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New challenges in the measurement of competitiveness in the economic globalisation

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Globalisation surely affects competitiveness and its measurements, more than other phenomena. The purpose of the paper is to discuss how the concepts, definitions (of the indicators), collection, integration, storage of statistical data and analyses on competitiveness should be reviewed to face the present and future challenges. Some general findings could be a useful guide to review also the production process of statistical information in other economic and social areas.

1. Introduction

Globalisation is an old concept and phenomenon, but in the last decades the level of interdependence, integration and interaction became really pervasive involving primarily the production processes and than all the every day life (Gereffi, 2005). The entry for the Oxford Companion to Politics (Krieger, 2001), states that globalisation is "a process (or set of processes) which embodies a transformation in the spatial organisation 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 the world-wide interconnectedness". It is obvious from this statement, that globalisation regards not only the economic dimension, but it has also a strong social impact.

All these changes modify the relationships among national economies, multinational and transnational organisations, firms, geographical localisations, consumers and so on and enlarge the spectrum of macro, meso and micro-economic policies.

From statistical point of view, we can synthetically say that globalisation provokes two main challenges:

(i) the need for measuring new phenomena (including the globalisation and its effects);

(ii) the need for revising the concepts, definitions, collection and storage of statistical data and analyses of the phenomena affected by the globalisation.

Firstly, the production of statistical information on globalisation processes implies numerous challenges for official statistics, in order to decide *what* is necessary to measure and *how to measure* globalisation and its changes. The analysis of the effects of globalisation generates demand for indicators of globalisation. There are many proposals in this area of interest and, in particular, OECD provided a comprehensive review and good conceptual work and suggestions for the indicators of globalisation in the economic domain (OECD, 2005). Many specific proposals have been made also by other international organisations and National Statistical Offices (as this DGINS Conference surely will point out).

Secondly, all the production processes, transactions and interactions can be affected by the process of globalisation: as a consequence, also the processes to produce statistical information on phenomena affected by globalisation need to be reviewed and, in some case, substantially changed, thus modifying the existing statistics

This paper refers to this second area, focusing on the issues and challenges to face in order to measure competitiveness in a period of economic and social globalisation. As many economists state, among economic phenomena and statistics, surely competitiveness is one of the most important factor of economic policy areas most subject to the influence of globalisation,; at the same time, it entails a growing use of target and performance indicators by governments (see, among others, Kovacic, 2002 and 2004).

In the development of globalisation process, definitions of competitiveness and traditional statistics soon revealed inadequate to obtain more valid, comprehensive and comparable data to carry out the requested analyses, therefore it is important to review them.

To this purpose, in section 2, the concept and definitions of competitiveness are being discussed. Section 3 introduces an example of a possible framework for competitiveness analysis at meso-level, useful also as reference scheme to produce statistical data. Section 4 focuses on the description of the necessary integration of existing and new data, taking into account the Italian experience in this field. Finally, the last section is devoted to some concluding remarks.

2. Concept and definitions of competitiveness

In the last decade competitiveness had considerable relevance for economic policy. For example, the Lisbon European Council set an objective for the EU to become “the most competitive and dynamic knowledge-based economy in the world”.

Therefore, the issue of statistical knowledge of competitiveness performance (of a firm, a sector, or the entire economy), the direction towards it is moving, the factors that affect competitiveness (firms size, specialization in industries, labour productivity, total factor productivity, export performances, investments in R&D, in particular products, processes and management innovation capacity, human capital and so on) have considerable relevance.

Competitiveness can be defined and measured at different levels of economic analysis: nations (macro-level), sectors of economic activities at national and regional level (meso-level) and firms (micro-level). The researches on the field have different variety of perspectives. There are studies involving macroeconomic, microeconomic, business, geographical, sectorial factors which are always interrelated. Therefore, the researchers use the concept of competitiveness in many different ways (Buzzigoli and Viviani, 2006), often overlapping, using different measures and indicators and methodologies of analysis.

Moreover, the globalisation process further enlarged the dimensions of analysis and contributed to the proliferation of definitions and indicators. In particular, in recent years "cluster strategies" have became a popular economic development approach among state and local policy makers and economic development practitioners (The Brookings Institution, 2006), therefore it is necessary to take into account of this approach (that is of the space dimension) as new reference level of competitiveness, and also of the indicators that can describe the clusters, in order to produce adequate statistics.

After all, we have to consider that competitiveness is a dynamic concept, because the factors affecting competitiveness change with time and context.

In conclusion, it is very difficult to give an unanimous definition of the concept of competitiveness. The divergent approaches to competitiveness have produced many different definitions of the concept (as the works of some Institutions like World Bank, OECD, IFM, WEF, Eurostat and the American Council on Competitiveness show). Actually, it is a very general and multifaceted concept and has a multidimensional nature linked to the optimal use of resources and oriented in capturing development perspectives. But, as many authors say, there is not a single "recipe" for achieving the targets.

Therefore, in order to review the statistical process of competitiveness measures and analyses, special attention has to be devoted to statistical issues when building sound indicators, choosing proper informative sources and applying suitable methods of analysis for the different perspectives and aims.

Actually, competitiveness indicators and analyses for national economy undergo criticism since they are not completely grounded in theory and not particularly useful for policy implementation (the concept of national competitiveness has been severely criticized in recent years, see: Pellegrini, 2006; Lall, 2001; Krugman, 1996). The concept of competitiveness is surely clearer and more measurable at

firm and sector level, as business school literature shows (Porter, 1990, 1998, and 2000; Porter and Ketels, 2003). National competitiveness is more difficult to define and, above all, its measurement, in a globalised economy, can be done essentially with reference to a specific sector of activity.

In our opinion, in order to obtain useful information for the implementation of adequate economic intervention policies, it is necessary to discuss the development of indicators and analyses at micro and meso level (at a firm, sector of activity, "cluster" of firms level) by using micro-data available for each firm (McGucking, 1995). Therefore, for the time being, our work is focused on the definitions and analysis of competitiveness at meso level, presenting a framework useful both for the collection of data and different analysis (Biggeri and Bini, 2006).

3. A possible framework for the competitiveness analysis at meso level

From the measurement point of view, competitiveness indicators have to capture something more than a simple growth factors' analysis based on productivity. Variables and their causal relations with growth must be clearly specified and used to capture the multidimensional aspect of the concept and the "recipe" by detecting redundancy, relevance or inter-relation, in order not to ignore complexities in the relationships and ambiguities in causation. The phenomenon refers to a very complex real world, where non linearities, specializations, scale and scope economies matter.

The only way to organize the definitions of competitiveness is a multi-criteria approach which develops different viewpoints for the various dimensions of the phenomenon.

Anyway, as an example of the work the National Statistical Offices have to do in revising competitiveness measure, it is possible to present the following definitions of competitiveness, derived from the Porter works:

- at the firm level (micro-level), competitiveness is the ability to provide products and services effectively and efficiently more than relevant competitors and to generate, at the same time, returns for the investments of the stakeholders;
- at the sector of economic activity of a country (and of a region) and cluster of firms level (meso-level), competitiveness is the ability of one nation's firms of the considered group to achieve sustainable success versus foreign competitors (for the cluster of firms and sector of activity of a region, the success should be also versus the competitors of other clusters and regions of the country).

Economic performance indicators related to competitiveness are different in relation to the level of the units considered (firm, cluster of firms, sector of economic activities) and to the objectives (targets); we have to take into account that there is not a single factor and way for achieving the targets. Anyway,

measures of competitiveness at the firm level include firm profitability and measures of cost and quality, the exports or foreign trade sales of a company divided by output, regional or global market share. Measures of competitiveness at sector of activity level include the overall profitability of one nation's firms in the specific industrial sector, the trade balance in the industry, the balance of outbound and inbound foreign direct investments, direct measures of cost and quality at industry level. An increase in the market share does not necessarily reflect a growth in the level of competitiveness of the firms. At the firm level, among the many suggested indicators, it is in any case important to consider at least: (i) the Return on Investment for the stakeholders; (ii) the productivity for the competition on the market; (iii) the quota of production exported. These last two ones are more significant at cluster and sector of activity levels. Finally, further sub-indicators are useful to gather specific aspects of the competitiveness.

In order to establish the correct framework for statistical analyses, it is important to point out that the competitiveness phenomenon has a hierarchical structure starting from firms level to clusters of firms (also at territorial level), at all firms included in a sector of activity and at all firms and sectors for the national economy. Therefore, this phenomenon is dynamic, multifactor and nested in different hierarchical levels (firms, clusters of firms, and sector of activity, and, if possible, at national economy).

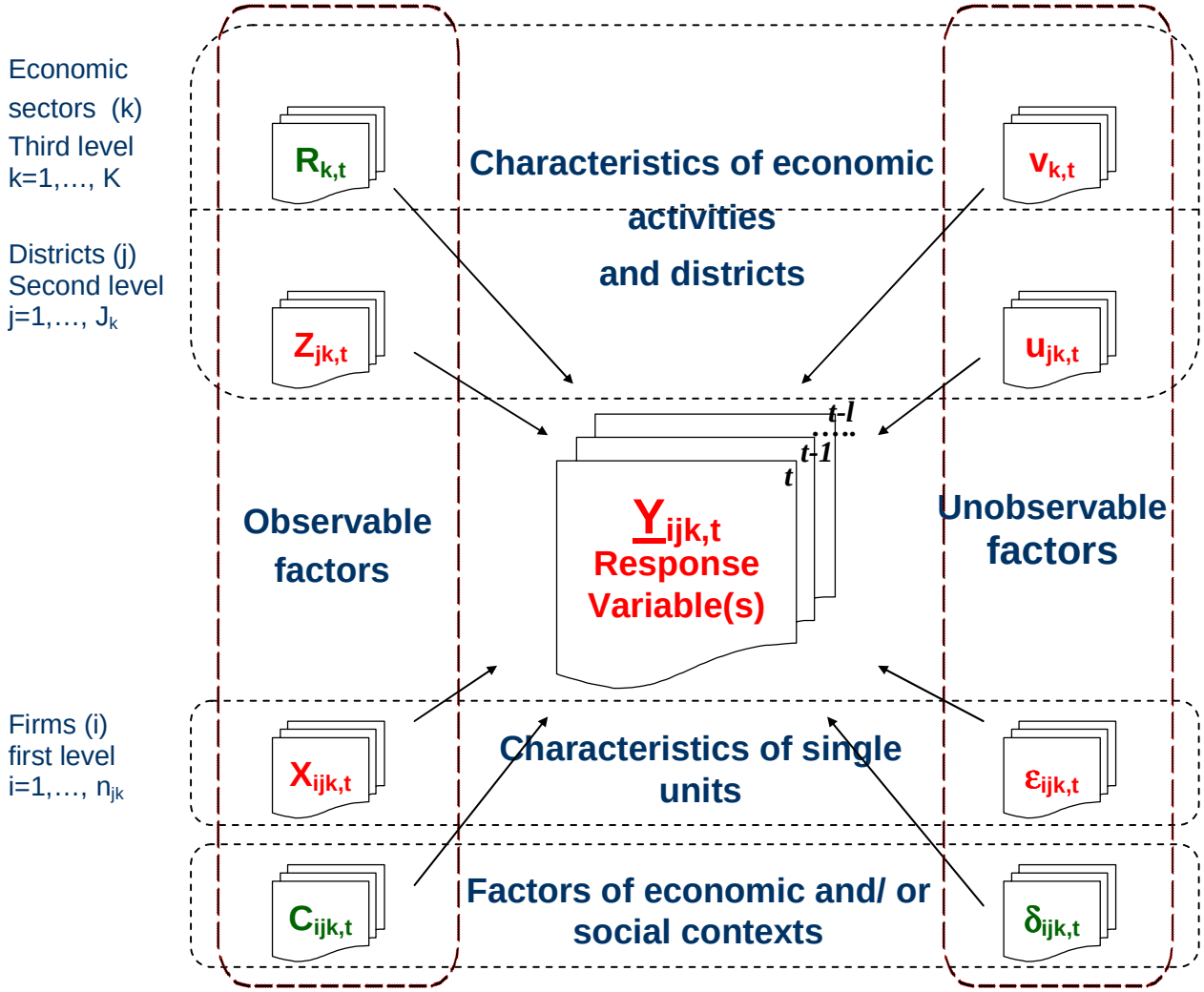
Taking into account the globalisation processes, two characteristics are very important, in general (Porter, 1998 and 2000) and at least in Italy, to clarify the complex phenomenon of competitiveness: the specialization of the economic activity and the existence of clusters of firms (industrial districts), that create a environment in which firms can gain competitive advantage (industrial districts are geographic concentrations of interconnected firms that have interactions with the institutional, economic and cultural context; cfr. Becattini, 1990; Becchetti and Rossi 2000; Becchetti, de Panizza and Oropallo, 2006). As Brookings Institution Paper (2006) states, "the industry cluster (or district, added by us) is a broad concept rather than a precise term. A cluster is a group of firms and related economic actors and institutions located near one another that draw productive advantage from their mutual proximity and connections". Moreover, there are many different dimensions of clustering and different types of clusters.

Therefore, it becomes important to identify the clusters of firms and to consider them for the analysis of competitiveness at cluster level and/or to consider the clusters a sub-level of the sector of activity at national level.

Taking into account the above mentioned characteristics, a simplified framework of reference is presented in the following Figure 1. The same scheme can be adapted to be used for the analysis of

competitiveness considering the sector of activity at regional level (both as second level or as third level).

Figure 1: Simplified scheme of an hierarchical (multilevel) structure of competitiveness in the economic context, for each time = *1,2,…,T*



In order to allow adequate analyses of competitiveness, both at national and international levels, it is evident from the scheme that we have to define and measure the:

a) *response variable(s)*: among possible response variables at the firm level, the most important indicators to be considered are: productivity of labour (Value added for worker) for the competition on the market, the share of production exported; Return On Investments (ROI) for the stakeholders, Cost of Labour for Unit of Product (CLUP). The productivity of labour as well

as the share of production exported are also important indices both at level of clusters of firms and sectors of activity;

b) *main characteristics of a single firm*, that affect or could affect its competitiveness in the future: age of the firm, events of transformation, inputs of the production process, investments, output, exports and so on;
c) *factors of economic and social contexts,* that affect or could affect the competitiveness in the future: level of unemployment and underground economy, infrastructures and social conditions, level of globalisation processes and so on;
d) *characteristics of cluster or industrial district* specialised in a product or group of products or not, territorial localisation of the district; economic importance and development, factors of economic and social contexts of the district, factors of the globalisation processes that have impact on the characteristics of the district, and so on;
e) *characteristics of sector of economic activity*: indicators that show the structure and the characteristics of the sector.

Finally, from the analyses point of view, it is also evident that it is necessary to use an adequate hierarchical model that incorporates the evaluation of the changes over time. It means that a longitudinal multilevel approach, due to the structure and repeated measurement of phenomenon on the time, should be used with micro-data at firm level to investigate the effects of some characteristics of firms and districts for the same sector of activities on the performance and competitiveness indicators (Biggeri and Bini, 2006).

4. The production of indicators for the analyses of competitiveness: need for micro data base and integration of different sources. Istat experience

In order to collect data and to produce adequate information to measure and analyse competitiveness following the previous framework, specific longitudinal data base consisting of elementary data has to be created. The challenges to face are evident.

The main characteristics of the data base should be as follows:

i. the requirements of the data base derive from the chosen framework of analyses: definition of the reference elementary units and of the all other interesting variables to conduct the different specific analyses; the necessary indicators to build up are usually classified in: performance indicators; impact indicators; context indicators;
ii. the elementary data must be temporarily and spatially comparables;

iii. the collection and storage of elementary data on the defined variables should be at the most possible detail of their characters (attributes), in order to allow the production of different classifications of variables and aggregates; only these detailed data allow to carry out analyses from different perspectives and, in particular, to adequate the definition of the variables to the evolution of the phenomenon;

iv. they should include information on:

- business demography and, in particular, on the new enterprises and on the events of firms' transformation (breakdowns and mergers);
- industry clusters or districts;
- population, immigration and labour force; available infrastructures; social conditions; environmental problems, and so on, at territorial level;
- indicators on the globalisation processes, as the services for the firms, the technology development, the networks that make easier the activity of the firms, and so on.

Moreover, it is obviously impossible to collect all the above mentioned data with a single statistical survey or from a single administrative data base; therefore it is necessary integrate different sources of data, constructing a new specific dynamic data base.

In any case, to do comparisons at international level (and in particular at European level) there is a need for standardisation of the definitions of units, variables and methods of collection and storage of data.

At present, Business statistics are harmonised at European level. In fact, Council Regulation n. 58/97 on Structural Business Statistics (SBS) provides the requirement for a wide set of variables referred to complex estimation domains. However, no regulations are provided for the computation and analyses in the field of competitiveness. Only some experiments are now being implemented in this field at European level.

In Italy, Istat has seriously committed itself in constructing adequate date bases for the analysis of competitiveness. To this end, in particular, Istat has developed and integrated different sources and data bases.

Istat data bases on enterprises derive from different sources of data:

i. Italian Business Register (ASIA), at firm level for all the firms (about 4,2 millions of units), obtained by the integration of different sources of data;

ii. Foreign Trade data base, at firm level for all the firms, obtained by statistical surveys;

These first two data bases provide information about legal structure and industry affiliation, year of the start of activity (age of firms), economic classification defined ATECO (Italian version of NACE classification), localization, employment, events of reorganization like

mergers, divisions, ceasing of activity, etc., the turnover (production) and the value of import and export.

iii. SBS data base, at firm level for an important sub-population of the firms, obtained by the integration of data coming from statistical surveys (SCI: a complete survey concerning about 10,000 units with 100 employees and more; and PMI: a sample survey concerning about 108,000 units with employees from 1 to 99) and administrative sources of data (security data base, financial statement register, income tax annual forms data base);

iv. Balance sheet data base, at firm level coming from incumbent limited liability firms register for about 240,000 units, that include information on assets, liabilities, profit and losses, and so on for about XY firms;

v. Factors of Business Success Survey (Fobs) data set, coming from a specifics sample survey, harmonized at European level, on about 6,500 new firms born in 2002 and still active in 2005 (the population was of about 145,000 firms);

vi. Local Labour Systems (including the industrial districts) at territorial level, obtained, as a clusters of municipalities, on the basis of 2001 censuses results for all the Italian territory (the LLS are about 686), that include information on the main characteristics of each LLS.

For the characteristics of the integration of micro-data and their use for the different analyses, see the works of Istat's researchers: Oropallo, 2005; Zeli, 2006 and Calza et al., 2006.

In order to carry out specific analyses on competitiveness Istat has implemented an experimental panel database, for years 1999 until 2004, representing the population of 233,000 incumbent limited liability firms of industrial and service sectors. They correspond to 6.3% of the population and also to 45% of the total Value added.

The information at a firm level is obtained by combining data deriving from the Balance sheet (assets, liabilities and profits and losses information) with data of Italian Business Register (ASIA) and Foreign trade data.

As it is clear from the mentioned papers, many integration issues have been discussed, identifying business units, dealing with matching problems, identifying changes in business units, addressing sampling problems (studying also the possibility to apply the methods of small area estimation), reconciling definitions and values among different sources, handling data editing and data reconstruction issues.

The main drawbacks to run up have been confidentiality problems related to the access to micro data of administrative sources, the fact that they are collected *ad hoc* for different purposes and may refer to

legal units and not to statistical units, and finally the instability of administrative sources that depend on political decisions.

Through the implemented data bases, a wide range of indicators can be computed and different types of competitiveness analyses performed, as Istat and university researchers have recently done. However, the existing data bases present some limitations and therefore do not face completely to the demand of the users and to all the needs of the requested economic analyses to analyse the effects of the globalisation on competitiveness.

The limitations refer to the coverage of the data base both in term of the units and information content of variables included.

First, the limited number of firms included in some data bases, prevents the analyses at territorial level, and in particular at level of the industrial clusters (for which only few variables are available), that should be carried out in a globalised economy.

Second, very few variables are referred to the globalisation processes indicators, in the economic and business areas (for example there is shortage of data on outward foreign affiliates statistics, localisation of part of firm in other countries, behaviour and flexibility of the organisation of the firms, relationships among firms and with the institutions, network of services available for the firms, credit access, and so on) and, in particular, on the field of social area (shortage of information on economic and social conditions of the population, immigration, and so on).

Therefore there is a lot of work to do for improving the Istat data bases (also using the methods of small area estimation), taking into account the experiences made by other NSIs and Eurostat.

But, the main issue in constructing the data bases is linked to the use of administrative sources that have required and requires long time and strong investment in term of human resources. In fact, at least in Italy, the administrative sources of data are constructed for administrative purposes with specific definitions and classifications that not always meet the statistical requirements: a lot of work is necessary to transform them into statistical information. As consequence, the construction of data bases are expensive and frequently their updating too require a lot of time, affecting their timeliness and their use for the analyses devoted to practical decisions by policy makers.

5. Some concluding remarks

This paper has pointed out that globalisation affects the concepts, the definitions and the processes to produce statistical measure and analyses of competitiveness. The main aspects and challenges raised are the following:

a) the need to review the economic framework of the competitiveness phenomenon for the definition both of units and variables for which collecting data and carrying out analyses;
b) taking into account the globalisation, competitiveness analyses should be done essentially at meso level; in particular, it is very important to collect data and to carry out analyses (using longitudinal multilevel models) for specific and specialised sectors of activities and for clusters of firms (industrial districts);
c) information on globalisation indicators in economic and social areas and on the context are very important to evaluate their impact on competitiveness;
d) the need to construct a comprehensive data base with information at very elementary and detailed level for units, variables and attributes, that can be obtained only by integrating different sources;
e) the difficulties met in the Italian experience for the construction of this kind of data base, due to the heavy work necessary to transform the administrative information into statistical information and to produce measures at an industrial district level.

Looking ahead, if European Bodies, National Governments and the European Statistical System (ESS) like to develop adequate measures and analyses of the competitiveness taking into account globalisation processes, we will have a lot of work to do and important decisions to take.

In general, the mentioned bodies have to decide if the statistical information and analyses on globalisation and competitiveness are a priority or not; in case of a positive reply, they have to provide adequate resources given the involved costs.

The ESS has carried out a lot of work on SBS statistics, even if some countries, including Italy, do not completely comply with the Regulation requirements. But still much more work in services and social statistics is needed. Moreover, if the ESS agrees with our proposal, standardisation of definitions and methodologies for the measurement of the phenomenon and of indicators is requested, and greater attention should be devoted to indicators at micro and meso level (also from territorial point of view). In fact, we think that the global measures and indicators for all the economy at a national level are, in the area of globalisation, less important to do comparisons at a international level of phenomena that are strongly heterogeneous and have different structures in the different territorial areas (regions and nations).

In order to facilitate the construction of data bases, it is necessary that the ESS proposes and obtains a modification of the legislative background for a more effective use of administrative data base. Since the beginning of the process, statisticians have to be involved in the construction of new administrative data bases and in their revision.

To implement what we have proposed, we are convinced that a real dialogue with users is very important to share the conceptual framework of analyses and operative definitions.

Finally, a provocative proposal. Surely all the activities to implement a system of indicators to measure globalisation and competitiveness require a lot of time before achieving agreement on different concepts, definitions, methods of collecting data and obtaining very high quality statistics. We and, above all, users cannot wait such a long time, with the risk that the provided statistical information refers to phenomena that have changed in the meantime. Do we need to consider the opportunity to provide timely imperfect data, specifying the level of quality, that could be later strongly revised?

References

Bagella M., Becchetti L., Sacchi S. (1998). The positive link between geographical agglomeration and export intensity: the engine of Italian endogenous growth?, *Economic Notes*, 1, 1-34.

Bartelsman E. J., Doms M. (2000), Understanding Productivity: Lessons from Longitudinal Microdata, *Journal of Economic Literature*, 38, 569-594.

Becattini G. (1990). The Marshallian industrial district as a socio-economic notion, in F. Pyke et al. (Eds.), *Industrial district and Inter-firm cooperation in Italy*, International Institute for Labour Studies, Geneva.

Becchetti L., Rossi S. (2000). The positive effect of industrial district on export performance of Italian firms, the *Review of Industrial Organisation*; 16/1, 53-68.

Becchetti L., de Panizza A., Oropallo F. (2006). The role of industrial district externalities in export and value added performance: evidence from population of Italian firms, *Regional Studies*, Forthcoming.

Biggeri L., Bini M. (2006), Competitiveness Analysis of the Italian Manufacturing Firms: A multilevel Longitudinal Approach, Proceedings of the Joint Statistical Meetings 6-10 August, Seattle, Washington, American Statistical Association.

Buzzigoli L., Viviani A. (2006), Firm and system competitiveness: problems of definition, measurement and analysis, preliminary version of a paper presented at the 62nd IAES Conference, Philadelfia.

Calza M. G., Cella P., Oropallo F., Rossetti S., Viviano C. (2006) Data Integration for Entrepreneurship Indicators in Italy. Performance, Impact and Context Analysis, Paper presented at Istat-Eurostat-OECD Workshop on Entrepreneurship Indicators, 6-7 December, Rome.

Clayton T., Lynch R. (2003), Globalisation: new needs for statistical measurement, Economics trends, 598, 48-57

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

Kovacic, A. (2002), New Economy Changes the Factors of the Competitiveness, Banking Review, 4, 13-17

Kovacic, A. (2004), Competitiveness as a Source of Development, Institute for Economic Research Working Paper, 28, Ljubljana

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

Krugman P. R. (1994). Competitiveness: a dangerous obsession, *Foreign Affairs*, 73(2), 28-44.

Krugman P. R. (1996). Making sense of the competitiveness debate, *Oxford Review of Economic Policy*, 12 (3), 17-35.

Lall S. (2001). Competitiveness Indices and Developing Countries: An Economic Evaluation of the Global Competitiveness Report, *World Development*, Elsevier, vol. 29 (9), 1501-1525.

McGuckin R. H. (1995). Establishment Microdata for Economic Research and Policy Analysis: Looking Beyond the Aggregates, *Journal of Business & Economic Statistics*, Jan, 13, 121-126.

OECD (2005), *OECD Handbook on Economic Globalisation Indicators*, Paris

Oropallo F. (2005). Enterprise Microsimulation Models and Data Challenges: Preliminary Results from the Diecofis Project in *"L'integrazione di dati di fonti diverse" by Falorsi, Pallara, Russo*, 159-188, F. Angeli, Milan, Italy.

Pellegrini G. (2006). Measures of competitiveness and attractiveness: a critical appraisal focued on Italy, *Proceedings of the Scientific Meeting of the Italian Statistical Society*, vol. (1), 355-364.

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

Porter M. E. (1998). *On Competition*, Harvard Business School Press.

Porter M. E. (2000). Location, Competition and Economic Development: Local Clusters in a Global Economy, *Economic Development Quarterly*, 14 (1), 15-34.

Porter M. E., Ketels C.H.M. (2003). *Uk Competitiveness. Moving to the next stage*, DTI Economic Paper 3, London, Department of Trade and Industry.

Skrondal A., Rabe-Hesketh S. (2004). *Generalized latent variable modeling*, Chapman & Hall/CRC.

Skrondal A., Rabe-Hesketh S. (2005). *Multilevel and Longitudinal Modeling Using Stata*, STATA Corporation LP.

Zeli A. (2006), The Use of Administrative Data in Structural Business Statistics: the Italian Experience, Paper presented in a seminar held on 5th of July in Belgrade.