

Introduction

The initial idea from which I originally intended to develop the present dissertation was the consideration of the importance of providing empirical applications to Pasinetti's approach of structural economic dynamics, in order to show that it is not a mere intellectual exercise, providing an elegant but not very useful theoretical framework, as it has been sometimes argued by some commentators, but that it can be used to interpret and understand real, concrete economic phenomena in a way which is really, deeply alternative to the dominant one.

With this purpose in mind, I asked myself which kind of application could have been a good starting point, and which kind of empirical investigation could have been the best way of implementing it. I initially decided to try to estimate the differences between actual and 'natural' rates of profit, in the conviction that it would have been possible to evaluate the performances of a concrete economy by comparing them with the 'norm' provided by the 'natural' economic system.

Disappointingly enough, it seemed to me I could not manage to achieve this goal. How to estimate actual rates of profit? How to use national accounts data consistently with Pasinetti's original framework? Which interpretative schema to adopt and which connections to the theoretical *corpus*? Going to the roots of the problem: which was the concrete rationale of performing such an exercise, and which the correct way of performing it?

I soon understood that my standpoint was completely wrong. No doubt that skepticism about this kind of approach could only be defeated by providing a concrete example of its usage to say something about reality. No doubt that discussions with economists belonging to different 'schools of thought' could be more effectively held on the basis of some data and results at hand, the only idiom that can be easily understood by everybody. But the ground on which I was trying to walk was not firm enough.

My conclusions, in fact, were that I did not know how to fit data into Pasinetti's framework, and that even if I could have managed to do so, I did not have a completely clear view of how to present the results, and of how to persuade an eventual interlocutor about their relevance. Far away from being an insurmountable obstacle, in fact on the contrary, the answers to these questions gave to me the right clue on the direction to follow.

More precisely, the answer to these questions gave to me quite an accurate idea of what I was lacking in order to pursue my original task. The present dissertation is the result of the attempt at filling the gap, in fact representing a preparatory *theoretical* work to pave the way for the kind of investigations which at the very beginning I fondly thought I could immediately face.

First of all, I felt the necessity of re-assimilating the whole framework put forward by Pasinetti's (1981) book in a deeper conceptual way, in order to fully understand all its, many, implications and hints. Many of the issues I have then considered were not in my initial 'agenda', but came about *in itinere*, since the answer to one question often opened up a series of new ones, and so on, in a not always linear process.

To begin with, I had to dissipate the doubts concerning the meaning of the term 'pre-institutional'. How is it possible to study an industrial economic system without reference to its institutional make up? How to say something about the theory of value and *income distribution* without mentioning any specific set of *social relations of production*? How to reconcile the apparent contradiction between my own task — actually, in my opinion, the very task of political economy — i.e. studying the functioning of actual economic systems, and the principal aim of Pasinetti's (1981) book, i.e. that of performing an analysis which completely abstracts from the mechanisms through which such economic systems come into being?

Answering these questions meant understanding that the above-mentioned apparent contradiction is not a contradiction at all. In order to be able to study actual economic systems, Pasinetti proposes to separate the *foundational* from the *institutional* aspect, as a way of understanding the latter in the light of the former, and thus to perform concrete investigations with a unifying interpretative schema at hand.

Pasinetti's (1981) definition of the concept of equilibrium — or better, of 'equilibrium *situation*' — is itself closely connected to the understanding of where the limit between foundational and institutional analyses lies. The object of the former, that is to say of the one developed by Pasinetti's (1981), is the *fundamental* functioning of a *capitalistic*, i.e. industrial, economic system, based on the process of production of commodities by means of commodities and on their accumulation: the task is that of singling out the *physical requirements* for its (extended) reproduction. The way in which such requirements can be met in practice pertains to the institutional stage of the analysis, that can be built by adding to the fundamental relations all the elements necessary to the description of a specific, contingent situation.

Secondly, Pasinetti's (1981) elaborations are based on a series of simplifying assumptions concerning the description of the technique in use. Such simplifications represented an obstacle to the immediate fitting of actual data

into the framework. In fact, almost all inter-industry relations are ruled out, by assuming that each consumption commodity is produced by means of labour and one intermediate commodity specific to it, that enters its own, and only its own, productive capacity. Reality clearly is much more complicated.

How to overcome this difficulty? In this respect, the way had been already paved by Pasinetti himself, in two different articles: the 1973 one on ‘The Notion of Vertical Integration in Economic Analysis’, and the 1988 one on ‘Growing subsystems, vertically hyper-integrated sectors and the labour theory of value’. Both of them make use of the complete set of inter-industry relations. Both of them consist of a re-partitioning of the activities taking place in the economic system, making direct reference to each single commodity composing the *net output*. Both of them propose the device of using a particular unit of measurement for each sector’s productive capacity.

At first sight, the difference seems to consist only in the fact that the latter includes not only direct and indirect, but also hyper-indirect requirements in the description of the technique. A more careful examination, however, reveals that a deeper, *conceptual* difference does exist, going way beyond the simple inclusion of the productive effort to be put forward to increase productive capacity in the set of activities performed by each sector.

This inclusion crucially depends on a re-definition of the very concept of net output, i.e. on a different treatment of new investments, which in Pasinetti’s (1988) formulation are no more part of the net output itself — which therefore comes to consist of consumption commodities only — and thus taken as *exogenous* with respect to technology, but rather produced together with, in the same way as, all the intermediate commodities necessary to replace those used up during the production process. In Pasinetti (1973), vertically integrated sector i produces the amount of commodity i required by the whole economic system as additional productive capacity; in Pasinetti (1988), each vertically hyper-integrated sector i produces the whole set of commodities necessary to constitute its own additional productive capacity. *This* is the difference between vertically integrated and hyper-integrated sectors.

This consciousness opened up a new question: do the sectors considered by Pasinetti (1981) belong to the former or to the latter category? Pasinetti himself is not that clear in this respect, since he uses indifferently both denominations in different parts of the book — in this way reinforcing the idea of a substantial equivalence between the two. Intense discussions and careful examination of the treatment devoted by Pasinetti (1981) to net output and new investments led me to conclude that they are vertically hyper-integrated sectors. The juxtaposition is the result of the fact that the book

is an extended version of Pasinetti's doctoral dissertation (Pasinetti 1962), where some chapters were reproduced exactly as they originally were — those talking about vertically integrated sectors — and some other chapters were written *ex novo* — those mentioning vertically hyper-integrated ones. For sure the concept was still in an embryonic stage, awaiting for its rigorous formalisation to come about with Pasinetti (1988). But the main idea was already there.

The last step to complete this conceptual *excursus* through Pasinetti's (1981) book was an examination of the characteristics and implications of the 'natural' economic system.

In the first 126 pages of his 1981 book, Pasinetti states the quantity and price systems, computes their solutions, derives the conditions for achieving flow and stock equilibrium at a single point in time, and singles out the pace at which capital accumulation has to take place in order for such an equilibrium situation to be preserved. And yet, still this is not the 'natural' economic system. We simply have a set of equilibrium solutions, one for each possible configuration of the distributive variables, i.e. one for each possible, exogenous, set of (sectoral) rate(s) of profit with which to close the price system.

Only one of these possible closures leads to the 'natural' economic system, the one — stemming from the adoption of Pasinetti's (1981) particular theory of income distribution — consisting in the 'natural' rates of profit.

It is at this point that one of my initial questions came back to the fore: how a theory of income distribution can be stated in a pre-institutional analysis? How can we define income recipients, if the categories we are used to have not yet been defined? The answer is straightforward if one has in mind the task of the foundational stage of the analysis: singling out the *physical* requirements for (extended) reproduction to take place. A necessary, even though not sufficient, condition for them to be met is the availability of the precise amount of resources that have to be devoted to capital accumulation, the residual being left for consumption. This is the key: the 'natural' profits exactly provide the economic system with the resources that must be re-injected into the production process as new investments and thus new productive capacity. The remainder of national income, wholly absorbed by wages, can be devoted to consumption. By adopting this closure of the price system, what we get are the 'natural' prices, i.e. the value counterpart of — or the exchange ratios necessary for realising — the physical-quantity equilibrium configuration. Incidentally, and interestingly enough, these exchange ratios bring with them a *pure labour* theory of value.

After completing the theoretical *excursus*, my primary aim was that of identifying the steps I needed to do in order to complete my 'preparatory

work?.

First, fitting actual data into the framework required to extend the generalisation as regards the description of the technique, started by Pasinetti (1988), to the whole of Pasinetti's (1981) theoretical construction. In addition, the degree of realism could have been further increased by introducing discrete time and non-steady rates of change of the exogenous variables.

Second, the generalisation would have been better performed by making the *formulae* more compact and easy to manage. To this end, I have restated the whole analytical framework by means of (partitioned) matrix algebra, making an extended use of Perron-Frobenius theorems for non-negative matrices.

Third, and closely connected to the previous point, I needed a mathematical formulation able to make it easier to work out empirical applications, and in particular to facilitate calculations when implementing the theoretical framework with statistical software. In order to do so I have restated the quantity and price systems as eigenproblems, the solutions being the eigenvectors associated to particular eigenvalues.

The accomplishment of these three tasks constituted the majority of my dissertation. Also in this case, the process has been an almost non-linear one, during which I have made many mistakes, I have many times changed my mind, I have often thought I was going nowhere; but nonetheless, during which I have reached many new conclusions, I have explored many new points of view, and I hope to have also achieved some theoretical advance.

The dissertation is organised as a collection of four papers (the first one written in co-authorship with Ariel L. Wirkierman). Though independent, the four papers are closely connected to each other, developing through different lines a unifying argument.

The first paper — 'Pasinetti's *Structural Change and Economic Growth*: a conceptual *excursus*' (Garbellini & Wirkierman 2010) — is a re-exposition of the framework developed in Pasinetti's (1981) book, read in the light of both: the clarification of some methodological and conceptual issues; and the contextualisation of the book within the whole intellectual path, going from 1962 to 1988, which led Pasinetti to the completion of the explicit and rigorous definition of the concept of vertically hyper-integrated sectors. The first task is accomplished through the clarification of the nature and meaning of the pre-institutional approach adopted; of the nature of its equilibrium 'paths'; and of the significance, and normative character, of the 'natural' economic system. The second aim is achieved by a historical account of Pasinetti's writings, to see how the 1981 book is an intermediate step towards

the 1988 CJE article. The conceptual idea was already present very clearly in the former, though a rigorous formalisation came about only in the latter.

However, the main theoretical and empirical implications of vertical hyper-integration are still to be drawn. In order to do so, the whole theoretical construction developed in Pasinetti (1981) has to be generalised by taking advantage of the step forward represented by Pasinetti (1988). This is precisely the aim of the second and third papers of the dissertation: ‘Structural Change and Economic Growth: Production in the Short Run — A generalisation in terms of vertically hyper-integrated sectors’ (Garbellini 2010b); and ‘Structural Change and Economic Growth: Production in the Long Run — A generalisation in terms of vertically hyper-integrated sectors’ (Garbellini 2010a).

Garbellini (2010b) has three parallel aims. The first one is that of rigorously and analytically showing the contention put forward in Garbellini & Wirkierman (2010), i.e. that Pasinetti’s (1981) framework involves the same treatment of new investments and net output as that of Pasinetti (1988), therefore already dealing with vertically hyper-integrated sectors, though in a still embryonic stage. The aim is achieved through the reformulation of Pasinetti (1973) and Pasinetti (1988) in terms analytically analogous to those of Pasinetti (1981) — though using matrix algebra, and in particular *partitioned matrices* — to show the differences of the first and the analogies of the second with respect to the third.

The second one is that of restating, in all cases, the quantity and price systems as eigenproblems, to be solved by looking for a specific eigenvalue and the associated eigenvector — the macroeconomic condition being the mathematical condition for the eigenvalue we are looking for to actually be an eigenvalue of the corresponding coefficient matrices; and the solution vectors being the associated eigenvectors. The conditions for getting economically meaningful solutions out of these eigensystems are then derived and discussed.

The last aim is that of generalising the first part of Pasinetti’s (1981) book, i.e. that devoted to production in the short run, by removing Pasinetti’s (1981) simplifying assumptions as to the description of the technique in use — i.e. by using the complete inter-industry matrix as in Pasinetti (1988) — in order to deepen the analysis and make all the theoretical categories directly comparable with the empirical ones, as coming from national accounts. In this way, the ground should be prepared for implementing empirical applications, deepening the analysis by considering the whole set of inter-industry relations, and extending the generalisation to the most important aspect of vertical hyper-integration, that is to say the one concerning dynamics, and thus production in the long run.

This last task is performed by the third chapter of the dissertation, Gar-

bellini (2010a). In this paper I restate the laws of motion of all the exogenous variables — intended by Pasinetti (1981) as exponential functions of their initial values, changing through continuous time at steady, though different from sector to sector, rates — in discrete time, thus introducing non-steady rates of change. It is my contention that this is an improvement with respect to the dynamics assumed in the original formulation, since it increases the degree of realism of the whole framework, allowing to single out determinants of the structural change of the economic system that cannot be identified by using exponential growth with steady rates of change.

By using these discrete dynamics — besides reconsidering the determinants of the structural dynamics of quantities and prices, as well as of the sectoral and aggregate capital/output and capital/labour ratios — I then restate the conditions for keeping stock equilibrium through time, i.e. Pasinetti's capital accumulation conditions, stressing their relations with the rate(s) of profit. This, together with the sketching of the particular theory of income distribution used by Pasinetti to get a closure of the price system (already detailed in Garbellini & Wirkierman 2010) allows to define the *natural rates of profit*, and therefore the 'natural' economic system. The characteristics of the latter, in particular as to the peculiarities of the value formation side of the economic system itself and thus of the resulting theory of value, are then analysed and discussed in detail. The last part of the paper is devoted to the restatement of Pasinetti's (1981) 'standard rate of growth of productivity' and thus 'dynamic standard commodity', and to resume the argument leading to the definition of the 'natural rate of interest', that has remained somehow unnoticed and obscure after its original statement in Pasinetti (1981).

Finally, the last chapter of the dissertation (Garbellini 2010c) aims at putting together the results of the first three chapters in order to provide a reply to the criticisms more often put forward against the approach of structural economic dynamics.

As a matter of conclusion, I would like to stress the fact that I did not make, in the present Introduction, any reference to the superiority of the approach of structural economic dynamics — and, more in general, of the 'modern classical' approach to economic analysis — with respect to mainstream economics. That famous controversy finished with an undoubted victory of the former against the latter. I personally consider it as one of the most fascinating pages of the history of economic thought. Though, unfortunately, nothing changed afterwards. For this reason, I am absolutely convinced that today, after half a century, it is necessary to keep up working on the *con-*

structive side, recovering what I consider the real strength of the ‘production paradigm’: a theorising process based on observable, measurable, concrete categories, closely connected to national accounting, constantly aiming at explaining reality. Deeply concerned with social matters. Not economic science, but Political Economy.

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