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Comment on: "Sraffa's Circular Process and the Concepts of
Vertical Integration," by L.L. Pasinetti

by
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This is a terse and concisely written paper on a highly specific topic. It calls for a comment in the same vein.

I think tht Professor Pasinetti has forcefully shown here and elsewhere, the power of his idea of vertically integrated sectors as an analytical device.

The crucial point is that it permits us logically and systematically to relate an analysis in terms of quantities of net product (final demand), taken item by item, to the respective quantities of labor and stock of means of production "ultimately" required to produce each and every one of those items of final product. The exact relation between final product and the labor and means of production which produce it is explicitly seen to be constituted by the complex circular process of interdependent production. As such, it cannot therefore be conceived in terms of a single one-way avenue from factors of production to final product that characterizes traditional marginalist theory. There are as many such avenues as there exist final products, and each goes through a complex structure of inter-industry relations. Similarly, prices of final products can, by the same mediation, be reduced to ultimate costs consisting of labor required for final output and a single unit of integrated productive capacity, so that their meaning as cost-determined prices immediately becomes transparent.

The essential feature of the device that permits this operation is that it "synthesizes in one single number the whole complicated circular process of production". In its construction, it is analagous with and uses the same information as Sraffa's subsystem and the Leontief

inverse. But it has the advantage of giving a more compact expression of production conditions than either of these and, unlike the Leontief inverse, is capable of taking explicit account of joint production and hence the use of fixed capital in production. The computations involved are, however, no less laborious and would for any actual economy require computers with an enormous capacity.

Provided that production conditions do not change in the period of the analysis, which is an important and crucial proviso, the main advantage of this device is one of economy of analytical effort. This comes from being able to relate directly changes in final demand to changes in "ultimate" input requirements using the one-time calculation of vertically-integrated-sector coefficients. In this way, also, the device allows a direct and immediate link between the usual Keynesian macro-analysis set out in terms of national income aggregates and a micro-analysis of prices, production conditions, and employment, at the level of individual commodity sectors.

But what if production conditions do change? Then, the computations have to be performed all over again, and for each successive change, using the new information about the individual technical coefficients. For the Sraffa and Leontief systems this recomputation would result in a wholly different set of numbers each time to represent the structure of the economy. Not so for Pasinetti's concept of vertically integrated sectors. In this latter construction, the synthetic unit of vertically integrated production capacity (constituted by a composite commodity) which ultimately produces one unit of final

good i is invariant to changes in its composition. Its production coefficient therefore remains the same, at unit level of output, regardless of the actual underlying pattern of technical change. The only change registered is in the production coefficient of vertically integrated labor, as long as technical change takes a labor augmenting form.

Professor Pasinetti evidently regards this feature of his method as its great merit. But it is a merit or demerit depending on what one is trying to achieve. The fact that a unit of vertically integrated productive capacity is entirely independent of its composition means that it is wholly insensitive to the actual pattern of technical change as it affects material inputs. Consequently, the concept of vertically integrated sectors fails to yield a quantitative measure of the character of technical change except and only insofar as technical change is labor augmenting. In this respect, it does little better than the existing inter-industry models of constant proportional growth in which by default it must be assumed that technical change is always purely labor augmenting. With Pasinetti's method, the actual rate of labor augmentation is of course captured separately for each specific commodity so that the uneven pattern of labor productivity growth can be directly represented. This is certainly a valuable feature of the method.

To get a closer picture of the actual sources of technical change and the changing pattern of input use, one must refer back to the inter-industry data. Moreover, in making the calculations that this method

uses to derive the integrated-sector coefficients, one must necessarily start each time from the information contained in the new set of inter-industry data that technical change generates. This means that the inter-industry analysis is both logically and in reality prior to the scheme of vertically integrated sectors. Taking the additional step of vertically integrated analysis is warranted if it yields useful measures of technical change. But the actual measure that it yields turns out to have rather restricted scope.

What the vertically integrated analysis successfully accomplishes is the remarkable conceptual feat of homogenizing the heterogeneous structure of production, considered as a complex circular process, by aggregating the diverse material inputs up to a simple scalar magnitude through an appropriate linear transformation. To some, this may uncomfortably evoke shades of the now defunct surrogate production function or the long dead average period of production. This would not be an unwarranted association so far as the mere goal of aggregating diverse inputs is concerned, but the method of aggregation used here is far more robust and, of course, the theoretical purposes are quite different.

Pasinetti's special method of aggregation makes sense, and indeed is an indispensable logical basis, for the limited purposes of a macro-economic analysis carried out under unchanged technical conditions. However, his strong claims to the contrary notwithstanding, it does not seem well suited for analysis of the dynamic properties of technical change except in the most summary fashion. To support this assertion,

one needs to say why. The reason, I think, lies in the very success of the method in accomplishing the feat of homogenization which turns out to be an obstacle in the way of capturing essential properties of the process of technical change. In other words, because of the homogenization of the production process that this method achieves, there is much that goes on in terms of the actual dynamics of the process of technical change which escapes the net of this method.

A large and growing body of concrete studies allows us to identify a number of salient ingredients of the process of technical change. Among these is worth mentioning the fact that the process is inherently and intrinsically a localised phenomenon, occurring in the first instance at the level of particular industries, firms and production techniques. Even though its direct and indirect effects may ultimately be far reaching across the whole economic structure, it is only through a systematic and time-intensive process of diffusion that these effects operate. Insofar as technical change is congealed in particular physical products, the product itself does not immediately take a fixed form but undergoes successive transformation as it goes through the diffusion process. There are organizational changes that accompany the process, quite apart from changes in the physical form of the product, which themselves account for significant gains in labor productivity. Moreover, there are "spillover effects" which operate between different production units and sectors of the economy so as to influence significantly the rate and pattern of technical change, quite independently of the interindustry flows of physical products.

Because of the existence of these and other notable features of the actual process, not only is the quantitative representation of technical change at an aggregative level fraught with deep conceptual problems, but all such aggregative measures have the unfortunate consequence of obliterating essential ingredients of the phenomenon being measured. This is so in the case of the commonly used growth-accounting framework. It is so, moreover, in the case of measures of the "factor-saving bias" of technical change. I might add that the concept of an aggregate organic composition of capital, as commonly used in some versions of Marian theory to measure technical change, fares no better in this regard. Compared with these alternatives, Pasinetti's method has some unique advantages already noted. But it still leaves us groping for elements of the process that are profoundly significant for analytical purposes.