Turbolence underneath the big calm: what is happening behind the flat trend of productivity in Italy

Giovanni Dosi† , Marco Grazzi†, Chiara Tomasi†, and Alessandro Zeli‡

† LEM, Scuola Superiore Sant'Anna, Pisa, Italy
‡ ISTAT, Roma, Italy

Data

The research we present here draws upon the Micro.3 databank developed by the Italian Statistical Office (ISTAT)[1]. The database, that covers the period 1989-2004 (2005 and 2006 are getting available at the time we are writing this extended abstract), contains information about 134625 Italian firms and represents a development of the former Micro.1 dataset, which was the census of all the Italian firms with 20 employees or more conducted by ISTAT over the period 1989-1997 (see Dosi, 2007, and the works cited therein for a survey of results on that dataset). Over the period covered by the data there are missing values partly due to the fact that some firms may exit from the database as they reduce their size and fall below the 20 employees threshold. The existence of missing values makes Micro.1 an unbalanced panel data-set. Despite that, the validity of the database is largely supported by its census nature, which avoids possible biases in the data collection process. In addition, as reported in Bartelsman et al. (2004), though manufacturing firms with less than 20 employees account for about 88% of the total Italian firm population, firms with more than 20 employees cover almost 70% of the total employment. Micro.3 contains standard variables appearing in firms' financial statement. In this work, for brevity, we focus on manufacturing sectors only and we consider 2 and 3 digit industrial sectors, according to the European NACE classification. The Micro.3 database has been merged with the ISTAT's external trade register (COE) and with a novel patent database. The COE database contains information on all trade exchanges involving Italian firms. As such we can always associate to every firm in our database the correct trade status and ensure that we are not introducing any selection bias. Further, we exploit a patent database that contains the number of registered patents (both USPTO and EPO). The patent database contains information on patents granted to Italian firms starting in 1949 for the USPTO and 1978 for the EPO, thus even before the beginning of the period considered for Micro.3.

Preliminary Results

International comparisons (OECD, 2008) shows that Italy registered a very poor performance with respect to other OECD countries. Italy ranked last in terms of growth of GDP per hour worked over the period 1995-2006 (see OECD, 2008, p. 17). Italy registered a zero growth in the years 2001-2005 and an average annual growth below 1% in the previous period, 1995-2000. Only Spain did worse in this subperiod. In a number of OECD countries labor productivity accelerated in the second half of the 1990s but slowed again in the first half of the new millennium. Italian performance on value added per worker was substantially lower than the OECD average in both sub-periods, so that over the longer time span 1995-2006 it ranks last.

To start with, we show that the aggregate statistics that one can build on Micro.3 are indeed coherent with the national statistics released by the OECD or Eurostat[2]. Once that such comparability of Micro.3 and aggregate

1This research could have not been possible without the valuable collaboration of the Italian Statistical Office (ISTAT- Industrial Statistics Division).The data are made available to our team under the mandatory condition of censorship of any individual information.

2 In this respect a methodological note is due. Aggregate statistics for productivity typically report a measure, value added per worker, that is the ratio between the whole value added of the economy (or of one of its sectors) and the sum of all workers employed. In this sense one is not able to assess the contribution of a firm (or a set of them) to the productivity of one sector or of the whole economy. On the contrary, exploiting the micro-data as those contained in Micro.3, not only one can (re)produce the same measure (by summing up value added and worker and then taking the ratio) but one can also estimate the average of the productivity of firms in a sector and its variance.

statistics is ascertained, we start exploiting the higher information content provided by the microdata. In particular, as far as the levels of productivity are concerned, this allows us to test the hypothesis of an increase in the average labor productivity over time. As said, due to the huge heterogeneity in the distribution of productivity - thus reflected in big standard deviations - it is not possible to come to such conclusion on the basis of comparisons of averages. Further the distributions of productivity displays a substantial departure from normality (Dosi and Grazzi, 2006; Bottazzi et al., 2007). Thus, in order to verify if two samples, in our case the distributions of productivity in two different years, differ in their central tendency we will perform a non-parametric test, namely the Fligner-Policello test (Fligner and Policello II, 1981). This test does not assumes neither normality nor equal variances and it can be interpreted as a test of stochastic equality between the two distributions, that is we statistically verify if the distribution of productivity in one year is dominating the distribution of productive in another year. As it could be expected the evidence is not encouraging. In the post-euro subsample, 1999-2004, for most sectors it is not possible to conclude that productivity was higher in 2004 than in other years. Not only, most of the years in the post-euro period report a higher number of sectors for which productivity in 2004 was lower than in the previous years; this is accounted for by the positive and significant values of the test statistics. Consider for instance, year 2004 versus 1999, the first after the euro introduction. The number of sectors, 4, in which productivity is higher in 1999 exactly equals those in which the productivity in 2004 is higher. In conclusion, the analysis of the dynamics of productivity reveals that, with respect to the period 1991-2004, there has been a considerable stagnation, once we consider constant price values, of value added per worker. Even more worrying, it is not possible to statistically discard the hypothesis that in some sectors labor productivity was higher in the past than in 2004. Such stagnation, somewhat counterintuitevely, goes together with the increase in the dispersion in the productivity distribution at the sectoral level. Firms in the first decile for productivity are five to six times more productive than firms in the lowest decile, and this gap is not shrinking over time. On the contrary, in some sectors there is evidence of increasing differences.

Hence, it would appear that the increasing gap between most and least productive is due to specific characteristic of firms, what one might call their constituent “identity card”. The richness of the information contained in Micro.3 allows us to perform analyses that enable us to carefully identify those dimensions of a firm’s performance on which these distinctive characteristics might exert their influence upon. To this end, we observe how export activity and innovativeness contribute to boost the intra-industry differences. One particularly suited way to investigate what drives such dynamics of increasing diversities of performance is by means of quantile regression. Exploratory analyses have indeed revealed that, selecting firms on the basis of these crucial dimensions (i.e. exporting and patenting) yields a relatively small subsample of firms that report a substantial difference in terms of productivity with respect to the industry average, meaning that the effect of a regressor on the dependent variable will not necessary be the same at all level of the conditional distribution of the dependent variable. Quantile regression enables us to ascertain if and by what extent this impact is varying and in this respect it also permits to to identify and highlight the existing heterogeneity.

References

Bartelsman, E. J., J. Haltiwanger, and S. Scarpetta (2004, Oct). Microeconomic evidence of creative destruction in industrial and developing countries. Working Paper 04-114/3, Tinbergen Institute.

Bottazzi, G., E. Cefis, G. Dosi, and A. Secchi (2007). Invariances and diversities in the evolution of Italian manufacturing industry. *Smal Business Economics* 29 (1-2), 137–159.

Dosi, G. (2007). Statistical regularities in the evolution of industries. a guide through some evidence and challenges for the theory. In F. Malerba and S. Brusoni (Eds.), *Perspectives on Innovation.* Cambridge University Press.

Dosi, G. and M. Grazzi (2006). Technologies as problem-solving procedures and technologies as input–output relations: some perspectives on the theory of production. *Industrial and Corporate Change* 15 (1), 173–202.

OECD (2008). *Compendium of Productivity Indicators.* Paris: OECD Publishing.