PSL Quarterly Review

vol. 77 n. 309 (June 2024)

Special issue on the Solow-Pasinetti debate on productivity measurement

On concepts and measures of changes in productivity: A special issue in honour of Luigi Pasinetti

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Abstract:
This special issue of PSL Quarterly Review is devoted to the Solow-Pasinetti debate on productivity and technological progress. Florencia Sember guides the reader through the main aspects of the debate, calling attention to those precursor features of a bifurcation that would later distinguish two competing approaches to growth theory. Ariel Wirkierman delves deep into the topic of productivity definition and measurement from a Classical perspective, as opposed to a more traditional standpoint. Gabriel Brondino, Miguel Casau Guirao and Facund Fora Alcalde put forward a method for computing total labour productivity in an open economy, following Pasinetti's hint to measure labour embodied in imports as the domestic labour necessary to produce the corresponding exports. Finally, Hernan Alejandro Roitbarg, Francisco Leiva and Joaquin Lucero employ a subsystem approach to examine the rise and fall of productivity in Argentina over the period 2004-2019.

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How to cite this article:
Brondino G., Garbellini N., Halevi J. (2024), "On concepts and measures of changes in productivity: a special issue in honour of Luigi Pasinetti", *PSL Quarterly Review*, 77 (309), pp. 123-126.

DOI: https://doi.org/10.13133/2037-3643/18520

JEL codes:
O4, C67, B51

Keywords:
productivity measurement, Solow-Pasinetti debate, technical change, input-output analysis

Journal homepage:
http: //www.pslquarterlyreview.info

This is the first in a series of special issues that some of the most important heterodox journals will dedicate to Luigi Pasinetti in the coming months. And it is particularly appropriate that this series opens with precisely this subject, since this debate was of crucial importance in the development of Luigi Pasinetti's approach to technical progress and development planning.

In 1957, in fact, while in his doctoral studies, Pasinetti received a grant from the US Embassy to spend an academic year at Harvard. Wassily Leontief, one of his supervisors, tasked him with writing an article to be presented within the Harvard Economic Research Project. The paper was published in 1959, under the title, "On Concepts and Measures of Changes in Productivity", as a response to Solow's "Technical change and the aggregate production function" article (1957).

The contribution by Florencia Sember, which opens this special issue, provides an excellent synthesis of the debate, while interpreting it as a precursor event to a subsequent division that would later distinguish two radically different approaches to the issue of technological change.[1]

In short, Pasinetti's critique of Solow's approach was that, since it was based on the aggregate production function, it did not account for the reproducibility of capital and, consequently, the fact

[1] The interested reader may refer to Garbellini and Wirkierman (2023).

that technological progress has a different effect, depending on whether it occurs in the production of capital or of consumption goods.

The different pace of productivity change in the two sectors was so crucial for Pasinetti that he took it as an indication of the direction of technical progress – based on Harrod's taxonomy, whereas Solow based his analysis on that of Hicks. It is at this stage that Pasinetti began to develop the concept of vertically (hyper-)integrated sectors – or growing subsystems, which includes the activities directly and indirectly needed to produce not only consumption goods and services but also the corresponding productive capacity.

Productivity and its measurement are the core of Wirkierman's contribution, which guides the reader through some foundational concepts to deal with the topic from a Classical perspective, as opposed to a more traditional standpoint. This is a crucial contribution, stressing the difference between measuring productivity from the expenditure side, as opposed to the value side. Whereas, in the former case, productivity change can be seen as an index of technical change, when computed according to the second procedure, it is an index of changes in profitability, an entirely different concept.

Pasinetti also criticised Solow for mistakenly identifying capital intensity with the capital/labour ratio, which Pasinetti called the degree of mechanisation, instead of the capital/output ratio. And in fact, while, according to Solow, the capital intensity had increased during the period 1909-1949, for Pasinetti it had decreased, while the degree of mechanization had increased.

A decrease in capital intensity takes place when productivity grows faster in the productive capacity sector than in the final goods sector, which means that the proportion between the quantity of labour to be locked into capital goods and the quantity of labour to be used directly decreases. A decrease in the capital/output ratio, moreover, implies a decline of the charge for capital in prices, and it therefore entails a reduction of the (natural) price of new capital vintages.

Pasinetti's debate with Solow on technological progress and productivity is clearly understandable as a first step towards a multi-sectoral analysis and the development of the hyper-integrated framework. This is especially evident if one reads it together with the article that Pasinetti wrote in 1959 with Luigi Spaventa and that was published the following year in *Rivista di Politica Economica* (Pasinetti and Spaventa, 1960).

In the article, the authors elaborated on a critique of aggregated macrodynamic models of development – which, according to them, had exhausted their potential and thus needed to be replaced by multisectoral models:

In order to analyze the behavior, not necessarily of equilibrium, of individual variables and parameters, an investigation in aggregated terms is now entirely inadequate, since it, by its nature, would conceal the very object of the research. Technological progress, productivity, consumption, investment are no longer sufficient to define the economic system in a dynamic research. It is necessary to go beyond and see what lies behind the facade of these aggregated expressions. In short, it is necessary to frame the research in more disaggregated terms (Pasinetti and Spaventa, 1960, pp. 20-21).

In other words, the primary effect of technological progress is precisely to continuously modify the proportions of the system as it manifests itself asymmetrically across different sectors. Moreover, increasing the average per capita income (in addition to altering its distribution), modifies the structure of final demand and consequently that of the production system, determining the disappearance or downsizing of mature sectors and the emergence or expansion of emerging ones.

In the paragraph dedicated to economic systems characterized by full employment, Pasinetti states that:

> [a] theoretical framework that aims to take into account technological progress must explicitly include variables such as the trends over time of productivity in various sectors, the consequent trends of individual costs and prices, of individual productions in physical terms, and of employment in various productive branches [...]; in this direction, one must now proceed if one wants to find an answer to the many problems still left open by macroeconomic dynamics, and if one wants to arrive at the development of economic policy measures somewhat more concrete and specific than the overly generic Keynesian measures of managing total public expenditure (Pasinetti and Spaventa, 1960, p. 24).

In other words, the endogenous forces of the system operate in the direction of continuous structural change; if left to market dynamics, any economic system, even starting from a situation of full employment, is therefore destined to generate friction, asymmetries, and unemployment. In order to prevent this from happening, such changes need to be managed. In particular, in addition to the condition of static equilibrium (full employment of labour force and full utilization of productive capacity), it is necessary for the dynamic equilibrium conditions to be satisfied, period after period – those conditions that Pasinetti calls capital accumulation conditions, as many as there are sectors in the economic system. These conditions ensure that capital accumulation proceeds in line with variations in final demand, following the Kaldor-Pasinetti scheme (see Pasinetti, 1974). Market mechanisms do not tend towards reducing instability but rather towards increasing it. Therefore, it is necessary to establish appropriate institutions tasked with maintaining full employment and capital accumulation.

It is important to stress that Pasinetti was among the first economists to understand the importance of technical progress in the production of machines as opposed to the production of consumption goods. Such a distinction then became crucial, for instance, in Adolph Lowe's (1976) *The Path of Economic Growth* – where he presents a theoretical model based on three sectors in a vein similar to Marx's schemes of reproduction. Yet, whereas Lowe's analysis is limited to the short run, Pasinetti's hyper-integration makes it possible to provide a norm for long-run trajectories. The device of vertical hyper-integration is particularly relevant when dealing with an analysis of the stages of economic growth: "It can be already anticipated that the feasibility of a particular development strategy will depend on a strict hierarchy in which the production of consumption goods is carried out" (Halevi, 1994, p. 71).

The issue of development – and of asymmetries between developed and underdeveloped countries – and its deep connection with the pattern of capital accumulation is central in Pasinetti's analysis. This is especially clear after reading *Structural Change and Economic Growth* (Pasinetti, 1981), particularly chapters IX (devoted to capital accumulation) and XI (devoted to international economic relations).

In this special issue, the bridge between theoretical and empirical analysis is provided by the last two contributions, by Gabriel Brondino, Miguel Casau Guirao and Facund Fora Alcalde and by Hernan Alejandro Roitbarg, Francisco Leiva and Joaquin Lucero.

Brondino and his coauthors put forward a novel method for computing total labour productivity in an open economy, following Pasinetti's hint to measure labour embodied in imports as the domestic labour necessary to produce the corresponding exports. Roitbarg et al., in turn, examine the recent rise and fall of productivity in Argentina, over the period 2004-2019, through a subsystem approach.

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