0%
		Adjusted Residual	,5	-,5	
	remained about the same	Count	55	17	72
		% within variation in the needed skills	76,4%	23,6%	100,0%
		Adjusted Residual	2,4	-2,4	
	increased	Count	40	33	73
		% within variation in the needed skills	54,8%	45,2%	100,0%
		Adjusted Residual	-2,8	2,8	
Total		Count	110	56	166
		% within variation in the needed skills	66,3%	33,7%	100,0%

Table 5
Variation in the needed skills * technologies adopted: marketing technology

			technologies adopted: marketing technology		
			no	yes	Total
variation in the needed skills	decreased	Count	16	5	21
		% within variation in the needed skills	76,2%	23,8%	100,0%
		Adjusted Residual	1,6	-1,6	
	remained about the same	Count	55	16	71
		% within variation in the needed skills	77,5%	22,5%	100,0%
		Adjusted Residual	4,0	-4,0	
	increased	Count	28	45	73
		% within variation in the needed skills	38,4%	61,6%	100,0%
		Adjusted Residual	-5,1	5,1	
Total		Count	99	66	165
		% within variation in the needed skills	60,0%	40,0%	100,0%

Table 6
Variation in the needed skills * technologies adopted: e-mail/web site/internet

			technologies adopted: e-mail/web site/internet		
			no	yes	Total
variation in the needed skills	decreased	Count	14	7	21
		% within variation in the needed skills	66,7%	33,3%	100,0%
		Adjusted Residual	2,6	-2,6	
	remained about the same	Count	38	34	72
		% within variation in the needed skills	52,8%	47,2%	100,0%
		Adjusted Residual	2,9	-2,9	
	increased	Count	15	58	73
		% within variation in the needed skills	20,5%	79,5%	100,0%
		Adjusted Residual	-4,6	4,6	
Total		Count	67	99	166
		% within variation in the needed skills	40,4%	59,6%	100,0%

Table 7
Variation in the needed skills * technologies adopted: business to business electronic networks

			technologies adopted: business to business electronic networks		
			no	yes	Total
variation in the needed skills	decreased	Count	20	1	21
		% within variation in the needed skills	95,2%	4,8%	100,0%
		Adjusted Residual	,7	-,7	
	remained about the same	Count	69	3	72
		% within variation in the needed skills	95,8%	4,2%	100,0%
		Adjusted Residual	1,9	-1,9	
	increased	Count	62	11	73
		% within variation in the needed skills	84,9%	15,1%	100,0%
		Adjusted Residual	-2,4	2,4	
Total		Count	151	15	166
		% within variation in the needed skills	91,0%	9,0%	100,0%

Table 8
Variation in the needed skills * employment variation

			employment variation			
			decreased	remained about the same	increased	Total
variation in the needed skills	decreased	Count	16	2	3	21
		% within variation in the needed skills	76,2%	9,5%	14,3%	100,0%
		Adjusted Residual	5,2	-2,8	-2,1	
	remained about the same	Count	22	40	10	72
		% within variation in the needed skills	30,6%	55,6%	13,9%	100,0%
		Adjusted Residual	,6	4,4	-5,0	
	increased	Count	9	19	45	73
		% within variation in the needed skills	12,3%	26,0%	61,6%	100,0%
		Adjusted Residual	-4,1	-2,5	6,4	
Total		Count	47	61	58	166
		% within variation in the needed skills	28,3%	36,7%	34,9%	100,0%

Table 9
Variation in the needed skills * firm invested in: new plant and equipment?

			firm invested in: new plant and equipment?		
			no	yes	Total
variation in the needed skills	decreased	Count	11	10	21
		% within variation in the needed skills	52,4%	47,6%	100,0%
		Adjusted Residual	1,4	-1,4	
	remained about the same	Count	38	34	72
		% within variation in the needed skills	52,8%	47,2%	100,0%
		Adjusted Residual	3,3	-3,3	
	increased	Count	15	58	73
		% within variation in the needed skills	20,5%	79,5%	100,0%
		Adjusted Residual	-4,2	4,2	
Total		Count	64	102	166
		% within variation in the needed skills	38,6%	61,4%	100,0%

Table 10
Variation in the needed skills * firm invested in: information technology?

			firm invested in: information technology?		
			no	yes	Total
variation in the needed skills	decreased	Count	10	11	21
		% within variation in the needed skills	47,6%	52,4%	100,0%
		Adjusted Residual	,0	,1	
	remained about the same	Count	47	25	72
		% within variation in the needed skills	65,3%	34,7%	100,0%
		Adjusted Residual	3,9	-3,9	
	increased	Count	23	50	73
		% within variation in the needed skills	31,5%	68,5%	100,0%
		Adjusted Residual	-3,8	3,8	
Total		Count	80	86	166
		% within variation in the needed skills	48,2%	51,8%	100,0%

Table 11
Variation in the needed skills * firm invested in: the purchase of patents & licensing?

			firm invested in: the purchase of patents & licensing?		
			no	yes	Total
variation in the needed skills	decreased	Count	18	3	21
		% within variation in the needed skills	85,7%	14,3%	100,0%
		Adjusted Residual	-,3	,3	
	remained about the same	Count	63	9	72
		% within variation in the needed skills	87,5%	12,5%	100,0%
		Adjusted Residual	-,2	,2	
	increased	Count	65	8	73
		% within variation in the needed skills	89,0%	11,0%	100,0%
		Adjusted Residual	,4	-,4	
Total		Count	146	20	166
		% within variation in the needed skills	88,0%	12,0%	100,0%

Table 12
Variation in the needed skills * firm invested in: the development of existing products?

			firm invested in: the development of existing products?		
			no	yes	Total
variation in the needed skills	decreased	Count	10	11	21
		% within variation in the needed skills	47,6%	52,4%	100,0%
		Adjusted Residual	,2	-,2	
	remained about the same	Count	38	34	72
		% within variation in the needed skills	52,8%	47,2%	100,0%
		Adjusted Residual	1,7	-1,7	
	increased	Count	27	46	73
		% within variation in the needed skills	37,0%	63,0%	100,0%
		Adjusted Residual	-1,9	1,9	
Total		Count	75	91	166
		% within variation in the needed skills	45,2%	54,8%	100,0%

Table 13
Variation in the needed skills * firm invested in: the development of new products?

			firm invested in: the development of new products?		
			no	yes	Total
variation in the needed skills	decreased	Count	11	10	21
		% within variation in the needed skills	52,4%	47,6%	100,0%
		Adjusted Residual	-,1	,1	
	remained about the same	Count	52	20	72
		% within variation in the needed skills	72,2%	27,8%	100,0%
		Adjusted Residual	4,2	-4,2	
	increased	Count	26	47	73
		% within variation in the needed skills	35,6%	64,4%	100,0%
		Adjusted Residual	-4,1	4,1	
Total		Count	89	77	166
		% within variation in the needed skills	53,6%	46,4%	100,0%

Annex 6.1 – SPSS results for χ^2 statistics

Table 1
Region * employee sources: family members

			EMPLOYEE SOURCES: FAMILY MEMBERS		
			NO	YES	Total
Region	Greek Macedonia	Count	18	32	50
		% within Region	36,0%	64,0%	100,0%
		Adjusted Residual	-1,0	1,0	
	South Italy	Count	9	15	24
		% within Region	37,5%	62,5%	100,0%
		Adjusted Residual	-,5	,5	
	Valencia, Spain	Count	17	10	27
		% within Region	63,0%	37,0%	100,0%
		Adjusted Residual	2,4	-2,4	
	North, Portugal	Count	26	40	66
		% within Region	39,4%	60,6%	100,0%
		Adjusted Residual	-,5	,5	
Total		Count	70	97	167
		% within Region	41,9%	58,1%	100,0%

Table 2
Region * employee sources: local community

			EMPLOYEE SOURCES: LOCAL COMMUNITY		
			NO	YES	Total
Region	Greek Macedonia	Count	7	43	50
		% within Region	14,0%	86,0%	100,0%
		Adjusted Residual	1,5	-1,5	
	South Italy	Count	1	23	24
		% within Region	4,2%	95,8%	100,0%
		Adjusted Residual	-,9	,9	
	Valencia, Spain	Count	0	27	27
		% within Region	,0%	100,0%	100,0%
		Adjusted Residual	-1,8	1,8	
	North, Portugal	Count	7	59	66
		% within Region	10,6%	89,4%	100,0%
		Adjusted Residual	,6	-,6	
Total		Count	15	152	167
		% within Region	9,0%	91,0%	100,0%

Table 3
Region * employee sources: from outside the region

			EMPLOYEE SOURCES: FROM OUTSIDE THE REGION		
			NO	YES	Total
Region	Greek Macedonia	Count	40	10	50
		% within Region	80,0%	20,0%	100,0%
		Adjusted Residual	,8	-,8	
	South Italy	Count	19	5	24
		% within Region	79,2%	20,8%	100,0%
		Adjusted Residual	,4	-,4	
	Valencia, Spain	Count	8	19	27
		% within Region	29,6%	70,4%	100,0%
		Adjusted Residual	-6,2	6,2	
	North, Portugal	Count	60	6	66
		% within Region	90,9%	9,1%	100,0%
		Adjusted Residual	3,6	-3,6	
Total		Count	127	40	167
		% within Region	76,0%	24,0%	100,0%

Table 4
Region * employee sources: parent firm

			EMPLOYEE SOURCES: PARENT FIRM		
			NO	YES	Total
Region	Greek Macedonia	Count	49	1	50
		% within Region	98,0%	2,0%	100,0%
		Adjusted Residual	-,1	,1	
	South Italy	Count	24	0	24
		% within Region	100,0%	,0%	100,0%
		Adjusted Residual	,7	-,7	
	Valencia, Spain	Count	27	0	27
		% within Region	100,0%	,0%	100,0%
		Adjusted Residual	,8	-,8	
	North, Portugal	Count	64	2	66
		% within Region	97,0%	3,0%	100,0%
		Adjusted Residual	-1,0	1,0	
Total		Count	164	3	167
		% within Region	98,2%	1,8%	100,0%

Table 5
Region * suppliers: associated local firm

			SUPPLIERS: ASSOCIATED LOCAL FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	28	22	50
		% within Region	56,0%	44,0%	100,0%
		Adjusted Residual	-2,7	2,7	
	South Italy	Count	19	5	24
		% within Region	79,2%	20,8%	100,0%
		Adjusted Residual	1,0	-1,0	
	Valencia, Spain	Count	18	9	27
		% within Region	66,7%	33,3%	100,0%
		Adjusted Residual	-,5	,5	
	North, Portugal	Count	53	13	66
		% within Region	80,3%	19,7%	100,0%
		Adjusted Residual	2,2	-2,2	
Total		Count	118	49	167
		% within Region	70,7%	29,3%	100,0%

Table 6
Region * suppliers: other local/regional firms

			SUPPLIERS: OTHER LOCAL/REGIONAL FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	29	21	50
		% within Region	58,0%	42,0%	100,0%
		Adjusted Residual	4,6	-4,6	
	South Italy	Count	8	16	24
		% within Region	33,3%	66,7%	100,0%
		Adjusted Residual	,1	-,1	
	Valencia, Spain	Count	5	22	27
		% within Region	18,5%	81,5%	100,0%
		Adjusted Residual	-1,7	1,7	
	North, Portugal	Count	12	53	65
		% within Region	18,5%	81,5%	100,0%
		Adjusted Residual	-3,1	3,1	
Total		Count	54	112	166
		% within Region	32,5%	67,5%	100,0%

Table 7
Region * suppliers: national firms

			SUPPLIERS: NATIONAL FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	19	31	50
		% within Region	38,0%	62,0%	100,0%
		Adjusted Residual	3,4	-3,4	
	South Italy	Count	0	24	24
		% within Region	,0%	100,0%	100,0%
		Adjusted Residual	-2,8	2,8	
	Valencia, Spain	Count	4	23	27
		% within Region	14,8%	85,2%	100,0%
		Adjusted Residual	-,9	,9	
	North, Portugal	Count	13	53	66
		% within Region	19,7%	80,3%	100,0%
		Adjusted Residual	-,5	,5	
Total		Count	36	131	167
		% within Region	21,6%	78,4%	100,0%

Table 8
Region * suppliers: EU firms

			SUPPLIERS: EU FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	14	36	50
		% within Region	28,0%	72,0%	100,0%
		Adjusted Residual	-1,7	1,7	
	South Italy	Count	14	10	24
		% within Region	58,3%	41,7%	100,0%
		Adjusted Residual	2,3	-2,3	
	Valencia, Spain	Count	11	16	27
		% within Region	40,7%	59,3%	100,0%
		Adjusted Residual	,4	-,4	
	North, Portugal	Count	24	42	66
		% within Region	36,4%	63,6%	100,0%
		Adjusted Residual	-,3	,3	
Total		Count	63	104	167
		% within Region	37,7%	62,3%	100,0%

Table 9
Region * suppliers: international firms

			SUPPLIERS: INTERNATIONAL FIRM		
			NO	YES	Total
Region	Greek Macedonia	Count	44	6	50
		% within Region	88,0%	12,0%	100,0%
		Adjusted Residual	2,4	-2,4	
	South Italy	Count	19	5	24
		% within Region	79,2%	20,8%	100,0%
		Adjusted Residual	,4	-,4	
	Valencia, Spain	Count	22	5	27
		% within Region	81,5%	18,5%	100,0%
		Adjusted Residual	,7	-,7	
	North, Portugal	Count	42	24	66
		% within Region	63,6%	36,4%	100,0%
		Adjusted Residual	-3,0	3,0	
Total		Count	127	40	167
		% within Region	76,0%	24,0%	100,0%

Table 10
Region * distributors: associated local firms

			DISTRIBUTORS: ASSOCIATED LOCAL FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	36	14	50
		% within Region	72,0%	28,0%	100,0%
		Adjusted Residual	-2,5	2,5	
	South Italy	Count	17	7	24
		% within Region	70,8%	29,2%	100,0%
		Adjusted Residual	-1,7	1,7	
	Valencia, Spain	Count	11	2	13
		% within Region	84,6%	15,4%	100,0%
		Adjusted Residual	,2	-,2	
	North, Portugal	Count	63	3	66
		% within Region	95,5%	4,5%	100,0%
		Adjusted Residual	3,6	-3,6	
Total		Count	127	26	153
		% within Region	83,0%	17,0%	100,0%

Table 11
Region * distributors: other local/regional firms

			DISTRIBUTORS: OTHER LOCAL/REGIONAL FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	31	19	50
		% within Region	62,0%	38,0%	100,0%
		Adjusted Residual	,4	-,4	
	South Italy	Count	10	14	24
		% within Region	41,7%	58,3%	100,0%
		Adjusted Residual	-1,9	1,9	
	Valencia, Spain	Count	7	6	13
		% within Region	53,8%	46,2%	100,0%
		Adjusted Residual	-,4	,4	
	North, Portugal	Count	43	23	66
		% within Region	65,2%	34,8%	100,0%
		Adjusted Residual	1,2	-1,2	
Total		Count	91	62	153
		% within Region	59,5%	40,5%	100,0%

Table 12
Region * distributors: national firms

			DISTRIBUTORS: NATIONAL FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	28	22	50
		% within Region	56,0%	44,0%	100,0%
		Adjusted Residual	2,1	-2,1	
	South Italy	Count	5	19	24
		% within Region	20,8%	79,2%	100,0%
		Adjusted Residual	-2,5	2,5	
	Valencia, Spain	Count	6	7	13
		% within Region	46,2%	53,8%	100,0%
		Adjusted Residual	,2	-,2	
	North, Portugal	Count	28	38	66
		% within Region	42,4%	57,6%	100,0%
		Adjusted Residual	-,3	,3	
Total		Count	67	86	153
		% within Region	43,8%	56,2%	100,0%

Table 13
Region * distributors: EU firms

			DISTRIBUTORS: EU FIRMS		
			NO	YES	Total
Region	Greek Macedonia	Count	28	22	50
		% within Region	56,0%	44,0%	100,0%
		Adjusted Residual	1,0	-1,0	
	South Italy	Count	16	8	24
		% within Region	66,7%	33,3%	100,0%
		Adjusted Residual	1,7	-1,7	
	Valencia, Spain	Count	6	7	13
		% within Region	46,2%	53,8%	100,0%
		Adjusted Residual	-,3	,3	
	North, Portugal	Count	27	39	66
		% within Region	40,9%	59,1%	100,0%
		Adjusted Residual	-2,0	2,0	
Total		Count	77	76	153
		% within Region	50,3%	49,7%	100,0%

Table 14
Region * distributors: international firms

			DISTRIBUTORS: INTERNATIONAL FIRM		
			NO	YES	Total
Region	Greek Macedonia	Count	42	8	50
		% within Region	84,0%	16,0%	100,0%
		Adjusted Residual	,5	-,5	
	South Italy	Count	15	9	24
		% within Region	62,5%	37,5%	100,0%
		Adjusted Residual	-2,6	2,6	
	Valencia, Spain	Count	11	2	13
		% within Region	84,6%	15,4%	100,0%
		Adjusted Residual	,3	-,3	
	North, Portugal	Count	57	9	66
		% within Region	86,4%	13,6%	100,0%
		Adjusted Residual	1,3	-1,3	
Total		Count	125	28	153
		% within Region	81,7%	18,3%	100,0%

Table 15
Region * sales destination: local/regional market

			SALES DESTINATION: LOCAL/REGIONAL MARKET		
			NO	YES	Total
Region	Greek Macedonia	Count	31	19	50
		% within Region	62,0%	38,0%	100,0%
		Adjusted Residual	3,3	-3,3	
	South Italy	Count	7	17	24
		% within Region	29,2%	70,8%	100,0%
		Adjusted Residual	-1,4	1,4	
	Valencia, Spain	Count	4	23	27
		% within Region	14,8%	85,2%	100,0%
		Adjusted Residual	-3,2	3,2	
	North, Portugal	Count	29	37	66
		% within Region	43,9%	56,1%	100,0%
		Adjusted Residual	,3	-,3	
Total		Count	71	96	167
		% within Region	42,5%	57,5%	100,0%

Table 16
Region * sales destination: national market

			SALES DESTINATION: NATIONAL MARKET		
			NO	YES	Total
Region	Greek Macedonia	Count	14	36	50
		% within Region	28,0%	72,0%	100,0%
		Adjusted Residual	,2	-,2	
	South Italy	Count	2	22	24
		% within Region	8,3%	91,7%	100,0%
		Adjusted Residual	-2,2	2,2	
	Valencia, Spain	Count	4	23	27
		% within Region	14,8%	85,2%	100,0%
		Adjusted Residual	-1,6	1,6	
	North, Portugal	Count	25	41	66
		% within Region	37,9%	62,1%	100,0%
		Adjusted Residual	2,6	-2,6	
Total		Count	45	122	167
		% within Region	26,9%	73,1%	100,0%

Table 17
Region * sales destination: EU market

			SALES DESTINATION: EU MARKET		
			NO	YES	Total
Region	Greek Macedonia	Count	20	30	50
		% within Region	40,0%	60,0%	100,0%
		Adjusted Residual	1,0	-1,0	
	South Italy	Count	11	13	24
		% within Region	45,8%	54,2%	100,0%
		Adjusted Residual	1,3	-1,3	
	Valencia, Spain	Count	7	20	27
		% within Region	25,9%	74,1%	100,0%
		Adjusted Residual	-1,0	1,0	
	North, Portugal	Count	19	47	66
		% within Region	28,8%	71,2%	100,0%
		Adjusted Residual	-1,2	1,2	
Total		Count	57	110	167
		% within Region	34,1%	65,9%	100,0%

Table 18
Region * sales destination: international market

			SALES DESTINATION: INTERNATIONAL MARKET		
			NO	YES	Total
Region	Greek Macedonia	Count	31	19	50
		% within Region	62,0%	38,0%	100,0%
		Adjusted Residual	-2,0	2,0	
	South Italy	Count	15	9	24
		% within Region	62,5%	37,5%	100,0%
		Adjusted Residual	-1,2	1,2	
	Valencia, Spain	Count	19	8	27
		% within Region	70,4%	29,6%	100,0%
		Adjusted Residual	-,3	,3	
	North, Portugal	Count	56	10	66
		% within Region	84,8%	15,2%	100,0%
		Adjusted Residual	2,9	-2,9	
Total		Count	121	46	167
		% within Region	72,5%	27,5%	100,0%

Table 19
Region * technologies adopted: inventory control

			technologies adopted: inventory control		
			no	yes	Total
Region	Greek Macedonia	Count	22	28	50
		% within Region	44,0%	56,0%	100,0%
		Adjusted Residual	,4	-,4	
	South Italy	Count	11	13	24
		% within Region	45,8%	54,2%	100,0%
		Adjusted Residual	,4	-,4	
	Valencia, Spain	Count	2	25	27
		% within Region	7,4%	92,6%	100,0%
		Adjusted Residual	-4,0	4,0	
	North, Portugal	Count	35	31	66
		% within Region	53,0%	47,0%	100,0%
		Adjusted Residual	2,4	-2,4	
Total		Count	70	97	167
		% within Region	41,9%	58,1%	100,0%

Table 20
Region * technologies adopted: production process technology

			technologies adopted: production process technology		
			no	yes	Total
Region	Greek Macedonia	Count	36	14	50
		% within Region	72,0%	28,0%	100,0%
		Adjusted Residual	1,0	-1,0	
	South Italy	Count	19	5	24
		% within Region	79,2%	20,8%	100,0%
		Adjusted Residual	1,4	-1,4	
	Valencia, Spain	Count	10	17	27
		% within Region	37,0%	63,0%	100,0%
		Adjusted Residual	-3,5	3,5	
	North, Portugal	Count	46	20	66
		% within Region	69,7%	30,3%	100,0%
		Adjusted Residual	,7	-,7	
Total		Count	111	56	167
		% within Region	66,5%	33,5%	100,0%

Table 21
Region * technologies adopted: product design technology

			technologies adopted: product design technology		
			no	yes	Total
Region	Greek Macedonia	Count	40	10	50
		% within Region	80,0%	20,0%	100,0%
		Adjusted Residual	2,4	-2,4	
	South Italy	Count	14	10	24
		% within Region	58,3%	41,7%	100,0%
		Adjusted Residual	-,9	,9	
	Valencia, Spain	Count	14	13	27
		% within Region	51,9%	48,1%	100,0%
		Adjusted Residual	-1,8	1,8	
	North, Portugal	Count	43	23	66
		% within Region	65,2%	34,8%	100,0%
		Adjusted Residual	-,3	,3	
Total		Count	111	56	167
		% within Region	66,5%	33,5%	100,0%

Table 22
Region * technologies adopted: marketing technology

			technologies adopted: marketing technology		
			no	yes	Total
Region	Greek Macedonia	Count	38	12	50
		% within Region	76,0%	24,0%	100,0%
		Adjusted Residual	2,7	-2,7	
	South Italy	Count	12	12	24
		% within Region	50,0%	50,0%	100,0%
		Adjusted Residual	-1,1	1,1	
	Valencia, Spain	Count	7	20	27
		% within Region	25,9%	74,1%	100,0%
		Adjusted Residual	-4,0	4,0	
	North, Portugal	Count	43	22	65
		% within Region	66,2%	33,8%	100,0%
		Adjusted Residual	1,2	-1,2	
Total		Count	100	66	166
		% within Region	60,2%	39,8%	100,0%

Table 23
Region * technologies adopted: e-mail/web site/internet

			technologies adopted: e-mail/web site/internet		
			no	yes	Total
Region	Greek Macedonia	Count	33	17	50
		% within Region	66,0%	34,0%	100,0%
		Adjusted Residual	4,3	-4,3	
	South Italy	Count	5	19	24
		% within Region	20,8%	79,2%	100,0%
		Adjusted Residual	-2,1	2,1	
	Valencia, Spain	Count	4	23	27
		% within Region	14,8%	85,2%	100,0%
		Adjusted Residual	-3,0	3,0	
	North, Portugal	Count	26	40	66
		% within Region	39,4%	60,6%	100,0%
		Adjusted Residual	-,3	,3	
Total		Count	68	99	167
		% within Region	40,7%	59,3%	100,0%

Table 24
Region * technologies adopted: business to business electronic networks

			technologies adopted: business to business electronic networks		
			no	yes	Total
Region	Greek Macedonia	Count	47	3	50
		% within Region	94,0%	6,0%	100,0%
		Adjusted Residual	,9	-,9	
	South Italy	Count	23	1	24
		% within Region	95,8%	4,2%	100,0%
		Adjusted Residual	,9	-,9	
	Valencia, Spain	Count	21	6	27
		% within Region	77,8%	22,2%	100,0%
		Adjusted Residual	-2,6	2,6	
	North, Portugal	Count	61	5	66
		% within Region	92,4%	7,6%	100,0%
		Adjusted Residual	,5	-,5	
Total		Count	152	15	167
		% within Region	91,0%	9,0%	100,0%

Table 25
Region * Adoption of new technologies

			Adoption of new technologies		
			no	yes	Total
Region	Greek Macedonia	Count	26	24	50
		% within Region	52,0%	48,0%	100,0%
		Adjusted Residual	2,4	-2,4	
	South Italy	Count	8	16	24
		% within Region	33,3%	66,7%	100,0%
		Adjusted Residual	-,5	,5	
	Valencia, Spain	Count	2	25	27
		% within Region	7,4%	92,6%	100,0%
		Adjusted Residual	-3,6	3,6	
	North, Portugal	Count	28	38	66
		% within Region	42,4%	57,6%	100,0%
		Adjusted Residual	,9	-,9	
Total		Count	64	103	167
		% within Region	38,3%	61,7%	100,0%

Table 26
Region * sources of technological knowledge: internal personnel

			sources of technological knowledge: internal personnel		
			no	yes	Total
Region	Greek Macedonia	Count	25	25	50
		% within Region	50,0%	50,0%	100,0%
		Adjusted Residual	2,4	-2,4	
	South Italy	Count	5	19	24
		% within Region	20,8%	79,2%	100,0%
		Adjusted Residual	-1,7	1,7	
	Valencia, Spain	Count	5	22	27
		% within Region	18,5%	81,5%	100,0%
		Adjusted Residual	-2,1	2,1	
	North, Portugal	Count	26	40	66
		% within Region	39,4%	60,6%	100,0%
		Adjusted Residual	,6	-,6	
Total		Count	61	106	167
		% within Region	36,5%	63,5%	100,0%

Table 27
Region * sources of technological knowledge: customers

			sources of technological knowledge: customers		
			no	yes	Total
Region	Greek Macedonia	Count	18	32	50
		% within Region	36,0%	64,0%	100,0%
		Adjusted Residual	-2,9	2,9	
	South Italy	Count	15	9	24
		% within Region	62,5%	37,5%	100,0%
		Adjusted Residual	1,0	-1,0	
	Valencia, Spain	Count	10	17	27
		% within Region	37,0%	63,0%	100,0%
		Adjusted Residual	-1,8	1,8	
	North, Portugal	Count	46	20	66
		% within Region	69,7%	30,3%	100,0%
		Adjusted Residual	3,4	-3,4	
Total		Count	89	78	167
		% within Region	53,3%	46,7%	100,0%

Table 28
Region * sources of technological knowledge: suppliers

			sources of technological knowledge: suppliers		
			no	yes	Total
Region	Greek Macedonia	Count	20	30	50
		% within Region	40,0%	60,0%	100,0%
		Adjusted Residual	-1,5	1,5	
	South Italy	Count	9	15	24
		% within Region	37,5%	62,5%	100,0%
		Adjusted Residual	-1,2	1,2	
	Valencia, Spain	Count	12	15	27
		% within Region	44,4%	55,6%	100,0%
		Adjusted Residual	-,5	,5	
	North, Portugal	Count	41	25	66
		% within Region	62,1%	37,9%	100,0%
		Adjusted Residual	2,7	-2,7	
Total		Count	82	85	167
		% within Region	49,1%	50,9%	100,0%

Table 29
Region * sources of technological knowledge: industry associations

			sources of technological knowledge: industry associations		
			no	yes	Total
Region	Greek Macedonia	Count	42	8	50
		% within Region	84,0%	16,0%	100,0%
		Adjusted Residual	1,5	-1,5	
	South Italy	Count	19	5	24
		% within Region	79,2%	20,8%	100,0%
		Adjusted Residual	,3	-,3	
	Valencia, Spain	Count	11	16	27
		% within Region	40,7%	59,3%	100,0%
		Adjusted Residual	-4,8	4,8	
	North, Portugal	Count	56	10	66
		% within Region	84,8%	15,2%	100,0%
		Adjusted Residual	2,0	-2,0	
Total		Count	128	39	167
		% within Region	76,6%	23,4%	100,0%

Table 30
Region * sources of technological: universities/colleges

			sources of technological: universities/colleges		
			no	yes	Total
Region	Greek Macedonia	Count	46	4	50
		% within Region	92,0%	8,0%	100,0%
		Adjusted Residual	1,5	-1,5	
	South Italy	Count	23	1	24
		% within Region	95,8%	4,2%	100,0%
		Adjusted Residual	1,5	-1,5	
	Valencia, Spain	Count	13	14	27
		% within Region	48,1%	51,9%	100,0%
		Adjusted Residual	-6,1	6,1	
	North, Portugal	Count	61	5	66
		% within Region	92,4%	7,6%	100,0%
		Adjusted Residual	2,0	-2,0	
Total		Count	143	24	167
		% within Region	85,6%	14,4%	100,0%

Table 31
Region * firm upgraded its workforce skills

			firm upgraded its workforce skills		
			no	yes	Total
Region	Greek Macedonia	Count	12	38	50
		% within Region	24,0%	76,0%	100,0%
		Adjusted Residual	,0	,0	
	South Italy	Count	2	22	24
		% within Region	8,3%	91,7%	100,0%
		Adjusted Residual	-2,0	2,0	
	Valencia, Spain	Count	0	27	27
		% within Region	,0%	100,0%	100,0%
		Adjusted Residual	-3,2	3,2	
	North, Portugal	Count	26	39	65
		% within Region	40,0%	60,0%	100,0%
		Adjusted Residual	3,8	-3,8	
Total		Count	40	126	166
		% within Region	24,1%	75,9%	100,0%

Table 32
Region * firm invested in: new plant and equipment?

			firm invested in: new plant and equipment?		
			no	yes	Total
Region	Greek Macedonia	Count	18	32	50
		% within Region	36,0%	64,0%	100,0%
		Adjusted Residual	-,5	,5	
	South Italy	Count	6	18	24
		% within Region	25,0%	75,0%	100,0%
		Adjusted Residual	-1,5	1,5	
	Valencia, Spain	Count	6	21	27
		% within Region	22,2%	77,8%	100,0%
		Adjusted Residual	-1,9	1,9	
	North, Portugal	Count	35	31	66
		% within Region	53,0%	47,0%	100,0%
		Adjusted Residual	3,0	-3,0	
Total		Count	65	102	167
		% within Region	38,9%	61,1%	100,0%

Table 33
Region * firm invested in: information technology?

			firm invested in: information technology?		
			no	yes	Total
Region	Greek Macedonia	Count	24	26	50
		% within Region	48,0%	52,0%	100,0%
		Adjusted Residual	-,1	,1	
	South Italy	Count	14	10	24
		% within Region	58,3%	41,7%	100,0%
		Adjusted Residual	1,0	-1,0	
	Valencia, Spain	Count	7	20	27
		% within Region	25,9%	74,1%	100,0%
		Adjusted Residual	-2,6	2,6	
	North, Portugal	Count	36	30	66
		% within Region	54,5%	45,5%	100,0%
		Adjusted Residual	1,3	-1,3	
Total		Count	81	86	167
		% within Region	48,5%	51,5%	100,0%

Table 34
Region * firm invested in: the purchase of patents & licensing?

			firm invested in: the purchase of patents & licensing?		
			no	yes	Total
Region	Greek Macedonia	Count	40	10	50
		% within Region	80,0%	20,0%	100,0%
		Adjusted Residual	-2,1	2,1	
	South Italy	Count	20	4	24
		% within Region	83,3%	16,7%	100,0%
		Adjusted Residual	-,8	,8	
	Valencia, Spain	Count	27	0	27
		% within Region	100,0%	,0%	100,0%
		Adjusted Residual	2,1	-2,1	
	North, Portugal	Count	60	6	66
		% within Region	90,9%	9,1%	100,0%
		Adjusted Residual	,9	-,9	
Total		Count	147	20	167
		% within Region	88,0%	12,0%	100,0%

Table 35
Region * firm invested in: the development of existing products?

			firm invested in: the development of existing products?		
			no	yes	Total
Region	Greek Macedonia	Count	32	18	50
		% within Region	64,0%	36,0%	100,0%
		Adjusted Residual	3,2	-3,2	
	South Italy	Count	12	12	24
		% within Region	50,0%	50,0%	100,0%
		Adjusted Residual	,5	-,5	
	Valencia, Spain	Count	7	20	27
		% within Region	25,9%	74,1%	100,0%
		Adjusted Residual	-2,2	2,2	
	North, Portugal	Count	24	42	66
		% within Region	36,4%	63,6%	100,0%
		Adjusted Residual	-1,8	1,8	
Total		Count	75	92	167
		% within Region	44,9%	55,1%	100,0%

Table 36
Region * firm invested in: the development of new products?

			firm invested in: the development of new products?		
			no	yes	Total
Region	Greek Macedonia	Count	33	17	50
		% within Region	66,0%	34,0%	100,0%
		Adjusted Residual	2,1	-2,1	
	South Italy	Count	13	11	24
		% within Region	54,2%	45,8%	100,0%
		Adjusted Residual	,0	,0	
	Valencia, Spain	Count	4	23	27
		% within Region	14,8%	85,2%	100,0%
		Adjusted Residual	-4,4	4,4	
	North, Portugal	Count	40	26	66
		% within Region	60,6%	39,4%	100,0%
		Adjusted Residual	1,4	-1,4	
Total		Count	90	77	167
		% within Region	53,9%	46,1%	100,0%

Table 37
Region * variation in the needed skills

			variation in the needed skills			
			decreased	remained about the same	increased	Total
Region	Greek Macedonia	Count	9	21	20	50
		% within Region	18,0%	42,0%	40,0%	100,0%
		Adjusted Residual	1,4	-,2	-,7	
	South Italy	Count	0	10	14	24
		% within Region	,0%	41,7%	58,3%	100,0%
		Adjusted Residual	-2,0	-,2	1,5	
	Valencia, Spain	Count	0	3	24	27
		% within Region	,0%	11,1%	88,9%	100,0%
		Adjusted Residual	-2,2	-3,7	5,1	
	North, Portugal	Count	12	38	15	65
		% within Region	18,5%	58,5%	23,1%	100,0%
		Adjusted Residual	1,8	3,1	-4,4	
Total		Count	21	72	73	166
		% within Region	12,7%	43,4%	44,0%	100,0%

Table 38
Region * employment variation

			employment variation			
			decreased	remained about the same	increased	Total
Region	Greek Macedonia	Count	24	13	13	50
		% within Region	48,0%	26,0%	26,0%	100,0%
		Adjusted Residual	3,7	-1,9	-1,6	
	South Italy	Count	3	8	13	24
		% within Region	12,5%	33,3%	54,2%	100,0%
		Adjusted Residual	-1,9	-,4	2,1	
	Valencia, Spain	Count	0	7	20	27
		% within Region	,0%	25,9%	74,1%	100,0%
		Adjusted Residual	-3,6	-1,3	4,7	
	North, Portugal	Count	20	33	12	65
		% within Region	30,8%	50,8%	18,5%	100,0%
		Adjusted Residual	,6	3,0	-3,6	
Total		Count	47	61	58	166
		% within Region	28,3%	36,7%	34,9%	100,0%

Annex 7.1 – SPSS outputs for Descriptive Statistics

A) Effects of investment on the workforce

Table 1

effects on workforce: displacement of existing employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	132	79,0	86,8	86,8
	yes	20	12,0	13,2	100,0
	Total	152	91,0	100,0	
Missing	System	15	9,0		
Total		167	100,0		

Table 2

effects on workforce: increased demand for higher skilled employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	87	52,1	57,2	57,2
	yes	65	38,9	42,8	100,0
	Total	152	91,0	100,0	
Missing	System	15	9,0		
Total		167	100,0		

Table 3

effects on workforce: increased demand for semi-skilled/unskilled employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	130	77,8	85,5	85,5
	yes	22	13,2	14,5	100,0
	Total	152	91,0	100,0	
Missing	System	15	9,0		
Total		167	100,0		

Table 4

effects on workforce: increased demand for temporary employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	122	73,1	80,8	80,8
	yes	29	17,4	19,2	100,0
	Total	151	90,4	100,0	
Missing	System	16	9,6		
Total		167	100,0		

Table 5

effects on workforce: change in the ratio part-time/full-time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	135	80,8	88,8	88,8
	yes	17	10,2	11,2	100,0
	Total	152	91,0	100,0	
Missing	System	15	9,0		
Total		167	100,0		

B) Factors inhibiting the adoption of new technologies

Table 6

factors that inhibited the adoption of technology: uncertain future benefits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	82	49,1	51,3	51,3
	yes	78	46,7	48,8	100,0
	Total	160	95,8	100,0	
Missing	System	7	4,2		
Total		167	100,0		

Table 7

factors that inhibited the adoption of technology: cost/access to finance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	89	53,3	55,6	55,6
	yes	71	42,5	44,4	100,0
	Total	160	95,8	100,0	
Missing	System	7	4,2		
Total		167	100,0		

Table 8

factors that inhibited the adoption of technology: lack of adequate information

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	123	73,7	76,9	76,9
	yes	37	22,2	23,1	100,0
	Total	160	95,8	100,0	
Missing	System	7	4,2		
Total		167	100,0		

Table 9

factors that inhibited the adoption of technology: size of market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	110	65,9	68,8	68,8
	yes	50	29,9	31,3	100,0
	Total	160	95,8	100,0	
Missing	System	7	4,2		
Total		167	100,0		

Table 10

actors that inhibited the adoption of technology: lack of qualified personne

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	118	70,7	73,8	73,8
	yes	42	25,1	26,3	100,0
	Total	160	95,8	100,0	
Missing	System	7	4,2		
Total		167	100,0		

Table 11

factors that inhibited the adoption of technology: a desire to keep a manageable size

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	109	65,3	68,1	68,1
	yes	51	30,5	31,9	100,0
	Total	160	95,8	100,0	
Missing	System	7	4,2		
Total		167	100,0		

C) Firm's response to changes in sales

Table 12

FIRM'S RESPONSE TO CHANGE IN SALES: INCREASED/DECREASED CAPACITY

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	65	38,9	40,1	40,1
	yes	97	58,1	59,9	100,0
	Total	162	97,0	100,0	
Missing	System	5	3,0		
Total		167	100,0		

Table 13

RM'S RESPONSE TO CHANGE IN SALES: SOUGHT MARKETS/LEFT EXISTIN

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	73	43,7	44,8	44,8
	yes	90	53,9	55,2	100,0
	Total	163	97,6	100,0	
Missing	System	4	2,4		
Total		167	100,0		

Table 14

FIRM'S RESPONSE TO CHANGE IN SALES: INTRODUCED ADDITIONAL PRODUCTS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	101	60,5	62,0	62,0
	YES	62	37,1	38,0	100,0
	Total	163	97,6	100,0	
Missing	System	4	2,4		
Total		167	100,0		

Table 15

FIRM'S RESPONSE TO CHANGE IN SALES: OUT-SOURCED TASKS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	123	73,7	75,5	75,5
	YES	40	24,0	24,5	100,0
	Total	163	97,6	100,0	
Missing	System	4	2,4		
Total		167	100,0		

Table 16

FIRM'S RESPONSE TO CHANGE IN SALES: FORMED PARTNERSHIPS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	152	91,0	93,3	93,3
	YES	11	6,6	6,7	100,0
	Total	163	97,6	100,0	
Missing	System	4	2,4		
Total		167	100,0		

Table 17

FIRM'S RESPONSE TO CHANGE IN SALES: ACQUIRED ANOTHER FIRM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	152	91,0	93,3	93,3
	YES	11	6,6	6,7	100,0
	Total	163	97,6	100,0	
Missing	System	4	2,4		
Total		167	100,0		

Appendices

Appendix 1 – Questionnaire

Technology-Related Strategies in Labour – Intensive Industries from Southern European Regions: consequences for local employment

Autora:

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Sob a orientação de:

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Professor Gordon L. Clark, School of Geography and the Environment, Oxford University

	número			CAE			região	
Código da entrevista: (a preencher pela autora)								

Esta entrevista enquadra-se no âmbito do projecto de Doutoramento, levado a cabo pela autora, sobre as estratégias empresariais das pequenas e médias empresas dos sectores dos têxteis e calçado localizadas nas seguintes regiões NUTS III portuguesas: **Cávado, Ave, Tâmega, Entre Douro e Vouga, Pinhal Interior Norte, Serra da Estrela e Cova da Beira.**

O projecto pretende analisar os comportamentos empresariais no actual contexto de globalização, deslocalização e integração das economias europeias. A forma como esses comportamentos influenciam os níveis de emprego e rendimento regional, estará também subjacente à análise.

A informação obtida no inquérito será tratada de forma confidencial. Os respondentes e as empresas a que pertencem não serão identificados em nenhum documento.

Ficaríamos muito gratos se pudesse anexar a este inquérito um documento com informação relativa à sua empresa (panfleto, brochura, etc.).

Muito obrigada pela sua colaboração!

I. Enquadramento geral

1. Qual a sua função na empresa? _____

2. Em que ano se constituiu esta empresa? _____

3. Quais os seus principais produtos? _____
_____

4. Qual foi o valor das vendas da empresa no último ano (nesta fábrica)? _____

5. Quantas pessoas esta empresa emprega actualmente (nesta fábrica)? _____

6. Dos empregados da empresa, quantos são:

(a) homens - tempo inteiro	☐	(b) mulheres - tempo inteiro	☐
(c) homens - *part-time*	☐	(d) mulheres - *part-time*	☐
(e) homens - temporário	☐	(f) mulheres - temporário	☐

7. Que % de trabalhadores vem da própria região[1]? _____

8. Qual a origem dos empregados da empresa:

	Sim	Não
(a) familiares	☐	☐
(b) comunidade local	☐	☐
(c) pessoas exteriores à região	☐	☐
(d) parceiros de *joint venture*	☐	☐
(e) outra empresa do grupo	☐	☐

9. Das opções anteriores, indique a mais importante_____

II. Propriedade/ Gestão da Empresa

10. A sua empresa é (seleccione os que se aplicarem):

(a) propriedade de uma pessoa	☐
(b) uma sociedade por quotas	☐
(c) propriedade de uma família	☐
(d) uma cooperativa	☐
(e) uma *joint venture* com outra empresa	☐
(f) uma empresa com responsabilidade limitada	☐
(g) uma filial de outra empresa	☐
(h) outra, especifique_____	

11. Se a empresa é propriedade de uma pessoa, de uma família ou é uma sociedade por quotas, o seu gestor é:

(a) o proprietário (um sócio)	☐
(b) outro pessoal familiar (de um dos sócios)	☐
(c) gestor externo	☐

12. Se a empresa é uma cooperativa, o seu gestor é:

(a) um sócio, da comunidade local	☐
(b) pessoa contratada, da comunidade local	☐
(c) pessoa contratada, fora da comunidade local	☐
(d) outro	☐

13. Se a empresa é uma filial, a empresa - mãe é:

(a) uma empresa sedeada na comunidade local	☐
(b) uma empresa nacional	☐
(c) uma empresa da UE	☐
(d) uma empresa internacional (fora da UE)	☐

14. Se a empresa é uma filial, a empresa - mãe está cotada na Bolsa? _____

III. Ligações com Fornecedores, Distribuidores e Clientes

15. Quais dos seguintes fornecedores são actualmente utilizados pela empresa:

	Sim	Não
(a) empresas locais associadas	☐	☐
(b) outras empresas locais/regionais	☐	☐
(c) empresas nacionais	☐	☐
(d) empresas da UE	☐	☐
(e) empresas internacionais (fora da UE)	☐	☐

16. Das opções anteriores, indique a mais importante_____

17. Quais dos seguintes canais de distribuição[2] são actualmente utilizados pela empresa:

	Sim	Não
(a) empresas locais associadas	☐	☐
(b) outras empresas locais/regionais	☐	☐
(c) empresas nacionais	☐	☐
(d) empresas da UE	☐	☐
(e) empresas internacionais (fora da UE)	☐	☐
(f) nenhuns, a empresa faz venda directa dos seus produtos	☐	☐

18. Das opções anteriores, indique a mais importante_____

[1] Por região considere o nível NUTS III correspondente: Cávado, Ave, Tâmega, Entre Douro e Vouga, Pinhal Interior Norte, Serra da Estrela e Cova da Beira.

[2] Grandes armazéns, grandes superfícies, grossistas, cadeias de lojas, retalhistas, etc…

19. Em caso de venda directa, quais dos seguintes mercados são actuais destinos das vendas da empresa:

	Sim	Não
(a) mercados locais/regionais	☐	☐
(b) mercados nacionais (fora da região)	☐	☐
(c) União Europeia	☐	☐
(d) mercado internacional (fora da UE)	☐	☐

20. Das opções anteriores, indique a mais importante_____

21. Considerando que por cooperação se entende qualquer actividade desenvolvida com outra instituição na persecução de interesses comuns, indique se a sua empresa já desenvolveu relações de cooperação:

Sim	Não
☐	☐

22. Se sim, indique aproximadamente em quantas ocasiões_____

IV. Estratégias Competitivas

23. Nos últimos 3 anos, as suas vendas totais (assinale uma opção):

(a) diminuíram drasticamente	☐
(b) diminuíram moderadamente	☐
(c) mantiveram-se constantes	☐
(d) cresceram moderadamente	☐
(e) cresceram drasticamente	☐

24. Nos últimos 3 anos, como respondeu a empresa às alterações nas vendas:

	Sim	Não
(a) aumentou/diminuiu a capacidade	☐	☐
(b) procurou outros mercados/deixou os mercados existentes	☐	☐
(c) introduziu produtos adicionais	☐	☐
(d) subcontratou tarefas	☐	☐
(e) formou sociedades	☐	☐
(f) adquiriu outra empresa	☐	☐

25. Das opções anteriores, indique a mais importante_____

26. Se a empresa adquiriu outra empresa nos últimos 3 anos, quais foram os resultados dessa aquisição:

	Sim	Não
(a) aumento da eficiência produtiva	☐	☐
(b) aumento da quota de mercado (nacional/UE)	☐	☐
(c) aumento dos recursos financeiros para o investimento	☐	☐
(d) transferência de tecnologia	☐	☐
(e) acesso a mão-de-obra mais qualificada	☐	☐

27. Das opções anteriores, indique a mais importante_____

28. Tem noção da quota de mercado que a sua produção representa:

	Sim	Não
(a) a nível nacional	☐	☐
(b) a nível internacional	☐	☐

29. Se sim, indique qual é aproximadamente essa quota _____

28. Aproximadamente com quantos concorrentes compete actualmente:

	Sim	Não
(a) menos de 3	☐	☐
(b) entre 3 e 10	☐	☐
(c) mais de 10	☐	☐

29. Esses concorrentes são:

	Sim	Não
(a) empresas nacionais	☐	☐
(b) empresas internacionais	☐	☐
(c) ambas	☐	☐

V. Estratégias de Investimento

30. Nos últimos 3 anos, a empresa investiu em:

	Sim	Não
(a) nova fábrica e novos equipamentos	☐	☐
(b) tecnologias de informação	☐	☐
(c) aquisição de patentes e licenças	☐	☐
(d) melhoria de produtos existentes	☐	☐
(e) desenvolvimento de novos produtos	☐	☐
(f) outros, especifique_____		

31. Das opções anteriores, indique a mais importante_____

32. Nos últimos 3 anos, quais das seguintes fontes foi utilizada pela empresa para financiar o investimento:

	Sim	Não
(a) fundos próprios	☐	☐
(b) banca	☐	☐
(c) fundos do governo/UE	☐	☐
(d) capital da *joint venture*	☐	☐
(e) outros, especifique_____		

33. Das opções anteriores, indique a mais importante_____

34. Nos últimos 3 anos, quais foram os efeitos do investimento realizado pela empresa na sua força de trabalho:

	Sim	Não
(a) despedimento de empregados	☐	☐
(b) deslocamento de actuais empregados para outras fábricas	☐	☐
(c) aumento da procura de pessoal com qualificação superior	☐	☐
(d) aumento da procura de pessoal desqualificado ou com qualificação média	☐	☐
(e) aumento da procura de pessoal temporário	☐	☐
(f) alteração da proporção de pessoal em *part-time*	☐	☐

35. Das opções anteriores, indique a mais importante_____

36. Quais são os resultados desejados do investimento realizado:

	Sim	Não
(a) aumento da produtividade do trabalho	☐	☐
(b) aumento da quota de mercado	☐	☐
(c) aumento do lucro	☐	☐
(d) aumento do nível tecnológico	☐	☐

37. Das opções anteriores, indique a mais importante_____

VI. Adopção de Tecnologias

38. O seu processo produtivo pode ser descrito como:

(a) adaptado ao cliente ☐

ou

(b) estandardizado ☐

39. Nos últimos 3 anos, quais das seguintes tecnologias foi adoptada pela empresa:

	Sim	Não
(a) controlo de inventário (ex: PCs, software etc.)	☐	☐
(b) tecnologias para processos produtivos (ex. CAM)	☐	☐
(c) tecnologias para design de produtos (ex. CAD)	☐	☐
(d) tecnologias de marketing (ex. Internet, *web sites*, etc)	☐	☐
(e) e-mail	☐	☐
(f) web site/ internet	☐	☐
(g) utilização de redes electrónicas para negócio	☐	☐
(h) outra, especifique_____		

40. Das opções anteriores, indique a mais importante_____

41. Nos últimos 3 anos, quais das seguintes fontes de conhecimento tecnológico foi utilizada pela empresa:

	Sim	Não
(a) pessoal interno	☐	☐
(b) clientes (locais/ nacionais/ internacionais)	☐	☐
(c) fornecedores (locais/ nacionais/ internacionais)	☐	☐
(d) associações industriais (locais/ nacionais/ internacionais)	☐	☐
(e) universidades e/ou escolas	☐	☐
(f) outra, especifique_____		

42. Das opções anteriores, indique a mais importante_____

VII. Trabalho e Mudanças Tecnológicas

43. Nos últimos 3 anos, a necessidade de empregados adequadamente qualificados (assinale uma opção):

(a) decresceu significativamente ☐
(b) decresceu moderadamente ☐
(c) permaneceu constante ☐
(d) cresceu moderadamente ☐
(e) cresceu significativamente ☐

44. Nos últimos 3 anos, o emprego total na empresa (assinale uma opção):

(a) decresceu significativamente ☐
(b) decresceu moderadamente ☐
(c) permaneceu constante ☐
(d) cresceu moderadamente ☐
(e) cresceu significativamente ☐

45. Nos últimos 3 anos, o custo unitário do trabalho (assinale uma opção):

(a) decresceu significativamente ☐
(b) decresceu moderadamente ☐
(c) permaneceu constante ☐
(d) cresceu moderadamente ☐
(e) cresceu significativamente ☐

46. Nos últimos 3 anos, os custos totais do trabalho (assinale uma opção):

(a) decresceram significativamente ☐
(b) decresceram moderadamente ☐
(c) permaneceram constantes ☐
(d) cresceram moderadamente ☐
(e) cresceram significativamente ☐

VIII. Enquadramento Institucional

47. Nos últimos 3 anos, quais das seguintes situações foram utilizadas pela empresa para melhorar as qualificações dos seus empregados:

	Sim	Não
(a) formação promovida pela empresa		
(b) formação promovida por Associações industriais		
(c) agências de formação privadas		
(d) universidades		
(e) escolas de formação técnica		
(f) programas de formação financiados pela UE		

48. Das opções anteriores, indique a mais importante_____

49. Nos últimos 3 anos, quais das seguintes fontes de financiamento foi utilizada pela empresa:

	Sim	Não
(a) empréstimos e facilidades de pagamento, etc.		
(b) incentivos para I&D		
(c) bolsas para formação		
(d) recurso a empresas de capital de risco		

50. Das opções anteriores, indique a mais importante_____

51. Nos últimos 3 anos, quais dos seguintes factores inibiram a adopção de novas tecnologias pela empresa:

	Sim	Não
(a) incerteza nos lucros futuros		
(b) custo/acesso ao financiamento		
(c) falta de informação adequada		
(d) dimensão do mercado		
(e) falta de pessoal qualificado		
(f) desejo de manter a empresa numa dimensão gerível		

52. Das opções anteriores, indique a mais importante_____

53. Fez alguma candidatura a sistemas de incentivos para financiar a sua empresa ao nível de:

	Sim	Não
(a) novas tecnologias		
(b) formação		
(c) expansão da empresa - instalações		
(d) outros (especifique) _____		

54. Das anteriores, indique em quais foi bem sucedido: _____

55. Quais das seguintes situações afectou adversamente a posição competitiva da empresa:

	Sim	Não
(a) a introdução do Euro		
(b) aumento dos custos de trabalho		
(c) aumento da concorrência nacional		
(d) aumento da concorrência da UE		
(e) aumento da concorrência dos países fora da EU		
(f) outros (especifique) _____		

56. Das opções anteriores, indique a mais importante_____

Appendix 2 – Design of questionnaire and Sampling procedures

Design of questionnaire and Sampling procedures

A. Design of questionnaire

The questionnaire used in the present research was designed, tested and applied in the scope of the EU FP5 Project RASTEI - Regional Adjustment Strategies to Technological Change in the Context of European Integration - HPSE-1999-00035.

This project aimed to study how local adjustment strategies designed to enhance productivity utilising technological change in labour-intensive industries has affected, and will affect in the future, European non-metropolitan regions in terms of their employment potential.

The results for the Greek, Italian and Spanish firms were gently yielded by the project coordinator for the present research. The same questionnaire was applied to the Portuguese sample firms during 2005.

Using common questions and an agreed coding system the data set allows for the pooling of data by question across a group of European southern regions.

> *"…the questionnaire provides an opportunity to test the expectations about the connections between the nature of firm, its competitive circumstances, choices made about the adoption of technology, and consequences for employment in regions subject to considerable stress on their employment profile."* (RASTEI, 2002)

The questionnaire has eight separate sections that can be summarised as follows:

I. Background: the questionnaire begins with the responsibility of the respondent, as well as the size of the firm as indicated by sales and employees.
II. Ownership: in the next section, the questionnaire seeks information about the formal ownership structure of the SME, recognising that these types of organisations vary in form and in practice between jurisdictions and in relation to related firms.
III. Supply and distribution links: in this section, the questionnaire sought to elicit information about the geographical and functional origin and destination of inputs to production and outputs of production.
IV. Competitive strategies: in this section firms were asked about the pattern of total sales over the past three years as well as the nature of SME response to changes in total sales.
V. Investment strategies: here, the questionnaire asks for information on the nature of investment, the sources of funds used to finance investment, the effect of investment on employment, and the desired results of investment for the firm.
VI. Technology adoption: this section links explicitly to the adoption of technology (broadly defined).
VII. Labour and technological change: the effect of technology change on employment is explicitly tackled here.
VIII. Policy and policy institutions: finally, the connection is made between decisions taken and identified in previous sections and the relevance and usefulness of existing regional, national and EU policy instruments.

B. Sampling procedures

It should be recognised that the results of the present research are dependent, certainly, upon the integrity of the survey instrument, the sampling procedures and the collection of the data in each country, as in every multi-team cross-country research.

B1. Final Sample

The final sample taken the four regions together is distributed as follows:

Table A2.1
Sample distribution by region and sector

	Footwear and Leather Products	Textiles and clothes	Total
North, Portugal	14	52	**66**
Macedonia, Greece	14	36	**50**
South Italy	-	24	**24**
Valencia, Spain	15	12	**27**
Total	**43**	**124**	**167**

Source: Author's elaboration

Table A2.2
Sample distribution by sector and firm size

Number of Employees	Footwear and Leather Products	Textiles and clothes	Total
Less than 10	11	31	**42**
10 – 49	16	58	**74**
More than 50	14	37	**51**
Total	**41**	**126**	**167**

Source: Author's elaboration

In the present research, the author assumes the responsibility for the Portuguese questionnaire application.

B2. Sampling exercise for the Portuguese regions

The sampling exercise for the North Portuguese firms, pursue the following phases:

1. Definition of target population

The total number of small and medium sized firms (<250 employees) from CEA 17, 18 and 19 from Portugal North Region were considered as the target population. The data source is the FUE from INE – *Instituto Nacional de Estatística*.

Table A2.3
Target population

Nuts III Region/ CEA	17	18	19	Total
Ave	**1100**	**1599**	**-**	**2699**
<49	966	1495	-	2461
50-99	79	83	-	162
100-249	55	21	-	76
Cávado	**368**	**902**	**-**	**1270**
<49	324	843	-	1167
50-99	27	50	-	77
100-249	17	9	-	26
Tâmega	**212**	**531**	**458**	**1201**
<49	199	445	376	1020
50-99	8	73	49	130
100-249	5	13	33	51
Entre Douro e Vouga	**-**	**-**	**746**	**746**
<49	-	-	663	663
50-99	-	-	71	71
100-249	-	-	12	12
Norte – Total	**1680**	**3032**	**1204**	**5916**

Source: INE - FUE 2005

Observations:
- Individual entrepreneurs and firms with zero employees were excluded.
- Firms belonging to sectors with a reduced weight in the region were excluded.

2. Definition of sample size

From Vicente *et al*. (1996) we have:

$$n = \frac{p(1-p)}{\frac{B^2}{Z^2}}$$

Where:

n = representative sample from the population N;

p = proportion of elements from the category to be studied (in this case there are multiple variables to be analysed for each firm);

B = maximum level of error: 5%;

Z = value of Normal Distribution for a significance level of 95%: 1.96

It is assumed p=0.5, since this is the value that better assure the levels of precision required (Vicente *et al*., 1996, p. 89). Replacing it in the formula, we have:

$$n = \frac{0.5(1-0.5)}{\frac{0.05^2}{1.96^2}} = 384$$

Since n/N = 384/5916 is ≥ than 5%, the assumption of independence of the sample is not assured, so the value for *n* needs to be reduced as following:

$$n = \frac{n}{1+\frac{n}{N}}$$

$$n = \frac{384}{1+\frac{384}{5916}} = 361$$

3. Information gathering

The sample was randomly selected, among the firms from the target population. The distribution among different regions and sectors was done proportionally.

A total amount of 722 questionnaires were distributed by RSF post during a 5 months period, followed by 217 phone contacts in order to supply complementary information and increase the final rate of answers (see the execution report in appendix 3).

Finally, it was possible to come up with a final sample of 66 respondent firms, corresponding to a final answer rate of 18.3% regarding the initial planned sample (n=361). As mentioned by Vicente *et al*. (1996), the representativity of a sample is not a matter of its dimension, rather is a matter of whether the non respondents' answers differ or not from the respondents' ones. Since it's believed that the non answers are mainly due to the entrepreneurs' lack of availability and awareness regarding the cooperation in such sort of research initiatives, it is assumed that the non respondents' opinions do not bias the representativity of the final sample.

Table A2.4
Final sample of respondent firms

Nuts III Region/ CEA	17	18	19	Total
Ave	**14**	**7**	**0**	**21**
<49	10	5	0	15
50-99	3	2	0	5
100-249	1	0	0	1
Cávado	**7**	**20**	**0**	**27**
<49	6	12	0	18
50-99	0	6	0	6
100-249	1	2	0	3
Tâmega	**1**	**3**	**2**	**6**
<49	1	1	0	2
50-99	0	2	1	3
100-249	0	0	1	1
Entre Douro e Vouga	**0**	**0**	**12**	**12**
<49	0	0	8	8
50-99	0	0	3	3
100-249	0	0	1	1
Total	**22**	**30**	**14**	**66**

Source: INE - FUE 2005

Appendix 3 – List of respondent firms

List of Portuguese respondent firms

Num	Nome	Nuts III	Concelho	CAE
1	LOPES & IRMÃO LDA	Ave	V Nova Famalicão	17600
2	GARCIA & SILVA LDA	Ave	Guimarães	17710
3	JUVENÁLIA & SÁ LDA	Ave	V Nova Famalicão	17400
4	MANSÃO TÊXTEIS LDA	Ave	Vizela	17210
5	PEDRO & ALBANO LDA	Ave	Sto Tirso	17303
6	PEUGAS MONTJAL LDA	Ave	Guimarães	17710
7	TÊXTEIS LEIPER LDA	Ave	Guimarães	17400
8	TÊXTEIS MASSAL LDA	Ave	V Nova Famalicão	17400
9	MASTO-TÊXTEIS LDA	Ave	Guimarães	17400
10	IRMÃOS FERNANDES SA	Ave	Guimarães	17720
11	CASTROS & MARQUES LDA	Ave	Guimarães	17400
12	FIAÇÃO DE COVAS S. A.	Ave	Guimarães	17110
13	ACA CONFECÇÕES LDA	Ave	V Nova Famalicão	18221
14	ARAUJO & LEITE LDA	Ave	V Nova Famalicão	18221
15	NATURAL TÊXTEIS LDA	Ave	Guimarães	18230
16	OLGA & FERREIRA LDA	Ave	V Nova Famalicão	18230
17	RIBEIRO & NOVAIS LDA	Ave	Guimarães	18221
18	BAPTISTA & SOARES LDA	Ave	Póvoa de Lanhoso	18221
19	LUÍS SOARES LDA	Cávado	Barcelos	17720
20	MF.BORDADOS LDA	Cávado	Barcelos	17542
21	MALHAS RIVAL LDA	Cávado	Barcelos	17600
22	BORDADOS BRIOTE LDA	Cávado	Barcelos	17542
23	MATIAS & ARAÚJO LDA	Cávado	Barcelos	17600
24	SIDONIOS-MALHAS LDA	Cávado	Barcelos	17600
25	CONFECÇÕES VILOR LDA	Cávado	Barcelos	17600
26	MALHAS CEF LDA	Cávado	Esposende	18230
27	R C V-TÊXTIL LDA	Cávado	Barcelos	18221
28	R.A.-TEXTEIS LDA	Cávado	Braga	18221
29	ARAUJO,IRMÃOS LDA	Cávado	Barcelos	18221
30	GOMPER-TÊXTEIS LDA	Cávado	Barcelos	18230
31	ABSOLUTA TÊXTIL LDA	Cávado	Barcelos	18221
32	BARROS & MACIEL LDA	Cávado	Barcelos	18222
33	MALHAS QUEIROGA LDA	Cávado	Esposende	18221
34	SIMÃO & OLGANDO LDA	Cávado	Barcelos	18221
35	CALJO-CONFECÇÕES LDA	Cávado	Braga	18221
36	MARVIMALHAS LDA	Cávado	Braga	18221
37	MALHAS SIMOFIL LDA	Cávado	Barcelos	18230
38	RODRIGUES & ABREU LDA	Cávado	Barcelos	18221
39	CONFECÇÕES NEGANGA LDA	Cávado	Barcelos	18221
40	BRETOS TÊXTIL - INDÚSTRIA TÊXTIL LDA	Cávado	Braga	18221
41	JOSE PINTO CARDOSO LDA	Cávado	Braga	18221
42	FLOR DA MODA-CONFECÇÕES S.A.	Cávado	Barcelos	18221
43	ARTIBORDA LDA	Tâmega	Felgueiras	17542
44	CONFECÇÕES TEMO LDA	Tâmega	Lousada	18221
45	SAVANA-CALÇADOS LDA	Tâmega	Felgueiras	19301
46	MARINA CALÇADO SA	Tâmega	Felgueiras	19301
47	NETO & COSTA LDA	Entre Douro Vouga	Oliveira Azeméis	19301
48	ROCHA & BRITO LDA	Entre Douro Vouga	Sta Maria Feira	19302
49	SILVA & COSTA LDA	Entre Douro Vouga	Oliveira Azeméis	19301

Num	Nome	Nuts III	Concelho	CAE
50	SOLAS VIMABRA LDA	Entre Douro Vouga	Oliveira Azeméis	19301
51	ANIBAL & IRMÃO LDA	Entre Douro Vouga	Oliveira Azeméis	19301
52	CALÇADO GAIATO LDA	Entre Douro Vouga	S João Madeira	19301
53	S.O.& MARQUES S.A.	Entre Douro Vouga	Oliveira Azeméis	19301
54	L COSTA LDA	Entre Douro Vouga	Oliveira Azeméis	19301
55	LISBOAS & CA LDA	Entre Douro Vouga	S João Madeira	19301
56	LIMA FERREIRA LDA	Entre Douro Vouga	S João Madeira	19301
57	TAVARES & IRMÃO SA	Entre Douro Vouga	S João Madeira	19301
58	CONFECÇÕES VIALPE LDA	Tâmega	Marco Canaveses	18221
59	NOT IDENTIFIED	Cávado	NA	18221
60	NOT IDENTIFIED	Ave	NA	18221
61	TECAMP TEXTEIS LDA	Ave	Trofa	17710
62	CASTRO & NUNES LDA	Ave	Guimarães	17541
63	MOURA & FILHOS	Tâmega	Penafiel	18221
64	CARDOSO & ARANTES LDA	Cávado	Barcelos	18221
65	SANTOS & FARIA LDA	Entre Douro Vouga	Sta Maria Feira	19301
66	IRJOMA - CONFECÇÕES LDA	Cávado	Barcelos	18221

Execution Report:

NUT III: AVE

EMPRESAS INQUIRIDAS: 297

Numero de respostas obtidas:

- Após envio RSF: 15
- Após contacto telefónico: 4

CONTACTOS TELEFÓNICOS EFECTUADOS

Empresas contactadas: **72**

N.º não atribuído/indisponível: 22

Empresas que recusaram participar: 5

Empresas que solicitaram novo envio: 37

Empresas que mostraram interesse em participar: 6

Empresas falidas/em fase de encerramento: 2

NUT III: CÁVADO

EMPRESAS INQUIRIDAS 151

Numero de respostas obtidas:

- Após envio RSF: 8
- Após contacto telefónico: 16

CONTACTOS TELEFÓNICOS EFECTUADOS

Empresas contactadas: **97**

N.º não atribuído/indisponível: 34

Empresas que recusaram participar: 6

Empresas que solicitaram novo envio: 55

Empresas falidas: 2

NUT III: ENTRE DOURO E VOUGA

EMPRESAS INQUIRIDAS: 77

Numero de respostas obtidas:

- Após envio RSF: 9
- Após contacto telefónico: 2

CONTACTOS TELEFÓNICOS EFECTUADOS

Empresas contactadas: **22**

N.º não atribuído/indisponível: 16

Empresas que solicitaram novo envio: 6

Empresas que faliram/vão encerrar: 1

NUT III: TÂMEGA

EMPRESAS INQUIRIDAS 126

Numero de respostas obtidas:

- Após envio RSF: 3
- Após contacto telefónico: 1

CONTACTOS TELEFÓNICOS EFECTUADOS

Empresas contactadas: **26**

N.º não atribuído/indisponível: 17

Empresas que solicitaram novo envio: 9