STRUMENTI
PER LA DIDATTICA E LA RICERCA

– 85 –

Firms and System Competitiveness in Italy

Edited by
Alessandro Viviani

Firenze University Press
2009

Firms and System Competitiveness in Italy / edited by Alessandro Viviani. – Firenze : Firenze University Press, 2009.
(Strumenti per la didattica e la ricerca ; 85)

http://digital.casalini.it/9788884539366

ISBN 978-88-8453-935-9 (print)
ISBN 978-88-6453-936-6 (online)

This volume is funded by MIUR (MInistero dell' Università e della Ricerca scientifica) grant on the research project "Firm competitiveness and system competitiveness: problems of definition, measurement and analysis" (n. 2005139549_203, 2005).

Immagine di copertina:
© Cugianza84 | Dreamstime.com

Progetto grafico di Alberto Pizarro Fernández

Università degli Studi di Firenze
Firenze University Press
Borgo Albizi, 28, 50122 Firenze, Italy
http://www.fupress.com/

Printed in Italy

Contents

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online), © 2009 Firenze University Press

A. Viviani

Introduction

The recent financial crisis and changes in the Italian industrial system show that the concept of localization/delocalization of production processes, factors of production, and markets have now very little to do with geographical/administrative borders; and this brings into question some foundations on which the quantification of economic phenomena are traditionally based. In this context, a very important element of complexity is represented by the evaluation of competitiveness.

Economic competitiveness is the object of frequent debates in the prominent national and international institutions. Problems regarding the concept and its proper measurement are not solved yet and they require a further elaboration, particularly regarding the context of analysis, the needed information and the available statistical data sources.

The literature on the subject is very extensive. Authors often take into consideration a set of indicators that are either a consequence of being competitive (growth of production, market penetration) or a cause of the competitiveness itself (investments in R&D, productivity increase, innovation capacity), drawing sometimes ambiguous conclusions. Part of this ambiguity can be attributed to the fact that it is not always clear if one refers to a micro or to a meso/macro-economic context: while at a micro-economic level the natural elementary unit of analysis is the firm (firm competitiveness), we need a systemic approach when we pass to a meso-/macro-economic level (system competitiveness). For example, firms belonging to local economic systems get a sizable part of their competitive advantages just from the context in which they operate and, hence, their competitiveness cannot be assessed disregarding the relationships with the local context. Therefore, the reference unit is not unique and the different possible definitions involve the concepts of local systems, firm networks, national economic systems: moreover, the choice of the reference level (micro,

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online), © 2009 Firenze University Press

meso, macro) has a strong effect, not only on the specification of the unit of analysis, but also on the identification of the relationships between units, time horizon, informative needs and related measurement of competitiveness. The micro, meso and macro perspectives are in someway integrated. In fact, if it is true that the competitiveness of a system largely depends on the competitiveness of the firms operating within it, it is also true that its competitiveness cannot be completely assessed by simply comparing the performance of the firms. In other words, we can say that firms and system objectives are different and they could even diverge: for example, the fact that the single firms are not competitive does not exclude that a system is instead highly competitive due to its capacity of creating new competitive firms and of expelling, at the same time, the weaker ones. Analogously, the fact that a system is able to create a high value added return does not imply that all of its firms have high returns; the returns could be compromised, for example, by an excessive financial burden. The consequence is that any proper analysis should necessarily take into consideration both aspects (micro and meso/macro). In particular, the aggregate approach (meso or macro) should face the crucial question of the reference level of analysis (firm networks, local or national system), that is which elementary unit should be considered in the analysis. In this respect, it is useful to refer to the concept of system which, as known, is based on the existence of components and relationships among components.

The definition of a system is founded on the concept that internal relationships are more important than external relationships (self-containing of the relationships). Hence, it is easy to understand how it is possible to identify minimal economic systems, characterized by common daily activities, and economic systems in which the self-containing concept can refer to common fiscal policy, industrial policy etc. Focusing on Italy, situation, the local labor systems, defined by ISTAT, seem to be the natural starting point, since they identify the minimal level at which many of the elements that influence the competitiveness of the higher level systems are born. In turn, the competitiveness of every local system is influenced by the nearby local systems and by the rules and policies adopted by the local and central administrations. In other words, if it can be affirmed that the Italian competitiveness (or the competitiveness of an Italian region) depends on the competitiveness of its local systems, it is also evident that the competitiveness of the national economic system (or regional system) has an effect on the competitiveness of the local systems that belong to it. This shows that the competitiveness of every local system depends, on the one hand, on the behavior of its internal components, and, on the other hand, on the interactions among the different territorial units, both at the same and at the higher hierarchical level.

These interactions are key factors which can explain the recent years' downturn in competitiveness for the Italian firms as well as the difference

in competitiveness we can observe in different sectors (see the Made in Italy or services vs. manufacturing).

This book aims at discussing the complex phenomenon called competitiveness from a critical viewpoint either at system or at firm level. In particular, Buzzigoli and Viviani (chapter 1) provide a comprehensive critical survey of the numerous contributions regarding competitiveness in its various aspects. Both theoretical and empirical issues are explored and discussed, with a special attention to statistical issues involved in the choice of proper informative sources, in the building of sound indicators and in the application of suitable methods of analysis.

In recent years, other than tertiarisation and reduction in firm size, substantial structural changes in the Italian economy between the last two censuses have affected Italian competitiveness. Grassini and Marliani (chapter 2) discuss the remarkable shift that occurred in the share of employment inside the industry sectors, from the production of home and personal goods towards the production of instrumental goods (light mechanics), as well as, inside the services sectors, from the production of personal services towards the production of business services in the period 1998-2004. They show a widespread decrease of labour productivity and a remarkable employment shift from industry to services. They also show that this employment reallocation across sectors had a negative effect on the performance of the whole economy: the employment share shifted towards less performing sectors. Services are mostly responsible for the presence of a robust structural burden.

Velucchi and Viviani (chapter 3) analyze the multidimensional competitiveness concept in a comparative perspective. Studies on this theme range from productivity and cost studies for specific activities and institutional analysis to general strategy papers, development plans and cluster studies. The best-known measure, however, seems to be the competitiveness index, a composite indicator ranking countries against each other according to selected criteria and proxies of competitive ability. In fact, competitiveness is a relative concept: it depends on the variables included in the analysis, on the disaggregation level, on the data sources. This chapter deals with competitiveness sensitivity and adapts a confirmatory factor analysis focusing on the economic and innovative capacity of the European regions. The results show the role of labor productivity and patenting on the regions competitiveness; in other words, the most competitive regions' are those with both high levels of economic prosperity human capital and, especially, innovative capacity.

Paniccià and Conti (chapters 4 and 5, respectively) analyse specific case studies to investigate the role of service sectors as a fostering force of competitiveness differentials at a regional level.

In particular, Paniccià (chapter 4), in his case study, analyses the interdependences in the fashion sector in Tuscany, in particular in the service

sector, using an input-output approach and the Tuscany-rest of Italy bi-regional matrices created by IRPET – the Tuscan Regional Institute for Economic Planning – for the years 1988 and 1997. He describes the level of integration within the production system showing the initial gap in 1988 and the dynamic trend over recent years of a very important sector in Tuscany (both in a territorial and sectoral perspective).

Conti (chapter 5) shows the use by Tuscan enterprises of business-related services. He analyses the main types of service used by companies, the size of the purchase markets, the criteria for choosing suppliers and the relative levels of user satisfaction, the main deficiencies encountered according to the type of service and the professional figures needed to improve the performance of the companies in the province of Florence. The investigation is based on a structured questionnaire distributed to a sample of 513 companies in the province of Florence. The paper shows that the great majority of companies in the province of Florence only require simple, standardised services, principally accounting for tax returns and tax matters in general, offered mainly by accountants and to a lesser extent by the Tax Assistance Centres. Only a tiny minority of companies buy more sophisticated services connected to business consultancy or patent law.

Finally, the last paper (Buzzigoli and Viviani, chapter 6) deals with the role of energy as an important dimension in international competitiveness. The paper aims at contributing to the analysis of interrelations between structural economic aspects and energy related issues in Italy. The focus is on the dynamic of energy intensity monitored in time, in order to catch the interaction between the economic dynamic, summarized by the value added, return and the employment of energetic resources, interpreted as a complex productive factor, integrated with the direct costs of the production process.

L. Buzzigoli
A. Viviani[1]

Firm and System Competitiveness: Problems of Definition, Measurement and Analysis[2]

1. Introduction

What is meant by competitiveness?

The theme is largely discussed and is of universal interest, not only in the academic environment, but also in the political and in the managerial ones. While researchers try to study in detail concepts and measures, almost every government in the world has identified competitiveness as a main goal of economic activity, setting up expert commissions to analyze its characteristics and to measure it.

In the USA the President's Commission on Industrial Competitiveness dates back to 1985 and in 1986 The Competitiveness Policy Council was created. Ever since the seventies, in some European countries, competeveness became a focus of discussion.

At present, the interest is even stronger. One primary example is the Lisbon Agenda, the ten year program to reform and renew the economy set out by the European Council on March 2000, in which the EU Heads of States and Governments agreed to make the EU «the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment». This widespread interest and this «institutionalization» of competitiveness – although it gave birth to a series of periodic reports at various levels of analysis (European Commission, 2004, a National Competitiveness Council, 2005, WEF, 2006, IMD, 2006 etc.) – didn't produce any final definition of the term and any comprehensive

[1] Dipartimento di Statistica «G. Parenti», viale Morgagni 59, 50134 Firenze, Italy; e-mail: buzzigoli@ds.unifi.it, viviani@ds.unifi.it.
[2] This paper is part of the research project no. 2005139545_003 funded by the MUR.

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online), © 2009 Firenze University Press

systematization of its different aspects. On the contrary, it opened a vast international debate producing an amazing amount of contributions, dealing with both theoretical and empirical issues (e.g. European Commission 2005 for Europe; Biggeri, Bini 2006, for Italy) and provoking a sort of «competitiveness fad» (Kitson *et al.* 2004). Researchers used the concept of competitiveness in many different ways, from a variety of perspectives and using different methodologies: there are studies involving macroeconomic, microeconomic, business, geographical, sociological, sectorial factors which are always interrelated.

A cursory Internet search of competitiveness (together with the adjective economic) turned up 45,700,000 web sites by universities, research institutes, national statistical agencies, industry associations, consultants, and cities, states, and regions reporting studies.

This multifaceted framework is due to the multidimensional nature of the concept and foreshadows the difficulties in defining what competitiveness really represents.

But, although often abused and misused, the concept of competitiveness incorporates important aspects of our economy that are useful to understand growth and wealth at various levels of analysis, especially in a globalized world.

The aim of this paper is to provide a comprehensive critical survey of the numerous contributions regarding competitiveness in its various aspects. Both theoretical and empirical issues will be explored, with special attention to statistical issues involved in the choice of proper informative sources, in the building of sound indicators and in the application of suitable methods of analysis.

The structure of the paper is organized in six sections. The next section, section two, introduces the general concept of competitiveness and underlines the role of statistics in describing it. The third section is devoted to globalization with special attention to statistical issues. The fourth section focuses on the different levels of analysis for competitiveness. The penultimate section describes various statistical problems involved in the measurement and in the analysis. In the final section, some final remarks close the paper.

2. Definitions and Measures: the Role of Statistics

The word competitiveness derives from the verb to compete, the etymology of which dates back to the Late Latin *cum-petere* (see Merriam-Webster's Collegiate Dictionary), which means «to seek together»: in fact, it is the union of the preposition *cum* (with) and the verb *petere* (to aim at, to ask) (Cellini, Soci 2002). Therefore, its original meaning stresses co-operation; nowadays, on the contrary, the prevalent meaning is «to strive consciously or unconsciously for an objective (as position, profit, or a prize); be in a state of rivalry» (Merriam-Webster's Collegiate Dictionary).

In this sense it is a dynamic concept, defining a behavior pursuing a definite objective.

Nonetheless, in the vast literature which is available on the subject competitiveness is sometimes seen as a prerequisite of economic success, while sometimes it is identified as a consequence or an outcome.

Moreover, these different definitions have risen – also independently – in many different fields of study: international trade, industrial organization, business economics etc.. The so called globalization process (see section three) further enlarged the dimensions of analysis and contributed to the proliferation of definitions and indicators.

Some economists do not share this attitude (Krugman's [1996b] thought is well known) and have warned against a generalized abuse of the concept, but, in spite of this, the general interest is at present even greater than before. Some simple considerations can help in understanding the complexity of the issue.

As far as international trade is concerned, competitiveness is often confused with comparative advantage (Leamer 1984). In fact, typical trade indicators used in competitiveness analysis are derived from the Balassa's approach which measures the revealed comparative advantage (Balassa 1965). Actually, the concept of comparative advantage derives from the Ricardian trade model and is rigorously defined in an economic theoretical framework where the resources endowment (land, location, natural resources and labor) plays a fundamental role in the creation of wealth and where intra-firm flows, together with the various price distortions in output value and cost, are not considered. Theoretical and empirical analysis are still on-going and the debate is still alive.

On the other hand when competitiveness is related to the activity of multinational enterprises, it often combines with attractiveness, a general concept dealing with a broad range of factors: market extent, capital and labor cost (where the taxation system plays a fundamental role), presence/absence of complementary/competitor enterprises, political stability etc. (Cœuré, Rabaud 2003), a set of elements that brings a country (or a region) to prevail over others in international consideration.

When competitiveness is analyzed at firm level it often deals with the concept of performance, including the notions of profitability and productivity, which – although well known in economic and business literature – are far from being univocally defined and measured.

Moreover these concepts must be reinterpreted in a fast evolving environment where technology and infrastructures are more important than in the past (see section three).

Similar problems arise when we try to give definitions of competitiveness at the various levels of economic analysis: macro level as far as competitiveness of nations is concerned, meso level for industrial or regional competitiveness, micro-level for competitiveness of firms. Michael Porter

(see section four) tried to connect the macro- (national) with the meso- (cluster) and micro-dimension (firm) by means of his competitiveness advantage theory, which goes beyond the comparative advantage approach to promote a more active attitude of firms towards economic opportunities.

This multifaceted world makes our work more difficult. First, the variety of concepts that are often linked to competitiveness is extremely fuzzy. Second, these concepts are derived from different levels of analysis: macroeconomic foundations, microeconomic principles, geographic approaches etc., which are always independently considered.

A look at the literature is enough to find numerous definitions of competitiveness.

Some of them refer to a whole country or nation.

«National competitiveness refers to a country's ability to create, produce, distribute and/or service products in international trade while earning rising returns on its resources» (Scott, Lodge 1984).

Competitiveness is «the ability of a country to achieve sustained high rates of growth in GDP per capita» (*World Economic Forum, Global Competitiveness Report* 1996).

Competitiveness is «the degree to which a country can, under free and fair market conditions, produce goods and services which meet the tests of international markets while simultaneously maintaining and expanding the real incomes of its people over the longer term» (President's Commission on Industrial Competitiveness 1985).

«A field of Economic knowledge, which analyses the facts and policies that shape the ability of a nation to create and maintain an environment that sustains more value creation for its enterprises and more prosperity for its people» (*IMD* 2003).

Other definitions directly refer to firm or industrial level.

«A firm is competitive if it can produce products and services of superior quality and lower costs than its domestic and international competitors. Competitiveness is synonymous with a firm's long-run profit performance and its ability to compensate its employees and provide superior returns to its owners» (*Select Committee of the House of Lords on Overseas Trade* 1985).

«Industrial competitiveness is the ability of a company or industry to meet challenges posed by foreign competitors» (US Department of Energy).

«The immediate and future ability of, and opportunities for, entrepreneurs to design goods worldwide whose price and non-price qualities form a more attractive package than those of foreign and domestic competitors» (European Management Produce and Market, also used for defining Competitiveness of Enterprises in the *World Competitiveness Report* 1991, IMD and World Economic Forum).

«Competitiveness includes both efficiency (reaching goals at the lowest possible cost) and effectiveness (having the right goals). It is this choice of

industrial goals which is crucial. Competitiveness includes both the ends and the means towards those ends» (Buckley *et al*. 1988).

«Competitive advantage at firm level is the ability to consistently and profitably deliver products and services which customers are willing to purchase in preference to those of competitors.» (Department of Enterprise, Trade and Employment, UK).

Some other definitions have a more general scope.

Competitiveness «is about creating high skills, high productivity and therefore a high usage economy» (Department of Trade and Industry, 1994).

«Competitiveness should be seen as a basic means to raise the standard of living, provide jobs to the unemployed and eradicate poverty» (Competitiveness Advisory Group 1995).

Some definitions are even more comprehensive and try to describe the multidimensional nature of the concept, like the one by OECD (1996), which embraces all the various levels of observation (micro-meso-macro).

«Supporting the ability of companies, industries, regions, nations or supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels» (OECD 1996).

Finally, some definitions try to underline the relativity of the concept.

«Competitiveness is relative and not absolute. It depends on shareholder and customer values, financial strength which determines the ability to act and react within the competitive environment and the potential of people and technology in implementing the necessary strategic changes. Competitiveness can only be sustained if an appropriate balance is maintained between these factors which can be of conflicting nature» (Feurer, Chaharbaghi 1994)

«Competitiveness implies elements of productivity, efficiency and profitability. But it is not an end in itself or a target. It is a powerful means to achieve rising living standards and increasing social welfare – a tool for achieving targets. Globally, by increasing productivity and efficiency in the context of international specialization, competitiveness provides the basis for raising peoples' earnings in a non-inflationary way» (Competitiveness Advisory Group 1995).

In summary, most of the definitions of national competitiveness relate both to trade performances and to the capacity of maintaining sustained standards of living for citizens in a framework which relies on economic growth, human development and quality of life.

On the other side, definitions of firm competitiveness are related to market performance and productivity.

In many cases the desired result is determined by the efficiency and the effectiveness of both the private sector and the public one in a sort of mutual relationship that underlines their interdependence.

This rapid review shows the variety of perspectives and scope of the different definitions, ranging from comparative advantage and price competitiveness perspectives (generally used by economists and referred to economic characteristics of the different countries), to strategy and management perspectives (used by management researchers who refer preferably to firm specific factors) and socio-cultural ones (adopted by sociologists and political theorists).

The only way to systematize this indefinable 'object' is a multi-criteria approach which develops different viewpoints for the different dimensions of the phenomenon. Moreover, once that the dimensions are established, a further and more serious problem is the translation of the defined concepts into rigorous and reliable measurement systems and the later detection of adequate statistical and administrative sources.

From a statistical point of view the search of the definition of competitiveness cannot be separated from the definition of the measurement method and from the associated data generation process, otherwise the definition is meaningless. These aspects further complicate our task but help in identifying the operational aspects and facilitate the successive empirical considerations.

3. Globalization and Competitiveness: the Statistical Perspective

Most of the economic literature mentions globalization as the main cause of the increasing importance of competitiveness. Actually globalization is an old concept and not a new one, but before the first world war the level of integration was rather scarce, because it was based essentially on trade between independent firms. However, in the last decades of the century the level of integration became pervasive involving primarily the production process (Gereffi 2005). Therefore a brief overview of the significance of globalization can help in introducing important dimensions of analysis, in order to fit the statistical tools to the new information needs.

The entry for the Oxford Companion to Politics (Krieger 2001), states that globalization is

> […] a process (or set of processes) which embodies a transformation in the spatial organization of social relations and transactions, expressed in transcontinental or interregional flows and networks of activity, interaction and power. […] In short, it can be thought of as the widening, intensifying, speeding up, and growing impact of world-wide interconnectedness.

In this sense, globalization regards not only the economic dimension, but also the political, and the cultural ones, all of which can have a social impact. Therefore the topic is typically interdisciplinary and multidimensional.

Moreover, globalization cannot be limited to internationalism, in the sense of geographic spread of economic activities, because it is qualitatively different: the adoption of new technologies (see the advancements in transportation, communication and information technology) together with the declining of trade barriers and the liberalization of capital movements and deregulation of financial services (removal of protectionist barriers, growth of transnational corporations, freer capital flows etc.) diminishes distances and national boundaries and favors «the functional integration of internationally dispersed activities» (Dicken 2003). Since companies find it profitable to reorganize the production network on an international scale, and to outsource shares of their activities, integration of trade is accompanied by a rising disintegration of production processes (Feenstra 1998).

This fragmentation of production processes leads to the loss of the territorial link between the economic subject – who owns or controls an entrepreneurial activity – and the place where the activity takes actually place. A well known consequence of this is the «new international division of labor» (Fröbel *et al.* 1980) exploiting low-wage economies of developing countries for the labor-intensive phase of production. Moreover, the rapid technological advances facilitate service trade.

All these changes modify the relationships among national economies, multinational and transnational organizations, firms, geographical localizations, consumers, people and these changes also enlarge the spectrum of macro- and micro-economic policies.

The nature of competition is influenced by this extremely dynamic context. The concept of competitiveness is in itself globalized, in the sense that the number of competitors is larger and more spread out than before: firms have to face competitors in a wide range of markets and in many different areas; innovation is an important competitive weapon, while price competitiveness is less determinant then before; flexibility as the need to be more responsive to changes and faster to adopt new ideas becomes essential to remain in business.

The strong impulse in international activities of firms due to the globalization and liberalization process opens up new and increasingly vast markets where resources are internationally mobile and national economies are becoming more and more interdependent.

In this new situation traditional statistics soon revealed inadequate to obtain more comprehensive and comparable data on the economic activities undertaken by enterprises beyond national borders and to describe the process of globalization in economic, technological, commercial and financial dimensions (a comprehensive review of the main sources of basic data concerning globalization indicators is in OECD 2005b).

In the traditional approach the indicators usually considered to evaluate the relationships among national economic systems are largely based

on export/import volumes. The definitions of competitiveness often refer to trade performances and a large part of statistics traditionally used in the analysis of competitiveness are trade indicators. Statistics describe the state of trade flows and trade patterns of a country or of several countries and can be used to analyze flows and patterns over time or across countries.

Trade data are available from national statistics and, for international comparisons, from international organizations (UN, UNCTAD, WTO etc.), but they are not always reliable (ITC 2005).

A synthesis of the indicators that can be built is not easy: for a review of trade indicators in the framework of a globalized economy we refer to OECD (2005b) but, following Mikic (2005), we can classify them into two groups: trade dependence and trade performance indicators; export specialization and competitiveness indicators.

Indicators in the first group (trade dependence indicators, relative growth of merchandise trade, major export category, export diversification, index of trade concentration, trade intensity coefficient etc.) capture country's export and import flows, their growth in value or volume, their temporal evolution, their product composition and geographic structure. Linking these characteristics with domestic economy, the importance of trade on the global economic system of the country can be estimated.

The indicators in the second group (revealed comparative advantage, intra-industry trade, trade overlap index, complementarity index, export similarity index, real effective exchange rate etc.) provide information on the degree of export specialization, the importance of intra-industry relationships and production patterns.

In an environment where the space dimension attains a new meaning, these indicators are largely insufficient to quantify the above mentioned integration (Garofalo *et al.* 2002) and many of the indicators built by official statistics which are traditionally based on the territorial concept of firm must be accompanied with other sources of information.

The complex production chains dispersed over different countries provoked a significant increase in intra-firm trade (cross-border trade between multinational companies and their affiliates, sometimes referred to also as «related party» trade) and inter-industry trade (trade between different firms of the same industry, involving the import and export of similar goods by the same country) (OECD, 2002).

While intra-industry trade involves only the traditional bilateral trade statistics for that product category, the quantification of intra-firm trade is more difficult to obtain, because international trade among firms/nations combines with international trade among the affiliates of the same firm. Therefore the evaluation of the performance is complicated by the trade-off between residence and ownership of the firm, it involves the knowledge of the relationship between the firms involved in the transactions and appropriate firm surveys must be organized.

New concepts and measures had to be defined, and this progressive renewal had to be developed starting from the principles of integration and harmonization. These concepts and measures must be integrated with existing tools and they must observe a common analytical framework. In summary, the approach is that of building on internationally agreed standards, and not that of suggesting modifications. Moreover these concept must be shared by the international community and therefore the statistical standardization is possible only with a great international cooperation.

There is vast literature on the measurement of the economic globalization that is evidence of the international interest on the subject: a significant result is the OECD Handbook on Economic Globalization Indicators (2005b) that, recognizing the multidimensional nature of globalization, identifies a set of indicators to estimate the globalization process, and provides national statistical institutes with the methodological guidelines needed to build the indicators and make them comparable with international standards.

In particular, national statistical offices soon faced significant difficulties in providing reliable information on the functioning and role of multinational enterprises (MNE) which operate across geo-political boundaries. For instance, national accounts systems base the measurement of transactions between residents and non-residents on the residence concept and refer to the economic territory of a country: an institutional unit is a resident unit of a country or economy when it has a centre of economic interest in the economic territory of a country. The suggested period for determining residence is one year. As a consequence, the production which is undertaken outside the economic territory of a resident enterprise by the personnel, plant and equipment of that resident enterprise is treated as part of host country production, and the enterprise is treated as a resident unit (branch or subsidiary) of that country, if the enterprise meets the conditions stated above (UN 2002).

Therefore much of the work focuses on the activity of multinational enterprises (MNE) and identifies three dimensions of analysis which are largely interrelated: foreign affiliate trade statistics, foreign direct investments, the role of technology.

The central concept in the analysis of MNE's activity is that of foreign affiliate. A foreign affiliate is an enterprise in the compiling country on which an institutional unit outside the compiling country has control[3], or an enterprise outside the compiling country on which an institutional unit in the compiling country has control (Eurostat 2003).

Traditional balance of payments and international investment position (IIP) statistics, do not measure the operations of the foreign affiliates of

[3] Foreign controlled corporations (non-financial and financial) consist of all resident corporations and quasi-corporations that are controlled by non-resident institutional units.

multinational enterprises, such as sales, employment and assets: they only consider the net investment of the direct investor in foreign affiliates (IMF 2003, IMF and OECD 2003).

Recently, great efforts are under way to encourage the compiling of the Foreign Affiliate Trade Statistics (FATS), which aim to describe the operations of foreign affiliates.

In particular, in the field of MNE's activity new informative requirements have risen in the field of trade in services, which is more difficult to measure than trade in goods, because of difficulties in the definition (services cannot be described by physical attributions or physical functions) and in the survey operations (for instance, there is no custom crossing with all the usual administrative documentation provided for goods).

Since the beginning of the nineties national statistical agencies and international organizations made a strong effort to develop a common set of harmonized rules and guidelines for the measurement of this complex new production system.

After the WTO's General Agreement on Trade in Services[4] (GATS), the first ever set of multilateral, legally-enforceable rules covering international trade in services, the need for shared general rules is even more important.

The *Manual on Statistics of International Trade in Service* (UN 2002) is an important frame of reference for countries that need to collect and disseminate data on international service trade. It is the result of the joint work of several international organizations (IMF, OECD, EUROSTAT, UNCTAD, WTO) and it proposes a clear and more detailed and comprehensive system for the measurement of trade in service. It is built upon the traditional system of statistical data, that uses internationally agreed standards for compilation, definitions and measurement methods (e.g. 1993 SNA – System of National Accounts, BPM5 – the International Monetary Fund's Balance of Payments Manual, BD3 – the OECD Benchmark Definition of Foreign Direct Investment etc.).

Definition, valuation, classification and recording of resident/non-resident trade in services in the conventional sense were already available in these systems; this concept is coherent with the one of international trade in goods and form the international trade in goods and services in the BPM5 account; the Manual extends the definition of *international trade in services* to include the value of services provided through foreign affiliates established abroad, described here as *foreign affiliates trade in services* (FATS, yet again), and it does so by considering the location of both the supplier and the consumer of the traded service. FATS statistics comprise sales and/

[4] GATS establishes a set of rules and disciplines governing the use by WTO member countries of trade measures in services. Such measures consist of laws, regulations, administrative actions and decisions affecting the purchase, payment or use of a service or the presence of foreign service suppliers (UN 2002).

or output, employment, value added, exports and imports of goods and services, number of enterprises etc. (OECD Glossary of statistical terms).

Therefore the term FATS doesn't have only one meaning, even in the international community: originally the acronym stood for Foreign Affiliates Trade in Services in the sense stated above; more recently, however, Eurostat has used it in a broader sense (Foreign Affiliates Trade *Statistics*), including all the activities of affiliates with the exception of trade (e.g. manufacturing) (OECD 2005b).

Data on the activities of majority-owned foreign affiliates in the compiling economy are usually referred to as inward FATS, and those relating to majority-owned foreign affiliates of the compiling economy that are established abroad are referred to as outward FATS.

Closely related to FATS are Foreign Direct Investments (FDI).

The OECD Benchmark Definition states:

> Foreign direct investment reflects the objective of obtaining a lasting interest by a resident entity in one economy (direct investor) in an entity resident in an economy other than that of the investor (direct investment enterprise). The lasting interest implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence on the management of the enterprise.

A foreign direct investment enterprise is an incorporated or unincorporated enterprise in which a direct investor resident in another economy owns 10% or more of the ordinary shares or voting power (for an incorporated enterprise) or the equivalent (for an unincorporated enterprise) (OECD Glossary of Statistical terms).

FDI is a category of international investment that reflects the objective of a resident entity in one economy to obtain a lasting interest in an enterprise resident in another economy, therefore reliable information on FDI can shed light on the competitiveness and/or attractiveness of economic systems or of specific sectors. Moreover, beyond the traditional purpose of measuring the financial flows between the source country and the recipient country, FDI measures the activity of MNE, the factors that can help in explaining these activities and the effects on the economy of both the countries involved. The most recent studies stress the importance of FDI as a «vehicle of transmission of ideas, technological knowledge, organizational knowledge and business knowledge» (Lipsey 2006). This kind of analysis requires data on several aspects of economic activity: production, sales, employment, research & development, plant and equipment etc., and this information must be available both for the parent firm and for its foreign affiliates.

Finally, another relevant issue is the internationalization of technology: industrial research and development, intangible trade in technology, high technology products, patents, strategic technology alliance between firms,

migration of highly skilled individuals etc., are some of the forms that this kind of internationalization can take. In general, there is a widespread interest on innovation as a fundamental key for facing the global competitiveness challenge (Hughes 2005).

The measurement of these aspects still needs the harmonization of concepts and definitions. For instance, maybe the most used indicators of technology output are patent indicators, often included in national science and technology publications. Nonetheless, it is well known that statistics on patenting are far from being reliable at an international level: a standard method for calculating indicators from patent data is still lacking, and therefore the analysis can give divergent results. The need for standardization is at present particularly important because patenting activity is expanding and therefore the risk of increasing noise and bias becomes higher and higher (OECD, 2004).

4. The Reference Levels of Competitiveness

The multidimensional nature of competitiveness can be described by a series of characteristics (Fanagan *et al.* 2005): first of all, as we have already said, it is *multi-defined* and *multi-measured*. Moreover it is *multi-layered*, because it may be applied to various reference levels, from the firm level to the national one, and *dependent* in the sense that its meaning depends on the objectives of the stakeholders acting in the context of interest. Finally it is *relative*, because it is evaluated by means of a comparison against an ideal situation or a maximum or rivals, *dynamic* (factors influencing competitiveness change with time and context), and it is related to *processes*.

The following systematization attempt is organized on the reference levels.

Many of the quoted definitions in section two refer to the nation (macro-level) and the firm (micro-level). Nonetheless, other intermediate viewpoints can be considered that help in identifying the various dimensions of the phenomenon under discussion.

The most natural concept of competitiveness is at firm level: a competitive firm is the one which is able to remain in business. At firm level, competitiveness is often identified with the classical productivity, profitability and performance measures. Although the basic meaning of these concepts and the relationships among them are still widely discussed by researchers, a simplified view can be proposed.

Productivity is surely one of the most important factors in firm competitiveness and although the many different definitions available can be confusing (see Diewert, Nakamura 2005) it is basically a physical concept, relating output to input by the way of the transformation process.

In the short run profitability – as the ratio between revenue and cost – is often considered as the best indicator of the firm's growth and suc-

cess: financial indicators as ROS (return on sales), ROA (return on assets) and ROE (return on equity) show respectively how much a company earns relative to its sales, its ability to utilize assets and how well the company is doing for the investors. These traditional measures can be of help in controlling direct costs but have been largely criticized (see Tangen 2003, for a review). In any case, they introduce price-factors in the input-output relation.

Performance measurement systems are also a complex issue and introduce a more general framework which integrates productivity and profitability issues with efficiency, effectiveness and adaptability. Therefore in this case, evaluation implies many non-cost factors, such as quality, speed, delivery and, in particular, flexibility which is becoming more and more important as a means to survive in an extremely dynamic environment and the availability of factor endowments is not essential.

Michael Porter is the author who has recently stressed the importance of the micro aspects of competitiveness. He also tried to give a unified framework for this complex issue at the various levels of interest (firm, industry and national) and with the cluster theory also introduced the geographical dimension into the discussion.

The theory introduced by Michael Porter founds competitiveness advantage on strategic choices summarized in his «diamond-model» (Porter 1990). At firm level the foundation of economic development lies not in factor endowments but in four interlinked factors which influence the conditions that impact on the productivity potential: the context for firm strategy, structure and rivalry, demand conditions, related supporting industries and factor input conditions, which are created through strategic choices and not inherited.

These criteria provoke the shift from comparative advantage (where wealth depends on endowments) to competitive advantage, the determinants of which can be summarized in a nation's policy and competition choices. The first one creates the necessary prerequisites for an encouraging and stimulating environment, while the foundations of competitiveness are essentially at microeconomic level. In this framework, economic and social policy are integrated and are highly important for a successful economy. But, in any case, wealth is created at a microeconomic level.

In Porter's theory the diamond schema produces the idea of clusters as «geographically concentrated groups of interconnected firms and associated institutions in a similar field» that create a favorable structure within which firms can operate.

The following are some observations on this approach.

First of all, Porter's theory is characterized by a bottom-up approach that, at the beginning of the nineties, offers a different view of economic development that, at those times, was more often investigated with a top-down view.

Secondly, these two approaches are viewed as complementary and influence each other: in this sense competition is a «unifying theme» (Snowdon, Stonehouse 2006), because Porter states that «you can take the same theory and apply it to nations, regions and cities, provided you make some important adjustments».

Finally, it points out an interesting paradox. Thanks to globalization goods and information can move easily and the importance of distance declines, but at the same time the importance of location is greater than before. Competitive advantages lie in local characteristics that help to gain success in particular fields. Therefore the global strategy, aiming at obtaining cost advantages with delocalization, must be combined with a «clear locational core» (Aisner 1999), defined as critical masses of knowledge, relationships and motivation. In other words, as the Mitchell report (USAID 2003) states, «while the focus is global, the momentum for change must be local».

Porter's contributions have had a great influence on policy makers both in the USA and in Europe and the cluster issue has gained vast success all over the world.

The discussion on clusters introduces a new reference level of competitiveness: the meso-level, which is intermediate between the national and the firm level and that can be referred not only to clusters themselves, but also to other observational units that have been recently rediscovered as a source of competitive advantage and economic organization. The large debate in the literature and the number of publications on the territorial aspects of growth is evidence of the increasing interest in 'regional' (in a wide sense) competitiveness.

In particular, the concept of cluster is not new in the literature (Perroux 1950). It comes from a long tradition of microeconomic studies. Porter's main contribution lies in pointing out clusters as critical for competitiveness and economic development. Industry clusters are a popular concept in industrial economics and in regional development studies since the last century and a wealth of literature is available on the subject (see Bergman, Feser 1999, for a review) where different definitions derive from different theoretical bases and different informational needs.

Particularly important for competitiveness issues are the analysis of industrial districts and regional studies. The Italian school (Becattini 2000), in particular, starting from the Marshallian approach has developed the concept of industrial district («Italianate district») where the firms are interconnected not only by typical firm behaviors but also by a wealth of shared values and knowledge resulting from economic, social, and community relations and producing elements of trust, solidarity, and cooperation that represent a key source of competitiveness. In this context, the concept of social capital has proven to be useful to explain how social values and norms affect economic behavior and impact the planning and the implementation of economic policies.

Another important level of analysis for meso-level competitiveness is the regional one. Many studies are in agreement on the fact that regional competitiveness is an elusive yet key concept (Kitson *et al.* 2004). Also the definition of regional units is not unequivocal, because sometimes it is synonymous with political/administrative areas, sometimes it is seen as clusters of economic activity determined on the basis of economic factors. We will refer to the first concept.

Between micro and macro-levels, regions stuck in the middle (Cellini, Soci 2002), in the sense that they are not like a lower level of a nation, are not like an aggregation of firms.

Storper's (1994) definition of regional competitiveness mentioning «the ability of a region to attract and develop firms with stable or rising market shares in sectors, whilst simultaneously maintaining or increasing the living standards of the population living in that region» is wide-ranging and opens interesting links with attractiveness and with the institutional role of these territorial administrative units. This is one of the cases where competitiveness and attractiveness become confused.

Moreover, the European Commission underlines that the idea of regional competitiveness «needs to capture the notion that, despite the fact that there are strongly competitive and uncompetitive firms in every region, there are common features within a region which affect the competitiveness of all firms located there» (European Commission 1999).

In this process, regional development policies have been originally seen as a means to reduce socioeconomic disparities inside national boundaries, and, more recently, as an active strategy to foster regional innovation, and to transform local competitive advantages into drivers of national economic growth (OECD 2006).

This is the reason why the regional issue is of increasing importance in policy deliberation and action, also in connection to competitiveness measures. In 2003 the Commission of the European Communities devoted a large part of the European Competitiveness Report to the regional aspects of competitiveness. Moreover, the Third Report on Social Cohesion (European Commission 2004a) states: «Strengthening regional competitiveness throughout the Union and helping people fulfill their capabilities will boost the growth potential of the EU economy as a whole to the common benefit of all». Finally, the region is the object of UE structural fund allocation and it is a subject of territorial and industrial policies.

Therefore regions represent an institutional interface both for national and supranational interventions and for local ones. From this perspective the issues of interest are not only the production activities, but also the infrastructural endowment (both material and not), which supports the regional economic dynamic.

Finally, the competitiveness of an economic system at meso-level cannot be properly analyzed without considering a sectoral perspective,

that can give interesting inputs to the study and the understanding of an economy at large analyzing which sectors of industry are most productive, which are growing and which are most successful in international trade, especially when there is a wide variation in productivity performance among them. This is important for a number of reasons (European Commission 2003): to detect which industries show superior performances; to help in understanding the forces underlying competitiveness; to analyze and understand the process of input use and technology adoption, which helps the upsurge of opportunities for new technological applications.

From the brief review presented above it is clear that at meso-level, too, the aspects of interest are not unequivocal because different concepts with different content are used in the various fields of analysis and are often overlapping: cluster, district, region, sector, etc..

When clusters, districts and regions are considered, the territorial dimension becomes the yardstick because in this reference level shared rules, interdependence among social and economic subjects and local policies are appreciated. The role of these events, which are exogenous to the firm, are synthesized in the observed territorial dimension competitiveness, so that these events can be considered as endogenous factors influencing firm behavior.

The macro-level is the most controversial dimension of analysis.

An impressive amount of contributions reporting different definitions and indicators is contrasted by a vast amount of literature showing that competitiveness resists definition and that many indicators are ambiguous (Cellini, Soci 2002).

Krugman's (1996a) position is well known: he states that «a country is not a company», in the sense that they do not compete in the same way: when two companies compete, when the first wins the other looses and goes out of business, while competition between two countries is not a zero-sum game.

Price and profitability indicators, together with trade performances, represent the most common aspects considered in the literature, but recently the evaluation of economic and political context has become relevant.

In particular, in the absence of a general consensus on the different concepts of competitiveness, especially at national level, many empirical contributions start from a simplified definition of competitiveness to specify indicators, compare performances and produce country rankings with a «media approach». Some of these indicators have a vast echo in the press because they seem particularly simple and easy to interpret.

Nonetheless the various definitions and measures of competitiveness at country level may help in understanding the range of aspects that must be considered to evaluate growth, attractiveness, productivity and government policies of a nation.

A different perspective, which intersects with the different reference levels described above, is the longitudinal analysis of business dynamics, the so-called business demography (European Commission 2002), which allows one to grasp the evolution of firms at individual, sectoral or territorial level. Moreover, the evaluation of each different event (firm's birth, persistence, transformation and death) with respect to exogenous factors helps in interpreting competitiveness at the considered level of analysis.

5. The Statistical Perspective

In many different fields of analysis competitiveness evaluation needs data deriving from both administrative (e.g. balance sheets) and statistical (e.g. survey data) sources.

The first problem is, therefore, to assure an adequate quality level for all this data.

From a statistical viewpoint administrative data has a number of specific qualities: the collected information is often very rich, with a broad coverage and, last but not least, is inexpensive because it derives directly from administrative activity. Nevertheless, the production of statistics is a secondary use of administrative data: this means that the measuring procedure is often out of the statistician's control and that administrative concepts are not necessarily in harmony with statistical ones.

A significant example is related to business demography: at present there is no adequate statistical information available to evaluate business creation dynamics; therefore the informative requirement is supported by administrative firm registration systems, which can be of help in individuating enterprise births, transformations and deaths. Nonetheless there are some statistical problems in using this kind of data: first of all registration systems, originated for the fulfillment of a legal obligation, do not contain all the necessary information for monitoring business evolution; secondly, data is not regularly updated and harmonized; finally, there are problems in distinguishing between real births and deaths and other demographic events in the life of a firm (Pilat 2001).

Therefore, the translation from administration to statistics involves several aspects (Statistics Canada 2003), because it is well known that statistical concepts, classification systems, and other statistical aspects must respect a wide range of criteria.

The most important question concerns the classical quality dimensions of statistical data. First of all validity and relevance must be considered. Can administrative data be used for estimating the concepts that are sought for in statistics? Are this data relevant? The next requirement concerns reliability (does the data faithfully reflect reality?) and precision (is data recorded with a degree of precision suited to the needs of the sta-

tistic?). Other aspects of great importance are connected to the temporal dimension – comparability over time (changes in legislation can alter data definition or content) and timeliness of information – and scalability issues (must the results be aggregated in some sense?). Finally, internal comparability is essential to form an integrated system of data.

In this context the role of metadata is essential in facilitating sharing, querying and understanding of the content of statistical information over the lifetime of data (UNECE Secretariat 2000). An important issue in this respect is metadata quality (i.e. the degrees to which metadata serve their purpose). Strategies for the management, control and nurturing of metadata through metadata collection, production, storage and dissemination must be necessarily and properly designed. The standardization of methods will be of great help and the dissemination of «best practices» could contribute to better data quality.

Similar issues apply directly to statistical data. At meso-level, large number of case studies describe clusters, their behavior and their evolution (for a bibliography, see van der Linde 2002; Sölvell *et al.* 2003), but the statistical analysis, although necessary, is still at the beginning and partly hindered by the lack of reliable data (Porter 2003).

Findings from the Cluster Meta-Study (van der Linde 2003) show that the numerous cluster reports suffer from a lack of quantitative data, not standardized methodology, incomplete data sources and methods.

As far as the literature on industrial districts is concerned, the concept of social capital has been often ill-defined and imperfectly measured, despite the immense amount of research on it. Vague conceptual frameworks, multiple definitions, lack of suitable data have negatively influenced both theoretical and empirical research (Sabatini 2006).

Sound statistical data at the regional level is required not only by researchers, but also by policy makers, to measure regional performances and address key factors that can be helpful in improving regional competitiveness. Unfortunately, also in this field of analysis data is seriously limited (Gardiner, 2003) and indicators are often difficult to compare, although supranational organizations and statistical institutes are trying to provide a set of comparable statistics (see, for instance, OECD).

At the same time, the regional level could be the appropriate level of analysis and intervention; for instance, in Italy this is due to the organization of the official data generation process and of the National Statistical System (SISTAN) (Buzzigoli, Martelli 2000).

Finally, although sectoral competitiveness seems rather easy to define and measure (in the sense that the measurements already available at firm level could be extended to this aggregation level), the studies available in the literature often underline the increased need of statistics and the problems that arise in the analysis (Salmi 2005) that are often due to the well known problem of data comparability.

Due to the multidimensional essence of competitiveness, many tentative measurements make use of synthetic indicators which summarize many different qualitative and quantitative aspects in a single statistic.

At country level the World Economic Forum (WEF) and the International Institute of Management Development (IMD) produce annual reports comparing and ranking the competitiveness of nations. Both of them are based on a large set of data – both qualitative and quantitative – which are condensed in a final indicator. The data originates from official statistics and from ad-hoc surveys.

The WEF published its first annual World Competitiveness Report in 1979 and in 1996 the Report's name changed to The Global Competitiveness Report. It reports two kinds of indexes: the Business Competitiveness Index (BCI), also called the Microeconomic Competitiveness Index, and the Growth Competitiveness Index (GCI) (WEF 2006) for a big number of countries (125 developed and emerging economies in the 2006-2007 edition). The basic idea is that the competitiveness of a country is «the collection of factors, policies and institutions which determine the level of productivity of a country».

The GCI is made up of three sub-indices which capture macro-economic stability and quality, the state of government institutions and, finally, the level of innovation. Sub-indexes are built on the basis of «hard data» and «survey data» and the weighting formulas used in the calculation are different for core-innovators countries[5] and all the others, in order to take into account their different levels of development.

Note that the measurement system is an evolving one in the sense that when new important factors emerge that can be of help in estimating competitiveness the index is modified (e.g. public health is one of the primary concerns of business heads in African countries and therefore it has been included in the 2006-2007 index as an important determinant of competitiveness).

The BCI is derived from Porter's theory of competitive advantage and is based on the principle that productivity of a country is ultimately caused by the productivity of its companies and that a sound microeconomic environment is as equally important as the macroeconomic one to give opportunities to business. Therefore the conditions permitting productivity growth must be adequately identified in order to make economic growth easier.

The dimensions of productivity at micro level that are considered for constructing the index are essentially two: company operations and strategy and the quality of the national business environment.

The information used to build the BCI is mainly drawn from a survey involving 7,707 senior business leaders in 101 countries, whose informed

[5] Countries with more than 15 US utility patents registered per million of the population.

judgments are considered of particular importance in analyzing competitiveness, because they reflect the attitudes of decision makers in the economies examined. Other quantitative data (patenting rates, internet penetration etc.) derive from other sources.

Since 1989, IMD indexes published in the World Competitiveness Yearbook, refer to 61 national and regional economies and «rank and analyze the ability of nations to create and maintain an environment in which enterprises can compete».

Also in this case it is assumed that wealth creation originates at firm level, but that the national environment can have an influence on competitive capacities by means of four factors: economic performance, government efficiency, business efficiency and infrastructures. Each factor is composed of sub-factors and each sub-factor depends on a number of criteria, which add up to 312. Criteria are quantified by means of international, national and regional statistical sources (2/3 of data) integrated with an executive survey (1/3 of data) to measure competitiveness as it is perceived by business heads.

As stated above, the rankings made at the national level presented in The Global Competitiveness Report made by the World Economic Forum and in The World Competitiveness Yearbook by the IMD receive great attention in the press. But they also receive much criticism, which usually refers to the arbitrariness of the definition, of the predetermined weighting procedure that produces the final index and the reliability of the data, especially the soft data derived from the executive surveys (see, for instance, Bowen, Moesen 2005; Dubini 2005).

The authors themselves are careful in assessing the quality of survey data for some countries[6] and to underline that analyzing the only number in the rankings is rather limitative[7].

From the statistical point of view these indexes – and other indexes at different reference levels – belong to the vast family of composite indicators and therefore they suffer the well known problems of these kinds of measures. In fact, it is well known that composite indicators are severely criticized by many statisticians, economists and other groups of users (Spaventa 2005).

Recent contributions have properly described characteristics of composite indicators in general, and many observations and remarks can be referred also to competitiveness indicators.

[6] «The quality of survey responses is expected to improve with future educational efforts and improved sampling in these countries. In the meantime, these rankings should be interpreted with caution» (p. 38).

[7] Porter himself states that the BCI «is made of 60 different variables. So with any given country, we can not only look at the overall number but we can actually look at what are the strengths and weaknesses of that particular country and what is holding that country back given the experience in the overall model from the world economy. So we see it as a tool not only just to create a ranking. We can debate whether the ranking is right or not» (Porter 2005).

Table 1. Pros and cons of composite indicators (source: OECD 2005a)

Pros of composite indicators
+ Summarize complex or multi-dimensional issues, in view of supporting decision-makers.
+ Are easier to interpret than trying to find a trend in many separate indicators.
+ Facilitate the task of ranking countries on complex issues in a benchmarking exercise.
+ Assess progress of countries over time on complex issues.
+ Reduce the size of a set of indicators or include more information within the existing size limit.
+ Place issues of countries' performance and progress at the centre of the policy arena.
+ Facilitate communication with ordinary citizens and promote accountability.
Cons of composite indicators
- May send misleading policy messages, if they are poorly constructed or misinterpreted.
- May invite drawing simplistic policy conclusions, if not used in combination with the indicators.
- May lend themselves to instrumental use (e.g. be built to support the desired policy), if the various stages (e.g. selection of indicators, choice of model, weights) are not transparent and based on sound statistical or conceptual principles.
- The selection of indicators and weights could be the target of political challenge.
- May disguise serious failings in some dimensions of the phenomenon, and thus increase the difficulty in identifying the proper remedial action.
- May lead wrong policies, if dimensions of performance that are difficult to measure are ignored.

For comprehensive reviews concerned with the design and statistical techniques involved in building composite indicators see JSRC (2002) and OECD (2005a), while their pros and cons are summarized in table 1.

National statistical agencies and international organizations are trying to define quality profiles for composite indicators in order to guarantee adequate standards of reliability for users. Most of them rely on the traditional dimensions of quality for statistical products (Eurostat 2000), already mentioned at the beginning of this section. In particular, the most recent standards for indicator building stress the importance of both the quality of the data and the quality of the procedures used (OECD, 2005a), where the procedures concern not only the statistical methods used to build the indicators, but also the sequence of operations that guarantee the real usability of the measure.

As far as data quality is concerned, the traditional approach must be appropriately adapted to the particular context of interest. For instance, composite indicators are often based on a large set of different data that are successively synthesized. Therefore, it is of particular importance to refer the various quality dimensions not only to the final result of the synthesis, but also to the basic data that produces it. In this sense, interpretabil-

ity must be guaranteed for each component of the index, while coherence must be considered both in time and in space.

In summary, a proper set of metadata is essential to avoid the risk of lack of transparency and to facilitate users' interpretation. As far as procedures quality is concerned, it can be easily shown that each step of the building process is a contributing factor to the total quality of the indicator and affects one or more of the quality dimensions summarized above. From the definition of the theoretical framework to data selection, from weighting and aggregation to dissemination, all the various operations must be under control to guarantee reliable results.

6. Conclusions

This work started with the question «What is meant by competitiveness?» and the reasoning that has been made during the treatment, although extremely simplified, leads us again to the starting point: despite its popularity competitiveness remains a complex issue to deal with, which has numerous operational definitions with corresponding measurement processes.

At the same time competitiveness analysis has become a prevalent component of national and regional economic development plans and data needs are increasing.

The different perspectives and levels of reference and, consequently, the different measures, lead us to conclude that competitiveness is not univocally definable and measurable, but that the term can be more easily identified when a precise comparison objective is set: in this sense it must always be accompanied by an adjective which helps in identifying an adequate definition and, consequently, a coherent measure.

Moreover, another element which causes uncertainty refers to the etymology of the term, because it can be referred both to conflict and to cooperation.

The choice to consider the various viewpoints (micro-economic, territorial, national etc.) represents an interpretative approach that, although not original nor exhaustive, allowed us to complete the various perspectives with the evaluation of the corresponding measures.

In any case, we would like to stress the fact that the discrepancies both at theoretical and at empirical level seem to be really insurmountable, at least at the moment. This is particularly true when we focus on levels of analysis which involve complex social and territorial environments, like regions or nations. This is an interesting challenge for statisticians, who are required with better and comparable data and operative solutions.

As we have seen there are still many problems in the production of reliable statistics on the economic aspects of globalization and competitiveness: the conceptual framework has been developed thanks to the efforts of national statistical offices and international organizations, but it will take

a long time before all the developed countries will be able to produce the recommended indicators.

Competitiveness is multifaceted and not easily measurable by a single indicator; moreover, the numerous indicators that have been proposed in the literature, ordinarily presented in national and sopra-national reports and often released by mass-media and newspapers are able to point out only partial aspects and often hide defects of various kind. A possible (although not exhaustive) conclusion is that competitiveness at the different levels of analysis could be considered as a latent variable, the dimensions of which could be specified by a measurement model together with a behavioral one.

Finally, to further substantiate these results, a closer examination of some significant issues that recently emerged in the economic and empirical debate is desirable: the factor endowment (as far as energetic sources are concerned) is going to renew its qualifying role in international competitiveness, and contents and behaviors concerning sustainable development are more and more relevant. Business demography can also evidentiate the dynamics that may be of help in detecting competitive factors. Last but not least, it is dangerous to consider competitiveness as a sort of race which necessarily produces winners and losers: from this point of view the trade-off between competition and cooperation becomes even more topical.

References

Aisner J. 1999, *Porter's perspective: Competing in the Global Economy*, Faculty Q&A, Harvard Business School.

Balassa B. 1965, *Trade Liberalization and 'Revealed' Comparative Advantage*, «Manchester School», 33: 99-123.

Becattini G. 2000, *Distretti industriali e sviluppo locale*, Bollati Boringhieri, Torino.

Bergman E.M., Feser E.J. 1999, *Web Book in Regional Science*, Regional Research Institute, West Virginia University, available at <www.rri.wvu.edu/WebBook/Bergman-Feser/contents.htm>.

Biggeri L., Bini M. 2006, *Competitiveness Analysis of the Italian Manufacturing Firms: a Multilevel Longitudinal Approach*, Paper presented at the 2006 JSM (Seattle, August 6-10 2006).

Bowen H.P., Moesen W. 2005, *Benchmarking the competitiveness of Nations: Non-Uniform Weighting and Non-Economic Dimensions*, Working Paper Series 2005/2, Vlerick Leuven Gent Management School.

Buckley P.J., Pass C.L., Prescott K. 1988, *Measures of international competitiveness: a critical survey*, «Journal of Marketing Management», 4, 2: 175-200.

Buzzigoli L., Martelli C. 2000, *Le regioni come nodo di linkage di archivi amministrativi: limiti e potenzialità di un nuovo ruolo per la gestione di fonti statistiche*, in: Gori E., Giovannini E. e Batic N. (a cura di), *Verso i censimenti del 2000*, Forum Editrice, Udine: II, 213-222.

Cellini R., Soci A. 2002, *Pop competitiveness*, «BNL Quarterly Review», 220, March 2002.

Cœuré B., Rabaud I. 2003, *Attractivité de la France: analyse, perception et mesure*, «Economies et Statistique», 363-364-365: 97-120.

Competitiveness Advisory Group [Ciampi Group] 1995, *Enhancing European competitiveness. First report to the President of the Commission, the Prime Ministers and the Heads of State*, June 1995.

Department of Trade and Industry 1994, *Competitiveness. White Paper*, CM 2563, HMSO, London.

Dicken P. 2003, *Global Shift: Reshaping the Global Economic Map in the 21st Century*, Sage, London.

Diewert W.E., Nakamura A.O. 2005, *Concepts and Measures of Productivity: An Introduction*, in Lipsey R.G. and Nakamura A.O. (eds.), *Services Industries and the Knowledge Based Economy*, University of Calgary Press.

Dubini P. 2005, *Misurare la competitività dei sistemi paese: il modello del World Economic Forum*, «Economia e Management», 6.

European Commission 1999, *Sixth Periodic Report on the Social and Economic Situation and Development of Regions in the European Union*, CX-21-99-472-EN-C, Brussels.

European Commission 2002, *Business demography in Europe*, Observatory of European SMEs, 5, Office for Official Publications of the European Communities, Luxembourg.

European Commission 2003, *EU productivity and competitiveness: An industry perspective*, Office for Official Publications of the European Communities, Luxembourg.

European Commission 2004a, *A new partnership for cohesion - convergence competitiveness cooperation. Third report on economic and social cohesion*., Office for Official Publications of the European Communities, Luxembourg.

European Commission 2004b, *European Competitiveness Report*, Office for Official Publications of the European Communities, Luxembourg.

European Commission 2005, *EU Sectoral Competitiveness Indicators*, Office for Official Publications of the European Communities, Luxembourg.

Eurostat 2000, *Assessment of the quality in statistics*, Doc.Eurostat/A4/Quality/00/General/Standard report.

Eurostat 2003, *Business Register Recommendations Manual. Glossary*, Joint UNECE/Eurostat Seminar on Business Registers (Luxembourg, 25-26 June).

Feenstra R.C. 1998, *Integration of Trade and Disintegration of Production in the Global Economy*, «Journal of Economic Perspectives», 12, 4: 31-50.

Feurer R., Chaharbaghi K. 1994, *Defining competitiveness: a holistic approach*, «Management Decision», 32, 2: 49-58.

Flanagan R., Jewell C., Ericsson S., Henricsson P. 2005, *Measuring construction competitiveness in selected countries. Final report*, The Research Team at the University of Reading.

Fröbel F., Heinrichs J., Kreye O. 1980, *The New International Division of Labor*, Cambridge University Press, Cambridge.

Gardiner B. 2003, *Regional Competitiveness Indicators for Europe - Audit, Database Construction and Analysis*, Regional Studies Association International Conference (Pisa, 12-15 April 2003).

Garofalo G., Morganti E., Passerini P. 2002, *La produzione di statistiche sui gruppi multinazionali nell'ambito di un sistema di misure per l'analisi della globalizzazione*, Sesta Conferenza Nazionale di Statistica (Roma, 6-8 novembre 2002).

Gereffi G. 2005, *The Global Economy: Organization, Governance and Development*, in Smelser N.J. and Swedberg R. (eds.), *The Handbook of Economic Sociology*, Princeton University Press and Russel Sage Foundation: 160-182.

Hughes K. 2005, *Facing the Global Competitiveness Challenge*, «Issues in Science and Technology», National Academy of Science.

IMD 2003, *The World Competitiveness Report*, Lausanne, Switzerland.

IMD 2006, *The World Competitiveness Report*, Lausanne, Switzerland.

IMF 2003, *Foreign Direct Investment Trends and Statistics*, IMF Statistics Department.

IMF, OECD 2003, *Foreign direct investments. How countries measures FDI*, International Monetary Fund, Washington, D.C..

ITC 2005, *Reliability of trade statistics. Explanatory notes, 2003 data*, Market Analysis Section.

JSRC 2002, *State-of-the-art Report on Current Methodologies and Practices for Composite Indicator Development*, Ispra, EUR 20408/EN.

Kitson M., Martin R., Tyler P. 2004, *Regional Competitiveness: An Elusive yet Key Concept?*, «Regional Studies», 38, 9: 991-999.

Krieger J. 2001, *The Oxford Companion to Politics of the World*, Oxford University Press, New York.

Krugman P. 1996a, *A country is not a Company*, «Harvard Business Review», January-February 1996.

Krugman P. 1996b, *Pop Internationalism*, The MIT Press, Cambridge, Massachusetts.

Leamer E.E. 1984, *Sources of International Comparative Advantage*, The MIT Press, Cambridge.

Lipsey R.E. 2006, *Measuring Foreign Direct Investment*, Paper presented at the 29th General Conference of the International Association for Research in Income and Wealth (Joensuu, Finland, 20-26 August 2006).

Merriam-Webster's Collegiate Dictionary 2003, Eleventh edition, Merriam Webster, Springfield, Massachusetts, U.S.A..

Mikic M. 2005, *Commonly used trade indicators: a note*, ARTNeT Capacity Building Workshop on Trade Research (Bangkok, Thailand, 22-25 March 2005).

National Competitiveness Council 2005, *Annual Competitiveness Report*, Forfàs, Dublin.

OECD 1996, *Industrial Competitiveness: Benchmarking Business Environments in the Global Economy*, OECD, Paris.

OECD 1999, *OECD Benchmark definition of Foreign direct investment. Third Edition*, OECD Publishing, Paris.

OECD 2002, *OECD Economic Outlook*, No.71, Chapter 6.
OECD 2003, *OECD's efforts to measure the activities of multinational enterprises*, CES/2003/15, CES Plenary Session (Geneva, 10-12 June).
OECD 2004, *Compendium for patent indicators*, OECD Publishing, Paris.
OECD 2005a, *Handbook on Constructing Composite Indicators: Methodology and User Guide*, OECD Statistical Working Paper, STD/DOC(2005)3.
OECD 2005b, *Handbook on Economic Globalization Indicators*, OECD Publishing, Paris.
OECD 2006, *Report into Newcastle and the North East's Regional Economic Prospects*, OECD Publishing, Paris..
Perroux F. 1950, *Economic space: theory and applications*, «Quarterly Journal of Economics», 64: 89-104.
Pilat D. 2001, *Understanding firm dynamics: A progress report on work at the OECD*, 15th International Roundtable on Business Survey Frames (Washington, D.C., October 22 – 26, 2001).
Porter M.E. 1990, *The Competitive Advantage of Nations*, The Free Press, New York.
Porter M.E. 2003, *Building the Microeconomic Foundations of Prosperity: Findings from the Business Competitiveness Index*, in *The Global Competitiveness Report 2003-2004*, Palgrave Macmillan, World Economic Forum, New York.
Porter M.E. 2005, *The Business Competitiveness Index*, Interview with M.E. Porter, World Economic Forum, available at <www.weforum.org/en/initiatives/gcp/GCR20052006VideoInterviews/index.htm>
President's Commission on Industrial Competitiveness (1985), *Global Competition : The New Reality*, U.S. Government Printing Office, Washington D.C..
Sabatini F. 2006, *The Empirics of Social Capital and Economic Development: A Critical Perspective*, FEEM Working Paper 15.06, Eni Enrico Mattei Foundation, Milan.
Salmi H. 2005, *Measurement of Competitiveness as the Basis for Policy Development*, Conference on Knowledge Economy – Challenges for Measurement (Luxembourg, 8-9 December 2005).
Scott, B. R., Lodge G.C. (eds.) 1984, *US Competitiveness in the World Economy*, Harvard Business School Press.
Select Committee of the House of Lords 1985, *Report of the Select Committee of the House of Lords on Overseas Trade*, London.
Snowdon B., Stonehouse G. 2006, *Competitiveness in a globalised world: Michael Porter on the microeconomic foundations of the competitiveness of nations, regions and firms*, «Journal of International Business Studies», 37: 163-175.
Sölvell Ö., Lindqvist G., Ketels C. 2003, *The Cluster Initiative Greenbook*, Bromma tryck AB, Stockholm.
Spaventa A. 2005, *Cosa si nasconde dietro le classifiche della competitività*, «ASTRID – Rassegna», 17.
Statistics Canada 2003, *Statistics Canada Quality Guidelines*, Catalogue no. 12-539-XIE, Minister of Industry, Ottawa.

Storper M. 1994, *Institutions in a learning economy*, Paper presented to OECD conference on employment and growth in a knowledge based economy, (Copenhagen, November 1994).

Tangen S. 2003, *An Overview of Frequently Used Performance Measures*, Work Study, 52, 7:347-354.

UN 2002, *Manual on Statistics on International Trade in Services*, Department of Economics and Social Affairs – Statistics Division, Statistical Papers, Series M, No. 86.

UNECE Secretariat 2000, *Report of the September 1999 Work Session on Statistical Metadata*, Statistical Commission and Economic Commission for Europe Conference of European Statisticians, 48th Plenary Session (Paris, June 13-15, 2000).

USAID 2003, *Promoting Competitiveness in Practice. An Assessment of Cluster-Based Approaches*, The Mitchell Group Inc., Washington D.C..

van der Linde C. 2002, *The Cluster Meta-Study. List of Clusters and Bibliography*, available at <http://data.isc.hbs.edu/cp/index.jsp>.

van der Linde C. 2003, *The demography of clusters – Findings from the cluster Meta-Study*, in Brocker J., Dohse D. and Soltwedel R. (eds.), *Innovation, Clusters and Interregional Competition*, Springer-Verlag.

World Economic Forum 1996, *The Global Competitiveness Report*, Palgrave Macmillan, World Economic Forum, New York.

World Economic Forum 2006, *The Global Competitiveness Report*, Palgrave Macmillan, World Economic Forum, New York.

L. Grassini
G. Marliani[1]

Italian Labour Productivity Changes: An Analysis of Firm Survey Data 1998-2004

1. Introduction

The Italian economy is going through a critical period. There is a common worry in the analysts' comments: Italy seems to have difficulty in keeping up with competitors, mainly because the productivity of the Italian economic system (particularly labour productivity) does not increase.

The leading official Italian analysts point out, as possible causes of those difficulties, some structural changes in the last years:

- Progressive tertiarisation of the economy (common to all advanced countries) and consequent labour reallocation towards sectors (services) with a lower productivity level or lower productivity growth rates; the idea of a *structural burden* linked to tertiarisation on aggregate productivity performance is known in literature as the Baumol effect (Baumol 1967; Baumol *et al.*, 1985);
- Persistent specialisation of the Italian firms in traditional manufacture activities of *made-in-Italy* (home and household products, light mechanics), which generally have lower productivity than high-tech sectors; in the last ten years, the sectors of made in Italy cover more than 60% of the Italian manufacturing value added and more than 70% of total manufacturing employment (National Account data);
- Reduced size of the Italian firms (the mean size of manufacturing firms was 8.7 workers in 2003, *vs* 9.5 in 1991); while until the 80's the key fac-

[1] Department of Statistics, University of Florence.

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online), © 2009 Firenze University Press

tor in the Italian performance was attributed to this characteristic of the productive system (*small is beautiful* was the slogan of economists at that time), now the small size of firms is considered one of the main problems in the global competitive scenario (small firms have generally a lower asset level and consequently a lower labour productivity than large ones)

What is the impact of such structural changes on macro-economic performance? This paper intends to answer the question by analysing the dynamics of the aggregate Italian labour productivity, and evaluating the impact that changes in the employment structure, in terms of economic activities and firm size, have had on this dynamics.

To this purpose, the structural decomposition analysis (shift and share), commonly used in the literature (see the recent contributions by Fagerberg 2000; Timmer, Szirmai, 2000; Peneder 2003; Savona 2004), is applied. To isolate the effect of structural changes in terms of labour reallocation among firms of different sizes within a sector, a minor modification of the usual decomposition is proposed.

The analysis is performed on 1998-2004 Structural Business Statistics data, collected by Istat, according to Eurostat regulations, on a large sample of Italian firms.

2. Decomposition of Aggregate Labour Productivity: Methodology

Shift-share analysis provides a convenient means of investigating how economic sectors contribute to the aggregate productivity change.

By considering one measure of output, let us say value added, and one measure of input, let us say total employment, in the economic sector i and firm size class (number of workers) j, we performed a two levels decomposition of labour productivity change.

The traditional decomposition of aggregate labour productivity change with respect to the economic sectors (first level decomposition) is:

$$(1)\quad p_{..t} - p_{..0} = \underset{(C1)}{\Sigma_i (p_{i\cdot t} - p_{i\cdot 0})\, s_{i\cdot 0}} + \underset{(C2)}{\Sigma_i p_{i\cdot 0}\, (s_{i\cdot t} - s_{i\cdot 0})} + \underset{(C3)}{\Sigma_i (p_{i\cdot t} - p_{i\cdot 0})\, (s_{i\cdot t} - s_{i\cdot 0})}$$

where:

$s_{i\cdot 0}, s_{i\cdot t}$ are the share of employment in sector i, at time 0 and t,
$p_{i\cdot 0}, p_{i\cdot t}$ are the labor productivity in sector i, at time 0 and t,
$p_{..0}, p_{..t}$ are the labor productivity in the whole economy, at time 0 and t.

The first term (labelled *C1*), called also the *within effect*, captures the change in aggregate labour productivity due to changes occurred in each sector, that is the change in aggregate labour productivity under the as-

sumption that each sector maintains at time t the same share of employment of time 0.

The second term (labelled *C2*), called also the *static (structural) shift effect*, represents the contribution to the aggregate labour productivity change due to the change in the allocation of employment among sectors.

The third term (labelled *C3*) expresses the so-called *dynamic shift effect* that accounts for a simultaneous variation of labour productivity and share of employment in each sector.

The interpretation of these three components given in the literature is the following.

Components *C2* and *C3* capture the effects of structural changes. Specifically, *C2* is positive (negative) if, between time *0* and *t*, increasing (decreasing) in the employment shares of sectors with higher labour productivity in the base year prevail. *C3* is positive if, between time *0* and *t*, employment share increases (decreases) in those sectors that exhibit an increasing (decreasing) productivity.

Components *C2* and *C3* are generally used to assess the so called *structural bonus* and *structural burden* hypotheses.

The *structural bonus* hypothesis (Timmer, Szirmai 2000) postulates a positive relationship between structural change and economic growth under the assumption that economies upgrade from activities with relatively low productivity levels to industries with a higher productivity value. The structural bonus hypothesis, thus, corresponds to an expected positive contribution of the *C2* component.

The *structural burden* hypothesis (Baumol 1967; Baumol *et al*., 1985) states that industries producing personal, social and public services cannot compensate for the rise in wage levels (determined by the industries with higher productivity), because of their limited potential to increase labour productivity through technological progress. The specific hypothesis with respect to Baumol's assumption is that, with the development of the service sectors, labour resources gradually shift from dynamic industries with high productivity growth towards industries characterised by lower rates of productivity growth. Hence, the structural burden hypothesis corresponds to an expected negative sign of *C3.*

The *within* component *(C1)* should be essentially related to technological changes that occurred in each sector, and it is positive when sectors with a productivity growth prevail.

Most of the empirical studies tend to emphasize the contribution of the within effect, that should capture the pure productivity change, after having removed the structural change effects.

This interpretation of *C1* is open to a well known criticism (Verdoorn 1949) connected with the fact that shift and share analysis neglects the effect of increasing returns to scale: if returns to scale differ across sectors, the effects of structural change on productivity growth are bigger than those

indicated by the conventional shift-share analysis (i.e. under-evaluation of the structural effect).

But another caveat must be considered in the interpretation of the within effect: a positive relationship between productivity level and firm size is usually observed particularly in the manufacturing activities (larger manufacturing firms have generally a higher asset level and consequently a higher labour productivity); hence, the effect of structural changes within a sector (shift of employment from smaller to larger firms) should be removed from the within component, in order to evaluate the actual technological effects.

If data classified by firm-size class are available, it is possible to deepen the investigation of the *within effect (C1)* through a second level decomposition, as described in the following formula:

$$(2) \quad (p_{i\cdot t} - p_{i\cdot 0}) = \Sigma_j (p_{ijt} - p_{ij0})\, s_{ij0} + \Sigma_j p_{ij0} (s_{ijt} - s_{ij0}) + \Sigma_j (p_{ijt} - p_{ij0})(s_{ijt} - s_{ij0})$$

where

s_{ij0}, s_{ijt} are the employment share in the *j-th* size class within sector *i*, at time *0* and *t*,

p_{ij0}, p_{ijt} are the labour productivity in the *j-th* size class within sector *i*, at time *0* and *t*.

By inserting (2) into the *C1* component of expression (1), we obtain a decomposition of aggregate labour productivity into 5 components, as summarised in the following table.

Table 1. Decomposition of aggregate labour productivity

Component n.	Label in (1)	Label in (2)	Formula
1	-	*W1*	$\Sigma_i s_{i\cdot 0} \Sigma_j (p_{ijt} - p_{ij0})\, s_{ij0}$
2	-	*W2*	$\Sigma_i s_{i\cdot 0} \Sigma_j p_{ij0} (s_{ijt} - s_{ij0})$
3	-	*W3*	$\Sigma_i s_{i\cdot 0} \Sigma_j (p_{ijt} - p_{ij0})(s_{ijt} - s_{ij0})$
1+2+3	*C1*	*W1+ W2+ W3*	$\Sigma_i (p_{i\cdot t} - p_{i\cdot 0})\, s_{i\cdot 0}$
4	*C2*	-	$\Sigma_i p_{i\cdot 0} (s_{i\cdot t} - s_{i\cdot 0})$
5	*C3*	-	$\Sigma_i (p_{i\cdot t} - p_{i\cdot 0})(s_{i\cdot t} - s_{i\cdot 0})$

The components *W1*, *W2*, *W3* are analogous to *C1*, *C2*, *C3* but are referred to change within sectors:

- *W1* measures the productivity changes generated in the system through productivity changes *within* the size classes of each sector;
- *W2* is determined by a change in the employment structure *across* the size classes *within* each sector;

- *W3* accounts for the simultaneous changes in productivity and employment share of each size class *within* each sector.

As for the interpretation: *W1* should be more suitable for capturing actual technological change, while *W2* and *W3* account for structural changes that have occurred across firms of different size in the same sector.

3. Labour Productivity Measure and Data Used

Labour productivity is commonly defined as a ratio of a volume measure of output to a volume measure of labour input and the traditional source for labour productivity computation at industry-level is National Account (NA) data.

Survey data collected by Istat to provide Eurostat with the Structural Business Statistics (SBS) constitutes a valuable alternative to NA data. SBS data is collected from a large sample of Italian firms (about 55000), refers to a rich set of variables, and covers almost all market activities (financial services are excluded).

From this data, it is possible to compute labour productivity measures by the 40 economic activities indicated in table 2 (NACE group 2-digit level) broken down in 4 size classes in terms of number of people employed: 1-9, 10-19, 20-49, 50 and over[2].

The productivity measure considered in the analysis is «value added (factor cost)/total employment».

Value added (instead of gross output) was chosen as a measure of output because it is considered more suitable in the analysis of industry contribution to economy-wide labour productivity and economic growth (OECD, 2001).

Total employment was preferred to the number of worked hours, because the number of hours data: (i) is less reliable; (ii) refers only to dependent workers (a considerable limitation for the Italian system where a relevant share of employment is allocated in one self-employed person firms).

SBS data has been available since 1995, but the Italian data set is more complete and comparable beginning in 1998. Therefore, the empirical

[2] As far as the firm size-classes is concerned, SBS data referred to the whole economy is published at a more detailed level. But, in some years and for some sectors (not ever the same in the different years) data is released at a more aggregated firm size classification, due to privacy protection policy. Hence, in order to perform an analysis that covers the maximum number of years and maintains the maximum detail in the classification of the activities, it is necessary to aggregate the firm size classes. The classification here adopted (1-9, 10-19, 20-49, 50 and over) does not allow for information on the large enterprise performance but it is suitable for the analysis of Italian economy, given the characteristics of the productivity system (at the 2001 census, 99.4% of firms and 67.3% of total employment was allocated in the «under 50» classes)

Table 2. Sectoral detailed classification (NACE Rev. 1.1)

Code	Division (codes and description)
C	10-14 - Mining and quarrying
DA	15-16 - Food, beverages and tobacco
DB	17 - Textiles
DB	18 - Manufacture of wearing apparel; dressing and dyeing of fur
DC	19 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
DD	20 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
DE	21 - Manufacture of paper and paper products
DE	22 - Publishing, printing and reproduction of recorded media
DF	23 - Manufacture of coke, refined petroleum products and nuclear fuel
DG	24 - Manufacture of chemicals and chemical products
DH	25 - Manufacture of rubber and plastics products
DI	26 - Manufacture of other non-metallic mineral products
DJ	27 - Manufacture of basic metals
DJ	28 - Manufacture of fabricated metal products, except machinery and equipment
DK	29 - Manufacture of machinery and equipment n.e.c.
DL	30 - Manufacture of office, accounting and computing machinery
DL	31 - Manufacture of electrical machinery and apparatus n.e.c.
DL	32 - Manufacture of radio, television and communication equipment and apparatus
DL	33 - Manufacture of medical, precision and optical instruments, watches and clocks
DM	34 - Manufacture of motor vehicles, trailers and semi-trailers
DM	35 - Manufacture of other transport equipment
DN	36 - Manufacture of furniture; manufacturing n.e.c.
DN	37 - Recycling
E	40 - Electricity, gas, steam and hot water supply
E	41 - Collection, purification and distribution of water
F	45 - Construction
G	50 - Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
G	51 - Wholesale trade and commission trade, except of motor vehicles and motorcycles
G	52 - Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
H	55 - Hotels and restaurants
I	60 - Land transport; transport via pipelines
I	61 - Trasporti marittimi e per vie d'acqua
I	62 - Water transport
I	63 - Supporting and auxiliary transport activities; activities of travel agencies
I	64 - Post and telecommunications
K	70 - Real estate activities
K	71 - Renting of machinery and equipment without operator and of personal and household goods
K	72 - Computer and related activities
K	73 - Research and development
K	74 - Other business activities

analysis focused on the period 1998-2004. SBS value added data was converted to 2000 constant prices, by using the corresponding NA sector deflators.

The decomposition analysis described in the previous section was performed at the most detailed classification of economic activity (40 sectors). However, for the sake of simplicity, results are sometimes presented in the following at a more aggregated level. This aggregated classification (detailed in table 3) is a mix of the ones proposed by OECD for the industrial sectors and by Miles (Miles *et al.* 1995) for the service sectors. Industrial sectors are grouped into four classes according to the different levels of technology that presumably characterises the production process (high, medium-high, medium-low, low tech). Service sectors are grouped into two classes: traditional services and knowledge intensive business services (Kibs)[3].

Table 3. Classification into macro-sectors

	Macro sector	Sections or divisions included
Industry(*)	High tech	30, 32, 33
	Medium-high-tech	24, 29, 31 34, 35
	Medium-low-tech	23, 25, 26, 27, 28
	Low-tech	15, 16, 17, 18, 19, 20, 21, 22, 36, 37
	Construction	Construction
	Other industries	C, 40, 41
Services(**)	Traditional services	50-71
	Kibs (Knowledge intensive business services)	72, 73, 74

In summary, the main advantage of SBS *vs* NA data lies in the fact that the first is a source for both input and output data. SBS date also offer greater industry detail than those used and published by the NA; furthermore, they allow to classify a firm's size in terms of number of people employed.

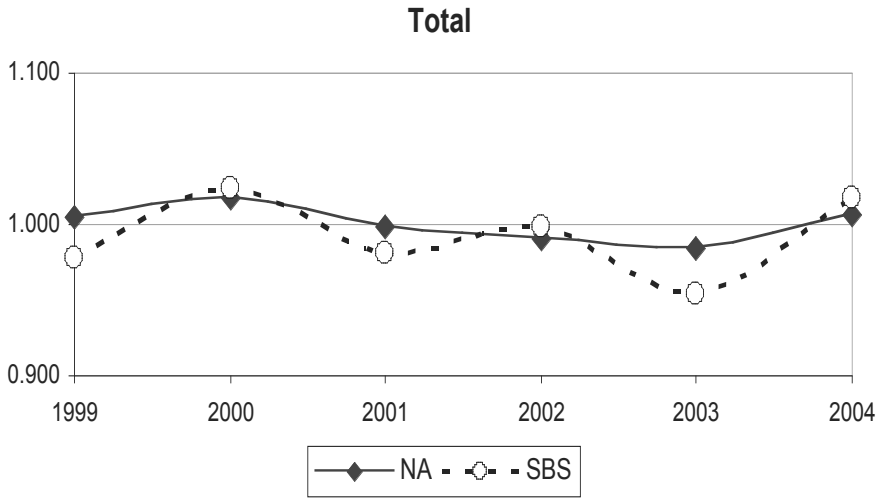
With respect to NA data, however, they suffer from two limitations: (i) unobserved economy is not considered; (ii) the labour volume is expressed in terms of number of employed persons (head counts).

[3] Kibs are services and business operations heavily reliant on professional knowledge. They are mainly concerned with providing knowledge-intensive support for the business processes of other organizations.

These limitations are particularly relevant for Italy: in fact, the contribution of unobserved economy is estimated to be about 16% of the Italian GDP; moreover, the policies recently adopted to increase labour flexibility (part-time, short term contract, etc.) make the head-count a less reliable measure of the labour volume, while the number of full-time equivalent persons (SLU: Standard Labour Unit), generally used in NA data, would be preferable.

The comparison between the labour productivity measures obtained with the two sources («value added adjusted for unobserved economy/ SLU number» for NA, and «value added/total employment» for SBS) in the period 1998-2004 shows that the SBS measure lies systematically below the corresponding NA measure (as expected because unobserved economy is not taken into account).

Figure 1. Labour productivity (value added/employment) from NA and SBS – Ratio between t and t-1 year values*



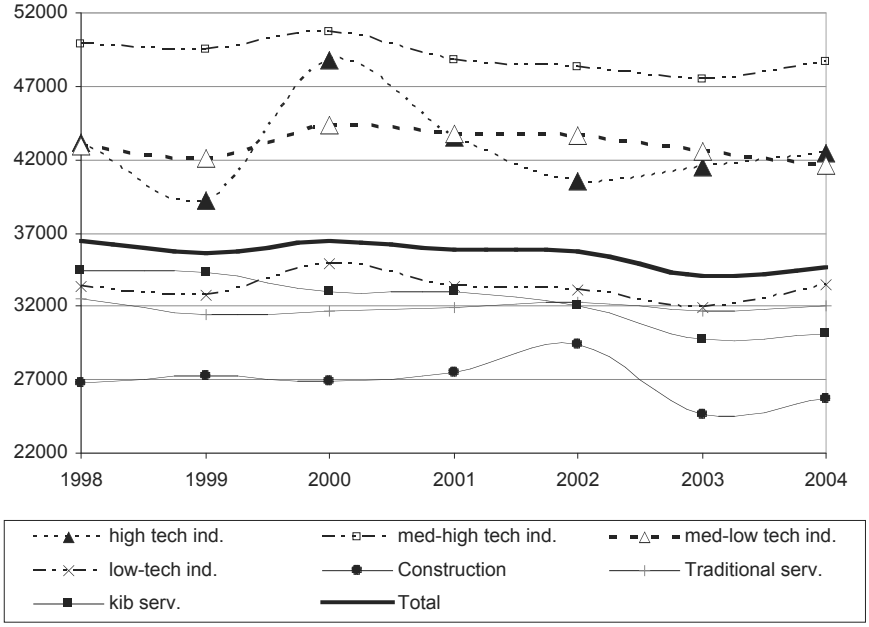
Nevertheless, the time pattern is substantially the same (as can be seen in figure 1) even if the SBS series exhibit a relatively greater variability (presumably due to the sample variability of SBS source, on the one hand, and from the adjustment procedures adopted in NA for fulfilling accounting constraints, on the other hand). Hence, the SBS data seems to be a suitable source to analyse labour productivity dynamics.

4. Labour Productivity Changes from 1998 to 2004

In this section, the 1998-2004 pattern of labour productivity by economic sector and dimension of enterprise is presented.

Labour productivity measured by SBS data for the macro-sectors of table 3 is reported in figure 2.

Figure 2. Labour productivity (VA/Employment): 1998-2004



(Value added at factor cost; 2000 constant prices)

Summarized below are the main comments regarding fig. 2.

- Aggregate (whole economy) labour productivity decreases over the whole time period; the same trend is shared by all sectors, even if with some fluctuations.
- As expected, different sectors exhibit different levels of labour productivity: manufacturing industries have a productivity greater than the average, with the exception of low tech; services sectors have lower productivity.
- Kibs labour productivity stays above the traditional services until 2000 and then decreases there after.
- The highest productivity levels occur in the medium-high tech sectors (chemical products, machinery, electrical apparatus, motor vehicles) characterised by the presence of large enterprises.

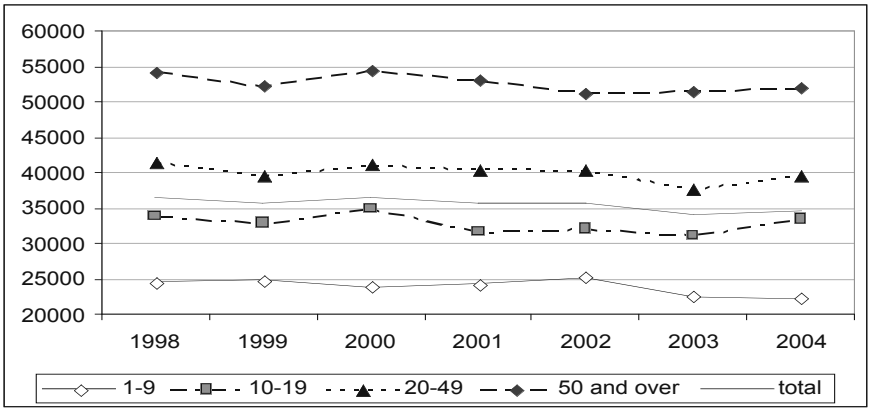
This last observation points out the interaction between sectoral and dimensional classification.

Labour productivity measured by SBS data in the four size-classes of the firms is reported in figure 3.

As expected, labour productivity levels differ according to the dimension of the firm. The ranking of productivity levels exactly coincides with the firm size classes ranking and the differences among levels are relevant and stable over the whole time period.

All the size classes exhibit a slight decrease, relatively more pronounced for the smallest class.

Figure 3. Labour productivity (VA/Employment) by firm size: 1998-2004



(Value added at factor cost; 2000 constant prices)

5. Employment Reallocation Process from 1998 to 2004

In this section we draw a synthetic picture of the employment reallocation process that occurred in the considered period across economic sectors and across different firm-size classes.

A relevant change in labour allocation across sectors occurred, mainly between manufacturing and service sectors. The share of total employment passes from 37.3% to 31.8%, in the manufacturing sectors, and from 50.8% to 55.2%, in the service sectors (figure 4).

A weak labour reallocation process occurred across manufacturing sectors as well (figure 5): the weight of low tech sectors decreases, while the weight of medium-low tech sectors increases.

The labour reallocation is more pronounced across service sectors (figure 6): the employment share of Kibs sectors increases and consequently the corresponding share of traditional services decreases.

The shares of total employment in the different firm-size classes are reported in figure 7.

Figure 4. Percentage of total employment (100=whole economy)

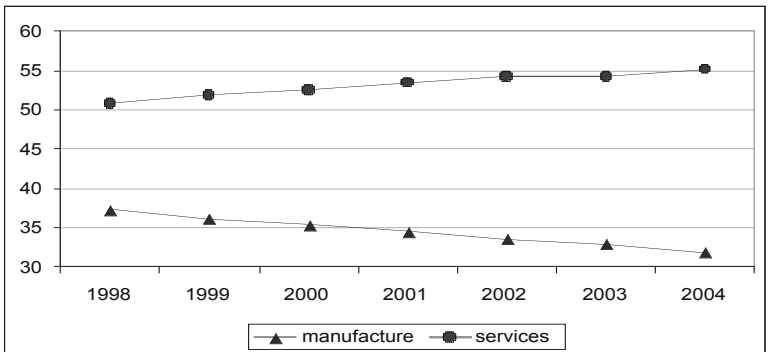


Figure 5. Percentage of total employment (100=whole manufacturing sectors)

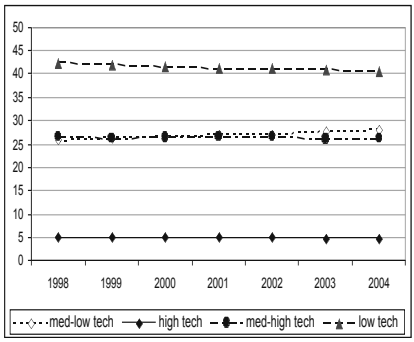


Figure 6. Percentage of total employment (100=whole service sectors)

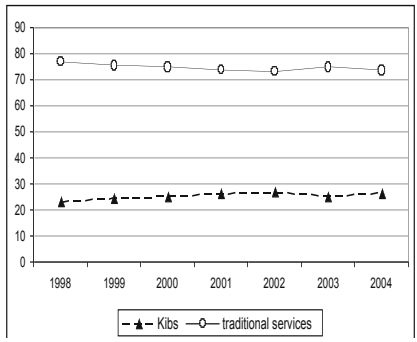
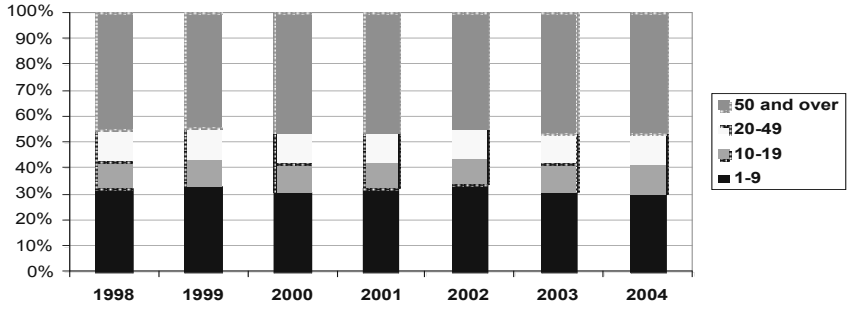


Figure 7. Percentage of total employment by size class (100=whole economy)



In opposition to what occurred across economic sectors, there are not relevant changes in the composition of total employment by firm size class. The relatively higher modification occurred in the class «50 and over», which passes from 30.4 to 31.2%.

6. Decomposition of Aggregate Labour Productivity Change

In summary, data presented in the previous sections confirms that relevant structural changes occurred in the Italian economic system over the period 1998-2004. The question is, "what has been the role of such structural changes in determining the aggregate negative labour productivity performance observed for the whole system?" A possible answer to this question can be given using the shift and share decomposition performed on the detailed classification described in table 2.

6.1 First Level Decomposition

The results of the first level decomposition described in section 3 are reported in table 8.

From table 8 we can argue that, on the short term (comparison between years t and t-1), the within component is the major factor responsible for the results, as stated in most of the empirical studies in the literature. In fact, it covers a large part of the yearly aggregate productivity change, both in the case of productivity growth and in the case of productivity decrease, with the exception of the period 2001-2002, when the structural effect prevails.

In all situations, the structural component is negative, denoting a loss (gain) of employment share in those branches with a higher (lower) productivity at the base year. The dynamic term is negative as well, even if almost negligible.

Table 8. First level decomposition (Euro at 2000 constant prices)

Period	Within	Static (structural)	Dynamic	Total
1998-1999	-658	-162	-17	-837
1999-2000	986	-99	-27	860
2000-2001	-424	-252	-14	-690
2001-2002	152	-228	1	-75
2002-2003	-1303	-275	-64	-1641
2003-2004	742	-154	-11	576
1998-2004	-260	-1011	-535	-1806

As expected, the structural effect increases its importance if we consider the whole period (1998-2004). The aggregate productivity decreases 1806 € *per capita* (from 36495 to 34689), and the structural component is the main factor responsible for this decrease, followed by the dynamic component. The negative sign of these two components confirms the presence in Italy of the so called *structural burden*, that is a labour reallocation that disadvantaged branches with higher productivity levels (structural component) and faster growth rates (dynamic component). A result that may be linked with the growth of the employment share of service sectors.

The aggregate figure in table 8 is a result of different compensating mechanisms operating in terms of both labour reallocation and productivity changes across sectors. Hence an analysis of the contribution of each sector is important in understanding the aggregate performance.

Table 9 presents the results of the decomposition performed in the detailed classification of table 2 and subsequently aggregated into the macro-sectors of table 3 [4].

Table 9. Contribution of the sectors to the first level decomposition

	1998-2004			
Sector	Within	Static (structural)	Dynamic	Total
high tech	-9	-163	25	-148
med-high tech	-112	-779	14	-877
med-low tech	-27	-390	2	-415
Low tech	-58	-892	16	-934
Total manufacture	-207	-2.225	57	-2.374
Other industries	267	-539	-45	-317
Construction	-116	396	-16	264
Traditional services	277	-34	-357	-114
Kibs	-482	1.390	-173	735
Total services	-205	1.356	-531	621
TOTAL	-260	-1.011	-535	-1.806

It immediately emerges from the data that the decrease of aggregate productivity between 1998 and 2004 is prevalently due to the employment shift from all the manufacture sectors towards Kibs.

[4] Note that the three components of one macro-sector are obtained by summing up the corresponding components of the sectors included in the macro-sector itself. Consequently, the sign of the dynamic component cannot be directly derived from the signs of the other two terms.

The dynamic component of manufacturing sectors is positive, indicating that the widespread loss of employment share that occurred in manufacturing sectors was more relevant in those sectors with a faster productivity decrease. However, the impact of the manufacture dynamic component is almost negligible (as we stated, the employment shares inside the manufacture are substantially stable during the considered time period). On the contrary, a remarkable negative dynamic component is observed in the service sectors due to the negative sign of the within component.

The within component appears to be largely dominated by the static one in each macro-sector (with the exception of traditional services), confirming that structural changes are the main factor responsible for the negative performance.

6.2 Second Level Decomposition

As stated above, the first level within component could hide structural change connected with different productivity levels among firms of different sizes in the same sector.

Table 10 shows the decomposition of the within component across the firm size classes.

The aggregate figures (last row) give us back a more troubling picture than that obtained by the first level decomposition.

Table 10. Second level decomposition (Euro at 2000 constant prices)

Period	Within	Static (structural)	Dynamic	Total
1998-1999	-661	12	-9	-658
1999-2000	841	127	17	986
2000-2001	-432	22	-13	-424
2001-2002	73	119	-39	152
2002-2003	-1,378	78	-3	-1,303
2003-2004	715	53	-26	742
1998-2004	-585	400	-74	-260

By removing the relevant positive contribution of *W2* (employment shifts towards size classes with higher productivity at the base year), the internal performance more directly connected to technological aspects, W1, is considerably worse than those highlighted by the within component (-585 instead of -260). The recovery via the structural *W2* component is relevant, but must be attributed almost exclusively to traditional services.

Table 11. Second level decomposition (Euro at constant prices 2000)

	1998-2004			
Sector	W1	W2	W3	Within
high tech	-19	-16	25	-9
med-high tech	-88	-22	-3	-112
med-low tech	-29	4	-1	-27
Low tech	-56	-1	-1	-58
Total manufacture	-190	-33	23	-207
Other industries	141	44	83	267
Construction	-140	29	-5	-116
Traditional services	68	357	-148	277
Kibs	-464	6	-23	-482
Total services	-396	363	-172	-205
TOTAL	-585	400	-74	-260

This discouraging result that occurred at the aggregate level comes up again at macro-sector level (*W1* is generally the predominant component and is smaller than *W2*)

The exception is Traditional services where the amount of *W2* and *W3* are relevant. In particular, the positive sign of *W2* indicates the presence of an employment shift towards size-classes with a greater productivity in 1998 (generally, towards larger firms) but, in the meantime, such a shift was not accompanied by a growth of productivity, because *W3* is negative.

In conclusion, any shift of employment among size classes was not able to oppose the decrease of the within-class productivity (*W1*), which remains the most responsible for the total within term (*C1*).

6.3 Contribution of Single Sectors

Despite the predominant role of the structural components, the fact remains that the aggregate within component is negative (loss of productivity inside sectors on the average), but some sectors increase and other sectors decrease their within productivity.

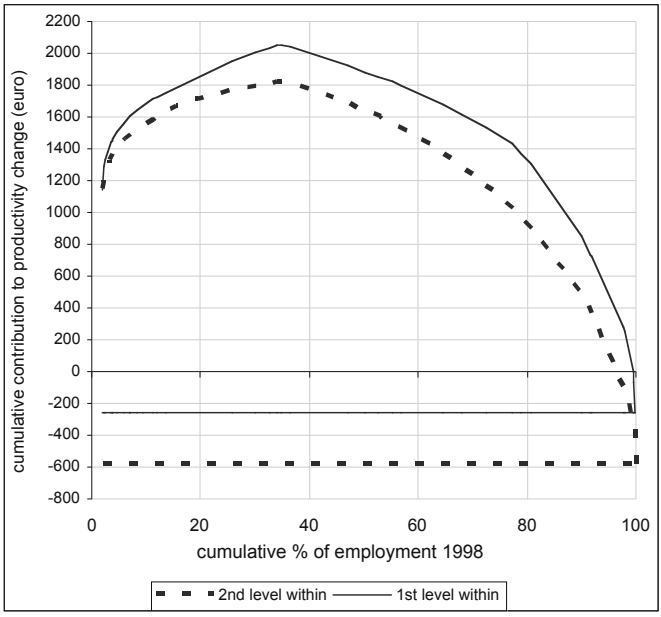
In order to highlight the different performances of the forty economic sectors, an Harberger-like diagram can be used. The diagram (Harberger 1998) provides an intuitive and standardized way to determine how widespread productivity performances are within an economy. When applied to the within component of our decomposition, the diagram is a Lorenz-type curve which depicts the contribution of each sector to aggregate labour productivity change.

Specifically, the sectors are ranked with respect to decreasing values of the change in the within productivity; and a Lorenz-type curve is obtained

by representing the cumulative % of employment *versus* the % cumulative contribution to the within aggregate productivity. The curve starts in (0,0) and ends in the value (100,P) where P is the aggregate within component and 100 is the 100% of total employment.

The diagram in figure 8 depicts the two curves referred, respectively, to the first and second level within component. The curve shapes are «mushroom-type». This reveals that the impact of differential productivity at sectoral levels is considerable. The two curves are close together: this confirms the weak contribution of the structural changes across size classes. Moreover, the relative position of the forty sectors is almost the same in both rankings (Spearman coefficient greater than 0.97). Hence, we are reporting only some brief remarks on the curve in reference to the first level within component.

Figure 8. Harberger type diagram: 1998-2004



Half out of the forty sectors increase their productivity from 1998 to 2004. These sectors employed less than 35% of the 1998 total employment.

The best performance is observed in two sectors, Post and Communications, Quarrying and Mining that, in the considered time period, were interested in remarkable technology innovations and management reorganizations.

Among the high tech sectors, Manufacture of radio, television and communication equipment and apparatus (NACE 32) and Manufacture

of medical, precision and optical instruments, watches and clocks (NACE 33) give a positive contribution, whereas Manufacture of office, accounting and computing machinery (NACE 30) is the second to last.

Few typical Italian products like Manufacture of clothing apparel, dressing and dyeing of fur (NACE18), Manufacture of paper and paper products (NACE21) are positioned in the group with growing productivity. Most of the made in Italy exhibits low performances.

Among the service sectors, surprisingly, Kibs lie in rank low positions

7. Summary and Conclusions

This paper focuses on the relationship between change in the employment structure and labour productivity in the Italian economic sectors. The empirical analysis was performed on the 1998-2004 time period.

The approach used is similar to the one followed by many authors: the shift and share decomposition among economic sectors. Most of the empirical analysis in the literature focuses on manufacture; here, both industrial and service activities have been considered at the level of 40 NACE divisions. Moreover, the availability of SBS Italian survey data, classified by firm-size classes, allowed the introduction of a minor modification to the usual decomposition, to isolate the effect of structural changes of firm size.

The analysis of 1998-2004 data indicates a widespread decrease of labour productivity and a remarkable employment shift from industry to services.

This employment reallocation across sectors had a negative effect on the performance of the whole economy. In fact, the employment share shifted towards less performing sectors (lower productivity levels and worse productivity trends). Services are mostly responsible for the presence of a robust *structural burden.*

Nevertheless, the aggregate labour productivity decrease is not entirely due to structural changes. The within component of the shift and share decomposition is negative as well, for most industry and service sectors. Moreover, by removing the positive effect of inside-sector structural changes (employment shift among firm size classes of the same sector), the 'technological' performance seems even to worsen.

Obviously, the forty sectors analysed do not exhibit the same performance. In fact, the Harberger-like diagram clearly shows the presence of a strong variability of sectoral labour productivity changes.

One thing is certain: the whole system lost productivity and, at least from what we can establish from the shift and share analysis, this is not only due to an employment shift across sectors (tertiarization and consequent structural burden) but also to an intrinsic weakness of most of the sectors. The only encouraging feedback is the positive effect of the employment shift among firm-size classes inside each sector. Hence, the only way

to recover productivity seems to be to operate within each sector as well as through reorganization in terms of firm-size.

References

Baumol W. 1967, *Macroeconomics of Unbalanced Growth: The Anatomy of an Urban Crisis*, «American Economic Review», 57: 415-426.

Baumol W.J., Batey Blackman S., Wolff E.N. 1985, *Unbalanced growth revisited: asymptotic stagnancy and new evidence*, «American Economic Review», 75, 4: 806-817.

Becattini G. 1990 *The Marshallian industrial district as a socio-economic notion*, in Pyke F. *et al.* (eds.) 1990, *Industrial districts and inter-firm co-operation in Italy, International Institute for Labour Studies*, International Institute for Labour Studies, Geneva: 37-51.

Coltorti F. 2006, *Il mal d'Africa e la competitività dell'Italia*, Rapporto Uniocamere, 2006, Roma

Dei Ottati G., Grassini L. 2006, *Italy's Industrial changes in the nineties: a comparison between large enterprises areas and industrial districts*, paper presented at the EUNIP Conference, Limerick, Ireland.

Fagerberg, J. 2000, *Technological progress, structural change and productivity growth: a comparative study*, «Structural Change and Economic Dynamics», 11: 393-411.

Harberger A.C. 1998, *A vision of the growth process*, «American Economic Review», 88: 1-32.

Havlik P. 2005, *Structural change, productivity and employment in the new EU Member States*, the Vienna Institute for International Studies, Series Research Reports, January, n. 313.

Miles I. *et al.* 1995, *Knowledge-intensive business services: - Users, Carriers and Sources of Innovation EC*, Luxembourg, (DG13 SPRINT-EIMS publication no. 15).

Nordhaus W.D. 2002, *Productivity growth and the New Economy*, «Brooking Papers on Economic Activity», 2: 2122-2244.

OECD 2001, *Measuring Productivity (OECD Manual), OECD.*

Pagano P., Schivardi F. 2003, *Firm Size Distribution and Growth*, «Scandinavian Journal of Economics», 105, 2: 255-274.

Peneder M. (2003), *Industrial Structure and Aggregate Growth*, «Structural Change and Economic Dynamics», 14, 4: 427-448

Savona M. 2004, *Structural change and macro-economic performance: the structural bonus hypothesis in services*, paper presented at the XIV Conference RESER (Castres, 23-24 Semptember 2004) <www.reser.net>.

Timmer M.P. Szirmai, A. 2000, *Productivity growth in Asian manufacturing: the structural bonus hypothesis examined*, «Structural Change and Economic Dynamics», 11: 371-392.

Verdoorn P.J.1949, *Fattori che regolano lo sviluppo della produttività del lavoro, l'Industria* in Ironmonger D. *et al.*, *National income and economic progress: essays in honour of Colin Clark,* MacMillan.

M. Velucchi
A. Viviani[1]

Innovative Competitiveness: a Latent Factor Approach[2]

1. Introduction

Policy makers all over the world express concern about national competitiveness. Such concern is not new; what seems new is its intensity and spread, a response to globalization, rapid technical change, shrinking economic distance and sweeping liberalization. The importance of competitiveness has spawned a significant impact in the economic literature, with a large audience in policy-making and corporate circles. Studies on this theme are diverse, ranging from productivity and cost studies for specific activities and institutional analysis to general strategy papers, development plans and cluster studies. The best-known measure, however, seems to be the competitiveness index, a composite indicator ranking countries against each other according to selected criteria and proxies of competitive ability. Competitiveness indices have become a significant part of the policy discourse. In view of their importance, surprisingly, little is known about the statistics of competitiveness indices: how soundly they are grounded in theory, how sensibly the variables are defined or how well they are measured and aggregated. In fact, competitiveness is a relative concept: it depends on the variables included in the analysis, on the disaggregation level, on the data sources.

This paper deals with competitiveness sensitivity and adapts a confirmatory factor analysis to study the characteristics of Europe using regional data from Eurostat. This approach is flexible and allows one to identify the significant variables, instead of choosing them a-priori, to define the latent phenomenon called competitiveness. Focusing on the economic and inno-

[1] Dipartimento di Statistica «G. Parenti», Università di Firenze, viale G.B. Morgagni, 59, 50134 Firenze, Italy; e-mail: velucchi@ds.unifi.it, viviani@ds.unifi.it. We would like to thank Gianni Marliani, Lucia Buzzigoli, Laura Grassini, Matilde Bini and Stefano Casini Benvenuti for their comments that strongly improved this paper. This paper is part of the research project no. 2005139545_003 funded by the MIUR.
[2] This version: January, 2008.

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online),

vative capacity of the European regions, we use factor analysis to show how the resulting ranking is influenced by the variables introduced.

The paper is structured as follows: in section two we briefly review the extended literature on competitiveness, in section three we present data and methods, in section 4 we discuss the results, and in section five we present our conclusion.

2. Measures of Competitiveness

The official OECD definition of a nation's competitiveness is «the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term». Country competitiveness and openness to global business activity are inextricably linked to a country's standard of living.

Analyses of competitiveness may differ with respect to the level of investigation and studies can be carried out for various levels of product aggregation, across the entire economy, a specific sector, or for a single product (or aggregate of products). Another differentiation of competitiveness exists with regard to the spatial dimension of the analysis. Since it is a relative measure, the competitiveness between firms or regions within a country, or between countries, may be compared. The indicator used does not always reveal the spatial extension and the level of product aggregation of a given analysis and the quality of the results obtained depends, to a considerable extent, on the quality of the data available. Although this is common to all indexes, it affects some more than others. In fact, the quality, type and amount of data required varies between the measures; the choice of the index to be used is therefore often dictated by data availability and the resulting ranking is inevitably affected by this decision.

Several approaches can be used to analyze the past performance of competitiveness (for a detailed survey, see Buzzigoli, Viviani 2006). Frequently employed are export levels market share indicators, the real exchange rate and Foreign Direct Investment (FDI). These approaches differ widely in methodologies and data requirements and a host of different indicators have been developed to measure competitiveness based on market and trade information. Although designed for international comparison, they may also be used to contrast the competitiveness of different regions. Although this is not without problems, one advantage of using trade data is that demand and supply responses are considered simultaneously. Some of these indicators are very simple to treat but at the same time their informative contribution is quite low. More sophisticated and comprehensive measures of international competitiveness are the Relative Export Advantage Index, the Relative Import Penetration Index and the Relative Trade Advantage Index (Balassa 1989; Scott, Vollrath 1992; Vollrath 1991).

A second approach to competitiveness is related to investments in other countries. Foreign Direct Investment (FDIs), both inward and outward, represent a good proxy together with export for competitiveness. Several attempts have been made to incorporate FDIs in the indices of competitiveness (see Traill, Gomes Da Silva 1996, for a detailed discussion). On the other hand, the amount of FDIs a foreign country attracts is also frequently seen as a sign of competitiveness of that nation as a whole, or of the sector or region attracting the investment. FDIs are then interpreted as the capability of the foreign country to pull in mobile international resources in the form of physical capital and know-how. In such a case, it is assumed that a country will attract FDIs if it has the advantage of production conditions that the country making such investments is lacking. This kind of information is available at firm and country level but it is not available at regional level.

Gross Domestic Product as a proxy of the wealth of a country (or region) is also very useful in the calculation of a competitiveness index but it is only related to production of goods and services and it does not include any information on innovative capacity or education level attained by the region or country which can also be considered good proxies of the wealth of a country. A significant contribution in this perspective is represented by Furman, Porter and Stern (2002) that develop the National Innovative Capacity Index. The Index is calculated using statistical modelling to examine how some measures affect innovative output across countries (of 17 OECD economies since 1973 and eight emerging economies since 1990) and over time. Innovative output is measured by international patenting, or patents filed in the United States (as well as another country). The statistical analysis yields a weighting of the relative importance of the measures (all statistically significant). This weighting is applied to each country's actual resource and policy choices to determine its index value. The index measures innovative capacity on a per capita basis, rather than its absolute level, highlighting that the intensity of innovative investment in a country is more meaningful for future prosperity. From a statistical point of view, this approach helps reduce the a-priori problem in creating a competitiveness index: only variables that significantly affect the richness of a country are considered in the calculation and the rankings reflect this.

3. Data and Methods

As we showed in the previous section, competitiveness is one of the most quoted concepts in economic literature but, its meaning and the way it can be measured are still a matter of lively debate. Following Porter (2003a, 2003b, 2005), to understand competitiveness the starting point must be the sources of a country's prosperity: a country's standard of living is determined by the productivity of its economy, measured by the value of goods and services produced per unit of the country's human, capital and

natural resources (Porter, Ketels 2003). Hence, a good measure of competitiveness has to include both the economic prosperity and the innovative capacity of the people living in a given area. In this perspective, we need an approach focussed on improving skills, stimulating innovation and fostering firms to invest in international markets in the long run.

Following this approach, we use data at the regional level (NUTS2) from REGIO database (Eurostat) for 232 regions on the economic prosperity (GDP pro-capite and labor productivity), the innovative capacity (patents) and the human capital endowment of the region (employment with high education and human resources in science and technology sectors). The factor analysis is then conducted to find evidence of a latent relationship between these variables and to rank European regions on the basis of the weights estimated. Two analyses are run: first, only economic prosperity proxies will be introduced, second, the innovative capacity variables are also included. The aim is to show how the introduction of innovative capability affects the EU regions' ranking and how the results and policies developed on those results can be influenced by the choice of the variables included.

Factor analysis is a statistical approach that can be used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). Hence, factor analysis is used to uncover the latent structure (dimensions) of a set of variables. It reduces attribute space from a larger number of variables to a smaller number of factors and as such is a «non-dependent» procedure (that is, it does not assume a dependent variable). The statistical approach involves finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions (factors) with a minimum loss of information (Hair 1992). This family of techniques uses an estimate of common variance among the original variables to generate the factor solution. Because of this, the number of factors will always be less than the number of original variables.

A model is specified on how latent variables depend upon or are indicated by the observed variables

$$y = \Delta_y \eta + \varepsilon$$

where η is a m x 1 random vector of latent dependent variables, y is a p x 1 vector of observed indicators of the dependent latent variables η and e is a p x1 vector of measurement errors in y.

The goal of estimation is to produce a covariance matrix $s(q)$ that converges upon the observed population covariance matrix, s, with the residual matrix (the difference between $s(q)$ and $s)$ being minimized. The general form of the minimization function is:

$$y = \Delta_y \eta + \varepsilon$$

where is the vector containing the variances and covariances of the observed variables, $s(q)$ is the vector containing corresponding variances and

covariances as predicted by the model and W is the weight matrix, chosen to minimize Q. The weight matrix corresponds to the estimation method chosen (maximum likelihood, unweighted least squares, generalized least squares)[3]. Factor analysis generates a table in which the rows are the observed raw indicator variables and the columns are the factors or latent variables which explain as much of the variance in these variables as possible. The cells in this table are factor loadings, and the meaning of the factors must be induced from seeing which variables are most heavily loaded on which factors.

In table 1 we give a brief definition of the variables and in table 2 we show the descriptive statistics across regions.

Table 1. Description of variables

Variable Name	Patents	GDP	Labor Productivity	Human Resouces	Employment Higher Education
	PATENTS	GDPPC	LPROD	HRST	EMPLHE
Description	Biotechnology and ICT patent applications to the EPO (per million of inhabitants)	Gross domestic product (euro per inhabitant)	GDP/ Employment (euro per person employed)	Human Resources in Science and Technology (% of active population)	Employment with secondary and tertiary education (% of total employment)
Year	2003	2004	2004	2004	2004

Table 2 shows that on average the labor productivity in Europe is quite low (especially when compared to the U.S.) while the GDP pro-capite is relatively high. Concerning the role of human capital, we can observe that workers with higher education (second and tertiary) is a very small portion of the employment (on average only 0.175 %) but that from this point of view, European regions are very different (ranging from close to 0% to 22%). The percentage of employment in Science and Technology sectors is quite low even if, also for this variable, human resources in S&T in the European regions range from 0.58 % to 2.38% of the active population. The number of patent applications to the European Patent Office is high, still with strong differences among regions. Following Furman, Porter and Stern (2002) this variable is considered with a lag due to the time needed for an innovation to affect the economy.

Table 2. Descriptive statistics

Variable	Mean	ST. Dev.	Skewness	Kurtosis	Minimum	Maximum
LPROD	45.274	19.651	-0.558	-0.554	4.21	89.28
HRST	1.42	0.355	-0.038	0.046	0.58	2.38

[3] In the following analysis we use the generalized least squares.

EMPLHE	0.175	0.267	12.802	183.747	0.001	4
PATENTS	129.643	136.497	1.871	4.304	1.3	748.37
GDPPC	19072.11	11813.41	-0.145	0	80.919	59554.5

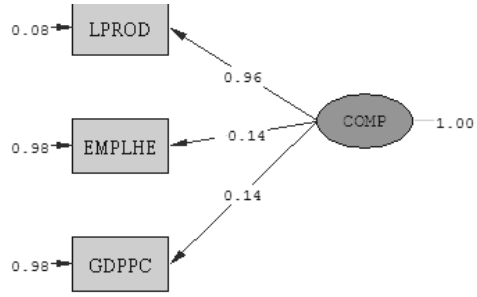
4. The Empirical Analysis

In the following analysis we run two factor analyses (focussing on the first factor only) on 232 European regions (NUTS2): first, we use economic performance proxies deriving a Competitiveness Index and, second, we add innovative capacity proxies obtaining the Innovative Competitiveness Index. Of course, the variance explained by the two is different and, in particular, the loss of information is lower in the latter but we show that the links are significant in both and that the fitness of the model tested by RSMA is good. The aim is to stress the difference in the rankings due to the introduction of innovative capacity. Table 3 reports the Varimax rotation scores from the analysis on the economic performance of EU regions[4]. Confirming recent debates emerging in both economic and political circles, the labor productivity turns out to be the most important variable in stimulating the latent factor called Competitiveness Index. High skill employment and GDP per-capite are significant but their weight is lower. The path diagram is shown in figure 1 while tables 2 and 4 show the ranking of EU regions.

Table 3. Scores (Varimax rotation). Competitiveness Index

LPROD	0.959
EMPLHE	0.144
GDPPC	0.137

Figure 1. Path diagram for Competitiveness Index



Chi-Square=0.00, df=0, P-value=1.00000, RMSEA=0.000

[4] Rotation serves to make the output more understandable and is usually necessary to facilitate the interpretation of factors.

Table 4. Ranking of the European regions with Competitiveness Index

Rank	Regione	Rank	Regione
1	Luxembourg (Grand-Duché)	47	Köln
2	Région de Bruxelles-Capitale/ Brussels Hoofdstedelijk Gewest	48	Martinique (FR)
3	Hamburg	49	Oberpfalz
4	Stockholm	50	Zeeland
5	Île de France	51	West Midlands
6	Wien	52	Lazio
7	Southern and Eastern Ireland	53	Greater Manchester
8	Oberbayern	54	Norra Mellansverige
9	Åland	55	Limburg (NL)
10	Utrecht	56	West Yorkshire
11	Darmstadt	57	Oberösterreich
12	Denmark	58	Prov. Brabant Wallon
13	Bremen	59	East Anglia
14	Groningen	60	Freiburg
15	Noord-Holland	61	Östra Mellansverige
16	Etelä-Suomi	62	Derbyshire and Nottinghamshire
17	Tees Valley and Durham	63	Overijssel
18	Stuttgart	64	Herefordshire, Worcestershire and Warks
19	Prov. Antwerpen	65	Oberfranken
20	Salzburg	66	Friuli Venezia Giulia
21	Mittelfranken	67	Kassel
22	Lombardia	68	Toscana
23	Karlsruhe	69	Prov. West-Vlaanderen
24	Zuid-Holland	70	Comunidad de Madrid
25	Cheshire	71	Border, Midland and Western
26	Vorarlberg	72	Länsi-Suomi
27	Unterfranken	73	Gelderland
28	Düsseldorf	74	Pohjois-Suomi
29	Västsverige	75	Alsace
30	Leicestershire, Rutland and Northants	76	Hannover
31	Niederbayern	77	Veneto
32	Tirol	78	Rheinhessen-Pfalz
33	Reunion (FR)	79	Emilia Romagna
34	Prov. Vlaams Brabant	80	Saarland
35	Provincia Autonoma Bolzano-Bozen	81	Prov. Oost-Vlaanderen
36	Provence-Alpes-Côte d'Azur	82	Guyane (FR)
37	Languedoc-Roussillon	83	Steiermark
38	Övre Norrland	84	Champagne-Ardenne
39	Sydsverige	85	Comunidad Foral de Navarra
40	Piemonte	86	Arnsberg
41	Mellersta Norrland	87	Braunschweig
42	Valle d'Aosta/Vallée d'Aoste	88	Pais Vasco
43	Provincia Autonoma Trento	89	Friesland
44	Schwaben	90	Liguria
45	Småland med öarna	91	Kärnten
46	Tübingen	92	Pays de la Loire
		93	Northumberland, Tyne and Wear
		94	Schleswig-Holstein

95 Haute-Normandie
96 Gießen
97 Lancashire
98 Centre
99 Marche
100 Cataluña
101 Niederösterreich
102 Bretagne
103 Bourgogne
104 Berlin
105 Franche-Comté
106 Shropshire and Staffordshire
107 Extremadura
108 Weser-Ems
109 Prov. Limburg (B)
110 Umbria
111 Auvergne
112 Cumbria
113 Basse-Normandie
114 Flevoland
115 South Yorkshire
116 Illes Balears
117 Koblenz
118 Lorraine
119 Lincolnshire
120 Limousin
121 Picardie
122 Itä-Suomi
123 La Rioja
124 Nord-Pas-de-Calais
125 Aragón
126 Languedoc-Roussillon
127 Dresden
128 Corse
129 Prov. Liège
130 Attiki
131 Burgenland
132 Leipzig
133 Brandenburg-Südwest
134 Lüneburg
135 Halle
136 Prov. Namur
137 Prov. Luxembourg (B)
138 Lisboa
139 Cantabria
140 Abruzzo
141 Chemnitz
142 Castilla y León
143 Notio Aigaio
144 Comunidad Valenciana
145 Prov. Hainaut
146 Mecklenburg-Vorpommern
147 Sardegna
148 Canarias (ES)
149 Praha
150 Ciudad Autónoma de Ceuta
151 Brandenburg-Nordost
152 Molise
153 Ciudad Autónoma de Melilla
154 Cypro
155 Principado de Asturias
156 Basilicata
157 Região Autónoma da Madeira (PT)
158 Región de Murcia
159 Guadeloupe (FR)
160 Galicia
161 Puglia
162 Sterea Ellada
163 Castilla-la Mancha
164 Calabria
165 Campania
166 Andalucia
167 Sicilia
168 Kriti
169 Bratislavský kraj
170 Algarve
171 Slovenia
172 Közép-Magyarország
173 Alentejo
174 Peloponnisos
175 Kentriki Makedonia
176 Ipeiros
177 Região Autónoma dos Açores
178 Thessalia
179 Centro (PT)
180 Dytiki Makedonia
181 Voreio Aigaio
182 Malta
183 Norte
184 Anatoliki Makedonia, Thraki
185 Dytiki Ellada
186 Nyugat-Dunántúl
187 Střední Cechy
188 Közép-Dunántúl
189 Jihozápad
190 Jihovýchod
191 Moravskoslezsko
192 Severovýchod
193 Severozápad
194 Estonia
195 Střední Morava
196 Slaskie
197 Dél-Dunántúl
198 Západné Slovensko

199	Wielkopolskie	216	Swietokrzyskie
200	Dolnoslaskie	217	Podlaskie
201	Dél-Alföld	218	Podkarpackie
202	Észak-Magyarország	219	Lubelskie
203	Pomorskie	220	Yugozapaden
204	Észak-Alföld	221	Vest Ro
205	Zachodniopomorskie	222	Centru Ro
206	Stredné Slovensko	223	Nord-Vest Ro
207	Lubuskie	224	Sud-Est Ro
208	Lithuania	225	Yugoiztochen
209	Opolskie	226	Sud-Muntenia Ro
210	Bucuresti-Ilfov	227	Sud-Vest Oltenia
211	Kujawsko-Pomorskie	228	Severoiztochen
212	Východné Slovensko	229	Severen tsentralen
213	Malopolskie	230	Severozapaden
214	Warminsko-Mazurskie	231	Yuzhen tsentralen
215	Latvia	232	Nord-Est Ro

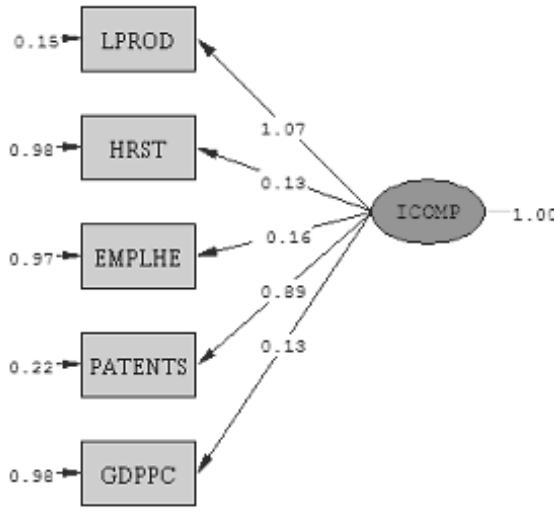
European regions' ranking derived using the factor scores from the analysis above is coherent with ranking proposed using different approaches (see for example Porter, Delgado, Ketels 2006). The most competitive regions in Europe are Luxembourg, Bruxelles, Hamburg, Stockolm, Ile de France, Wien while the least competitive regions are those from countries that only recently joined the EU. Italian regions are ranked between 22th and 167th position with evident differences between northern and southern regions. The best Italian region turns out to be Lombardia (22th) while the worse is Sicilia (167th). This result is coherent with several studies showing that Italian regions have different performance, but when compared to other European regions they tend to cluster in three macroregions, North, Center and South. In particular, even if Italy is the 7th richest economy in the world, it emerges that Italian best performers are not among the European best performers.

Results from the factor analysis with Innovative Competitiveness factor (ICOMP) are shown in table 5 and the path diagram is reported in figure 2.

Table 5. Scores (Varimax rotation). Innovative Competitiveness Index

LPROD	1.073
HRST	0.13
EMPLHE	0.158
PATENTS	0.886
GDPPC	0.125

Figure 2. Path diagram for Innovative Competitiveness



Adding innovative capacity to economic prosperity proxies, rankings change accordingly; table 4 and table 6 show that using this definition, the most competitive regions in Europe are still Luxembourg, Bruxelles, Hamburg, Stockolm, Ile de France, Wien, Denmark and Groninger and the least competitive regions are still the Eastern Europe regions that only recently joined the Union but in between there is a strong reshuffling. This result is also coherent with the National Innovative Capacity Index ranking (Furman, Porter, Stern 2002) showing, using country data, that the most competitive countries are those having both economic prosperity human capital and innovative capacity. Focussing on Italy, the effect of the introduction of innovative capacity and human capital variables is twofold: a group of 7 regions is negatively affected (by comparison of relative positions in ranking) by it, while a more numerous second group (14 over 21 regions) strongly benefits from its introduction. Comparing the two rankings, in the first group we find Lombardia, Regione Autonoma di Trento e di Bolzano, Piemonte, Val d'Aosta and Molise, while Friuli Venezia Giulia has almost the same rank. All remaining regions benefit from innovation and human capital, showing that their ranking in Europe is better than that described using only economic performance proxies. Among the latter, the best performers are Lazio, Veneto and Emilia Romagna. In particular, Lazio jumps in rank from 52th to 24th in rank thanks to very high levels of R&D expenditures and number of patents application (and, hopefully, following registration). However, several Italian regions show good per-

formance: Lombardia is ranked 25th and Toscana, Emilia Romagna, Friuli Venezia Giulia and Veneto are grouped between 66th and 72th positions. On the contrary, South of Italy shows a negative performance and several southern regions are ranked between 154th and 164th position, close to Greece, Southern Spain and Eastern European regions that recently joined the European Union (especially Romanian and Bulgarian regions).

Tab. 6. Ranking of the European regions with Innovative Competitiveness Index (cont.d)

Rank	Regione	Rank	Regione
1	Luxembourg (Grand-Duché)	40	Oberösterreich
2	Région de Bruxelles-Capitale	41	Sydsverige
3	Hamburg	42	Övre-Norrland
4	Stockholm	43	Prov. Vlaams Brabant
5	Île de France	44	Oberpfalz
6	Wien	45	Martinique (FR)
7	Oberbayern	46	Smaland medöarna
8	Southern and Eastern Ireland	47	Provincia Autonoma Trento
9	Darmstadt	48	Valle d'Aosta
10	Aland	49	Piemonte
11	Bremen	50	West Midlands
12	Utrecht	51	Östra Mellansverige
		52	Tübingen
13	Denmark	53	Köln
14	Groningen	54	Norra Mellansverige
15	Noord-Holland	55	Zeeland
16	Stuttgart	56	West Yorkshire
17	Etelö-Suomi	57	Derbyshire and Nottinghamshire
18	Mittelfranken	58	Greater Manchester
19	Tees Valley and Durham	59	Freiburg
20	Unterfranken	60	Oberfranken
21	Karlsruhe	61	Kassel
22	Prov. Antwerpen	62	Herefordshire, Worcestershire and Warks
23	Salzburg		
24	Lazio	63	Prov. Brabant Wallon
25	Lombardia	64	Limburg (NL)
26	Niederbayern	65	East Anglia
27	V⊚stsverige	66	Toscana
28	Vorarlberg	67	Friuli-Venezia Giulia
29	Cheshire	68	Alsace
30	Reunion (FR)	69	Länsi-Suomi
31	Mellersta Norrland	70	Veneto
32	Zuid-Holland	71	Overijssel
33	Düsseldorf	72	Emilia-Romagna
34	Tirol		
35	Provence-Alpes-Côte d'Azur	73	Prov. West-Vlaanderen
36	Languedoc-Roussillon	74	Pohjois-Suomi
37	Provincia Autonoma Bolzano-Bozen	75	Kärnten
38	Schwaben	76	Saarland
39	Leicestershire, Rutland and Northants	77	Hannover
		78	Champagne-Ardenne

79 Comunidad de Madrid
80 Border, Midland and Western
81 Guyane (FR)
82 Steiermark
83 Gelderland
84 Pays de la Loire
85 Haute-Normandie
86 Berlin
87 Rheinhessen-Pfalz
88 Liguria
89 Comunidad Foral de Navarra
90 Prov. Oost-Vlaanderen
91 Braunschweig
92 Pais Vasco
93 Northumberland, Tyne and Wear
94 Prov. Namur
95 Arnsberg
96 Centre
97 Gießen
98 Marche
99 Friesland
100 Niederösterreich
101 Bourgogne
102 Lancashire
103 Weser-Ems
104 Lorraine
105 Schleswig-Holstein
106 Franche-Comté
107 Bretagne
108 Cataluña
109 Umbria
110 Shropshire and Staffordshire
111 Extremadura
112 Prov. Limburg (B)
113 Auvergne
114 Basse-Normandie
115 Cumbria
116 Lincolnshire
117 South Yorkshire
118 Itä-Suomi
119 Flevoland
120 Illes Balears
121 Koblenz
122 Limousin
123 Nord - Pas-de-Calais
124 Burgenland
125 La Rioja
126 Languedoc-Roussillon
127 Picardie
128 Brandenburg - Südwest
129 Lisboa
130 Praha
131 Corse
132 Aragón
133 Dresden
134 Prov. Liège
135 Prov. Luxembourg (B)
136 Attiki
137 Abruzzo
138 Lüneburg
139 Leipzig
140 Cantabria
141 Halle
142 Sardegna
143 Brandenburg-Nordest
144 Canarias (ES)
145 Región de Murcia
146 Cyprus
147 Chemnitz
148 Castilla y León
149 Mecklenburg-Vorpommern
150 Notio Ai gaio
151 Comunidad Valenciana
152 Prov. Hainaut
153 Ciudad Autonoma de Ceuta
154 Basilicata
155 Molise
156 Ciudad Autonoma de Melilla
157 Principado de Asturias
158 Puglia
159 Calabria
160 Região Autónoma da Madeira (PT)
161 Guadeloupe (FR)
162 Sicilia
163 Bratislavský kraj
164 Campania
165 Galicia
166 Castilla-la Mancha
167 Sterea Ellada
168 Andalucia
169 Algarve
170 Kriti
171 Alentejo
172 Slovenia
173 Közép-Magyarország
174 Ipeiros
175 Peloponnisos
176 Kentriki Makedonia
177 Centro (PT)
178 Regiao Autonoma dos Açores
179 Thessalia
180 Dytiki Makedonia
181 Norte

182 Voreio Aigaio
183 Malta
184 Anatoliki Makedonia, Thraki
185 Yugoiztochen
186 Severozapaden
187 Severen tsentralen
188 Severoiztochen
189 Střední Cechy
190 Warminsko-Mazurskie
191 Yuzhen tsentralen
192 Jihozápad
193 Opolskie
194 Wielkopolskie
195 Zachodniopomorskie
196 Nyugat-Dunántúl
197 Kujawsko-Pomorskie
198 Moravskoslezsko
199 Lubuskie
200 Stredné Slovensko
201 Severozápad
202 Lithuania
203 Dolnoslaskie
204 Pomorskie
205 Střední Morava
206 Východné Slovensko
207 Macroregiunea patru (V)
208 Sud-Muntenia
209 Yugozapaden
210 Západné Slovensko
211 Jihovýchod
212 Bucuresti - Ilfov
213 Severovýchod
214 Macroregiunea doi (N-E)
215 Macroregiunea unu (N-V)
216 Podlaskie
217 Sud-Vest Oltenia
218 Macroregiunea unu (centru)
219 Dytiki Ellada
220 Macroregiunea doi (S-E)
221 Dél-Dunántúl
222 Malopolskie
223 Slaskie
224 Estonia
225 Közép-Dunántúl
226 Észak-Alföld
227 Dél-Alföld
228 Észak-Magyarország
229 Swietokrzyskie
230 Podkarpackie
231 Latria
232 Lubelskie

5. Conclusion

Competitiveness is a relevant topic in the economic literature, but its meaning and the way it can be measured are still a matter of lively debate. Following recent literature, competitiveness is strictly related to the sources of a country's prosperity. In this perspective, several authors suggest an approach focussed on improving skills, stimulating innovation and fostering firms. It is only by building such capacity, that developed and less developed countries will be able to move to the next stage of improving competitiveness and achieve sustained high levels of prosperity.

From the empirical side, the most used measure in literature is represented by the competitiveness index, a composite indicator ranking countries against each other according to selected criteria and proxies of competitive ability. Competitiveness indices have become a significant part of the policy discourse even if only few contributions focus on the statistics of competitiveness indices. In fact, competitiveness is a relative concept: it depends on the variables included in the analysis, on the disaggregation level, on the data sources. Hence, policy measures strongly depend on these variables.

This paper deals with competitiveness indices and uses confirmatory factor analysis to study the characteristics of European regions using da-

ta from Eurostat Regio database. Focusing on the economic and innovative capacity of the European regions, the factor analysis is conducted to find evidence of a latent relationship between these variables and to rank European regions on the basis of the weights estimated. Two analyses are run: first, only economic prosperity proxies will be introduced, second the innovative capacity variables are also included. We show how the introduction of innovative capability affects the EU regions ranking and how the results and policies developed on those results can be influenced by the choice of the variables included.

From the confirmatory factor analysis some conclusions can be drawn. First, the most important variables in stimulating innovative competitiveness is the labor productivity and patenting application. Second, the most competitive regions in Europe are Luxembourg, Bruxelles, Hamburg, Stockolm, Ile-de-France, Wien while the least competitive Bulgarian and Romanian regions, independently of the index considered. This result is coherent with Porter analyses showing that the most competitive countries are those having both economic prosperity human capital and, especially, innovative capacity. Third, the analysis shows that rankings are strongly affected by the variables included. In particular, best and worst performers are large regions with capital and regions that recently joined the EU, respectively and independently of the variables included but, all remaining regions show very different positions. This result shows how sensitive rankings are and that policy measures based on competitiveness indices should be made with care because they strongly rely on relative indicators. Finally, focussing on economic performance only, Italian regions perform quite well and show the well known differences between northern and southern regions. The introduction of innovative and human capital proxies, instead, has a composite effect on Italian regions. A group of 7 regions is negatively affected by it, while a more numerous second group (14 over 21 regions) strongly benefits from it. In particular, Lazio shows the biggest jump thanks to very high levels of R&D expenditures and number of patent applications and several other regions show good performance: Lombardia, Toscana, Emilia Romagna, Friuli Venezia Giulia and Veneto. Southern regions, instead have low ranking close to Greece, Southern Spain and Eastern European regions that recently joined the European Union.

References

Balassa B. 1989, *Comparative Advantage, Trade Policy and Economic Development*, New York University Press.

Buzzigoli L., Viviani A. 2007, *Firm and system competitiveness: problems of definition, measurement and analysis*, Mimeo, University of Florence.

Furman J.L., Porter M.E., Stern S. 2002, *The determinants of national innovative capacity*, «Research Policy», 31, 6: 899-933.

Hair J.F. 1992, *Multivariate data analysis*, 3rd ed.. Macmillan, New York,.

Porter M.E. 1990, *The Competitive Advantage of Nations*, The Free Press, New York.

Porter M.E. 2003a, *The Economic Performance of Regions*, «Regional Studies», 37, 6-7: 549-578.

Porter M.E. 2003b, *Building the Microeconomic Foundations of Prosperity: Findings from the Business Competitiveness Index*, in *The Global Competitiveness Report 2003-2004*, Palgrave Macmillan, World Economic Forum, New York.

Porter M.E. 2005, *The Business Competitiveness Index*, interview with M.E. Porter, World Economic Forum, available on <http://www.weforum.org/en/initiatives/gcp/GCR20052006VideoInterviews/index.htm>.

Porter M., Ketels C.H.M. 2003, *UK Competitiveness: Moving to the Next Stage*, Management Research Forum, Summary Report 6, Advanced Institute of Management Research, London.

Porter M.E., Delgado M., Ketels C., 2006, *The Microeconomic Foundations of Prosperity: Findings from the Business Competitiveness Index*, in *World Economic Forum, The Global Competitiveness Report*, Palgrave MacMillan.

Scott L., Vollrath T.L. 1992, *Global Competitive Advantage and Overall Bilateral Complementarity in Agriculture. A Statistical Review*, United States Department of Agriculture, Economic Research Service, «Statistical Bulletin», no. 850, Washington D.C.

Traill B., Gomes Da Silva J. 1996, *Trade, Foreign Direct Investment and Competitiveness in the European Food Industries*, «International Business Review», 5, 2: 151-166.

Vollrath T.L. 1991, *A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage*, «Weltwirtschaftliches Archiv», 127, 2: 265-280.

R. Paniccià[1]

The Integration Process in the Fashion Industry with the Service Sector: a Comparative Analysis 1988-1997

1. Introduction

A very sound tool for studying regional and inter-sectoral interdependences within a sector is input-output analysis.

This paper, which has essentially descriptive aims, will carry out some exercises to analyse the interdependences in the fashion sector in Tuscany, in particular with the service sector, using the Tuscany-rest of Italy bi-regional matrices created by IRPET – the Tuscan Regional Institute for Economic Planning – for the years 1988 and 1997[2].

The analysis is based on two techniques widely tested in literature. The first is based on mapping the matrix of intermediate inputs according to the method put forward by Momigliano and Siniscalco (hereinafter MS) in various articles (1980, 1982, 1986), which in turn follows Pasinetti's concept of the vertically integrated sector (1973). This concept is extremely useful as it allows us to define and identify the production block needed to produce an end good. The second technique is taken from the seminal work of Miyazawa (1976). By using the analytical categories of external/internal multipliers and inter-sectoral propagation, this method allows us to calculate the inter-sectoral and regional backward linkages between the Tuscan fashion sector and the other regional and interregional branches.

As a result, the paper will be divided into the following parts. A note on the theoretical framework for the two analysis techniques, a brief descrip-

[1] IRPET – Istituto Regionale per la Programmazione Economica della Toscana

[2] A first version of this paper was written in 2001 and the matrices utilized are now in the IRPET repository since they were created using the old SEC79 method. Nevertheless, unlike more recent matrices, they allow to use a timespan that takes in important structural changes.

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online), © 2009 Firenze University Press

tion of the data set and the models used and a presentation of the results of the application.

2. The Service Industry Inter-Sectoral Integration Process: Some Notes on the Debate

The service industry inter-sectoral integration process is part of the line of economic analysis that has attempted to explain the growth in the role of the services within advanced economic systems[3]. Fisher (1939) and Clark (1940) tried to provide a demand driven interpretation of the growing importance of service sector employment. According to the authors, the higher the level of development, the higher the demand would be for services and therefore, supposing there would be smaller increases in productivity in the services compared to other goods, higher levels of employment, this could happen because the greater elasticity of the final demand for services with respect to the profit and the price of other goods.

Bauer and Yamey[4] (1951) shifted the debate to the supply side and Baumol (1967) and Fuchs (1968) introduced the role of sectoral differences in the growth of productivity (lower in the service sector) as the most important variable for explaining the growth in employment in the services industry.

By using a Miyazawa[5] formalization, employment in the service sector can be specified as:

$$[1] \quad L_s = \left[\frac{q}{1-q}\right] \cdot \left[\frac{\pi_b}{\pi_s}\right] \cdot L_b$$

where:

q = average propensity to purchase services;

π = productivity in the service (subscript s) and industry macro-sectors (subscript b);

L = employment in the industrial sectors.

The first element in [1] is the demand factor connected to the Clark-Fuchs hypothesis, while the second component reflects the theory of Baumol and Fuchs on the differences in productivity.

[3] In Prosperetti 1986 there is a good review of the debate.

[4] The criticism later raised by Bauer and Yamey (1951) singled out the following weak points in this theory: a) the hypothesis of a smaller increase in productivity compared to the production of goods would lead to gradual increases in the relative cost of the services and therefore a reduction in the share of overall consumption; b) problems relating to the production function parameters implicit in the Clark and Fisher model; c) the ability to validate the hypothesis.

[5] For a demonstration, see Miyazawa (1974).

It was in the 1970s that a new line of analysis emerged based on analysing industrial interdependences between sectors and not just on explicative variables determined within the single sectors (productivity) or on variables exogenous to them (service consumption, welfare state). The hypotheses of this new line of studies can be summed up as follows: «the growth in tertiary employment is due, to a large extent, to an increase in the integration of the services with the production system and this integration is due to the growth in the industrial sector's demand for producer services» (MS 1982).

Therefore, we get the distinction between *producer services* and *consumer services*, put forward for the first time by Greenfield (1966). Then in subsequent articles Momigliano and Siniscalco established the bases for a structural analysis, using the input-output model, of the tertiarisation and de-industrialisation process. This type of analysis of the services sector in systemic terms had nevertheless already been started by K. Miyazawa who in 1974 had introduced the possibility to isolate the disjoined effects of inter-sectoral backward linkages in inter-industrial studies.

The latter two contributions provide the theoretical framework for this paper.

2. The Theoretical Framework

2.1 The Vertically Integrated Sector Concept and Analysis of the Tertiary Industry for Production

In his 1973 article, L. Pasinetti noted how the concept of the vertically integrated sector was implicit in many seminal writings on economic theory by the classic economists Walras and J.M. Keynes. So what is a vertically integrated sector (VIS)? A VIS or sub-system (Sraffian definition) is the unit of analysis that includes all the activities used directly and indirectly in the system to satisfy the final demand for a given product.

In that article Pasinetti opposed the concept of industry with the VIS. The former featured a costs column (technical coefficient vectors also called direct units of production capacity or composite goods defined by the technical coefficients column of the matrix) and the labour coefficients needed for the production of the industries' physical units. In order to determine a VIS, we instead need to make an appropriate reclassification. If we use the symbols used by Pasinetti, we can write the formula:

$$[2] \quad S = A \cdot \left(I - A\right)^{-1} \cdot Y$$

where:

A = matrix of the coefficients of direct requirements for floating and fixed capital for the production of the industries' physical units

$A^{(-)}$ = matrix of the coefficients of floating and fixed capital consumed during the production process in a given year

Y = final goods

S = quantity of floating and fixed capital needed to replace what was used in the production process to obtain the industries' physical units also defined in the structural form as $S = A \cdot X$

The equation [2] can also be written as follows:

[3] $$S = H \cdot Y$$

where:

[4] $$H = A \cdot \left(I - A\right)^{-1}$$

The columns in the matrix H therefore express «the heterogeneous physical quantities of the goods 1, 2, …m that are directly and indirectly required in the whole economic system for the purpose of obtaining an i-th physical unit as a final good» (Pasinetti 1973).

Each single column in the matrix H will therefore express, like matrix A, the vertically integrated production unit for the i-th good.

In Sraffian terms, each column of the matrix H defines n sub-systems, or in Pasinetti's terminology, n vertically integrated sectors.

In the same way, we can define the labour requirement as:

[5] $$L = l \cdot \left(I - A\right)^{-1} Y$$

where:

l = direct requirement of labour units for producing one of the industries' physical production units

The vector v of the vertically integrated work coefficients resulting from the following equation:

[5] $$v = l \cdot \left(I - A\right)^{-1}$$

provides a consolidated quantification of the quantity of labour required to produce a unit of the i-th goods as an end good.

The concept of vertically integrated sector proposed by Pasinetti was used for the first time in analysis of service sector integration by Momigliano and Siniscalco. The same authors claim that their analysis aimed to study: «the integration between services for the production of industrial goods using an analysis by branches and sub-systems (or vertically integrated sectors) with the empirical application of the concepts developed for theoretical purposes by Sraffa and Pasinetti» (MS 1986).

Their technique for mapping the matrix of activation coefficients in branches and sub-systems (or blocks) was based on the formula (using MS's symbols):

$$[6] \quad B = \hat{x}^{-1} \cdot \left(I - A\right)^{-1} \cdot \hat{f}$$

The matrix (or operator) B reclassifies the branches into blocks or sub-systems and therefore contains the information on both. Each row represents the branches and each column the blocks. So the element b_{ij} expresses the share of output of the i-th sector that has to be allocated to the j-th block (sub-system or VIS) in order to meet the final demand for the j-th good. The total of the rows in matrix B will therefore equal unity. The elements in the columns cannot be added together as they are composition ratios with different denominators. Nevertheless, as MS suggest, by first multiplying operator B by a variable expressed in homogenous terms (y), it is possible to obtain the total of a column and relativise the corresponding i-th elements to it.

$$[7] \quad G = \hat{y} \cdot B$$

if y is taken to be the vector of the labour units per branch, the generic element G_{ij} will tell us the quantity of labour units required of the i-th sector by the j-th VIS to produce a unit of final demand of the VIS j.

By relativising matrix G to the column total:

$$[8] \quad C = G \cdot \left(i \cdot G\right)^{-1}$$

we will obtain matrix C whose generic element C_{ij} will be the share of work units coming from the i-th branch required by the j-th VIS to produce a j-th unit of final demand.

The use of this operator has been criticised on occasions (see for example Proseretti 1986 and Rampa 1986), in particular concerning its weakness in grasping technological changes. Indeed, the same authors underline: «Nevertheless despite its properties (editor's note: independence from variations in relative prices), the operator B is not an indicator of technological change that does not relate to the relative prices. It is an indicator of the technical change and modification in final demand and the effects of the two on B are apparently inseparable[6]» (MS 1982).

[6] Even though the same authors state in a later work (1986): «We are convinced that the final demand and change in techniques are linked by complex relationships […] and that the demand performances of single national products are not independent from the technical and organisational changes that have taken place in the respective fields of production» MS (1986).

Other authors have attempted to disentangle this problem. The most interesting approach seems to be that of Buccellato (1990), who proposes an analytical approach that can isolate the effects of changes more correlated to the production system. To this end, he divides the production system into sectors exogenous to the reproduction mechanism (luxury goods, arms and exports) and endogenous variables (production techniques (intermediate demand), possession of fixed capital, volume and composition of labour force consumption). Only the first elements cause structural changes. Hence the author proposes to construct a matrix of the total expense that includes all the flows in endogenous terms described above. This is also called the *reproduction matrix*.

2.2 The Partitioned Activation Matrix Technique

We have seen how the conceptual category of the vertically integrated sector uses the Leontief inverse matrix, reclassifying it in order to group together sub-systems or production blocks similar to vertically integrated sectors. The approach proposed by K. Miyazawa (1974, 1976) is based on opportunely partitioning the inverse matrix. The aim of this partition is to identify what K. Miyazawa calls *disjoined interdependences.* The data expressed in the matrix record the overall effects of inter-sectoral activation, while it would be equally as interesting to obtain information on the partial activation interactions among 2 or more sectors. Miyazawa dealt with the problem by developing the new concepts of the internal and external multipliers.

In short, the procedure consists of partitioning the inter-sectoral matrix of the intermediate flows A into blocks of sectors (or regions).

If we are to use the original terminology, and to consider for the sake of simplicity a system closed off from external exchanges, matrix A with the technical coefficients can be partitioned into two groups of sectors, P (industry) and S (services).

Therefore, the partition layout will be the following:

$$[10.1] \quad A = \begin{matrix} P & P1 \\ S1 & S \end{matrix}$$

where:

P1 = sub-matrix of the services' use of the industrial products;

S1 = sub-matrix of the industrial sector's use of the service products.

The sub-matrices S1 and P1 therefore represent the technical relationships between the two groups of sectors, while P and S inform us about the conditions of production within the macro-sectors.

If we coherently partition the Leontief inverse matrix R so that:

$$[10.2]\quad R = \begin{matrix} R_p & R_{P1} \\ R_{s1} & R_s \end{matrix}$$

R_P and R_S will represent the direct and indirect activation of the goods and services respectively in the face of a unit of final demand for the same, while the off-diagonal partitions R_{S1} and $R_{(P1)}$ will quantify the direct and indirect inter-sectoral activation between industry and services and vice-versa. As underlined previously, these coefficients are the ultimate effects of the activation while it would be more interesting to break up the activation into the various steps making them up and attribute them in causal terms to the various macro-sectors.

By inverting the partitioned matrix (I-A) we can obtain the breakdown required in the following aspects of inter-sectoral propagation:

1. multipliers within the macro-sectors; these will measure the propagation exclusively inside the industrial macro-sectors:

   $$[11.1]\quad B = (I - P)^{-1}$$

   and the services:

   $$[11.2]\quad T = (I - S)^{-1}$$

2. Inter-sectoral effects that can be divided into 4 components:

2.1 the input of services caused by the propagation within the industrial sector:

$$[12.1]\quad B1 = S1 \cdot B$$

2.2 the propagation within services production following the input of services by industry:

$$[12.2]\quad T2 = T \cdot S1$$

2.3 the input of goods caused by the propagation within the services sector:

$$[12.3]\quad T1 = P1 \cdot T$$

2.4 the propagation within the production of goods following the input of industrial products by the services:

$$[12.4]\quad B2 = B \cdot P1$$

3. External multipliers that divide into:

3.1 industrial sector external multiplier that quantifies the propagation effect of a sector due to the internal multiplier initial propagation that goes back to the same after activating the other macro-sector (inter-sectoral propagation and multiplier within the services)[7]

$$[13.1] \quad L = \left(I - B2 \cdot T1\right)^{-1}$$

3.2 service sector external multiplier:

$$[13.2] \quad K = \left(I - T1 \cdot B2\right)^{-1}$$

Matrix R can therefore be broken up into a multiplicational form:

$$[14] \quad R = \begin{pmatrix} B & 0 \\ 0 & T \end{pmatrix} \cdot \begin{pmatrix} I & B2 \\ T2 & I \end{pmatrix} \cdot \begin{pmatrix} L & 0 \\ 0 & K \end{pmatrix} = \begin{pmatrix} L \cdot B & B2 \cdot K \cdot T \\ T2 \cdot L \cdot B & K \cdot T \end{pmatrix}$$

by combining the three activation aspects, that is: internal multipliers, multipliers of inter-sectoral propagation and external multipliers. When the drive comes from the industrial sector the formula [14] can be written in the following equivalent addition form:

$$[15] \quad R = \begin{pmatrix} B + \left(B2 \cdot K \cdot T \cdot B1\right) & B2 \cdot K \cdot T \\ K \cdot T \cdot B1 & K \cdot T \end{pmatrix}.$$

The first term in the diagonal measures the direct and indirect activation and is broken down into the two internal multiplier terms plus the Blair feedback effect (in brackets).

The Miyazawa method has found numerous applications, and has subsequently been refined in both sectoral and spatial terms[8]. As it is inherent to the paper, we should mention the method adopted by Caselli and Pastrello (1982). The authors start off with the consideration that the off-diagonal term of the Miyazawa breakdown may vary not only by modifying the exchange ratio between the two macro-branches, but also due to the effect of a variation in self-propagation. For example, the effect of industry-services propagation is measured by:

$$[16] \quad R_{S1} = T2 \cdot L \cdot B = T \cdot S1 \cdot L \cdot B$$

[7] In the steps of propagation the external multiplier concept is similar to the feedback effect proposed by Blair (1981).

[8] See Hewings *et al.* (1999).

It can therefore vary on the basis of B or T self-activation, a change therefore not inherent in the interdependence ratio between P and S. This interdependence is instead captured by S1·L. If in a particular period there is both self-activation and integration in the services and industry, the variation of the multiplier in the partition R_{P1} will contain both without distinction. As a quick measure for the purpose of the study the authors first of all propose using the variation of the integration of the total of the S1·L elements of R_{P1}, followed by a shift-share type breakdown method in order to avoid distortions due to the double sum. This breakdown can group together the two components that represent the effect of the variation in R_{P1} due to self-activation:

$$[17] \quad {}_{A}R_{S1} = T_t \cdot (S1 \cdot L)_{t-1} \cdot B_t - T_{t-1} \cdot (S1 \cdot L)_{t-1} \cdot B_{t-1}$$

and variation in the integration process[9]:

$$[18] \quad {}_{X}R_1 = T_{t-1} \cdot (S1 \cdot L)_t \cdot B_{t-1} - T_{t-1} \cdot (S1 \cdot L)_{t-1} \cdot B_{t-1}$$

The greatest criticism (see Rampa and MS 1986) of breakdowns concerns the use of matrices at current prices whereas, as we have underlined, it would be more correct to use deflationed tables.

3. The Models of Analysis

The two approaches outlined above have been applied to national data alone (MS) or alternatively to macro-sectors and regions (Miyazawa, Caselli and Pastrello). They have never been applied to macro-branches and regions at the same time. Since this is what we need to analyse in this paper, we therefore need to modify the two approaches to a regional level (MS) or to integrate them (macro-branches + regions).

As far as MS's approach is concerned, if using a bi-regional model, the branch/sub-system matrix will have to be broken down into regions.

The operator B specified in [7] will also have a spatial dimension broken down into two parts (Tuscany-ROI). If we consider two macro-sectors and two VISs for each region, we can obtain a block matrix like this:

$$[19] \quad B = \begin{matrix} {}_{11}B_{TT} & {}_{12}B_{TT} & {}_{11}B_{TR} & {}_{12}B_{TR} \\ {}_{21}B_{TT} & {}_{22}B_{TT} & {}_{21}B_{TR} & {}_{21}B_{TR} \\ {}_{11}B_{RT} & {}_{12}B_{RT} & {}_{11}B_{RR} & {}_{12}B_{RR} \\ {}_{21}B_{RT} & {}_{22}B_{RT} & {}_{21}B_{RR} & {}_{22}B_{RR} \end{matrix}$$

[9] In the article in question, the complete development also includes a leftover term that the authors consider of little numerical importance. The complete formula is thus as follows:
$\Delta R_{P1} = \Delta_A R_{P1} + \Delta_X R_{P1} + res$

where:

$_{11}B_{TT}$ = block containing the percentages of output of the Tuscany macro-sector 1 that flows as input into the Tuscany VIS 1

$_{11}B_{TR}$ = block containing the percentages of output of the Tuscany macro-sector 1 that flows as input into the ROI VIS 1

$_{12}B_{TR}$ = block containing the percentages of output of the Tuscany macro-sector 1 that flows as input into the ROI VIS 2

$_{21}B_{RT}$ = block containing the percentages of output of the ROI macro-sector 2 that flows as input into the Tuscany VIS 1

and so on.

Matrices G and C, which contain the values and shares of the generic variable y respectively, will also be partitioned in the same way.

Therefore the matrix B contains the technical and allocational information (interregional distribution) of the regional VISs. For the sake of analytical simplicity, in the specific case, we identified 8 macro-sectors (agriculture, energy, fashion, manufacturing, trade, other market services, non-market services) then for every sector we calculated a VIS identified in spatial terms. As far as matrices G and C are concerned, we then filled them using both the effective production and the work units.

In the Miyazawa model the partition must also be consistent with both a sectoral and spatial analysis, therefore the matrix of technical coefficients A must be broken down into macro-sectoral coefficients of intra-regional exchange and macro-sectoral interregional coefficients in line with the chosen bi-regional model. The resulting matrix R will therefore be:

$$[20] \quad R = \begin{Bmatrix} {}_{P}R_{TT} & {}_{P1}R_{TT} & {}_{P}R_{TR} & {}_{1P1}R_{TR} \\ {}_{S1}R_{TT} & {}_{S}R_{TT} & {}_{S1}R_{TR} & {}_{S}R_{TR} \\ {}_{P}R_{RT} & {}_{P!}R_{RT} & {}_{P}R_{RR} & {}_{P1}R_{RR} \\ {}_{S1}R_{RT} & {}_{S1}R_{RT} & {}_{S1}R_{RR} & {}_{S}R_{RR} \end{Bmatrix}$$

where:

$_{p}R_{tt}$= intermediate input from the Tuscan industrial sectors required by the Tuscan industrial macro-sector

$_{s1}R_{tt}$= intermediate input from the Tuscan service sectors required by the Tuscan industrial macro-sector

$_{p}R_{tt}$= intermediate input from the ROI industrial sectors required by the Tuscan industrial macro-sector

$_{S1}R_{tt}$= intermediate input from the ROI service sectors required by the Tuscan industrial macro-sector

And so forth.

The partitioned inversion procedure (I-R) will produce more internal and external multipliers, however the spatial separation will lead to new elements and a different way of reading them.

The internal multipliers will have to be read not just as propagation within the sector but also within the region or intra-regional propagation. The same goes for external propagation. Take for example the increases in intermediate input connected to an increase in intra-regional propagation within sector P of region T. They will be as follows:

a. [21.1] $_{S1}B1_{TT} = B_T \cdot {}_{S1}R_{TT}$

that is, the input of services from region T caused by the intra-regional propagation within sector P;

b. [21.2] $_{P}B1_{RT} = B_T \cdot {}_{P}R_{RT}$

that is, the input of industrial products from region R caused by the intra-regional propagation within sector P.

c. [21.3] $_{S1}B1_{RT} = B_T \cdot {}_{S1}R_{RT}$

that is, the input of services from region R caused by the intra-regional propagation within sector P.

Mutatis mutandis the type T1 matrices will be partitioned in the same way obviously both for region T and for region R. For the type B2 matrices, again in reference to intra-regional propagation of sector P in region T, they will be as follows:

a. [21.4] $_{S1}B2_{TT} = B_T \cdot {}_{P1}R_{TT}$

that is, the input of services from region T caused by the intra-regional propagation within sector P;

b. [21.5] $_{P}B1_{RT} = B_T \cdot {}_{P}R_{RT}$

that is, the input of industrial products from region R caused by the intra-regional propagation within sector P;

c. [21.6] $_{S1}B1_{RT} = B_T \cdot {}_{S1}R_{RT}$

that is, the input of services from region R caused by the intra-regional propagation within sector P.

For the applicative purposes described in the paper, the Miyazawa method was integrated by the methodology proposed by Caselli and Pastrello described above. This permitted a more accurate identification of the inter-sectoral propagations due to effective production integration.

4. The Data Set

The data set consists of the bi-regional Tuscany-ROI tables estimated by IRPET[10] for the years 1988 and 1997 according to SEC79. These tables are at current prices *départ-usine* in 44 branches of production. The fashion macro-sector includes the branches of «textiles and clothing» and «leather and footwear». In all the applications that involve macro-sectors the branches of transport services, banking, business-related services, and health and education market services[11] will be included under tertiary or marketable services whereas the trade sector will not be included in this definition.

5. The Results

5.1 Use of the Vertically Integrated Sector

The analysis of the integration of the service sector in the manufacturing production processes and above all in fashion begins by estimating an index to measure the incidence of the producer services (TPSinc) in the production processes in the two years of reference (table 1)[12].

Table 1. Work units in the service sector, percentages of the tertiary sector for the production system (TPS) and other components: Tuscany, Rest of Italy 1988/1997

	Tuscany	Rest of Italy	Total
1988			
TPS	31.74	39.29	1664.5
Trade	14.66	10.48	
Final demand	53.60	50.23	5094.6
1997			
TPS	37.69	39.99	-2533.8
Trade	11.35	10.12	
Final Demand	50.96	49.89	-4289.0

Source: author's calculation on IRPET figures

[10] In order to be able to make comparisons over time, we used I-O tables estimated in 2000 according to the construction method cf. Casini-Martellato-Raffaelli (1993) no longer used by IRPET that refers to SEC79 to define the aggregates (*départ-usine i*) and to make classifications (44 NACE-CLIO branches of production)

[11] In SEC79 the latter includes research and development activities. Note that IRPET is currently estimating new multiregional tables according to the new SEC95.

[12]

$$TPSinc = \sum_{i=k}^{n} \frac{\sum_{j=k}^{n} x_{ij}}{x_j} \cdot l_i$$

where:
k= first service sector in the classification
n= number of sectors
l = work unit.

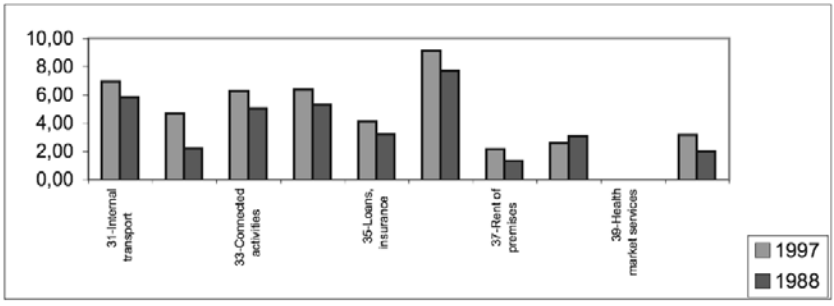
Table 1 shows that in the period from 1988-1997, the share of TPS grew more in Tuscany (+6%) than in the ROI[13] which however started off from higher values. However, demand for TPS by the Tuscan production system would seem to have grown more than the Tuscan producer services could cover as the interregional TPS totals got significantly worse, going from positive figures (net exports of work units) to net imports.

The integration of Tuscan producer services became more widespread which explains the almost all-round increase in labour units in the services recorded in the period 1988-1997 (+11.6% against 5.1% for the ROI).

The TPS incidence describes the importance of the phenomenon in sectoral terms while our goal is more ambitious and as underlined by MS «we need to study the functional destination of the intermediate services and therefore the tertiarisation of the various lines of production, that is, the integration of the service sector in the various vertically integrated sectors».

If we return to the specific case of fashion, graph 1 shows the crossover between the service branches and the vertically integrated sector of fashion in terms of overall input. It is an operator B that refers not to production but to the total of the resources available in matrix B (cf.eq. [9]).

Graph 1. Shares of resources available in the market sectors that flow as input into the VI fashion sector in Tuscany



Source: author's calculation on IRPET figures

The increase in the service sector's technical integration towards the VI fashion sector in Tuscany is evident above all in the services that are more producer services such as «business-related services». In 1988 the share of resources of this branch flowing into the fashion VIS was 7.73% against 5.86% in the ROI, while in 1997 it went up to 9.14% in Tuscany and 6.1% in the ROI.

[13] Many authors agree on the fact that the phase of the biggest increase in TPS took place, on a national level, during the 1970s. For the last year of reference (1975) MS found the figure of 36.28% in their analysis.

In order to give a spatial breakdown, it is useful to use table 2 which sums up the contents of matrix B. This time it refers to production for the VI fashion sector in Tuscany and the ROI compared to the VI manufacturing sector.

Table 2. Shares of production of the market sectors in Tuscany and the ROI that flow as input to the VI fashion sector in Tuscany and the ROI

		Tuscany		ROI	
		Manufacturing	Fashion	Manufacturing	Fashion
1988	31-Land transport	13.41	4.46	23.89	4.83
	32-Sea and air transport	3.47	0.90	9.63	1.72
	33-Supporting and auxiliary transport services; travel agency services	12.13	4.09	21.29	4.25
	34-Post and telecommunication services	8.17	3.86	15.66	4.66
	35-Financial intermediation	4.23	2.52	7.63	2.53
	36-Business activities, R&D and IT	11.65	5.82	20.90	6.35
	37-Real estate and renting	1.66	0.96	3.02	0.94
	38-Education	13.54	1.08	23.24	2.09
	39-Health market services	0.01	0.01	0.15	0.03
	40-Recreational market services	3.68	1.42	6.72	1.44
1996	31-Land transport	16.49	5.35	27.63	5.18
	32-Sea and air transport	11.21	2.71	16.86	2.80
	33-Supporting and auxiliary transport services; travel agency services	15.36	4.73	24.20	4.42
	34-Post and telecommunication services	10.61	4.48	18.33	5.06
	35-Financial intermediation	5.22	2.87	8.47	2.64
	36-Business activities, R&D and IT	15.72	7.14	23.53	6.62
	37-Real estate and renting	2.64	1.35	4.12	1.20
	38-Education	11.18	0.70	27.59	2.08
	39-Health market services	0.00	0.00	0.11	0.03
	40-Recreational market services	5.72	1.95	8.34	1.66

Source: author's calculation on IRPET figures

Since they are shares of regional production that flow into the regional VI sectors the effect of greater integration in the ROI is evident. Nevertheless, what we are interested in is the trend, and in this table we can see confirmation of the greater dynamism of the producer services in the Tuscan integration process (catch-up effect in manufacturing) but even more in the VI fashion sector where we go beyond the catch-up effect and in some cases achieve levels (see 'business-related services') that are greater than in the ROI.

In the period in question there was both a technical growth (graph 1) and a growth in regional production in the Tuscan producer services integration process towards the Tuscan fashion sector. This latter increase was nevertheless not sufficient to balance out the stronger technical integration and Tuscan fashion experienced an increase from 3385 to 6300 billion in the services exchange deficit for its own VI sector.

5.2 Analysis Using Partitioned Matrices

In the analysis using partitioned matrices, we will use the original Miyazawa model, integrated by the Caselli-Pastrello *S1L* type extension that many authors consider the most interesting evolution of Miyazawa's contribution.

Table 3 shows the calculation of the internal and external multipliers as well as the effects of S1L integration for the fashion sector in Tuscany.

Tab. 3. Multipliers associated with S1L integration

		1988	1997
Internal multiplier		1.17803	1.10952
Integration effect Tuscany	Manufacturing	0.07663	0.07750
	Market services	0.04473	0.06631
	31-Land transport	0.01071	0.01467
	32-Sea and air transport	0.00010	0.00097
	33-Supporting and auxiliary transport services; travel agency services	0.00192	0.00228
	34-Post and telecommunication services	0.00260	0.00419
	35-Financial intermediation	0.00782	0.01008
	36-Business activities, R&D and IT	0.01807	0.02782
	37-Real estate and renting	0.00168	0.00331
	38-Education	0.00002	0.00002

	39-Health market services	0.00000	0.00000
	40-Recreational market services	0.00188	0.00304
Integration effect ROI	Fashion	0.05920	0.09092
	Manufacturing	0.05874	0.06792
	Market services	0.00217	0.00577
	31-Land transport	0.00098	0.00186
	32-Sea and air transport	0.00120	0.00053
	33-Supporting and auxiliary transport services; travel agency services	0.00000	0.00002
	34-Post and telecommunication services	0.00036	0.00027
	35-Financial intermediation	0.00050	0.00011
	36-Business activities, R&D and IT	0.00071	0.00302
	37-Real estate and renting	0.00000	0.00000
	38-Education	0.00001	0.00002
	39-Health market services	0.00000	0.00000
	40-Recreational market services	0.00000	0.00001
External multiplier		1.00037	1.00019

Source: author's calculation on IRPET figures

The comments on table 3 offer interesting cues starting from the fall in the multiplier within the Tuscan fashion sector to the benefit above all of the integration effect in the fashion sector in the ROI (increase in intermediate intra-sectoral exchanges) and the market services in particular from Tuscany. Within this aggregate the branch that shows the most dynamic trend in terms of integration is without doubt the business-related services and communication branch. As was to be expected given the previous analyses, in this case too, the more dynamic trend in intermediate demand coincided with an increased activation effect towards the services provided by the ROI. Instead, there was a decrease in the external multipliers, which is an indirect sign of a reduction in the propagation effect from the ROI to Tuscany.

6. In Lieu of a Conclusion

Three stylised facts emerge from the analysis.

First of all, the producer services in Tuscany are becoming more and more integrated within the production system. The initial gap in 1988 had

almost been made up in 1997. This catch-up process made Tuscany experience the process that had happened in Italy in the 1970s and 80s with the same employment trends (for example the increase in employment in the service sector is mainly due to TPS).

Second, the integration of Tuscan producer services with regard to the VI fashion sector in Tuscany registered a more dynamic trend, taking its values to higher levels than in the ROI. The same can be said if we are to analyse the effects of inter-sectoral propagation.

Third, this trend was not enough to cover the even higher demand for integration expressed by the fashion sector, and this led to a worsening in the interregional exchange of services.

References

Bauer P.T., Yamey B.S. 1951, *Economic Progress and Occupational Distribution*, «Economic Journal», n. 61, pp. 741-755.

Baumol W.J. 1967, *Macroeconomics of Unbalanced Growth*, «American Economic Review».

Buccellato C. 1990, *Input-Output Analysis, Technological Change and Relations between Industry and Services*, «Economic Systems Research», n. 2, pp. 56-63.

CaselliG.P., Pastrello G. 1984, *L'integrazione industria-terziario in Italia tra il 1965 e il 1975. Un'analisi input-output mediante scomposizione dei coefficienti di attivazione*, «L'Industria», n. 3.

Clark C. 1940, *The Condition of Economic Progress*, MacMillan.

Fisher A.G.B. 1939, Production, Primary, Secondary and Tertiary, Economic Record, n. 15, pp. 14-38.

Fuchs V.R. 1968, *The Service Economy*, NBER.

Greenfield H.I. 1966, *Manpower and the growth of producer services*, Columbia University Press.

K. Miyazawa 1976, *Input-Output analysis and the structure of income distribution*, Springer Verlag.

Pasinetti L. 1973, *The Notion of Vertical Integrated Sector in Economic Analysis*, «Metroeconomica», n. 25, pp. 1-29.

Prosperetti L. 1986, *Servizi e sviluppo economico*, in Pasinetti L. (ed.), *Mutamenti strutturali del sistema produttivo,* Il Mulino, Bologna.

Siniscalco D., Momigliano F. 1980, *Terziario totale e terziario per il sistema produttivo*, «Economia e politica industriale», n. 25.

Siniscalco D., Momigliano F. 1982, *Note in tema di terziarizzazione e deindustrializzazione*, «Moneta e credito», n. 138, pp. 143-181.

Siniscalco D., Momigliano F. 1984, *Specializzazione internazionale, tecnologia e caratteristiche dell'offerta*, «Moneta e credito», n 146, pp. 121-166.

Siniscalco D., Momigliano F. 1986, *Mutamenti della struttura del sistema produttivo ed integrazione fra industria e terziario*, in Pasinetti L. (ed.), *Mutamenti strutturali del sistema produttivo,* Il Mulino, Bologna.

Sonis M., Hewings G.J.D. 1999, *Miyazawa's contributions to understanding economic structure: interpretation, evaluation and extensions*, in Hewings G.J.D *et al.* (eds.), *Understanding and Interpreting Economic Structure*, Springer Verlag, Heidelberg (Advances in Spatial Sciences).

E. Conti[1]

Business-Related Services Role in Driving Firms' Competitiveness: a Territorial Study

1. Introduction

The interest of economists in the business-related services sector is due to the central role that it has played in economic development, in particular in the most advanced countries. The tendency towards the vertical break-up of companies and the tertiarisation process that has taken hold since the 1970s have led to a consistent growth in the use of services as intermediate input in the production processes in all sectors, a growth which sped up further in the 1990s following companies widespread application of information technology.

At first economists concentrated above all on the consequences in terms of productivity of the mass inter-sectoral shift of the workforce. The work by Baumol (Baumol 1967) depicts the service sector as a segment characterised by sporadic and mediocre spurts of growth in productivity and a tendentially non-elastic demand. The shift of the workforce from the manufacturing to the service sector may therefore result in imbalanced growth, with rising costs and a decline in the growth rate of productivity and, as a result, of the whole economy. This is the so-called *Baumol's disease*.

On the other hand, since the 1990s the economists' focus has mainly shifted towards the theme of innovation, both concerning *innovation in the services* (the service companies and the innovative processes within them) and *services in innovation* (their role in the division of creative work in the modern innovative systems). According to this perspective, if not already innovative driving forces, service companies nevertheless benefit from the systemic trends and external sources to develop their own

[1] IRPET – Istituto Regionale per la Programmazione Economica della Toscana.

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online), © 2009 Firenze University Press

innovative processes (Evangelista 2000; Gallouj, Weinstein 1997). These innovative processes are not strictly or only technological. Often service companies innovate in organisational terms and in an informal manner, and since it is very difficult to measure the input and output of the production processes, it is also difficult to measure increases in productivity (for a recent review see Metcalfe, Miles 2000; Sundbo 1997, but also Barras 1996; Gallouj, Gallouj 1996; Gallouj, Weinstein 1997). This line of economic literature pinpoints the application of information technology in to the services as the decisive factor in overcoming Baumol's disease. Hence, the services, once a sector with little growth in productivity and a key factor in slowing down the most developed economies, have become a strategic component in increasing the competitiveness of companies, sectors and nations.

A more recent focus of economic literature has since singled out the so-called *knowledge intensive business services* (hereinafter KIBS) in some specific parts of the sector. Characterised by the intensive use of knowledge and specialist skills, these services are an additional driving force in innovating and increasing the productivity of their client companies.

KIBS refers to the set of activities joined by the fact that they supply clients (often another company) with intermediate (often immaterial) input, the production of which requires primarily highly specialised human capital (Bilderbeek *et al.*, 1998). Though as yet there is no unanimous agreement among academics as to a precise sectoral definition of the KIBS, many of the services examined in this research are without doubt part of this set. Belonging to it in particular are all the services offered by the so-called liberal professions which in Italy have been subject, at least until the Bersani Decree was approved, and to a large extent still today, to some of the most complex and extensive regulations in Europe and the world. These regulations are considered responsible by many for slowing down their evolution and modernisation.

This is where the interest stems from as to how the business-related services market works in the Province of Florence. What role do these sectors play? Are they leaders in innovation or protected and inefficient sectors? It is by no means a coincidence that we have selected the Florentine area. We have chosen what is in actual fact the only true metropolitan area in the region, and at the same time its most important administrative hub. As a result, it is here that we expect to find the highest demand for services from the most advanced companies. The study concentrates in particular on analysing the demand expressed by the economic system. How big is the business-related services market and what is it like? What role do the services play in the Florentine economy? To what extent do companies request them; what expectations do they have of them; and how satisfied are they with them? What mechanisms dominate in forming the prices for the services?

1.1 Goals of the Investigation and Methodology

The goal of the research is, therefore, to show the use by Tuscan enterprises of business-related services. Here business-related services is taken to mean those economic activities included in division 74 of the ATECO 2002 classification. They include: legal services, accounting and administrative services, consultancy for tax, finance, administration, strategy, services, etc. employment consultancy services, engineering and architectural technical services, advertising services, staff recruitment series, surveillance services, cleaning and pest control services.

As a result, we analysed the main types of services used by companies, the size of the purchase markets, the criteria for choosing suppliers and the relative levels of user satisfaction, the main deficiencies encountered according to the type of service and the professional figures needed to improve the performance of the companies in the province of Florence.

The investigation was based on a structured questionnaire which was distributed to a sample of 513 companies in the province of Florence, selected from the ASIA 2004 archive[2].

The population of reference comprised all the companies in the province of Florence belonging to the fashion, engineering, transport and information technology sectors that were active in 2004.

A mixed-level sampling method was used: it was layered to take into account the different numbers of employees so as to cover as large a variety of companies as possible while interviewing as few companies as possible. The sample was layered on the basis of the following variables:

- Sector (four types):
  - fashion;
  - metalwork and mechanical engineering;
  - transport;
  - information technology.

- Number of employees (three types):
  - from 1 to 9 employees
  - from 10 to 49 employees
  - over 49 employees.

We tried to interview all companies with over 49 employees.

The interviews were effected using the CATI – Computer Assisted

[2] The CATI survey on companies in the province of Florence is part of a wider survey carried out as part of a research project commissioned by the Regione Toscana and carried out by the University of Florence and IRPET involving companies from the provinces of Florence, Pisa, Livorno, Lucca, Prato and Pistoia.

Telephone Interviewing – system, a standardised mixed method for finding data. The structured interviews were carried out by telephone with an interviewer but, unlike traditional methods, the operator could direct the discourse by asking questions and inputting them directly into the computer.

The interviews took place in the month of February 2007. The average duration of the interviews was between six and eight minutes.

Of the 3,700 companies that were contacted, 513 (13.9%) took part in the survey; 505 of them (98.4%) declared that they had bought professional services during 2006 and only 8 (1.6%) had not bought any services during the year under examination.

Each company that was interviewed could declare buying up to a maximum of 9 types of services. As a result, the percentages of the companies buying the different services does not necessarily add up to 100.

2. Survey Results

2.1 The Requested Services: Company Sector and Size Do Count

For the most part the companies in the province of Florence bought services of little complexity belonging to the categories of legal, accounting and administrative services included in the ATECO K 74.1 set.

Primarily of all, they were administrative, accounting and management services provided to a large extent by accountants, who were used by 82.2% of the companies interviewed. These were followed by employment consultant services (33.3%) and legal services (21.8%). A relevant, although minor part of the of the demand (9.3%) was for Tax Assistance Centres, while development of the Technical Assistance Centres market (2.6%) was still at a very early stage. Security and advertising services were bought by 11.7% and 11.3% of the companies respectively, while in quantitative terms, architectural and engineering services (1.6%) counted for relatively little, with a marginal role played by chemical services (0.4%) (cf. graph 1)[3].

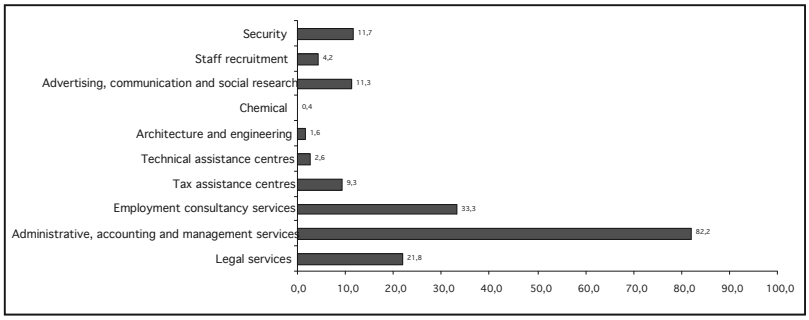
By dividing the services up in terms of the level of complexity of the professional service[4] we get a picture of an industrial system that in the great majority of cases uses quite simple and standardised services. Altogether

[3] Each company could declare to the interviewer that it had bought a maximum of nine services from three different categories. This is why the total distribution of the companies according to the type of service bought often amounts to more than 100%.

[4] In order to analyse the quality of the services requested by the companies, the latter were divided into those which require a higher level of professionalism because they are more complex, and those which are instead simpler and standardised and therefore require a lower level of professionalism. The professional services were classified under the two types described on the basis of the indications that emerged from the interviews with key informants, professionals and representatives of the professional associations.

only 7.6% of the services acquired can be defined as complex and non-standard. The percentage varies greatly between the various service sectors and is particularly low for administrative and accounting services (3%) while it is slightly higher for legal services (10.2%) and employment consultants (9.7%). For architectural and engineering services this percentage rises sharply (40%), substantially thanks to the importance of technical inspections.

Graph 1. Professional services bought in 2006



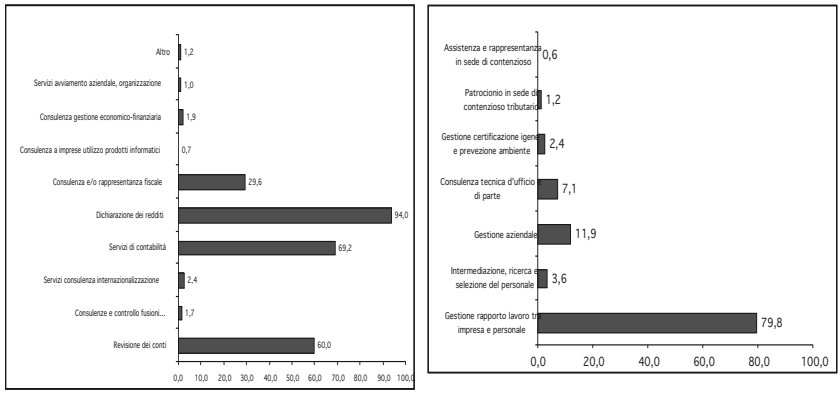
Out of 82.2% of companies that bought administrative services, 94% required a consultancy for their tax return, while only 2.4% required services for internationalisation, 1.9% bought financial planning and consultancy services, and only 1.7% consultancy for mergers, takeovers and asset contributions.

Out of 33.3% of companies that bought employment consultancy services, almost all (95.8%) required consultancy for dealing with the work contracts of their employees (that is accounting, economic, legal, insurance, social security and social aspects); it is important to note that these services, which make up the core of the employment consultants' activity, are included in this professional category along with accountants and lawyers. Only a minority of companies (11.9%) bought high-level services relating to company management, such as analysis, setting up production plans, management checks and cost analysis. Finally, 7.1% of companies bought the services of court or party-appointed experts (see graph 2). Out of 21.8% of those who bought legal services there was a small, although not wholly irrelevant minority of companies that bought high-level legal services, including those for the internationalisation of companies (7.3%), business consultancy (8.2%) and patent law (1.8%).

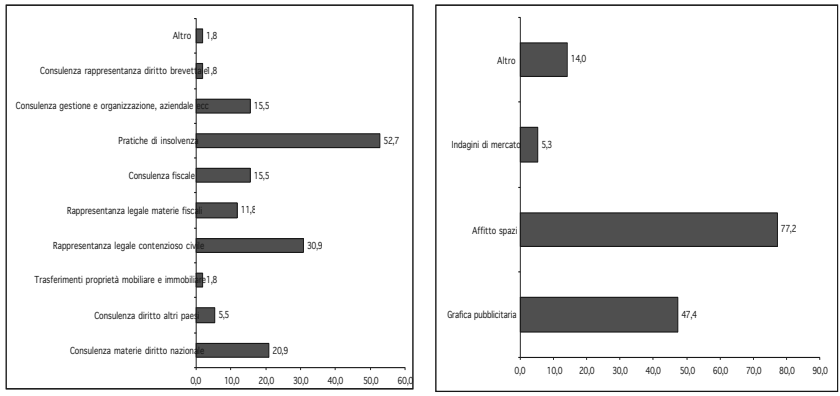
Compared to the other types of services, the Florentine companies' demand for engineering and architectural services featured a bigger percentage of high professional complexity. This was due to technical inspections in particular, which occurred for 20% more in the province of Florence than the average for northern Italian regions. Of the 1.6% of companies that

bought architecture and engineering services, 50% required services for technical checks for certificates and inspections and services to assess the impact and effects of projects and/or plans and programmes, followed by 25% that bought services for planning and restoring buildings and 12.5% that bought services for design, to obtain building permits, estimates and property surveys and along with other services. The demand for advertising services seemed to tend towards standard services. Out of 11.3% of companies that bought services for advertising, communication and social research, 77.7% needed to buy advertising space, 47.4% needed consultancy for advertising graphics, and 14% for other services (see graph 3).

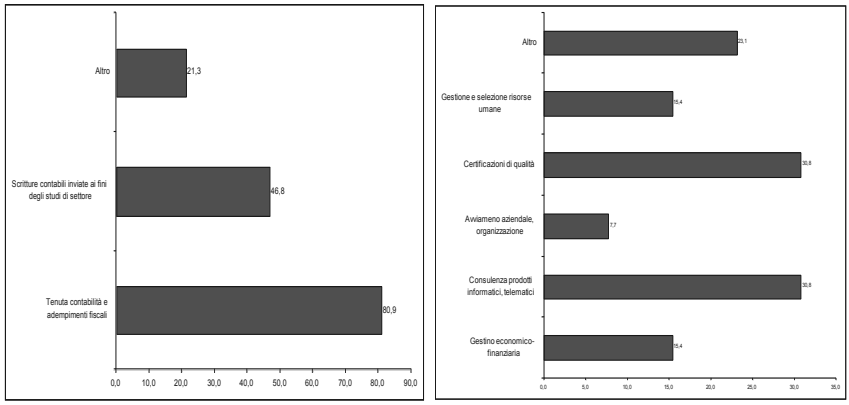
Graph 2. Services bought in administration, accounting and employment consultancy



Graph 3. Services bought in the legal field and in advertising, communication and social research



Graph 4. Services bought from tax and technical assistance centres



No graphs have been put together for staff recruitment or security services because unlike the other services, for example legal services (see graph 3), they cannot be broken down into different types.

Some particularities appear from an analysis of the services bought by the different sectors.

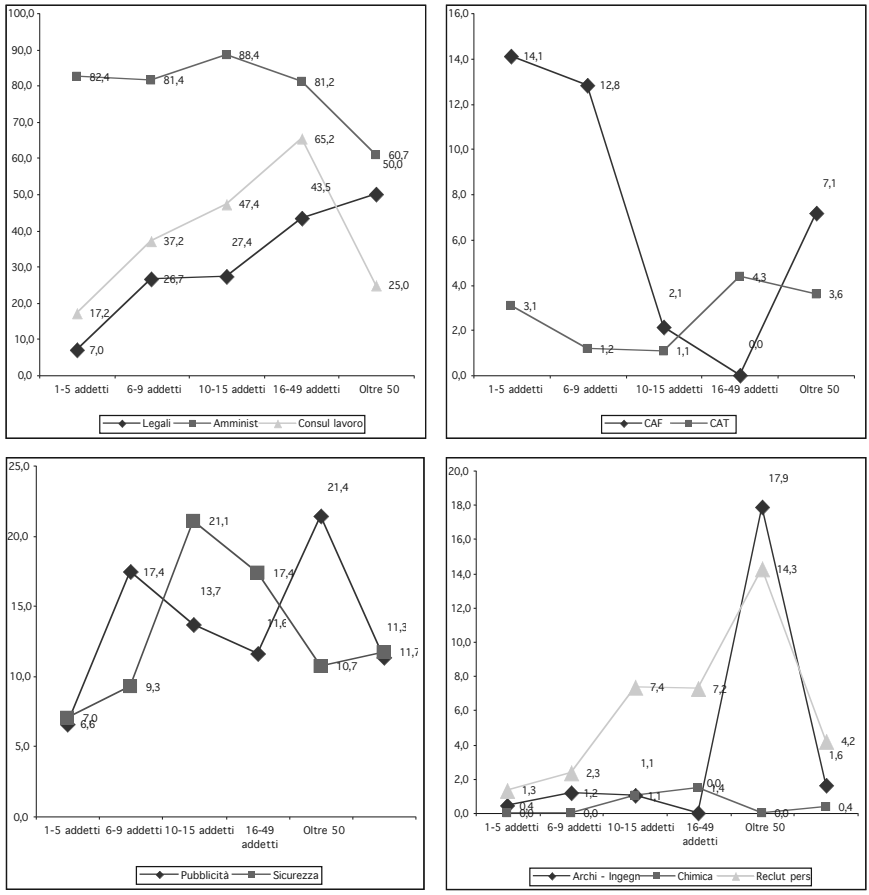
The fashion sector seems in particular to tend to require the standard and simple services provided by accountants and employment consultants, primarily in connection with the management of tax matters and employee relations. This is also partly caused by the small size of the companies and therefore the need to outsource, for example, to deal with the human resources employed by the company. On the contrary, metallurgy and mechanical firms in particular tend to use these services less, although they are the services most purchased in these sectors too. The difference compared to the fashion sector is particularly great if we only analyse the less complex services.

Use of engineering and architectural services was practically non-existent in all the sectors of the fashion system, which also used advertising services very little. This particular fact might seem quite surprising. The component of end products produced by the fashion sector is indeed definitely greater compared to the metalwork and mechanical engineering sector, in which the importance of intermediate goods is, proportionally higher. Therefore, one would expect sectors producing end goods that need promoting on national and international markets to make more use of advertising services. However, in this case too, the industrial structure of the two sectors and the size factor seem to play a decisive role.

Indeed, in Tuscany the fashion sector comprises clusters of small businesses which are often linked to the few leaders in the sector by subcontracting contracts. They have little direct access to the market, therefore advertising services are neither needed nor accessible. The purchase of

more complex services, aimed at better penetration of the international markets or the preparation of company expansion strategies, is reserved to the very few big companies.

Graph 5. Percentage of companies that bought the different types of service according to company size



The use of services relating to engineering and architecture highlights a real size threshold. Only about 1% of companies with less than 50 employees bought this type of service, while once past this size threshold, almost 18% of the companies interviewed used them. This explains to a large extent the total lack of the use of this type of service shown by the sample. They were only bought by the few big companies, which represent a high percentage of the employees and presumably of the overall added value.

Lastly, we tested the significance of the main relationships described in the paragraph using logistic regression, that is the probability of a company buying a highly complex professional service. Unfortunately, due to the small size of the sample, not all the variables turned out to be significant even though the sign of the coefficients was confirmed. Therefore, we used a sample of companies layered in the same way but with more companies (1007), from a wider area (provinces of Florence, Livorno, Lucca, Pisa, Prato and Pistoia). From this additional regression it emerged that the likelihood of a company purchasing a highly complex professional service was significantly higher if the company did not belong to the fashion sector, had more than 5 employees, was a joint-stock company and had a sufficient level of integration, that is, it did not mainly work for third parties. This set of associations gives quite a good explanation of the Tuscan companies' failure to use the so-called knowledge intensive services and therefore the reason why the Tuscan model does not follow the KIBS model described in European literature[5].

2.2 Do Information Asymmetries Still Exist? The Companies' Ability to Assess the Quality of the Service Purchased

Almost all the companies (97.9% of the sample) believed that they were able to give a sufficient assessment at least of the quality of the service purchased. The result is quite important since the theory of professional service regulation hinges around the existence of *information asymmetries* between the professional and the client[6].

In relation to the lesser or greater importance of the information asymmetries, the goods and/or services exchanged are defined respectively as search goods, experience goods and credence goods. In the literature it is now quite widely agreed that only in the presence of markets characterised by *credence goods*, that is by goods/services for which there are large information asymmetries *ex ante* and *ex post*, the absence of regulation generates real and persistent risks of adverse selection and moral hazards, so as to cause inefficient allocation and therefore justify the implementation of a system of rules.

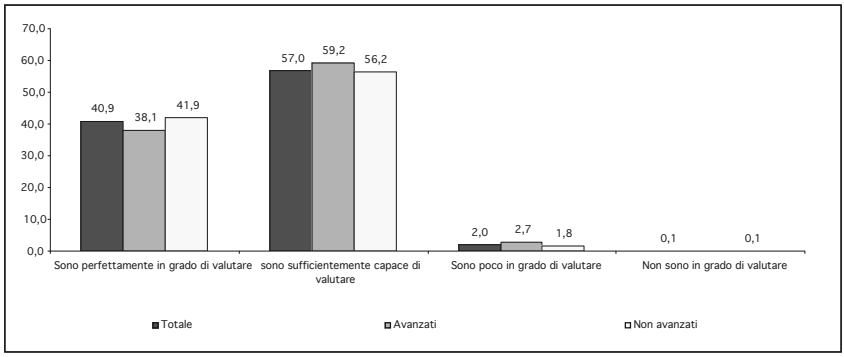
Since *credence goods* are goods or services whose quality cannot be perceived by the user even after use and even if used on more than one occasion, the answer that the questionnaire gives, also taking into account levels of subjectivity, seems to confirm what has been established by the literature[7], that is, that in the case of companies there are no information

[5] For a methodological description and the panel of results, see the statistical appendix.
[6] Among the fundamental contributions to the theory of information asymmetries and minimum quality standards, compare: Akerlov 1970; Leland 1979; Shaeked, Sutton1981; Shapiro 1983, 1986.
[7] Cf. AGCM 1997.

asymmetries such as to justify the existence of such widespread regulation as in Italy[8]. Therefore, the markets seem to be mainly characterised by *experience goods* and to a large extent by *search goods* (approx. 41%), for which regulation appears substantially counterproductive.

In order to calculate variability in the companies' assessment capacities, it does not seem important either to make a division between the more and less complex services or between sectoral or size differences, even though the bigger companies declared that they were to some extent even surer than the small companies of their ability to assess the quality of the services purchased (see graph 6).

Graph 6. Ability to assess the quality of the service purchased



2.3 The Size of the Services Purchase Market

The business-related services markets are characterised by a very local dimension. 55.7% of the companies used suppliers situated primarily in the same municipality or the immediate vicinity, 37.8% used service/professional companies from the province, 4.4% from outside the province but within the region, 1.8% purchased services in other regions and only 0.3% used foreign companies (see table in the appendix).

Associated with the preference for vicinity is the importance of trust as the principal criterion for choosing the professional figure. 59% of the companies chose the supplier of the service on the basis of trust in the professional's loyalty towards them, while the vicinity itself appeared to be a much less important selection criterion (10%). How can these statements be reconciled with the one relating to the lack of information asymmetry? Why is trust and vicinity important if the company has the possibility of assessing the professional's work and, if need be, of replacing them? The

[8] Italian legislative decree no. 223, 4 July 2006.

answers, if read together, lead us to formulate the following interpretation: the professional service markets in Tuscany are small not so much because proximity is important and it means lower access costs, but because vicinity contains the hidden variable of the essential relationship of trust between the professional and the client. According to this interpretation, the companies choose the supplier of the professional service in the vicinity because they select them within a close network of socio-professional relations that are built up in a close territorial area and upon frequent contact. This does not result in information asymmetries, or rather, that the companies do not know how to assess the quality of the service provided by the professional and if necessary replace them. On the contrary, it means that the relationship with the professional is by its nature a one of trust due to the quality of information flow between the company and the professionals themselves.

Then we need to highlight another aspect. The small size of the market is associated in particular with the purchase of not very complex services, which the company buys on quite a frequent basis, where good quality services do not seem to be scarce on the market.

Among the companies that exclusively bought less complex professional services, the percentage that bought the service within the same municipality rose to 60.6%, 34% in the same province, 3.7% in the same region and only 0.7% outside the region. Among the companies that bought at least one high-level service, the percentage of those buying in the same municipality went down to 40%, the percentage of those buying in the province went up to 46.8%, but there were also 6.8% that bought in the region, 4.5% that bought outside Tuscany and 1.4% that used services from outside Italy.

Company size turns out to be another variable that, if considered together with the quality of the service, implies different conduct in relation to the size of the purchase market. Companies with more than 9 employees bought their professional services in the same municipality in 58.1% of cases if they were buying non-complex services, and only in 29.7% of cases if they were buying highly complex professional services. The same companies bought on the regional market in 4.2% of cases for less complex services and in 10.2% of cases if the services were highly complex, and on the Italian market in 1.7% and 6.8% of cases respectively.

Companies with more than 50 employees, alone representing half of the employees in the sample, only bought services in the same municipality in 36% of cases, while 13.8% turned to the regional market, and a further 5.2% went directly abroad.

Only in 27% of cases did companies with more than 50 employees buy highly complex services within the same municipality, while 21.6% referred to the regional market, and 8.1% to a foreign supplier. It is interesting to note how when they do not buy inside the region, the companies with more than 50 employees do not look for their services in Italy, but look directly abroad. The only two companies interviewed with more than 500

employees, in particular, bought half of their services in the province of Florence and the other half abroad.

In the first analysis, the economic sector did not appear to be a very important factor in explaining the variance in the size of the service purchase market. There are differences among sectors far as the total of services purchased, but the underlying feature is the strong reliance on the local market. On the whole, the sector that makes most use of the strictly local market is the transport sector which bought no less than 79% of its services in the same municipality. Instead, the mechanical sector showed a tendency to acquire a smaller share of services in the same municipality (39.5% against an average of 55.5%), even though this was made up for by the greater amount of services bought in the province (46.5%). In the mechanical sector around 11.2% of services were bought on the regional or supra-regional market, against 9% in the textile sector, 3.9% in the leather and footwear sector, 6.3% in the metallurgy sector, 1.3% in the transport sector and 3.9% in the information technology sector.

If we restrict the analysis to high-level services only, the results change slightly. On the whole it was the fashion sector that looked most not to a local but to a regional or extra-regional market (16.9% of cases) against 13.7% in the metalwork and mechanical engineering sector and 3.7% in the transport sector.

There were few companies that on the whole bought services outside the region. In Italy, the region where most services were bought were Emilia Romagna and Lombardy, while the countries of reference for the companies that looked abroad were France and Germany.

The results highlight that the overriding reason for turning to services offered from outside the region consisted not of the excessive price nor the scarce expected quality, but the absence of the required service. However, it needs to be underlined that the number of answers received was so small (five), that this result cannot be considered very significant.

Lastly, we broke down the companies' responses related to the area where services were purchased to take into account the types of services purchased.

The results are of some interest even though they confirm the general local dimension of the service purchase market. Nevertheless, the differentials that emerged from analysing the various types of services bought quite clearly indicate how engineering, architectural and chemical technical services were those with a wider market with around 20% of the companies buying on a regional scale, and a further 5.3% in other Italian regions.

Advertising and staff recruitment services also appear less linked than the average to the local area. Among the companies that purchased advertising services 7.4% used the national market, and 4.5% the regional market. These percentages were more or less inverted in the case of staff recruitment services.

On the other hand, the market for the legal services sector is of a very similar size to the overall average.

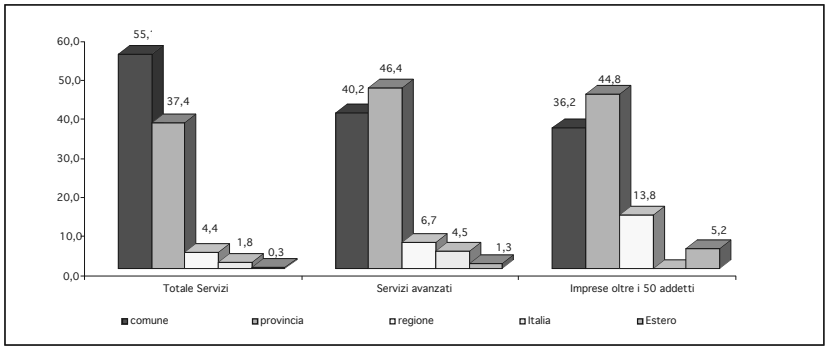
54% of the demand was met within the municipality and a further 35% within the province. The regional market only satisfied 7.7% of the demand with just 2.6% looking to the Italian market.

The types of services that seem to have a minimal market size are those relating to the administration and accounting services of accountants and employment consultants.

In the case of administrative and accounting services and the services offered by the Tax Assistance Centres, just under 60% of the demand was met within the municipality where the company was located or in the immediate vicinity. A further 36-38% purchased the service in the same province. Only 4.5% of the companies that purchased administrative and accounting services turned to professionals outside the province, and just 1.4% to foreign service companies (see graph 7).

A logistic regression analysis, once again carried out on the Tuscan sample, confirmed and corroborated the results highlighted by the descriptive analysis. We modelled the probability that a company would buy its services outside the strictly local sphere i.e. the same municipality. Unfortunately the lack of numbers in the sample prevented us from also modelling the probability of purchase outside the province, or even better outside the region. The probability that a company would buy services outside the same municipality became significantly higher when the firm was a joint-stock company with more than ten employees in the mechanical or information technology sector, which bought at least one technical (engineering or architecture), advertising or legal service and considered the excellence of the service offered as one of the criteria of reference in the choice the supplier.[9]

Graph 7. Geographical area where the service was purchased



[9] Cf. methodological statistical appendix.

2.4 Satisfaction with the Services Purchased: Sufficient but not Totally Satisfactory Services

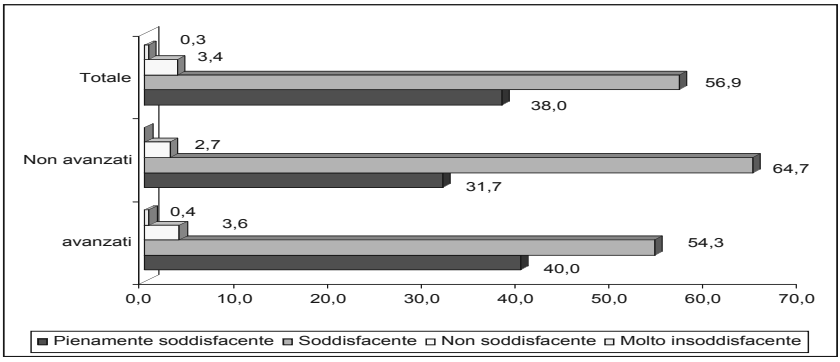
The overall level of satisfaction concerning the services purchased seems quite high. Only 3.7% of the companies were explicitly unhappy with the services, but 'only' 38.0% were fully satisfied. There were in fact 56.9% of companies that considered the service obtained sufficient but not wholly satisfactory. Besides, the percentage of companies that were fully satisfied dipped sharply when judging the highly complex professional services (32%) compared to less complex services (41%).

On splitting the results into sectors we can highlight some particularities. On the whole the transport sector appears to be the segment where there was least friction between expectations and reality. Fully satisfied companies amounted to 75.7% of the total, even though there were 5.5% that were definitely not satisfied. Higher levels of dissatisfaction than the overall average, but still very low, could be seen in the mechanical sector in which 31% were fully satisfied while the number of very unsatisfied companies amounted to 5.8%. The percentage of fully satisfied companies was also less than the average in the textile sector (32.5%).

An analysis on the basis of company size did not come up with any particular patterns or revelations, even though on the whole companies with less than 10 employees tended to be less fully satisfied with the services.

Among the companies not happy with the purchased services, the main reason that emerged for their lack of satisfaction was the insufficient quality of the service (47.5% of cases). The price variable seemed to count much less (25%), and even less so the service's lack of adaptation or completion (12.5%).

Graph 8. Satisfaction with the services purchased



An analysis in terms of company size came up with a notable difference in opinions. For companies with less than 10 employees, the key variable in lack of satisfaction was not quality (26.3%), but excessively high prices

(47.4%); this was followed by the service's insufficient level of adaptation to the requirement (10.5%).

However, the analysis of the reasons for the lack of satisfaction should be considered with much caution given the small number of answers (cf. graph 8).

2.5 Decisive Factors in the Choice of Supplier

A key question in the questionnaire concerned the decisive factors in the choice of a service supplier.

As hinted while commenting on the size of the service markets, the key criterion that emerged from the answers was not the vicinity of the supplier, but the trust that they would effectively provide the service. This response was given by the majority of companies, whatever their size or sector, for both of the service categories, i.e. highly complex and less complex services. Altogether, this was the criterion used to choose the supplier by about 84.2% of the companies in the sample, while vicinity was considered a crucial factor by only 14.5%. The result is therefore very important, but its meaning is not self-evident.

First of all, we compared the lack of importance attributed to vicinity among the factors for choosing the professional with their actual proximity to the company indicated in the answers to the specific question. It is evident that professionals were chosen close by, but not due to the importance that the company attributed to proximity *per se*. Therefore, in other words, there must be a hidden variable that explains the proximity.

The interpretation we put forward here, at least in part, is that it is the central importance of trust in the relationship between the company and the professional that explains the proximity.

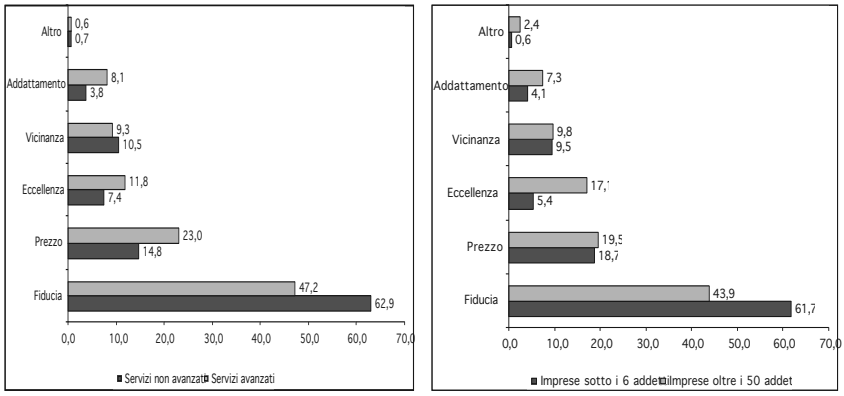
Nonetheless, why should they point to trust as the key factor in selecting a professional when they are able to assess their services (answer 8) and therefore also replace them if they are unsatisfactory?. In order to be able to do their work, the professional figures come into contact with crucial information concerning the company and carry out operations that, even when they are not very complex, can have significant consequences; just think of the importance of the figures in financial statements, both in terms of tax and the market. This is why their loyalty towards the company is crucial. Therefore, the professional is chosen on the basis of trust within a network of professional relationships that are established in a traditional manner and often also in close surroundings. This happens in particular if the qualitative level of the services required by the company is not very high.

The second criterion for choosing the supplier, although a long way behind, was price (23.3% of companies). The result can be read as quite a strong signal that there is little elasticity on the part of the companies in terms of price.

The two criteria concerning the quality of the service, that is, its excellence and adaptation to the client's requests were the two criteria selected least, by respectively 11.9% and 6.7% of the companies.

An analysis concerning the companies that purchased at least one highly complex service highlighted the increased importance of excellence (selected by 19% of the companies) and adaptation (13%) as the choice criteria, but also price (37%), while the importance of trust went down, although not by much (76%) (see graph 9).

Graph 9. Criteria for selecting the service supplier



There were two sectors in which the excellence variable took on more importance. The mechanical sector (19.2% of the companies) and the information technology sector (21.3% of the companies). In the two sectors the companies that chose the supplier on the basis of the service's adaptation amounted to 16.4% and 10.6% respectively, making the quality factor on the whole seem relatively more important compared to the other sectors. This was the case in particular compared to the transport segment and the two fashion sectors in which trust, price and the vicinity of the supplier alone seemed to be the only significant criteria for choice.

An analysis based on company size highlighted a close positive correlation between size and the importance of excellence in the choice of supplier. Around 27% of the companies with more than 50 employees singled out excellence as one of the two fundamental criteria in the choice of supplier, while only 7.5% of the companies with less than five employees did so.

The companies with more than 50 employees, together with those counting between six and nine employees, also considered adaptation (11.8%) and price (30.8%) relatively more important in comparison to the other sized companies.

Considering that the number of employees in the bigger companies counted for around 50% of the whole sample, the abovementioned result seems to

take on a certain degree of importance. The fact that the bigger companies, those which for the most part bought more complex services and which evaluated excellence as a decisive factor in supplier choice, look more than the others to distant suppliers and in particular to foreign markets should lead us to reflect on the quality of the system of professional services in our region.

Even though in numerical terms the companies that looked abroad were few, nevertheless their size and probable location in the production chain lead us to place particular importance on this fact.

Neither did the figure concerning satisfaction, higher among the companies with over 50 employees compared to the others, contrast this. This higher level of satisfaction could indeed be caused by the greater capacity to select suppliers in a not necessarily local market and in some important cases in a supra-national market.

An analysis based on the type of service purchased shows how excellence was considered a more key criterion for technical services (20%), staff recruitment (19.1%) and advertising services (15.5%), followed by legal services (11.5%). The services for which excellence seemed to be seen less as a criterion for selecting the supplier were therefore those provided by the Tax Assistance Centres (7.1%), administrative and accounting services (8.1%) and employment consultants (9.9%). The price variable seemed particularly appreciated by companies purchasing technical, engineering and architectural services, followed by companies buying services from Technical Assistance Centres. Nevertheless, beyond the percentages it is important to note how the classification and to a certain extent also the gaps between the answers relating to the different types of service reflect reflect, on closer inspection the answers relating to market size and the importance of the less complex or more standard services.

Therefore, it can be hypothesised that companies look closer to home for more standardised services which do not require excellence on the part of the professional so much as their loyalty to the company, given the information flow between the two. Relationships remain at the centre of the services market over and above excellence, at least for the less complex services such as accounting, administration and legal services, which is what most of the Tuscan companies make use of.

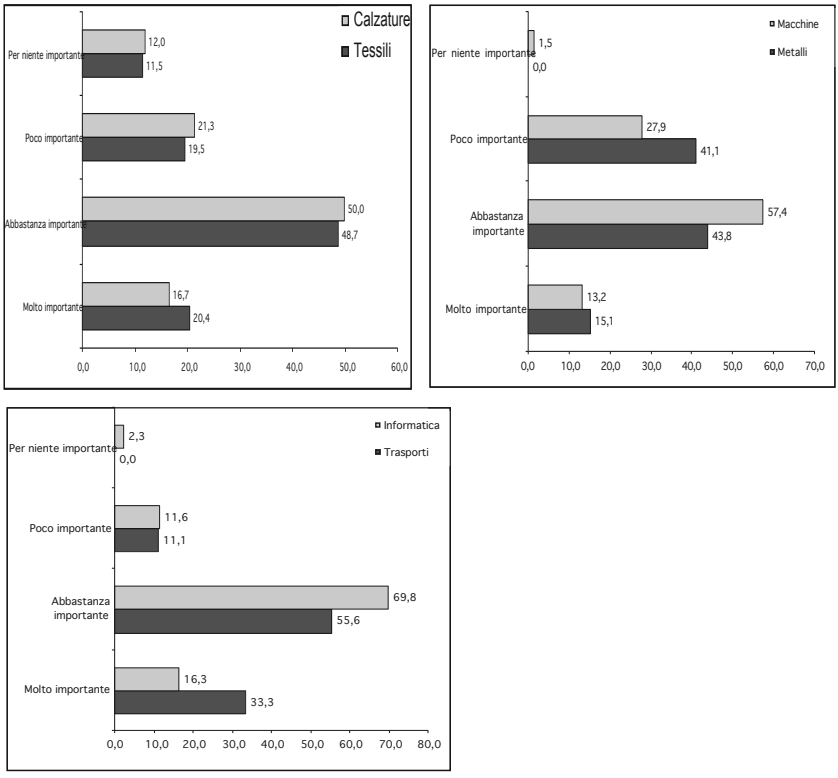
A logistic regression analysis carried out on the Tuscan sample modelled the probablity that a company would select the supplier on the basis of the excellence of the service offered. Once again this confirmed the importance of the size and sectoral variables. Those seeking excellence when purchasing a service were above all the bigger companies who used subcontractors, were joint-stock companies and belonged to the information technology sector, followed by the mechanical sector.[10]

[10] Cf. methodological statistical appendix.

2.6 The Services' Impact on Competitivity

The figures concerning the judgement of the importance of the professional services seems to confirm how they play an important though not always decisive role in the company's level of competitivity. 70% of those interviewed claimed that the services that they purchased were an important or quite important factor in the company's degree of competitivity. Indeed only 18% considered the latter a very important and thus crucial factor (see graph 10). This percentage increased considerably (34%) upon analysis of only those companies with more than 50 employees which represented, in terms of the number of staff, 50% of the sample, and which bought the majority of high-level services (58%). On the contrary, for companies with less than five employees, the services bought, were almost all of a middle-low level (94%), they seemed to be a factor of little or no importance for around 40% of the companies interviewed.

Graph 10. Assessment of the services' impact on the companies' degree of competitivity



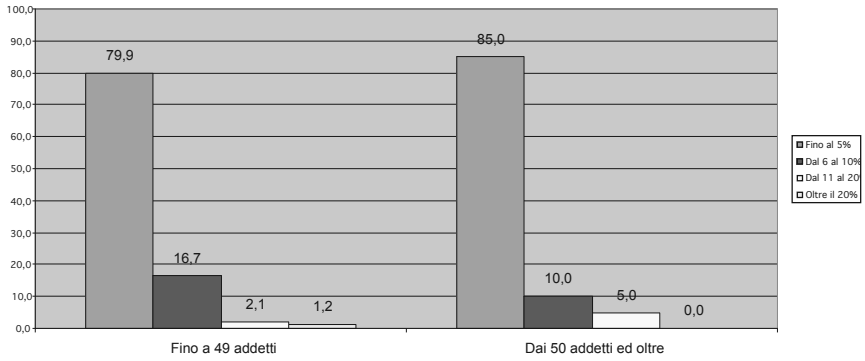
At first sight, the variability of the results among the four sectors analysed does not appear very significant. The transport sector appeared to be the segment in which the services were given most importance (33% of companies).

2.7 Service Costs

The answers to the question on the percentage spent on professional services out of the total costs sustained by the companies gave some interesting results[11].

On average, the percentage of the service costs out of the companies' total production costs, equalling 5.7%, appeared to be in line with the indications in the Italian inter-sectoral tables[12]. which for 2003 highlighted that business services accounted for 5.3% of production at basic prices.

Graph 11. The percentage cost of services for the different company sizes.



In sectoral terms, in line with the findings according to the type of service bought, the information technology and mechanical sector, followed by

[11] In order to calculate the burden of the costs for each general type of service, we crossed over questions 6 and 16. As a result, we produced three tables in which each company could respond from one to three times on the cost burden of each general type of service bought. In order to obtain a total average incidence per type of service, we therefore calculated the weighted average. In the weighted average, the single values were multiplied by the assigned weight (frequency) before being added together. We did not make the division using the number of values but the total of the cost burdens. In our case, we excluded any questions left blank.
The general formula was

$$M_{a,pond} = \frac{\sum_i x_i \cdot f_i}{\sum_i f_i}$$

where f_i is the weight assigned to the value 'i'.

[12] The figure for Tuscany was calculated using the total of divisions 72-73-74, not just division 74.

the transport sector, appeared to be the segments that spent most in relative terms. In particular, for between 16% and 21% of companies in these sectors service costs accounted for between 10% and 12% of their total production costs (see tables 1 and 2).

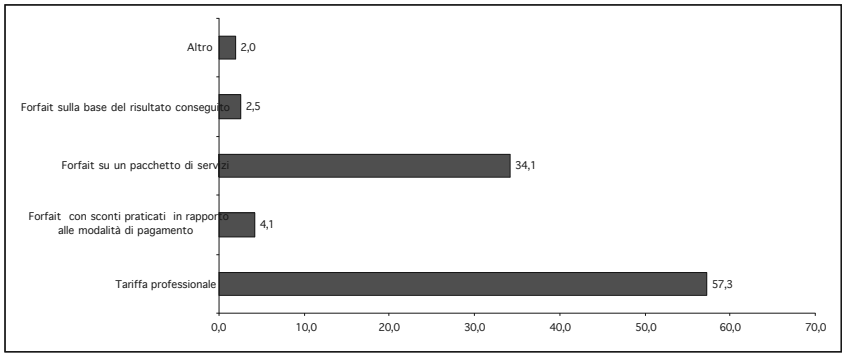
In terms of company size, the result is not wholly clear. The service costs seemed on the whole to account less for companies with more than 50 employees, even though the percentage of firms with service costs of over 11% of their total outgoings was lower in smaller companies.

2.8 Service Payment Methods

As in other cases, the companies could give two answers to the question as to how the companies set the prices for the services.

The results are particularly interesting because they do justice to many statements made by the various professional categories concerning the presumed marginal importance of set rates as the price of reference for the service. No less than 57.3% of the companies declared that the professional rates were the method used to set the price for the service purchased. A lump-sum payment for a package of services also appeared as quite a common payment method (37.6% of the companies), whereas it was very uncommon to calculate the total on the basis of the result obtained (2.8%). Finally, 4.6% of companies reporting discounts depending on the payment method also seems quite significant since these can easily be interpreted as off-the-books payments (see graph 12).

Graph 12. Methods companies use to fix prices for the professional services



3. Conclusions and Policy Suggestions

The business-related services included in category 74 are an increasingly important component in developed economies. This is both in terms of quantity, since they represent an important and growing share

in terms of added value and employees, and in terms of quality. In particular, what we are referring to are the so-called knowledge intensive business services, which make up the great majority of the services, and which, according to the most recent economic literature, are considered responsible for the function of spreading innovation and driving productivity in other branches of manufacturing and in the services themselves.

Recent research by IRPET – the Tuscan Regional Institute for Economic Planning –, publication forthcoming, calculates that in Tuscany the production of business-related services for categories 72-74 has grown in nominal terms by almost 15.6% per annum and that at least 40% of this increase is due to the change in the way goods and services are produced. Thus, business-related services appear to be an increasingly important ingredient in the economic sectors' 'production recipes'.

So, how does the business-related services market work in the province of Florence? Which services do companies request most and what role do they play? How significant are they in terms of costs?

While not lacking some interesting trends, the picture relating to the province of Florence seems very different from the slightly idyllic image often traced by literature on KIBSs. The great majority (80.2%) of companies in the province of Florence only require simple, standardised services, principally accounting for tax returns and tax matters in general, offered mainly by accountants and to a lesser extent by the Tax Assistance Centres. Secondly, the companies require the services for the management of admisnistrative staff, tax and social security matters offered by employment consultants, and legal services used mainly to collect debts and resolve civil disputes or for consultancy on matters of Italian law. While only a tiny minority of companies buy more sophisticated services connected to business consultancy or patent law.

It also emerges that very little use is made of architectural and engineering services, in part because they are only requested by bigger companies, in part because some functions are integrated in the companies, and in part because a large part of the demand comes from families.

In general we can note a significant and positive relationship between the use of more complex services and company size. This relationship also varies according to the different sectors. It is above all the bigger companies and companies from the information technology and mechanical sector that buy the more complex professional services, while the fashion sector, in which the great majority of companies are small or very small, buys almost exclusively low-level services. On the contrary, the few big companies in the sector all buy complex services. Of these, a small but relevant percentage looks to foreign markets. This interpretation is backed by a logistic analysis that confirms the greater probability (38%) that the company model making use of more complex services is a joint-stock company

with more than five employees that does not belong to the fashion sector and is not a contractor.

In general the market size turns out to be small. Professionals are selected on the basis of their proximity to the company and their trustworthiness, from a network of relationships and customary habits, rather than as a result of the quality of the service. This by no means signifies large information asymmetries between the companies and the professionals, as these are excluded by the great majority of those interviewed. Rather it suggests the importance of the trust relationship due to the information flowing between the two. Market size varies both depending on the purchaser's size and sector, as well as the type of service bought. The more complicated the service, the larger the area within which it is bought and the more quality is appreciated in singling out the supplier.

In line with what has been established thus far, companies in the mechanical and information technology sectors as well as bigger companies, i.e. the same companies that buy most of the more complex services, show a greater appreciation of excellence.

Now we consider the result of three queries. First of all, the low elasticity of the demand in terms of price, which appears as one of the key variables in the choice of professional for only 23% of companies. Second the lack of great importance of information asymmetries between the company and service provider. Almost all the companies believe that they are capable of judging the quality of the service bought. This assessment seems to do justice to the debate around the need to regulate the professional services sector. Since there are no great information asymmetries between the contractor and the agent, with a market of substantially *research* or at most *experimental goods*, the quality of which can be seen when the purchase is repeated, subjecting the market to restrictive regulations as is presently the case turns out to be counterproductive in terms of the consumer's affluence, which is transferred to the professionals as income. In this connection, the third answer concerning how the price for the professional services is fixed seems important. Indeed, still in February 2007, in 57.3% of cases the price of the professional service was established according to the rate, for 34.1% a lump sum payment was fixed, while the price was only linked to the result obtained in 2.5% of cases.

In conclusion, the current economic fabric of the province of Florence, to a great extent characterised by small and very small companies in technologically mature sectors, only has a limited capacity to improve the quantity and quality (i.e. modernisation) of the services on offer from professionals.

There are hardly any dynamic KIBS in our area, also because the companies make little use of them. On the other hand, in Tuscany there seems to be a particularly high density of some professional categories: account-

ants and employment consultants first of all, but also architects and lawyers who mainly carry out simple services and apply the professional rates.

The analysis carried out therefore confirms and reinforces the need to free up the business-related service sector. First of all, we need to favour a more competitive set-up, with the goal of lowering the price of services, in particular the less complex and more standard services, for which the presence of minimum rates to protect quality does not seem in any way justified.

Nevertheless, another important circumstance emerges from the survey with striking clarity. The great majority of the services requested by the companies are mainly aimed at satisfying a demand created by the relationship between the company itself and, broadly speaking, the public administration. First of all, the demand is created by relations with the tax authorities, and second by the need to deal with complicated employment contracts, and third the need for civil justice that is at the same time excessive and unfulfilled. Just think of the amount of administrative work needed to set up a company, the growing number of requirements that companies must fulfil in order to obey new national and regional norms, the numerous types of employment contracts that have sprung up all over the place in recent years and are therefore not easy to manage, the complicated relationship with the tax authorities, and, finally, the negative impact of one of the slowest and most uncertain civil justice mechanisms in Europe concerning company competitivity. In particular, the uncertainty regarding the law encourages, as described by Daniela Marchesi, the unscrupulous use of civil justice and overburdening of an administrative machine that is already in grave difficulty.[13] All this forces companies to make excessive use of some types of professional service.

Therefore, if the goal is for companies to reduce the weight of the cost of less complex professional services and to free up resources to invest in more advanced services, which are crucial in order to be able to compete on national and international markets, as well as to make the services – professional service companies - on offer more efficient by freeing the market, in all probability a fundamental springboard would be to simplify the relations between companies and the public administration and to increase its overall efficiency.

[13] Marchesi 2003.

Appendix Statistics

Tables

Questions 1c and 1d _ small owner-operated business (yes/no) and family business (yes/no)[14]

	Owner-operated		Family	
	Frequency	Percentage	Frequency	Percentage
No	205	40	288	56.1
Yes	308	60	225	43.9
Total	513	100	513	100

Question 4 _ As a whole, production is carried out

	Frequency	Percentage
Mainly on own behalf	182	35.5
Mainly for third parties	271	52.8
Both equally	57	11.1
No answer	3	0.6
Total	513	100

Question 5 _ Does the company use subcontractors? yes/no

	Frequency	Percentage
Yes	251	48.9
No	249	48.5
No answer	13	2.5
Total	513	100

[14] The tables relating to the four sectors under consideration were analysed in relation to services bought in 2006.

Question 7 _ Which professional services does the company purchase on a frequent basis?[15]

Architectural services

	Frequency	Percentage
Planning and restoring buildings	2	25
Technical checks and inspection certificates	4	50
Assessment of the impact and effect of projects	4	50
Design	1	12.5
Obtaining building permits	1	12.5
Property estimates and surveys	1	12.5
Other	1	12.5
Go to next question	10	125

Chemical services

	Frequency	Percentage
Chemical analysis of products and validation	2	100
Go to next question	4	200

Question 9_Where is/are the company/ies that provide these services mainly located?

	Frequency	Percentage
In or near your municipality	501	55.1
In your province	340	37.4
Elsewhere in the region	40	4.4
In another region	16	1.8
Abroad	3	0.3

[15] The tables shown only relate to services that were not shown in graphs in the text because the results were not sufficiency significant.

Questionnaire

1 Company details

1a Type of company
1b Sector of economic activity
1c Small owner-operated business (Yes/no)
1d Family business (Yes/no)

2 What are your main products/services (max 2)

3 How many employees does the company have?

1-5
6-15
15-50
50-199
200-299
300-500
Over 500

4. As a whole, production is carried out:

mainly on own behalf
mainly on behalf of third parties
both equally

5. Does the company use subcontractors? Yes/no

---

6. In general, what professional services did the company buy in 2006? (max 3 answers)

Legal services
Administrative, accounting, management services
Employment consultancy services
Tax assistance centres
Technical assistance centres
Architecture and engineering
Geology
Biology

Chemical
Advertising, communication and social research
Staff recruitment
Security

7. What do you require from these services in more precise terms? (start from the list of services used in the previous question giving the general service category type) *see annexed tables*

On the basis of the list of specific services requested (taken from question 6), ask questions 8, 9, 10, 11 and 12 for each service:

8. To what extent do you believe you possess the tools to assess the service quality?

	Quality of the service purchased
I am perfectly able to assess it	
I am sufficiently able to assess it	
I am not very able to assess it	
I am not at all able to assess it	

9. Where is/are the company/ies that provide these services mainly located?

In or near your municipality
In your province
Elsewhere in the region
In another region in Italy → specify which
Abroad → specify country

10. Why did you not use a service company/professional from your region?

Service required not available	
Price too high	
Poor quality of the service	
Failure of the service to adapt to the company's needs	
Expected the service not to be completed properly	
Other – specify	

11. What is your opinion of the service bought?

fully satisfied
adequate

not satisfied
very unsatisfied

12. If you were not satisfied, please indicate why (max. 2)

Price too high	
Poor quality of the service	
Failure of the service to adapt to the company's needs	
Insufficient integration of the professional services required by the company	
Service not completed properly	

13. When you choose which companies/professional firms/professionals will provide their services to your company, what are the two most important criteria?

Excellence/exclusivity of the services offered	
Price of the services offered by the supplier	
Proximity of the service provider to your company	
Adaptation of the service to the company's particular needs	
Trust that the supplier will provide an effective service	
Other (specify)	

14. What impact do the professional services (wherever they are purchased) have on your company's competitivity?

very important
quite important
not very important
not at all important

15. In order for your company to operate well/better, do you consider that you require services that are currently not available on the market?

Yes No

15.a If yes, which?

16. Specify

In percentage terms, how much does the cost of the various professional services impinge on the company's total costs (from the list made in question 2 – general category types)

Total	100%

17. What main methods do you use to establish the price of the professional services that you buy? (max. 2 answers)

Professional rate
Lump sum with discounts depending on the payment method (cash or instalments)
Lump sum for a service package
Lump sum on the basis of the result obtained

Annex: Professional Services

LEGAL SERVICES	
Consultancy regarding matters of Italian law	
Consultancy regarding laws in other countries (for the internationalisation of production processes or companies)	
Transfers of chattels and real estate	
Legal representation in civil disputes	
Legal representation on tax matters	
Tax consultancy	
Liquidation procedures	
Corporate management and organisation consultancy and other business advice services	
Consultancy and representation regarding patent law	
Other	

ADMINISTRATIVE, ACCOUNTING AND MANAGEMENT SERVICES	
Auditing (obligatory/optional)	
Consultancy and checks (review) for mergers, takeovers and asset contributions	
Consultancy services for company internationalisation	
Accounting services (not including tax returns)	
Tax returns	
Tax consultancy and/or representation	
Consultancy on economic-financial management: financial planning, services linked to credit and financial and investment resources	
Services relating to setting up businesses, corporate organisation, business plans, reorganisation, retraining	
Employment consultancy on the use of IT and electronic products	
Drafting corporate communication and marketing plans	
Other business advice services	
Patent law consultancy and representation	
Other	

EMPLOYMENT CONSULTANCY SERVICES	
Management of the employment contract between the company and its employees (accounting, economic and legal aspects, insurance, social security and social aspects)	
Intermediation, seeking and selecting staff through the Fondazione Lavoro dell'Ordine	
Corporate management, that is, analysis, start-up and production plans, tax and social security consultancy, bookkeeping, management checks and costs analysis	
Court and party-appointed experts	
Health and safety at work certificate management	
Aid in tax disputes with tax authority commissions and offices	
Corporate aid and representation in out-of-court disputes (settlements and arbitration) deriving from employee and freelance contracts	
Corporate aid and representation in disputes with social security, insurance and employment institutions	
Other	

TAX ASSISTANCE CENTRES	
Keeping/conserving/checking accounts / Drawing up, compiling, sending tax returns and any additional tax requirements	
Bringing accounts into line with figures sent for industry studies	
Other	

TECHNICAL ASSISTANCE CENTRES	
Consultancy on economic-financial management: financial planning, services linked to loans and financial and investment resources	
Services relating to setting up businesses, corporate organisation, business plans, reorganisation, retraining	
Assistance in accessing EU, national and regional funding	
Employment consultancy on the use of IT and electronic products	
Drafting corporate communication and marketing plans	
Human resources management and selection	
Planning and promotion of business networks and franchises, purchase groups, affiliation	
Certificates regarding quality, consumer safety, environmental protection, work health and safety	

ARCHITECTURAL AND ENGINEERING SERVICES	
Preparation of plans (town planning, landscape, sector) at different territorial levels	
Building planning and restoration	
Project management, tenders and contracts	
Obtaining building permits	
Preparation of urban and local transformation projects and works	
Works management	
Technical checks and certificates, testing	
Real estate estimates and surveys	
Assessment of the impact and effects of projects and/or plans and programmes	
Planning interiors and fittings	

Topographic surveys, marking boundaries, land registry	
Design	
Advertising and communication graphics	
Other	

CHEMICAL SERVICES	
Chemical analysis of products and their validation	
Planning, works management and testing of industrial plants	
Consultancy for implementing or improving company quality systems in connection with chemical aspects	
Technical consultancy for the use of industrial chemical products	
Chemical and chemical-toxins checks for environmental and industrial security (checks as to the level of danger posed by inflammable, harmful, corrosive, irritant, toxic chemical substances contained or present in containers, reactors, containers for transportation, warehouses, production departments and in any living or work environments)	
Consultancy and opinions on fire prevention; obtaining certificates and relative authorisations	
Legal opinions relating to chemical analyses	
Other	

GEOLOGY SERVICES	
Studies to check and/or assess environmental impact (EIA) and strategic environmental assessment (SEA); certification of geological materials and analysis of physico-mechanical characteristics	
Geognostic and geophysical surveys; geological studies applied to constructions. Analysis, prevention and reduction of geological, hydrogeological, earthquake and environmental risks	
Finding, assessment and management of georesources, including water and geomaterials of industrial and trade interest	
Programming, planning, works management, testing and monitoring geological and geotechnical operations	
Analysis and management of geological, hydrogeological and geochemical aspects of pollution and resulting risks	

Planning and management of works for the exploitation of water resources (wells, springs…)	
Planning specific territorial information systems and their implementation	
Execution of bureaucratic procedures relating to the management of georesources, water domain, town planning and building tools	
Other	

BIOLOGY SERVICES	
Assessment of environmental impact in relation to biological factors. Assessment of environmental parameters (water, air, soil) in order to assess the integrity of natural ecosystems	
Identification and checks of goods of organic origin	
Checks and studies of activity, sterility, harm caused by insecticides, fungicides, antibiotics, vitamins, hormones, enzymes, serum, vaccines, medications in general, radioisotopes	
Identification of pathogens (infective and pests) affecting man, animals and plants; identification of organisms harmful to foodstuffs, paper, wood, artistic heritage; indication of the means to combat problems	
Planning and management of works and plant inspection in connection with biological factors; classification and biology of animals and plants	
Other	

ADVERTISING, COMMUNICATION AND SOCIAL RESEARCH SERVICES	
Include list of services from our questionnaire	
Call centre operations	
Market research	
Advertising graphics	
Advertising space hire	
Other	

STAFF RECRUITMENT SERVICES	
Include list of services from our questionnaire	
Employment agencies	
Other	

SECURITY SERVICES	
Include list of services from our questionnaire	
Other	

References

AGCM, *Indagine Conoscitiva nel settore degli Ordini e Collegi professionali*, 1997.

Akerlov G.A. 1970, *The Market of Lemons: Quality Uncertainty and the Market Mechanism*, «Quarterly Journal of Economics», 84, 3: 488-500.

Leland H.E. 1979, *Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards*, «Journal of Political Economy», 87, 6: 1328-1346.

Marchesi D. 2003, Litiganti, avvocati e magistrati, Bologna, Il Mulino.

Shaeked A., Sutton J. 1981, *The Self-Regulating Professions*, «Review of Economic Studies», 48: 217-234.

Shapiro C. 1983, *Premiums for High Quality Products as Returns to Reputations*, «The Quarterly Journal of Economics», 98, 4: 659-679.

Shapiro C. 1986, *Investment Moral Hazard and Occupational Licensing*, «Review of Economic Studies», 53: 843-862.

L. Buzzigoli
A. Viviani[1]

Energy Intensity as a Competitive Factor in the Industrial Sector: the Case of Italy[2]

1. Introduction

At present the world energy context is characterized by an increasing interdependence and uncertainty. Ever since the oil crisis of the 1970s the energy factor turned out to be an important dimension of international competitiveness. But, the series of events that in the last decade have compromised the stability of oil and gas markets (the oil bust after the Asian financial crisis in 1998, a series of strikes in Europe and Venezuela, the 9/11 terrorist attack, the Iraq war, the rise of Asian demand, the hurricane in the Gulf of Mexico, which damaged oil and gas production and refining plants, the Russia/Ukraina gas dispute etc.), drove prices to particularly high levels and led policymakers to consider the energy problems even more seriously than before (World Energy Council 2006).

On the other hand, the ultimate objective of the Kyoto Protocol, that is the prevention of irrecoverable environmental damages to the climate system, commits the contracting parties to reduce greenhouse gas emissions by at least 5% from 1990 levels by the period 2008-2012: the consequent measures are going to impact deeply in the future energy scenario.

In this international framework the countries which are more energy dependent are facing new challenges for their future economic competitiveness.

In the European Union, in particular, the energy dependency is rising (Eurostat 2006b): between 1995 and 2004 energy consumption in the EU25

[1] Dipartimento di Statistica «G. Parenti», viale Morgagni 59, 50134 Firenze, Italy, e-mail: buzzigoli@ds.unifi.it, viviani@ds.unifi.it.

[2] Revised version of the paper «New Challenges in Competitive Analysis» presented at the 63rd International Atlantic Economic Conferente (Madrid, 14-18 March 2007).

Alessandri Viviani (a cura di) *Firms and System Competitiveness in Italy*,
ISBN 978-88-8453-935-9 (print) ISBN 978-88-6453-936-6 (online), © 2009 Firenze University Press

rose by 11%, production fell by 2% and net imports rose by 29%. In 1995 the energy dependence rate[3] was 44%, while in 2005 was 56% and, according to some scenarios, in the next 20 to 30 years it will amount to 70%.

The recent EU Commission Green Paper (Commission of the European Communities 2006) underlines the deficiencies of European internal energy markets and opens the debate on a future common European Energy Policy. A recent contribution to the implementation of the actions outlined in the Green Paper is the Intelligent Energy-Europe Programme[4] – which is part of the Competitiveness and Innovation Framework Programme (2007-2013) of the EU – aiming at «supporting sustainable development in the field of energy by contributing to a number of the EU's general policy objectives, notably the security and stability of energy supply, competitiveness and environmental protection».

In Italy the situation is even more serious: the above mentioned energy dependence rate in 2005 figures up at 86.8% and, at the same time, the GDP growth rate in 2004 and 2005 has been well below the Eurozone average. The strategic role of energy policies for competitiveness is a recurrent theme in the political agenda and in the debate on economic issues.

The paper aims at contributing to the analysis of interrelations between structural economic aspects and energy related issues in Italy in the more general context outlined above.

In order to make the subject less broad we need to establish some strict limits for our work: first of all we limit our analysis to energy intensity, a widespread indicator for monitoring energy use; secondly we will consider only the industrial sector, therefore excluding sectors like transport that have a relevant importance in energy issues; finally, we will use energy intensity decomposition methods, that are well known in the specialised literature as tools to evidentiate a number of different factors that can be of help in explaining the shift in aggregate energy intensity.

The paper is structured as follows. Section two gives a brief overview on energy data and indicators. Section three synthetically describes the energy situation in Italy, with particular attention to the industrial sector. Then section four describes the most popular energy intensity decomposition methods which are successively applied to the Italian context followed by section five where these methods are successfully applied to the Italian context. Finally, a brief concluding paragraph underlines the most relevant results and the possible developments.

[3] The energy dependence rate is defined as net imports divided by gross consumption, expressed as a percentage. Gross consumption is equal to gross inland consumption plus the energy (oil) supplied to international marine bunkers. A negative dependency rate indicates a net exporter of energy. Values greater than 100% occur when net imports exceed gross consumption. In this case, energy products are placed in stocks and not used in the year of import.

[4] See <http://ec.europa.eu/energy/intelligent/index_en.html>.

2. Statistical Sources and Indicators for Energy Studies

The use of energy indicators, both at national and international level, considerably increased after the 1970s oil crisis, when it became clear that the analysis of energy trends and the monitoring of energy policies was essential for assuring an increased efficiency in energy supply and consumption and, at last, progress towards a sustainable development.

Energy use is influenced by a number of factors, both technical and economic, both on the supply side (fuel prices, supplying sources) and on the demand side (consumption typology, economic structure, energy efficiency etc.) in addition to socio-environmental aspects that can interact with it (climate, demography, lifestyle, pollution etc.). As a consequence, energy data are needed in both physical and economic terms.

Most of the studies usually analyze a set of different indicators including (IEA 2004): activity measures, structural development measures and energy intensity ones, in order to consider a set of dimensions that can help in interpreting the reduction or the rise in energy use. The final purpose is often the evaluation of energy efficiency, that is the reduced energy use per unit of economic activity within a particular sector (e.g. industrial sector).

Although «no set of energy indicators can be final and definitive» (IAEA 2005), numerous international agencies have active indicator programmes and set out definitions, guidelines and methods, always trying to develop a shared set of measurements. For instance, the entry «Energy statistics» in the Eurostat Metadata in SDDS format[5] proposes a set of indicators that are recognised as important monitoring instruments.

In any case, their interpretation and usage should be handled carefully, especially when cross-country comparisons are made. First of all, because energy indicators are linked to economic, social and environmental issues and, therefore, the same measure may have different meanings in different countries with different development levels, economies, energy resources etc. (IAEA 2005). Secondly, because the indicators make use of a relevant amount of statistical information, the quality of this information determines the reliability of the corresponding indexes.

In fact, the situation of energy statistics is not good, and the quality of the data produced by national and international agencies suffers from a series of problems that does deserve a proper analysis (Garnier 2004).

The main problem is that often energy statistics are not produced by national statistical offices and therefore they are not included in the frame of official statistics. This is a twofold problem: on the one hand the quality framework are often not satisfied; secondly, integration of energy statistics with other kinds of statistics which are strictly connected with them is not possible.

[5] Available on the web page<http://europa.eu.int/estatref/info/sdds/en/nrg/nrg_indic_sm.htm>.

Therefore it is important to coordinate the efforts of national statistical institutes to improve official energy statistics. Many international organizations have energy statistics on their agenda. The Commission of the European Union has recently proposed a regulation on energy statistics with the primary aim of establishing a «common framework for the collection and compilation of Community statistics on energy production, imports and exports, transformation and consumption». The proposed solution doesn't need a new statistical domain, but introduces a legal basis to improve timeliness, methodological uniformity and comparability of the data that are already collected, in the framework of potentiated international cooperation (Commission of the European Communities 2007).

At a more general level (not only European) the Oslo Group, the UN City Group on Energy Statistics created in 2005, has the main objective of building a multipurpose and coherent system for official energy statistics to monitor the yearly supply and use of energy in a country, and to address all user needs (Secretariat of the Oslo Group 2006).

The review of energy indicators could deserve a large digression. We will only refer to the indicator we are going to analyse in our application: energy intensity. This is one of the most popular energy indicators, used both for national analysis and for international comparison, measured as a ratio of energy inputs to GDP.

Aggregate energy intensity at time t is denoted as:

$$I_t = \frac{E_t}{Y_t}$$

where E_t is the total energy consumption and Y_t is the total production.

At national level energy intensity measures energy consumption per unit of GDP (taken at constant prices), while at industrial level the production is measured by means of value added.

Energy consumption is measured in units of oil equivalents. For instance, very often the unit of measurement is the «tonne of oil equivalent» (toe) and its multiples (like the Mtoe, million of toes), which permit one to compare and aggregate different fuels, originally measured in different units. Note that it should be regarded as a measure of energy content rather than a physical quantity. The conversion factors for each type of fuel used for the calculus are usually available in the publications reporting energy statistics (see, for Italy, ENEA 2005).

The aggregate variation in energy intensity can depend on:

- a higher technical efficiency (a lower consumption with the same production or the same consumption with more production);
- a change in the structure of the economic system;

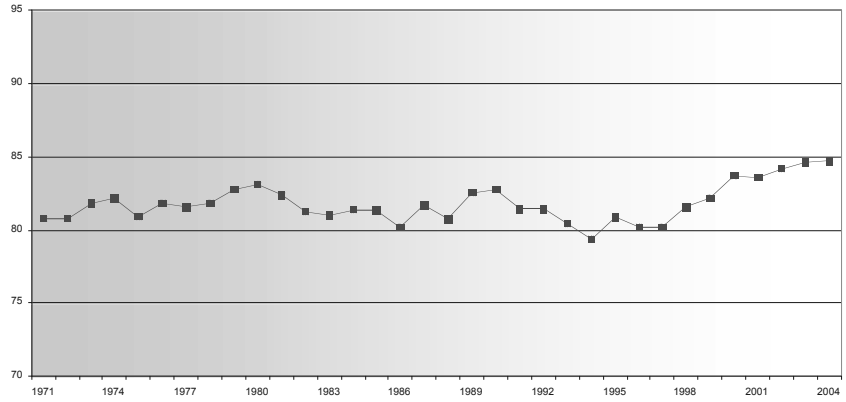
- a growth of the value added (due to [a] above-mentioned condition or due to substitution effects between productive factors that are more «output oriented»).

The indicator can be built at various aggregation levels: it gives «a picture of the decoupling of energy use from GDP growth» (Eurostat 2006a).

3. The Situation in Italy

Italy is one of the world's largest economies, but its domestic energy sources are very limited: therefore, as already said before, Italy suffers from a high energy dependence (EIA 2006), which is also increasing (figure 1).

Figure 1. Energetic dependence (%) for Italy, 1971-2004



The informative basis to evaluate energy dependence is energy balances, which contain basic energy statistics expressed in common units in order to permit the estimation of total energy supply, total energy demand for each different fuel and for the different economic sectors. International organization, such as OECD, produce standardized energy balance sheets for a great number of countries.

Two energy balances for Italy (years 2004 and 2005) are reported in table 1, while the percentage differences are in table 2.

In Italy the energy demand reached nearly 198 mtoes in 2005, the main part of which is imported. The 28% of the 146,591 mtoes for end use are employed in the industrial sector.

As far as the different energy sources are concerned, oil consumption is stable since 1970 and in the primary energy mix oil's share has decreased, while gas' share, together with consumption, has increased (figure 2). The national consumption distinguished by fuel type is in figure 3.

Table 1. Italy's energy balances: 2004 and 2005

Mtoes	2005					
	Solids	Gas	Oil	Renewables	Electricity	Total
Production	0,629	9,959	6,111	12,732		29,431
Imports	16,57	60,605	108,374	0,78	11,058	197,387
Exports	0,196	0,327	28,904	0,001	0,244	29,672
Change in resevers	-0,035	-0,932	0,337	0		-0,63
Availability for domestic consumption	17,038	71,169	85,244	13,511	10,814	197,776
Consumption and leakage in energy sector	-0,517	-0,835	-6,591	-0,086	-43,156	-51,185
Conversion into electricity	-11,892	-25,284	-9,434	-11,598	58,208	0
Total end user	4,629	45,05	69,219	1,827	25,866	146,591
-Industry	4,432	16,97	7,495	0,265	11,899	41,061
-Trasportation		0,384	42,568	0,157	0,853	43,962
-civil use	0,008	26,525	6,625	1,252	12,653	47,063
-agricolture		0,171	2,617	0,153	0,461	3,402
-chemical synthesis	0,189	1	6,492			7,681
-bunkering			3,422			3,422
Mtoes	2004					
	Solids	Gas	Oil	Renewables	Electricity	Total
Production	0,556	10,693	5,445	14,15		30,844
Imports	16,988	56,024	107,804	0,796	10,214	191,826
Exports	0,214	0,326	25,016	0,001	0,174	25,731
Change in resevers	0,248	-0,111	0,276	0		0,413
Availability for domestic consumption	17,082	66,502	87,957	14,945	10,04	196,526
Consumption and leakage in energy sector	-0,486	-0,817	-6,124	-0,075	-43,904	-51,406
Conversion into electricity	-12,147	-22,386	-11,907	-12,833	59,273	0
Total end user	4,449	43,299	69,926	2,037	25,409	145,12
-Industry	4,315	17,329	7,61	0,276	11,864	41,394
-Trasportation		0,364	42,955	0,243	0,826	44,388
-civil use	0,009	24,472	6,597	1,353	12,273	44,704
-agricolture		0,14	2,616	0,165	0,446	3,367

-chemical synthesis	0,125	0,994	6,755	0		7,874
-bunkering			3,393			3,393

Tab. 2. Italy's energy balances: 2004 and 2005 (% changes)

Mtoes	2005-2004 Percent difference					
	Solids	Gas	Oil	Renewables	Electricity	Total
Production	13,1%	-6,9%	12,2%	-10%		-4,6%
Imports	-2,5%	8,2%	0,5%	-2%	8,3%	2,9%
Exports	-8,4%	0,3%	15,5%	0%	40,2%	15,3%
Change in resevers						
Availability for domestic consumption	-0,3%	7%	-3,1%	-9,6%	7,7%	0,6%
Consumption and leakage in energy sector	6,4%	2,2%	7,6%	14,7%	-1,7%	
Conversion into electricity	-2,1%	12,9%	-20,8%	-9,6%	-1,8%	
Total end user	4%	4%	-1%	-10,3%	1,8%	1%
-Industry	2,7%	-2,1%	-1,5%	-4%	0,3%	-0,8%
-Trasportation		5,5%	-0,9%	-35,4%	3,3%	-1%
-civil use	-11,1%	8,4%	0,4%	-7,5%	3,1%	5,3%
-agricolture		22,1%	0%	-7,3%	3,4%	1%
-chemical synthesis	51,2%	0,6%	-3,9%			-2,5%
-bunkering			0,9%			0,9%

Figure 2. Energy consumption in Italy per fuel (mtoe) - 1971-2005

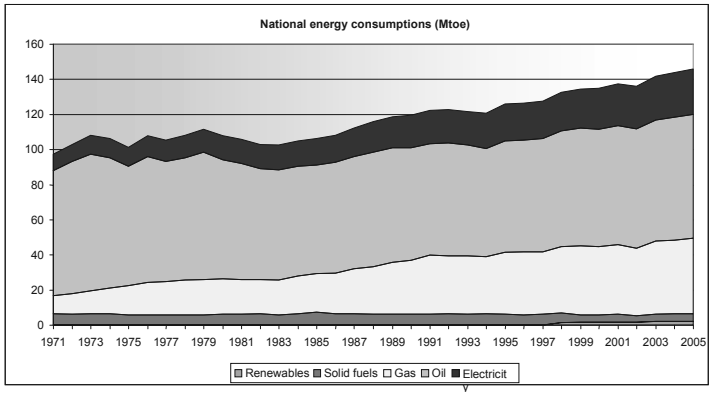
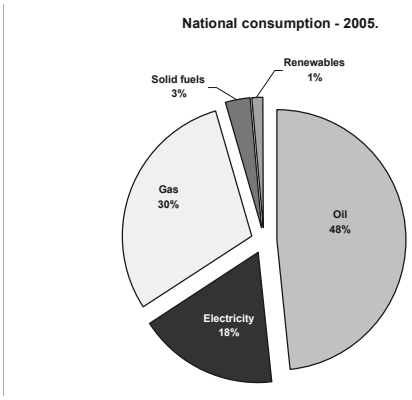


Figure 3. Energy consumption in Italy per fuel: year 2005 (% values)



As far as the industrial sector is concerned, the share of industrial final consumptions has slowly decreased during the last 34 years (figure 4), but at absolute level the industrial final consumptions for the various fuels have followed different trends (figure 5).

Figure 6 shows the composition of the industrial aggregated consumption and evidentiates the oil crisis in the 1970s, the industrial reorganization of the 1980s and the economic crisis in 1992-1993.

These critical periods are visible also in figure 7, showing the industrial value added at constant prices (1995).

Fig. 4. Industry energy final consumption in Italy: industry share vs other sectors 1971-2005

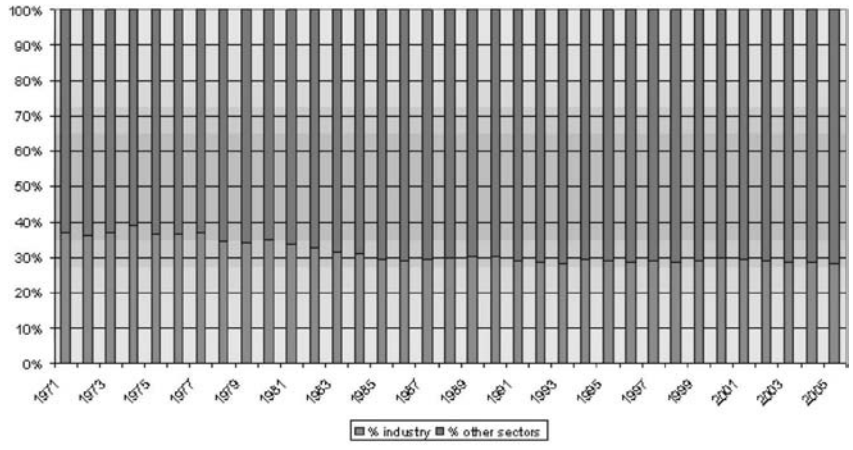


Figure 5. Industry energy final consumption in Italy per fuel (mtoes): 1971-2005

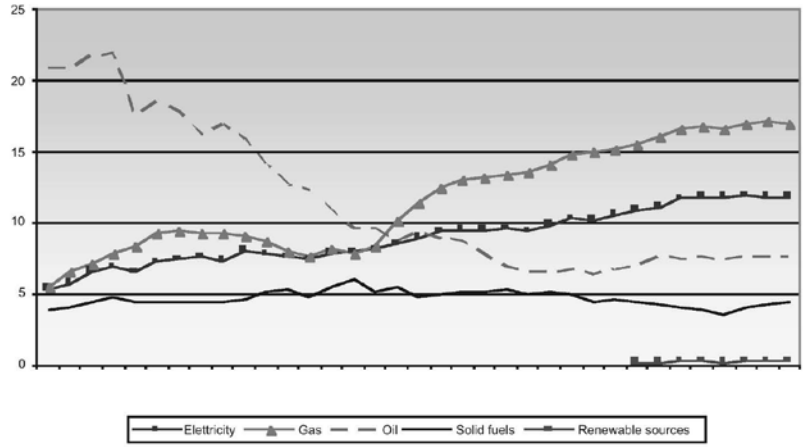


Figure 6. Italian industry energy consumption per sector (mtoes): 1971-2005

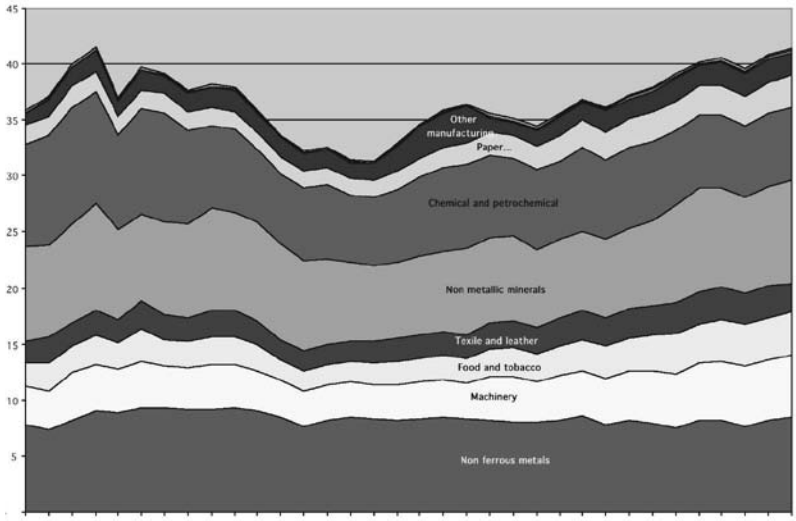
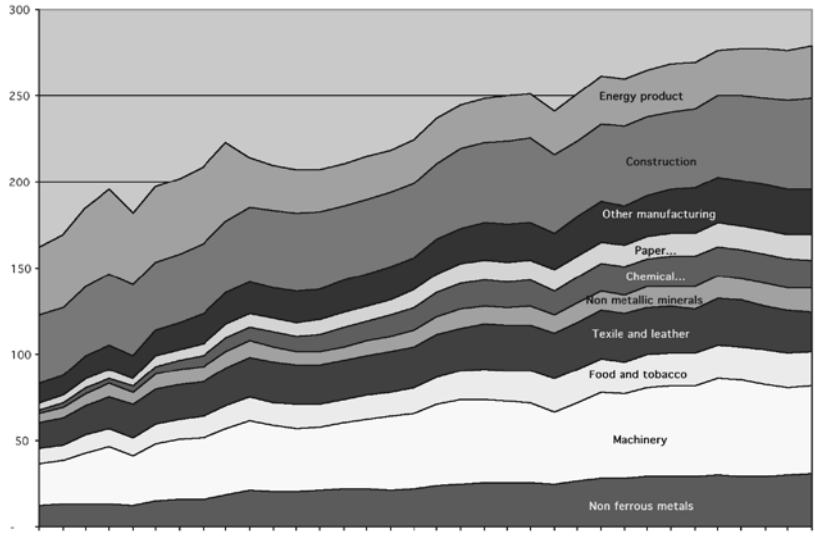


Figure 7. Italian industry value added (billions of Euro-Lire; prices 1995)



4. Decomposition Methods

The use of index decomposition methods to investigate industrial energy demand dates back to the seventies, but these kinds of studies have experienced a renewed interest in more recent years as energy issues became more and more relevant.

Decomposing energy indicators at aggregate level is a method to detect single contributions of different factors.

The literature on the subject presents both methodological contributions and empirical ones.

From the methodological point of view several reviews are available which analyze the characteristics of the various methods (Ang, Zhang 2000; Ang 2004; Liu 2005; Ang, Liu 2007), highlighting advantages and disadvantages for each of them. Some papers refer to the price index methodological framework and transfer many typical results of this formulation into energy analysis.

Historically, the first methods are based on formulation à la Laspeyres, very easy and comprehensible, but in the 90s new methods came into use that tried to solve the shortcomings of the previous ones.

From the empirical point of view these methodologies have been used to fulfill a series of informative objectives: energy trends tracking, monitoring the assessment of predefined efficiency targets, energy demand analysis etc.

In section two we already defined aggregate energy intensity as:

$$I_t = \frac{E_t}{Y_t}$$

The sectoral energy intensity for the generic *i*-th sector is:

$$I_{i,t} = \frac{E_{i,t}}{Y_{i,t}}$$

where $E_{i,t}$ is the energy consumption of sector *i* and $Y_{i,t}$ is its industrial production.

Therefore the production share of sector *i* is defined as:

$$S_{i,t} = \frac{Y_{i,t}}{Y_t}$$

The aggregate intensity can be expressed by means of sectoral intensity and product mix:

$$I_t = \frac{E_t}{Y_t} = \sum_i \frac{E_{i,t}}{Y_t} = \sum_i \frac{E_{i,t}}{Y_{i,t}} \frac{Y_{i,t}}{Y_t} = \sum_i I_{i,t} \cdot S_{i,t}$$

Decomposition methods separate aggregate energy intensity into a structural effect and an intensity effect. The first one depends on the composition of industrial activity, while the second one is due to the different sectoral energy intensities. Therefore this kind of analysis can be of help in evaluating whether a change in aggregate energy intensity can be imputed to a real shift in energy intensity of the various industrial sectors or is it due to a structural change in activity composition.

Aggregate energy intensity decomposition derives from the comparison of energy intensity in two distinct periods, *T* and *0*, and can be developed in additive or in multiplicative form.

The additive form estimates the aggregate industrial energy intensity change ΔI_{TOT}:

$$\Delta I_{TOT} = I_T - I_0 = \Delta I_{STR} + \Delta I_{INT}$$

while the moltiplicative form estimates the aggregate industrial energy intensity index D_{TOT}:

$$D_{TOT} = \frac{I_T}{I_0} = D_{STR} \cdot D_{INT}$$

In any case it is possible to highlight the structural effect (ΔI_{STR} and D_{STR}) and the intensity effect

(ΔI_{INT} and D_{INT})

In the following we will refer only to the multiplicative form.

When the identity is perfectly satisfied we say that there is perfect decomposition. Unfortunately, some of the proposed methods do not guarantee this result and generate an unexplained residual term, which can seriously disturb the analysis. In this case we have:

$$D_{TOT} = \frac{I_T}{I_0} = D_{STR} \cdot D_{INT} \cdot D_{RSD}$$

and D_{RSD} indicates the effect of the residual term.

Among the numerous proposals for the decomposition we chose the methodological frame by Liu and Ang (2003), who introduce a general classification of methods into two groups – Group 1 and Group 2 – on the basis of their properties.

The first group includes Laspeyres/Paasche indexes, often reported in empirical applications; they do not produce perfect decomposition and therefore table 3 includes a column specifying the expression for residuals.

The second group includes indices that adopt the concept of Divisia integral index and are quite different from the indices in Group 1. They are specified in table 4.

Table 3. Formulae for Group 1 methods

Method	D_{STR}	D_{INT}	D_{RSD}
Laspeyres	$D_{STR} = \frac{\sum_i S_{i,T} \cdot I_{i,0}}{\sum_i S_{i,0} \cdot I_{i,0}}$	$D_{INT} = \frac{\sum_i S_{i,0} \cdot I_{i,T}}{\sum_i S_{i,0} \cdot I_{i,0}}$	$D_{RSD} = \frac{D_{TOT}}{D_{STR} \cdot D_{INT}}$
Paasche	$D_{STR} = \frac{\sum_i S_{i,T} \cdot I_{i,T}}{\sum_i S_{i,0} \cdot I_{i,T}}$	$D_{INT} = \frac{\sum_i S_{i,T} \cdot I_{i,T}}{\sum_i S_{i,T} \cdot I_{i,0}}$	$D_{RSD} = \frac{D_{TOT}}{D_{STR} \cdot D_{INT}}$

Table 4. Formule for Group 2 methods

Generic formula	$D_{STR} = \exp\left[\sum_i w_i \cdot \ln\left(\frac{S_{i,T}}{S_{i,0}}\right)\right] \quad D_{INT} = \exp\left[\sum_i w_i \cdot \ln\left(\frac{I_{i,T}}{I_{i,0}}\right)\right]$
Törnquist weights	$w_i = \left(\frac{E_{i,T}}{E_T} + \frac{E_{i,0}}{E_0}\right)/2$
Vartia I weights	$w_i = \frac{L\left(\frac{E_{i,T}}{Y_T}, \frac{E_{i,0}}{Y_0}\right)}{L(I_t, I_0)}$
Sato-Vartia weights	$w_i = \frac{L\left(\frac{E_{i,T}}{E_T}, \frac{E_{i,0}}{E_0}\right)}{\sum_i L\left(\frac{E_{i,T}}{E_T}, \frac{E_{i,0}}{E_0}\right)}$

In the Divisia type indexes D_{STR} and D_{INT} are in exponential form and the weights w_i change according to the specific formula. We had considered Törnquist index, which uses simple arithmetic means of the base and current period value shares as weights, and Vartia I and Sato-Vartia, which make use of the logarithmic mean $L(\cdot)$ of positive numbers defined as:

$$L(x, y) = \frac{y - x}{\ln \frac{x}{y}}$$

The Törnquist index is very popular in the literature, but suffers from two important disadvantages: it cannot be applied directly to data sets with zero values and it doesn't guarantee perfect decomposition.

On the contrary, both Vartia I and Sato Vartia produce perfect decomposition.

The choice of a synthetic Divisia index for the analysis of economic aggregates is justified on the basis of two considerations: first of all, it satisfies numerous formal properties; secondly, this index is consistent with an evolutionary law which gets its main informative content from the economic point of view. In fact, this index is derived from a particular aggregation function which is a second order approximation of numerous differentiable aggregation functions and, in particular, of homogenous functions like the translog (Caves, Christensen, Diewert 1982).

In economic terms, when we hypothesize a particular production function or cost function for the economic phenomenon under study, this is the functional form that permits the more general formulations of returns of scale and elasticity substitution. Therefore, the Divisia formulation permits a more general approach when compared to Laspeyres (or

Paasche), which are coherent with more limited (economic and aggregational) hypothesis.

5. An Application to Italian Data

Although there are many empirical applications of decomposition methods, the analysis of the Italian situation is often included in more comprehensive studies, not specifically interested in the Italian context, and often referring to short periods.

Our aim is to consider the dynamics of energy intensity for the industrial sector in Italy for the time span 1971-2005, in order to distinguish the effect of the structural and the intensity component.

The sources of energy data in Italy are the Ministry for the Economic Development (Ministero per le attività produttive 2000, 2001, 2002, 2003, 2004, 2005) and ENEA, the Italian National Agency for New Technologies, Energy and the Environment (ENEA 2000, 2001, 2005).

The activity in the industrial sector is measured by means of value added at 1995 constant prices, taken from Istat publications.

A practical problem arose from the different classification of the economic activities used in the energy reports and in Istat publications. Another problem was due to some inconsistencies in the data which probably deserve a closer inspection.

The graph of the aggregate energy intensity for industry (figure 8) clearly shows the remarkable decline soon after the 70s and the following stabilization, with only a weak increase in the last three years.

The change, over 30%, has a moderate significance, because it is simply the result of a change in value added of 71.5% and a correspondent less important growth in energy consumption.

As already shown in section two, there are some characteristic periods in the time series of the two aggregates: the oil crisis in the 70s and, in particular, the industrial reorganization in the second half of the 80s, after which the intensity variations seem moderate.

The sectoral intensities are very dissimilar: in order to facilitate the comparison we report them in figures 9-11, always together with the pattern of the aggregate intensity. We use a logarithmic scale on the Y-axis because the intensity values are low in some sectors and much higher in others. Therefore, the differences on the Y-scale are approximations of the relative differences on the original values.

A possible interpretation of the different observed patterns is that there is an industrial group that has an energetic intensity dynamic which converges to the average and it represents the typical activities of the Italian industrial system (textiles, paper, machinery, food and agriculture). Moreover, these industries should have reached an «energy saving» level of activity.

Figure 8. Energy intensity in Italian industry (Toes/1000 €): 1971-2004

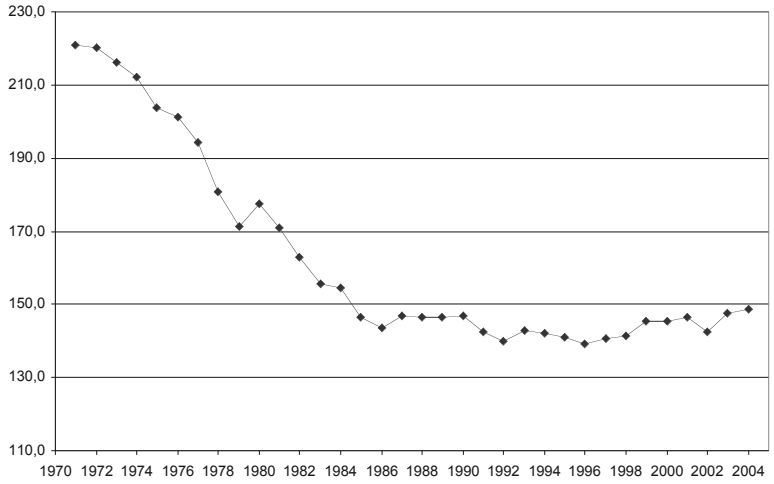
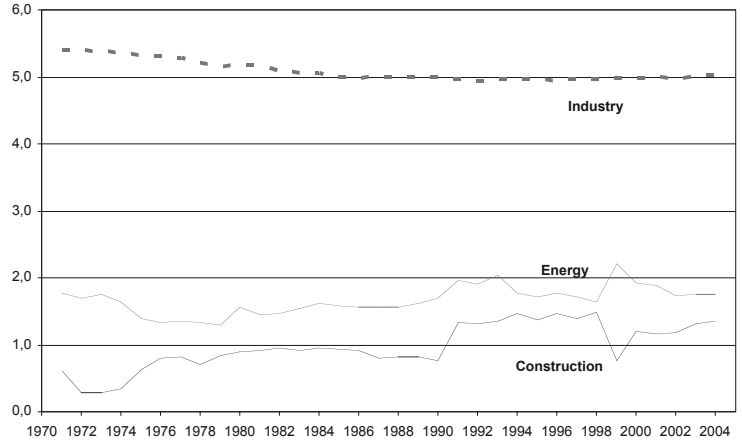


Figure 9. Sectoral energy intensities vs aggregate energy intensity (log scale): 1971-2004



We decomposed these aggregated values with the indexes specified in Table 3 and 4, but Laspeyres and Paasche showed high residuals and therefore we present only the results for Divisia type indexes, in particular for the Sato-Vartia specification, which is also the most informative index.

We applied the index with different basis: 1971, 1991 and 1995, in order to refer to time periods that have a particular economic meaning.

The 1971 basis permits one to highlight the effects of the first oil crisis (1973-1974) and the complete historical pattern of energy intensity evolu-

tion. To look at the problem from a medium/short period point of view, we choose 1991 and 1995 basis for two relevant statistical events: the adoption, respectively, of the new ATECO91 classification and of SEC95 frame.

Figure 10. Sectoral energy intensities vs aggregate energy intensity (log scale)

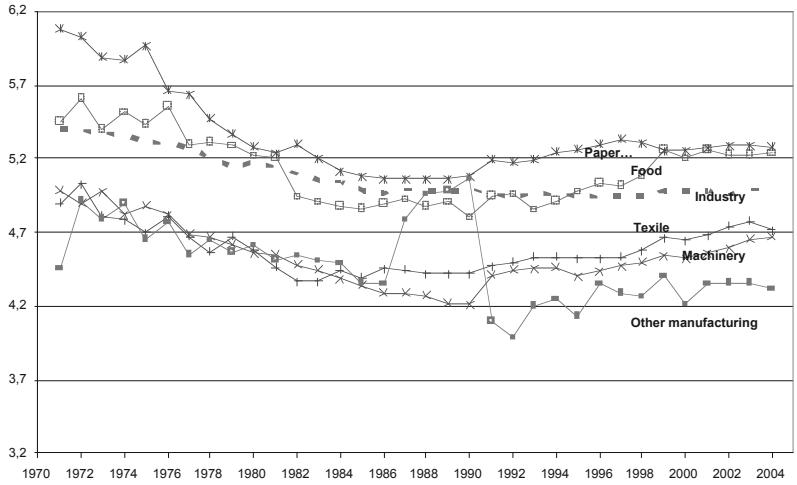


Figure 11. Sectoral energy intensities vs aggregate energy intensity (log scale)

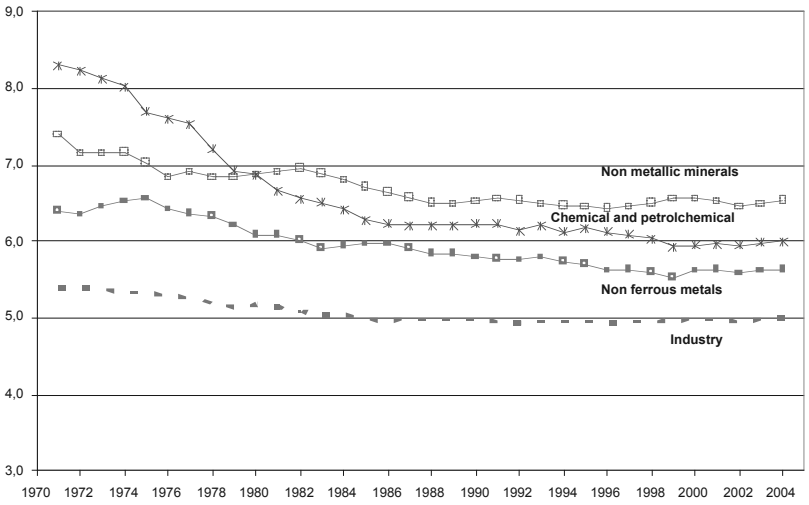


Figure 12. Sato-Vartia (1971=1)

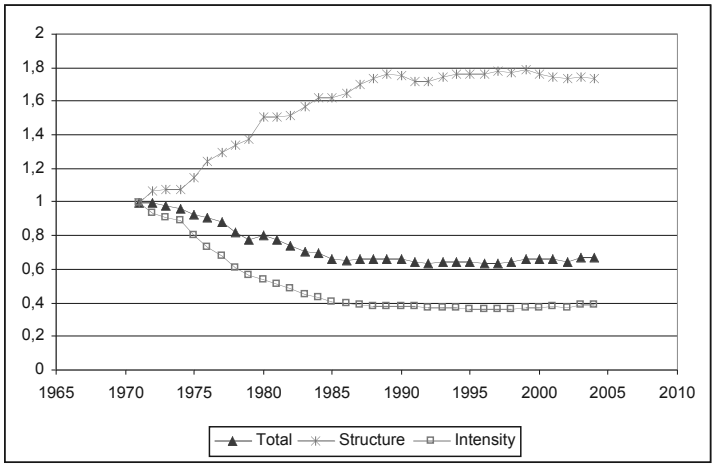
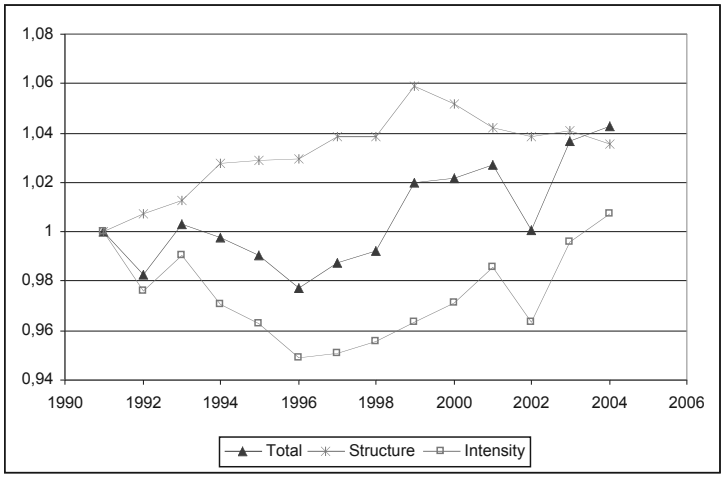


Figure 13. Sato-Vartia (1991=1)

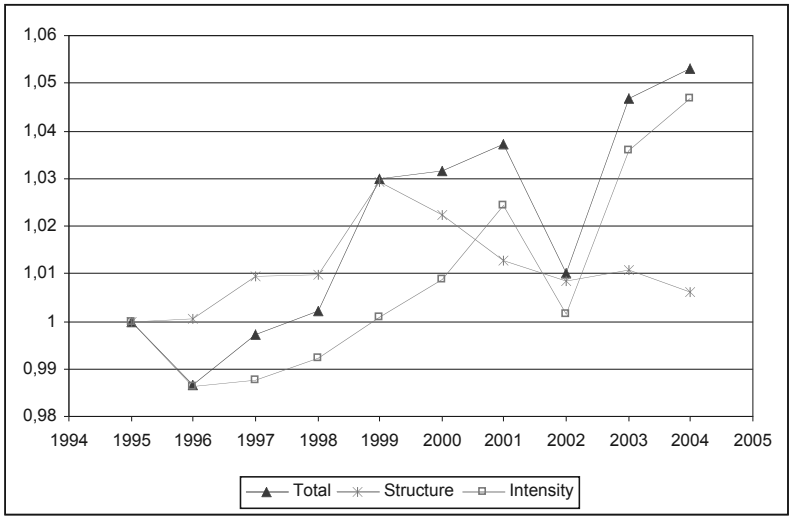


The dynamic of the industrial energy intensity and of the two components (structural and intensity) from 1971 to 2004 with basis 1971 (figure 12) has some important features.

First of all, the total energy intensity index shows a decreasing pattern and in the last period is quite constant. The other two patterns initially diverge, but also tend toward a stationary level.

The intensity component is always under the general index: this means that the drop in energy intensity – the productive structure being equal to

Figure 14. Sato-Vartia (1995=1)



the one in 1971 – would have been even stronger: actually there were some relevant modifications in the productive structure – beginning from the second half of the 80s – that have stabilized the indicator. This situation is easily traced back to the heavy reorganization of the manufacturing system that occurred in that period.

In fact, the structural component is always well above the general index: it shows that the value of the index would have been higher than one, the sectoral intensity being equal to the one in 1971.

Again, when the basis is moved to 1991 (figure 13) the three patterns reflect the same disposition: the general index is intermediate between the structural component and the intensity one, but the last ones converge.

Finally, when the basis is the year 1995 the situation is completely different: from 1999 onwards all the indeces are greater than one, but now the general index is always greater than its components.

6. Conclusions

The aim of this work was that of considering the dynamic of energy intensity monitored in time, catching the interaction between the economic dynamic, summarized by the value addeds, and the employement of energetic resources, interpreted as a complex productive factor, integrated with the direct costs of the production process.

A general consideration refers to the comparison with other analyses on the energetic consumption of the Italian industrial sector which highlight

that Italy has a satisfying general level of energetic intensity because the productive mix has a moderate energy intensity. In other words, the final aim (energy efficiency) would be mainly due to the productive structure effect than to an adequate technology.

In our case, in the period 1991-2004 we notice moderate variations in the general index (less than 5% during the period): the analysis shows that for Italian industry there are limited increments due to a non energy-intensive activities structure.

It is obvious that the context we considered doesn't highlight directly a number of factors that surely influence the phenomenon under study: for instance, the relative prices of energetic products, the comparison with other price dynamics (labor) and cost dynamics (financial and capital services).

References

Ang B.W. 2004, *Decomposition Analysis for Policymaking in Energy: Which is the Preferred Method?*, «Energy Policy», 32: 1131-1139.

Ang B.W., Liu Na 2007, *Energy Decomposition Analysis: IEA Model versus Other Methods*, «Energy», 35: 1426-1432.

Ang B.W., Zhang F.Q. 2000, *A Survey of Index Decomposition Analysis in Energy and Environmental Studies*, «Energy», 25: 1149-1176.

Autorità per l'Energia Elettrica e per il Gas 2006, *Annual Report on Regulatory Activities and of Services*, Milano.

Buzzigoli L., Viviani A. 2006, *Firm and system competitiveness: problems of definition, measurement and analysis*, 62nd International Atlantic Economic Conference (Philadelphia, USA, 5-8 October 2006).

Caves D.W., Christensen L.R., Diewert W.E. 1982, *The Economic Theory of Index Numbers and the Measurement of Input, Output and Productivity*, «Econometrica», 50: 1393-1414.

Choi K.H., Ang B.W. 2002, *Measuring thermal efficiency improvement in power generation: the Divisia decomposition approach*, «Energy», 27: 447-455.

Commission of the European Communities 2006, *Green Paper. A European Strategy for Sustainable, Competitive and Secure Energy*, COM2006 105 final, Brussels.

Commission of the European Communities 2007, Proposal for a Regulation of the European Parliament and of the Council on energy statistics, COM2006 850 final, 10.01.2007, Brussel.

Enea 2000, *Rapporto Energia e Ambiente*, Roma.

Enea 2001, *Rapporto Energia e Ambiente*, Roma.

Enea 2005, *Rapporto Energia e Ambiente*, Roma.

Energy Information Administration 2006, Italy, Country Analysis Brief.

Eurostat 2006a, *Eurostat Structural Indicators Quality profile*, Eurostat Press Office, Luxembourg.

Eurostat 2006b, *News Release*, 126/2006, Eurostat Press Office, Luxembourg.

Gallino L. 2003, *Il declino del''Italia industriale*, Einaudi, Torino.

Garnier J.Y. 2004, *Background, Objectives and Agenda*, Paper presented at the Energy Statistics Working Group Meeting, IEA (Paris, 16-17 November 2004).

International Atomic Energy Agency 2005, *Energy Indicators For Sustainable Development: Guidelines And Methodologies*, STI/PUB/1222, Vienna.

International Energy Agency 2004, *Energy Statistics Manual*, OECD/IEA, Paris.

International Energy Agency 2004b, *Oil Crises and Climate Challenges: 30 Years of Energy Use in IEA Countries*, OECD/IEA, Paris.

Janes M. 2004, *The energy statistician; from number crunching to an important role in the energy debate*, Paper presented at the Energy Statistics Working Group Meeting, IEA(Paris, 16-17 November 2004).

Liu C.C. 2005, *An Overview fo decomposition of Industry Energy Consumption*, «American Journal of Applied Science», 2, 7: 1166-1168.

Ministero Attività produttive 2000, *Bilancio Energetico*, Direzione generale dell'Energia e delle Risorse minerarie, Osservatorio statistico energetico, Roma.

Ministero Attività produttive 2001, *Bilancio Energetico*, Direzione generale dell'Energia e delle Risorse minerarie, Osservatorio statistico energetico, Roma.

Ministero Attività produttive 2002, *Bilancio Energetico*, Direzione generale dell'Energia e delle Risorse minerarie, Osservatorio statistico energetico, Roma.

Ministero Attività produttive 2003, *Bilancio Energetico*, Direzione generale dell'Energia e delle Risorse minerarie, Osservatorio statistico energetico, Roma.

Ministero Attività produttive 2004, *Bilancio Energetico*, Direzione generale dell'Energia e delle Risorse minerarie, Osservatorio statistico energetico, Roma.

Ministero Attività produttive 2005, *Bilancio Energetico*, Direzione generale dell'Energia e delle Risorse minerarie, Osservatorio statistico energetico, Roma.

Nanduri M. 1996, *An Assessment of Energy Intensity Indicators and their Role as Policy-Making Tolls*, Report n. 232, Simon Fraser University.

Secretriat of the Oslo Group 2006, *Proposal for a detailed disposition of the new manuals*.

Unander F. *et al.* 1999, *Manufacturing Enrgy Use in OECD Countries: Decomposition of Long-Term Trends*, «Energy Policy», 27: 769-778.

United Nations Statistics Division 2008, *Preliminary report ob the Global Assessment of Energy Statistics and Balances, Statistical Commission*, 39th Session, 26-28 February 2008.

World Energy Council 2006, *World Energy in 2006*, London.

STRUMENTI
PER LA DIDATTICA E LA RICERCA

1. Brunetto Chiarelli, Renzo Bigazzi, Luca Sineo (a cura di), *Alia: Antropologia di una comunità dell'entroterra siciliano*
2. Vincenzo Cavaliere, Dario Rosini, *Da amministratore a manager. Il dirigente pubblico nella gestione del personale: esperienze a confronto*
3. Carlo Biagini, *Information technology ed automazione del progetto*
4. Cosimo Chiarelli, Walter Pasini (a cura di), *Paolo Mantegazza. Medico, antropologo, viaggiatore*
5. Luca Solari, *Topics in Fluvial and Lagoon Morphodynamics*
6. Salvatore Cesario, Chiara Fredianelli, Alessandro Remorini, *Un pacchetto evidence based di tecniche cognitivo-comportamentali sui generis*
7. Marco Masseti, *Uomini e (non solo) topi. Gli animali domestici e la fauna antropocora*
8. Simone Margherini (a cura di), *BIL Bibliografia Informatizzata Leopardiana 1815-1999: manuale d'uso ver. 1.0*
9. Paolo Puma, *Disegno dell'architettura. Appunti per la didattica*
10. Antonio Calvani (a cura di), *Innovazione tecnologica e cambiamento dell'università. Verso l'università virtuale*
11. Leonardo Casini, Enrico Marone, Silvio Menghini, *La riforma della Politica Agricola Comunitaria e la filiera olivicolo-olearia italiana*
12. Salvatore Cesario, *L'ultima a dover morire è la speranza. Tentativi di narrativa autobiografica e di "autobiografia assistita"*
13. Alessandro Bertirotti, *L'uomo, il suono e la musica*
14. Maria Antonietta Rovida, *Palazzi senesi tra '600 e '700. Modelli abitativi e architettura tra tradizione e innovazione*
15. Simone Guercini, Roberto Piovan, *Schemi di negoziato e tecniche di comunicazione per il tessile e abbigliamento*
16. Antonio Calvani, *Technological innovation and change in the university. Moving towards the Virtual University*
17. Paolo Emilio Pecorella, *Tell Barri/Kahat: la campagna del 2000. Relazione preliminare*
18. Marta Chevanne, *Appunti di Patologia Generale. Corso di laurea in Tecniche di Radiologia Medica per Immagini e Radioterapia*
19. Paolo Ventura, *Città e stazione ferroviaria*
20. Nicola Spinosi, *Critica sociale e individuazione*
21. Roberto Ventura (a cura di), *Dalla misurazione dei servizi alla customer satisfaction*
22. Dimitra Babalis (a cura di), *Ecological Design for an Effective Urban Regeneration*
23. Massimo Papini, Debora Tringali (a cura di), *Il pupazzo di garza. L'esperienza della malattia potenzialmente mortale nei bambini e negli adolescenti*
24. Manlio Marchetta, *La progettazione della città portuale. Sperimentazioni didattiche per una nuova Livorno*
25. Fabrizio F.V. Arrigoni, *Note su progetto e metropoli*
26. Leonardo Casini, Enrico Marone, Silvio Menghini, *OCM seminativi: tendenze evolutive e assetto territoriale*
27. Pecorella Paolo Emilio, Raffaella Pierobon Benoit, *Tell Barri/Kahat: la campagna del 2001. Relazione preliminare*
28. Nicola Spinosi, *Wir Kinder. La questione del potere nelle relazioni adulti/bambini*
29. Stefano Cordero di Montezemolo, *I profili finanziari delle società vinicole*
30. Luca Bagnoli, Maurizio Catalano, *Il bilancio sociale degli enti non profit: esperienze toscane*
31. Elena Rotelli, *Il capitolo della cattedrale di Firenze dalle origini al XV secolo*

32. Leonardo Trisciuzzi, *Barbara Sandrucci, Tamara Zappaterra, Il recupero del sé attraverso l'autobiografia*
33. Nicola Spinosi, *Invito alla psicologia sociale*
34. Raffaele Moschillo, *Laboratorio di disegno. Esercitazioni guidate al disegno di arredo*
35. Niccolò Bellanca, *Le emergenze umanitarie complesse. Un'introduzione*
36. Giovanni Allegretti, *Porto Alegre una biografia territoriale. Ricercando la qualità urbana a partire dal patrimonio sociale*
37. Riccardo Passeri, Leonardo Quagliotti, Christian Simoni, *Procedure concorsuali e governo dell'impresa artigiana in Toscana*
38. Nicola Spinosi, *Un soffitto viola. Psicoterapia, formazione, autobiografia*
39. Tommaso Urso, *Una biblioteca in divenire. La biblioteca della Facoltà di Lettere dalla penna all'elaboratore. Seconda edizione rivista e accresciuta*
40. Paolo Emilio Pecorella, Raffaella Pierobon Benoit, *Tell Barri/Kahat: la campagna del 2002. Relazione preliminare*
41. Antonio Pellicanò, *Da Galileo Galilei a Cosimo Noferi: verso una nuova scienza. Un inedito trattato galileiano di architettura nella Firenze del 1650*
42. Aldo Burresi (a cura di), *Il marketing della moda. Temi emergenti nel tessile-abbigliamento*
43. Curzio Cipriani, *Appunti di museologia naturalistica*
44. Fabrizio F.V. Arrigoni, *Incipit. Esercizi di composizione architettonica*
45. Roberta Gentile, Stefano Mancuso, Silvia Martelli, Simona Rizzitelli, *Il Giardino di Villa Corsini a Mezzomonte. Descrizione dello stato di fatto e proposta di restauro conservativo*
46. Arnaldo Nesti, Alba Scarpellini (a cura di), *Mondo democristiano, mondo cattolico nel secondo Novecento italiano*
47. Stefano Alessandri, *Sintesi e discussioni su temi di chimica generale*
48. Gianni Galeota (a cura di), *Traslocare, riaggregare, rifondare. Il caso della Biblioteca di Scienze Sociali dell'Università di Firenze*
49. Gianni Cavallina, *Nuove città antichi segni. Tre esperienze didattiche*
50. Bruno Zanoni, *Tecnologia alimentare 1. La classe delle operazioni unitarie di disidratazione per la conservazione dei prodotti alimentari*
51. Gianfranco Martiello, *La tutela penale del capitale sociale nelle società per azioni*
52. Salvatore Cingari (a cura di), *Cultura democratica e istituzioni rappresentative. Due esempi a confronto: Italia e Romania*
53. Laura Leonardi (a cura di), *Il distretto delle donne*
54. Cristina Delogu (a cura di), *Tecnologia per il web learning. Realtà e scenari*
55. Luca Bagnoli (a cura di), *La lettura dei bilanci delle Organizzazioni di Volontariato toscane nel biennio 2004-2005*
56. Lorenzo Grifone Baglioni (a cura di), *Una generazione che cambia. Civismo, solidarietà e nuove incertezze dei giovani della provincia di Firenze*
57. Monica Bolognesi, Laura Donati, Gabriella Granatiero, *Acque e territorio. Progetti e regole per la qualità dell'abitare*
58. Carlo Natali, Daniela Poli (a cura di), *Città e territori da vivere oggi e domani. Il contributo scientifico delle tesi di laurea*
59. Riccardo Passeri, *Valutazioni imprenditoriali per la successione nell'impresa familiare*
60. Brunetto Chiarelli, Alberto Simonetta, *Storia dei musei naturalistici fiorentini*
61. Gianfranco Bettin Lattes, Marco Bontempi (a cura di), *Generazione Erasmus? L'identità europea tra vissuto e istituzioni*
62. Paolo Emilio Pecorella, Raffaella Pierobon Benoit, *Tell Barri / Kahat. La campagna del 2003*
63. Fabrizio F.V. Arrigoni, *Il cervello delle passioni. Dieci tesi di Adolfo Natalini*
64. Saverio Pisaniello, *Esistenza minima. Stanze, spazî della mente, reliquiario*

65. Maria Antonietta Rovida (a cura di), *Fonti per la storia dell'architettura, della città, del territorio*
66. Ornella De Zordo, *Saggi di anglistica e americanistica. Temi e prospettive di ricerca*
67. Chiara Favilli, Maria Paola Monaco, *Materiali per lo studio del diritto antidiscriminatorio*
68. Paolo Emilio Pecorella, Raffaella Pierobon Benoit, *Tell Barri / Kahat. La campagna del 2004*
69. Emanuela Caldognetto Magno, Federica Cavicchio, *Aspetti emotivi e relazionali nell'e-learning*
70. Marco Masseti, *Uomini e (non solo) topi* (2ª edizione)
71. Giovanni Nerli, Marco Pierini, *Costruzione di macchine*
72. Lorenzo Viviani, *L'Europa dei partiti. Per una sociologia dei partiti politici nel processo di integrazione europea*
73 Teresa Crespellani, *Terremoto e ricerca. Un percorso scientifico condiviso per la caratterizzazione del comportamento sismico di alcuni depositi italiani*
74 Fabrizio F.V. Arrigoni, *Cava. Architettura in "ars marmoris"*
75. Ernesto Tavoletti, *Higher Education and Local Economic Development*
76. Carmelo Calabrò, *Liberalismo, democrazia, socialismo. L'itinerario di Carlo Rosselli (1917-1930)*
77. Luca Bagnoli, Massimo Cini (a cura di), *La cooperazione sociale nell'area metropolitana fiorentina. Una lettura dei bilanci d'esercizio delle cooperative sociali di Firenze, Pistoia e Prato nel quadriennio 2004-2007*
78. Lamberto Ippolito, *La villa del Novecento*
79. Cosimo Di Bari, *A passo di critica. Il modello di* Media Education *nell'opera di Umberto Eco*
80. Leonardo Chiesi (a cura di), *Identità sociale e territorio. Il Montalbano*
81. Piero Degl'Innocenti, *Cinquant'anni, cento chiese. L'edilizia di culto nelle diocesi di Firenze, Prato e Fiesole (1946-2000)*
82. Giancarlo Paba, Anna Lisa Pecoriello, Camilla Perrone, Francesca Rispoli, *Partecipazione in Toscana: interpretazioni e racconti*
83. Alberto Magnaghi, Sara Giacomozzi (a cura di), *Un fiume per il territorio. Indirizzi progettuali per il parco fluviale del Valdarno empolese*
84. Dino Costantini (a cura di), *Multiculturalismo alla francese?*
85. Alessandro Viviani (a cura di), *Firms and System Competitiveness in Italy*
86. Paolo Fabiani, *The Philosophy of the Imagination in Vico and Malebranche*
87. Carmelo Calabrò, *Liberalismo, democrazia, socialismo. L'itinerario di Carlo Rosselli*
88. David Fanfani (a cura di), *Pianificare tra città e campagna. Scenari, attori e progetti di nuova ruralità per il territorio di Prato*
89. Massimo Papini (a cura di), *L'ultima cura. I vissuti degli operatori in due reparti di oncologia pediatrica*
90. Raffaella Cerica, *Cultura Organizzativa e Performance economico-finanziarie*
91. Alessandra Lorini, Duccio Basosi (a cura di), *Cuba in the World, the World in Cuba*
92. Marco Goldoni, *La dottrina costituzionale di E.J. Sieyès*
93. Francesca Di Donato, *La scienza e la rete. L'uso pubblico della ragione nell'età del Web*

Finito di stampare presso
Grafiche Cappelli Srl – Osmannoro (FI)