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KNOWLEDGE FLOWS
INNOVATION & UPGRADING
IN THE CHILEAN AGRI-
BUSINESS

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ABBREVIATIONS

Abbreviations/Acronims	Original Name	English Name
BPA		Best Agricultural Practices
CORFO	Corporación de Fomento de la Producción	Chilean Economic Development Agency
FIA	Fundación para la Innovación Agraria	Fund for Agricultural Innovation
HACCP		Hazard Analysis and Critical Control Points
INDAP	Instituto de Desarrollo Agropecuario	Institute for Agricultural and Livestock development
INE	Instituto Nacional de Estadística	National Statistics Institute
INIA	Instituto de Investigaciones Agropecuarias	Institute of Agricultural Research
INN	Instituto Nacional de Normalización	National Institute of Metrology
ISO		International Organisation for Standardisation
MINAGRI	Ministerio de Agricultura	Ministry of Agriculture
PABCO	Planteles de Animales Bajo Control Oficial	Animal Establishments under Official Certification
PDP	Programa de desarrollo de proveedores	Development program for breeders
QAS		Quality Assurance System
RCP		Residues Control Program
SAG	Servicio Agrícola Ganadero	Agriculture and Livestock Service
SAGO	Sociedad Agrícola y Ganadera de Osorno	Agricultural and Livestock Society of Osorno

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ABSTRACT

This work contributes to the debate on innovation and upgrading in the agro-food industry by presenting the results of a study of the impact of knowledge flows on innovation and upgrading in the Chilean meat sector.

In spite of not being a livestock country, Chile is an interesting case study because, by exploiting the initial advantage of being freed from animal diseases, it has been able to develop a meat exporting sector, enter global value chains and service high value meat to demanding markets.

The universe of firms in the sector is however very heterogeneous: Dynamic successful firms coexist with laggards. Why these differences in performance? A key explanation lays in firm's capacity to innovate, and to ensure continuous improvements in products and processes.

Without neglecting the importance of the internal sources of innovation, this thesis focuses on the firms' external sources. Thus, the work aims at investigating how firms' upgrading processes are simultaneously affected by the horizontal and vertical linkages they establish externally, by also looking at the role played by food standards.

In line with the branch of literature that explores the nature and effects of innovation systems, a first research hypothesis is that a central driver of innovation are the complex systemic interactions among many different players. Connections work as conduits for knowledge and, therefore, contribute to build firms' innovative capacity. To test this hypothesis, firms' network structure is analysed in order to assess whether there is a significant relationship between firm's position in the network and its innovation performance.

The second research hypothesis is that the characteristics of the dominant node/s in the chain and the type of chain governance affect the flow of knowledge throughout the chain, defining firms' learning opportunities and upgrading potential.

On the basis of recent literature, this work also investigates the role of standards in spurring and supporting innovation, assuming that their effect as innovation devices depends on the specific standard.

The empirical test of these hypotheses is based on secondary data and on primary data collected by the author through firm-level questionnaires and interviews to the

whole population of slaughtering and processing plants in six regions in the south of Chile. Data was generated to allow the use of Social Network Analysis (SNA). The outcome of the SNA was then used as independent variable in a logistic regression model aimed at explaining firm-level innovation.

The results confirm the initial hypotheses, providing at the same time unexpected results and interesting insights.

The work is structured as follows. Chapter one provides the background, the purpose and the set of goals of the study. Chapter two reviews the literature on knowledge flows, innovation and upgrading, and defines the core concepts used in this dissertation. Chapter three describes the Chilean meat sector, while chapter four the research methodology adopted for the analysis. Chapter five, six and seven are the core parts of the work, providing the empirical evidence. Final remarks and future research suggestions conclude the thesis.

PREFACE

As I finish writing this thesis, the world is shaken by an international crisis the impact of which are yet unknown although expected to be tremendous. What started as a financial crisis is now hurting the real economy, with a slowdown of all sectors across countries, and with a likely particular strong impact on those sectors based on natural resources, such as the agro-food sector.

Although post-crisis actual figures may be quite different from some reported here, I believe this doesn't weakness the analysis and the results. Actually, it is precisely in situations of crises where the capacity to turn disadvantages into advantages becomes most important. This is what innovation is about. And this is what, in essence, this thesis is about.

“If you found an answer to all your questions,
it means that you haven't asked the right questions“

(O. Wilde)

CHAPTER ONE

Introduction

“It is not only a matter of whether to participate into the global economy, but how to do so in a way which provides sustainable growth, especially for poor people and poor countries. As a matter of fact, in recent years, we observed many countries and regions suffering from declining income shares while have experienced a growth of their participation in global trade” (Kaplinski 2003).

THIS CHAPTER constitutes an introduction to this thesis. The first section provides a background for this study. The second sets the Chilean meat sector within the country’s broader strategy to become a global food power, therefore providing also a rational for the specific context of this study. It follows a description of the theoretical framework and the research hypothesis, which arise by both evidence and theory. The fourth section describes the methodology used to test the research hypotheses and answer the research question. The contributions of this study are discussed at the end, followed by an overview of the structure of this thesis.

I.1. Background for the study

Knowledge creation, adoption and diffusion have become key elements of competitiveness. Innovation is at the base of competition between firms in order to enter global value chains and access exigent markets. The food sector is no exception.

In addition, over the last decade, the food sector, and especially the meat sector, has experienced repeated diseases outbreaks, with a consequent rise in buyers’ concerns and, therefore, higher demand for quality and safety assurance.

The adoption, on the one hand, of sanitary standards imposed by governments as a consequence of the spread of infectious diseases and, on the other hand, of technical and quality standards imposed by giant supermarkets as part of their strategy to reduce costs and differentiate products, has called for higher coordination between firms

participating in the same value chain and for higher collaboration between firms and external business and scientific partners.

In the wake of the safety crises of the past ten years in the food sector, supermarket chains have set up radically new relationships with their upstream suppliers. Even if the public authorities were tightening Minimum Quality Standard (MQS) and creating new control procedures, new labelling strategies were being adopted by certain retailers.

These strategies were based on a higher degree of involvement in upstream farming. Initially developed in the meat sector which had been directly impacted by the "mad cow" crisis, these procedures were then applied to other sectors, such as fruits and vegetables, fish, cheese and wines.

Within the food sector, the meat sector appears as particularly important both as particularly involved in issues related to food safety, but also for providing examples of new forms of industrial organisation as a direct consequence of contemporary trends.

The sector is particularly important from both a consumption side (is the most direct source of protein and iron), its demand raise directly with income, and from a production side, as an important income source for many producers in low developing countries and as an important proportion of middle countries national income, especially in Latin America.

In the wake of this, is surprising how little importance it has had in the academic discussion about trends in the food sector and changes in industrial organisation, especially if compared to other sectors, such as fruit and vegetables, and wines.

This work aims at filling, to some extent, this gap.

I.2. Chile's race to become a global food power

In spite of not being a livestock country, Chile was chosen as a case study because, by exploiting the initial advantage of being freed (because of geographical isolation) from cattle, pork and poultry diseases, it has been able to develop a meat exporting sector, and to service high value meat to very demanding markets that are instead closed to giant traditional livestock producers such as Argentina and Brazil. This was achieved through a restructuring of the sector, and an active role of the state as provider of regulations (standards settler for instance) and support.

Chile is working to become a “Global Food Power”. The country has already become a leader in the production of salmon, and one of the main exporters of grapes, wines and berries. The meat sector is part of this strategy to make the country internationally competitive in food production. The Chilean pork sector has become an international leader, taking the place of traditional exporters such as Denmark. The poultry is following right behind, while the beef sector is far behind.

Chilean experience in salmon, wine, berries and pork is an example of how competitive advantages can be built by focusing efforts. The successful story of newly born sectors suggests that there is scope also for the beef sector, which is, indeed, experiencing important transformations.

If cross-sector differences do matter, so it does also the behaviour of the single firms. Indeed, within all meat sub-sectors, some firms are very dynamic, while others struggle to survive. Understanding what originates such differences is of paramount importance for the survival of the specific firms, for the sector as a whole, and for the country’s export strategy.

This work aims at understanding the determinants of such differences in firms capacity to innovate and compete. It does so by analysing how the external sources of knowledge influence firms’ process of innovation and upgrading. “External” refers to the sources of knowledge from outside the firm, whereas the firm is understood as a single cognitive entity. External sources can be other national or international firms, from the same sector or different sectors that operate at the same stage of the chain, as well as firms occupying different segments of the chain (therefore acting as a supplier or buyer of the firm). Within the external sources of knowledge, this work distinguishes between external sources that belong to the same value chain the firm belongs to, and that therefore define vertical relations, and sources that, not belonging to the same chain, are at the same stage of the chain. The latter are horizontal relationships, in general characterised by the exchange of purely immaterial (i.e. knowledge) resources. The reason for such distinction is that the two forms of relationship and knowledge exchange are characterised by different dynamics that respond to different needs and are aimed at different purposes.

But organisations external to the firm with important knowledge transfer roles are also universities and public agencies that operate in the same sector, as well as other

actors, such as consultants, that depending on the specific circumstances may play a relevant role.

The choice to focus on the firms' external sources of knowledge doesn't imply that the internal sources are neglected: Learning is an interactive process and in order to be utilised, knowledge inflows need to be understood, processed and synthesized, which requires the existence of certain potential within the firm. Cohen and Levinthal (1990) call this cognitive requirement "absorptive capacities", while Lall defines them as "technological capabilities". Although these definitions stress different aspects, both refer to the firm's need to have some basic learning attitudes, which are not given, but rather need to be (internally) developed. These capabilities are the result of a continuous process of investment and knowledge accumulation within firms.

The same concept of "absorptive capacity" implicitly refers to a process of firms' interaction with the environment: the capacity is "internal" but developed in order to allow firms to "absorb" knowledge from the environment .

The underlying idea of all the knowledge and innovation literature is that the level of innovativeness of a firm always results from the interaction between existing capabilities/capacities and external sources of knowledge. Therefore, even when the focus are the external sources of knowledge, the internal factors cannot be neglected.

The distinction between "internal" and "external" is an artificial construct, given that the "internal" sources receive stimulus from the "external" and these, in turn, rely on the former. The distinction between the two, and the selection of only one aspect to be the focus of this work, is due to the necessity of both facilitate and bound the analysis.

Core in the approach taken by this study is the idea that the firm is not an island, and that it does not operate in isolation. The relationships a firm establishes and the distribution of knowledge that from it derive, are essential determinants of its performance.

Such relationships, however, don't develop in a vacuum. They are shaped by the institutional setting, at both the national and international level: They are influenced by the rules of the game that prevail in each and every moment, by contributing, to some extent, in generating new rules. Therefore, this study looks also at some elements of the institutional setting in which firms operate and that are specific of the sector under

study. The main examples of this being the international food standards, as well as government's regulations.

I.3. Theoretical framework, research question and hypotheses

By looking at the literature on innovation, this study proposes two explanations for the heterogeneity among firms observed in the Chilean meat sector. These explanations constitute the research hypotheses of this thesis. These hypotheses are:

- (1) The (horizontal) relationships the firm has with other firms and organisations contribute to determine its innovative and upgrading capacity, because they can work as channels for the transfer of knowledge. Within this context two types of relationships are analysed: formal collaborations and informal relationships.
- (2) The governance structure of the value chain, by determining the vertical distribution among firms of power and knowledge, determines the firm's capacity to innovate and upgrade. Within this context, two types of knowledge transfer are analysed: A codified one, based on the imposition of standards and a not codified one, based on informal relations.

The underlying idea to the first hypothesis is that central drivers of innovation are the complex systemic interactions among many different players. This is in line with the branch of literature that explores the nature and effects of innovation systems and networks.

Connections work as conduits for knowledge and, therefore, contribute to build firms' innovative capacity. To test this hypothesis, firms' network structure is analysed in order to assess whether there is a significant relationship between firm's position in the network and its innovation performance.

The second research hypothesis concerns how the characteristics of the dominant node/s in the chain and the type of chain governance affect the flow of knowledge throughout the chain, defining firms' upgrading potential. Within this framework, the

role of standards as governance tools will be analysed, to see whether they can spur and support innovation, and therefore work as potential innovation devices.

Global value chains represent a new form of industrial organization that is widely diffused in many industries across countries. Therefore, an analysis of its potential implications and consequences for firms in developing countries is of utmost relevance. However, recent research efforts in this direction have not fully clarified how global value chains foster innovation and learning processes in developing countries' firms.

The idea that entering global value chains will automatically have an impact (positive or negative) leads mistakenly to the analysis of the detailed mechanisms linking value chains with local firms' learning and innovation processes.

The broad theoretical background against which these hypotheses are tested is the theory of innovation and industrial organisation in developing countries, within the broader framework of evolutionary theory. Within this, a Network and a Value Chain perspective are taken. These two approaches will define the analysis of, respectively, hypothesis one and two.

Must be clarified, however, that value chains are also made up by webs of (vertical) relationships. Likewise, even when analysing firms' horizontal interaction, this must be understood as part of a broader system of relationships they establish with the world. Horizontal linkages may help firms' exploit the opportunities of insertion within value chains and, in turn, the way the chain is structured may influence the way firms interact horizontally.

Within the theory of GVC, the attention is limited to the branch of literature that focuses on how innovation and upgrading are influenced by the knowledge flows across the different nodes of the chain.

I.4. Methodology

The empirical test of the hypotheses is based on secondary data and on primary data collected by the author through firm-level questionnaires and interviews to the whole population of slaughtering and processing plants in six regions in the south of Chile. Firms were selected on the basis of official sources and industry associations' databases.

Data was generated to allow the use of Social Network Analysis (SNA), the core elements of the analysis being the connections and knowledge flows which relate one actor to another.

Indeed, when discussing knowledge exchange between organizations, a multitude of levels of analysis should be taken into account and considered together. The empirical studies in this thesis address two different levels of analysis: (1) the firm, defined as a single cognitive unit (2) the relationships among firms, and between firms and other organisations.

Therefore, the unit of analysis is not restricted to the single firm, and also the relationships they establish are analysed and measured.

The definition of the unit of analysis determines, in turn, the data that will be collected and how it will be collected. Beside attribute data, the author has collected and analysed relational data.

The collection of relational data has implied modification to the questionnaire normally used in innovation surveys. Chapter two and four discuss the limitations of commonly used innovation surveys, especially in the case of developing countries and when there is a relational dimension to be captured, and explains how this study tries to overcome those limitations. The questionnaire was built to gather both attribute data, related to firm's activities related to innovation, and relational data. The relational part of the questionnaire aims at identifying the flows of knowledge between actors.

Data was generated to allow the use of Social Network Analysis (SNA). The outcome of the SNA was then used as independent variable in a logistic regression model aimed at explaining firm-level upgrading.

I.5. Contributions

The contributions of this work are numerous: (1) Although there is agreement on the importance of the linkages that firms develop externally (within a network or a chain), the analysis of the actual process has not been adequately studied empirically. This thesis contributes in filling this gap with new evidence and by adopting a relatively new methodology that allows to illuminate some aspects of the process. (2) To what concerns upgrading opportunities in GVC in most studies, the unit of analysis is rarely

the firm, the studies ranging from clusters to industries and nations. The individual firm is never the central focus, although the majority of studies implicitly incorporate this dimension into the analysis. In this thesis, instead the unit of analysis is the firm and the relationships it builds around.

(3) The analysis of the impact of firms' external sources of knowledge on innovation and upgrading is applied in this study to a sub-sector within the food industry that is surprisingly less studied, in spite of being of paramount importance for many developing countries. This sector is undergoing rapid transformations, becoming increasingly technology intensive and strongly competitive.

On the methodological side, the thesis contains numerous merits: (4) It provides some important elements of innovation with regards to questionnaires for innovation surveys; and (5) combines qualitative and quantitative analysis and, within the latter it uses different methodologies. Indeed a Social Network Analysis (SNA) is used to measure the knowledge transfers across firms and, then, the outcome of the SNA analysis is used as explanatory variable in a logistic regression model aiming at explaining upgrading. The econometric analysis alone would not have allowed to uncover the relational part of the story.

(6) The thesis also emphasises the role played by local actors. Although the literature on networks and national systems of innovation tend to stress their importance, the empirical evidence tends to concentrate the analysis on the relationship among only firms. Local actors may supposedly play a minor role, but still their analysis helps understand how firms acquire technology from outside, and if and how they are supported in their efforts to develop TCs. Thus, it is useful to know which actors - firms, business associations, research centres and government supporting agencies - are involved, how they master and adapt foreign technologies, and how they influence the level and direction of investments in TCs, and so forth.

Finally, (7) The thesis integrates the horizontal and vertical dimension, proposing a systemic interpretation of the innovation and upgrading processes.

Although the analysis requires to distinguish between the vertical and horizontal dimension, the two are in fact deeply interconnected.

I.6. Structure of the study

The work is organised as follows: The first chapter defines the background for the study, the theoretical framework as well as the main research question and hypotheses. It also describes the methodology adopted to test the hypotheses and emphasises the contributions of the study.

The second chapter constitutes the theoretical background for this thesis. It is aimed at placing the present research in the context of existing knowledge and at identifying gaps, while also exemplifying and justifying the methodology adopted. It reviews the literature on networks and value chains from the perspective of the relationship between knowledge flows innovation and upgrading, and within the broader framework of evolutionary theory.. Concepts core to the approaches adopted and to the present work, such as “knowledge”, “innovation” and “upgrading”, are introduced and defined.

Chapter three describes the context of this study, by showing the idiosyncrasies of the beef and the pork sector, and the functioning and structure of the slaughtering and processing industry.

The fourth chapter describes in detail the methodology adopted in this thesis. Its purpose is to explain *how* this thesis went about testing the research hypotheses and answering the research question discussed in chapter one.

Chapter five analyses the horizontal knowledge flows between firms as well as the knowledge transfers from universities and government agencies to firms. Social Network Analysis (SNA) is used for the purpose. A combination of both graphical and mathematical/statistical tools reveal interesting patterns of horizontal ties and knowledge flows, and their relationship with innovation.

Chapter six analyses the knowledge flows among firms operating within the same value chain. Global value chain approach is used for this purpose. The chapter analyses both qualitatively and quantitatively chain governance and the power relationships within the Chilean meat chain, to see how they impact on firms’ learning and upgrading opportunities.

The final chapter concludes and provides some suggestions for future research agenda.

II.7. Summary of the chapter

This chapter defines the background for the study, the theoretical framework as well as the main research question and hypotheses. It also describes the methodology adopted to test the hypotheses and emphasises the contributions of the study. At the end, it provides an overview of the structure of the study.

CHAPTER TWO

A literature review on knowledge flows, innovation and upgrading

THIS CHAPTER constitutes the theoretical background for this thesis. It is aimed at placing the present research in the context of existing knowledge and at identifying gaps, while also exemplifying and justifying the methodology adopted. The chapter starts by collocating the themes of this research within the broader framework of evolutionary theory. It then reviews the literature on networks and value chains from the perspective of the relationship between knowledge flows innovation and upgrading. Concepts core to the approaches adopted and to the present work, such as “knowledge”, “innovation” and “upgrading”, are progressively introduced and defined.

II.1. Innovation

II.1.1. The need for innovation

This work takes an evolutionary approach. This means it adopts a dynamic perspective, stressing the primacy of competitive advantages over comparative advantages, emphasising the importance of technical change and innovation; it also treats uncertainty as a central feature of economic life, which implies that agents cannot maximise because they don't possess perfect foresight. Instead, agents make mistakes and stick to satisfactory behavioural patterns while, at the same time, they learn slowly and attempt to innovate in order to survive in the Schumpeterian process of creative destruction.

Creation and destruction dominate the evolution of the economy: The innovation mechanism generates new technologies, firms and institutions, while selection and

adaptation eliminate unfit institutions. Failure at the micro level serves the progress at the system level.

“Evolutionary”, however, is not a mere synonym of dynamics, which can be found to some extent even in neoclassic theory (Hodgson 1993). It refers to a more complex type of dynamics, which has two main characteristics (1) mutation, which generates variety among the units of analysis; and (2) selection, which allows only some units to survive and therefore reduces variety. The existence of variety implies that evolutionary theorists study populations of heterogeneous units. The existence of selection implies that the individual units in the population studied interact; for instance, they compete in the same market. Therefore, the assumption of a representative agent commonly used in neoclassical economics, is at odds with an evolutionary approach, since are the differences between units that drive evolution (Dosi and Nelson 1994).

Variety is conceived as the qualitative difference between technologies and organisations, and captures the Schumpeterian emphasis on the qualitative nature of economic change: Not only do productivity and income increase, but also new technologies, firms and industries appear in the economy and compete with existing technologies.

Variety is usually created through the innovation process. According to the evolutionary view, then, the innovation process deserves great attention. In modelling it, evolutionary theorists stress the importance of tacit knowledge, uncertainty, learning by doing, and search by trial and error. Nelson and Winter (1982) embrace the Schumpeterian idea that the firm is the main source of innovation. However, while Schumpeter focuses on the role of entrepreneurs in the process of innovation, attributing to them the introduction of innovations, in Nelson and Winter (1982) the process is more complex: Firms have special search routines dedicated to the introduction of innovations (that is, of new routines). But the search process proceeds by trial and error and is dominated by uncertainty, therefore the results are unpredictable. This is why in formal models the search process is often represented by random processes, although in Nelson and Winter (1982) the process is not completely random, since firms follow some criteria that include market considerations, costs and technical feasibility. Technical feasibility is influenced by knowledge previously accumulated by the firm and by the network of institutions with which the firm interacts.

Innovations will not commonly be breakthroughs. More likely, they will be gradual advancements within a same “technological paradigm” (Dosi 1982), that is, within a “shared understanding of the core problems and the scientific principles” (???). Freeman and Perez (1988) introduce the distinction between “radical” and “incremental” innovations to emphasise the difference between discontinuous (breakthroughs that shift paradigm) and cumulative aspects of technical change which take place within the same paradigm and that can be responsible for significant advances in productivity. This distinction is useful as it takes into account the fact that technical change is characterised by increasing returns to use for the economy as a whole; it also overcomes the artificial distinction between innovation and diffusion (Dosi 1988). Since the knowledge produced in the innovative process is also used as an input for future innovations, the more a technology is adopted in the economy the better it becomes as firms and other actors (suppliers, customers, universities) learn about it. Many adoptions are therefore also incremental innovations that improve the initial innovation.

This work takes an evolutionary view to analyse incremental innovation processes in the Chilean meat sector. The underlying idea is that if firms cannot change their behavioural traits quickly, and there is a strong selection, less profitable firms will disappear, while profitable firms, by investing their profits, will grow,² and concentrated market structures will result. To survive in the competitive process, firms are continually searching to improve their profitability through successful innovation, but their search builds incrementally on their specific knowledge.

The following sections will define the concepts of innovation and knowledge, emphasising how they are related to one another. The chapter will then turn to the sources of knowledge and innovation, focusing on those external to the firm, namely its network and the value chain in which it is inserted.

² The observation that unprofitable firms disappear does not necessarily mean that remaining firms behave optimally. Since selection acts on fitness, which includes but is not limited to technological efficiency (producing at lower unit costs than competitors which, assuming firms face the same price, leads to higher profits), the results may be perverse. In fact, survivors can even be inefficient. I use the term “profitability” instead of “efficiency” to account for the fact that profitability may include efficiency but is not limited to it, because fitness/profitability of firms, in fact, depends on many non-technological factors such as marketing strategies, location, ease of access to customer, etc.

II.1.2. Defining and measuring innovation

Defining and measuring innovation is not an easy task. The process of innovation, both at firm and national levels, has been the subject of much investigation. Following Schumpeter (1934, 1942), analysts from the 1960s onwards, including Schmookler (1966), Mensch (1979), Mowery and Rosenberg (1979), Freeman (1982), Nelson and Winter (1982), Roobeek (1987) and many others later on, have tried to define innovation. Conceptual advances over this period have also been directed towards the understanding of the innovation process which is needed for a more informed public policy in this arena (Kline and Rosenberg 1986).

There have been several major sets of approaches. The first, prevalent during the 1950s and 1960s, was the *science-push* approach. This approach assumed that innovation was a linear process, beginning with scientific discovery, passing through invention, engineering and manufacturing activities and ending with the marketing of a new product or process. The model was rapidly shown to apply only to relatively simple forms of product such as petrochemicals.

From the early to mid-1960s a second linear model of innovation, the *demand-pull* model, was adopted by public policy makers in advanced capitalist economies. In this model, innovations are viewed as derived from a perceived market demand which then influences the direction and rate of technology development (Kamien and Schwartz 1982). Many scholars saw both linear models of innovations as oversimplified (eg Stienmueller 1994; Rothwell 1992). For example, Rothwell (1992), uses the case of the biotechnology industry to show that at an industry-wide level the importance of science-push and demand-pull may vary during different phases in the innovation process.

A third proposed model, the “coupling” model, looked at the innovation process as interactive and logically sequential, though not necessarily continuous (Rothwell and Zegveld 1985). The emphasis in this model is on the feedback effects between the downstream and upstream phases of the earlier linear models: The stages in the process are seen as separate but interactive.

Later models have incorporated the feedback processes operating within and between firms. Kline and Rosenberg, for instance, in their “chain-linked model” show the complex iterations, feedbacks and interrelationships between marketing, R&D,

manufacturing and distribution in the innovation process, emphasising the high degree of integration between various elements of the firm.

The latest generation of innovation models includes consideration of the growing strategic integration between different organisations inside and outside the firm, and of the way these are enhanced by the use of new organisational techniques. The current debate on the conceptualisation of innovation comprises two main ideas: The evolutionary and interactive features of the innovative process, and the idea that knowledge and learning play a key role in this process (Arundel et al. 1998). This systemic approach to innovation focuses on the importance of networks of firms and other economic agents, stressing the role of the exchange of information and knowledge between all types of agents in the innovation system. The linkages between actors and the flows of knowledge between them are seen as multidirectional, with constant feedback at every stage of the process.

The need to understand innovation for policy purposes, together with the need to compare nations and firms regarding their innovative efforts led to the development of a framework for the measurement of innovation, first with the Frascati Manual, and later with the Oslo Manual. These manuals established the guidelines for the execution of Innovation Surveys. Indicators developed from these surveys are a tool to delve into the black box of innovation (Arundel et al. 1998).

The first version of the Oslo manual provided the guidelines for the construction of Innovation Indicators that would be the base of several Innovation Surveys that have been carried since then. Applications by the Community Innovation Surveys (CIS) and the academic debate generated by its use lead to several revisions since it was launched in 1992.

The approach of the Oslo Manual considers the firm as the core unit of observation. Innovation is conceptualised according to the recent advancements in the field, that is, it is understood as a non-linear process, and as the result of an interactive process between agents from a national innovation system, in accordance to the Kline and Rosenberg model (Costa 2005).

Despite the Oslo manual has considered innovation in a broad sense, its application in the CIS has generated many criticisms. One of these is that several surveys that apply the manual tend to focus on inputs and outputs, ignoring to a certain extent the

interactive process of the innovative activity (Arundel et al. 1998). In addition, it has been argued that the indicators comprised in the CIS focus on the inventive effort (R&D) leaving aside adoption efforts. That is, the innovative firm is understood as the one that has performed R&D. Following a Schumpeterian approach to innovation, where only radical innovative attempts count, firms that successfully adopt innovations but which don't carry out their own R&D are left aside. This is a reductive view of innovation, especially in developing countries, where minor innovations, adaptive and improvement efforts are an important part of the process of accumulation of technological capabilities (RICYT 2001).

Another shortcoming of the Oslo Manual is the exclusive focus on technological innovations. Non-technological innovations are also relevant for the firm performance and therefore should be taken into account (Lugones and Peirano 2004). Organisational changes are required when new technologies become available to firms, and since acquired technology is a large part of developing countries' technology, organisational innovations often become a key element to explain firm's performance.

The Manual was also criticised for the exclusion from the analysis of all the unsuccessful cases of non-innovators. These may be firms developing/adopting new products and processes that haven't translated into innovations by the time the questionnaire was delivered. The criticism stresses the fact that the focus on output may neglect important aspects of the innovation process. Given that not all firms attempting to innovate are, in fact, successful, analysing failures or firms who are only "potentially" innovative, may also contribute to policy effectiveness in assisting firms overcome the obstacles to innovation (Costa 2005; Salazar and Holbrook 2003; Arundel et al. 1998).³

Finally the Oslo Manual does not enquire into the relations among firms and between firms and other organisations in the innovation system. As a consequence, little is known about the dynamics of national innovation systems and on firms' linkage capabilities (Salazar and Holbrook 2004). Firms' "linkage capabilities" is a concept developed by Sanjaya Lall which addresses the ability of firms to establish collaborative relationships with other firms, R&D institutes, universities and government agencies;

³ Several other critics to the Oslo Manual that not deal specifically with the purpose of this work have been left aside; Issues regarding, for instance, innovation in the service sector. For further discussions, see Salazar and Holbrook 2003; Arundel et al. 1998.

Aspects considered paramount to firms' competitive and technological performance (Lall 1992), as demonstrated by numerous empirical studies (see below the discussion about the application of the network approach and analysis to the study of innovation). To acknowledge for this, the third version of the CIS has introduced some questions regarding collaborative innovation. Moreover, the subject is deeply addressed in the recommendations for innovation surveys for developing countries.

Developing countries have rapidly followed the wave of Innovation Surveys, Chile being the first one in 1995 to do so. After the first results, however, a debate started about the need to adapt the Oslo Manual, developed by developed economies, to the peculiar characteristics of technological change in developing countries.

The core of the criticism regards the very conceptualisation of innovation, which fails in considering specific features of the innovation activity in developing countries. As pointed by Salazar and Holbrook (2003) and INTECH (2004), these are: The informal organisational setting where innovation often takes place; a relatively smaller amount of R&D projects; the importance of organisational and incremental changes in the innovation process; the structure and fragmentation of innovation flows in the national system of innovation and, finally, the acquisition of embodied technology.

The discussions and the efforts to rethink some guidelines applicable to the specific context of developing countries, based more on natural resources than on high technology, led to the Bogotá Manual, published in 2001 by Colciencias and RICYT, both Latin American institutions in the field of Science and Technology, and now applied in Innovation Surveys in several Latin American countries (Chile Innova 2005). This also led to the inclusion of an annex about innovation in developing countries in the revised version of the Oslo Manual (OECD 2005).

One of the most distinctive features in the developing countries' perspective on Innovation Surveys deals with the consideration of a broader category of innovation activities, which goes beyond R&D expenditures in order to capture real technological efforts of firms. The measurement suggested to capture also non-technological innovations takes into account innovation efforts in the form of design, installation of new machinery, acquisition of embodied technology, organisational modernisation and marketing (RICYT 2001).

Another important aspect in the context of developing countries is the network environment in which linkages between the actors of the innovation system take place. Traditionally, such network is weak in these locations, especially for the smaller firms present in the economy. Large and foreign firms have advantages in establishing linkages, especially with international knowledge networks (RICYT 2001). Since much of the innovative routines depend on such linkages, understanding relational processes is core to the comprehension of innovation in these countries (INTECH 2004).

This work builds upon the latest thinking about innovation. In dealing with innovation in a middle-income country like Chile and with an industry still at its early stage of development, innovation cannot be confined to (and measured by) mere investments in R&D. The work also follows the systemic conceptualisations in what it acknowledges the importance of the network component for innovation processes, as well as the necessity to define innovation in incremental terms, rather than in radical, and to distinguish between different forms of innovation (product, process and organisational). All these aspects have informed the design of the empirical research carried out in this work, from the conceptual and operational definition of the key variables to the data collection process and analysis, as well as the unit of analysis considered, which is not limited to the individual firm but it also includes the network of relations it establishes with the outside world, and that becomes vehicle for knowledge that can then be converted into innovation.

II.2. knowledge: Definition, importance, sources

II.2.1. Defining knowledge

For decades it has been well understood by economists that knowledge is a major component of economic growth. Early analysis of knowledge (Arrow 1962; Nelson 1959) viewed it as a public good, that is, expensive to create, but non-rival, infinitely extensible, and virtually costless to duplicate. On this view the major issue is the (lack of) incentive to create knowledge since it is difficult to appropriate. More recent inquiry, instead, has emphasized the tacit nature of knowledge (Nelson and Winter 1982; Cowan et al. 2000), the fact that an agent may have difficulty absorbing existing

knowledge (Cohen and Levinthal 1989), and the stickiness of data, which move only with difficulty from one location to another (von Hippel 1994).

Technological change is a very complex phenomenon, which suggests that we must go beyond the notion of technology as information, and that viewing innovation as a linear process neglects some important dimensions of the innovative process. Representing technology as information, neglects the important role of tacit knowledge and the complex links between various institutions in the economy. The results from historical and quantitative studies of technological change suggest that using a non-linear approach and a systemic perspective is essential to understand the generation of innovation.⁴

Technology can be seen in two main ways: as a body of knowledge, or as an artefact (Zack 1999). These two definitions are linked, since an artefact embodies the knowledge needed to produce it. Knowledge can be viewed both as a thing to be stored and manipulated and as a process of simultaneously knowing and acting (i.e. applying expertise) (Zack 1999). It is therefore essential to consider the nature of the knowledge required to produce artefacts. Information, the instructions necessary to transform raw materials, is only one part of technology.

Technological knowledge also requires skills that are not codifiable and can only be acquired through experience (for instance, learning-by-doing). Those tacit skills are necessary to use codified information effectively, and the newer the technology, the more important is the tacit element (Nonaka 1991; Simmonds et al. 2001).

Therefore, a first step in defining what knowledge is, consists in distinguish it from data and information. Data represent observations or facts out of context, and therefore not directly meaningful. Information results from placing data within some meaningful context, often in the form of codified instructions. Knowledge is “that which we come to believe and value based on the meaningfully organized accumulation of information (messages) through experience, communication or inference” (Zack 1999 : ???).⁵

This conceptualisation of knowledge consists of two parts: information (explicit knowledge) and know-how (tacit knowledge) (Nonaka 1991; Simmonds et al. 2001).

⁴ For an historical approach see, among others, Dosi (1988), Rosenberg (1994) and Von Tunzelmann (1995).

⁵ Knowledge has also been defined as information whose validity has been established through test of proof and can therefore be distinguished from opinion, speculation, beliefs, or other types of unproven information (Liebeskind 1996).

Explicit knowledge can be more precisely and formally articulated; it can be more easily codified, documented, transferred or shared; It can be written down (Grant 1996; Nonaka 1994). Tacit knowledge instead is difficult to identify and explain because it encompasses the owner's accumulated experience, intuition, and judgment; it is subconsciously understood and applied, difficult to articulate, developed from direct experience and action. Because it involves both technical and cognitive elements, tacit knowledge is difficult to formalize and to communicate, and sharing it often raises uncertainty because it may give rise to multiple interpretations (Grant 1996; Nonaka 1994). While explicit knowledge can be found on manuals, tacit knowledge is shared informally, through highly interactive conversation, story-telling and shared experience.

The critical distinction between tacit and explicit knowledge, then, lies in their transferability across individuals, space, and time (Grant 1996). The issue is important, as the balance struck between tacit and explicit knowledge can affect competitive performance (Zack 1999). Explicit knowledge is playing an increasingly large role in organizations, and, as it will be better explained in the next section, it is considered by some to be the most important factor of production in today's economy.

Zander and Kogut (1995) have shown that increasing degrees of knowledge codifiability and teachability speed knowledge transfer. Although tacit knowledge develops naturally as a by-product of action, it would be more easily exchanged by being made explicit. However, appropriately explicating tacit knowledge so it can be efficiently and meaningfully shared and reapplied, is one of the least understood aspect of knowledge management.

Comparing the potential explicability of knowledge to whether or not it has actually been articulated defines different situations regarding the balance between tacit and explicit knowledge. Potentially explicable knowledge that has not been articulated represents a lost opportunity to efficiently share and leverage that knowledge. If competitors have articulated and routinised the integration and application of similar knowledge, then they may obtain a competitive advantage. In contrast, knowledge that is inherently difficult to articulate, although firms attempt to make explicit, may result in the essence of the knowledge being lost (Zack 1999).

Knowledge may be inherently tacit or may appear so because it has not yet been articulated due to social constraints. Articulating particular types of knowledge may not

be culturally legitimate, challenging what the firm knows may not be socially or politically correct, or the organization may be unable to see beyond its customary habits and practices. And of course, making private knowledge public and accessible may result in a redistribution of power that may be strongly resisted in particular organizational cultures. Knowledge also may remain unarticulated because of intellectual constraints in cases where organizations have no formal language or model for its articulation (Zack 1999) .

Knowledge is either created within the organization or acquired from many different internal and external sources (suppliers, customers, universities, research centres, other firms, business associations, governmental and non-governmental institutions). Capturing knowledge, however, involves a value-adding processes consisting of cleansing, abstracting, standardizing, integrating, and re-categorizing (Zack 1999) and thus requires internal capabilities (Lundvall and Nielsen 1999).

Having a strong knowledge base, including R&D capacity and a well trained labour force, is key to successful innovation (Lundvall and Nielsen 1999). R&D efforts constitute an important (although neither necessary nor sufficient) condition for a firm's successful exploitation of knowledge (Gambardella 1992).

Education and training enhance competencies and give people and organisations the basis to acquire knowledge and introduce innovation (Lundvall and Nielsen 1999). Thus, the impact that acquired knowledge will have on the organization's performance will depend on the firms' ability to exploit its knowledge and learning capabilities better than the competition. Characteristics of actors important in the knowledge-sharing process include the absorptive capacity, the ability to exploit outside sources of knowledge (Cohen and Levinthal 1990; Szulanski 1996), levels of motivation, (Szulanski 1996), and spatial proximity (Strang and Soule 1998).

Like individuals, organizations acquire skills that relate to the organization as a whole. Such skills include also the way people interact, such as the organizational setting and corporate culture, as well as employees' skills. These skills are specific to each firm as they are learnt through experience. Likewise, the firm-specific context also affect knowledge transfer mechanisms: The formal rules, as well as the socio-cultural factors affecting knowledge management such as culture, power relations, norms, reward systems, and management philosophy are of great importance (Zack 1999). In

addition, variations in the organizational contexts with respect to formal structures may affect the number of attempts and outcomes of attempts to transfer knowledge (Szulanski 1996): Interconnected organizations such as chains can transfer knowledge more readily across their respective units (Argote et al. 2000).

Therefore, relationships between knowledge sources and recipients are also an important determinant of knowledge transfer (Strang and Soule 1998). Cohesion through strong ties such as close social relations, organizational cultures, or a shared identity promotes knowledge sharing in a number of ways. These include frequent interaction, pressures for conformity, increased trust, and individuals feeling more comfortable sharing knowledge with those belonging to the same group (Kane et al. 2005; Strang and Soule 1998; Wang and Nicholas 2005). In addition, weak ties such as those between individuals in overlapping social circles play a role in knowledge sharing through the spreading of news or information (Granovetter 1973; Strang and Soule 1998).

Moreover, the exploitation of available knowledge will be pervasively influenced by the broader institutional environment of its use. Knowledge creation, sharing, and leveraging requires a climate and reward system that values and encourages cooperation, trust, learning, and innovation and provides incentives for engaging in those knowledge-based activities and processes. Therefore, in order to understand the recombination of knowledge into innovation, it is important to understand the social context firms are embedded in (Fleming 2001; Fleming and Juda 2004; Grabher 1993).

II.2.2. The knowledge-based view of the firm

In recent years, knowledge has emerged as the most strategically significant resource of the firm (Grant 1996). Many scholars have written that knowledge is the key ingredient in gaining a competitive advantage (Gnyawali et al. 1997; Kogut and Zander 1992). Because knowledge-based resources are usually difficult to imitate and socially complex, heterogeneous knowledge bases and capabilities among firms are thought by scholars in the organisational and management literature to be the major determinants of sustained competitive advantage and superior corporate performance.

More of a set of ideas about the firm that emphasize the role of knowledge, rather than a theory in any formal sense,⁶ the “knowledge-based view of the firm” is based on a number of assumptions concerning the nature of knowledge and its role. These include the idea that knowledge is the overwhelmingly important productive resource in terms of market value and the primary source of Ricardian rents (Machlup 1980; Grant 1996); and that there are different types of knowledge that vary in their transferability: explicit knowledge can be articulated and easily communicated between individuals and organizations, while tacit knowledge (skills, know-how, and contextual knowledge) manifest itself only in its application and cannot be articulated easily, thus transferring it from one individual to another is costly and slow (Nonaka 1994; Kogut and Zander 1992).

According to this view of the firm, knowledge is subject to economies of scale and scope. The underlying idea is that initial creation of knowledge is more costly than its subsequent replication. Economies of scale in knowledge together with the complementarity of different types of knowledge imply increasing returns. To the extent that knowledge is not specific to the production of a specific good, economies of scale translate into economies of scope. The extent of economies of scale and scope vary considerably between different types of knowledge. They are especially great for explicit knowledge, information in particular, which is “costly to produce, but cheap to reproduce” (Shapiro and Varian 1999: 3). Tacit knowledge, instead, tends to be costly to replicate, but these costs are lower than those incurred in its original creation (Winter 1995).

Other key elements of this view are the idea that knowledge creation requires specialization (Simon, 1991), while knowledge application requires diversity of knowledge (Kogut and Zander 1992). Given the limited transferability of knowledge, this presents considerable difficulty for the organisation. The solution lies in some process of knowledge integration (Demsetz 1988).

⁶ Originating from the strategic management literature, this perspective builds upon and extends the resource-based view of the firm (RBV) initially promoted by Penrose (1959). Although the resource-based view of the firm recognizes the important role of knowledge in firms that achieve a competitive advantage, proponents of the knowledge-based view argue that the resource-based perspective does not go far enough. Specifically, the RBV treats knowledge as a generic resource, rather than having special characteristics. It therefore does not distinguish between different types of knowledge-based capabilities (Alavi and Leidner 2001).

The knowledge-based view of the firm focuses on knowledge creation and mobilisation within organizations. However, the capability of a firm to absorb knowledge and information from external sources is one of the pillars in the process of transformation of knowledge and information into new knowledge and its conversion into new value.

Cohen and Levinthal (1990) have developed a framework, which conceptualises the effectiveness of processes relating to learning and knowledge creation and the absorptive capacity of firms. The absorptive capacity refers to the ability of firms to not only acquire and assimilate new external knowledge but also the ability to apply such knowledge to commercial ends and thus create the opportunity for profit (Cohen and Levinthal 1990).

The absorptive capacity framework relies on two important elements: the existing knowledge base, and the intensity of efforts made for the development of technological capabilities (Kim 1999). The existing knowledge base increases the ability to search, recognise and represent a problem as well as assimilate and use new knowledge for problem solving. The intensity of effort in problem solving refers to the amount of energy that members devote to solve problems (Kim 1999). People and firms possess different amounts of knowledge to the extent that they have different experiences and have performed different levels of efforts.

Rather than being viewed as a vehicle for processing information (i.e. the standard neoclassical view of the firm as an agent that simply reacts to information signals that it receives from the outside), firms are conceived as a collection of resources and capabilities and considered as organisations that can learn, share, diffuse, and create knowledge through interaction. Cognitive processes are cumulative, idiosyncratic and path-dependent, as past and accumulated experience determine the capability of firms to absorb knowledge and further develop new products, processes or services (Cohen and Levinthal 1990).

Besides Cohen and Levinthal (1990), this perspective is present in several scholars. Teece et al. (1997) and Zollo and Winter (2002) use “dynamic capability” to refer to competences and capacities not necessarily R&D-based, that may involve many non-technological dimensions but that are drivers of innovation. An example is provided by Hirsch-Kreinsen et al. (2003) with the case of hospitals that show low knowledge

intensity (R&D is done elsewhere) and high competence intensity, including a very high skilled staff.

The notion of absorptive capacity may be enhanced in a way to encompass the capability of the firm to interact with other actors and access external sources of knowledge (Kastelli et al. 2001). In a world of increasing competition and rapid technological change, the firm cannot rely only on its own capabilities and knowledge base but needs to benefit from the experience and knowledge of other economic actors. More and more, innovative companies establish linkages with other actors and access external knowledge in order to benefit from the dynamic effects of interactive processes. A firm's in-house resources and capabilities may not be always adequate for solving complex technical problems.

Increasingly, then, know-how and competence is developed interactively and shared within subgroups and networks (Lundvall 1994). Economic literature on innovation positively relates interaction between organisations with innovativeness. Firms need to make relation-specific investments and be able to benefit from interaction with other agents in order to produce high added value and novelty (Caloghirou et al. 2004).

II.2.3. External sources of knowledge and innovation

If innovation was once thought of as merely a product of a firm's autonomous research and development (R&D) department (Nelson 1959; Mowery 1983), in today's fast-paced advanced technology industries, however, the innovative capability of a company cannot be studied without considering the external organizational relationships that firms maintain with numerous kinds of partners such as universities, research institutes, public and private laboratories, granting councils, consulting companies, standards-setting or certification agencies (Powell et al. 1996).

Even though the innovation capacity of a firm depends first of all on its own internal capabilities (Von Hippel, 1988; Lundvall, 1988; Hakansson, 1989), networking and knowledge exchange between clients, suppliers, universities, etc. have a key role to play. A firm's competitive position is increasingly based on the existence of networks where exchanges of codified and tacit knowledge occur.

International experience suggests that developing horizontal linkages and engaging in joint activities are key factors underlying the capacity of SMEs to insert themselves

effectively into global value chains, since networking facilitates lobbying government for assistance, and undertaking joint activities, such as quality auditing, branding, and especially learning and innovation (Kaplinsky and Morris 2006).

Recent technological changes have had the effect of making the knowledge base on which both production and innovation are founded, much broader, covering more and different types of knowledge (Cowan and Jonard 2006). As a consequence, firms increasingly discover that their in-house knowledge is not sufficient for efficient production or innovation. This has driven them to seek the knowledge they need outside.

However, and precisely due to the nature of knowledge, this task is difficult to achieve through pure market interaction. Thus, firms are now forming relatively long term alliances, formal and informal, with other, often competing, firms. Strong, stable contacts with other firms can provide a firm with the knowledge it needs for its immediate production or innovation. In addition, contacts of this type can also provide a form of insurance, giving a firm rapid access to information about developments taking place in other firms or related industries (Cowan and Jonard 2006).

Knowledge transfer, particularly among competing firms, is a challenge for economists, especially if there is no market for knowledge (Cowan and Jonard 2006). Two patterns of transmission have been observed empirically. Allen (1983) describes “collective invention” in which knowledge is given away as a (local) gift. In the steel industry in Cleveland U.K. in the mid 19th century, for example, steel producers met regularly under the auspices of societies like the Cleveland Institute of Engineers, the South Wales Institution of Engineers or the national Iron and Steel Institute and disclosed their own recent technological developments. As a producer made an advance, that producer would document the change - how it was accomplished, the technical effects and so on - and present this to other local firms. Knowledge was essentially given away to competitors within the local cluster, and as a consequence, the technology developed rapidly (Cowan and Jonard 2006). Von Hippel (1987) on the other hand documents a barter exchange. Technical managers of steel mini-mills in the US exchange technical information and explicitly help each other solve problems. But here the transfer is not a gift: there is a *quid pro quo*. While the interaction is not market-based, there are social sanctions if an agent routinely receives but does not give

knowledge. In essence, knowledge is bartered. In both of these cases, knowledge transmission is local, taking place in face-to-face interactions (Cowan and Jonard 2006).

University-industry cooperation also has increased in importance, in both industrialised and developing countries (Fransman and Tanaka 1995; Geuna 1997). In a world of increased competition and rapid technological change, firms seek to access external technological resources from the academic sector and complement or substitute expensive R&D efforts. Cooperation with universities or research centres may assure a critical mass of R&D for projects that are considered too expensive or risky for a company (Vavakova 1995). Recent surveys in developed economies show that as industrial research is facing pressures to decrease time-to-market for new inventions. Basic research in corporate laboratories aiming at the creation of new scientific knowledge has decreased, and the remaining basic research is closely linked to related applied research activities (Caloghirou et al. 2004). On the other hand, universities are also under the pressure of integrating the real world into their research and teaching activity and becoming more applied (Carayannis et al. 2000). This is why the number of collaborations between firms and academia has increased over the last 15 years. This type of collaboration has been significantly promoted by public national and supranational policies as a way for increasing the interaction between research and markets, and foster specific technology intensive sectors.

According to modern innovation theory, the complexity of the array of agents within an economy, and the complexity of the interactions between them can be regarded as a key element of the innovation processes. Systemic approaches to innovation in particular, point to the idea that economic knowledge is a complex outcome of such interactions. From this perspective knowledge creation and use is a socially collective process. This means firstly that it is misleading to think of knowledge creation in terms of simply the internal R&D performed by a firm (which is what is implied by using R&D intensity indicators as a measure of knowledge intensity). Secondly, it is misleading to think, as argued in some new growth theory literature, of a single knowledge producing sector that supplies generic knowledge to the rest of the economy.

II.3. A network perspective on knowledge flows and innovation

II.3.1. Why a network perspective for the study of innovation?

The previous sections introduced to the idea that innovative efforts, are increasingly based upon interaction with a multiplicity of heterogeneous actors.

One important consequence of conceiving technology as a system is that we have to look beyond the firm that ultimately introduces the innovation to identify the sources of new technology. Although usually introduced by private firms, innovation is the product of a system of institutions that are closely linked together by economic and social relationships. If some of the relevant institutions are missing or cannot communicate properly, then the whole innovation process is jeopardised.

In scholars' recent effort to understand what explains heterogeneous performance of firms, several studies have emphasised the external environment of firms, and have indicated that the position of firms in inter-organizational networks influences firm's behaviour and outcomes (among others, White 1970; Granovetter 1985; Powell et al. 1996; Walker et al. 1997). As scholars in the innovation and inter-organizational learning literatures have argued, this is because linkages work as vehicles through which firms obtain access to external knowledge (Powell et al. 1996) that then can be recombined into innovation.

The importance of different activities and institutions in the innovation system varies across industries according to how knowledge is generated.⁷ In some industries, scientific discoveries are important. In other, the learning generated in the interaction between the innovators and the users of new technology is more important, while in others suppliers are a vital source of innovation (Pavitt 1984).

The idea of technical change as a process of accumulation of knowledge in a system of institutions brings a new way of looking at technical change. The way in which institutions interact during the innovation process is far from linear. Innovative activities are constantly carried out to improve existing products and generate new ones,

⁷ Technological systems have been defined in different ways. Freeman (1988), Lundvall (1992) and Nelson (1992), for instance, explore the importance of national systems of innovation for technology policy. Carlsson and Stankiewicz (1991), on the other hand, define technological systems by dimensions such as the type of product, the actors that are part of the system and its institutional structure. The boundaries of such technological system do not coincide with a country's boundaries, and the inclusion of multinational companies gives them an international dimension.

and feedbacks occur between the different stages of the innovation process. The distinction between invention, innovation and diffusion becomes blurred, and instead of focusing on innovations as isolated acts which introduce discontinuity with the past, each innovation is just a small step in the continuous advance of a technology, which co-evolves with the institutions that are part of the system (Dosi 1982; Nelson and Winter 1982; Freeman and Perez 1988).

The systemic approach poses the accent on the interaction between heterogeneous actors, rather than on the attributes of these. Network analysis is a useful analytical tool to account for the systemic approach, since it focuses on the relations connecting pairs of agents into larger relational systems, where the relations are not the property of agents, but of systems of agents (Scott 2000). The network perspective “allows new leverage for answering standard social and behavioural science research questions by giving precise formal definition to aspects of political, economic, or social structural environment” (Wasserman and Faust 1994 : 3).

In the industrial organisation and management field, numerous studies show that networks may serve as loci of innovation because provide favourable access to knowledge and resources that are otherwise unobtainable. Ties between actors can provide access to knowledge, as well as serving as information conduits through which news of innovations, discoveries and successful (or failed) approaches, and insights to problems travel within the firm or from one firm to another.

In study of the biotechnology industry, Powell et al. (1996) attempt to test empirically the claim that when the knowledge of an industry is broadly distributed and rapidly changing, the locus of innovation will be found in inter-organizational networks of learning, rather than in individual firms. Breschi and Lissoni (2003) as well as Singh (2003) expand the study of Jaffe et al. (1993) and find that social proximity has a stronger relevance for the degree of knowledge spillovers than geographical proximity.

II.3.2. The contribution of Social Network Analysis (SNA) to the study of innovation

Social network analysis provides a way of quantitatively analyze relationships among people or other information-processing agents.⁸

Collaboration between mathematicians, statisticians, and computer scientists in this field led to a rapid development of formal analyzing techniques which made it an attractive tool for other disciplines like economics, marketing or industrial engineering (Scott 2000). This is probably why, in the last decade, there has been a rapid increase of network research in several disciplines, and in innovation research in particular. Academics argue that one of the reasons behind management theory's interest in network today is because of the emergence of a new form of competition (Nohria 1992). Whereas the old model of organizational form was the large hierarchical firm, the model of organization that is considered characteristic of the new competition is networks of direct and indirect linkages among firms (Nohria and Garcia-Pont 1991; Nohria 1992; Schilling and Steensma 2001, Verspagen and Duysters 2004). Borgatti and Foster (2003) have shown that the exponential growth of the literature in social network research is part of a general shift, beginning in the second half of the 20th century, away from individualist, atomistic explanations toward more relational, contextual and systemic understandings (Coulon 2005).⁹

An important distinction made by social network analysts is the one between information about the social actors and information concerning the social structures within which these actors are located. Wellman (1988) clearly emphasize this paradigm:

⁸ Social network analysis is an interdisciplinary methodology developed mainly by and researchers in social psychology in the 1960s and 1970s. SNA combines the concept of the sociogram (a visual representation of relationships in a social group) with elements of graph theory to analyze patterns of interaction among people in various kinds of networks, allowing quantitative comparisons between different network structures. There is a large body of scholarly literature describing the use of SNA. Much of this work addresses the basic science of SNA, that is the development of theoretical models of network organization and the mathematical derivation of quantitative measures of network characteristics. More recent work examines the association of these quantitative measures with organizational performance outcomes (Scott 2000).

⁹ The increasing interest in the use of network analysis can also be explained by the availability of standard texts (Wasserman and Faust 1994; Scott 2000), the emergence of robust software package needed for the complex calculations involved in the measures previously introduced, such as UCINET, and packages for the visualisation of large networks, such as NetDraw or Pajek. Moreover, the diffusion of this methodology to a large audience of researchers in various areas of social science is accelerated through international conferences (the Sunbelt Social Network Conferences) since 1997, sponsored by the International Network for Social Network Analysis (INSNA), which exists since 1978 and has its own electronic Journal of Social Structure (JoSS) since 2000.

“behavior is interpreted in terms of structural constraints on activity rather than in terms of inner forces within [actors]” (Wellman, 1988: 20). For some social network scholars (Doreian, 2001: 83), the “rather than” can be replaced by “in addition to.” Therefore social network analysts have developed two strands of thought: In one, they focus only on structure to interpret behaviour; In the other, they focus on both structure and actor-diversity to interpret behaviour.

In the second strand the network is viewed as a conduit for the propagation of knowledge or the exertion of influence, and an individual’s place or position in the overall pattern of relations determines what knowledge that person has access to or, correspondingly, whom he or she is in a position to influence.¹⁰ This is the approach taken in this work.

The purpose of this section is to review the innovation research literature which has made an explicit use of social network analysis methodology in order to provide empirical support to innovation theories. Although traditionally SNA has focused on networks of individuals, this section reviews studies which make use of SNA measures applied to networks of firms, other organisations, patents, and even whole sectors. When not dealing with individuals but, for example, with organizations, it should be used the term “network analysis” instead of SNA. This is what it will be done in the rest of this thesis. All measures developed by social network analysts, however, can be adapted to networks of firms or other organizations, since the network nodes can represent anything from humans and organizations to technologies.

In spite of the accumulation of studies focusing on organizational relations and networks over the last decades, Oliver and Ebers(1998) suggest that this work has not resulted in an accumulation of knowledge, nor in a conceptual consolidation. By examining several articles from leading journals, the authors have shown that methodological approaches are dominated by cross-sectional, quantitative empirical studies carried out at the organisational level. They also argue that there has been a

¹⁰ An exception to these strands is Granovetter (1973), which introduced the distinction between strong and weak ties, e.g., contractual/formal and informal ties, or friend and acquaintance. Granovetter shows that effective social coordination does not arise from densely and strongly interconnected networks but from the presence of occasional weak ties between individuals who frequently didn’t know each other that well or have much in common. According to Granovetter’s “strength of weak ties” theory, in order for an individual to get a job, it is not its close friends who are important and who will inform about that job but casual acquaintances who can give access to information that would never have been received otherwise (Scott, 2000: 34-35).

focus on the driving forces behind inter-organizational networking, rather than on the possible consequences or outcomes of networking (such as network performance), and there has been little attention devoted to analysing the detailed structuring of the relationships between organisations (Sobrero and Schrader 1998).

Since 1999 there seems to be a rapid increase in the number of empirical studies employing network analysis, thus looking at the detailed structuring of the relationships between organisations and at the impact of network structure on performance, particularly in innovation studies (Coulon 2005). Powell et al. (1996), for instance, found that strong-performing firms have larger, more diverse alliance networks than weak-performing firms.

In social network analysis, the observed attributes of social actors (such as innovation, access to resources, and strategy) are interpreted as a function of their location in the network and, therefore, network position, which is an outcome of the relationships between actors, is considered a key variable (Wasserman and Faust 1994). The idea behind the network approach and the conclusion of many studies that apply it to innovation is that network position could be considered as an intangible strategic resource. This consequently raises the question of how a firm can position itself to access useful knowledge from other organizations to gain innovation benefits.

Roughly speaking, there are two competing views about how a firm's position in a network affects its performance. On the one hand, following Coleman (1988), it is possible to argue that dense sub-groups are a source of social capital. A group of highly inter-connected agents generates trust, common languages and problem solving and social disapprobation for opportunistic behaviour. If i is working on a problem, using information gathered from j and k , or in discussion with j and k , an ability of j and k to discuss the problem with each other, or exchange information about it, can only have a positive effect on i 's ability to solve its problem. This approach is observed, for instance, in empirical studies by Dyer and Nobeoka (2000), on the automobile industry; Gulati and Gargiulo, (1999) in a study of alliance formation in several industries; Powell et al. (1996) who study the impact of network position on innovation performance in the biotechnology sector; and Rowley et al. (2000) in a study of strong and weak ties in innovation networks in the steel and semiconductor industries.

On the other hand, Burt (1992) argues that dense local links are redundant, that locally dense networks can be a source of rigidity, and that the existence of structural holes in a firm's ego network is efficient. According to Burt (1992), ties that lead to the same actors are redundant. Structural holes are lack of ties between ego's partners. A structural hole (gap in the information flow) indicates that the people on either side of the hole have access to different flows of information (Hargadon and Sutton 1997). Ego networks rich in structural holes then, imply access to mutually unconnected partners and, consequently, to many distinct information flows. Actors embedded within networks rich in diverse knowledge and information will have a higher probability of creating novel innovations, relative to those embedded within networks with redundant information and knowledge (Burt 1992): Access to diverse knowledge provides more potential combinations from which to select when recombining it into an innovation (Fleming and Sorenson 2001), under the obvious condition that the diverse knowledge is appropriate to the intended task. This is closely related to the argument of Podolny (1993), that firms attempt to increase their betweenness centrality.¹¹ From the perspective of structural hole theory, then, ego networks in which a firm's partners have no links with each other are preferred to networks in which its partners are densely tied to each other. The structural holes view has been examined empirically by, for example, Ahuja (2000) in the context of the international chemical industry (structural holes have a negative impact on industry performance, whereas indirect and direct ties have a positive impact on firm innovative performance); Gargiulo and Bennassi (1998) who find in a study of an Italian IT firm that dense local networks do not respond well to change (they find a trade-off associated with the safety conferred by cohesive ties (social capital) and the flexibility conferred by ties that connect different parts of a network); Baum et al. (2003) study the sources of inter-clique link formation in the Canadian merchant banking industry.

The contradictory effects of connections between partners prompt two competing predictions with respect to the relationship between structural holes and innovation. If structural holes in ego's network may increase ego's access to diverse knowledge and, thus, enhance innovation performance, at the same time, a more densely connected

¹¹ If many shortest paths between firms go through firm *i*, then *i* can exert considerable control over knowledge flows. Particularly in the knowledge economy, control of knowledge flows can be translated into rents (Podolny 1993).

network, with fewer structural holes, might promote trust and reduce opportunism, leading to more productive collaboration (Walker 1997).¹²

According to Cowan and Jonard (2006), when an industry is young, technologies are being explored, and many different avenues of advance are potentially fruitful. Here, it is important to have rapid access to “distant” (both in geographical and technological space) information. Thus redundant ties are less valuable than ties that connect to different parts of the network. Structural holes are desirable. However, in a more mature industry, there are fewer technological surprises, so exploitation is more common. Here, a dense core of agents addressing similar issues creates the critical mass that is necessary to make further progress along the chosen path. Social capital becomes, then, more valuable.

The most common measure used by scholars that attempt to describe and measure properties of actor location in a social network is centrality. Being centrally located refers to the position of an individual actor in the network and represents the extent to which the focal actor occupies a strategic position in the network by virtue of being involved in many significant ties. Centrality is the structural property most commonly related to beneficial outcomes including access to resources (Sparrowe et al. 2001), influence (Friedkin 1993), and innovation (Ibarra 1993). The idea behind the network approach and the conclusion of many studies that apply it to innovation is that regardless of which ties are analysed, network position is to be considered as an intangible strategic resource.

There are different kinds of centrality that measure different aspects of being a central actor involved in many ties. Degree centrality is one of the most often used measures. Degree centrality refers to a count of the number of ties an actor has, meaning the number of organizations the actor is in contact with. The actor with the most connections, i.e. the highest degree, is the most central. The idea is that actors that are

¹² Providing empirical support to Coleman (1988), Ahuja (2000) findings suggest that while structural holes may positively affect access to knowledge spillover, the impact in terms of resource-sharing is negative. The resource-sharing benefits of collaboration arise from firms combining their skills, sharing their knowledge, and conducting joint projects to obtain scale economies, all of which presume the existence of significant trust between the partners. Without trust and shared norms of behaviour, these actions are likely to be difficult and unproductive (Coleman 1988). Likewise, Gulati and Singh (1998) suggest that in horizontal networks of competitors, connectivity may spur collaboration by reducing opportunistic behaviour and fostering trust. In closed networks, indeed, deviant behaviour is less likely to arise because of the threat of reputation loss, and because sanctions for deviants are more easily imposed (Walker et al. 1997).

more centrally located accumulate greater knowledge and, thus, are in a better position to convert this knowledge into further innovations. As Wasserman and Faust (1994) put it, an actor with a high centrality level, as measured by its degree, is where “the action is” in the network.

Most studies, including this thesis, incorporate centrality measures based on networks of direct ties.¹³ Ahuja (2000) identifies three different channels through which the number of direct ties a firm maintains can have a positive impact on innovation: Complementarity (Richardson 1972; Arora and Gambardella 1990), scale (Shan et al. 1994), and knowledge sharing (Berg et al. 1982). The latter is the focus of this thesis.

There is no agreement among scholars, however, about the relative importance of direct and indirect ties in terms of their contribution to firm’s innovation (Ahuja 2000), and.¹⁴ Indirect ties allow knowledge access in a manner that goes beyond the capabilities of the single firm (Ahuja 2000). Through indirect linkages, a firm can access not just to the knowledge held by its immediate partners but also the knowledge held by its partner’s partners (Gulati and Garguilo 1999; Salman and Saives 2005). Likewise, faced with a specific problem, a firm can activate its network to identify the sources that are likely to be well informed about the specific issue at hand (Freeman 1982). Thus, other things being equal, firms that have many indirect ties, have access to more knowledge than firms whose reach in the network is more limited (Ahuja 2000).

In spite the fact that both direct and indirect ties seem to have positive effects, Ahuja’s (2000) suggests that the relative addition to knowledge through indirect ties is likely to be greater for firms with few direct ties than for firms with many direct ties (Ahuja 2000). In addition, firms with many direct ties may even be limited in their ability to profit from information from their indirect ties for when a firm’s partners have

¹³ Many authors (among others, Gulati and Garguilo 1999; Salman and Saives 2005), especially in the biotech industry, stress the importance of indirect ties. The authors assume that indirect ties may potentially lead to access to a combination of intangible resources such as information, knowledge, and skills that flow through the network. Granovetter (1973) argued in his classic article that weak tie relations (indirect and informal) give greater access to new information and opportunities. He claims that strong ties (direct) restrict information flows from outside sources. Granovetter proposes that weak relations (indirect ties) serve as bridges to other social groupings holding information and resources unavailable within ones direct social circle. a major benefit of weak ties is that they provide a strong form of social capital for access to knowledge and skills (Granovetter 1973; Walker et al. 1997).

¹⁴ In a study from the biotech industry for instance, Ahuja (2000) found that the magnitude of indirect tie contribution was much smaller than that of direct ties. Using centrality measures and hierarchical regressions in the biotech sector, Salman and Saives (2005) find that by occupying a central position in a network of indirect ties, a firm is more likely to access useful knowledge from its direct partners and increase innovation.

many connections, the information that reaches the firm through the network also reaches many others, who can potentially represent competition for the firm in the use of that information (Ahuja 2000). When information circulates among many potential users, other attributes (alertness, responsiveness, and flexibility) of individual users are likely to determine the benefit that they obtain from it (Zaheer and Zaheer 1997).

A final important characteristic of networks, relatively less stressed in the literature and analysed by Cowan and Jonard (2006), concerns the distribution of edges over nodes, and in particular the extent to which this distribution is skewed, with a few nodes having many links and the majority having few. The authors argue that firms with many existing links are likely to be valuable partners, and so attract more links. If, on the one hand, a large number of partnerships indicates that a firm both has useful knowledge and knows how to collaborate, on the other hand, a skewed distribution implies the presence of “stars” in the network - agents through whom many paths pass. Stars in a network can serve as important centres of knowledge distribution, and so a highly skewed network may be conducive to very rapid diffusion of knowledge. However, while this structure is robust to random failures, since the failure of a randomly selected node affects most likely affects only a few other nodes, it is very fragile to specific failures: If a star fails, many other nodes, and paths between many pairs of nodes, are affected.

The studies reviewed so far focus on the relationships among firms occupying the same position along the value chain. However, customers and suppliers are also important sources of knowledge for firms. Moreover, the learning and innovation process involves simultaneously many different actors, such as universities, research labs, government agencies, trade unions, and so forth. Examples of applications in this sense are done, for instance, by Park and Kim (1999), who provide an inductive taxonomy of industries based on user-supplier relations in terms of knowledge diffusion; Powell et al. (1996) and Salman and Saives (2005), who consider the external organizational relationships that firms maintain with numerous kinds of partners such as universities, public laboratories, investors, and so forth. In the biotech industry; Christensen et al. (2000), who analyse the collaboration between manufacturing firms and knowledge institutions on product development in Australia, Denmark, Austria, Norway and Spain; and Owen-Smith et al (2002), who compare linkages between

research universities, public research institutes and the private sector in life sciences. The literature analysing these other types of interactions are, however, surprisingly less abundant. It is true, however, that the specific role different actors may play should be evaluated looking at the specific institutional context and industry.

After this overview of the literature answering the question of how network analysis has been used so far in innovation studies, it is also important to understand why it was used instead of other available methodologies, for example, statistical analysis or case study (Yin, 2003).

According to Coulon (2005), the use of (social) network analysis in innovation research has been mainly motivated by the need to explain or simply describe *causal (social) mechanisms* related to innovation. The author defines a causal mechanism as the process by which a cause brings about an effect. And, following Kosowski (1996), a *mechanism* is a theory or an explanation about how one event causes another (Coulon 2005). Thus, a causal mechanisms related to innovation is the study of the process by which “social proximity” has an effect on “knowledge spillovers”, or the process by which “network structure” shapes or affects “innovative output.” What is meant by the words between quotes depends on the theory chosen to formulate the research question relative to the causal mechanism under study. In many of the studies reviewed here, the causal mechanisms are the process by which interactions between agents cause another event such as the creation of something new (e.g., new knowledge). Statistical analysis alone cannot help for studying these interactions or relations between agents because it is based on the inputs and outputs of the causal mechanism, neglecting the causal mechanism itself, which is considered as a *black box* (Coulon 2005).

Coulon (2005) also argues that among the network literature, few studies have made use of case studies for exploring node diversity in addition to network analytical constructs. With the exception of Cambrosio et al. (2004) that show how network visualization can be successfully blended with and used as an input for more traditional ethnographic research which, in turn, can be recursively used to interpret network patterns.

In this thesis, a combination of network and statistical analysis, as well as case study is used. These different methodologies are intended as complementary, allowing together a more complete understanding of the innovation process.

II.4. A Global Value Chain perspective on knowledge flows, innovation and upgrading

II.4.1. Why a Global Value Chain (GVC) perspective for the study of innovation and upgrading?

The literature reviewed in the previous sections focuses on the network of relationships firms develop with other firms and other type of organisations. Although they stress the systemic nature of innovation processes, they also seem to neglect that firms simultaneously develop horizontal and vertical linkages. When supplier-buyer relationships are considered, they are analysed as all the other relationships, without considering an important aspects that characterise vertical linkages, namely, the distribution of power within the chain which, in turn, affects the transfer of knowledge.

In the following sections, the network approach will be complemented with a chain approach which, by also taking a systemic view on innovation, it emphasises some important characteristics of firms learning and innovating in global value chains.

Analyses that take the entire production chain into account are not new. The literature on the French filière, which has its origin in technocratic agricultural research developed by French researchers at the Institute National de la Recherche Agronomique (INRA) and the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), used the concept of chain (filière) to study primarily agricultural export commodities such as cotton, coffee and cocoa (Raikes 2000). The application of the filière approach to agriculture in developing countries was heavily influenced by the needs of the colonial and post-colonial French state, since state (agricultural) development policy in former French colonies was commodity-centred and required a matching framework. For this reason, the filière research has more often been directed towards former French colonies in Africa or Asian countries.

The Anglophone Global Commodity Chain (GCC) analysis was developed by Gary Gereffi and other scholars within a political economy of development (and underdevelopment) perspective, originally derived from world systems theory, itself an elaboration of dependency theory (Wallerstein 1974; Hopkins and Wallerstein 1994). Differently from the filière approach, mostly confined to the local or national

dimension, the Global Commodity Chains (GCC) approach (Gereffi and Korzeniewicz 1994), stresses the fact that current economic integration goes beyond the trade in inputs and outputs to encompass coordinated but internationally dispersed production of many of the activities along the chain. “Global”, indeed, refers to the fact that many of the activities and functions that were previously carried out within the vertically integrated corporations are now externalised.

In contrast to the *filière* analysis applied to agricultural commodities and without any specific time-frame, Global Commodity Chain analysis has been developed primarily for industrial commodity chains, mostly originating in Southeast Asia, which are seen to have been globalised somewhere between 1960 and 1980, and to be related to various processes normally referred to as globalisation and/or “post-Fordism” (Raikes et al. 2000).¹⁵ Indeed, it is claimed that the study of commodity chains has revealed the potential for unveiling some of the key characteristics of contemporary capitalism, and the dynamics of change that have emerged in the age of globalisation. It can also capture the changing role of developing countries in the precise context of global commodity chains.

In spite both traditions study specific commodities by covering all or most processes and transactions from primary processing to consumption, they are separated in their political and theoretical grounding. In the Francophone *filière* tradition, the concept of chain is a neutral category, and it constitutes a mere empirical tool for the analysis of activities and exchanges concerning a specific commodity, and as a way to delimit the scope of such analysis (Gibbon and Ponte 2005). Within this approach, importance has been attached to the technical side of the material flow rather than to the role of social actors. The GCC approach, on the contrary, deals with power issues neglected in the French tradition, stressing the control of key agents within the chain. Until recently, the only powerful agents in *filière* studies were the public institutions which regulate trade and marketing, on whose behalf much of the *filière* analysis was performed (Raikes et al. 2000).

¹⁵ The GCC approach, especially in the mid-Nineties, when it started gaining attention, was mainly adopted in the analysis of manufacturing, particularly in the textile industry. Later applications were in services (Rabach and Kim 1994), electronics (Kennedy and Florida 1994), tourism (Clancy 1998), footwear (1999), automobiles (Barnes and Kaplinsky 1999) and finally agriculture (Dolan and Humphrey 2000).

In spite of their differences, both the *filière* and the GCC traditions seem to be more “approaches” to the study of commodity chains than “theories”. In comparison to the *filière* tradition, that constitutes an assembly of studies using different approaches rather than a body of literature unified by the same theoretical approach, the GCC tradition provides a much more coherent approach. Nevertheless, although most recent work on upgrading within GCC (Gereffi 1999; Gereffi and Tam 1999) is moving on the direction of fine tuning theoretical concepts, it is still far from constituting a solid theoretical paradigm.

It has been argued that a number of concepts seem to be too loosely defined in the GCC to bear the weight of theorisation imposed upon them. First, as Gereffi et al (2001) argue, the GCC approach is less effective in dealing with chains lacking strong control exercised by a lead firm. The definition of GCC as dominated by a key agent, would seem to exclude flows of any given commodity or product which are not organised and controlled according to the standard “key-agent” pattern. This could be constraining in considering flows of produce that don’t follow to this principle. It has been argued, indeed, that the producer-driven versus buyer-driven distinction may be useful as a general guide at the beginning of a research project, but seems too rigid and uncontextualised to be used uncritically thereafter (Raikes et al. 2000).

Having been developed largely in relation to industrial commodity chains, some aspects of the GCC approach need significant adaptation for use in relation to flows of agricultural products. Certainly, there are agricultural products, such as fresh fruit and vegetables, whose analysis can be set within the category of buyer dominated GCCs. But even in this case, there seem to be subordinate chains which are differently organised, while chains for non-perishable products seem often to fit less well into this set of concepts, for example, having power concentrated neither with producers nor with retailers but dispersed between different links along the chain (Raikes et al. 2000).

According to Raikes et al. (2000), another weakness of the GCC approach is the close relation between capital intensity and technological advancement, which not always holds in fact. Present trends seem to indicate a movement for key agents towards the control of brand names and thus access to markets, that is a movement away from productive activities, including the most technologically advanced. The application of some of the insights of convention theory - derived from the French tradition - could

benefit, claim the authors, the GCC approach, in particular the analysis of how quality conventions may shape the structure and/or restructuring of commodity chains, and how quality determines current competitive strategies observed in the labelling and normatisation processes. Indeed, the GCC approach could be enriched by some of the insights gained in the *filière* tradition, for example, in paying more systematic attention to general types of regulatory change and the specificities relating to particular commodity-groups.

Finally, the authors also argue that the concept of power in GCC could be further elaborated and qualified through empirical grounding.

In recent years there has been a switch in terminology: The term commodity chain has been substituted with the term value chain, borrowed from the industrial organization literature. The new term stresses the sequential nature of economic activity in which each link adds value to the process, and it has also freed the analysis from the “commodity” focus allowing for applications in different sectors.

While in Porter (1985, 1994) the notion of value chain is a tool to help firms in capturing more value added and become more competitive, in political economy - and according to the GVC approach specifically - the subject of study is not the specific firm and its surrounding activities but the chain as a whole, considered as a sequence of links strongly connected one to the other, therefore reflecting a more systemic approach. To this approach the coordination process (or governance) of all the activities required to bring a product to life, from its conception to its end use and beyond, becomes core. The analysis is therefore centred on the flows of resources, finance, information and knowledge between buyers and suppliers (Palpacuer 2000). In comparison to the GCC, the value chain perspective has more seriously attempted to quantify the distribution of profit/value added along chains, just like the *filière* studies have done before. And, likewise the *filière* studies, it has also shown considerably greater historical focus and depth than GCC ones.

Before the Bellagio meeting held in September 1999 in the Institute of Development Studies (IDS) at the University of Sussex, which tried to put some terminological order among the variety of overlapping terms that have been used to describe the different forms of industrial organisation that characterise the global economy, there was some confusion about names and concepts. Although still often (mis)used interchangeably,

the three concepts (filière, Commodity Chain, Value Chain) presented above emphasise different aspects.

In comparison to the two previously reviewed traditions, the Global Value Chain approach, seems to go further in terms of theoretical elaboration, while at the same time integrating aspects of both the filière and the GCC approaches. The relevant additional contribution of the value chain perspective to the previously discussed literatures is that it has tried to provide a definition of the concept of power and of the relation between how power is exercised and the learning and upgrading possibilities at the firm and the industrial level. This approach draws strongly from evolutionary theory in what is characterised by a dynamic perspective. Innovation and upgrading are always an option, although they depend on initial conditions (path dependency). But the idea behind is that advantages are dynamic and can be created through learning processes and innovation efforts. Within the same broad theoretical framework, the GVC perspective shares with the knowledge-based view of the firm the idea that firms are repositories of productive knowledge. In the GVC view, however, firms not only are endowed with immaterial resources such as knowledge, but are active creators of such resources.

The next sections will discuss in detail the value chain approach, as well as the concept of power that characterises it and its relationship with knowledge, innovation and upgrading.

II.4.2. The Global Value Chain approach

The value chain describes the full range of activities that are required to bring a product from its conception, through the different phases of production, to its end use and beyond, and in which each link adds value to the process. The focus moves beyond manufacturing only to include activities such as design, marketing, distribution and support to the final consumer. In this view, essential becomes the problem of governance, that is, how chains are organised and managed (Gereffi et al. 2001). In turn, the problem of governance is directly linked, according to this approach, to the one concerning the distribution of the gains, and the identification of winners and losers in the globalisation process, and how the number of gainers can be increased (Kaplinsky 1998; 2000), which is probably the distinctive feature of the value chain approach in comparison to the approaches described in the previous section.

The concept of value chain refers to integrated but separated and internationally dispersed activities that need to be efficiently coordinated. In doing this, it shifts the focus from the firm to the chain as a whole, adopting a more systemic view, under the idea that “going beyond firm-specific analysis and concentration on inter-linkages, it allows for an easy uncovering of the dynamic flow of economic, organizational and coercive activities between producers within different sectors even on a global scale” (Pietrobelli and Saliola????).

In recent years there has been a growing body of work analysing globalisation processes from the perspective of value chains. Many scholars, especially those researching in sectors such as garment, electronics and agricultural commodities, have taken up the idea that international trade should not be seen solely as a multitude of arms-length market-base transactions, since an important part of it is conducted either within MNCs or through systems of governance that link firms together in a variety of sourcing and contracting arrangements (Gereffi et al. 2001).

In the value chain approach, the unit of analysis is the organisational (vertical) network or chain, rather than the single firm and the main focus are the relationships between firms within the chain. The view of the chain as an integrated system stresses, then, the strategic interaction among actors occupying different links. The analysis is therefore centred not only on the flows of material resources, but also on the exchange of information and knowledge between buyers and suppliers necessary to support the coordination of activities.

The value chain approach emphasises the role that organisational capabilities of leading firms play in the economy. This is a distinctive feature from the neo-classical approach that identifies markets as the key determinants of economic progress, and also from the political science emphasis on the role of the state in shaping national competitive advantage. While competitive markets and effective states are clearly important, the value chain perspective highlights a different dimension ignored by these other approaches, namely, the power exercised by lead firms in global industries and the ways in which the governance structure of these industries shape the creation of markets as well as national development outcomes (Gereffi 2001).

II.4.3. GVC structure and governance

Core to the GVC approach is the concept of governance, that is, the “authority and power relationships that determine how financial, material, and human resources are allocated and flow within a chain” (Gereffi, 1994), and which refers to how the chain is managed and organized, and to how resources (including knowledge) and gains are distributed.

Implicit in the concept of governance is the aspect of control, intended as the direct or indirect influence that one or more actors (firms) in the chain have on the other firms in the chain, and over the organisation of global production, logistics and marketing. The literature highlights two critical parameters of governance: What is to be produced, and how it is to be produced. This includes defining the products to be produced and specifying the processes and standards to be used. Lead firms’ power depends on their market power (measured by concentration or market share) and their position in chain segments in which they can appropriate high returns. Both sources of power derive from a multiplicity of barriers to entry (Kaplinsky 1998, Gereffi et al. 2001). Chains differ with respect to how strongly governance is exercised, how much power is concentrated in the hands of a single firm, and how many lead firms exercise governance over chain members.

Humphrey and Schmitz (2000) argue that buyers exert power, and hence govern, in the following three scenarios: (1) When global buyers are not only competing on price but also on factors such as reliability, product variety, product quality and speed of innovation and there is a gap between market requirements and producer capabilities. Dolan and Tewari (2001) provide examples of this from the horticulture sector in Kenya and in the textile (apparel) sector in India. They argue that both sectors have moved into highly differentiated and complex products, where the specifications are not easily transferred. These factors, claim the authors, place collaborative relationships at the heart of the supply chain. (2) When there is a gap between the knowledge required for production for the domestic market compared to the one required for the export market. Usually the domestic market places fewer demands on firms with respect to quality, consistency and reliability and, in general, the knowledge and capabilities required to produce goods for overseas markets has demanded close interaction between suppliers and buyers. (3) When there are significant risks to buyers due to poor suppliers performance. Especially in the food sector, food safety standards impose much higher

pressure for compliance on producers because of the higher health-risk and consequent penalties in case of deviation. In these cases, compliance can only be achieved through monitoring/verification that, in extreme cases, leads to complete (vertical) integration.

Governance structures in value chains evolve in conjunction with the forces that shape industry structures (Gereffi 2001), and according to Gereffi et al. (2001), power relationships within chains need to be given greater prominence in discussions of chain dynamics. As a consequence, the concept of governance in the GVC literature is dynamic. Humphrey and Schmitz (2002) underline three factors which may determine a governance change: a) power relationships may evolve when existing producers acquire new capabilities; b) establishing and maintaining quasi-hierarchical governance is costly for the lead firm and leads to inflexibility because of transaction specific investments and c) firms and clusters often do not operate only in one chain but rather simultaneously in several types of chains, therefore they may apply competencies learned in one chain to supply other chains.

A relevant aspect in these dynamics is the process of upgrading. Enterprises may upgrade in various ways, as for example by entering higher unit value market niches, by entering new sectors, or by undertaking new productive or service functions. In addition, within this context innovation is clearly not defined only as a breakthrough into a product or a process that is new to the world. It is rather a story of marginal, evolutionary improvements of products and processes that are new to the firm and that allow it to keep up with an international (moving) standard (Pietrobelli and Saliola).

II.4.4. Chain dynamics: Entering, learning and upgrading in GVC

The concept of governance is of particular importance when studying value chains within a development perspective, as the dimension of power emphasises the local firms' capacity to extract rents out of their participation in global value chains, whereas the dimension of co-ordination sheds light on the capabilities needed for meeting requirements and upgrading (Palpacuer 2000).

In chapter one we distinguished two paths of insertion into the global economy. The low road, in which producers face intense competition and are engaged in a "race to the bottom", leading to immiserising growth, and a high road, identified by a virtuous circle of participation into the global economy by realising sustained income growth. The

capacity to innovate, to ensure continuous improvements in products, processes, and organisation, are what explain the differences between the two different roads. Consequently, the ability to learn becomes core, not only for the productive sector itself, but also for the entire National System of Innovation (Lundvall 1992; Nelson and Winter 1993; Kaplinsky and Morris 2006; Pietrobelli and Rabellotti 2006).

In developing countries, following an established line of research exploring the international sources of development – e.g. learning by exporting, FDI spill-over - the Global Value Chain approach has recently shown how international linkages can play a crucial role to access technological knowledge and enhance learning and innovation (Gereffi, 1994 and 1999; Giuliani *et al.*, 2005; Kaplinsky, 2000; Humphrey and Schmitz, 2002; Pietrobelli and Rabellotti, 2006). More precisely, these scholars have developed a framework that ties the concept of value-added chain directly to the globalization of industries, stressing the key role played by global buyers and producers in supporting developing countries' producers learning and innovation activities (Morrison *et al.* 2006).

However, innovation may not suffice. If the rate of innovation is lower than that of competitors, this may result in declining value added and market shares. Thus focus must be placed on how fast compared to competitors a firm is able to innovate. This process of innovating by adding value is referred in literature as *upgrading*,¹⁶ which is defined as the ability to make new and better products, to produce more efficiently or to move into more skilled functions or activities (Humphrey and Schmitz 2002; Pietrobelli and Rabellotti 2006).

The main focus of the GVC literature is to investigate how different patterns of governance may enhance or hinder different types of firms upgrading. Upgrading may take different forms. Humphrey and Schmitz (2000) distinguish four different: product, process, functional (or intra-chain) and inter-sectoral (or inter-chain). The first one consists in moving into product lines with increased per-unit values. Firms can also

¹⁶ Morrison *et al.* (2006) point out that while business scholars use this word extensively (Porter 1990), economists are more reluctant since, following the principle of specialization and comparative advantage, tend to focus their attention on production efficiency. However, in the context of imperfections and extra-normal rents in international markets, and considering the different dynamic learning opportunities offered by different sectors and management functions, the idea of upgrading to newer sectors and functions is indeed appealing. The problem is, argue the authors, that most of the literature lacks clarity on this concept. For a critical discussion of the concept of upgrading and its use in the GVC literature, see Morrison *et al.* (2006).

upgrade by transforming inputs into outputs more efficiently through better technology or organisation of the production process. Functional upgrading involves several types of upgrading opportunities that exist within a particular chain: Firms can move from production to design and marketing, or can move backward and forward to different stages via vertical integration. An example is moving from the production of finished goods to intermediates or raw materials. Finally, inter-sectoral upgrading occurs when firms apply the competence acquired in one sector (e.g. competence in producing specific inputs, or in export marketing) to a new sector (Gereffi et al. 2001).¹⁷

Upgrading depends heavily on firms' learning capacity (Humphrey and Schmitz 2000)(Morrison, Pietrobelli and Rabellotti 2006). The willingness of those who govern the chain to transfer the required knowledge will determine to a large extent local firms' opportunity to upgrade and access new rents (Altenburg 2006).

GVC affect innovation performance because they either facilitate or hamper knowledge transmission among firms participating in it. In fact, this happens to the extent that knowledge transfers contribute in building capabilities, or that constitute specific knowledge that can be absorbed, and then adapted or converted into innovation, thanks to pre-existing internal capabilities. As Morrison et al. (2006) point out, the role played by technological capabilities in upgrading processes in value chains is crucial, in spite of the fact it has always most often than not considered implicit and therefore neglected in the analyses.

According to some scholars (Bell and Albu 1999; Caniëls and Romijn 2003; Schmitz 2004; Morrison et al. 2006), the GVC approach may be enriched by explicitly studying how upgrading occurs at the firm-level through the external linkages taking place within value chains, by paying attention to the pre-conditions, the mechanics, the investments and the strategic behaviour required. Although external sources of knowledge are essential, the creation and improvement of technological capabilities essentially require some previous accumulation of skills, coupled with substantial firm-level efforts: selection, adaptation and improvements are not mechanical, straightforward processes, but they require specific activities and investments..

¹⁷ The concept of upgrading is important not only with respect to firms, but also in understanding how countries shape development strategies to attempt to move themselves into relatively high-value, sustainable niches in the global economy (Humphrey and Schmitz 2000; Gereffi et al. 2001). The development path of the Asian tigers provides excellent examples of this. See, among others, UNIDO (2004), Humphrey y Schmitz (2002), Sturgeon y Lester (2002).

Morrison et al. (2006) also argue that a more thoroughly reference to innovation (besides upgrading) would be useful in drawing the attention to some key knowledge features such as codifiability and complexity. In general, it is believed that the higher the complexity of knowledge, the greater the need for integrated forms of governance/interaction. On the other hand, simple technology may be easily transferred/absorbed through market based relationships (see beyond on absorptive capacity). But they do not analyze whether the new capabilities are either routine, basic capabilities or rather of higher, innovative and advanced order (Morrison et al. 2006), and only recently some studies (Gereffi *et al.*, 2005; Giuliani *et al.*, 2005), drawing on innovation theories, have stressed that differences in knowledge may crucially help to elaborate a theory of value chain governance.

Distinctively from innovation, however, the concept of upgrading recognises relative endowments and hence the existence of rents. In such perspective, successful integration within global chains, or industrial upgrading, involves not only increasing value creation through the sophistication of locally performed activities and outward linkages, but also appropriating greater value at the local level through higher profits and/or higher wages (Palpacuer 2000). The challenge is not only to improve firms' capabilities in order to access new market and maintain them, but also to spread the gains beyond the globally tied exporters to non-exporting domestic firms (Dolan and Tewari 2001).

However, insertion into buyer-driven chains carries some risks. Suppliers can be tied to one or two buyers, eventually facing barriers to the development of new capabilities and risking substitution. Entry into global markets increasingly requires compliance with standards set by private parties. Achieving conformity to these standards has proven to be a problem for firms, especially SMEs in developing countries. Although global value chains offer a real possibility of linking into more profitable export markets and open up the possibility for upgrading, often firms don't have access to the necessary resources such as equipment, finance and skills to meet these requirements. Kaplinsky and Morris (2006) provide the example of ISO accreditation, the cost of which is invariant with respect to firm-size and therefore penalises SMEs.

According to Humphrey and Schmitz (2000), local firms' potential to upgrade strongly depends on the internal governance of the value chain. Global Buyers, by adopting hierarchical forms of coordination, tend to confine competencies of developing countries' producers to simple, low value-added tasks, making them potentially very vulnerable and subject to increasing competition and falling returns (Schmitz 2000). Suppliers may find themselves increasingly obliged to take on a succession of generally low-profit activities that often include the capacity to perform a range of service functions, as well as production ones. Researchers in the food industry (Dolan and Humphrey 2001; Fearn and Hughes 1999) have pointed out that large-scale retailers are systematically re-engineering their supply bases to capture higher shares of income. This involves identifying core suppliers for each product category and transferring to them functions such as analysis of sales data, prediction of demand, and new product development. It further involves an expectation of delivery of products on ever shortening times. Correspondingly, suppliers who lack the financial and human resources to perform these functions are marginalised or eliminated completely.

The GVC approach, therefore, calls the attention on the real opportunities for local producers to learn from the leader of the global chain (Pietrobelli and Rabellotti 2006). The question on how actors can gain access to the skills, competences and knowledge required to participate in GVC and take full advantage from such participation, and what potential is there for firms to upgrade by actively changing the way they are linked to GVC (Gereffi et al 2001) are the question that scholars in this literature have addressed so far. For instance, Gereffi (1999) shows how apparel manufacturers in East Asia have evolved from being purely suppliers of apparel to organising various elements of the chain and eventually moving into Original Equipment Manufacturer (OEM) and Original Brand Name Manufacturer (OBNM) production. He further argues that this was possible because of the knowledge flows transmitted through the chains and the extensive organizational learning occurred at the firm level (prompted by the insertion into GVCs). According to Morrison et al. (2006), Gereffi makes clear (although implicit) reference to the development of "innovative entrepreneurial capability" (Gereffi 1999 : 55, quoted in Morrison et al. 2006 : 14).

An inter-industry comparison of numerous value chains in Latin America and the Caribbean by Pietrobelli and Rabellotti (2007) sheds new light on the relationship

between the different forms of governance and firms' learning and upgrading possibilities in different sectors, linking the global dimension of value chains with the local dimension of clusters.

The authors argue that in traditional manufacturing sectors, and in those based on natural resources, firms tend to integrate in global and local value chains according to different governance schemes, where quasi-hierarchical relationships prevail in the global chains, while arms-length relationships characterise local chains. These two different forms of integration provide different upgrading opportunities. In global chains, characterised by higher requirements, buyers depend very much on suppliers capabilities, and have therefore a strong incentive to assist them in improving processes and products, especially at the initial stage. Participation in local chains, instead, opens up different upgrading opportunities, because of lower concentration of buyers and because of the possibility to take advantage of direct sales, using own representatives, brand and label.

Consistently with Humphrey and Schmitz (2002), the authors conclude that quasi-hierarchical forms of governance limit upgrading to only product and processes, while hinder functional and inter-chain upgrading. Likewise, in chains characterised by market-based relationships, product and process upgrading tend to be slower (not fostered by global buyers), but there are more opportunities for functional upgrading.

The case studies presented by both Humphrey and Schmitz and Pietrobelli and Rabellotti (2007) recognise, however, that chain governance is a dynamic process and that, thus, the limits of functional upgrading in quasi-hierarchical chains may be temporary, because of its relational nature: The exercise of power by one party depends on the powerlessness of the other parties in the chain. Producers' capacity to acquire new capabilities and explore new markets may change the power relationship. This puts emphasis back to the need for firms to invest in developing these internal capabilities through new equipments, organisational arrangements and skills (Bell 1984; Humphrey and Schmitz 2002).

Firms can break out of quasi-hierarchical structures in using the knowledge acquired in working for the main global buyer to supply other markets in which supplier- buyer relationships are more uneven (Bazan and Navas-Aleman 2001). Other opportunities of upgrading is to take up functions that the buyers are willing to relinquish, as it was the

case in the Sino's Vallee with logistics, which was initially controlled by buyers and then taken over by independent firms (Humphrey and Schmitz 2002).

In their study, Pietrobelli and Rabellotti (2007) also link clusters' collective efficiency with the possibilities of learning and upgrading in global value chains. They argue that collective efficiency plays an important role in explaining upgrading processes in the traditional manufacturing sectors and in those based on natural resources. Kaplinsky and Morris (2006) also point out that, in many cases, developing horizontal linkages or engaging in various forms of joint action can enhance the capacity of SMEs to effectively enter global value chains, since they facilitate lobbying government for assistance, undertaking joint activities such as quality auditing and branding, and especially exchanging knowledge (Kaplinsky and Morris 2006). Humphrey and Schmitz (2002) argue that especially in inter-sectoral upgrading, depends heavily on local and national systems of innovation. The fact that this form of upgrading is commonly seen in East Asia but relatively rare in other parts of the world is related, they argue, to the characteristics of industry policy and innovation systems in these countries.

However, Morrison et al. (2006) claim that, until recently, the GVC literature has paid little attention to the specific and often differentiated forms of linkages established between producers joining clusters and networks. They argue that any proposition stating that *any* form and extent of firms' insertion into global value chain is beneficial to *all* the other clustered firms implicitly assumes that knowledge can be freely acquired by other cluster's members. This is not the case, however. Knowledge does *not* freely flow within clusters and networks, it is not evenly distributed therein and some (local) actors may enjoy locational or other advantages to get access, absorb, and use knowledge deriving from insertion into GVC.

Finally, it should not be assumed that the specific governance structure is the *only* determinant of the leaders' inherent ability or interest to convey (or not to convey) knowledge to local producers. The latter technological efforts and absorption capabilities are also crucial, as well as sectoral specificity and knowledge features (Morrison et al. 2006).¹⁸

¹⁸ See Morrison et al. (2006) for a critical review of the role that technological capabilities play in Global Value Chains.

This brings us back to where we started, reminding that although the analysis requires to distinguish between the vertical and horizontal dimension, the two are in fact deeply interconnected (Humphrey and Schmitz 2002).

II.5. Summary of the chapter

Both strand of literature analysed in this chapter, the network and the chain, view the interaction among actors as central to the process of innovation and upgrading. However, while the former focuses on interaction with local firms and institutions, the latter looks at the interaction with global buyers, stressing the asymmetry of this form of interaction. In spite of their differences, both literatures emphasise the role of firm's external sources of upgrading and competitiveness (without however never neglecting the importance of internal capabilities), stressing the importance of knowledge acquisition and recombination through interaction and learning.

CHAPTER THREE

The Chilean meat sector

THIS CHAPTER, describes the context of this study. It is divided into two parts. After a short introduction, it describes the Chilean beef sector, describing its position in the international market. After briefly synthesising the recent evolution of the sector, it then describes the beef chain, as a whole and in its individual segments. The second part of the chapter is dedicated to the pork sector. After providing an overview, it describes its evolution and market structure, with reference to the role played by the public sector and the trade associations.

III.1. Introduction

The beef and the pork are two very different sectors. It may seem awkward, then, to treat them as a unique one. Nevertheless, given that this study focuses mainly on the industrial dimension of the meat sector, namely the slaughtering and processing stage, which is where the live animal becomes meat, it does make sense. Table III.1. shows some characteristics of the meat sector which are common to both sub-sectors.

The story of the modernization process of the Chilean slaughtering sector has been one only, regardless of sub-sector distinctions. And as a unique sector is also how it is treated in secondary sources (among others, see Ponce Vergara 2005, and Maino et al. 2007).

Moreover, increasingly, some firms in the beef sector are entering the pork or the ovine sector, by using the same distributional channels, knowledge about safety regulations, international markets and strong of a conquered reputation and good commercial relationships.

This makes the distinction between sectors at the industrial level more complex.

Although the sectors exhibit different economic performance, which is very much due to

Table III.1 Characteristics of the meat sector

Type	Autonomy	Evolution	Market	Property structure	Size
Buyer-driven industry; Market segmentation: Domestic vs. export	Export market: low, concentration of external buyers; Domestic market: To large extent based on supermarkets	Orientation towards de-commodification and product differentiation; label development.	Orientation towards international high quality markets. The rest for the domestic market.	<u>Primary</u> Atomistic; <u>Slaughtering</u> Highly concentrated for export	Varies according to segment
Dynamics	Product specialization	Weight of new products	R&D activities	R&D teams	Quality assurance
Fluctuating in beef, positive in pork, explained by competitiveness of sector and growing international demand	Mostly low for Europe and domestic market. Medium/high for Asian markets. High in some cases for domestic market	Growing, especially in the Asian and domestic market	High in genetics and in specific firms	Low and mainly informal	High for export and supermarkets Low for the rest of the domestic market
Chain Integration	Contracts	Technical assistance	Informal interactions	Formal cooperation	Linkages with institutions
High for export and supermarkets	Important for export and in the final links of the chain. Scarce for domestic market and at initial stage of the chain	Especially in quality assurance, and in the initial stages of the chain (primary production).	Medium, essentially in meeting organized by business associations and government agencies and in visits to the plants.	Scarce	High in specific cases at the initial stage of the chain. Medium for plants exporting, scarce for the rest.

Source: The author

each sector's idiosyncrasies, firms' heterogeneity in innovation and upgrading performance seems to be explained to a large extent by factors other than the specific sub-sector they belong to, and successful experiences of innovation and insertion in

international value chains can be found in both sub-sectors. This, however, will be analysed and discussed in chapter six.

This chapter is aimed at providing an overview of how the two sectors function, which is still important in order to understand how the chains, and the firms within them, operate, and which are the challenges and the opportunities they face.

Moreover, some historical digression on the origins of the two sectors –which is accounted for in this chapter - may help view of economic processes in a dynamic perspective.

As it has already been said in chapter one, successful Chilean export experiences in the food sector are in most cases the story of developing new competitive advantages and, as such, a history of unsuspected historical evolution made possible by focused efforts.

The story of each sector should then be read within this perspective.

III.2. The Chilean beef sector

The current size of the cattle meat sector in Chile is very small, both in production and in foreign trade. The farming sector in Chile represents only 1.8% of the total GDP. This includes different types of livestock (sheep, poultry, pigs, etc.) among which cattle represents 25% of the total. Nevertheless, this sector is significant in terms of hand labour employed, especially in the south of the country (regions VI to X). It is estimated that the sector employs a total of 135.000 persons in the primary sector and over 6.000 at the slaughter and processing sectors (Maino et al. 2007).

Indeed, it is not the first time that a sector faces such a situation in Chile. There are successful examples of sectors that, after a structured and focused effort, were able to jump ahead in productivity and in the development of exports. The sectors of pigs, wine, salmon and avocados are the most famous examples.

The Free Trade Agreements created opportunities to enter into the meat market in Europe, Japan, Korea and the U.S.A, reducing tariffs, eliminating quotas and facilitating compliance of sanitary regulations. The increase in expected and actual competition has driven many agents to increase efficiency and reduce unit costs of

production. Moreover, the increase in the quantity and quality of demand for beef and dairy products has stressed the existing productive capacity and led to increased imports. Prices tended to fall and reduce the gap with foreign prices, in spite of the existing excess demand, because of increased foreign competition. This has contributed to the re-organization of the cattle industry. According to Dresdner (2004), this process should continue in the future as a consequence of the reduction in protection of the home industry, implicit in the signed commercial treaties, and the expected changes in the economic conditions of near competitors. It will continue to modify the structure of the cattle industry, concentrating activities and reducing the wide existing heterogeneity in the sector (Dresdner 2004).

In spite of the many problems characterising the sector, Chile has been able to take the FTA and the consequent impositions of sanitary requirements by import countries, as opportunities to restructure the sector and turn it into a dynamic component of its strategy to become a Global Food Power.

The promulgation in 1992 of the law 19.162, so called “Ley de la carne” (“Meat law”), gave an important push in this direction. The law established a compulsory system of livestock classification and meat tipification and nomenclature, besides regulating the functioning of slaughtering and processing plants and of all the other activities linked to the meat sector (e.g. cold systems of transportation). Such law has had an important impact in diminishing the slaughtering plants and in raising the quality standards of those plants that managed to survive, contributing to a horizontal concentration process (Dresdner 2004).

Thus, the industrial organization of the beef industry in Chile has been changing rapidly during the nineties, spurred by the commercial policies of the government and changes in the regulation of the beef industry. The agents that have been leading these changes are the slaughtering plants.

Chile follows an “import-to-export” strategy in the beef sector. This means that it imports low quality products for the domestic market, and exports high quality meat to niche markets. This is due to the reduced dimension of the sector, which cannot compare in volumes to its neighbours (Brazil, Argentina, Uruguay and Paraguay). Chile can, however, compete in terms of safety, quality and service, exporting high quality and customised meat to demanding markets. Indeed the domestic market, as it

happens in low and middle income countries, is still more concerned with price than with quality. Differences in quality explain intra-industry trade in meat (the United States being, for instance, both the bigger exporters and importers of beef).

III.2.1. The evolution of the Chilean beef sector

Maino et al. (2007) identify three stages in the recent evolution of the Chilean beef sector during the last two decades.

Stage 1: 1995-2003

This stage is characterised by a permanent decline in domestic beef consumption due to its low competitiveness compared to substitute products (essentially, poultry and imported beef). This translated in a fall of domestic prices below the average cost of production, which in turn translated in a low profitability that led many entrepreneurs to abandon the sector.

Stage 2: 2003-2005

In 2002 and 2003, different actors of the sector met in Chillán in order to analyse the problems the sector is facing and find a way out from the crisis. A strategy is identified based on three pillars: Insertion in the export process, attention to the sanitary endowment and orientation towards quality products.

This strategy was quickly implemented, exports reaching 6.443 tons in 2003; 9.021 in 2004, 18.721 in 2005, at the same time receiving better prices than in the domestic market. All of which produced an increase in production and positive expectations from the producers' side.

Stage 3: 2006 – 2008

At the beginning of the 2006 there was a 60% fall in exports due to a combination of two factors: a devaluation of the US dollar in comparison to the Chilean peso, and a simultaneous fall in meat availability for domestic consumption due to sanitary problems in Brazil and Argentina, the principal providers for the Chilean domestic market. The latter produced a reduction in supply, which increased the domestic price, which made more profitable for producers to sell at home rather than to export. The

situation, however, turned into normal as soon as the borders were opened again once Brazil and Argentina were able to export safe meat again.

The lack of prices stability, combined to the alternative cost of milk production and other purposes for the land (e.g. farm crops, orchards, forest plantations, etc.), lead in the last three years to a drop in the cattle population (Maino et al. 2007).

Nevertheless, important efforts were made to take the sector ahead. All efforts were concentrated on, and priority was given to, achieving compliance with the export requirements (e.g. sanitary, infrastructure, controls, logistics, packaging, etc.) and in an aggressive advertising campaign of the Chilean products. A plan was developed that allowed getting the quality (genetics) and quantity of the necessary animals to comply with the requirements of the more demanding consumers world-wide. The incorporation of new technology in the productive processes was the basis to reach efficiency as well as competitive production costs for exporting. Finally producers' associativity and training was seen as the key to define a common vision and align expectations in the sector. Training became essential due to the radical changes of the techniques and procedures utilized.

III.2.2. The Chilean beef exports

The positive expectations followed the opening to international markets like Europe, Korea, United States, and Mexico, as a consequence of the FTAs, have spurred the dynamism of the beef exports. This lead exports to increase by 15 times in value between 2002 and 2005 (MINAGRI and Fundación Chile 2005).

Exports begun in November 2002, with sales to Israel and Cuba. In 2003 the European market became accessible, as a result of the FTA there is a 0% tariff for a quota of 1.000 tons per year, and which increases by 100 tons each year. Between 2004 and April 2005, 1.200 tons were sent to the European market (MINAGRI and Fundación Chile 2005).

A part from the FTAs, other factors played an important role in spurring Chilean export dynamism. In first place, the interruption of imports from the United States due to a case of BSE in 2003. The same happened for the meat sent from Brazil and Argentina. Safety became a very important issue regulating international trade in meat.

Chile had a comparative advantage there, given by its naturally being free from animal diseases as a consequence of its geographical isolation (the Pacific Ocean on one side and the Andes on the other that work as a barrier to animals' migration).

But from this initial comparative advantage, Chile was able to develop competitive advantages. Indeed, it is not only important not to be contaminated by infectious diseases, it is also important to be able to demonstrate it to the world and make the world trust you. In this sense, the Chilean government has made an amazing job, and today Chile is recognised as the safest meat exporter (MINAGRI and Fundación Chile 2005). But reliability does not only involve supplying safe meat. Buyers also want meat delivered on regular basis, and on time, and look for reliable partners. Chilean firms knew that sooner or later, after defeating animal infectious outbreaks, traditional livestock countries would return to the market again. They realised that small volumes can also be an advantage, since they allow you to customise production, to develop closer relationship with buyers and therefore gain their trust as a valuable commercial partner. This is the strategy adopted by the Chilean firms and this is the factor that all the firms interviewed recognise as the main competitive advantage of the country. This is especially true for the Asian markets, like Japan, which are particularly demanding not only in terms of technical requirements, but also in terms of “knowing your customer”, gaining trust and developing good and stable relationships.

To what relates the value of the exports, the main markets for Chilean beef meat in 2007 were Mexico (49%); Cuba (15%); Japan (15%) and countries within the European Union (6%). However, the market that paid the higher price was the EU, followed by Mexico, Japan and then the United States.

Imports from these countries differ in terms of meat cuts and quality. Indeed, one important aspect in meat production is to be able to sell all the animal, trying to do so in the market that pays the highest price for each cut and quality specification. In this sense, we can think of this market as opposite to the electronics one, where modules coming from different markets are then unified, and where the capacity to reap profits depend on the possibility to outsource the production of the single modules to where it is cheaper making it.

In the meat market the possibility to reap profits depends on the possibility to sell the whole animal by selling each of its parts to the market willing to pay for it the

higher price. This implies knowledge of final markets and the possibility to export simultaneously different products to different markets.

In some cases, as in the one of Chile with Japan and Korea, this may also entail learning about the possibility of making profits by selling parts of the animal that traditionally were thrown away, since not valued in the domestic market.

Beef is usually exported by sea under FOB (Free on board) condition,¹⁹ which means exporters' obligations finish when the merchandise is left next to the ship. Importers set the price and search for suppliers who are able to deliver at that price. Payments are received one month after the delivery. Only in few cases transactions are regulated by a formal contract, even though they had been carried out for a long period of time. Beef processors prefer to spread their sales over the three channels: export, supermarkets and small retailers.

The degree of processing varies. In the international trade, much of the beef is frozen. Boxed and boneless cuts have the advantage of saving shipping costs. Prices differ between forequarter destined for manufacture and hindquarters destined directly for the table. The best sales prices are for quality cuts sold in the EU. As a result, it is more profitable to trade in cuts, as these can be sold to different buyers according to market demand and prices. Cutting standards and grades also varies from one nation to the other, and these differences in grades and standards complicate negotiations, increasing information and overall trade costs.

A preferential treatment, the Hilton Quota, by the EU for special beef cuts which originated at the GATT Tokyo Round in 1979 regulates high price imports to the EU. These cuts mean around 5% to 10% of the animal weight. The EU Commission

¹⁹ The f.o.b. price (free on board price) of exports and imports of goods is the market value of the goods at the point of uniform valuation, (the customs frontier of the economy from which they are exported). It is equal to the c.i.f. price less the costs of transportation and insurance charges, between the customs frontier of the exporting (importing) country and that of the importing (exporting) country. Definition taken from the OECD website < <http://stats.oecd.org/glossary/detail.asp?ID=1009>> which in turn was taken from the United Nations (1998) "International Merchandise Trade Statistics, Concepts and Definitions", *Studies in Methods*, Series M, No. 52, Rev. 2, page 35, paragraph 5.

The c.i.f. price (i.e. cost, insurance and freight price) is the price of a good delivered at the frontier of the importing country, including any insurance and freight charges incurred to that point, or the price of a service delivered to a resident, before the payment of any import duties or other taxes on imports or trade and transport margins within the country. Definition taken from the OECD website <http://stats.oecd.org/glossary/detail.asp?ID=332> which in turn was taken from the United Nations (1998) "International Merchandise Trade Statistics, Concepts and Definitions", *Studies in Methods*, Series M, No. 52, Rev. 2, page 35, paragraph 7.

Regulation (EC) No 936/97 of 27 May 1997 defines Hilton Quota. Shipments need to be accompanied by a health certificate. All beef exported to the EU must originate from animals that have never been treated with growth hormones. Export processors need to be approved for export to the EU with a certificate that guarantees that the product shipped meets the definition of the Hilton quota. Both the health certificate and the certificate of authenticity need to be obtained via an inspector present in the exporting establishment. In the case of Chile, these inspectors are named by the Agriculture and Livestock Service (Servicio Agrícola Ganadero, SAG) but are paid by the firm. The meat that responds to the characteristics of the European market come from farms classified as PABCO A.

The competent authorities in the EU countries issue import licence and communicate to the European Commission the quantity of license applications on a monthly basis. Currently, several importers have been asking for Hilton standards, even if their sales are not included in the Quota.

III.2.3. Cross-country comparisons in beef chain organisation

III.2.3.1. The United States

The US beef industry is characterised by a high concentration on the processing as proved by the last decades concentration rates (CR) among the four biggest firms. CR4 was 72% in 1990, 76% in 1995, 79% in 1998. In 2000, the CR4 was 81%, the four largest processors being Tyson (IBP inc), ConAgra Beef Companies, Cargill (Excel Corporation) and Farmland National Beef Pkg Co (Marques Vieira 2006). All four companies act independently of each other and compete against each other. Two of them, Cargill and ConAgra, are diversified protein suppliers, selling beef, pork and poultry.

Vertical integration backwards (livestock breeding) to assure a full monitoring of the input quality and lower prices has become the common form of governance. Currently, the largest meat processors have shifted from only slaughtering operations to also branding and marketing their products.

III.2.3.2. New Zealand

New Zealand has a national herd of around five million cattle on natural pasture. It exports 80% of beef production, the main destination being North America. The local market is dictated by export prices and is small due to the preference for white meat, mainly poultry. Meat New Zealand is an association that co-ordinates the activities of the 42 plants processing beef in the country. This Board has representatives in each major market that provides information, contacts and other assistance to the exporters. The New Zealand strategy shows that when there is large number of participants involved in exporting, there is a need for a national coordinated external agency (Marques Vieira 2006).

This case, a small livestock producer able to export to highly demanding markets and, thus, becoming one of the most important actors internationally, is often looked in Chile, both by producers and public officials, as a model.

III.2.3.3. Australia

Australia is an export-driven beef producer, focusing on the Japanese, Korean and North American markets. This country exports 60% of total production and fills a large part of the US beef import quota of fresh/chilled and frozen beef. Australia was the pioneer in introducing a cattle trace back system in 1972, but at the time, it was tracing just the carcasses. Later, following the EU directives, it started to develop a new system through public and private institutions, allowing a trace back from the muscle cuts to the birth animal (Marques Vieira 2006) and which has been of inspiration for the Chilean traceability system.

Australia's leadership in the beef export market is not unjustified, being the result of several conjoint efforts in both public and private sectors through the Meat and Livestock Australia (MLA), a board responsible for stimulating demand, designing marketing strategies and negotiating market access for their products. Several promotional initiatives and trade shows are organised by this board targeting the Asian and North American markets. This Board also supports Supply Chain Management for the beef chain to improve overall competitiveness and information exchange (Marques Vieira 2006).

III.3. The Chilean beef chain

III.3.1. Overview

The first group of actors in this chain is represented by the breeders, calf producers that, as soon as the animal reaches a certain weight, sell them to those responsible for fattening. A significant number of breeders also taken upon the fattening stage. The Chilean livestock system is made up by 3,5-4 million heads, in the hand of 160 thousand farmers. Nevertheless, only 55 thousand possess more than 10 animals.

The slaughtering and processing firms supply themselves with fat animals sold by the fatteners. Annual slaughtering fluctuates around 900 thousand animals/year (200 thousand tons, approximately), which satisfies more or less 60 percent of the domestic demand. The rest is imported from MERCOSUR countries, mainly Argentina and Brazil.

After slaughtering and processing, meat is distributed nationally through the retail systems in supermarkets and butchers. Some supermarkets buy the animals and contract the slaughtering service.

In the last decade the industry has made an important effort in order to export (reaching a 18 thousand tons in 2005). This has implied investments to improve processes and products quality, by developing quality attributes (PABCO certification).

The main inputs of the breeding, rearing and fattening stage are grass-lands, forages, and sub-products from the food sector, produced nationally, and some imported food such as soy and maize). Pharmaceutical inputs, such as drugs and vaccines and most of the improved genetic material (semen) are imported.

Also the machinery used in the slaughtering and processing stage are imported, as well as inputs used for packaging and labelling.

Fairs are a very important actor at this stage, since they are the place where an important percentage of total sales of calves and steers takes place.

Very important is also the transport industry, both for the live animals and the carcasses or the refrigerated meat. This is a very specialised sector.

Important actors at this stage are some public technical assistance agencies (SAG, responsible for the PABCO certification and INDAP and CORFO or the PDP Program) and research institutions (mainly universities and INIA).

Originally, there has been a geographical “imbalance” between animal concentration and slaughtering concentration. Breeding and fattening would take place between the VII and X Region, and especially in the latter, while the slaughtering and processing plants were located around Santiago, where also other input providers were localised. The imbalance was caused by a traditional focus on the local market (higher demand in the Metropolitan Region) and because, historically, the costs of transportation of live cattle were significantly lower than those of frozen meat. However, due to a higher focus on exports as well as to smaller difference in transportation costs, and other important factors (such as the impact of animal “stress” on the final product), this “imbalance” has started to change. The slaughtering and processing plants once located in the Metropolitan Region (where Santiago is), have started moving towards the south, between the VIII and X Region. If in 1997 50% of the slaughtering took place in plants located around Santiago, in 2004 this percentage decline to 33.7 (Maino et al. 2007). Today, the Regions VIII, IX and X concentrate 47.4% of total slaughtering. This also caused the other suppliers to also move from Santiago into other main cities in the south.

Similarly to the Brazilian case described by Marques Viera (2006), the Chilean Beef sector also is characterised by a paradox of supplying two completely different markets: Export and supermarkets (we will call this “system A”) on the one side, and local shops on the other (we will call this “system B”). “System A” covers the quality and safety requirements from the urban domestic markets and from the international market, while “system B” supplies only low income and geographically dispersed consumers through local markets, where there is little or no inspection, no demand for quality and safety (thus no pressure to upgrade) and where price is the main attribute. This thesis is only concerned with chains of the System A.

System A emerged from a strategy to add value to the products by paying special attention to its quality, mainly safety, as fundamental part of the export process. This focus has led to important investments in the slaughtering and processing plants that have completely transformed the sector, and which has seen the appearance, among other things, of the first formal contracts between fatteners and slaughtering firms.

III.3.2. Domestic Marketing Channels

Changes in the beef marketing channels have been pushed by public regulation and opening of the Chilean economy and the rapid raise of supermarkets in Latin America. The latter will be discussed in the following section.

To what concerns the regulatory framework, the most important change has been the introduction of the law 19.162 (07.09.1992) also called “Ley de la Carne” (Meat law) and which establishes regulations that affect all segments of the meat chain, from breeding to slaughtering, refrigeration and finally transportation and marketing. Compliance with this regulation is under the responsibility of the SAG (Ponce Vergara 2005).

Traditionally, meat was sold in the neighbourhood shops, boned there with no cold storage and all flies flying around. In the 1960, a firm known as “Carnes La Hacienda” started commercializing meat in plastic trays and covered with cellophane, which represented a real technological advance at that time. The firm established also an alliance with Frigorifico Osorno (one of the slaughtering plants located in the Region X), according to which the slaughtering plant became its only supplier. It was a winning combination: Frigorifico Osorno, the biggest and most modern slaughtering plant located in the Region X, right next to beef production location, supplied with its meat Carnes La Hacienda, one of the biggest wholesalers and retailers in the Metropolitan Region (MR). At the time the meat was transported by train, and refrigeration was only through ice-blocks. Carnes La Hacienda sold to approximately 150 small shops located throughout the MR, and to ALMAC, the first supermarket chain (Ponce Vergara 2005). The alliance between Frigorifico Osorno and Carnes La Hacienda lasted for ten years, and it broke down with Allende’s government, in 1971. Allende’s government fixed a price ceiling for the meat that was below the costs of production, and which obliged private companies to sell part of their shares to the public sector. Indeed, Frigorifico Osorno and Carnes La Hacienda ended up selling part of their shares to CORFO.

The innovation introduced by Carnes La Hacienda was the ancestor of what today is known as “boxed beef”, vacuum packed beef cuts, which was introduced in Chile by Fundacion Chile, who hired a North American expert, Donald Long for the introduction of this system in Chile. This technological innovation was implemented

by PROCARNE SA (one of the slaughtering/processing plants still functioning today) born out from the initiative of Fundacion Chile and a group of breeders, changed the way meat was distributed and sold in the country. Indeed, the system involves more than a specific meat processing system, it refers to a particular distribution and marketing system. According to this system, the beef is slaughtered and boned in its place of production (rather than in its place of consumption, as it was originally), vacuum packed under perfect hygienic conditions and positioned in carton boxes of approximately 30 kilos. Then it was transported in cooling systems under a temperature of 0° C. The rectangular boxes assured a maximum storage and transportation benefit, and also facilitated customers' inventories. Moreover, the vacuum packaging assured a longer durability, which allowed traders to choose when to sell according to the market conditions. This is the way meat is still marketed today.

However, while at the time of the introduction of the boxed beef sales to final consumers were mainly through local butcher's shops,²⁰ existing only one supermarket, today the situation has radically changed, and most of the meat consumed domestically is sold in supermarkets.

Traditionally, the retail sector in Chile had low levels of concentration and/or internationalisation. This structure allowed the processors to decide products and prices. Recently, the retail became concentrated and dominated by large transnational groups and convenience shops (Reardon and Berdegue 2002). The concentration process has been increasing, with supermarket chains opening new stores far from the main urban centres, changing the consumption habits as well as the traditional practices of food processors and farmers (Reardon and Berdegue 2002).

III.3.3. Supermarkets

Supermarkets have replaced butcher's shops. In all the different forms (from minimarkets to hypermarkets), they are the main agents of the retail sector. To what concerns supermarkets' participation in the meat market, there are not actualised figures; Nevertheless, according to Maino et al. (2007), in 2002 45 percent of the production was sold to supermarkets.

²⁰ Butchers worked as independent buyers and sellers selling all kinds of meat (beef, pork, lamb, poultry, sausages) and other complementary products such as charcoal, salt, spices, among others.

To what concerns supermarket's provision of national meat, two different systems can be identified. One system consists of vertical integration and control over all production functions apart from breeding. The other system focuses purely on the retail function and looks for suppliers who deliver meat already prepared to be sold. The first strategy is the one followed by D&S, which buys live animals from different locations, it slaughters them (buying the service from slaughtering plants), processes them, contracts firms specialised in cooling, and then distributes the product all over the country with its own label. Cencosud, on the other hand, the immediate rival of D&S, buys directly from the slaughtering plants, and only takes over the distribution function. This chain sells part of the meat with its own label, and part with the processing firm's label.

Other chains follow intermediate systems, some maintaining still some form of processing. According to Maino et al. (2007), however, the tendency is for the boning and processing function to be transferred to the plants of the 2nd cycle (only slaughtering). Therefore, transforming original slaughtering plants into slaughtering and processing firms.

III.3.4. Analysis of the primary sector (breeding and fattening)

Livestock activity consists of a series of operations involving breeding, raising young animal and feeding these animals to market weights. These operations can be performed all by one farm (vertical integration) or by different farms (horizontal). The horizontal system reduces the necessity of cash flow and shortens the production cycle, but results in longer chains with the presence of more intermediaries (merchants, wholesalers) during the transaction, or sales through auction markets, both of which don't allow control over product quality.

On the other hand, the vertical system minimizes commercialisation risks but requires larger areas and capital.

Primary producers are usually small or medium independent businesses, who use a number of different breeds, feed sources and management practices.

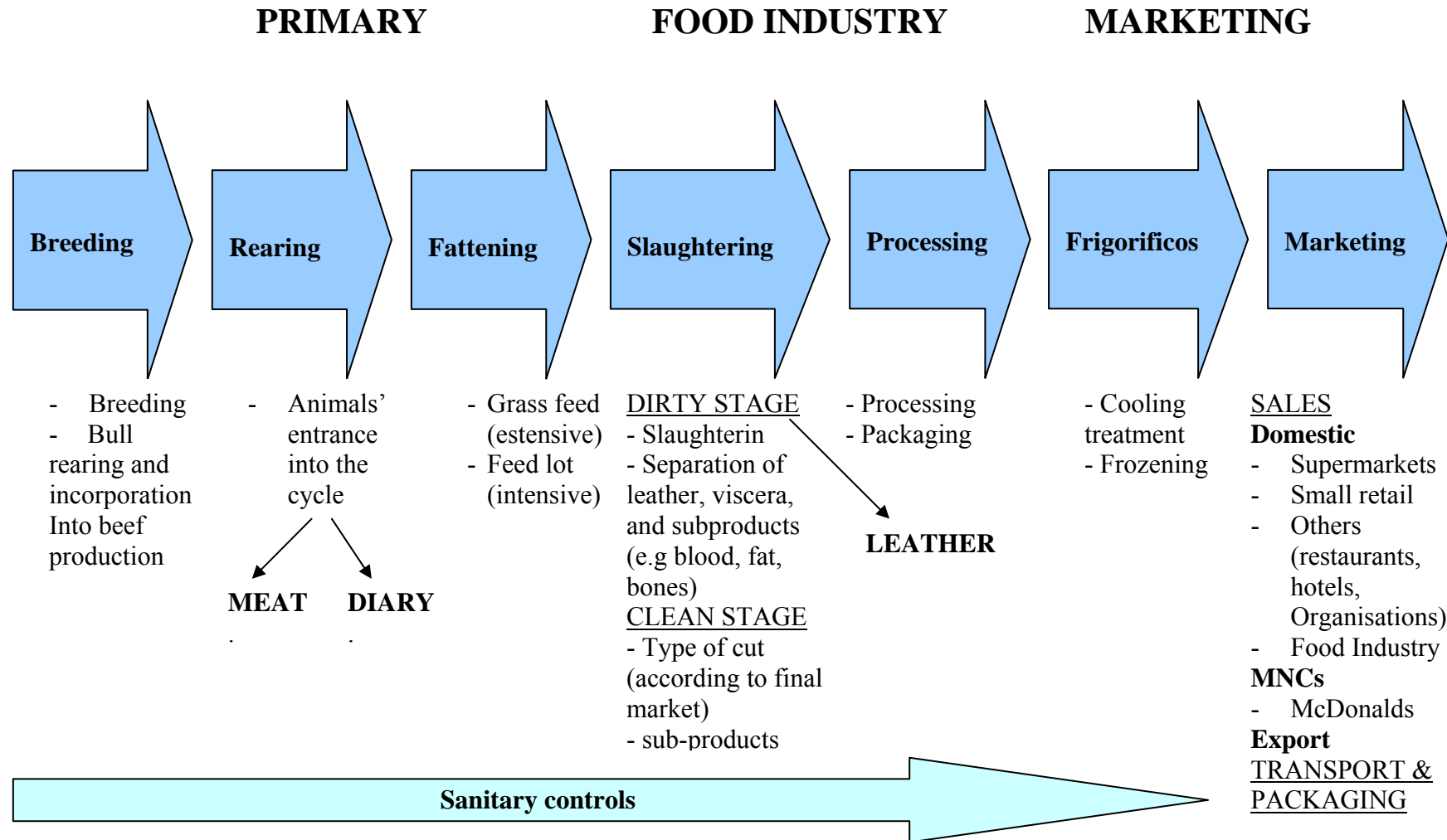
Farmers' access to technical and market information is disseminated basically through informal conversations among farmers (social networks).

BEEF VALUE CHAIN

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Sales prices are guided by an auction or a talk to a trusted person. Few farmers considered their own production cost to establish the selling price. For example, the decision taking process of selling cattle compares the price of calves or thin cattle (replacement), but does not account for other input costs (medicines, vet assistance).

Table III.2. Livestock production processes

Process	Main features
Nursing	From reproduction to weaning, process takes about 14-16 months.
Rearing	From wean and thin to the beginning of reproduction (female) or fattening (male), process takes about 18 months.
Fattening	Grass-fed, takes about 6-8 months for a steer (castrated male at any age)

Source: Marques Vieira (2006)

The general rule of selling livestock is the live weight transaction. This system provokes uncertainty over product quality because processors are unable to determine accurately the eating qualities of the beef based solely on this characteristic.

Breeders (those who perform the first two activities) earn less due to the lack of negotiation power against the input industry. Conversely, the fattener can pressure the breeder over price. An alternative explanation is that the fattener can improve technologically (adding grain-fed, for example) to reduce the product cycle. On the other hand, there is no technology for the breeder to reduce the gestation period.

The nursing activity has the calf as the final product. This farmer is the owner of the cow, taking care of the reproduction (through a bull or artificial insemination). The animal is sold when eight months old or within one year and half, a steer (10% above finished cattle price). Efficiency means producing one calf per cow in a year, but usually the average is below 0,7 per year. Usually, these farmers specialised in reproduction techniques and are categorised as small and medium sized producers. Their farms are not located on the best pastures (those are use for fattening).

Fattening is the activity responsible for bringing steers to an appropriate weight for slaughtering. The fattener buys directly from a farmer or an auction. Afterwards, he/she

sells to a slaughterhouse or “cattle-merchant”. Sometimes, large farmers integrate the three processes and, in addition, buy steers to fat. Generally, the fattening process takes place on medium and large-sized properties in more valuable locations. There are different methods of feeding: nature pasture, cultivated pasture and feed-lot. The expertise needed is cattle nutrition. Traditionally, there is a lack of trust between producers and processors. Problems caused for this bad relationship are the instability in the cattle supply, no reward for a better quality product, and the fact payment is based on live weight and paid at least 30 days after receiving the meat.

An analysis performed by ODEPA with data from the 1997 census, classified the 329,705 farms existing according to their size and availability of resources. According to this classification, 8 percent are big and medium size, 53.4 percent are small, 31.2 percent are subsistence. Nevertheless, in terms of distribution of resources (grass-lands, animals, etc.) the big and medium farms concentrate approximately 70-80 percent of the grass-land and 57 percent of the animals (Maino et al. 2007).

The report by McKinsey et al. (2004) showed Chilean low labour productivity levels both in its primary production (breeding and fattening) as well as in the industrial stage (slaughter and processing) being 12 percent and 35 percent respectively (vs. a U.S.A. index of 100%).

The low productivity in the primary sector is explained mainly by: Producers low scale, observed in the reduced number of animals as well as in the high number of employees per producer. The scale is an important factor to determine the productivity level of the primary sector, since the marginal costs of managing a higher number of animals are very low. The producers in Chile show a very low scale, with only 41 animals per producer in average and with a high number of employees compared to other countries. Also in the United States producers have less than 50 animals. Nevertheless, the difference lies in the fact that the North American producers keep in average a higher number of animals per hectare, thus raising the productivity of their prairies (McKinsey et al. 2004).

Low level of associativity and a lack of common vision among the members of the chain regarding the future of the sector are other important problems of the sector identified by McKinsey et al. (2004); and, finally, a lack of focus on the fattening

systems (e.g. feedlot for export to the U.S.A. and prairies for export to Europe) and the type of cattle in function of the objective market.

In Chile are used two different fattening systems: prairie and feedlot, both quite different in terms of cost, processes and final product obtained. In this sense, selection of the system to be used is the key, based on the geographic location of the lot (irrigation features and fertilizing level of the prairie) and the type of market at which the product should be focused (U.S.A. vs. Europe). Prairie fattening belongs to the usual pasture system used for breeding and termination of animals in large grass surfaces. It is the system most used in Chile. Due to the feeding based on natural grass, the meat of the animals shows a yellowish fat cover, which is highly appreciated by European and Central American markets. Feedlot fattening is used exclusively in the termination stage of the animals (last 3-4 months) in order to reach a level of approximately 500 kilos. The animals are fed grain, which allows to generate meats with white and intramuscular fat (marble-like) highly sought-after mainly in the markets of U.S.A., Mexico, Japan and Korea. The feed-lot systems often uses anabolic steroids, which are prohibited in the European market.

Another important factor regards the optimization of the cattle type in function of the objective market. Today in Chile, there is an 80 percent cattle with double purpose, which generates channels of 255 kilos vs. 334 and 290 kilos in the U.S.A. and New Zealand respectively, where they use predominantly meat breeds.

Among the meat breeds, Hereford is the most common one in Chile, especially in the south. It is rapidly increasing however the number of breeders who incorporate Angus in the cross-breeding. The same happened in the US. This is because Angus beef gains weight more quickly and have more intra-muscular fat (marbling) which is index of better quality.

This is why in the United States as in Europe, there is a premium for Angus beef or cross-breeds with Angus.

Recently it has been created the denominated Chilean Clavel Breed, since it is the most appreciated breed in the country. This breed is not diffused in the world. Actually it is only present in Chile and in Germany. The Clavel complies perfectly with the EU requirements for weight and low intra-muscular fat content.

III.3.5. Analysis of the slaughtering sector

This segment is characterised by processing plants that slaughter and bone using modern facilities. There are freezing facilities, frozen chambers and trained employees. This thesis, focuses on this stage of the chain, which is where the product meat is generated, by transforming live animals into meat cuts.

This industry is highly concentrated, and ten firms control over 68 percent of the supply. Table III.2. shows some of the concentration trends in the industry. Empresas AASA have bought in the last five years all the plants in column two, which originally were autonomous firms. The other two rows represent very recent consolidation processes taken place in 2008.

Even though the concentration levels of the industry are high, still they are not at the same level of the more developed markets and one could expect higher consolidation of this industry, principally in some regions of the country where still the number of existing plants is relatively high and where still exists a significant number Autonomous Slaughter Center (low technology slaughtering plants).

The report by McKinsey et al. (2004) described the Chilean beef value chain as quite de-structured, thereby generating a high level of inefficiencies and poor use of resources.

Table III.3. The concentration levels in the sector

Firm	Plant	Municipality
Empresas AASA	Frigorífico Valledor Matadero Comafri SA Frigorífico Agrolomas Frigorífico Camer Frigorífico Temuco	Santiago Rancagua Concepción SantiagoSur Temuco
Carnes Ñuble	Carnes Ñuble MAFRISUR	Chillán Osorno
Holding Ganasur	FRIVAL SA Ganasur SA Socosur SA	Valdivia PuertoMontt Santiago

Source: The author

In contrast with other sectors like pigs, the cattle meat sector still does not count with an organization that will effectively and efficiently represent all the actors of the chain, so as to align the incentives and priorities of the sector.

There are several advantages as a consequence of having a well structured sector. The generation and flow of information is one of them. Currently, not all the processing plants count with information regarding the heads flow they will receive and process in a given day, or with information on the supermarkets and international markets meat demand and requirements.

The McKinsey report (2004) listed some of the improvements needed to help the Chilean beef chain gain competitiveness. First, the development of an association - maybe inspired by the Australian or New Zealand cases - to integrate and represent all stages of the chain would be crucial. This would not only allow improving communication and information transfer among the actors, but also could drive more formal relations (e.g. contracts) that would provide better price stability. Indeed, this is what happens in the Chilean pork sector, where one association, ASPROCER, brings together all the segments of the chain. On the contrary, in the Chilean beef sector there are two associations for the breeding and fattening stage (Fedecarne and Confederacion de la Carne), two for the slaughtering and processing stage (FAENACAR and Asociacion Plantas Ciclo Tres), and only one for the commercialisation (Asociacion Chilena de la Carne) (McKinsey et al. 2004).

Second, motivate associativity among the producers is also important, as a way to increase their negotiating power for materials purchases and animal sales, promote knowledge transfer, etc.

Third, promote the definition of a vision and export strategy at sectorial level. The road to follow is producing in function of the needs of the objective market (e.g. do not use anabolics for exporting to Europe, grain feed required for export to the U.S.A., etc.). This strategy should be supported with overseas offices that would allow developing the products and the image of a Chilean brand.

Finally, coordinate efforts to drive training and research and transfer. There is a need to improve the method of transfer to the producers of the acquired knowledge in research and development. In addition, the way of implementing this knowledge in a practical form must be structured better, so that the majority can take advantage of it.

Also, training along the whole chain is required in order to implement the existing better practices.

Since the McKinsey report was compiled in 2004, many things have changed. If compared to the pork sector, the beef sector still appears with low coordination among the different chain segments and across firms in the same segment. This is especially true for some chains. Nevertheless, as it will be discussed in chapter six, things have improved for firms operating in some, although not in all, the chains.

III.4. The Chilean Pork sector

III.4.1. Overview

The Chilean pork sector provides a successful example of sectors that, after a structured and focused effort, were able to jump ahead in productivity and in the development of exports.

There had been some exports of this product since the late 1980s to the less demanding Latin American markets. In 1997, exports took off, going from US\$6.6 million (in 2000 U.S. dollars) to US\$26.5 million. In 1996-2005, exports grew at a rate of 51.1 percent per year. Exports today are US\$272.3 million (2000 dollars; US\$305.6 million in current dollars) (Agosin and Bravo-Ortega 2009).

Pork shares some of the advantages of Chilean fruit in the international market. Chile's geographic location between the Pacific Ocean, the Andes, the Atacama Desert, and the South Pole have prevented the introduction of most exotic swine diseases. The only three that have been detected (Foot and Mouth Disease, Newcastle, and Swine Fever) have been eradicated. Benign climate conditions (low humidity and rainfall, and moderate temperatures) favour swine reproduction and productive efficiency, and reduce energy costs.

One big disadvantage of pork production and exports is the relatively capital intensive nature of any successful operation, which means that there are entry barriers that prevent rapid spread of the export discovery.

In the future, the recently negotiated free trade agreements with major importers could provide the space for a major increase in exports. In the case of Korea, the free trade agreement (FTA) went into effect in April 2004. Korea has a tariff of 25 percent

on pork imports. As a consequence of the FTA, it was immediately reduced to 20 percent and will continue to decline annually in a linear fashion, reaching complete free trade in 2014 (Agosin and Bravo-Ortega 2009).

China is a potentially huge market for Chilean pork, and in 2005 Chile and China signed an FTA, that went into effect on January 1, 2006. Pork imports are affected by tariffs that range between 12 and 20 percent. The treaty calls for a linear reduction in all tariffs on these products in five to ten years, depending on the product line (Agosin and Bravo-Ortega 2009).

Negotiations of an FTA with Japan were expected to be concluded in November 2006; given the sensitivity of pork for Japan, imports of this product have not been negotiated and are unlikely to be liberalized very significantly. Japan has a system of domestic price supports for pork, implemented with a variable tariff. Even so, Chilean exports to the Japanese market have soared (Agosin and Bravo-Ortega 2009).

III.4.2. The evolution of the Chilean pork sector

Ponce Vergara (2005) reports some data from the Chilean National Statistical Institute (INE) according to which in 1979 there were 579 breeders between the Region IV and IX, and the quantity of female-mothers (*hembras-madre*) was 28,860. In 1998, the number of breeders had declined to 240, while the number of female-mothers had risen to 136,193.

The annual number of slaughtered heads had passed from 302,674 in 1950, to 671,646 in 1970. During the Eighties has soared, passing from 697,497 in 1980 to 1,666,679 in 1990. And in 2004 it was 3,860,149 (Ponce Vergara 2005).

These figures alone reflect the amazing change in the pork industry. The peak during the Eighties is due to the introduction of a new pork breed, called “new pork” (*Nuevo Cerdo*). This type of pork which contained less fat, together with a massive advertising campaign aimed at emphasising the low-fat and good nutritional qualities of pork meat, radically increased the domestic demand for pork. Moreover, the massive increase in supply made prices fall, which also contributed to the increase in domestic demand, which, as it had previously happened with the broiler chicken, substituted the beef meat in the domestic consumers’ preferences.

This also caused, however, the exit from the sector of small producers. Only survived those who were able to exploit economies of scale and integrate vertically.

Also the weight of the animals experienced an ascending trend, mainly due to the modern and standardised production systems still in use today.

The transformation of the sector also involved a geographic move of the pork production. Today, more than 50 percent of total production is concentrated in the Metropolitan and the VI Region (Ponce Vergara 2005) and more than 80 percent of total slaughtering is concentrated in six plants.

When the pork production saturated the domestic market, the industry looked for new markets, and this is how at the beginning of the Nineties began to export. Pork exports, however, only gained significance in 1998, when the country was recognised as freed from any animal disease. The perfect sanitary condition produced the spectacular export increase in the following years, which passed from 10,098 tons in 1997 to 78,797 in 2004 (Ponce Vergara 2005).

III.4.3. The market structure

Exports outside Latin America began when Nippon Meat, the subsidiary of a Japanese multinational in the food business, started exporting frozen pork meat to the Japanese market. Nippon Meat arrived in Chile with the intention of exporting sea urchins. Although it is still in that business, pork exports are now its chief business in Chile.

Nippon Meat started looking for suppliers of pork for the Japanese market in the mid-1990s, when foot and mouth disease hit Taiwan and Denmark, the two main suppliers of pork meat to Japan. The company found that Agrosuper,²¹ a diversified producer of food products, and other firms already exported pork to Latin American markets. The first export to Japan, by Nippon Meat, which purchased the product from Agrosuper, took place in 1997.

The advantage of Nippon Meat is its marketing channels in Japan and its knowledge of the Japanese language and culture, which are barriers for Chilean firms. The advantage of producing in Chile is that the country has excellent phytosanitary conditions, such as being free of foot and mouth disease. The executive interviewed said

²¹ Agrosuper's website provides a lot of information: <<http://www.agrosuper.cl/>>

that SAG certification had made an important contribution, because it had gained recognition from the Japanese authorities. European destinations are now appearing attractive, but the European Union requires its own certification, and Chile has only three plants that are certified by the EU.

Nippon Meat does not produce pork meat, all of its exports from Chile are purchased from Agrosuper. Originally, it also sourced pork from FRIOSIA (Frigorífico O'Higgins S.A.).²² FRIOSIA withdrew from this tripartite agreement in 2001, seeking to sell its product through traders rather than through Nippon Meat. The intention of the agreement was to create a brand that could differentiate the product and be adapted to the tastes of Japanese consumers. In this, the relationship between Agrosuper and Nippon Meat has been extremely successful. Between the two of them, they export almost US\$200 million, while FRIOSIA's exports have remained below US\$35 million. Agrosuper is a very interesting company. It is family held and now its sales, within Chile and for export, are worth about US\$1,200 million. It started out as a producer of eggs in 1955, later branching out to chickens and chicken meat. It created a brand name (Super Pollo) that has wide recognition in Chile (Agosin and Bravo-Ortega 2009). Later, through greenfield investments and acquisitions, it diversified into fresh and processed fruits, turkey meat, salmon, wine, pork, sausages and hams, and, very recently, olive oil (a new export product, with an excellent chance of becoming an export discovery).

It is a vertically integrated firm producing feed, raising hogs, and processing them into pork meat. This helps to ensure the quality of the pork produced, which is tailored specifically to individual consuming markets. In the case of Japan, with the assistance of Nippon Meat, they developed a brand that was suited to the demands of Japanese consumers (Japan Andes Export), which has similar characteristics to the pork that is consumed in Japan.

In order to achieve this, Agrosuper practiced genetic engineering with the objective of obtaining products that would sell in the demanding Japanese market (in terms of taste, juiciness, colour, and consistency). In Japan, Agrosuper's exports (through Nippon Meat) now represent 3 percent of imports.

²²Friosia's website provides a lot of information: < <http://www.friosia.cl/>>

Likewise, in Korea, the second largest market for Agrosuper's pork exports, Agrosuper's share of imports is now 15 percent, exceeding that of U.S. producers, which are a traditional source of imported pork. Its success is due to its diligence in producing a product that is tailored to the demands of Korean consumers (Agosin and Bravo-Ortega 2009).

In Korea, Agrosuper sells to three large importers exclusively and has developed a specific product for each importer. It emphasizes long-term relationships with importers. The executives interviewed claimed that Korean consumers were unable to tell the difference between domestically produced pork and Agrosuper's product. This allowed the latter to be considered "Korean" and to reach higher prices than other imported pork.

For U.S. and European exporters, the Korean market is treated as a residual, and they do not tailor their products to the market or have exclusive sales arrangements with importers. This has given Agrosuper's products an edge: Not only are its costs lower, but its products reach higher prices at the wholesale level.

Agrosuper uses the latest technology in the whole chain of production. It does R&D at the level of breeding, but in the processing operation it uses imported technology. It does not appear to have a financing constraint. This may be due to the fact that it is a conglomerate and applies profits from one product to fund investments in others.

The firm also pays above-market wages and working conditions are such that workers are highly motivated to remain with the firm. This assures low turn-over of personnel, which also represents a condition for constant investing in training.

Agrosuper has developed its own international marketing network, opening offices in Tokyo, Atlanta, Mexico City, London, and Milan. These offices are in charge of the marketing aspects of exports, including product development to suit the demands of local consumers. The Tokyo office handles marketing in Korea and other parts of Asia.

There are other Chilean exports of pork meat, but they are much smaller. Nippon Meat and Agrosuper account for about two-thirds of Chilean pork exports. Other exporters do not produce all of the hogs they process and must rely on other producers, without being able to control the quality of the product, and don't have the distribution network that Agrosuper has, having to rely on traders in the destination markets for their exports.

Agrosuper executives claim that it is difficult to replicate the firm's model, because it requires the development of vertically integrated production, something that is highly unlikely for domestic firms, given the capital requirements of such an operation. They suspect that the only competition could come from foreign investors who might discover the very favourable conditions of producing pork meat in Chile.

Nonetheless, other smaller producers have also been able to export pork. One such firm is Agrícola Industrial Lo Valledor, which began exporting pork in 2000 with a very small volume (less than US\$150,000) and now surpasses US\$20 million (Agosin and Bravo-Ortega 2009).

Lo Valledor is a large beef producer for the Chilean market. It has exported beef since the mid-1990s. It started in the pork export business as a result of inquiries from its buyers of beef. In fact, it started producing pork for export markets and then diversified to the domestic market. Pork exports have received a big boost from Japanese (Mitsui) and Korean traders that have come looking for pork suppliers, partially as a result of the successes of the Nippon Meat Agrosuper partnership. They do not produce all of the hogs they slaughter and must buy supplies from independent producers. They claim to make efforts to meet the quality requirements of Japanese and Korean customers. However, the fact that they do not have hog-raising facilities is an impediment to the total quality control.

SAG inspectors work inside their plants to ensure they meet the sanitary requirements in their major markets.

The government has played a marginal role in the development of pork exports. Perhaps the largest contribution comes from the quality-control and phytosanitary preservation activities of SAG. But even this is contested by Agrosuper executives, who claim that SAG is woefully understaffed and that the company has had to defray most of the costs of supervising quality norms that must be met to export to different markets.

The role of the trade association ASPROCER (Asociación de Productores de Cerdo) is very incipient. It has worked mainly in disseminating information on the quality requirements of different export markets. Given the dominance of one company, it is really Agrosuper that supports ASPROCER rather than the other way around. Agrosuper executives claim that ASPROCER is mainly a medium of communication with the government.

III.5. Summary of this Chapter

This chapter has provided a description of the beef and the pork sector to provide a background to understand the context in which firms, networks and chains analysed in this work operate.

The two sectors tell very different stories: The Chilean pork sector provides a successful example of sectors that, after a structured and focused effort, were able to jump ahead in productivity and in the development of exports, while the beef sector still remains disarticulated. Still, both sectors present successful experiences of insertion into global value chains, as well as cases of less successful ones.

Although it is important to have an overview of the complexity of the sector and the specific sub-sectors idiosyncrasies, from now on, the meat industry will be treated as one being the industrial stage (comprising the slaughtering and processing stage), regardless of sub-sector specificities, the focus of this work.

CHAPTER FOUR

Research methodology

THIS CHAPTER describes the research methodology adopted in this thesis. Its purpose is to explain *how* this thesis went about answering the research questions discussed in chapter one and it discusses ways of designing and carrying out network and value chain research. Section one discusses issues concerning the unit of analysis, while section two the operational definition of the main variables. Section three describes the data collection process, from the questionnaire design to its administration and the interviews, including the field work. The fourth section describes how the analysis of the data gathered was conducted, while also discussing case study methodology.

IV.1. The unit of analysis

The unit of analysis has traditionally been the firm, but this seems less and less relevant innovation takes place increasingly across a network of firms and other institutions rather than within one firm.

If we are to understand innovation now then questions about what happens between firms and other institutions are just as important, if not more important, as what happens within them. The different relations developing between firms such as those along the supply chain, the development and setting of industrial standards, or R&D collaborations, all have a different influence on the innovation process.

Furthermore the nature of competition has fundamentally changed. If we take a more distributed view of production then it is networks of firms that collaborate or compete rather than individual firms. And sometimes there appears to be collaboration and competition taking place simultaneously.

The interlacing of these networks of firms is extremely complex and may be overriding the traditional relationships that used to hold sway, such as the relationship

between innovation and firm size or sectoral considerations. Several small firms may contribute to an innovation by collaborating, but individually may not report any innovative behaviour themselves. This does not mean that firm size is unimportant, merely that the interpretation of traditional “independent” variables needs to be considered with care.

It seems nearly impossible to set up a sampling frame based around networks, so it would appear that firms will have to remain the sampling units of innovation surveys. However, questionnaires can be developed which try to capture the relational dimension of firms’ innovation activity.

Many of the established methods of collecting data are suitable for gathering network data. The important thing to remember is that in addition to the basic questions about the firm being interviewed, other types of questions about the relationship the it establishes externally must be asked, and that, although it is the firm to be interviewed, this should be done within a network/chain perspective.

IV.2. Conceptual and operational definition of key variables

Although the Community Innovation Surveys (CIS) ask about collaboration and some of the external sources of information, it cannot be related to specific innovations. It does not allow to tell whether certain innovations were done alone or as part of a network or a combination of the two. This stems from the nature of the innovation questions themselves. Rather than simply ask the question “have you innovated or not?” and then base the rest of a questionnaire around this response, it would be more useful to ask firms about specific important innovations. It might be better to ask what the firm’s most recent or most significant innovations were and then ask questions related to these innovations. In this way it would be possible to disentangle the extent of collaboration or innovation expenditure for particular innovations rather than an indefinite and unspecified collection of “innovations”. This would not, of course, restrict questions about overall innovation expenditures or other questions about firm organisation as a whole, which are still necessary to assess general levels of innovative activity.

In designing the questionnaire used in this thesis, attention was paid to this. Indeed, the questionnaire attempt to not only acknowledge whether there was innovation, but also to know what was the innovation (see section V of ANNEX I). Consistently, the rest of the questionnaire tries to relate collaborations and learning and innovation efforts to the specific innovations (see section V.5., V.7. and sections IX.1. and IX.2. in ANNEX I).

Following the previous discussion the next problem arises when defining innovation. Often the definitions of innovation used in surveys need clarification. It is too easy for the respondent to misinterpret the intentions. For example, in the case of “services”, the UK CIS service questionnaire asks for “significantly improved services or methods to deliver services” (Tomlinson 2000). It would be more useful, perhaps, whether delivery was improved qualitatively or quantitatively. A “significant” improvement could be either increasing the target customer base or improving the service to it’s existing customers, or both. Clearly there are differences in interpretation and significance of these two factors, but both could illicit a “yes” response to the initial question. This type of problem repeatedly occurs throughout the questionnaires in CIS.

Some of the problems of ambiguity in the phrasing and filtering throughout the questionnaires could easily be eliminated. In the questionnaire used in this research, this was done by eliminating adverbs such as “significantly” and by substituting the above sentence with one asking “has your firm developed services new to the firm/ market”. This wording eliminates any doubt regarding quantity or quality, and only leaves the possibility for acknowledging the development of “new” services, where “new” is defined in incremental rather than radical terms (see section V.3 and V.4. in ANNEX I).

Indeed, the questionnaire only uses potentially vague adjectives such as “relevant” (which is vague in the same way than “substantial” is) in a very precise sense “could you mention any international actor that has transferred technical knowledge to this firm that was relevant for the innovations listed in section V.?” (see section IX in ANNEX I).

Trying to capture what an innovation is or is not is a delicate task. Chapter two discusses most of the issues related to the conceptual and operational definition of innovation, and to what extent Community Innovation Surveys (CIS) have contributed in this sense. However, some problems with CIS questions still remain. One of the main

problems, for instance, is the increased blurring of the distinction between a “product” and a “service”.

Increasingly manufacturing firms bundle their products with services, such as automobile manufacturers who give a servicing package away with their new cars, or offer financial services to allow the car to be purchased. Or computer manufacturers that bundle software with their PCs and now increasingly provide telephone support for the user in case of problems (Tomlinson 2000). In the food sector, telephone support is becoming increasingly common to provide information on new products and on how to use them (recipes). And increasingly innovations involve manufacture and service firms working together.²³

The solution here is for the interviewer to decide (arbitrarily, but consistently with the purpose of the research) how these innovations should be considered, and to make the appropriate distinction. This is another justification for the face-to-face interviews: The interaction made possible by the face-to-face interviews allows to go in-depth into the issue to better identify the characteristics of what the firm defines as innovation.

As also discussed in chapter two, another problem common to innovation surveys is the bias towards R&D expenditures.

Most firms in developing countries do not have an R&D department and only in some cases they would consider product development as requiring R&D rather than, for instance, an empowered marketing division. This is exacerbated by the repeated inclusion of the word “technological” when referring to innovation. As discussed in chapter two, if only R&D and technological innovations are considered, a proportion of innovation efforts made by some firms may be left out. The case of the retail sector, where innovations and value added come not from technological research but from marketing and logistics is quite revealing. Likewise, in some cases organisational innovations may be crucial, but the CIS does not allow to gain a deeper understanding of these processes (Tomlinson 2000). The questionnaire for this study, takes all the above into consideration. Besides acknowledging eventual efforts in R&D and technological innovation, it also tries to capture other sources of innovation and non-technological forms of innovation, including the organisational (see sections V.5.-V.9 in ANNEX I).

²³ For instance when call centres are instituted to provide information on a specific product.

A final problem with the definition and measurement of innovation deals with its economic significance. Ultimately, firms' innovation performance matters as long as it improves the firms' competitiveness, and therefore the economic significance of the innovations introduced is essential. In this work, innovation is considered as a necessary step in order for the firm to gain competitiveness, but not sufficient.²⁴ Therefore, this work only considers those innovations that were commercialised and/or had an impact in terms of higher profits. For this purpose, the concept of “upgrading” introduced in chapter two seems more appropriate.

The operationalisation of the dependent variable used in the econometric analysis in chapter five and six is shown in Table IV.1.

Tabel IV.1. Upgrading indicators

Type of upgrading	Explanation	Indicators
PRODUCT	Making a product that is of better quality, more sophisticated and which carries a higher price	New product (e.g. ready-meal), new lines (e.g. fat-free, premium, natural, organic)
PROCESS	Doing certain tasks better, so that production costs are lower and/or quality is increased	Investments in machinery, introduction of total quality programmes (e.g. ISO), environmentally sound practices

Source: Author's adaptation from Navas-Alemán (2006)

The depended variable in the econometric analysis in chapter five and six only refers to product and process upgrading Other forms of upgrading, namely functional and inter-sectoral, will be qualitatively assessed in chapter six, which is entirely dedicated to this effort.

The two main explanatory variables for predicting upgrading are the horizontal knowledge flows and the chain governance. The former is conceptually defined as the incoming technical knowledge transfers that were relevant for innovations that had economic significance. These transfers are measured by the actor-level degree centrality

²⁴ Indeed, there was the case of one firm interviewed who declared to have developed a new product, with investments in special machinery coming from Germany and in international consultants, which turned to be not profitable, and the production was therefore quitted. This type of innovation, for instance, is not considered in here. It definitely reflects the firm's efforts in learning and innovating, but it didn't improve the firm's position in the market, it didn't allow to access new or high value markets, it didn't allow to reduce costs; in other words, it had no positive economic impact.

index $C_D(n_i)$, a network measure, which is a count of the number of ties the actor (firm) i has directly established with other j actors in the network.

$$C_D(n_i) = d(n_i) = \sum x_{ij}$$

The actor-level degree centrality is calculated here using directed dichotomous data. For directed data, the centrality measure returns two indexes: In-Degree Centrality index and Out-Degree Centrality Index. Only the In-degree centrality index is used as explanatory variable in the econometric model. This index measures the extent to which technical knowledge is acquired by/transferred to a firm from other local firms or other organisations.

Chain governance is operationally defined on the basis of Humphrey and Schmitz (2000) categorisation, shown in Table IV.2.

Humphrey and Schmitz (2000) categories, however, are ideal types rarely encountered in their pure form in the real world, where differences in chain governance are often a continuum, as the same authors recognise. Nevertheless, these categories are useful in order to analyse a complex world. When turning to the real world, however, it may happen that elements belonging to one ideal type of governance coexist with elements belonging to a different type of governance. In this study, value chains have been identified empirically by observing which chain governance indicators are most prevalent in the group of firms serving a specific buyer. Chapter six shows how these efforts have been applied in the Chilean meat sector.

Comparative research on upgrading is difficult because of locational and sectoral specificities. In this research, locational specificities are minimised by the choice of two sub-sectors belonging to the same country, and therefore where the social, economic and political environment is the same.

The research design does not emphasise technical differences between the two sectors, but focuses on the effort undertaken by producers to learn, innovate and upgrade within their value chain. Often, the same firms operate in both sub-sectors, and there are cooperative efforts between firms across sub-sectors.

Despite the fact that there have been no investigations absolutely identical to the topic of this research, variables and measurement constructed and applied by other

authors in similar studies (see Giuliani and Bell 2005; Giuliani 2006, 2007; Navas-Alemán 2006) will be utilised to test the hypothesis.

Tabel IV.2. Chain governance indicators

Type of chain governance	Explanation	Indicators
Market	“Arms-length” relations between firms	Low buyer and producer concentration. There is no dependence. Buyer not involved in product definition. No technical assistance. Repeated transactions are possible, but information flows are limited.
Network	Coordination of activities between firms but mutual independence	There is no buyer or producer dependency. Few exit options on both sides. There is no asymmetry in knowledge (producer has knowledge that is valuable to the buyer and hard to substitute)
Quasi-hierarchy	Producer is subordinated to one or few buyers Strong power asymmetries and long-term relationship	High buyer dependency (main buyer takes more than 30% of producer’s output) High buyer concentration Buyer sets production parameters for the producer Few direct-sales producer-buyer: Intermediaries keep producers away from final markets Producer’s exit options are more restricted than buyer’s Information asymmetry (buyer knows more about producer’s costs and capabilities than producer knows about buyer’s “Antagonistic cooperation”
Hierarchy	Vertical integration	Not included in this research which is concerned with relationships between formally independent firms.

Source: Author adaptation from Humphrey and Schmitz (2000)

Using variables and constructs that have been implemented in previous research will bring some advantages. First, the variables and constructs have passed reliability test; Second, certain results can be compared with other research.

IV.3. Data collection

IV.3.1. The use of secondary data

Already available material was used to give the research a good start. It also saves time - not only the researchers' but also that of the respondents.

Secondary sources included previous research on the sector and other official and unofficial statistics and reports, as well as area-specific articles from journals and newspapers, satellite photos and maps, and any other relevant documentation previously produced (Bernard 2000; Blaxter et al. 2001).

Accessing relevant published and unpublished documents can be a major challenge, especially in developing countries. Many documents are in offices rather than publicly available places like libraries or bookshops. The researcher must first find out that they exist, then learn where they can be found, and (often) finally persuade their keepers to release them.

Although this was sometimes the case in the specific study, where some inedited but very useful material was discovered through informal conversation with people rather than through comprehensive research in statistical and other offices or libraries, it must be recognised that Chile is highly organised in terms of providing availability and reliability of public research and statistics.

Generally secondary sources are used in two ways. At the beginning of a study, they help the researcher to become familiar with what has already been done. In this way, they help to avoid duplication of effort and guide the choice of research design and methodology (Bernard 2000; Blaxter et al. 2001). A good technical report may not only give a detailed picture of the industry but may also have information about relevant contacts who might be worth following up. These are invaluable if identified early in the research process. In addition, information available on Firms' and public agencies websites provided very useful sources to prepare for the interviews.

Secondary sources are also useful at the data analysis and report writing stage, when it becomes possible to compare findings (Bernard 2000; Blaxter et al. 2001).

IV.3.2. The fieldwork

The study aimed first to depict and then to analyse the structures of the relevant value chains and the networks in which firms were inserted. In a second stage, the study aimed at identifying upgrading efforts and achievements by local firms, to classify those efforts and achievements (product, process, functional and inter-sectoral) and to observe which type of horizontal network and chain governance they were linked to.

The first step in network analysis, regardless of whether vertical or horizontal, is to specify the boundaries of the network. The need for this is obvious in the case of social networks, but even in value chain analysis the boundaries must be set.

In the analysis of a garment chain, for example, will the vertical dimension go back only to textile firms or all the way to yarn producers or cotton growers? Will relations with all suppliers be studied or only with those supplying major inputs?

In the specific case of this study, the analysis go back to the rearing and fattening stages, as the main “input” providers to the slaughtering and processing plants. Instead, other suppliers or suppliers of suppliers, such as, for instance, animal drug and feeding providers are not considered. In the same way, the boundaries set for the network analysis is given by the population of slaughtering and processing plants in the same sector and sharing the same characteristics. This is because they face the same challenges and the researchers intention is also to see how and whether heterogeneous firms exposed to the same challenges react and, in case, cooperate to survive. Thus, in the specific case it would have not made any sense to consider a different network, although it is obvious that actors are simultaneously part of many overlapping networks (Hanneman and Riddle 2005).

While in the horizontal network analysis described in chapter five, network members were asked based upon a roster (a list) of firms derived from official lists, in the case of the value chain, not all the participants to the vertical network were identified. A snowball technique was then used: starting from the easiest entry point to the chain, which in the specific case of this study are the slaughtering and processing firms, the buyers and producers were identified when named by the firm during the

interview.

Firms were approached without assuming they had one or another type of network structure or belonged to a specific chain.

Primary data were collected in six Chilean regions at the south of the capital city of Santiago (see Figure IV.1), from the VI to the X region, and between January and June 2008.

The collection was done in different stages. There was a preparatory stage in Santiago, where the pilot study was conducted and local firms were interviewed in order to test the questionnaire. At this stage, many meetings with the key informants (see table IV.3.), and also those with the buyers, took place. Also at this stage, secondary data was collected to gain a better understanding of the sector. Statistics and documents concerning the sector and in particular the slaughtering and processing segment, were analysed; and the face-to-face interviews.



The second stage of the fieldwork involved visiting and administering the questionnaire to the firms in the VI Region, “Del Libertador General Bernardo O’

Higgins”, the regional capital of which is Rancagua. After this stage, another period was spent in Santiago.

Table IV.3. List of key informants

Type and number of key informants	Key informant’s affiliation
Trade associations (3)	ASPROCER - Asociación de Productores de Cerdo de Chile (Trade association of pork producers) FAENACAR – Asociación gremial de plantas faenadoras y frigorificas de carne (Trade association of slaughtering and refrigerating plants) ACHIC - Asociación Chilena de la Carne (Meat Trade association)
Government Agencies (6)	CORFO - Corporación de Fomento de la Produccion (Chilean Economic Development Agency) FIA - Fundación para la Innovación Agraria (Fund for Agricultural Innovation) Fundación Chile – Chilean Foundation for technological transfer in the renewable natural resources- based sectors INIA - Instituto de Investigaciones Agropecuarias (Institute of Agricultural Research) ODEPA – Oficina de Estudios y Políticas Agrarias (Agricultural Research and Policy Office) ProChile (The Trade Commission of Chile)
International Organisations (3)	Livestock specialist FAO Rome – Food and Agriculture Organisation, headquarter, Rome Livestock specialist FAO Latin America – Food and Agriculture Organisation Regional Office, Santiago Agricultural Unit, ECLAC – Economic Commission for Latin America and the Caribbean, headquarter, Santiago
Universities and research institutes (4)	Universidad de Chile (2) Universidad Católica (2)
Buyers (4)	European Importers (2) Japanese Traders (1) Supermarkets (1)
Suppliers (2)	SAGO - Sociedad Agrícola y Ganadera de Osorno (Agricultural and Livestock Society of Osorno) Independent providers (1)
Source: Author’s fieldwork 2008	

The third, and longest, stage of the data collection involved a long journey through the country to interview all the other regions located in the south, until the X Region,

“de Los Lagos”, the Regional capital of which is Puerto Montt, and which where the famous town of Valdivia nad the island of Chiloé are located.

During the fieldwork, the author personally carried out structured face-to-face interviews to thirty-six slaughtering and processing firms in the sector, and face-to-face unstructured interviews to other actors (producers, buyers, representatives of local Universities, research centres, trade associations). Also when the questionnaire was administered, the interview was very important in that it allowed discussion of the qualitative aspects of the knowledge flows across firms in the network and in the value chains, and of the upgrading that took place (or not) within the value chains.

Visit to a local trade fair, which was organised by one of the producers interviewed, was also useful to discuss issues on knowledge exchange, chain governance, innovation and upgrading with a wider range of producers, buyers, and input suppliers from all over Chile and abroad. This triangulation of sources was reinforced through analysis of local literature and secondary statistics.

Structured interviews were administered to the whole population of slaughtering and processing plants in these six Regions involved in the production of beef and pork, and that have a production cycle of at least five days.²⁵ Firms were identified on the basis of official sources and industry associations’ databases. A list was created containing those firms that met the selection criteria: Doing at least a first stage of processing, meeting the basic national regulations and having at least five days of activity. The full list of interviewees to whom the questionnaire was submitted may be found in Appendix IV, although they are not identified in the thesis, since this was a condition made by some to allow the interview to happen.

After the data was collected, the author returned to Santiago, were new meetings with the key informants were arranged to discuss the results of the fieldwork. At this stage, interviews with buyers were arranged, as well as those with most of the public agencies (some of them were at least partly interviewed before visiting the south, and also helped to arrange meetings with their offices dislocated throughout the country).

²⁵ The total number of slaughtering plants is much higher (around 81) but these include plants that don’t do any processing, or that don’t slaughter regularly (less than five days of production cycle) and that are located in marginal areas and service only local rural markets, and therefore don’t even comply with basic national requirements. There are also other slaughtering and processing plants in the XI and XII Regions, but these are mainly for ovine meat.

A first draft report was prepared based on all the information collected, and it was presented to the agricultural unit of the Economic Commission for Latin America and the Caribbean (ECLAC) in Santiago, where I was located. Feedback from that presentation has contributed to this work.

IV.3.3. The interviews

The interview method involves “questioning or discussing issues with people” (Blaxter et al. 2001 : 172). It can be a very useful technique for collecting data which would likely not be accessible using techniques such as questionnaires.

In this study, interviews were used in two different situations. Face-to-face structured interviews were used in the case of the thirty-six firms. These interviews were devoted to the administration of the questionnaire, but also used for open discussion on the themes of the questionnaire. Indeed, although the questionnaire was designed to be compiled in less than an hour, interviews lasted between one and a half hour (the shortest) and three hours (the longest), depending on the availability of the interviewee. Most interviews to the firms were preceded by a visit to the slaughtering and processing plant, which provided the opportunity to learn more about the production process, the products (how they were made, packed, labelled, stored, and so forth) and to observe the labour conditions, the kind of machinery used, the hygienic conditions, and to meet some of the staff, included the vets and the certifiers from the Agriculture and Livestock Service (Servicio Agrícola Ganadero, SAG), responsible to certify that the plant accomplishes with all the food safety conditions required by the national regulations and for exporting to the different markets.

But open interviews were also used to discuss themes with key informants. The main purpose for in-depth unstructured interviews to key informants was to collect qualitative data so as to explore issues that are difficult to capture in a questionnaire (change processes, decision-making processes, depiction of emerging trends) and that would help contextualise quantitative findings.

Key individuals are people who have particular knowledge about the topic under study. They may include specialists, such as academics who have studied the industry or retired managers or workers of the company. They may also include government officials at national or local level, or officials of international organisations involved in the sector, or members of trade unions. Key individuals can also be ordinary people. A

person who remembers when the factories first began their activity can provide important information. Key informants are often identified in a sequential process, beginning with the obvious official types and continuing by asking each interviewee who might provide additional information.

Informant interviewing requires considerable preparation. It takes reading and thought to decide what questions to ask. It is essential not to waste informants' time by asking for things that might be easily obtain elsewhere. Some essential criteria were used in interviewing: The questions and their order were decided in advance and listed on a paper in such a way that it was easy to tick them in the case the informant shifted from one topic to another. In this way it was possible to monitor which topics were covered and which not. Precision was encouraged and specific examples were asked for when answers or discussion were vague or rhetorical. As a general principle, the informant carried the discussion and the researcher only said as little as possible in order not to bias the informant's responses. An interview should not last too long.

Interviews were planned to last approximately thirty minutes. However, they often lasted more, because of interviewees enjoyed the discussion once they started.

Kumar (1989) provide useful suggestions in order to apply critical listening while interviewing, since the material supplied by informants may not always be fully reliable. The author suggests a series of questions the research should ask when analysing the interview. Questions such as: "How does the informant know this - from personal experience, a report, or merely opinion?", "does this account serve his/her personal prejudices or commitments?", "What evidence is there that this person is usually accurate? Is it consistent with what others have said?".

No voice recording was used during the interviews, and there was also the attempt to take only the essential notes during the discussion. Right-after each interview, when the information was still fresh in the memory, a report was written, which included all available information about the informant as well as his/her responses to the questions asked. It also included the researcher's observations of the setting, and notes on the informant's reliability.

The decision to not record it was guided by the idea that respondents would have felt less comfortable to speak, and would have provided much less information, given that most of the information they were asked for is sensitive (annual sales, final

markets, percentage exported, number of clients and providers, and so on), and/or linked to tacit processes that had not been explicitly codified by the firms (how to design a new product, how to find new buyers in new markets, how to create a new brand). For the same reason, taking notes during the interview was reduced to the necessary, in order not to lose for too long the eye-contact with the respondent so that the interview could resemble an informal conversation, making him feel comfortable.

IV.3.4. The questionnaire

Questionnaires are one of the most widely used social research techniques (Blaxter et al. 2001).

The questionnaire designed for this study aimed at gathering both quantitative and codified qualitative information.

Interview questionnaires tend to be favoured in developing countries for a number of reasons. Low education levels mean that many people would have difficulty completing a questionnaire alone. Moreover, some cultures tend to favour oral over written communication. Although time and money consuming, face-to-face surveys tend to provide better response rate, and allow to have more accurate answers, since the respondent has the chance to ask for clarifications in case of doubts. Moreover, face-to-face surveys usually provide some space for informal talk about the topic which may be very useful (Bernard 2000; Blaxter et al. 2001). For these reasons, this way of administering the questionnaire was preferred over alternative means (email, phone, mail).

Just as questionnaires can be administered by different means, so there are a variety of ways in which questions can be asked (Bernard 2000; Blaxter et al. 2001).

As discussed previously in this chapter, there are a number of issues to be considered when wording questions for survey purposes (see section IV.2.).

In constructing the questionnaires, reviews of previous studies were conducted in order to find existing scales (Giuliani 2005; Navas-Aleman 2006; Maino 2007). Where possible, these scales were used or adapted to the purposes of this work. As a result, the questionnaires were based upon a mixture of established scales from the literature and own measures of constructs relevant for this thesis. Pilot tests of all instruments were conducted with modifications made to the questionnaire based on the results of the pilot tests. Throughout the data collection processes, individuals were assured that their

responses would be kept confidential and that all results would be presented only on an aggregate level.

Question types contained in the questionnaire designed for this study are the following: Quantity or information (see section II.4. or VII.3. in Annex II), category (see section V.8 in Annex II), multiple choice (see section V.1. or VII.1. in Annex II), scale (see section VII.7 or VII.10 in Annex II), ranking (see section V.6. in Annex II), complex tables (see sections VII.6., VII.7, IX.1. in Annex II) and, finally, open-ended (see section X.4. in Annex II).

The fact that the interviewer is fluent in Spanish facilitated the interaction with local respondents, since English is not widely spoken in the South of Chile, even by top executives of exporting firms. In addition, author's fluency in Spanish implied that the material collected during the fieldwork has not been interpreted by a third party (i.e. a translator) which prevented the "lost in translation" issues associated in these cases (Bernard 2000).

Being a foreigner brought unexpected advantages such as the perceived impartiality of the author which was much appreciated in a sector sometimes characterised by strong antagonism and distrust (suppliers versus buyers, firms versus government agencies). Also the fact the author was fluent in Spanish in spite of not being Spanish was particularly appreciated, as a sign of interest and respect for their culture.

In addition, the Italian nationality of the author also provided advantages, since people in the South Cone, and in Chile and Argentina in particular, feel very strong cultural affinities with the Italians. This probably made respondents perceive the interviewer as someone who would empathise with some aspects that did not show the firm in the best possible light, and therefore made them feel at ease and inclined to be honest. There is also a widespread admiration for the Italian culture (cuisine, music, cinema), which makes many people wish they were Italian. Indeed, very often the interview was facilitated by an incipit such as "Where are you from in Italy? You know my ancestors came from...". Almost every interviewee seemed to have a grandfather or a grandmother coming from Italy.

Finally, I also had the perception that being a woman facilitated the interview process. Since all the managers interviewed were men, it probably was perceived as less threatening the fact that a woman was investigating on their activity.

For all the above mentioned reasons, once the interviews were granted, in almost all the cases collaboration was highly above the expectations. The hardest part of the entire process was probably contacting the firms and being granted the interviews.

The survey results have been used in combination with qualitative analysis. The questionnaire was developed in Spanish (see Annex III) with the help of an expert of the meat sector (one of the key informants, a Professor from one of the best Universities in Chile), and then translated to English in order to be inserted in an Annex to this thesis (see Annex II). The information gathered from the questionnaire provided data that cannot be captured by using secondary data.

Questions were coded, so that once the questionnaire was completed, responses could be coded as well to be then used in packages for statistical analysis.

IV.4. Data Analysis

IV.4.1. Quantitative and qualitative analysis

In general, research method is distinguished between qualitative and quantitative approaches; the former stresses analysis of processes and meanings whereas the latter focuses on analysis of causal relationships between variables. Due to this difference between the qualitative and quantitative, each research method has its own strengths as well as weaknesses. It can be assumed that qualitative method brings about richness and precision by generating in-depth and in context analysis of the topic under investigation.

On the other hand, quantitative method provides reliability and generality by constructing statistical model and testing to explain the topic under investigation. It can be concluded that the strength of one method happens to be the weakness of another method; and therefore both methods could actually complement each other and can be used to optimize their contribution to the research.

The main reason for researchers combining different methods in a single study is that, even those fairly small and well focused, require a considerable amount of information. Some of this is background information that is needed to put the study into context. This may include data on the country's economy, the history of the industry, or the socio-economic characteristics of actors. In addition to this, there is the information needed to address the particular research questions of the study at hand. In this case the

research questions guide the choice of the method. Questions aimed at qualitative or intangible realities, such as perceptions, feelings, or ideas require a different method from those whose answers are more easily measurable. When, as is often the case, the study has both types of questions, multiple methods are called for.

Another reason for using multiple methods is to check the results of different methods against each other. If, for instance, the questionnaires return puzzling or contradictory information, or that some of the data they provide is either under- or over-recorded one may decide to test answers by looking at secondary data and/or interviewing key informants who have deep knowledge of the sector. The use of several different research methods to test the same finding is called *triangulation*.

Data analysis is the process of bringing order, structure and meaning to the mass of information collected. Qualitative analysis differs from quantitative in that it is often done throughout the process of data collection rather than after it has been completed. The analysis involves a continuous process of organising and reorganising all material, including the researcher's own notes, in order to create categories, themes, and patterns.

Some of these categories and themes will have emerged from the initial literature review; others will become evident in listening to key informants. Writing is an important aspect of qualitative data analysis. Writing up a case study, for example, forces the researcher to analyse and be precise about how the facts about a case firm or individual support or do not support a particular research hypothesis.

Doing a qualitative analysis means to provide an interpretation and make statements on how categories or themes are related to one another. As in the words of Bernard (2000), if quantitative analysis involves reducing people to numbers, qualitative analysis involves reducing people to words - and ones own words.

Logistic regression will be used to test the impact on upgrading of firms' knowledge network and of the governance mode of the chain it belongs to. Regression analysis is concerned with the study of the dependence of one variable, i.e. the dependent variable, on one or more other variables, i.e. the independent (or explanatory) variables. Since in this case the dependent is a categorical variable, logistic regression is the most suitable technique for the analysis. Applying logistic regression allows us to determine the percent of variance in the dependent variable explained by the independents; to rank the

relative importance of independents and to assess interaction effects (Hosmer and Lemeshow 1989).

IV.4.2. Case study methodology

Case study research helps to answer “why” and “how” type of research questions within real-life context. These type of questions cannot be answered with the survey method, since this only allows to establish causal relationships.²⁶ In addition, the case study “is the “choice when the phenomenon under study is not readily distinguishable from its context” (Yin 2003 : 4).

Case studies, as the name indicates, concentrate on special cases. Generalisations from case studies must be handled with caution. To serve as a foundation for generalisations, case studies should be related on a theoretical framework which may in turn be adjusted as case study results provide new evidence (Blaxter et al. 2001; Yin 2003).

Case study methodology involves systematically gathering enough information about a particular person, social setting, event, or group to permit the researcher to understand how it operates or functions (Berg 1998). It is not actually a data-gathering technique in itself, but a methodological approach that uses several data collection tools. A case study of a firm or a sector might be built up by supplementing the firm(s) data collected through a survey with a series of in-depth interviews to key informants, factory visits, and gathering of historical and product information from the company’s website.

The in-depth interviews usually used to develop case studies allow the researcher to probe more deeply than might otherwise be possible.

Case studies of networks require the additional dimension of studying the relationships among actors as well as the actors themselves. Since a value chain is essentially a network of relationships between buyers and suppliers instead of firms competing at the same level of the chain, same considerations apply.

The researcher can decide to examine the nature of the relationship between actors on many possible dimensions. He/she may be interested in the origins of the

²⁶ The typical criticism towards case study research concerns biasness and generalization. To deal with the criticism Yin (2003) suggests important tactics to be applied at each stage of the case study.

relationship, as well as those regarding the content of the relationship. Did the two parties go to school together or meet through a business association? Is the relationship between actors also the occasion for passing along market information and technical knowledge? This is the typical kind of questions that case studies allow to answer, as well as.

IV.5. Summary of the chapter

This chapter discusses the research methodology used in this thesis to carry out the analysis described in chapter five and six. The unit of analysis was identified and the main variables used were conceptually and operationally defined. The chapter also described the field work and the process of data collection, which included both structured and unstructured face-to-face interviews to different actors. The chapter also discusses the criteria followed for the design of the questionnaire in Annex II. Finally, quantitative and qualitative forms of analysis were discussed, including case study methodology, and emphasis was placed on the need to combine different methods for the analysis of complex phenomena as those studied in this thesis.

CHAPTER FIVE

Network structure, knowledge flows, innovation and upgrading in the Chilean meat sector

THIS CHAPTER analyses the horizontal knowledge flows between firms as well as the knowledge transfers from universities and government agencies to firms. Social Network Analysis (SNA) is used for the purpose. A combination of both graphical and mathematical/statistical tools reveal interesting patterns of horizontal ties and knowledge flows, and their relationship with innovation. After a brief introduction, a methodological section follows with a description of the model specification, the data and the conceptual and operational definition of the variables. The analyses are contained in sub-section three, which also includes a discussion of results.

V.1. Introduction

In the previous section it has been have mentioned that the Chilean sector appears to be highly heterogeneous, and that innovative firms coexist with laggards. The literature review suggests that firm's innovative capacity depends, to some extent, on their network structure. Specifically, the linkages, direct and indirect, connecting the firm to other partners, as well as the lack of these seem to play a role in defining firm's potential to innovate and upgrade. Building on this evidence, it is tested the hypothesis that in the specific case analysed, there is a significant relationship between a firm's network structure and its upgrading performance, based on the assumption that innovation and upgrading are the result of complex systemic interactions among many different players, including other firms, universities and government institutions.

Although two types of linkages, horizontal and vertical, are important in explaining firm's learning and innovation processes (Stuart 1998; Gulati and Lawrence 1999), this chapter looks only at the horizontal linkages, that is, the linkages between firms occupying the same position in the chain.

This chapter, however, only analyses firms' direct linkages. Attempts to include in the analysis the effect of indirect linkages, through a Bonachic centrality measure, and of structural holes, as suggested by the literature, were made initially, in a first specification of the model. With the inclusion of these measures, however, the model would not work (give odds too large or too small to have any possible sense), probably due to multicollinearity problems or to the limited number of observations. Thus, the quantitative analysis won't tell us what role the indirect linkages play depending on the direct linkages, as analysed by Ahuja (2000). Likewise, it won't reveal whether in this population, structural holes increase or reduce the probability to innovate, by respectively giving access to diverse information or by limiting the communication flow. Although this may seem an important limitation of the study, the analysis of direct linkages seems the most important, given the case under analysis. In her study, Giuliani (2006) analyses the role played by indirect ties in the wine industry in Chile, but the wine sector is a step further in comparison to the meat sector, if not in terms of technology intensity, for sure in terms of outward orientation and mind-openness. As the analysis of the network will show, in the specific sector under study the knowledge exchange process tends to be less intense, and the network less dense.

V.2. Methodology

V.2.1. The model

Different methodologies have been applied to the study of the nexus between firms' external relationships and innovation. Warren-Rodriguez (2008), for instance, uses firm-level data and logit regression analysis to identify factors associated with firms' decision to engage in technology-upgrading efforts in the Mozambican manufacturing sector. Silva and Leitão (2007) apply a logistic model to the study of cooperation in innovation practices among Portuguese firms to find a positive effect of relationships on product innovation. Giuliani (2006) applies probit and ordered probit models to the

study of the relationship between network structure and innovation in the wine sector in Chile. Ahuja (2000) conducts a longitudinal analysis with a panel Poisson approach using the patenting frequency of firms as dependent.

The choice of the statistical model is neither obvious or straightforward. When dealing with a categorical dependent variable and continuous independent variables, different possibilities arise: logistic regression, Discriminant Analysis, logit/probit models, GEV models. Although some of these methods may be used interchangeable and often produce same or similar results (logistic and logit, for instance), they actually answer different questions and differences in the underlying assumptions may have implications (Kachigan 1991 ch.6).

This study uses binary logistic regression, a form of regression that used when the dependent is a dichotomy (or multinomial or ordinal) and the independents are of any type. Logistic regression applies maximum likelihood estimation after transforming the dependent into a logit variable (the natural log of the odds of the dependent occurring or not). In this way, logistic regression estimates the odds of a certain event occurring. Unlike logit regression, however, there can be only one dependent variable.

$$\text{logit}(Y) = \text{natural log (odds)} = \ln [\pi / (1 - \pi)] = \alpha + \beta X$$

(Equation 1)

$$\pi = [e^{\alpha + \beta X} / (1 + e^{\alpha + \beta X})]$$

(Equation 2)

In this study we use logistic regression to predict a dependent variable on the basis of continuous and categorical independents and to determine the percent of variance in the dependent variable explained by the independents; to rank the relative importance of independents; to assess interaction effects; and to understand the impact of covariate control variables. The impact of predictor variables is usually explained in terms of odds ratios, where π is the probability of the outcome of interest or “event”, α is the Y intercept, β is the regression coefficient, and $e = 2.71828$ is the base of the system of natural logarithms. X is a vector of independent variables, which can be categorical or continuous, but Y is always categorical. According to Equation 1, the relationship

between logit (Y) and X is linear. Yet, according to Equation 2, the relationship between the probability of Y and X is nonlinear. For this reason, the natural log transformation of the odds in Equation 1 is necessary to make the relationship between a categorical outcome variable and its predictor(s) linear. The value of the coefficient β determines the direction of the relationship between X and the logit of Y . When β is greater than zero, larger (or smaller) X values are associated with larger (or smaller) logits of Y . Conversely, if β is less than zero, larger (or smaller) X values are associated with smaller (or larger) logits of Y .

Note that logistic regression calculates changes in the log odds of the dependent, not changes in the dependent itself as OLS regression does (Campbell 2006). Logistic regression has many analogies to OLS regression: logit coefficients correspond to b coefficients, the standardized logit coefficients correspond to beta weights, and a pseudo R^2 statistic is available to summarize the strength of the relationship. Unlike OLS regression, however, logistic regression does not assume linearity of relationship between the independent variables and the dependent, does not require normally distributed variables, does not assume homoskedasticity, and in general has less stringent requirements. It does, however, require that observations be independent and that the independent variables be linearly related to the logit of the dependent.

V.2.2. The data

On the basis of official sources and industry associations' databases, a list of firms was created. While the unit of analysis included in non-network analysis tend to be the result of independent probability sampling, in network studies they tend instead to include all of the actors who occur within some (usually naturally occurring) boundary. In our case, we have considered the entire population of exporting slaughtering and processing plants, therefore no sampling has been done.

A number of pilot interviews in the sector indicated that firms' managers were the best informants about the history and current characteristics of the firms. More important, they were also those responsible for the linkages between firms. For these reasons the questionnaire was administered to them, in face to face structured interviews.

Apart from allowing the collection of general information about the firm and its innovative efforts and performance, the questionnaire sought information that would permit the development of quantitative indicators. The questionnaire was built to gather both attribute and relational data, used for the network analysis aimed at identifying the knowledge flows between actors. Relational data were collected through a “roster recall” method (Wasserman and Faust 1994). Each firm was presented with a complete list (roster) of the other firms, universities and government agencies, and was asked to indicate, in a scale from 0 to 4, the intensity of relationship with each of the listed parties. This variable was been dichotomise, to indicate only the presence/absence of relationship. The disadvantage of this is a loss of information, but the advantage is that it allows a more reliable interpretation of results.

The interviews gave access to information far beyond what can be collected through an electronic questionnaire. This information was used to complement the quantitative analysis, through a better understanding of the context and the sector’s idiosyncrasies.

Besides the firms, we have included government agencies and universities, both private and public, involved with the sector. Government agencies and universities were added by a snowballing technique, that is, they were not in the initial list and have been added as firms were naming them (Hanneman and Riddle 2005; Wasserman and Faust 1994). The population under analysis is therefore composed by 49 nodes (or actors), including 36 firms ($F = 1, \dots, 36$), 7 government agencies ($A = 1, \dots, 7$) active in the food sector and providing support to firms, and six universities ($U = 1, \dots, 6$). This defines somehow the universe of players in the specific sector, which gives us an asymmetric (directed) matrix of $(N*N-1)^{27} = (49*48) = 2352$ observations.

There are seven isolates in the study population. These isolates must have had a circle of local contacts but they were not cited by any of the other nodes, and therefore have not been included (Burt 2004).

²⁷ We don’t consider the ties of actors with themselves (the main diagonal).

V.2.3. Operational definition of variables

This section deals with the definition of the variables included in the model. Below it is explained how they are measured.

V.2.3.1. The dependent variable

Many studies, especially in the chemical industry, use firms patenting frequency as a measure of innovation performance. “Patents are an important measure of innovation output because they are directly related to inventiveness, they represent an externally validated measure of technological novelty and they confer property rights on the assignee and therefore have economic significance” (Ahuja 2000 : 10). The “economic significance” issue is quite important: It is interesting to know what determines firms’ intentions or efforts to innovate but, ultimately, firms’ innovation performance matters as long as it improves the firms’ competitiveness. Finding a good measure for firms’ innovation performance with an economic implication is not always that easy. In the wine sector, Giuliani (2006) constructs a measure of innovation based on the wine ratings of specialised wine journals. This original solution, however, cannot be replicated in the meat sector, since there is no such system of rating. What we did, however, was to consider only those innovations that were commercialised and had an impact in terms of profits. For this reason, instead of “innovation” we will use the concept “upgrading”, to refer to innovations that had an economic impact. Indeed, there was the case of one firm who declared to have invested two years in the development of a new product, involving also investments in a special machinery coming from Germany and international consultants, which was not profitable and the production of which was quitted. This innovation, for instance, is not included in here. It does reflect the firm’s efforts in learning and innovating, but it didn’t improve the firm’s position in the market, it didn’t allow to access new markets, it didn’t allow to reduce costs, in other words, it had no economic significance (a part from the costs involved).

Chapter two has introduced the concept of upgrading distinguishing four different forms: product, process, functional and inter-sectoral. Chapter six will go more in-depth analysing qualitatively what kind of upgrading has taken place in the Chilean meat sector. Here the analysis will only include product and processes upgrading. The information collected would allow to distinguish between product and process

upgrading, and between different forms of innovation within these two broad categories. In the computation, however, it was not possible to categorise the dependent variable to such extent (parameters would gain values without meaning, either exaggeratedly big or small). The obliged option was to dichotomise the variable with a consequent loss of information (see table V.1.). Our dependent variable, UPGR, is dichotomous, meaning it can only assume the value 0 (the firm does not innovate) or 1 (the firm innovates). Where coded 1 those firms that, in the last three years, have developed and sold products and/or developed or adapted processes as defined above. All the other firms were coded 0.

Table V.1. Definition of variables

Conceptual Definition	Operational Definition
Knowledge flows among firms, universities and government agenc.	C_IND = Number of incoming ties
Age of the firm	AGE = Number of years the firm has been operating
Presence of internal technological capabilities	SKILLS = % employees w/technical, university degree
Firm size	FIRMSIZ = Number of employees
Exposure to international competition	EXPORT = % sold abroad as an average of the last 3 years
Upgrading performance	UPGR = Dichotomous. Introduction of new products or processes in the last 3 years that had positive economic impact

V.2.3.2. The main explanatory variable

These are independent variables that according to our hypothesis are key in explaining innovation. These variables are obtained as a result of a network analysis.

In the questionnaire-based interview, relational data were collected through a “roster recall” method. Each firm was presented with a complete list (roster) of the other firms, universities and government agencies, and, following Giuliani and Bell (2005) they were asked the following questions:

Q1: Reception of technical knowledge

Could you name, among the actors included in the roster, those that over the last three years have transferred knowledge to this firm relevant for the innovations you listed? [Please indicate the importance you attach to the information obtained in each case by marking the identified firms on the following scale: 0 = none; 1 = low; 2 = medium; 3 = high].

“Knowledge transfer” refers to flows between firms and between firms and other private and public entities with the objective to exchange technical knowledge. “Relevant” refers to the fact that these flows are perceived as having had a positive impact on the upgrading of products and processes, contributing to higher profits. Knowledge transfer takes often the form of a suggestion on how to solve specific problems, such as, for instance, the high levels of pH in the meat, but it could also include the exchange of technical personnel in order to solve specific problems.

The fact that the question is specifically about knowledge-transfer related ties, and the fact that knowledge refers to specific innovation, creates a direct correspondence between ties and knowledge flows on the one hand, and between knowledge flows and upgrading on the other. A one mode dataset was manually created from the relational data collected. Once transferred to Ucinet (Borgatti et al. 2002), these data were converted into a firm by firm adjacency matrix by creating ties if nodes exchanged knowledge with each other. Knowledge transfer was dichotomised, and coded 1 in the case of presence of transfer and 0 in the case of no transfer.

Our hypothesis is that firms with higher number of ties are also the most innovative, because a higher number of ties means a higher exposure to knowledge flows. Centrality refers to a count of the number of ties an actor has, meaning the number of organizations the actor is in contact with (Wasserman and Faust 1994). Degree Centrality measures the degree to which a firm is central in the knowledge network. Based on the matrix created using the question above, this measure counts the number of adjacent links to or from an actor. Data are here treated as asymmetric and, therefore, the computation returns two different measures: C_OUTD for out-degree centrality and C_IND for in-degree centrality. However, only the latter was considered, as operational definition for knowledge inflows. Indeed, in-degree is a count of the number of ties directed to the node.

Note that the degree measure of centrality may represent the number of alternatives available to an actor. Although we have no information about the sources of knowledge transfer (whether it is good or bad), we assume that more alternatives sources are better than fewer (Brass and Burkhardt 1992).

Although this is not the only centrality measure that exists, it has been chosen as the best measure for directed ties. Giuliani (2006) and Ahuja (2000), among many others, use it in a similar analysis.²⁸

V.2.3.3. The control variables

- *Age of the firm*

This is a control variable used in all models aimed at explaining innovation (see, for instance Giuliani 2006). The underlying idea is that firm's innovation capacities builds on existing capabilities which are cumulative over time, and therefore the number of years a firm has been operating in the sector constitutes an advantage. This study follows the literature in what it uses as measure for the age of the firm the number of years the firm has been operating. This variable is indicated as AGE.

- *Technological capability*

There is a well-established tradition of studies on Technological Capabilities (TC) in developing countries (Bell and Pavitt 1992 and 1995; Katz 1987; Lall, 1987; 1992 and 2001). Drawing upon the evolutionary approach of Nelson and Winter (1982), the TC literature claims that technological change is the result of purposeful investments undertaken by firms, and therefore transfer and diffusion of knowledge and technology are effective insofar as they also include elements of capability building (Morrison et al. 2006).

Figueiredo (2002), Morrison et al. (2006) focus on the practical implications of technological capability-accumulation paths for inter-firm differences in developing countries. They argue that the underlying learning processes made within the firm are crucial in explaining inter-firm differences in innovation performance. Technological Capabilities are the skills - technical, managerial or organizational - that firms need in order to utilize efficiently the hardware (equipment) and software (information) of

²⁸ Although with some differences: Giuliani (2006) for instance treats data as symmetric (undirected ties).

technology, and to accomplish any process of technological change. Capabilities are firm specific knowledge, made up of individual skills and experience accumulated over time. Technological change is neither exogenous nor automatic, but rather it is the result of purposeful activities, in other words of “technological efforts”, undertaken by firms. Most of the technological efforts do not take place at the frontier of technology. Individual efforts are required to make explicit the many tacit elements of technology and to access, implement, absorb and build upon the knowledge required in undertaking production. The transfer of technology implies essential elements of capability building. Since simply providing equipment, operating instructions, patents, designs and blueprints does not ensure that the technology will be effectively utilized, learning plays a central role in this approach, and firms’ differences in absorptive capacity influence the path, speed and direction of learning and innovation (Cohen and Levinthal 1990; Breschi *et al.* 2000; Nelson and Winter 1982; Morrison *et al.* 2006).

A branch of literature, drawing on innovation and learning processes in developing countries, emphasises the acquisition of technological capabilities as a major source of innovation at the firm level (Lall 1992; Bell and Pavitt 1993; Pietrobelli 1997; Ernst *et al.* 1998). This literature underlies the difficult firm-specific processes involved in building technological capabilities to use imported technology efficiently and to develop new. The central argument is that firms have to undertake conscious investments in training, engineering, and even research and development. Furthermore, capability building rarely occurs in isolation and involves active cooperation between firms and support institutions. Through the application and extension of knowledge and skills (in particular technologies and techniques), the firm builds its stock of both explicit and tacit knowledge accordingly. Therefore, knowledge is both an input and an output of the process of technological capabilities building: There is a minimum threshold of technological capabilities required in order for firms to make the best of new knowledge. For firms to acquire exogenously the knowledge available and convert it into innovation, they must be able to recognize, capture and assimilate this knowledge (Cohen and Levinthal 1990).²⁹ At the same time, knowledge inflows build into a firm’s technological capabilities. Indeed, the abilities required to recognize, capture and

²⁹ Cohen and Levinthal (1990) use the concept “absorptive capacity” to identify something very similar to the concept of technological capability introduced by Lall. Both concepts assume a resource-based view of the firms and dynamic abilities (either called capabilities or capacities).

assimilate new knowledge are not given, and firms must develop both internally and through cooperation between firms and support institutions. Differences in the efficiency with which firm-level capabilities are created are themselves a major source of competitive advantage.

R&D expenditures are often included in measures of technological capabilities. Ahuja (2000) uses it as determinant of innovative outcomes. Although this makes sense in the chemicals sector analysed by the author, in the sector analysed by this chapter, where most firms not only don't have an R&D department, but most of the times don't even have employees exclusively dedicated to R&D activities, its inclusion would make no sense. Instead, we took as measure of technological capabilities the percentage of skilled labour of the firm (i.e. workers with technical education or university degree).

- Firm size

Joseph A. Schumpeter (1950) started the debate on the relationship between firm size and innovation by contending that large corporations with monopoly power were likely to advance industrial technology because of superior access to capital, ability to pool risks, and economies of scale in the maintenance of R&D laboratories. According to Schumpeter, big firms have the resources and possess a monopolistic power that enable them to face the inherent risk of innovation.

However, empirical evidence does not confirm the role of the size of the firm in relation to innovation and some approaches support that it is also plausible that big firms have rigidities in introducing novelty. Problems with statistics, sectoral specificities or even the technological characteristics of innovation interfere and make the relation between size and innovation much more complex (Freeman and Soete, 1997) and in that sense it is not possible to conclude on that question.

Although the direction of the relationship seems controversial, there is no doubt about the existence of a relationship, and therefore it is conventional to control for firm-size effects when analysing innovation (Cohen and Levin 1989). It is also conventional to use the number of employees as a measure of firms size. This is the measure used, for instance, by all the studies just cited. In this chapter we do the same. Therefore, the variable FIRMSIZ measures the number of employees each firm has.

- *Export orientation*

Exporters are more productive than non-exporters. Empirical evidence for this claim can be found in numerous recent studies¹, though causality in the relationship is not that clear. There are two main non exclusive theories which attempt to explain these findings. The first, often referred to as the self-selection theory, proposes that more productive firms self-select into exporting due to the existence of sunk costs connected with entering foreign markets² and possibly stronger competition on foreign markets (Saxa 2008).

Cassiman and Golovki (2007) criticise this approach in what it implicitly assumes that firms are born with their productivity, as if it were an inherent ability, and assume productivity to be somehow determined exogenously: firms with low productivity exit, while “lucky” firms with high productivity survive and grow. The authors state that while there is a strong positive association between productivity and export activity at firm level, we know very little about the connection. They take a step backward, and argue that a potential underlying mechanism for the selection of more productive firms into exporting is related to firm’s innovation: Successful innovation enhances the firm productivity leading to the selection of the more productive firms into the export markets. These authors introduce innovation into the equation, but they still assume it as a determinant of export performance.

The second theory, referred to as the learning-by exporting theory, suggests instead that exporting firms enhance their productivity and innovative capacity through selling abroad. This can happen in several ways. Exporters can learn from foreign customers, they can increase productivity and innovation due to the pressure of international competition, or they can simply gain new markets and benefit from economies of scale. In terms of causality, there is a clear distinction between the two theories. These two theories are non-exclusive: More productive firms can self select into exporting but, at the same time, the productivity and the innovative capacity of exporters can grow faster than in the case of non-exporters (Saxa 2008).

The power of the second theory becomes clearer if the domestic economy is less developed and relatively small. For a less developed country, the greater difference in technology levels between domestic and foreign firms increases the possible learning

gains that exporting firms can achieve through contacts with more developed foreign partners (Saxa 2008).

In this chapter, the variable that measures export orientation, EXPORT, is the percentage of product sold abroad, averaged over the last three years.

In conclusion, we assume that:

$$\text{INNOV} = f(\text{C_IND}, \text{AGE}, \text{SKILLS}, \text{FIRMSIZ}, \text{EXPORT})$$

V.3. The analysis

V.3.1. A graphical analysis of network structure, knowledge flows and innovation

NetDraw (Borgatti et al. 2002) allows some interesting graphical analysis. Figure 1 shows the knowledge flows (relevant technical knowledge transfer) between the actors of the network. The blue nodes represent the firms, while the red nodes the universities and the government agencies. Flows are expressed by the directed edges between the nodes.³⁰ Blue edges highlight the knowledge flows between firms, while red edges those between firms and other public/private entities.³¹

The relationships between government agencies, and those between universities, as well as the relationships between these two categories, are absent, as a natural consequence of how technical knowledge transfer has been defined in the previous section, which would make no sense between universities and between public agencies, as well as between these two type of institutions.

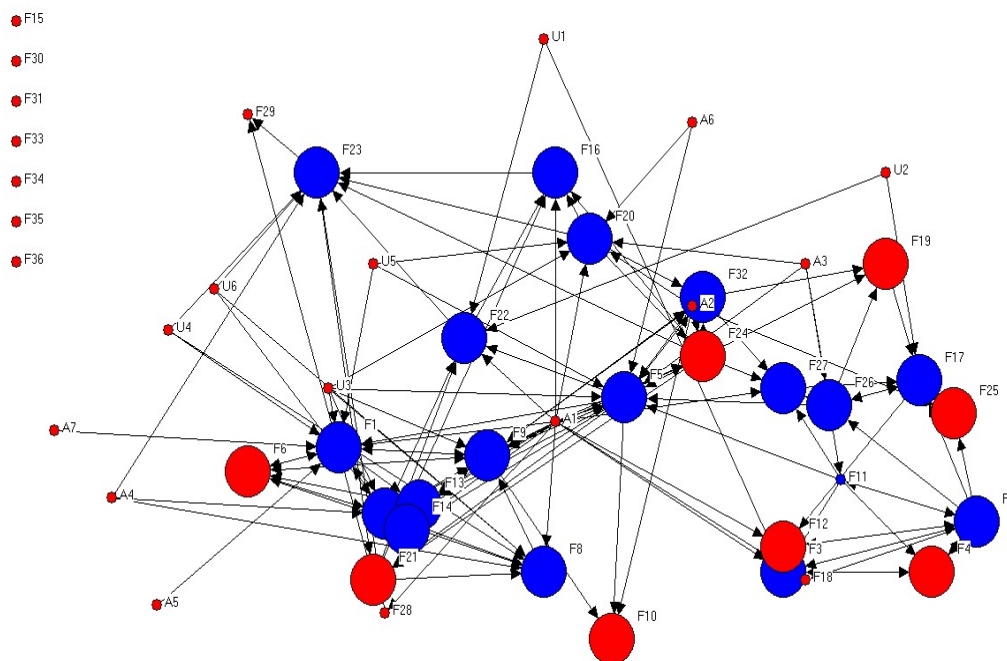
³⁰ In this case it has also been selected the “node repulsion” criterion, which helps to separate objects that would otherwise be located very close to one another. We have also used the “equal edge length” option to make similar the distances between adjacent objects.

³¹ The network under analysis regards a specific relationship, that is, the knowledge transfers as defined above. Such knowledge transfers would make no sense when considering the relationships between universities or between universities and public agencies. A specific section at the end of this analysis will explain more in detail how universities and government agencies work, and will provide more information about their connections.

subtracted from the number of pairs possible ties from the firm to the universities and government agencies, those between universities and government agencies and those between universities and government agencies. This is because the knowledge flow we consider, as defined previously, makes no sense between and within these other organisations. The density measure can give as insights into such phenomena as the speed at which information diffuses among the nodes, and the extent to which actors have high levels of trust and/or social constraint. The density (matrix average) for this network is 0, 24. This indicates that only 24% of all possible ties are present. We can easily conclude that this network is not very cohesive.

The graphical analysis provide both a crude first examination of hypothesis about patterns that may be present in the data, and are also a useful descriptive tool. Especially if used in combination with the mathematical/statistical analysis with Ucinet (Borgatti et al. 2002), it can reveal interesting things.

Figure.V.2. Knowledge inflows and upgrading



Source: Authors' own data

The network in Figure 2 has been obtained seizing the nodes according to their InDegree Centrality (knowledge inflows). In the figure the colour blue indicates the upgraders, that is, firms that according to the definition given in the previous section upgrade. In this case the centrality measures that are the outcome of the mathematical analysis with Ucinet have been used as attributes for the graphical analysis. The InDegree centrality measure has been dichotomised for this graphical analysis: Firms were coded 1 when had ties above the average and 0 when below. This allowed to clearly distinguish those with high (above the average) centrality, in order to allow an easier comparison with those innovating.

Of the 26 nodes most active in the knowledge exchange (centrality above the average), 19 are receivers of knowledge. While 69% (18 firms) of the 26 firms that share knowledge above the average upgrade, hundred percent of those that upgrade are involved in knowledge exchange. Since all those who innovate, exchange knowledge and most of those who exchange knowledge innovate, the graphical analysis could suggest a positive relationship between exchanging knowledge and upgrading.

Those who are net receivers (calculated as the difference between Firm's In-Degree and Out-Degree) are likely so out of necessity. The reason could be that either they don't have nothing to transfer, or that they are not perceived by many others as potential senders and therefore they don't send because are not asked to do so. The fact that only half of them innovate may suggest that there is no automatic relationship between being knowledge receivers and being innovators, and that those who manage to innovate are probably those who, for some reason, can make the best of the received knowledge. Data was checked to see whether there were differences in terms of skills between the net receivers that innovate and those that don't, to see whether different levels of internal technological capabilities could explain the difference, being those with more skills better equipped to capture, absorb, process, and recombine the knowledge received. The data reveals something interesting: Those who among the net receivers innovate, show on average higher levels of internal sources of knowledge (as self-estimated), and internal sources of knowledge are intimately linked to the presence of technological capabilities. An additional possible explanation of the difference in performance could also be some form of organisational capital: Firms that have the same amount of (immaterial) resources (knowledge and skill) may show different levels

of efficiency in recombining these resources. Unfortunately, our data don't capture this dimension, and don't allow us to further examine this aspect.

V.3.2. An econometric analysis of knowledge flows and innovation

The graphical analysis suggested the existence of a positive relationship between exchanging knowledge and innovating. In this section we want to use statistical techniques to test whether there is indeed, such positive relationship.

In order to do so, we have a logistic regression model was applied to the data using the variables defined previously. The model has a fit of 89% (Nagelkerke R Square), which is quite high (see table V.1.).

Of the 36 firms included in the analysis, half innovate. The results of the logistic regression suggest that the number of direct knowledge linkages that a firm establishes with other firms contributes significantly in explaining their innovative performance. This is in line with most of organizational sociology's literature (Powell et al. 1996; Ahuja 2000, among others), which supports the view that the structural position of a firm in the knowledge network affects or is positively related to the firm innovative performance.

Table.V.1. Model estimation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	C_IND	1.621	0.776	4.360	1	0.037	5.056
	AGE	0.272	0.592	0.210	1	0.647	1.376
	SKILLS	0.635	1.812	0.123	1	0.726	1.887
	FIRMSIZ	0.010	0.014	0.581	1	0.446	1.010
	EXPORT(1)	0.396	1.899	0.043	1	0.835	1.485

a. Variable(s) entered on step 1: C_IND, AGE, SKILLS, FIRMSIZ, EXPORT.

Our results, however, also reveal a difference in terms of impact between knowledge inflows and knowledge outflows, where only the former increase firms' probability to innovate.

Table V.2. shows the odds (Upgrade /Not Upgrade) of the dependent variable as the independent vary. Knowledge inflows seem to increase approximately by five times a

firms' probability to upgrade. The odds >1 indicates a positive relationship between the knowledge inflows, measured by C_IND, and the probability to innovate.

To what concerns the other variables, we see that SKILLS is positively correlated with the probability to innovate: Having at least 15% of the employees with technical or university education almost doubles the chance to innovate. The odd-ratio for EXPORT is 1,485, which means that the probability to innovate is 1,5 times bigger for those that export compared to those that don't export. The fact the odd-ratio for FIRMSIZ are equal to one, indicate that the firm size doesn't seem to have any effect on the probability to innovate, while AGE does seem to have a positive impact.

Note that we don't look at the level of significance since, working on an entire population, there is no need for statistical inference. The use of the logistic regression in this case is therefore solely exploratory and descriptive. That is, this is the relationship we observe in the population of firms under study. This doesn't allow to generalise or draw any conclusion about possible results in replicating this research in a different context and with different firms. Nevertheless, it highlights some interesting factors and suggests some useful reflections.

V.3.3. Discussion of results

Some important things emerge from this analysis: 1) in the complete network, the number of existing ties is dramatically lower than the potential; 2) there is high heterogeneity in firms' capacity to network; 3) developing relationships and participating to knowledge exchanges is crucial for innovation and upgrading; 4) receiving knowledge dramatically increases the probability to upgrade.

We will start the discussion of the results from the latter (point 4). The fact that the outflow of information is negatively correlated to the probability to innovate could suggest that sharing knowledge is bad, maybe because it burns the competitive advantage derived from the knowledge possession. This suggests that the knowledge that matters in this sector is fairly codified knowledge, that can be easily transferred and utilised, regardless of tacit components.

From findings 2 and 3, new questions spring, namely: If building networks is so crucial, why only few firms do so? What does the capacity to build networks depends on?

Based on the qualitative analysis, we would tend to think that in the specific context of this study, linkages are very much left to the individual action. That is, what guides the networking and information/knowledge sharing process is not an institutionalised and well-defined strategy, but rather personal initiative. The consequence of the fact that the process of exchange relies on the specific person, rather than on a specific role, may be that choices are sometimes driven more by personal motivations rather than by systemic efficiency considerations. In addition, it also implies the possibility of network disruption once the specific person is substituted. If firms are made of persons, this is especially true in small and medium ones, where roles are less institutionalised and people less constrained. In this case, the contribution of a single person is not only its networking capacity but, to a large extent, its actual network. In such situation, it is hard to conclude that the relationships firm create are driven by strategic thinking, and therefore respond to efficiency consideration.

But another important issue, not captured by the quantitative analysis relates to the quality of the linkages. With respect to this, Uzzi's (1997) distinction between arm-length ties and embedded ties, is illuminating. According to the author, arm-length ties are characterised by lean and sporadic transactions and function without any prolonged social contact between parties who do not enter into recurrent or continuing relations. They are characterised by minimal publicly available-information exchange and are grounded in mutual distrust. Embedded ties are characterised by their strength, redundancy, transmission of tacit, thick and additional information and their grounding in norms of trust and reciprocity. The mere existence of ties, then, doesn't reveal much about the degree of cohesion among actors. Many of our informants have alluded to the distrust, and the consequent hypocrisy, that characterises even frequent exchanges between actors. Moreover, if most of relationship are bilateral, rather than multilateral, this also reduces the degree of knowledge circulation in the network. As in friendships, if I am friend to A but not to A's friends, I may tend to exercise more control over the information I pass to A, because I may fear that A will pass such information to those she considers as friends but towards whom I am diffident, due to the fact they are not my friends. These are all speculations, of course, but all however based on the observation of the context and the relationship dynamics that can't be captured in the

quantitative analysis as undertaken here. Further research is, therefore, needed to answer the new questions and test the new hypotheses arisen from this analysis.

We carried the analysis on Chilean meat industry data, and we found that, indeed, connections play a great role in determining firm's probability to innovate. This carries significant implications for the development of industry policy as well as government and firm policies. Funds dedicated to projects linking university and industry research could be expanded. Governments could augment current programs aimed at increasing cohesion and knowledge exchange within the sector. A better understanding of the factors that enhance the ability of firms to generate novel innovations will be inherently helpful for firms striving to compete in domestic and international markets. An understanding of this process will enable firms to integrate network design into organisational strategy, thus placing themselves in a better position to increase their competitiveness in an industry where competition is defined by innovation. For example, in light of findings in favour of weak tie dominant structures being of greater utility in the idea inception phase of development, firms could change their organisational structure so as to better identify, incorporate and exploit these phenomena (for instance by participating in international conferences). Therefore, the contributions to policy provided by this study pertain to both organisations and governments involved with the specific industry, and potentially those associated more broadly with knowledge intensive industry.

But these findings also suggest future research directions. Once assessed the positive contribution of connections for innovation and, consequently, the need to network and share knowledge, one is left with the question of how these characteristics come about, and to what extent they are part of a business strategy or a personal attitude.

A more ambitious development of the present study could attempt to extend the network analysis to include providers of equipments and other inputs, as well as buyers. Buyers do seem to play an important role, if not in direct knowledge transmission, at least in the transmission of standards which, to some extent, incorporate some knowledge or stimulate its acquisition for their adoption. Suppliers of materials and machinery, jointly with consultants, are also important sources of knowledge (Giuliani and Bell 2005). In this chapter, however, we look only at the horizontal linkages, leaving aside the vertical connections firm have with buyers and suppliers.

As the food industry is rapidly becoming global, insertion of input providers and buyers would require to extend the analysis to different countries/continents. In addition, international sources of knowledge, in particular foreign consultants, also seem to play an important role in the transfer of frontier knowledge and techniques in the field (Giuliani and Bell 2005). However, given the sector's tendency towards concentration upstream, the relevant actors would be quite easy to identify, contributing to create a well-defined network with many shared connections. Although these are only possible developments that go far beyond the scope of the present study, it is useful, nevertheless, to keep in mind that the network considered here could be (and should be, at least as an exercise of abstraction) extended beyond national borders. Although this chapter refers to attempts to explain innovation through national systems such universities, firms and government network, the limitations of this approach in today's globalised world have also been noted (Nelson 1993).

V.4. Summary of the chapter

This chapter has investigated the relationship between horizontal knowledge flows and the probability to upgrade. The results suggest that knowledge inflows increase by five times the probability to upgrade.

The analysis in this chapter has concentrated on horizontal linkages and knowledge flows among different national actors. The globalisation of the food industry, however, calls for the consideration of firms' relationships with input providers and buyers. Likewise, the network considered here should be extended beyond national borders, and viewed as inserted in a more complex web of international interactions. The following chapter attempts to fill this gap by looking to the vertical linkages and knowledge flows between the firm and the other actors that are part of the same chain. This will necessary drive us to a more international realm.

CHAPTER SIX

Chain governance, knowledge flows, innovation and upgrading in the Chilean meat sector

THIS CHAPTER analyses the knowledge flows among firms operating within the same value chain. Global value chain approach is used for this purpose. A combination of both qualitative and quantitative analysis tools reveal interesting patterns of governance and knowledge flows, and their relationship with innovation and upgrading in the Chilean meat sector. After a brief introduction, the meat chain structures is analysed, by paying special attention to the degree of coordination and knowledge flows among the different links. The second part of the chapter analyses, both qualitatively and quantitatively, chain governance and the power relationships within the Chilean meat chain, and their impact on innovation and upgrading. The final part of the chapter is about chain dynamics, and analyses how chains are changing and restructuring under the pressure of different elements affecting governance structures.

VI.1. Introduction

Global value chains represent a new form of industrial organization that is widely diffused in many industries across countries. The value chain concept enhances our understanding of the way trade takes place today. Research on value chains shows that an increasing amount of international trade occurs within trading networks (McCormick and Schmitz 2001). Firms in the networks are formally independent of one another, but linked by personal relations, repeated transactions, and often dense information flows.

Networks contain firms of many different types, from global buyers to small local workshops.

Value chain analysis also allows to understand problems of market access for developing countries even when developed countries reduce tariffs or eliminate other trade barriers. Indeed, critical factors for participating into global value chains are not only price, quality and punctuality but also the willingness to develop relationships, interact, learn, absorb from the lead enterprises and adapt to their requirements (McCormick and Schmitz 2001).

One of the major and innovative elements of the value chain approach is that it acknowledges that knowledge flows within value chains play a central role, and that they are themselves the object of a severe competition where power is often exercised. This stems from the central role that knowledge plays today in all economic/productive activities: competitiveness is affected by the knowledge flows and the capabilities to exploit them fruitfully (Kaplinsky and Morris 2000).

In addition, the value chain approach provides a good picture of the process of creating value. By showing that a product is brought to market through a combination of activities, all of which contribute to its final value, it shows clearly that production is not the only way to create value. In fact, in many chains, the value added for stages such as design or marketing is higher than that of the production process (Kaplinsky and Morris 2000; McCormick and Schmitz 2001; Humphrey and Schmitz; Sturgeon 2001, 2008), with important distributional implications (Kaplinsky 2000).

Participation in global value chains can build foundations for innovation and upgrading, but core are the strategic choices on the linking relationship, which define access to the right technology and knowledge (Humphrey and Schmitz 2000, 2001, 2002). Producers that gain access to a chain are pushed to upgrade their production capability, and also become receivers of knowledge (best practices and provide hands-on advice on, for example, how to improve production and raise workers' skills). This helps to understand how relatively underdeveloped regions can become major export producers in a short period of time. However, it also explains how lead firms' focus on transmitting only production skills, for instance, may avoid developing country producers to become proficient in higher value added activities, such as design and marketing. Empirical evidence shows that developing country firms tend to be locked

into production activities, in which they manufacture to the specifications of the lead firm. Since many producers are capable of doing this, competition is intense and returns are low (Kaplinsky 2000; Pietrobelli and Rabellotti 2004).

The characteristics of global value chains, their organization, the strategies of the leading players in them, and their dynamics can directly affect the process of upgrading of local players in developing countries. Their analysis is, therefore, of paramount importance.

Last but not least, the value chain approach helps to identify the weaker links in the chain, that is, those with low returns and little bargaining power and, thus, to find ways of improving the situation. Therefore its policy implications are considerable.

An underlying assumption of the GVC approach is that serving the *global* market is the key to upgrading for local firms in developing countries. The fact that the industry under investigation also targets the *domestic* market may be seen as incongruent with the GVC approach. However, recent research has shown that the essence of the GVC approach can be used to analyze inter-firm linkages serving domestic markets within countries (Bazan and Navas Aleman 2004; Navas-Aleman 2006; Tewari 1999). Indeed, Sturgeon (2008), relative to the Gereffi, Humphrey and Sturgeon (2005) framework of value chain governance has argued that “regional, national and local value chains are nested firmly within global value chains, as we perceive them, and GVC governance theory operates equally well at any and all of these spatial scales” (Sturgeon 2008 : 15).

From an analytical point of view, the analysis of global value chains implies the study of activities taking place outside the firm, and in particular to understand the strategic role of the relationships with key external actors, buyers and suppliers.

Most studies analysing supply chains from a GVC perspective have concentrated on industries like electronics, automotive and textile. Until recently, few were the studies applied to the agro-food sector. This is probably because, traditionally, the agro-food sector has been dominated by arms-length relationships and characterised by low technological intensity, and therefore issues like learning, developing capabilities, innovating and upgrading, which are core to the GVC approach, seemed not be important.

In recent years, however, a growing number of studies (Kaplan and Kaplinsky 1998; Dolan and Humphrey 2000; Dolan and Tewari 2001; Pelupossy and van Kempen 2005;

Humphrey and Memedovic 2006; Fold and Pritchard; Wiegratz et al. 2007; Vieira and Traill 2007; Palpacuer and Tozanli 2008; Challies 2008, among others)³⁴ has analysed agro-food chains from either a GVC or a transaction cost perspective. The reason for this increase is clear: The sector is undergoing important changes, from both the demand and the supply side. Giant retailers have emerged and acquired control of the chain, just as in other buyer-driven sectors like garment. Consumer concern for quality assurance combined with a need from the supply side to add value and differentiate products in order to survive to international competition have increased the technological intensity of the sector and called for higher coordination along the value chain.³⁵

Raynoud et al. (2005) propose a useful stylized model of agro-food vertical chain to compare governance modes in different agro-food sectors. Their model is mainly based on a technological decomposition of the production process along the chain and integrates five main transactions:

- Transaction between farmers and their input suppliers (hereafter labeled *T.1*),
- Transaction between farmers and the first processing stage (*T.2*),
- Transaction between the first and the second processing stages (*T.3*),
- Transaction between the last processing stage and wholesalers (*T.4*),
- Transaction between wholesalers (or the last processing stages) and retailers (traditional and/or large retail chains) (*T.5*).

The length of each chain varies mainly from sector to sector (as well as within them). For instance, the vertical chain in the fruits and vegetables sector is shorter than the other two sectors, since the transaction between the first and the second processing

³⁴ Check the Global Value Chain website, which provides a list of publications on global value chains for each sector. The website is a joint initiative of the Centre on Globalization, Governance and Competitiveness (CGGC) at Duke University; John Humphrey of the Institute of Development Studies (IDS) at the University of Sussex; and Timothy Sturgeon, of the Industrial Performance Centre at the Massachusetts Institute of Technology. <<http://www.globalvaluechains.org/>>

³⁵ Check also the Regoverning Markets website: <<http://www.regoverningmarkets.org/en/global>>

A collaborative research project is analysing growing concentration in the processing and retail sectors of national and regional agro-food systems and its impacts and implications for rural livelihoods and communities in middle and low income countries.

stage ($T.3$) does not exist. This is because the vast majority of the case studies in this sector are about fresh products. In the cheese sector, the transformation of milk into cheese is always followed by a maturation stage (of variable length depending on the product). In the meat sector, fresh meat involves only one processing stage (slaughtering), whereas processed meats also involve a second processing stage (for instance sausages or hamburgers).

For each transaction $T.i$ of their model of vertical chain, Raynaud et al. (2005) looked at the governance structure, identifying six different governance structures.

The main lack of this literature is in the empirical methodology: Case studies have the privilege to capture country specificities but results are not easy to generalize (Pietrobelli and Saliola 2006).

This chapter takes up the challenge by Pietrobelli and Saliola (2006) and tries to provide an analysis of the Chilean meat chain based on Kaplinsky and Morris (2000) Handbook and on McCormick and Schmitz (2001),³⁶ as an attempt to respond to a well defined methodological framework that can be adopted to allow comparisons across time, space and sectors. Moreover, following Pietrobelli and Saliola (2006), this work tries to go beyond mere qualitative approach by proposing a quantitative analysis of the relationship between governance and innovation.

Morrison et al. (2006) distinguish two main approaches within GVC analysis. The *internationalist* approach includes the North-American school on GVCs, well represented by Gereffi and some European-based scholars as Kaplinsky and Gibbon, and colleagues at the Danish Institute for International Studies (DIIS); and the *industrialist* approach, represented by Humphrey, Schmitz and colleagues at the Institute of Development Studies (IDS), at the University of Sussex. *Internationalists* tend to privilege a macro perspective, both in terms of level of analysis and of policy focus; conversely the *industrialists* adopt a micro founded framework of analysis with a policy focus oriented towards local and cluster development. What marks the difference between them is the method of inquiry: the *internationalists* mostly concentrate on the industry as a whole, while the *industrialists* mainly investigate specific clusters, and adopt a case-study methodology (Morrison et al. 2006). Although the approach of this thesis is more industrialist, both Kaplinsky and

³⁶ Chapter four explains why these two references were chosen.

Morris (2001) and McCormick and Schmitz (2001) handbooks on how to analyse GVC were used.³⁷

Although these two Handbooks are the guiding light in this analysis, their framework will be complemented or extended, when necessary, to give account of the idiosyncrasies of the specific sector under analysis.

VI.2. Chain structure

VI.2.1. The entry point

Following Kaplinsky and Morris (2000), the first step in analysing value chains is to clearly identify the point of entry for the research enquiry. Which chain-or chains-will be subject of enquiry will very much depend on this initial choice. The authors suggest different possible entry points: retailers, independent buyers, key producers, sub-suppliers, agricultural producers, small farms and firms, and so forth. The entry point will define which links and which activities in the chain are to be subject of special enquiry. For example, if the focal point of the enquiry is in the design and branding activities in the chain, then the point of entry might be on design houses, or the branding function in key global marketing companies. This will require to go backwards into a number of chains which feed into a common brand name, for example the different suppliers of Nestle.

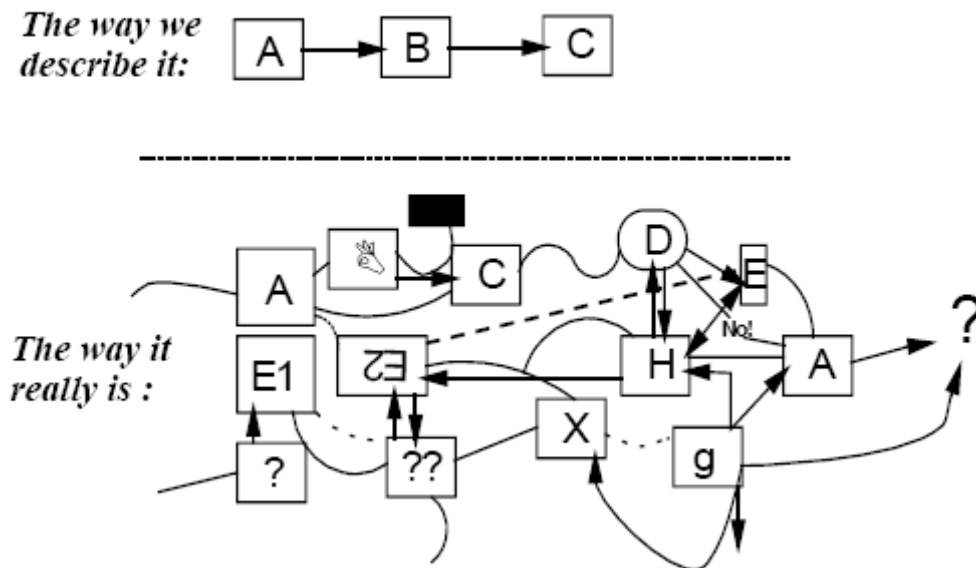
In this analysis of the Chilean meat chains, the primary area of research interest is the role of key producers, hence slaughtering and processing plants was taken as entry points (See the scheme of the Chilean meat value chain). In this case, mapping the chain requires to go forwards to buyers and backwards to suppliers and their suppliers.

However, although theory of value chains suggests simplicity and easy clarity of focus (Kaplinsky and Morris : 52), mapping the chain can be a complex task in a complex world. Indeed, the common assumption when analysing a value chain is to imagine it as linear and directed in its relationships and flows. As shown by the famous

³⁷ Actually, only Kaplinsky and Morris text is called “Handbook”. Nevertheless, although McCormick and Schmitz work is a research on homeworkers in the garment industry, it contains a very comprehensive methodological part. This part is a proper manual on how to conduct research in GVC, from the identification of the value chains to the analysis, and which includes also a part on questionnaire design and administration, and interviews.

representation by Brown et al. (2000) cited in Kaplinsky and Morris, this is all but realistic (Figure VI.1.).

Figure VI.1. Value chain mapping, theory and reality



Source: Brown et al. (2000) , cited in Kaplinsky and Morris.

VI.2.2. Mapping the chain

Mapping a chain means giving a visual representation of the connections between actors.

In the Chilean meat sector we can identify four different chains. These will be identified as chain A, B, and C.

Chain A

Processor A sells 45% of its beef production abroad and 55% to the domestic market (supermarkets and small retailers). It has two slaughtering plants and a total slaughter capacity of up to 4,500 cattle heads per day. This processor has a backward vertical integration, owning three farms involved in breeding, raising and fattening. This acts as a protection against price distortions or lack of supply. The purchase department also sources from local farms, buying at auction markets or through cattle merchants. Thus, this processor combines the two extreme forms of co-ordination: vertical integration and

spot market. The first transaction, between farmer and processor, occurs through vertical integration and the second transaction, between processor and buyer, happens using spot market. The search attributes and the need to cover process standards lead this transaction to have high asset specificity. Spot market transactions could no longer guarantee regularity of supply. The processor complies with process standards through vertical integration between production and processing activities. To date, the exporter has been fully complying with the required national and international public and private standards. And it is certified for export in almost all main markets excluding the USA. The product sold abroad is high quality with no differentiation. The brand used in the final market is not his. While in the domestic market, it sells with his own brand, which is well known and trusted.

Chain B

This company is a large processor which slaughters 2,800 heads per day at three processing plants. From the total production, 70% of the total is exported and 30% is sold to the domestic market. This company, in addition to conventional beef, also produces organic beef. The production and processing of organic beef is the focus of this case. This is done using vertical integration to assure the compliance with organic production according to EU standards. The manager says that organic beef receives from 5 to 10% more than conventional beef price. In addition to the use of vertical integration to produce organic beef, “B” takes advantage of spot markets. The processor sources from more than 300 different suppliers and argues that there is a lack of trust between farmer and producer to implement closer relationships and greater coordination, which is a barrier to the development of a quality and safety assurance scheme, as enforced by EU regulation. Organic beef opens up sophisticated markets abroad (UK, Germany, and the Netherlands). To be able to export organic beef, the company must obtain an ISO 14000 (environmental standards), homeopathic and phytotherapeutic products can be given to the livestock and the pasture cannot receive artificial pesticides or fertilizers. Conversion to organic production, therefore, takes time (in average, two years). Organic standards focus on credence attributes, for which even the consumption does not bring information about the quality (for example, the use of pesticides). These attributes are not detected and there is a need for inspection or

labelling which customers can trust. The certifying body plays this role in the importing country. The transaction between producer and processor lacks trust. At the time of the decision to produce organic beef, there was little interest or knowledge amongst beef producers to convert their production system. The processor had no option of supply apart from developing a vertical integration upstream. On the other hand, cognitive trust exists between processor and importer. The importer helped the exporter to meet international organic standards, asking for the recognition in European certifying bodies. Both importer and exporter share information and develop a differentiation strategy together. The exporter is upgrading its production system (for example, adopting best environmental practices) resulting in access to sophisticated markets. The importer is also supplying customers who demand a differentiated and premium product, easy to commercialise. The hybrid form created a competitive advantage for both agents.

The cognitive trust was developed during the interaction of the two agents in developing a product and due to the investment that the exporter made in this project (vertically integrating its beef production and complying with strict standards). Trust, in this case, can also be considered an input of the relationship. These two partners developed the product together because they believe that the other would act honestly. The organic standards are based on public standards (EU directive) enforced by a third party (a certifying body). Organic farming involves process-oriented attributes and relies on credence attributes. The importer helped the company to meet the standards (executive governance) and is responsible for the re certification in Europe. The high specificity of the organic standards led to the formation of a hybrid form of co-ordination in the transaction between importer and exporter. There was also a change of co-ordination upstream, when the processor had to vertically integrate to be able to comply with the standards applied to the beef production.

Chain D

This beef processor exports 60% under customer's brand and sales 40% under its own brand in the domestic market. This co-operative was a joint effort between some local medium and large sized farms to develop a differentiated product and quality recognised

brand locally and abroad. This was done through a forward vertical integration, where the company owns its shops (“boutiques”).

VI.2.3. The final market: Segmentation and Critical Success Factors

One of the distinctive features about contemporary food production systems is that they tend to be “market pulled”, as opposed to the “supplier-push” nature. This puts a primacy on the characteristics of final product markets in every chain. It is important to decompose the final market into different market segments. For instance, in foodstuffs, segmented markets comprise low income processed foods, convenience foods, organic foods, premiums, exotics, and so on. Each of these will have its own distinctive market characteristics.

These characteristics are referred to as *Critical Success Factors* (CSFs). Generally, in low income final markets, price will be a relatively important CSF, but it will not be unique. Customers will also require quality, differentiation and branding. In higher income markets these non-price CSFs will generally be more important, with innovation, customisation and quality dominating.

Table VI.1. Different perceptions of market requirements

EUROPE	ASIA	DOMESTIC
Safety	Quality specification	Safety
Quality specifications	Packaging	Price
Price	Responsiveness	Quality
Delivery reliability	Innovation	
	Delivery reliability	

Source: Author’s own data

Not only are markets increasingly segmented, with each segment having distinctive combinations of CSFs but they are also increasingly volatile, that is, they change rapidly.

The CSFs in each market can be grouped into those which are “order qualifying”, that is, producers need to achieve in order to participate in markets, and those which are “order winning”, which lead particular firms to succeed, perhaps by selling at a premium price.

Table VI.1. shows firms' perceptions of market requirements in the main three markets for Chilean meat.

The analysis of CSFs, was based on secondary data, through a report prepared by a consultancy firm (McKinsey 2004), and on primary data, through key informants from both universities and trade unions, and through the responses obtained by firms in the questionnaire.³⁸

Table VI.2. Direction of innovation efforts³⁹

	Absent	Low	Medium	High	Very high
	% Firms				
Keep or gain market shares	16	0	0	17	34
Improve production process	34	8	7	9	9
Improve product quality	25	0	0	8	34
Improve labour conditions	42	2	17	6	0
Improve environmental performance	8	0	7	10	42

Source: Authors own data Missing Data (non respondent): 33%

VI.2.4. How producers access final markets

One of the powers of value chain analysis is that it goes beyond firm-level analysis. Indeed, a narrow focus on the competitiveness of individual producers may not explain their success in global markets. This is because each of these producers needs an entry point into global markets (Kaplinsky and Morris 2000). Different forms of connecting intermediaries will affect the terms of entry into global markets and the capacity of individual producers to upgrade. This is why the ways in which producers are connected to final markets is of particular importance to value chain analysis.

³⁸ One of the key problems which emerges in collecting data involving qualitative perceptions of key informants is the issue of triangulation, that is, the means of verifying data which have been collected. Therefore, wherever possible, it is desirable to cross-check data. In this case, this was done by asking the same questions to different respondents. This serves a dual function of triangulating the data and of assessing producers' capacity to "hear" their final markets effectively. In the specific case of this analysis, it emerges, for instance, a different perception of domestic buyers and sellers: Suppliers over-estimate buyers interest in safety, compared to price. This may be explained because of the government's stress on safety issues, which is perceived by producers obliged to respect strict regulations but not perceived by buyers in domestic markets.

³⁹ "In the last five years, how were the firm's innovation efforts towards each of these goals?"

There are different type of key buyers, the major forms being retail chains buying in large volumes, wholesale firms (“category agents” in the food industry) buying in large volumes, independent buyers, generally selling to small scale retailers, large firms in key links of the chains which buy in large volumes and/or who set the rules (“legislative governance”) which govern incorporation in final markets. In many chains, the buying function is becoming increasingly concentrated (Dirven 1999; Humphrey and Memedovic 2006; Fromm 2007), and this is especially true in Latin America and Chile (Reardon and Berdegú 2002; Reardon et al. 2003).

Although the Critical Success Factors (CSFs) these buyers exercise are defined by the market segment in which they operate, often buyers in the same segments will nuance their requirements in particular ways. In the oil extraction industry, for example, BP and Shell place considerable emphasis on the environmental practices of their suppliers, whereas the large US firms in general have distinctively distanced themselves from these concerns. Likewise, in the meat sector, European retailers will place emphasis on the fact that the meat must be hormone free, whereas for buyers in the US this is not be an issue.

Linked to this, buyers will often have strategic judgements about specific sources of supply. They may favour particular regions, countries, and so on, and identifying these preferences of buyers is an important component of the analysis (Kaplinsky and Morris). In the case of the Chilean meat it is clear that a great portion of the success is due to Chile been perceived as a reliable commercial partner. Reliable both in terms of meat safety and quality, and in terms of delivery service (delivery within established times and according to the agreements), which has made the country gain a competitive advantage over bigger meat producers such as Argentina, Uruguay and Paraguay. Similarly, Chile’s special success in Asian markets – from where the other Latin American meat producers are almost excluded - is due to cultural affinities that make buyers feel at ease with the Chileans, and trust them. Indeed, both the government of Chile as well as Chilean producers have invested in learning about Asian culture, and in building long-lasting commercial relationships based on trust.

Supply chain management techniques have helped to upgrade systemic competitiveness. They are often linked to the durability of relationships between buyers and suppliers, which in turn is linked to the number of suppliers with whom buyers

cooperate. The development of long-term and high-trust relationships generally require a smaller number of suppliers. The number of, and the degree of concentration of, key suppliers, are important legislative elements of value chain governance discussed in chapter two and in the second part of this chapter.

Related to this is the issue of supply chain upgrading, that is, the executive functions in value chain governance. In some cases, where supplier capabilities are inadequate, buyers may provide inputs to assist their suppliers to upgrade their efficiency.⁴⁰ In other cases, buyers may work to limit value chain upgrading.⁴¹

VI.3. Chain governance

VI.3.1. Governance structure

Gereffi, Humphrey, and Sturgeon (2005) propose a typology of value chain governance consisting of market-based relationships between firms and vertically integrated firms at the two opposite ends of the spectrum of explicit coordination between firms and three types of intermediate modes of governance in-between. The types of value chain governance are therefore as follows, in the ascending order of the level of explicit coordination: (1) market, (2) modular, (3) relational, (4) captive, and (5) hierarchy. The authors argue that the forms of inter-firm governance are fundamentally shaped by three factors: (1) complexity of information and knowledge transfer required to sustain a particular transaction, (2) the extent to which this information and knowledge can be codified, and (3) the capabilities of actual and potential suppliers in relation to the requirements of the transaction.

The Chilean meat case study shows the coexistence of four different forms of chain governance: (1) *Arm's length market* relations, where buyer and supplier do not develop close relationships because the product is standard or easily customised (i.e. with limited exchanges of information and without the use of transaction-specific assets); (2) *Modular production networks*, where buyers purchase customised products that they design, and therefore must exchange information (on product specification, scheduling,

⁴⁰ Kaplinsky and Morris provide the example of the furniture sector, where the UK based B&Q utilises local buyer agents in South Africa to perform this function.

⁴¹ This is the case of buyers sourcing leather shoes from Brazil described by Kaplinsky and Morris.

etc) with the suppliers. However, the interaction between buyer and supplier is made less complex because the information on products and processes can be codified in technical norms, and the suppliers use generic machinery that can be used for various customers. The suppliers also have the necessary skills for the tasks they undertake, which reduces the buyers' need for monitoring. As a result, even though products are specific to each customer, the level of transactional dependence is low on both sides: Different suppliers can be inserted or removed from the value chain. Buyers have various suppliers across their product range, and suppliers work for various customers; (3) *Quasi-hierarchy or captive*, where one firm exercises a high degree of control over other firms in the chain, frequently specifying the characteristics of the product to be produced, and sometimes specifying the processes to be followed and the control mechanisms to be enforced. This level of control can arise not only from the lead firm's role in defining the product, but also from the buyer's perceived risk of losses from the suppliers' performance failures. In other words, there are some doubts about the competence of the supply chain. The lead firm in the chain may exercise control not only over its direct suppliers but also further along the chain; (4) *Hierarchy*, where the lead firm takes direct ownership of some operations in the chain. The case of the intra-firm trade between MNCs and their subsidiaries falls into this category.

There are no *networks or relational* forms of governance, where firms co-operate in a more information-intensive relationship, frequently dividing essential value chain competences between them, and where the interaction is coordinated and the relationship is characterised by reciprocal dependence.

Raynaud et al. (2005) propose a different classification of governance modes, which is very similar to the previous one but which emphasises some other aspects of each form of governance, such as the degree of trust. For each transaction $T.i$ of their model of vertical chain (see the introduction in this chapter), they identifying six different governance structures: (1) *Spot market contract*. A contract for the immediate exchange of goods or services at current prices where the identity of the parties is irrelevant (because the switching costs to find a new partner is low); (2) *Relational* (or implicit) contract. Share understanding that are not legally enforceable but based on reputational or more generally social ties. Because the transactions are repeated with the same partners, their identity does matter now; (3) *Relational contract with "approved*

partner(s)". Firms are freer to choose their trading partners, but have to select them among a set of "qualified" partner (buyer and/or seller accredited for instance by the certifying organization in chains or retail shops that must deal only with ISO certified producers); (4) *Formal (written) contract*. Legally enforceable promises with variable duration; (5) *Equity-based contract*. One of the firms is a stockholder of its partner but stays legally independent from it. Joint venture, characterized by a particular level of equity participation, is a canonical example; and, finally (6) *Vertical integration*. Bringing two or more successive stages in production and distribution under common ownership and management.

Although the classification by Raynaud et al. (2005) is clearly based on Williamson (1991) typology that distinguishes between market, hybrids and hierarchical governance (and therefore is inspired by a transactional approach), it is close to the one used by some agricultural economists (Peterson et al. 2001) and similar in spirit to the one used by Gereffi (2001). It is useful here because specifies some aspects of the different forms of governance that are implicit in the categorisation done by GVC scholars, but not adequately emphasised but that are particularly important in the agro-food industry.

The reason for governance should be clear. No firm will incur the expense of developing arrangements with specific suppliers in order to purchase products that the market freely provides. Thus, quasi-hierarchical or hierarchical relations are likely to emerge when the buyer seeks to define the product and/or the buyer is exposed to considerable risk if the supplier fails to perform.

The Chilean meat sector is moving away from price-based competition to factors such as reliability, product variety, product quality, innovation and compliance with external standards. While these factors increase the need for chain governance, they also provide opportunities for firms to enhance their competences through specialisation and assuming more functions in the chain.

Vertically related firms need to co-ordinate their activities by exchanging information of various types: they have to learn about the quantities available and required at present and in the future, about the prices set, about the nature and reliability of suppliers and buyers, about the precise technical characteristics of the products to be

exchanged, and about the changes in such products as they undergo improvement and technical innovation (Lall 1980).

In economic theory, a perfectly functioning market achieves the required co-ordination costlessly. In a world of large numbers of buyers and sellers, which operate in competitive conditions with perfect foresight and which possess all the knowledge (including technology) they need, the necessary information is exchanged without any transaction cost. There is no need for any firm to bypass the market since it is, by assumption, able to maximize its profits within the “pure” market framework (Lall 1980).

The free market may suffice to achieve co-ordination for goods where the technologies involved are standardized and well-diffused, there are large numbers of buyers and sellers, none of the parties exercises significant market power and the future is reasonably predictable (or, at least, uncertainties can be insured against contractually). If, traditionally, primary markets were considered to possess these characteristics, this is no longer true. Agro-food markets exhibit gross “imperfections” (one notable characteristic of agricultural value chains is buyer power) which compel their buyers and sellers to resort to other means of achieving the required co-ordination (Dirven 1999; Humphrey, J. and Memedovic 2006; Fromm 2007).

Nevertheless, coordination and having a role of governance involves considerable cost in monitoring and enforcement. According to Humphrey (2005) the reasons for governance (and firms incurring in such expenses) lie in three factors. First, when buyers pursue a strategy of product differentiation (i.e. packaging, labeling, varieties, processes), the need to work directly with suppliers on issues such as product design, specifications, delivery schedules and handling is increased. Second, failures by suppliers create risks for buyers and thus, costs increase. Humphrey adds that the increasingly complex standards environment puts retailers’ reputations at risk, particularly when they are legally responsible for applying due diligence along the supply chain. In supply systems a reliable and frequent delivery of products is expected, thus increasing the need for assurances about supply performance. The final reason is that innovation requires simultaneous changes at various points in the value chain.

Thus, vertical coordination tends to increase in agribusiness systems as innovation requires vertical coordination (Dirven 1999; Humphrey, J. and Memedovic 2006; Fromm 2007).

VI.3.2. Measuring power

Chains differ with respect to how strongly governance is exercised, how much power is concentrated in the hands of a single firm, and how many lead firms exercise governance over chain members (Gereffi et al 2001).

The power which any party may have in the chain may paradoxically be reflected in two seemingly contradictory attributes. The first arises from the power to force other parties to take particular actions, for example, limit themselves to specific functions rather than undertaking more profitable functions. But, secondly, it may also reflect the capacity to be deaf to the demands of others to confine activities to specific ones only. These contradictory effects may arise from the fact that parties are often involved in different value chains and these may result in cross-cutting power between value chains with the demands of one dominating the other with detrimental effects down the chain. An example of this is the timber in South Africa provided by Kaplinsky and Morris (2000), where two distinct value chains emanate pulp and paper on the one hand and furniture on the other. The major corporation involved in growing and sawmilling is dominated by its producer-driven pulp and paper interests and hence is unresponsive to, often blocks the operations of, and is deaf to the requirements of downstream firms in the buyer-driven furniture value chain.

The extent of power may be related to the relative size of a particular firm in the chain. In general, the larger the firm the more influential its role (Kaplinsky and Morris 2000). But “large” in relation to what? Kaplinsky and Morris (2000) suggest to look at the share of value added, of chain buying power, or to the control over a key technology or competence, or to the hold of a brand name or some sort of market identity in order to identify the governor of the chain.⁴²

⁴² The share of chain profits may be a good reflection of chain power, but may also arise from monopoly control over scarce resources, and may have little influence over downstream processing. Moreover, the data source would be balance sheets, but this data are likely to be available only for publicly-owned companies. The other indicators, on the contrary may be obtained through firm-level interviews.

The control over a key technology is a good indicator in the producer-driven chains (such as autos) since this defines the distinctive competence of the chain (think of BMW). It may also be the case in the food sector where the biotech component is important, like in transgenic foods (think of Monsanto). Although this may be an issue in the meat sector as well, where genetics is becoming increasingly important, this is not yet the case.

Table VI.3. Shows how firms decisions about what to produce, how produce it, inputs, price, packaging and logistics take place in the Chilean meat sector. Where buyers' power is prevalent is in establishing the price at which the good is sold, the product specifications and the packaging requirements. In the latter, however, only in the 17% of the cases product specification is uniquely imposed by buyers, while in the majority of cases it is a shared decision of the buyers and the firm. In this sense, the Chilean meat sector is different from other sector, such as for instance the shoe sector in Brazil described by Bazan and Navas-Aleman (2004), where buyers where the undisputed leaders of the chain. Buyer specification of the product is most likely to arise when the buyer has a better understanding of the demands of the market than the supplier. It often occurs when the buyer uses product differentiation as part of its competitive strategy.

Table VI.3. Decisional process

Product specification	Decided by buyer	Decided by buyer after consultation with firm	Decided by firm but subject to approval by buyer	Decided independently by your firm
	%Firms			
Product specification	17	58	8	0
Process specification	5	20	8	50
Inputs	8	7	0	68
Price	36	34	14	6
Packaging	8	50	18	7
Logistics	8	0	0	75

Source: Author's own data Missing data (non respondent): 17%

The more the buyer focuses on product differentiation, for example through design and branding, the greater the need to provide the supplier with precise product specification and to monitor that these specifications are met (Humphrey and Schmitz 2003). This also suggest the space, in the Chilean case, for producers to take control over these other functions.

The fact that only in the 20% of the cases process specification is decided by buyers (in consultation with firms) while in 50% of the cases is decided independently by firms suggests that knowledge is highly codified, and that, therefore, buyers may rely on standards such as HACCP, ISO, and so forth. The increasing importance of non-price competition does not mean that price has ceased to be important. As (Humphrey and Schmitz 2003 : 5) suggest: “pressure on prices has been relentless especially for products which can be sourced from developing countries, and this leads global buyers to look constantly for lower-cost production sites”.

Table VI.4. on the rationale for firms’ investments confirms some of what just said. Essentially, it reveals that, although buyers do not strongly impose product specification, there is a lot of effort from firms to please them. Indeed, in more than half the cases, firms adapt products to buyers requirements and spend time and effort in learning about their commercial practices. This is especially true when buyers come from Asian countries (Japan and Korea, essentially) since the cultural differences also affect business relations. Indeed, almost 70% of the firms admit that they put time and effort in developing relationship with buyers. This can also be understood as a strategic behaviour firms adopt, since developing trust lowers the chances of substitution.

Table VI.4. Rationale for investments⁴³

	Strongly disagree	Disagree	Agree	Strongly agree
	%Firms			
Machinery & equipment	17	0	25	33
Organizational structure	33	8	20	14
Adapt product to buyers’ requirements	6	8	11	50
Time & effort to learn buyers’ commercial practices	17	5	33	20
Time and effort to develop the relationship with buyers	9	0	24	42

Source: Author’s own data Missing data (non respondent): 25%

⁴³ “In the last five years, in which of the following has the firm made investments aimed at delivering specific products to buyers?”

VI.3.3. Model estimation of the impact of supermarkets on firms' innovation performance

As already described in chapter III, supermarkets are the chain leaders in the domestic and Latin American market. In many sections of this thesis it has been discussed the controversial role that big retailers play in enhancing (or hampering) firm-level innovation and upgrading.

In this section, an econometric estimation of the impact of supermarket's power on firm level innovation is computed.

Logistic regression is used for this purpose, and the model specification is essentially the same one used in chapter V to analyse the impact on innovation of network relations, since it is based on the determinants of firm-level innovation as acknowledged in the literature. The model, however, differs from the previous one in what it includes a new variable, namely, the one that we are interested in measuring the impact of. We have called this variable SUPERM, since it measures the percentage of sales that go to supermarket chains.

Summarising, the function takes the form:

$$\text{INNOV} = f(\text{SKILLS}, \text{C_IND}, \text{FIRMSIZ}, \text{AGE}, \text{EXPORT}, \text{SUPERM})$$

Whereas, INNOV is a dichotomous variable, assuming values 0 (absence of innovation) and 1 (presence of innovation). Innovation is not measured in terms of efforts but rather as innovative performance, in what it refers to innovation that have had economic impact (significant cost reduction in the case of processes, or higher value added in the case of products).⁴⁴ SKILLS is the percentage of workers with technical education or university degree; C_IND measures the firms' linkage capability and the extent to which it is exposed to external knowledge inflows. This variable is the outcome of the network analysis performed in chapter V.; AGE measures the years of activity of the firm; FIRMSIZ measures the number of employees a firm has; and EXPORT the percentage of total sales that goes abroad.

⁴⁴ For a discussion, refer to chapter V.

Table VI.5. Model Estimation:
The impact of supermarkets' leadership on firms' innovation performance

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	SKILLS(1)	0,361	2,936	0,015	1	0,902	1,435
	C_IND	1,519	0,743	4,183	1	0,041	4,567
	FIRMSZ	0,013	0,016	0,702	1	0,402	1,013
	AGE	0,010	1,534	0,016	1	0,692	1,011
	EXPORT(1)	0,014	1,730	0,000	1	0,993	1,014
	SUPERM	0,575	5,589	0,011	1	0,918	1,777

a. Variable(s) entered on step 1: SKILLS, C_IND, FIRMSZ, AGE, EXPORT, SUPERM.

b. Cases included in the analysis = 35. Cases missing = 1

c. Nagelkerke R Square: 0,884. Estimation terminated at iteration number 10 because parameter estimates changed by less than ,001.

The relationship is measured on the entire population of slaughtering and processing firms as defined in chapter IV, which include 36 firms from six different Chilean regions.⁴⁵

Logistic regression applies maximum likelihood estimation after transforming the dependent into a logit variable (the natural log of the odds of the dependent occurring or not). In this way, logistic regression estimates the odds of a certain event occurring (in this case, innovation).⁴⁶

The value of the coefficient β determines the direction of the relationship between X and the logit of Y . When β is greater than zero, larger (or smaller) X values are associated with larger (or smaller) logits of Y . Conversely, if β is less than zero, larger (or smaller) X values are associated with smaller (or larger) logits of Y . The results show a strong impact of our governance measure on innovation, second only, in terms of weight, to the one related to firms' knowledge inflows (Table VI.5.).

The (Nagelkerke) pseudo R^2 statistic summarises the strength of the relationship and gives a measure of the overall model fit, which in this case is 88%, which is higher than the one obtained in chapter V without the inclusion of the SUPERM variable. This

⁴⁵ See chapter IV for a description/discussion about how the data was collected.

⁴⁶ $\text{logit}(Y) = \text{natural log}(\text{odds}) = \ln \left[\frac{\pi}{1 - \pi} \right] = \alpha + \beta X$. For an in-depth explanation refer to chapter V.

suggests the importance of taking into account the impact of the end customer and the related power relationships when studying firms' innovative performance.

The results suggest that selling to supermarkets increases the probability to innovate. However, the econometric analysis doesn't provide an explanation for the mechanism making this possible.

Global Value Chain theory would suggest that it is because of knowledge transmission combined with the pressure to comply with the strict standards imposed.

In the previous section, however, we have seen that the knowledge content is to a large extent explicit (involving international public/private standards, such as HACCP or ISO, and only in some cases buyers' own standards, which would imply a higher degree of tacit knowledge).

Face-to-face interviews with firm managers of all the firms provide us with an alternative explanation. In the Chilean case, it seems that the positive impact of having supermarkets as buyers deals more with the pressure these buyers put on producers rather than to the actual transfer of knowledge from them to the suppliers. Indeed, respondents explicitly said that the asymmetric relationship and the pressure of supermarkets on their margin of profits is pushing them towards insertion in different chains, where relationships are less uneven and where they can take over new functions such as logistics and branding. This is made possible thanks to the increased domestic demand for quality products and to the possibility of on-line sales, which an increasing number of firms are adopting. This is an ongoing process, the results of which will be observable only in the future. But it suggests a future trend that is likely to change the structure of the chains and their mode of governance.

VI.3.4. The rules of the game

An important component of value chain governance is the extent to which the rules pervade chain relationship. It also relates to the fact that chains may have more than one rule setting lead-firm, so the issue is one of whose rules is heard more loudly.

As seen in chapter two, the function of governance deals with the activities of "making the rules" (legislative governance), "implementing the rules" (executive governance), and "enforcing the rules" (judicial governance) (Kaplinsky and Morris

2000). Table VI.6. provides examples of legislative, judicial and executive value chain governance.

Table VI.6. Examples of value chain governance

Type of governance	Exercised by parties internal to the chain	Exercised by parties external to the chain
Legislative	Setting standards for suppliers in relation to one-time deliveries, frequency of deliveries and quality	Safety standards Environmental standards Labour standards
Judicial	Monitoring the performance of suppliers in meeting these standards	1) Monitoring of labour/environmental standards by NGO's; 2) Specialised firms monitoring conformance to ISO standards
Executive	1)Supply chain management assisting suppliers to meet these standards; 2)Producer clubs assisting members to meet the standards; 3)Representative agents assisting members to meet these standards.	1) Specialised service providers; 2) Government industrial policy support; 3) Producer business associations assisting members to meet these standards

Source: Adapted from Kaplinsky and Morris 2000 : 68.

Standards may be set in legal codes and be subject to fines if transgressed. They may also be internationally recognised, and widely used, even though they have no legal basis. This recognition may be less than global, but cover a number of product markets, or they may be firm specific. They may cover both products or processes. Some standards are cross-sector (e.g. ISO 9000; ISO 14000), while others are industry specific (e.g. HACCP in the food sector). Often, different rules will be simultaneously exercised within the same chain.

Increasingly, rules which pertain in the final market, are being set by supranational bodies such as the European Union. In the meat sector, these are for instance the rules concerning the use of beef hormones, which are banned in Europe but not in the US.⁴⁷ These rules can be identified by examining legal codes. Less obvious, instead, are those rules which are informal, that is, have no official legislative backing, such as the ISO and the HACCP, but which govern a chain by requiring conformance to certain quality processes. Other sort of rules which have no legal backing, may arise due to pressure

⁴⁷ The debate has heated up once again at the beginning of 2009. See Bridges Trade BioRes (2009).

from the civil society, such as those aimed for value chains to achieve environmental standards or exclude child labour.

In most chains the auditing process will be done by a mix of parties, both internal and external to the chain. ISO 9000 standards are monitored, with annual inspections, by firms which undertake this service on behalf of the ISO organisation headquartered in Geneva. In Chile, the HACCP control is done by vets from the SAG, the government agency responsible for food hygiene. Vets are provided by the SAG and paid by the firm. This strange combination reveals that it is in the firms own interest to comply with the standard if they want to export or to sell to retail chains and MNCs. On the other hand, many of the rules set by key links in the chain for the suppliers are monitored by the buying firm itself, for example the performance of suppliers with respect to on-time deliveries, especially important in sectors, such as the meat, characterised by high perishability.

In order for rules to be enforced, there must be an effective incentive/sanction system at work. Positive and, especially, negative sanctions are, in fact, the means through which chain governance is exercised. Sanctions may be exercised from both inside or outside the chain. Among the former, the key sanction is delisting, that is, exclusion of a supplier from participating in the chain. A milder form of sanction may be consigning the supplier to a “swing” status (Kaplinsky and Morris 2000 : 72), that is, a backup position in case of supply shortfalls, or ensuring that all deliveries from that supplier are checked and the cost passed on to the supplier through lower purchase prices. The converse of this is that well-performing suppliers are favoured with longer-term contracts and high prices.

Sanctions may come also from outside the chain, for instance from governments checking compliance to legislation and prosecuting offenders through fines or compulsory closure. Chilean government has been very strong in prosecuting offenders and impose compulsory closure, as a mean to be recognised internationally as a reliable partner.

In recent years the sanctioning power of civil societies campaigns has grown considerably. Boycotts and publicity campaigns have forced many leading firms to change the way they produce, or to de-list particular suppliers.

The question of how standards are demanded and implemented along the value chain and how compliance has affected chain governance and, ultimately, local upgrading will be examined in-depth in the next chapter. What matters in this chapter is the recognition that they work as means through which buyers exercise control over the chain.

VI.3.5. Trust and the legitimacy of power

The effectiveness of a governor's command of a chain does not reside only in the power of its sanctions, but also in the trust relationship he is able to build with its customers and suppliers.

There is ample empirical evidence suggesting that trust has a role in economic development (Humphrey and Schmitz 1996; Furlong 1996). Market economies characterized by high levels of trust appear to perform better than those with low levels. Trust affects the ways in which people and enterprises engage in economic activity. In the exchange of goods and services, trust is needed.

Raiser (1999) affirms that this is particularly the case for incomplete contracts, where one party is unable to fully monitor the other party's fulfilment of his or her obligations taken under the contract, a typical problem in transactions that take place over time. The risk of opportunistic behaviour could be so great as to prevent the exchange taking place altogether (see Williamson 1985). A lack of trust may thus impose prohibitively high transaction costs on contracting parties, thereby limiting mutually beneficial transactions. Ideally, the value chain could create relationships where all the participants benefit through the establishment or expansion of secure markets. Thus trust is one of the biggest issues in the value chain analysis, although often overshadowed.

It is important to identify whether the links in the chain are embedded in a high-trust or low-trust environment, since from this it depends the long-term viability of the chain (Humphrey and Schmitz 1996). Elements identified by Kaplinsky and Morris in order to categorise chains as high or low trust are the length of trading relationships, the ordering procedure, the contractual relationship, the degree of dependence, the presence of inspections, the provision of technical assistance, the frequency and quality of communication, the price determination mechanism, and the credit and payment terms.

This study looks at the interaction between the links in the chain in order to determine if through this interaction there is any chance for upgrading and learning. The variables that are considered include the number of buyers, significance of largest buyers, price determination, contractual relationship, frequency of contact, perception of trust, and type of information received.

Most of the producers interviewed had few buyers, on average only 5 buyers. It seems that most companies are dependent on just a few clients. Over 80% sell more than 80% of their total production to just 3 clients. These chains exhibit a quasi-hierarchy type of relationship because the lead firms are exerting a high degree of control on their suppliers. A significant problem for these firms is the danger of “lock-in”: A large part of their output is going to one or a small number of customers, and they are specialized in one particular activity, in this case production. They are heavily dependent on this relationship, which implies limited bargaining power.

The degree of dependency of the plant varies between suppliers and buyers, being much higher for the latter. That is, usually the plants tend to have a large number of providers, the biggest of which provides approximately something between 5 and 15 percent of the total. On the contrary, they have only few buyers, the biggest of which may get to up 60 percent of the total output.

Firms’ relationships tend to be long term with buyers and first tier suppliers, but the percentage of buyers and suppliers with whom relationships are long-term varies according to the specific chain. Most plants who don’t integrate breeding, tend to buy a big proportion of animals from trustworthy suppliers with whom relationships are long-term, and a smaller proportion from fairs. Some plants, however, have only 30-40 faithful medium providers (300-600 heads/year in the case of cattle). With these producers, relationships tend to be frequent, also because of spatial proximity.

Table VI.7. shows the plants length of trading relationships with buyers, and reveals that for a 34 percent of the firms interviewed, these relationships last more than seven years, and that for a 25 percent, from five to seven years. And that only for a little percentage of firms, the years of relationship fall below four.

The frequency of contact between the firm and the buyers was studied. From Table VI.8. one can observe that most of the firms interviewed have frequent contact with the buyers: 33 percent are permanently in contact, and 50% not less than four times per

year. One firm – the biggest of all – has even offices established in the buyer’s country, in order to be closest as possible to the final market. The means of communication is usually by phone or by email. But include also face-to-face meetings, sometimes as often as once a month. Frequent communication is common especially with foreign buyers different than supermarkets. These buyers, especially the Korean and Japanese, tend to have very specific requirements, the satisfaction of which requires high interaction. Supermarket, on the other hand, tend to require more standardised products, thus requiring less interaction for information and knowledge transfer.

Firms were asked to describe what type of information they received from buyers. Most of the information regards product specifications, quality standards and market information.

Firms were asked how much trust they had in their buyers. Some respondents claimed that, in the case of supermarkets, the long-term relationship with buyers is not due to trust. Firms don’t trust supermarkets, they perceive them as unreliable partners, while trust is instead more common in the relationship with other buyers (e.g. including McDonalds, Wholesalers, small retail shops and big Japanese buyers).

Table VI.7. Length of trading relationship with buyers

Length of trading relationship	Percentage of Firms (%)*
Less than a year	7
From 2 to 4 years	9
From 5 to 7 years	25
More than 7 years	34
TOTAL	100

Source: Author’s own data

*Missing data: 25% (non respondent)

Table VI.8. Frequency of communication with buyers

Frequency of communication	Percentage of Firms (%)*
Never	8
From 1 to 3 times per year	7
From 4 to 6 times per year	25
More than 6 times per year	10
Every month	0
More than once a month	9
Permanent	33
TOTAL	100

Source: Author’s own data

*Missing data: 8% (non respondent)

Contracts are almost always absent, especially upwards in the chain. Although in some cases the lack of contract reflects a high degree of trust in the other party's commitment and in its capacity to comply with requirements, in some other cases, however, the lack of contracts reveals the convenience of not being tied up to anybody in order to be able to sell/buy to the best offer. This, however, causes big uncertainty and reduces investments.

Because of the lack of contracts, communication is often multi-channeled, frequent and informal.

Trust and reputation still represent two relevant dimensions of long-term relationships between suppliers and buyers, and are vital to the success of the business. However, at every tier of the chain there is the widespread feeling of vulnerability due to constant pressure to decrease costs.

VI.4. Learning and upgrading

VI.4.1. The relationship between chain governance and upgrading

One of the most important issues to be addressed in the research on value chains and governance is the extent to which producers in the chain are helped to meet requirements and to upgrade. Upgrading may involve changes in the nature and mix of activities, both within each link in the chain, and in the distribution of intra-chain activities. This relates both to the development of new product and processes, and in the reconfiguration of who does what in the chain.

Evidence from across the world shows that market forces alone are sub-optimal in enhancing learning and upgrading, and that a key function of governance is to compensate for this market failure (Kaplinsky and Morris 2000).

The distinction between different governance modes introduced in section VI.3.1. helps to assess whether some types of chains offer local producers better upgrading prospects than others. In order to address this question it is necessary to distinguish between different types of upgrading. We distinguish four upgrading types: (1) *Process* upgrading: transforming inputs into outputs more efficiently by re-organising the production system or introducing superior technology; (2) *Product* upgrading: moving into more sophisticated product lines (which can be defined in terms of increased unit

values) (3) *Functional* upgrading: acquiring new functions in the chain (or abandoning existing functions) to increase the overall skill content of activities. The functional upgrading route frequently discussed in the literature is the transition from assembly to OEM (original equipment manufacture) to ODM (own design manufacture) to OBM (own brand manufacture); (4) *Inter-sectoral* upgrading: using the knowledge acquired in particular chain functions to move into different sectors. This distinction developed by GVC scholars is widely accepted in the international debate (as shown for example in UNIDO 2003).

According to the GVC framework, firms capacity to upgrade depend on the chain governance. In particular, it is assumed that there is a relationship between the governance mode and the type of upgrading firms can achieve.

Humphrey and Schmitz (2002, 2003) claim that in *quasi-hierarchical chains*, developing country producers experience fast product and process upgrading but make little progress in functional upgrading. Pietrobelli and Rabellotti (2006) reach a similar conclusion in the cases of other agro-food chains in Latin America analysed in their book. As already discussed in the section on chain governance in this chapter, this is maybe the most common form of governance also in the Chilean meat sector.

Humphrey and Schmitz (2002, 2003) also claim that *network-based (relational) chains* support an open-ended upgrading path but local producers in developing countries rarely find themselves in such chains. The rationale is that network-based chains are characterised by intense knowledge based interaction aimed at developing new products and processes. Such interaction implies the sharing and complementing of competences between firms; competences that are rarely found in developing countries. Indeed, this is the only type of chain governance totally absent in the Chilean meat sector.

In *market-based chains*, producers experience neither support for, nor blockages to, upgrading (from within the chain). Since products can be obtained freely on the market, there is no need for buyers to invest in relationships with suppliers. Conversely producers are not tied to buyers and obstacles to upgrading do not arise from within the chain (Humphrey and Schmitz 2002, 2003).

This happens when the requirements are low, products are standard and require only knowledge that is highly codified. The buyers are design-takers, who buy products from

suppliers who take responsibility for design and production. This is most likely to occur when the buyers are relatively small. They may lack the competences to define product and process parameters, or the volume requirements may be too small to justify the costs of explicit coordination. In these situations it can also be assumed that the suppliers are competent. has to be able to be able to meet the requirements of customers without inputs with regard to product design or process. If the supplier is to take responsibility for product design, then it has to know what the buyers want before a specific order is made, which requires familiarity with the user market (Humphrey and Schmitz 2002, 2003).

As described at the beginning of this chapter, in some segments of the Chilean meat chain quasi hierarchical relations coexist with market-based interactions. Precisely, quasi-hierarchical chain link producers to Europe and Asia, while market-based chains link producers to both the domestic market and regional markets within Latin America.

VI.4.2. Governance and upgrading in the Chilean meat sector

In the case of Chile some firms have pursued both product and process upgrading. Some firms have also achieved functional upgrading, passing from simple slaughtering activities to product transformation, thus, overtaking also the processing activity. At the same time, many firms who initially produced only beef, have started to produce pork or lamb. This can be interpreted as a form of sectoral upgrading since lamb and pork meat are considered far more profitable activities than beef production.

Table VI.9. shows how the different forms of upgrading were achieved in the Chilean meat case, and their outcome.

Within-firm *process upgrading* has occurred in response to buyer or third party imposition of standards. The most recent and prominent type of process upgrading has resulted from the strong sanitary and environmental standards. The meat production, especially pork, has been exposed to negative publicity resulting from environmentally damaging production processes. As a result, retailers assume corporate social responsibility for the conditions throughout their supply chains, and have adopted codes of conduct in diverse areas such as food safety, environmental protection, animal welfare. This changed quality practices (in slaughtering, cooling and packaging, but also in logistics) and management procedures and imposed the acquisition of new

machinery. The result was lower costs, enhanced quality and delivery performance (shorter time-to-market).

Table VI.9. Examples of upgrading practices and performances

Type of upgrading	Practices	Performances
PROCESS	Within the chain link Introducing new machinery; changes in logistics and quality practices	Lower costs; enhanced quality and delivery performance; shorter time-to-market; improved profitability
	Between chain links Increasing animals with specific characteristics; Facilitating supply chain learning; supply chain management procedures	Lower final products costs; enhanced final product quality and shorter time-to-market; improved profitability throughout the value chain
PRODUCT	Within the chain link Sophistication of existing products, through creation of “premium” cuts or natural meat; Development of new products, like ready meals; expansion of design and marketing departments	Percentage of sales coming from new products (e.g. products introduced in past year, past 2, past 3 years); Percentage of sales coming from branded goods
	Between chain links Cooperating with suppliers and customers in new product development; concurrent design	Increase in relative unit product prices without sacrificing market share; number of copyrighted brands
FUNCTIONAL	Within the chain link New higher value added chain specific functions absorbed from other links of the chain	Key functions undertaken in individual links in the chain
	Between chain links Moving into new links chain	Higher profitability; increase in skill and salary profile
INTER-SECTORAL	Moving to a new chain; adding activities in a new value chain	Higher profitability; proportion of sales coming from new and different product areas

Source: Adapted from Kaplinsky and Morris (2001)

The adoption of these rules with which suppliers need to comply, has become one of the key ways retailers safeguard their credibility in global markets.

Whether compliance with these standards, especially with the environmental standards, is an upgrading response *per se* is open to debate. Yet, firms that meet these standards are not only able to lessen their vulnerability to substitution but are also able to sustain their position in global markets.

The main challenge in beef chain *process upgrading* is to increase the supply of animals with specific characteristics. The problem being the competing uses of animals (in diary production). Producers also operated in a sellers' market for many years, and consequently are unresponsive to manufacturers' needs, delivering at unpredictable intervals, with varying quality and inconvenient product specifications.

In addition slaughterers need to work with different requirements requires close collaboration with the buyers (for example, regarding knowledge about fat density) and the suppliers. Thus, chain process upgrading can only be achieved through a combination of firm specific innovations and inter-firm collaboration to improve communication and to address important chain-specific problems.

At the firm level, *product upgrading* took the form of a move into more sophisticated types of products (like "premium" cuts and natural meat) as well as the development of new products (like ready-meals) through the expansion of design and marketing departments. In addition, many firms have improved packaging in order to better preserve the properties of the product, or to make it more alluring for the final consumer as ways to increase their value to supermarkets and minimise the risk of substitution, and in order to be able to sell their own label. These have been key sources of competitive advantage.

At the chain level, this has required higher coordination with buyers (learn what products were demanded, and learning about customers preferences) and with suppliers, especially in the case of "premium" cuts and natural meat.

With regard to *functional upgrading*, that is, the move of successful firms into new links in the value chain, many firms of the sector have acquired control over more segments of the chain expanding both backwards and forward. Creation of backward linkages is explained by the need to ensure control over the production process. Control over ones own production guarantees continuity of supply and reduces the risk of losing suppliers to competitors. At the same time producing own meat allows improvements that strictly depend on how the animal is fed and treated when still alive, such as for

instance the degree and quality of fat and its distribution. Most firms interviewed believe that vertical integration provides great control over processes and scope for reducing costs. This has lead retailers (Falabella, for instance, one of the giant retailers in Latin America) to buy land in the south of Chile in order to provide year round supply from their own farms, to control for animal genetics, rearing and fattening and to capitalise on their capabilities in production and marketing.

But slaughtering plants also in many cases have expanded backwards to acquire control over breeding, rearing and fattening, and forward, into processing (passing from cycle I – slaughtering- into cycle II – slaughtering and first processing – and cycle III – advanced processing, as the preparation of ready meals).

In another case a group of producers from the Region X have formed a cooperative and bought a slaughtering plant, and who have created their own standards and label. That is, second tier suppliers who have moved forwards in the chain.

In many cases firms have also taken over control over logistics (see Table on how decisions are taken), not only to increase final product quality and reduce costs and improve speed, but as a competitive advantage and a marketing strategy, to reduce intermediaries. Gaining control over logistics, especially through investments in IT and cold storage, has become a core competence in the chain. The high perishability of the product places a premium on rapid and reliable delivery to buyers. In one case, an exporting company has established its own office abroad to improve access to the market and streamline logistics.

Also, increasingly, firms are selling on-line, thus establishing direct relationship with the final consumer and jumping retailers. In other cases, slaughtering plants have bought butchers shops or butchers spaces within big chains of supermarkets where, selling with their own label, they have been able to gain high visibility. These forms of marketing are by far more profitable than selling to wholesalers or to hotels, restaurants and casinos). Schmitz and Knorringa (1999) also point out that where there are intermediaries, there is greater scope for developing countries' firms to move into value-added activities.

In order to understand this achievement, it is important to recognise that the producers pursue a double strategy - maintaining their OEM production (which often means continuing in a quasi-hierarchical chain) while starting to experiment with and

build up their ODM operations in a different chain. This Taiwanese experience has also given rise to Lee and Chen's thesis on the leveraging of competences across chains. They argue that firms were able to acquire new capabilities by applying lessons from one chain to another. Firms could, for example, take a design supplied by one customer and then make adaptations and use the modified design to supply other customers in other markets (Lee and Chen 2000).

This is precisely what happened in the Chilean meat sector with the meat slice. Initially it was produced on request by Asian buyers. Special investments were done for the purpose. Producers, however, started then to sell ready-to-use meat slices in individual packages for the domestic market. While in the Asian market they were not approaching the final consumer with their own brand, in the domestic market they were selling with their own brand, initially to supermarkets, and then, once they acquired a reputation thanks to supermarkets, through small retailers, own shops and on-line sales.

Chilean firms, even those serving global customers often have a diversified customer base including local customers, with whom local firms are likely to develop more symmetrical relationship than with the global customers. This suggests that local suppliers have at least some room to manoeuvre with their own growth strategies.

Dolan and Tewari (2001) show how as the supermarkets push more value-added functions back towards the source of supply (bar coding, packaging, logistics), there is greater scope for exporters to assume many of the functions in ways that have expanded the range of options they are able to offer their buyers. In the Chilean case this is also observable. Yet, as the authors point out, this form of governance also limits the prospect for certain types of upgrading. Because of high degree of buyer concentration, the opportunities for knowledge and technological acquisition are limited, in the sense that only a small number of companies are able, in fact, to meet the stringent criteria imposed to them. This upgrading of some firms and producers comes, as Gibbon (2000) and Dolan and Humphrey (2000) at the cost of the exclusion of others. As indicated earlier, the top five Chilean slaughtering (processing) firms control approximately 70% of the exports. That is, there is little scope for exporters lacking the investment capabilities to ensure compliance with the requirements of retailers. Although firms have a wide array of market segments – from low-end domestic market to more demanding domestic and export markets – which gives the weakest firms more room to manoeuvre, it carries

the risk of excluding low performing domestic firms from the circles where new skills and learning are generated. Without an explicit policy attention to this risks, the potential for spreading the gains of globalisation to broader segments of the population is limited.

To what concerns *inter-sectoral upgrading*, many firms who initially produced only beef, have started to produce also pork or lamb. This can be interpreted as a form of sectoral upgrading since lamb and pork meat are considered more profitable than beef production. The production technique are very different between the different sub-sectors, however, firms have been able to exploit their reputation, label and distributional channels to enter these new markets. Likewise, firms that have undergone all the process to become certified for exporting beef abroad, are able to exploit their knowledge about norms and certification processes in order to export pork or lamb. Safety norms are of course different for each sub-sector, but it is nevertheless a great advantage the fact of having had previous experience in achieving conformance.

As in the case of Dairy (Dirven 1999) and Salmon (Maggi 2004) – at least at its initial stage of development - production in Chile, technology for the meat sector is totally imported, and therefore what takes place in Chile is more of an adaptation process. This has been the case for machinery, veterinary inputs (drugs), chemicals, but also for biotechnology, where genetic material was imported and adapted. However, things are likely to change as the country is quickly specialising in natural resources based biotechnology, especially in those areas, like natural resource-based sectors, in which it exports. It is therefore likely that, as happened in the Salmon and fruit industry before, the country might be able to become an important actor in biotechnology research in the meat industry as well.

The experience of the Chilean meat sector leads to challenge, at least to some extent, the idea of a sequential upgrading process that starts with process upgrading and passes through product upgrading to then end in functional upgrading, as the different forms of upgrading take place simultaneously and to different extents across firms. In the Chilean salmon cluster, upgrading has taken different forms over time, showing a more sequential path: In the early years, upgrading of products and processes has been achieved through joint actions that implied private-public partnerships. Functional and inter-sectoral upgrading occurred only later, due to individual initiatives, often of the

private sector or with its constant involvement, that were made possible by the complex system of institutions and policies that had been put in place (Pietrobelli and Rabellotti 2004).

Besides analysing the efforts taken to upgrade and measuring the performance outcomes of these efforts, it is also important to determine who is responsible for upgrading. This goes back to the previous section on governance, since upgrading not only reflects the capacity to meet the rules of chain-incorporation, but also to be proactive in the process (Kaplinsky and Morris 2000). This pro-activity may be reflected in the capacity to determine the rules that others have to follow (i.e. chain leadership), or in developing capabilities to perform at standards which lead chain leaders to set more demanding rules for competitors to follow. The latter is what happens, for instance, when a particular link in the chain achieves performance levels (e.g. better quality at reduced costs) which exclude competitors from the chain.

Kaplinsky and Morris (2000) also suggest the importance to identify blockers and enablers of upgrading within the chain, distinguishing those that are endogenous to the firm and those which depend on the action of others. For instance, in the case of the sector under analysis, an important factor which blocks upgrading activities inside the firms is the lack of adequate skills. An important blocker outside the firm, instead, are buyers who constraint suppliers from using own brands.

Enablers of upgrading inside the firm are the presence of CEOs committed to upgrading, effective R&D management or structured processes for continuous improvements. Factors outside the firm that enhance upgrading are chain leaders, such as the Asian ones in the sector under study, that promote and assist upgrading by the chain members.

VI.4.3. The systemic dimension of upgrading and the role of capabilities

Although help to producers may come from the dominant rules setters, there are generally a number of parties who act as intermediaries and help suppliers meet the chain-rules. The major parties involved in the case of the Chilean meat chains are buying agents of lead firms located outside the home country who not only broker contracts but also assist supplier firms in meeting the standards required. Business associations also have been very active in facilitating the upgrading process. Often,

horizontal learning networks develop to assist producers in meeting chain rules. In some cases, these networks are outcomes of Business Associations (is the case of FAENACAR and ASPROCER), or local government initiatives, or national programs, as well as new legislation that forces firms to upgrade. Finally, rising price of inputs and increased competition has also worked to forced firms to upgrade.

The meat chain restructuring initiative came from a combination of external and internal (national) pressures. The existence of upgrading opportunities does not mean that these opportunities are necessarily taken. Indeed, various parties including specific government support agencies like CORFO, Fundacion Chile, ProChile have worked for a restructuring of the sector, including adopting elements of a chain-perspective. Within this, although the stimulus to change emanated from both ends of the chain, it was the changing perspective of the slaughterers that had the greatest impact. This provided the foundation for a strong sense of interdependence to develop among the participants in the value chain. This willingness to be seen as part of a whole, induced by emerging oversupply in low quality product and competition by neighbour countries, was a critical first step in improving the possibilities for cooperation along the value chain. However, translating an awareness of the need for interdependence into actual cooperation with mutual benefits for all value chain stakeholders, as well as overcoming long-standing barriers, is difficult.

It is important to note that with greater trade liberalisation, the state has become more, not less, involved. Involvement includes efforts to broker links between local firms and buyers, engage producers and their associations in a deliberative process to identify new ways of improving firm productivity, and important attempts to redefine state's role in the area of innovation, also through the creation of specialised agencies. This, however, often has not been accompanied by a redefinition of the role of old agencies involved in the sector, with sometimes overlapping and conflicting competencies.

Firm's upgrading, ultimately, is a historical process that is influenced by several extra-chain factors, such as local practices, political arrangements, physical and human resources, infrastructure, and the larger business environment. It cannot be argued that in this sector the impetus to acquire knowledge and capabilities has been driven solely by global buyers, since local institutions, including government initiatives, have

facilitate this process in many ways and the emerge and growth of the export sector appear to have been based primarily on private sector initiative.

Thus, it should not be assumed that the specific governance structure is the *only* determinant of the leaders' inherent ability or interest to convey (or not to convey) knowledge to local producers. The technological efforts and absorption capabilities of the latter are also crucial (Morrison et al. 2006). In principle, buyers facilitate the link with the market by signalling the need and the modes of the necessary upgrading. Buyers become a major conduit for producers to understand the needs of their final customer (Kaplinsky, 2005: 91). Nevertheless, although buyers and chain leaders are becoming more and more demanding, they do not necessarily provide support or transfer knowledge and capabilities. When the requirements of the international market are codified by standards (e.g. HACCP), imposing them on to producers bears little transactions costs: buyers relay information on the standards that need to be met, but do not normally support the SMEs' upgrading process, and select SMEs complying with these standards.

This entails that local firms need to invest in learning and building technological capabilities (TCs) to effectively innovate and upgrade. The actual pace and direction of learning and upgrading remains crucially affected by firms TC-building strategies. In a recent analysis about the de-commoditization process occurring in the coffee industry, Kaplinsky and Fitter (2004:20) claim that the *“more durable and substantial way of enhancing producers incomes lies in the systematic application of knowledge to the coffee value chain”*, and that firms need to enhance their “branding” capabilities – that is they have to learn how *“to promote the virtues of location-specific ‘images’ and tastes”* (Kaplinsky and Fitter 2004: 18). Although external sources of knowledge are essential, the creation and improvement of technological capabilities essentially require some previous accumulation of skills, coupled with substantial firm-level efforts: selection, adaptation and improvements are not mechanical, straightforward processes, but they require specific activities and investments. Sometimes the role played by local firms in this process tends to be overshadowed (Morrison et al. 2006), but as Table VI.10. shows, firms seem to be quite conscious of this.

Table VI.10. Importance of information and knowledge sources⁴⁸

	0 = Not important	1	2	3	4 = very important
	% Firms				
Internal sources	8	0	25	25	34
External sources	8	8	1	33	42
Institutional sources	25	25	8	25	8
Other	0	0	33	26	33

Source: Authors own data

Missing Data (non respondent): 8%

VI.5. Value chain dynamics

The governance structures in global value chains need to be understood in a historical perspective. It evolves over time. Technological, institutional, and organisational innovations as well as changes in regulatory environments and capabilities transform the structures of industries and the power relations within the chain..

Although the debate on global value chain is often associated to a trend toward de-verticalisation (for instance in electronics and apparel), this is not always the case.⁴⁹ In the food chain we assist to growing vertical integration along the value stream from production to distribution. This is also happening in the Chilean meat chain.

Gereffi et al. (2005) provide a framework that allows to anticipate changes in chain governance by looking at the evolution of the degree of complexity of transactions, in the ability to codify information, and s in the capabilities of the supply-base. The combination of these three elements determines the chain governance.

Arms-length transactions are characterised by low complexity, high codifiability of knowledge and information and high capability of suppliers (they must know what the buyers' requirements are and how to meet them). However, as complexity of transactions increase as well as the tacit component of knowledge, and suppliers capabilities are low, there will be tendency towards vertical integration.

The increasing product and process specification in the food industry increases the complexity of transactions. However, if the knowledge required for these transactions

⁴⁸ "In the last five years, how important were the following sources of information and knowledge for the firm?"

⁴⁹ The cinema industry is another example of growing vertical integration along the value stream (OECD 2007).

can be codified, or if the capabilities of suppliers are high, the trend will not be necessarily towards higher vertical integration. This is why the knowledge content (the relative importance between its codified and tacit components described in the second chapter) matters. This is also why suppliers' opportunities to learn and develop capabilities within the value chain are so important.

If we look closely at the Chilean meat sector, we can see a tendency towards concentration at every stage of the chain, as well as a tendency towards higher integration. Indeed, the medium-size breeders tend to disappear, and remain the big ones and the small ones, who only survive thanks to government support (through INDAP, a specialised government agency), and the breeding and rearing functions are increasingly taken over by those who perform the fattening stage. This is also testified by the statistics about the increasing land concentration in the beef production.

At the same time, slaughtering plants are also moving towards higher concentration: as I was conducting this research, two plants were bought by another, bigger, plant.

Concentration is explained by both increasing economies of scale, as well as by the need to acquire higher bargaining power against ever bigger buyers. Indeed, the concentration process is occurring also at the final stage of the chain: The disappearance of small retail and the emergence of giant retailers (such as Auchan, Tesco, Carrefour in Europe; Wal-Mart in the States; and Falabella in Latin America). In the case of big retailers, the tendency is away from market-based relationships (because of higher product specificity) and from vertical integration (since core competencies can become core rigidities in an rapidly changing world), towards a more relational or captive form of governance.

Higher integration is explained by increasingly stringent requirements that increase the complexity of transactions. The increasing de-commodification of production increases the tacit component of the knowledge required. The combination of these two factors in the absence of specialised skills, leads to higher integration, as a mean to reduce transaction (coordination) costs and the uncertainty related to suppliers incapacity to comply.

In the apparel industry described by Gereffi et al (2005), the expansion and growing capabilities of the supply-base have permitted the chain to evolve from a captive towards a relational form of governance. Relational forms of governance require

suppliers to develop the capability to interpret design, make samples, monitor product quality, meet the buyers' price and guarantee on-time delivery. From a development perspective, the main advantage of this transition is that it allowed local firms to learn how to make internationally competitive consumer goods and generates substantial backward linkages to the domestic economy, as well as to reap higher profit.

In the case of the apparel industry, the establishment of overseas buying offices and frequent international travel supported the intense interaction required for exchanging tacit information and building personal relationships between buyers and suppliers. Trade rules have had an important impact. US import quotas established by the Multi-Fiber Arrangement (MFA) fueled the spread of global production networks in apparel beginning in the early 1970s. The existence of quotas prompted the rise of value-chain intermediaries to coordinate the flow of orders from US and European buyers to a large numbers of apparel factories established around the world in places with available quota (Gereffi et al 2005). This also provides an example of how variables other than the three identified before work to shape the architecture of cross-border economic activity.

The changing nature of fresh vegetables trade between Kenya and the United Kingdom highlights, instead, a shift from market-based global value chain governance to more explicit coordination, and it reveals the importance of the competitive strategies of UK supermarkets in driving this change. Beginning in the mid-1980s UK supermarkets began to use the quality and variety of their produce offerings as a main source of competitive differentiation, and in doing so generated several distinct forms of governance at different stages in the chain.

Until the mid-1980s, the fresh vegetables trade was handled through a series of arm's-length market relationships. Traders in Kenya bought produce in wholesale markets or at the farm gate and exported it to the United Kingdom, where it was sold in wholesale markets. However, as supermarket chains in the United Kingdom gradually took an increasing share of fresh food sales and therefore became more powerful actors, they began to introduce more explicit coordination in the chain. Supermarket saw fresh produce (fruit and vegetables) as strategic because it was one of the few product lines that could persuade consumers to shift from one supermarket chain to another. In order to attract customers, the supermarkets introduced new items, emphasized quality, provided consistent year-round supply, and increased the processing of products to

provide fresh produce that required little or no preparation prior to cooking or eating. At the same time, the supermarkets were forced to respond to an increasingly complex regulatory environment related to food safety, particularly pesticide residues and conditions for post-harvest processing, as well as environmental and labour standards. Supermarkets pursued these strategic goals by increasing explicit coordination in the value chain. Instead of purchasing through wholesale markets, they developed closer relationships with UK importers and African exporters, and moved to renewable annual contracts with suppliers whose capabilities and systems were subject to regular monitoring and audit. The interaction of the firms in the chain also became more complex and relational. Suppliers and buyers worked together on product development, logistics, quality, and the like. This created new value chain relationships and competencies. Over time, relationships between supermarkets and UK importers took new forms, with the recent trend moving value chain governance in the direction of modularity. The supermarkets have reduced the number of UK suppliers/importers for each product range and given the remaining suppliers greater responsibility for supply chain management, product development, and consumer research. The exporters have become increasingly sophisticated and competent, as additional processing functions were transferred to Africa where costs are lower (Gereffi et al. 2005).

The case of Chile resembles very much the one of fresh vegetables just described. Higher requirements by supermarkets lead to higher integration. At the same time, as suppliers capabilities developed and standards diffused (reducing the tacit component of knowledge and increasing the codified one), more relational forms of interaction and more symmetric relations appear. Indeed, we have seen that many important decisions are taken together by buyers and suppliers, and that the latter have space for manoeuvre.

This also suggests, however, that an important element is the time frame: Standards in their initial stage of development and adoption work as new requirements for suppliers, therefore increasing the complexity of transaction and the capability requirement, which is likely to require more coordination. As standards diffuse, however, they allow a shift towards more relational forms of coordination because transform initially tacit knowledge into codified knowledge. The possibility of this shift, however, will depend on the pace at which new standards are developed and adopted,

since standards as well continually evolve. Indeed, within industries there is a continuing tension between codification and innovation (Gereffi et al. 2005). In addition, supplier competence changes over time: increasing as suppliers learn, but falling again as buyers introduce new requirements.

There is clearly no single best way to organize global value chains. In some product categories, where integral product architecture makes it difficult to break the value chain, vertical integration may be the most competitive approach to value chain governance. Moreover, what it is competitive in a certain time frame and location, may not be so in the future or elsewhere.

VI.6. Summary of the chapter

This chapter started with a description of the structure of the Chilean meat chain, to then analyse issues related to power, governance and upgrading.

It has been argued that in the face of increased threats due to globalisation and liberalisation, a subset of firms has succeeded in restructuring to maintain a competitive niche: Producing more efficiently, developing new products, and extending the range of their activities through forward and backward linkages in the chain, while also moving into multiple chains and different sub-sectors.

The sector is inserted into buyer-driven chains where customers often define product standards, quality requirements and control brands, design and distribution. It has been claimed that the governance structure offers opportunities for learning and developing skills for those who already are in the chain, as well as protection against substitution.

For those outside the chain, however, opportunities are much more limited, unless explicit policies assist in diffusing these capabilities across the sector.

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ANNEX I

Other tables and figures

Table V. 3. Case Processing Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	36	100
	Missing Cases	0	0
	Total	36	100
Unselected Cases		0	0
Total		36	100

Table V.4. Classification Table(a)

			Predicted		
			INNOV		Percentage Correct
			No	Yes	
Step 1	Observed	INNOV	17	1	94,4
		No			
		Yes	1	17	94,4
	Overall Percentage				94,4

a. The cut value is ,500

Table V.5. Model Summary

Table V.6. Logistic Regression

Unweighted Cases(a)	N	Percent
Selected Cases	36	100,0
Included in Analysis		
Missing Cases	0	0,0
Total	36	100,0
Unselected Cases	0	0,0
Total	36	100,0

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

Table V.7. Correlations

		AGE	C_IND	FIRMSIZ
AGE	Pearson Correlation	1	0,611**	,416*
	Sig. (2-tailed)		0,20	0,012
	N	36	36	36
C_IND	Pearson Correlation	0,611**	1	0,106
	Sig. (2-tailed)	0,20		0,54
	N	36	36	36
FIRMSIZ	Pearson Correlation	,416*	0,106	1
	Sig. (2-tailed)	0,12	0,54	
	N	36	36	36

** Correlation is significant at the 0,01 level (2-tailed)

Correlation is significant at the 0,05 level (2-tailed)

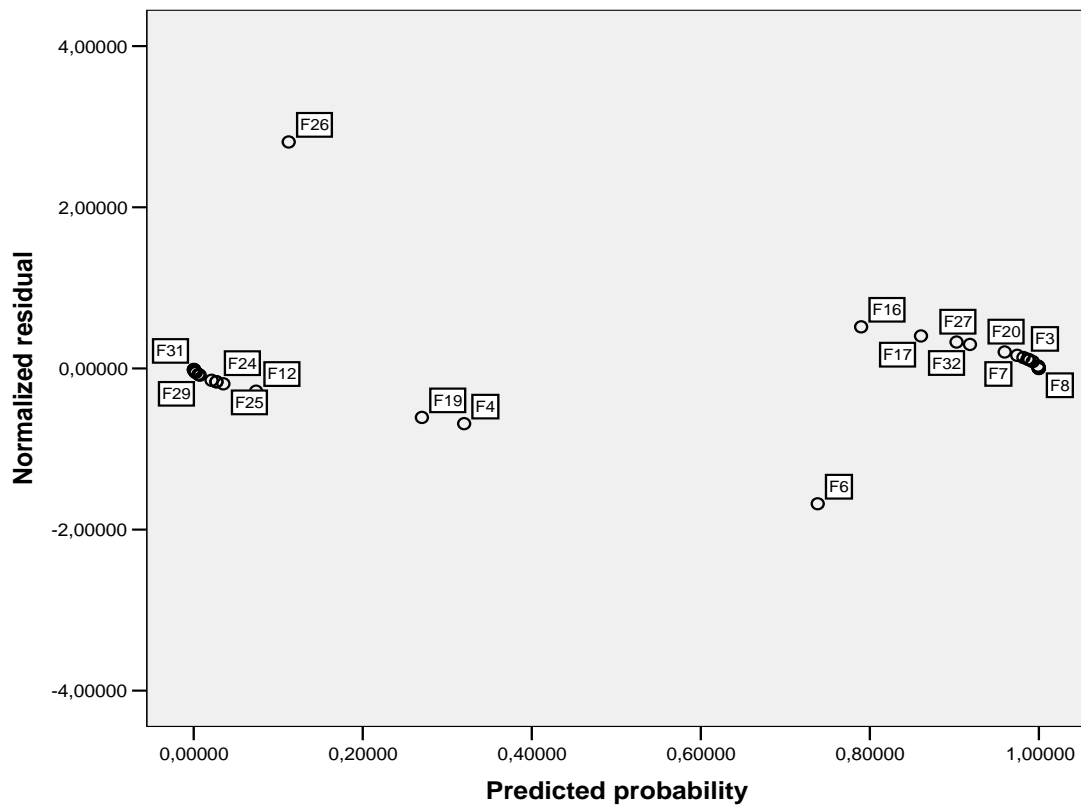
Figure V.3. Distribution of the standard errors

Figure VI.2. The meat value chain

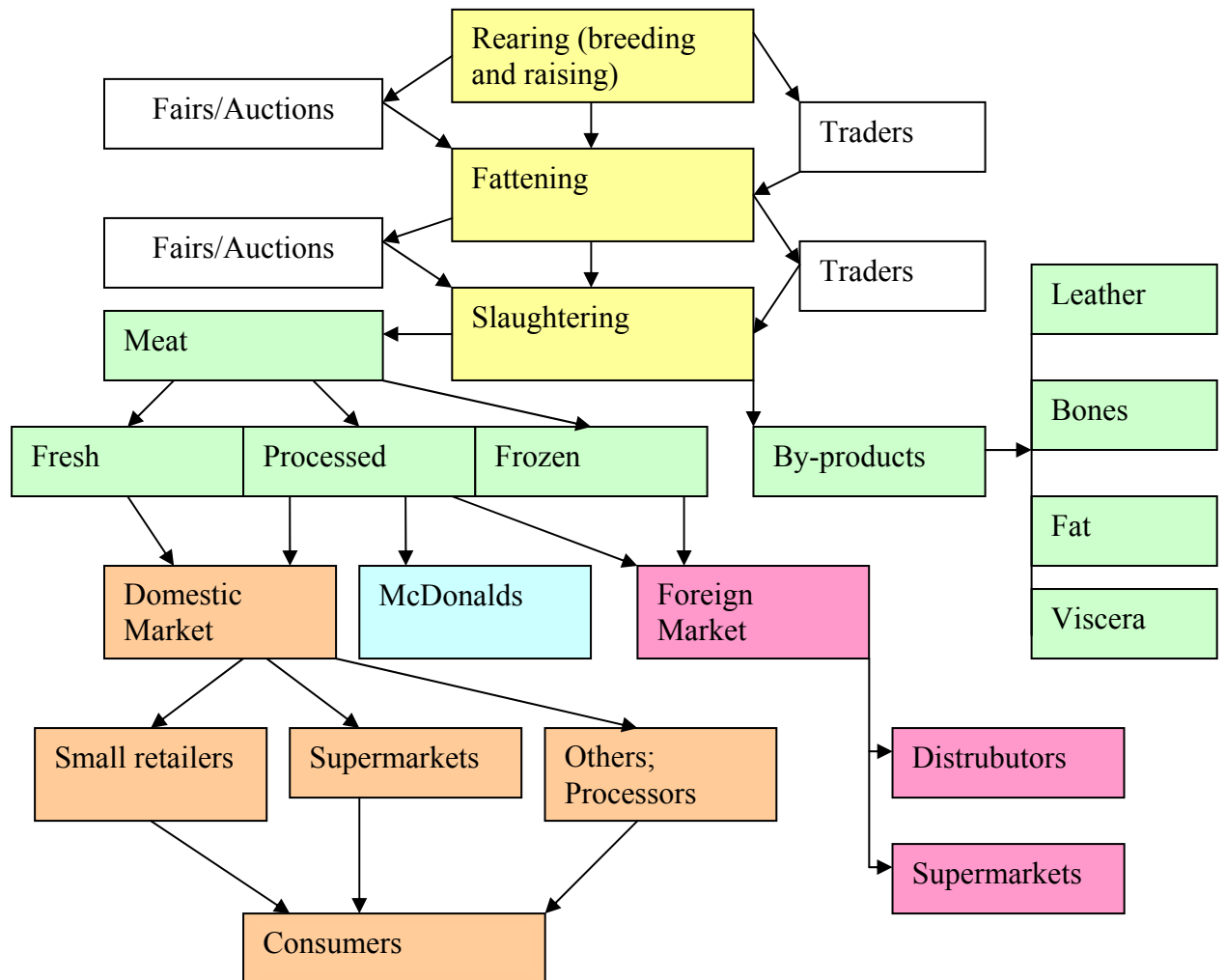


Figure VI.3. Possible degrees of integration in the meat chain

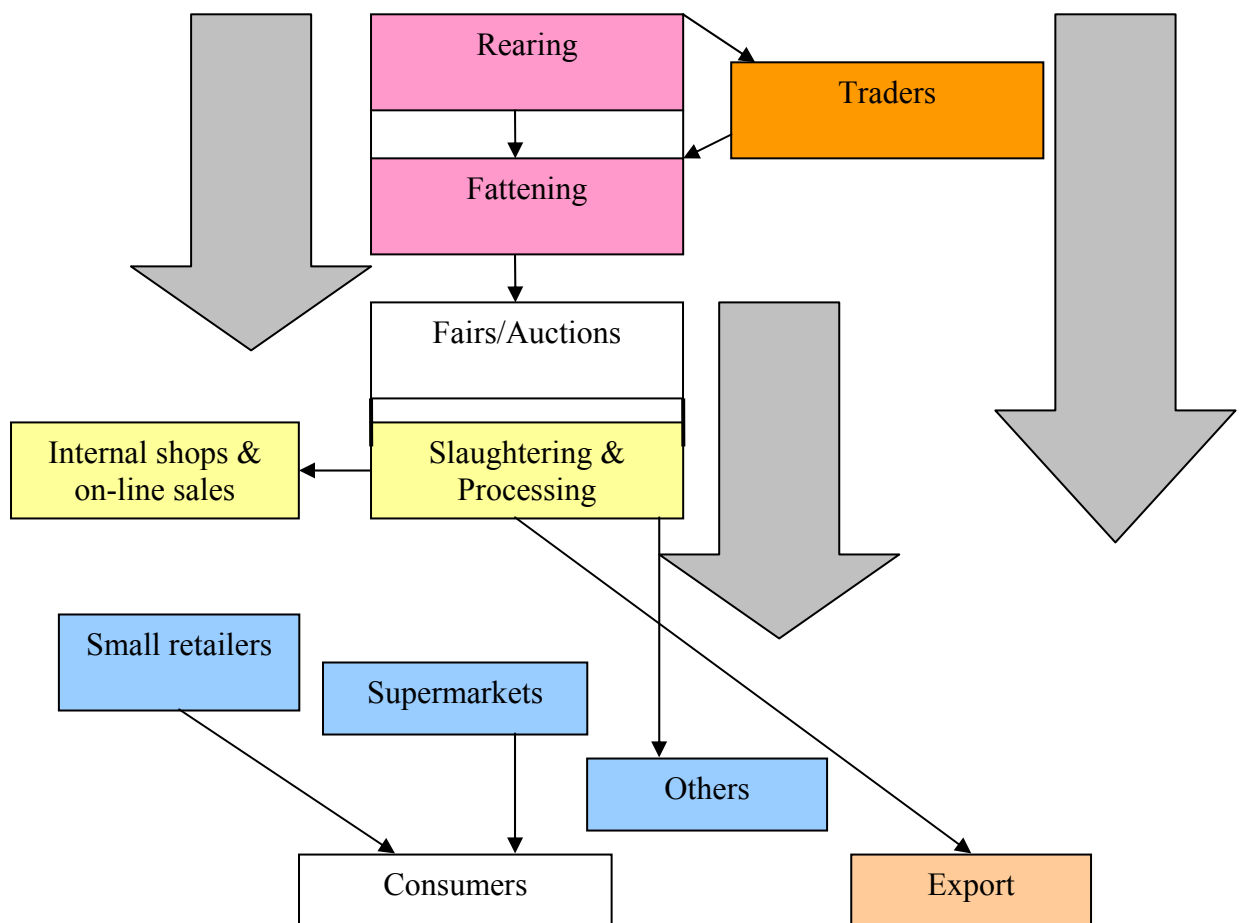
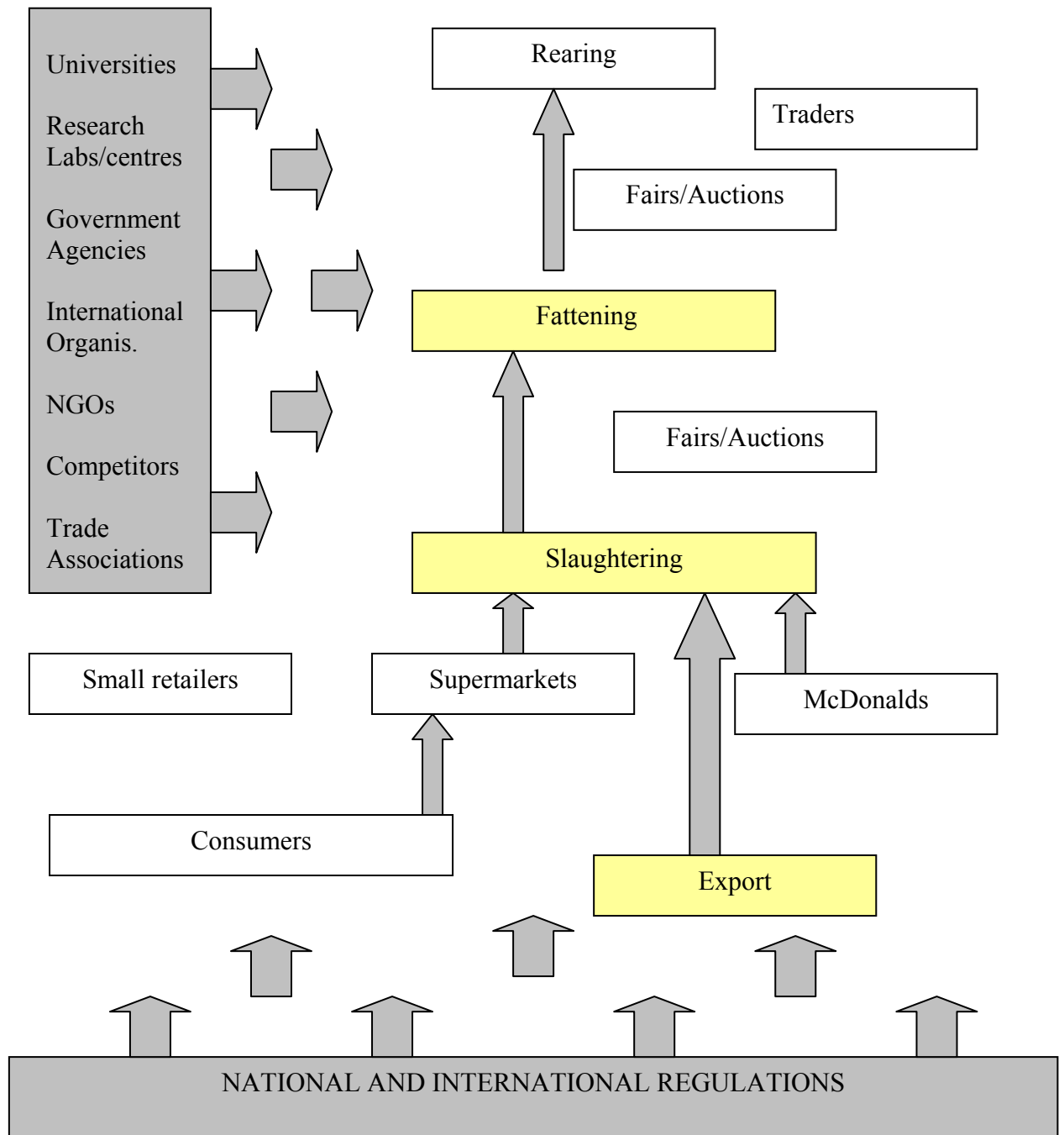


Figure VI.4. Knowledge flows in the meat chain



ANNEXII

English Questionnaire

The survey consists of ten sections and you are requested to answer to all the questions.

Confidentiality statement

All data and information gathered in this survey will be treated as highly confidential, will not be shared without permission and will only be processed and analysed as aggregate.

I. ABOUT YOUR FIRM

I.1. Name of firm: _____

I.2. Firm address (gerencia u oficina matriz):

Street _____ N. _____ Town: _____

Region _____ Phone _____ Website _____

N. of firm plants _____

I.3 What is the ownership structure of your firm?

a. 100 domestically owned

b. 100 Percent foreign owned

c. Joint venture

→ Domestic equity _____ %
Foreign equity _____ %

I.4. Year of (first) establishment _____

I.5. Year of any subsequent relevant changes (mergers or acquisitions): _____

II. ABOUT THE PLANT

II.1. Name of the plant: _____

Street _____ N. _____ Town: _____

Region _____ Phone _____ Website _____

II.2. First year of production: _____

II.3. Main activity: _____

II.4. What are the THREE (3) main products of your firm and respective price you impose for them?

- a. _____
- b. _____
- c. _____
- d. _____

III.SALES

III.1. Total yearly production capacity

1997	2002	2007

III.2. Total yearly sales

1997	2002	2007

III.3. Value (in .000 pesos) of total yearly sales

1997	2002	2007

III.4. Share of sales (%) going to:

a. Local market

1997	2002	2007

b. National market

1997	2002	2007

c. Regional (Latin American) market

1997	2002	2007

d. International (Europe, North America, Asia, Africa, Oceania) market

1997	2002	2007

III.5. If your firm sell to international market, how long has your firm been exporting?

- a. Less than 2 years
- b. 2 – 5 years
- c. 6 – 10 years
- d. More than 10 years

III.6. Value (in .000 pesos) of total yearly exports (FOB)

1997	2002	2007

--	--	--

III.7. What is your product brand or label?

- No brand or label
- In local market (*please specify*): _____
- In national market (*please specify*): _____
- In regional market (*please specify*): _____
- In international market (*please specify*): _____

III.8. How does your firm sell its main products on the domestic market?

Método de venta	Porcentaje medio de ventas usando este método en los últimos tres años
a. Sell to domestic distributor	_____ %
b. Sell directly to domestic buyers	_____ %
c. Sell to domestic partners	_____ %
d. Others (<i>Please specify</i>): _____	_____ %

III.9. How does your firm sell its main export product?

Method of exporting	Share of your exports using this method in 2006
a. Sell to domestic export agent/ distributor	_____ %
b. Sell to overseas import agent / distributor	_____ %
c. Export directly to buyer overseas	_____ %
d. Sell to equity partner overseas	_____ %
e. Others (<i>Please specify</i>): _____	_____ %

IV. EMPLOYMENT AND SKILLS

IV.1. Number of employees

	1997	2002	2007
Total			
Permanent			
Temporary			

IV.2. Employees breakdown by educational level in 2007?

- Primary school or lower _____ %
- Secondary school _____ %
- Vocational _____ %
- University/college _____ %
- MSc, MPhil, PhD _____ %

IV.3. How did the above mentioned breakdown change over the last five years?

IV.4. How many veterinaries and technicians were employed by the firm (plant) in the last five years?

IV.5. How many foreign consultants were employed by the firm (plant) in the last five years? In what specific areas and tasks?

IV.6. Does the firm provide to its employees opportunities for training and capacity building in specific areas?

a. Yes (please specify area and training organization _____)

b. No (please explain why _____)

V. INNOVATION

V.1. Over the last five years has your plant (firm) developed processes new to

- a. The firm
- b. The local market
- c. The national market
- d. The international market
- e. None of the above

Please specify _____

V.2. Over the last five years has your plant (firm) developed products new to

- f. The firm
- g. The local market
- h. The national market
- i. The international market
- j. None of the above

Please specify _____

V.3. Over the last five years has your plant (firm) developed services new to

- a. The firm
- b. The local market
- c. The national market
- d. The international market
- e. None of the above

Please specify _____

V.4. Over the last five years has your plant (firm) developed or adopted qualitative improvement in packaging (*please specify*)?

V.5. Over the last five years has your plant (firm) adopted any innovation in organizational management that can be related to the innovations introduced in section V.1, V.2, V.3? (*please specify*)?

V.6. Over the last five years what have been the innovation objectives?

	0 = none 3 = high	1 = low 2 = average 4 = very high
a. Create new products		
b. Improve the production process		
c. Improve the product quality		
d. Improve the plant working and security conditions		
e. Improve the plant environmental performance		

V.7. Over the last five years what have been the main sources of information/knowledge that contributed to your innovations?

	0 = none 3 = high	1 = low 2 = average 4 = very high
a. Internal sources (generated within the plant/firm)		
b. External sources (providers, customers, other firms within the same sector, consultants, private I+D Institutions)		
c. Institutional sources (Universities, Research Centers, Governmentl Agencies)		
d. Other sources (professional/industrial associations, fairs, conferences, exhibitions, scientific journals, technical publications)		

V.8. The firm (plant) has:

- Professionals working in I+D
- A Department dedicated to I+D
- None of the above

V.9. ¿What are the objective of I+D activities?

- Machinery and equipment maintenance
- Quality control
- Adapting machinery,equipment and processes
- Development of
 - new processes
 - new products
- Others (*please specify*): _____

VI. STANDARDS, CERTIFICATIONS AND TECHNICAL NORMS

VI.1. Does the firm have quality certification (PABCO, BPA, HACCP, ISO, others)?

- Yes → Which one? (*Please specify*): _____

b. No → Why not? (*Please specify*): _____

VI.2. If “Yes”, please indicate the main reason for adopting certification procedures

VI.3. Over the last five years did the firm develop/ adopt any standard of its own?

- a. Yes Which ones _____
b. No Why not _____

VII. ABOUT YOUR FIRM RELATIONSHIP WITH BUYERS

VII.1. How many buyers do you have?

- a. less than 5 buyers
b. 6 – 10 buyers
c. 11 – 15 buyers
d. more than 15 buyers

VII.2. Who are your THREE (3) largest buyers:

Buyer's name	Location
1.	
2.	
3.	

VII.3. What share of your firm's sales goes to the largest buyer? _____ %

VII.4. Since how long is your firm doing business with this buyer?

- a. less than 1 year
b. 2 – 4 years
c. 5 – 7 years
d. more than 7 years

VII.5. How frequent your firm meet with the largest buyer in a year?

- a. Never
b. 1 – 3 times
c. 4 – 6 times
d. more than 6 times

VII.6. Please indicate (by crossing), who makes the decisions regarding:

a. product specification	1	2	3	4
b. process specification	1	2	3	4
c. inputs purchasing	1	2	3	4
d. product price	1	2	3	4
e. product packaging	1	2	3	4
f. logistic operation	1	2	3	4

Where: (1) decided by buyer, (2) decided by buyer after consultation with your firm, (3) decided by your firm but subject to approval by buyer, (4) decided independently by your firm

VII.7. Over the last 10 years (1997 – 2007), has your firm made any major investment specifically to deliver products to a certain buyer:

a. in machineries and equipments	1	2	3	4
b. in system and organisational structure	1	2	3	4
c. on tailoring your product to buyer's specification	1	2	3	4
d. in time and effort to learn buyer's business practices	1	2	3	4
e. in time and effort to develop relationship with buyer	1	2	3	4

VII.8 If your firm switches to another buyer, will you suffer a substantial loss on the investments made to sell to the former buyer?

- a) *Yes*
- b) *No*

VII.9. If your firm stops working with a given buyer, will you suffer a serious loss of knowledge regarding the buyer's product and process specification

- c) *Yes*
- d) *No*

VII.10. Please answer the following questions by crossing: (1) very low, (2) low, (3) high, (4) very high

a. How do you rank your products in terms of technical complexity

1 2 3 4

b. How do you rank your product's level of customisation to buyers?

1 2 3 4

c. How do you rank impact of relationship with buyer on new market access?

1 2 3 4

d. How do you rank impact of relationship with buyer on market share?

1 2 3 4

e. How do you describe impact of relationship with buyer on range of product?

1 2 3 4

f. How do you rank impact of relationship with buyer on quality of product?

1 2 3 4

g. How do you rank impact of relationship with buyer on productivity?

1 2 3 4

VIII. ABOUT YOUR FIRM RELATIONSHIP WITH SUPPLIERS

VIII.1. How many suppliers does your firm (plant) have?

- e. Less than 5
- f. 6 – 10
- g. 11 – 15
- h. More than 15

VIII.2. The THREE (3) largest suppliers:

Supplier's name	Location
1.	
2.	
3.	

VIII.3. % What share of your firm's buys comes from the largest supplier? _____ %

VIII.4. Since how long is your firm doing business with this supplier?

- e. less than 1 year
- f. 2 – 4 years
- g. 5 – 7 years
- h. more than 7 years

VIII.5. How frequent your firm meet with the largest supplier in a year?

- e. Never
- f. 1 – 3 times
- g. 4 – 6 times
- h. more than 6 times

IX. ABOUT YOUR FIRM RELATIONSHIP WITH OTHER PUBLIC/PRIVATE ORGANISATIONS

IX.1. Could you mark, among the following national actors, those that have transferred technical knowledge to this firm that was relevant for the innovations listed in section V.? Please indicate the relevance you attach according to the quality of information obtained. Add up additional actors in the list if necessary.

	<i>None(0)</i>	<i>Low (1)</i>	<i>Medium (2)</i>	<i>High (3)</i>
Univeristies, other Research Centers, Laboratories, etc.				
Universidad de Chile				
Universidad Católica				

Universidad Austral (Valdivia)				
Universidad de Concepción				
Universidad la Frontera (Temuco)				
Universidad Mayor				
Universidad de Los Lagos				
	<i>None(0)</i>	<i>Low (1)</i>	<i>Medium (2)</i>	<i>High (3)</i>
Public Institutions				
CORFO				
FIA				
Fundación Chile				
INIA				
ProChile				
INDAP				
Business Associations				
Faenacar				
ASPROCER				
SAGO				
Other firms of the Association				
(Complete list provided at the end of this questionnaire)				
Other firms of the same sector, input and machinery suppliers, etc.				

IX.2. Has the firm made formal cooperative agreements with other local firms that were relevant for the innovations listed in section V.?

- a. Yes (please specify _____)
b.No (please indicate why _____)

IX.3. Could you mention any international actor (institutions, associations and firms) that have transferred technical knowledge to this firm that was relevant for the innovations listed in section V.? Please indicate the importance you attach according to the quality of information obtained. 0 = none; 1 = low; 2 = medium; 3 = high.

1.	0	1	2	3
2.	0	1	2	3
3.	0	1	2	3
4.	0	1	2	3
5.	0	1	2	3

VII. COMPETITION

X.1. Who are the main global competitors in your industry?

- a. _____
- b. _____
- c. _____
- d. _____

X.2. What are your competitors' main advantages? (*you may cross more than one*):

- a. product quality
- b. product range
- c. price
- d. response rate
- e. others (*please specify*): _____

X.3. Is the firm encountering difficulties in placing its products abroad?

- a. Yes
- b. No
- c. Don't know

X.4. If yes, What are the main reasons for this difficulties?

CONTACT PERSON IDENTITY

Name of contact person: _____

Role within the firm: _____

Telephone number: _____

Fax number: _____

E-mail address: _____

Thank you for your valuable contribution and kind cooperation

List of Firms

Name	<i>Ninguna</i> (0)	<i>Baja</i> (1)	<i>Media</i> (2)	<i>Alta</i> (3)
SOFACAR Ltda				
Frigorífico O'Higgins S.A.				
Frigorífico y matadero CODECAR S.A.C.I.				
Matadero Frigorífico La Pintana				
Faenadora y Frigorífico CORDILLERA S.A.				
Quiebra Frigorífico DARC				
Frigorífico CAMER Ltda				
Faenadora de Carnes RV Ltda				
Codipra S.A.				
Agroindustria el Paico Ltda				
Pablo Massoud Compañía Ltda				
Granja Magdalena S.A.				
COMAFRI S.A.				
Joaquín González M.				
Faenadora Lo Miranda Ltda Doñihue				
Agr. Viscaya Ltda				
Faenadora Rosario Ltda				
COEXCA				
Planta Faenadora de Carnes Talca				
Mat. y Frig. Benedicto Guerra e Hijos Ltda.				
Planta Faenadora San Francisco				
Planta Faenadora Carnes Linares				
FRIGOSUR-O'HIGGINS				
CARNES ÑUBLE S.A				
LOMAS COLORADAS LTDA.				
Frigorífico Temuco S.A.				
Procesadora de Carnes del Sur S.A.				
Planta Faenadora Rio Bueno Ltda				
MATADERO FRIGORIFICO DEL SUR LTDA				
Frigorífico Osorno S.A				
Mödingen Hnos. S.A				
Abascar Ltda.				
Soc.Mat. Ancud Ltda.				
Luis Vidal Vidal				
Berta Andrade Macías				
Rodrigo Saldivia Remolcoy				

ANNEX III

Cuestionario

La encuesta consiste de diez secciones y se le ruega contestar a todas.

Acuerdo de confidencialidad

Toda la información recolectada en esta encuesta será tratada como altamente confidencial, no será compartida sin permiso y solo será analizada de forma agregada.

VIII. SOBRE LA EMPRESA PROPIETARIA

I.1. Nombre de la empresa: _____

I.2. Dirección de la empresa (gerencia u oficina matriz):

Calle _____ N. _____ Comuna: _____

Región _____ Teléfono _____ Sitio Web _____

N. de establecimientos que tiene la empresa _____

I.3. ¿Cual es la estructura propietaria de la empresa?

d. 100% capital nacional

e. 100% capital extranjero

f. Mixta

→ Capital nacional _____ %
Capital extranjero _____ %

I.4. Año de inicio de fundación: _____

I.5. Cambios importantes (fusiones o adquisiciones): _____

IX. SOBRE EL ESTABLECIMIENTO

II.1. Nombre del establecimiento: _____

Calle _____ N. _____ Comuna: _____

Región _____ Teléfono _____ Sitio Web _____

II.2. Año de inicio de la producción: _____

II.3. Actividad principal: _____

II.4. ¿Cuales son los TRES principales productos y el respectivo precio al comprador?

- e. _____
f. _____
g. _____

X. SALES

III.1. Capacidad productiva total

1997	2002	2007

III.2. Ventas totales

1997	2002	2007

III.3. Indique el monto de las ventas del establecimiento en miles de pesos de cada año

1997	2002	2007

III.4. Cuanta parte (%) de las ventas van al:

e. Mercado local (región)

1997	2002	2007

f. Mercado nacional

1997	2002	2007

g. Mercado regional (Latinoamérica, Centroamérica y Caribe)

1997	2002	2007

h. Mercado internacional (Europa, Norte América, Asia, África, Oceanía)

1997	2002	2007

III.5. ¿Por cuanto tiempo el establecimiento ha estado exportando?

- e. Por menos de dos años
f. 2 – 5 años
g. 6 – 10 años
h. Mas de 10 años

III.6. Indique el monto de las exportaciones del establecimiento en miles de pesos de cada año (valor FOB)

1997	2002	2007

III.7. ¿Con que marca o etiqueta vende el establecimiento su producto?

- f. No hay ni marca ni etiqueta
- g. En mercados locales (por favor especifique): _____
- h. En mercados nacionales (por favor especifique): _____
- i. En mercados regionales (por favor especifique): _____
- j. En mercados internacionales (por favor especifique): _____

III.8. ¿Como vende el establecimiento sus principales productos para el mercado interno?

Método de venta	Porcentaje medio de ventas usando este método en los últimos tres años
a. Vende a distribuidores nacionales	_____ %
b. Vende directamente a compradores nacionales	_____ %
c. Vende a establecimientos relacionados	_____ %
d. Otros (<i>por favor especifique</i>): _____	_____ %

III.9. ¿Como vende el establecimiento sus principales productos de exportación?

Método de venta al extranjero	Porcentaje medio de ventas al extranjero usando este método en los últimos tres años
a. Vende a exportadores o distribuidores nacionales	_____ %
b. Vende a importadores o distribuidores extranjeros	_____ %
c. Exporta directamente a compradores extranjeros	_____ %
d. Vende a establecimientos relacionados	_____ %
e. Otros (<i>por favor especifique</i>): _____	_____ %

XI. EMPLEO Y CAPACIDADES

IV.1. Empleados en el establecimiento

	1997	2002	2007
Totales			
Permanentes			
Temporeros			

IV.2. Nivel educacional de los empleados en el establecimiento

- f. Escuela Primaria o menos _____ %
- g. Escuela Secundaria _____ %
- h. Vocacional _____ %
- i. Universidad _____ %
- j. Postgrado _____ %

IV.3. ¿Como ha cambiado este porcentaje en los últimos cinco años?

IV.4. ¿Cual ha sido el número medio de veterinarios y técnicos empleados en el establecimiento en los últimos cinco años?

IV.5. ¿Cual ha sido el número medio anual de consultores extranjeros que han trabajado en el establecimiento en los últimos cinco años?

¿En cuales áreas han desenvuelto sus tareas?

IV.6. ¿La empresa u el establecimiento otorgan a sus empleados oportunidades de entrenamiento y para construir capacidades en campos específicos?

c. Si

- Por favor especifique el área _____

- ¿En conjunto con cual organización se realizan dichas oportunidades?

d. No

Por favor explique porque no _____

XII. INNOVACIÓN

V.1. En los últimos cinco años el establecimiento ha desarrollado procesos que sean nuevos a

- a) La empresa misma
- b) El mercado local
- c) El mercado nacional
- d) El mercado internacional
- e) Ninguno de los anteriores

V.2. En los últimos cinco años el establecimiento ha desarrollado productos que sean nuevos a

- f) La empresa misma
- g) El mercado local
- h) El mercado nacional
- i) El mercado internacional
- j) Ninguno de los anteriores

V.3. En los últimos cinco años el establecimiento ha desarrollado servicios que sean nuevos a

- k) La empresa misma
- l) El mercado local
- m) El mercado nacional
- n) El mercado internacional
- o) Ninguno de los anteriores

V.4. ¿En los últimos cinco años el establecimiento ha creado o introducido mejoras substanciales desde un punto de vista tecnológico de empaque y embalaje (*especifique*)?

V.5. ¿En los últimos cinco años el establecimiento ha introducido innovaciones de la gestión organizativa (*especifique*)?

V.6. ¿En los últimos cinco años cuales han sido los objetivos de la innovación?

	0 = ninguna 2 = media 3 = alta	1 = baja 4 = muy alta
a. Crear nuevos productos		
b. Mejorar el proceso productivo		
c. Mejorar la calidad		
d. Mejorar las condiciones de trabajo y seguridad en el establecimiento		
e. Mejorar el desempeño medioambiental		

V.7. ¿En los últimos cinco años cuales fueron las principales fuentes de información/flujos de conocimiento?

	0 = ninguna 2 = media 3 = alta	1 = baja 4 = muy alta
a. Fuentes internas (generadas al interior del establecimiento y/o empresa)		
b. Fuentes externas (proveedores, clientes, empresas del mismo sector, consultores, institutos privados de I+D)		
c. Fuentes institucionales (Universidades, centros de investigación, agencias de gobierno)		
d. Otras fuentes (asociaciones a nivel profesional e industrial, ferias, conferencias, exposiciones, revistas científicas, publicaciones técnicas)		

V.8. En el establecimiento hay:

- d. Profesionales que trabajan en I+D
- e. Un departamento dedicado a I+D
- f. Ninguno de los anteriores

V.9. ¿Que finalidad tienen sus actividades de I+D?

- f. Manutención de maquinarias y equipos
- g. Control de calidad
- h. Adaptación de maquinarias, equipos y procesos
- i. Desarrollo de
 - i) nuevos procesos ii) nuevos productos
- j. Otros (*por favor especifique*): _____

XIII. ESTANDARES, CERTIFICACIONES Y NORMAS TECNICAS

VI.1. ¿La empresa tiene certificación de calidad (PABCO, BPA, HACCP, ISO, otras)?

- c. Si → Cuales? (*Por favor especifique*): _____
- d. No → Porque no? (*Por favor explique*): _____

VI.2. Si respondió 'Si' a la pregunta anterior, ¿cual es la razón principal de la adopción de formas de certificación?

VI.3. ¿La empresa ha desarrollado/introducido algún estándar propio en los últimos cinco años?

- a. Si ¿Cuales? _____
- b. No ¿Porque no? _____

XIV. SOBRE LAS RELACIONES CON LOS COMPRADORES

VII.1. ¿Cuántos compradores tiene el establecimiento?

- i. Menos de 5
- j. 6 – 10
- k. 11 – 15
- l. Mas que 15

VII.2. Los TRES compradores más grandes

Nombre del comprador	Localización
1.	
2.	
3.	

VII.3. ¿Que porcentaje de las ventas van al comprador mas grande? _____ %

VII.4. Hace cuanto la empresa tiene relación con este comprador?

- i. Menos de 1 año
- j. 2 – 4 años
- k. 5 – 7 años
- l. Mas que 7 años

VII.5. ¿Cuántas veces en el año hay encuentros entre el establecimiento con el comprador más grande?

- i. Nunca
- j. 1 – 3 veces
- k. 4 – 6 veces
- l. Mas que 6 veces

VII.6. Por favor indique quien toma las decisiones a propósito de:

a. la especificación del producto	1	2	3	4
b. la especificación del proceso	1	2	3	4
c. la compra de insumos	1	2	3	4
d. el precio del producto	1	2	3	4
e. el empaquetamiento del producto	1	2	3	4
f. la logística	1	2	3	4

Adonde: (1) decide el comprador, (2) decide el comprador en consulta con la empresa, (3) decide la empresa condicionado a la aprobación del comprador (4) decide la empresa de forma independiente

VII.7. En los últimos 10 años (1997 – 2007), la empresa ha hecho inversiones específicas para entregar productos a algunos compradores:

a. en maquinarias y equipos	1	2	3	4
b. en estructura organizativa	1	2	3	4
c. en adaptar el producto a las exigencias del comprador	1	2	3	4
d. en tiempo y esfuerzo para aprender las practicas comerciales del comprador	1	2	3	4
e. en tiempo y esfuerzo para desarrollar la relación con el comprador?	1	2	3	4

Adonde: (1) fuerte desacuerdo (2)desacuerdo, (3) acuerdo, (4) fuerte acuerdo

VII.8. ¿Si el establecimiento cambia de comprador, perderá muchas de las inversiones hechas?

- a) Si
- b) No

VII.9. ¿Si el establecimiento deja de trabajar con ciertos compradores, perderá conocimiento acumulado sobre la especificación de productos y procesos?

- c) Si
- d) No

VII.10. Conteste a las siguientes preguntas usando: (1) muy bajo, (2) bajo, (3) alto, (4) muy alto

a. ¿Como define el grado de complejidad técnica de los productos del establecimiento?

1 2 3 4

b. ¿Como define el nivel de adaptación del producto del establecimiento a las exigencias del/los comprador/es.

1 2 3 4

c. ¿Como define el impacto de la relación con el comprador en términos de acceso a nuevos mercados?

1 2 3 4

d. ¿Como define el impacto de la relación con compradores en términos de cuotas de mercado?

1 2 3 4

e. ¿Como define el impacto de la relación con el comprador sobre la gama de productos?

1 2 3 4

f. ¿Como define el impacto de la relación con el comprador en términos de calidad del producto?

1 2 3 4

g. ¿Como define el impacto de la relación con el comprador en términos de productividad?

1 2 3 4

XV. SOBRE LAS RELACIONES DE LA EMPRESA CON LOS PROVEEDORES

VIII.1. ¿Cuántos proveedores tiene el establecimiento?

- m. Menos de 5
- n. 6 – 10
- o. 11 – 15
- p. Mas que 15

VIII.2. Los TRES proveedores más grandes de la empresa:

Nombre del comprador	Localización
1.	
2.	
3.	

VIII.3. ¿Que porcentaje de las compras del establecimiento vienen del proveedor mas grande?
_____ %

VIII.4. ¿Hace cuanto el establecimiento tiene relación con este proveedor?

- m. Menos de 1 año
- n. 2 – 4 años
- o. 5 – 7 años
- p. Mas que 7 años

VIII.5. ¿Cuántas veces en el año se encuentra el establecimiento con el proveedor más grande?

- m. Nunca
- n. 1 – 3 veces
- o. 4 – 6 veces
- p. Mas que 6 veces

XVI. SOBRE LAS RELACIONES DE LA EMPRESA CON OTRAS ENTIDADES PUBLICAS/PRIVADAS

IX.1. ¿Podría indicar entre los actores **nacionales** incluidos en la lista, aquellos que hayan transferido a la empresa conocimiento técnico relevante, indicando la relevancia que atribuye a cada uno por la calidad de la información obtenida.

	<i>Ninguna (0)</i>	<i>Baja (1)</i>	<i>Media (2)</i>	<i>Alta (3)</i>
Universidades y otros centros de investigación, laboratorios, etc.				
Universidad de Chile				
Universidad Católica				
Universidad Austral (Valdivia)				
Universidad de Concepción				
Universidad la Frontera (Temuco)				
Universidad Mayor				
Universidad de Los Lagos				
	<i>Ninguna</i>	<i>Baja</i>	<i>Media</i>	<i>Alta</i>

	(0)	(1)	(2)	(3)
Instituciones publicas				
CORFO				
FIA				
Fundación Chile				
INIA				
ProChile				
INDAP				
Asociaciones				
Faenacar				
ASPROCER				
SAGO				
Otras empresas de la asociacion				
(Complete list provided at the end of the questionnaire)				
Otras empresas del sector, de insumos, de maquinarias, etc.				

IX.2. ¿La empresa ha establecido **acuerdos formales de colaboración** con empresas locales?

- Si (por favor especifique el tipo de acuerdo y la asociación_____)
- No (por favor explique porque_____)

IX.3. ¿Podría mencionar a los actores **internacionales** (instituciones, asociaciones, laboratorios, etc.) que hayan transferido conocimiento técnico relevante para la empresa? Por favor, al lado del nombre, indique la importancia que atribuye a cada uno en términos de relevancia de la información, según la escala: 0 = ninguna; 1 = baja; 2 = media; 3 = alta.

1.	0	1	2	3
2.	0	1	2	3
3.	0	1	2	3
4.	0	1	2	3
5.	0	1	2	3

XVII. COMPETITIVIDAD

X.1. Quienes son los principales competidores globales en su sector?

- _____
- _____
- _____
- _____

X.2. Cual es la principal ventaja de su principal competidor? (*puede elegir más de una respuesta*):

- Calidad del producto
- Gama de productos

- h. Precio
- i. Capacidad de respuesta
- j. Otros (*por favor especifique*): _____

X.3. La empresa encuentra problemas en posicionar sus productos en el extranjero?

- a. Si
- b. No
- c. No se

X.4. Si contestó si, cual es la razón principal de estas dificultades?

PERSONA DE CONTACTO

Nombre: _____

Rol adentro de la empresa (carga): _____

Telefono: _____

E-mail: _____

Se le agradece la valiosa contribución

Listado de empresas

Name	<i>Ninguna</i> (0)	<i>Baja</i> (1)	<i>Media</i> (2)	<i>Alta</i> (3)
SOFACAR Ltda				
Frigorífico O'Higgins S.A.				
Frigorífico y matadero CODECAR S.A.C.I.				
Matadero Frigorífico La Pintana				
Faenadora y Frigorífico CORDILLERA S.A.				
Quiebra Frigorífico DARC				
Frigorífico CAMER Ltda				
Faenadora de Carnes RV Ltda				
Codipra S.A.				
Agroindustria el Paico Ltda				
Pablo Massoud Compañía Ltda				
Granja Magdalena S.A.				
COMAFRI S.A.				
Joaquín González M.				
Faenadora Lo Miranda Ltda Doñihue				
Agr. Viscaya Ltda				
Faenadora Rosario Ltda				
COEXCA				
Planta Faenadora de Carnes Talca				
Mat. y Frig. Benedicto Guerra e Hijos Ltda.				
Planta Faenadora San Francisco				
Planta Faenadora Carnes Linares				
FRIGOSUR-O'HIGGINS				
CARNES ÑUBLE S.A				
LOMAS COLORADAS LTDA.				
Frigorífico Temuco S.A.				
Procesadora de Carnes del Sur S.A.				
Planta Faenadora Rio Bueno Ltda				
MATADERO FRIGORIFICO DEL SUR LTDA				
Frigorífico Osorno S.A				
Mödingen Hnos. S.A				
Abascar Ltda.				
Soc.Mat. Ancud Ltda.				
Luis Vidal Vidal				
Berta Andrade Macías				
Rodrigo Saldivia Remolcoy				

ANNEX IV

Name and location of firms interviewed

Region	Name	Municipality	Functioning days
RM	SOFACAR Ltda	La Florida	5
RM	Frigorífico O'Higgins S.A.	Cerrillos	6
RM	Frigorífico y matadero CODECAR S.A.C.I.	San Joaquín	7
RM	Matadero Frigorífico La Pintana	La Pintana	5
RM	Faenadora y Frigorífico CORDILLERA S.A.	Puente Alto	5
RM	Quiebra Frigorífico DARC	San Bernardo	5
RM	Frigorífico CAMER Ltda	San Bernardo	5
RM	Faenadora de Carnes RV Ltda	La Pintana	5
RM	Codipra S.A.	San Bernardo	6
RM	Agroindustria el Paico Ltda	El Monte	6
RM	Pablo Massoud Compañía Ltda	Mellipilla	6
RM	Granja Magdalena S.A.	Talagante	6
VI	COMAFRI S.A.	Rancagua	5
VI	Joaquín González M.	Graneros	5
VI	Faenadora Lo Miranda Ltda Doñihue	Rancagua	5
VI	Agr. Viscaya Ltda	Rengo	5
VI	Faenadora Rosario Ltda	Rengo	5
VII	COEXCA	Talca	5
VII	Planta Faenadora de Carnes Talca	Talca	5
VII	Mat. y Frig. Benedicto Guerra e Hijos Ltda.	Curicó	5
VII	Planta Faenadora San Francisco	Molina	5
VII	Planta Faenadora Carnes Linares	Linares	5
VIII	FRIGOSUR-O'HIGGINS	CHILLAN	5
VIII	CARNES ÑUBLE S.A	Ñuble	5
VIII	LOMAS COLORADAS LTDA.	San Pedro	5
IX	Frigorífico Temuco S.A.	Temuco	5

Region	Name	Municipality	Functioning days
X	Procesadora de Carnes del Sur S.A.	Valdivia	5
X	Planta Faenadora Rio Bueno Ltda	Río Bueno	5
X	MATADERO FRIGORIFICO DEL SUR LTDA	Osorno	5
X	Frigorífico Osorno S.A	Osorno	5
X	Mödingen Hnos. S.A	Llanquihue	5
X	Abascar Ltda.	Puerto Montt	5
X	Soc.Mat. Ancud Ltda.	Ancud	5
X	Luis Vidal Vidal	Castro	5
X	Berta Andrade Macías	Castro	5
X	Rodrigo Saldivia Remolcoy	Quellón	5