INTRODUCTION: NEW DIRECTIONS IN PRODUCTIVITY ANALYSIS

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Today, economists acknowledge the basic relationship between productivity growth and improvements in living standards and all agree about the need to provide a more accurate assessment of productivity gain across time and space. But, beyond this basic consensus, the stream of empirical productivity analysis is certainly one of the most vividly debated in the economic literature. Since the surge of growth accounting exercises in the 1950's, each decade witnessed important controversies which lead to new developments and further improvements. In the last decade, these renewals have been profound and motivated by three main sources. Firstly, the resumption of productivity growth in the 1990s after the productivity slowdown of the 1970s and 1980s provoked controversies among policymakers and researchers, and forced economists to re-examine the fundamental question of measurement techniques (Hulten *et al.*, 2001). Secondly, the important contribution of Philippe Aghion and Peter Howitt's 1992 paper opened up new directions for empirical productivity analysis. In formalizing aggregate productivity growth as the outcome of a process of creative destruction, they invited us to explore the correlation between productivity growth and the endogenous flow of firm entry and exit and the endogenous rate of capital obsolescence. Thirdly, the new and growing availability of large scale longitudinal firm-level datasets, provided radically new ways to connect micro-and aggregate productivity growth dynamics. Following on the pioneering micro-

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econometric works of Zvi Griliches and Jacques Mairesse[1], these datasets have been used to address a wider set of issues involving various aspects of firms heterogeneity (see Bartelsman and Doms, 2000). Moreover, in enabling the reallocation process across individual producers within narrowly defined sectors to be characterised and analysed, this reallocation can be related to aggregate productivity growth (Foster *et al.*, 2001).

In this part of the special issue, all the papers focusing on productivity can be regarded as examples of these new research directions. All provide improvements to the conventional framework of productivity analysis allowing the relationship between technological change and productivity growth to be addressed more accurately. To facilitate their reading, the papers are grouped into two broad categories. The first contains papers that use macro-level datasets; the second contains work on productivity analysis based on the newly available micro (firm) level datasets.

Each of the papers in the first category takes up a different empirical challenge. The first, by Dale Jorgenson, is an updated version of his 2003 paper in *World Economics*,[2] which basically deals with the impact of the information technology (IT) revolution. Dale Jorgenson emphasises Islam's (1995) methodological improvements to the growth accounting framework and Schreyer's (2000) work on internationally harmonized prices. Drawing on these two works, he shows how international differences in the relative importance of IT-producing industries play a key role in generating the wide disparities in the impact of IT on economic growth among the G7 economies. More generally, Jorgenson's paper shows how important it is to provide both cross country and inter-industry comparisons of productivity and capital intensity, not only in terms of growth rates, but also in levels. This paper is a good illustration of the recent efforts conducted by the OECD and GGDC[3] (see Van Ark, 2005) to go beyond the traditional comparisons of GDP and labour productivity. These efforts have been particularly important to focus policy-makers' interest on the significance of competitiveness, and the efficiency with which resources are exploited. The second paper by Patrick Musso focuses on the Productivity Paradox of the 1970s and 1980s. His objective is to explain both the slowdown and the resurgence in productivity growth in the US by addressing the problem of capital obsolescence. In assuming a constant rate of capital obsolescence, traditional growth accounting studies could lead to sizeable inaccuracies in TFP growth measurements, especially in IT-related sectors. In his paper, Patrick Musso shows how a moderate increase in the capital retirement rate may explain a good deal of the productivity slowdown observed in the US economy during the 1974-2000 period.

1. See Griliches and Mairesse (1995) for a critical assessment on the achievements made in micro-based production functions estimates.

2. Dale W. Jorgenson (2003), "Information Technology and the G7 Economies"; World Economics, December.

3. Groningen Growth and Developement Center.

The last paper in this group, by Carole Chevallier, Arnaud Fougeyrollas, Pierre Le Moal, and Paul Zagamé, is devoted to an analysis of R&D spending-productivity relationship. These authors apply the detailed macro-econometric model NEMESIS to European Union countries, in order to show how an increase in R&D spending may first induce inflation and increased deficits, and then allow for long-run productivity improvements. This investigation aims at assessing the expected impact in terms of growth, employment and competitiveness of the R&D promoting policies that were introduced by EU Member States in late 2004. This kind of exercise is very useful from a policy evaluation point of view. It should be pursued further in order to assess the potential impact of the European Commission's 7th framework programme within the Lisbon strategy, and to search for more instruments that can be adapted to achieve successful outcomes from these R&D programmes.

The second group of papers all use large scale firm-level datasets. This surge in micro-level productivity analyses in recent years has been made possible by the increasing availability and reliability of micro-datasets in a large variety of countries. In the first paper, Philippe Aghion and Evguenia Bessonova used these datasets to provide empirical support for the theoretical proposition that increased entry (and entry threat) should stimulate innovation by incumbent firms that are already close to the technological frontier, and discourage innovation by firms that are far behind the frontier. This paper reports earlier evidence based on UK firm-level panel data and the recent liberalisation in India, and provides new evidence on a panel of Russian firms. In the specific context of Russia, the authors highlight the ambiguous role of foreign competition in boosting domestic innovation. More generally, they show that the neo-Schumpeterian paradigm, in emphasising that countries differ in terms of key economic variables such as distance from the technological frontier, or degree of financial development, advocates for 'systematising' the case-by-case approach of growth policy recently defended by Dani Rodrik (2005). They show that the design of national structural and macroeconomic policies aimed at fostering productivity growth should be contextualised.

The second paper in this group, by Gianfranco E. Atzeni and Oliviero A. Carboni, uses a sample of Italian firms to investigate investments in IT. They use advanced matching methods to assess the effectiveness of subsidies on overall investment and investment in IT. The effect overall is found to be positive and strongly dependent on firm size. The effect of subsidies on IT spending is also positive, the decision to adopt IT being positively correlated with age, workplace organisation, R&D and subsidies, net negatively affected by credit constraints. The decision of *how much* to invest in IT is in turn positively linked with capital intensity and the ratio of white to blue collar workers, and negatively related to regional interest rates and the level of industry mark-up. Similar to Chevallier *et al.*'s paper, this type of investigation is shown to be well suited to evaluating the role

of public policies in boosting technical change and productivity growth. Both the macro-econometric models, such as NEMESIS, and the new micro-econometrics techniques described in this paper are good illustrations of policy evaluation analyses that still need to be developed, especially in Europe.

The third paper by Holger Görg and Frederic Warsinsky is also highly significant for policy in pointing out the relationship in the UK between the implementation of the Single Market Program and the dramatic decline in price cost margins after 1990. The paper applies the Hall-Roeger methodology to estimate mark-ups at firm-level, and provides a first estimate of the dynamics of price cost margins in UK manufacturing firms over the period 1989-1997. It demonstrates the flexibility of the Hall-Roeger methodology, and its utility for the estimation of TFP growth corrected for the presence of imperfect competition. This paper offers new methodological prospects for future improvements in the measurement of productivity.

The fourth paper by Flora Bellone, Patrick Musso, Lionel Nesta and Michel Quéré investigates the relationship between market selection and firm-level productivity in a panel of French manufacturing industries. The authors find that market selection in France rightly operates in favour of more productive firms, but displays some potential inefficiencies in its favouring of mature firms over young firms, and barriers to the growth of young firms. These authors also show that, on the whole, productivity improvements based on market selection within French manufacturing are primarily due to market share reallocation across the incumbents and that the net entry effect is weak relative to the findings for other industrialised countries. More generally, this paper highlights the need for further analysis on the efficiency of micro-structures underlying aggregate productivity growth. It is striking that the deficiencies of micro structures, while increasingly often being put forward to explain the Europe-US gap and/or Intra-European discrepancies in productivity achievements, is still rather poorly documented. This lack of empirical evidence must be overcome in order to identify the role of imperfect competition in promoting/impeding both static efficiency and dynamic productivity gains through innovation.

The fifth paper in this second category, by Futoshi Kurukawa and Kiyohiko Nishimura, focuses on the determinants of firm-level TFP within the information services industry. This study is interesting not only because of the relative paucity of research on non-manufacturing industries, but also because of the prominent role of the IT service industries in recent economic development. The authors find that outsourcing has persistent negative effects on TFP, suggesting that productivity-enhancing modularisation is not being fully utilised in Japan. They also show that the traditional main-contractor–subcontractor relationships, which still prevail in the information service industries in Japan, may hinder productivity

improvements. In addition to providing new findings in relation to the Japanese economy, this paper points to the potential from combining conventional productivity analyses with Industrial Organization (IO) theory within detailed industry case-studies. This work is a first step towards achieving the fully developed international comparisons of industry case studies recently advocated by Baily and Solow (2001).

The paper by J. Stanley Metcalfe and Ronnie Ramlogan concludes the special issue with a more general discussion about the relevance of micro-based productivity analysis for tackling the central role of creative destruction in economic dynamics. Assessing the limits of micro-level decomposition exercises in productivity analyses, the authors argue that the population method drawn from evolutionary theory provides a more coherent frame within which the various processes impinging on productivity change can be integrated. While some of the contributors to this special issue would want to discuss this point further, all will certainly agree that the new directions being explored by productivity analysis during the last decade makes it much more akin to industrial dynamics than ever before. It has opened up fascinating areas for fruitful exchanges between the Schumpeterian and Evolutionary traditions in the field of economic dynamics and standard productivity analysis.

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