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MODERN STRUCTURAL ECONOMIC DYNAMICS IN THE SHORT AND THE LONG RUN

BY
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During several decades and until the end of the 1990s, the theory of structural economic dynamics has been absent in the field of so-called mainstream economic analysis. The literature included only either empirically oriented contributions or developments that were related to so-called critical theoretical approaches of structural change. At the end of the twentieth century, however, mainstream economic theorists changed this situation and began to investigate the field of structural dynamics, often using the Solovian theory of economic growth. During the last two decades, they contributed to change substantially the state of the theory of structural change. This contribution first provides an assessment of the advances realized by these theorists. It then confronts these advances with the so-called alternative or critical theoretical approaches of structural dynamics—namely, Luigi Pasinetti's contribution and 'evolutionary' approaches—in order to provide a more complete picture of structural dynamics in the short and the long run.

I. INTRODUCTION

During several decades and until the end of the 1990s, the theory of structural economic dynamics has been absent in the field of so-called mainstream economic analysis. The literature included only either empirically oriented contributions often developed by economists belonging to economic institutions or agencies, or developments that were related to so-called critical theoretical approaches of structural change.

Richard Arena, GREDEG, University of Nice-Sophia Antipolis and CNRS. This contribution is dedicated to the memory of Pier-Luigi Porta, who strongly contributed to the development of the analytical and historical contents of the theory of economic structural dynamics and whom I miss so greatly since the end of January 2016.

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Among others, William Baumol, Luigi Pasinetti, and, more surprisingly, Robert Solow were often quoted and praised for their respective works. See, for instance, Pasinetti and Solow (1994); see the special issue of *Structural Change and Economic Dynamics* (*SCED*) edited by Roberto Scazzieri (1996) and including contributions of the "Symposium on Pasinetti's Structural Economic Dynamics"; see also in the journal *SCED* Angelo Reati (1998), Pasinetti (1998), Solow (1998), Baumol (2000); and see the contributions of Baumol, Pasinetti, and Solow in Richard Arena and Pier-Luigi Porta (2012).

At the end of the twentieth century, however, mainstream economic theorists changed this situation and began to investigate the field of structural dynamics, often using the Solovian theory of economic growth. During the last two decades, they contributed to change substantially the state of the theory of structural change. However, they did not consider the theory of structural dynamics in the short and the long run, trying, for instance, to connect the respective theories of business cycles and structural change as it was done by Alessandro Vercelli (2000), Lionello Punzo (2006), and Roberto Veneziani and Simon Mohub (2006); or by Mark Setterfield and Shyam G. Suresh (2016). This analytical choice was not really new. It revived the old macroeconomic agreement within mainstream economics, which developed separately a theory of short-term fluctuations and a theory of economic growth, and considered that business cycles and growth or structural change were two independent economic phenomena. This agreement, born in the 1930s, still prevailed at the end of the 1990s, when Robert Solow reasserted it (Solow 1997).

During the same period, however, new models of *stochastic optimal growth* were introduced and tried to connect business cycles and long-term changes, breaking the old agreement prevailing in standard macroeconomics. Thus, after the seminal works of Finn E. Kykland and Edward C. Prescott (1982), and John B. Long and Charles I. Plosser (1983), Thomas F. Cooley and Prescott noted, for instance, that the origin of these models was the real business cycle theory and "start[ed] with the view that growth and fluctuations are not distinct phenomena to be studied with separate data and different analytical tools" (Cooley and Prescott 1995, p. 4). However, if business cycles and growth were connected, growth was supposed to be the result of a program of intertemporal optimization of the rate of growth related to a state of distribution between present and future aggregate consumption. It is useless to stress the fact that the existence of a path of optimal aggregate growth excluded a priori the existence of economic structural change. Therefore, even if growth and business cycles were connected, structural change was still considered as another field of analysis by builders of stochastic optimal growth models.

Our contribution starts from this separation between structural change and business cycles, which still prevailed in contemporary mainstream macroeconomic dynamics in the 1990s. It tries to characterize the new state of economic dynamics resulting from mainstream contributions of the last two decades, investigating both the degree of novelty of those contributions and the possible new issues raised for contemporary mainstream, as well as critical or alternative, economic dynamics. It will include seven sections. We will first look at optimal and endogenous growth models and see if they offer a contribution to mainstream economists in the field of structural change (section II). We will then consider contributions that formed the starting point of the integration of the theme of structural change in the contemporary theory of economic growth

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(section III). Next, we will consider the models of "generalized balanced growth" that provide the core of modern mainstream theories of economic growth and structural change (section IV). In section V, we will consider the extent to which these theories can contribute to a better understanding of the relation between short- and long-run structural changes, but also question the presence of the so-called neoclassical flavor of these models and see if it is still really present today. We will then confront these new theories of structural change with so-called alternative or critical theoretical approaches of structural dynamics (Pasinetti's contribution in section VI and 'evolutionary' approaches in section VII), in order to provide a more complete picture and appraisal of the state of structural dynamics in the short and the long run. The final section offers concluding remarks.

II. THE FIRST AND SECOND STAGES: OPTIMAL AND ENDOGENEOUS GROWTH MODELS

A *first stage* of our investigation concerns the development of *optimal growth* models. These models, often called 'Ramsey–Cass–Koopmans models'—originally Frank Plumpton Ramsey (1928), then David Cass (1965), but also some contributions by Tjalling C. Koopmans (1965 and onwards); see also a canonical presentation of the standard form of these models in Robert J. Barro and Xavier Sala-i-Martin (2003, p. 86)—were credited in the literature with paying greater attention to the nature of the microfoundations of the theory of growth, but above all with advances in transitional dynamics that facilitated the use of numerical simulations and, eventually, econometric calculus. These achievements did, however, also facilitate the tendency "to assimilate growth and development, abetted by the vogue of cross-country regressions," as pointed out by Solow (Solow 1997, p. 6). These models did not, therefore, in any real sense, face up to the problems of structural change from an analytical standpoint. Moreover, optimal growth models are by their very nature normative and thus rather ill-equipped to tackle the empirical features of structural change. Solow also observed that "it seems to me foolish to interpret as a descriptive theory what my generation learned from Frank Ramsey to treat as a normative theory, a story about what an omniscient, omnipotent, and nevertheless virtuous planner would do" (1997, p. 12). In spite of Solow's remarks, however, like the Solow standard neoclassical growth model, the Ramsey–Cass–Koopmans model generates a system of differential equations determining a balanced, stable, and convergent equilibrium growth path, where capital and consumption grow at a constant rate. As we already noted, *stochastic optimal growth models* contributed to connect business cycles and economic growth. Their conception of macrodynamics revives the old distinction between impulses and propagation, and characterizes business cycles as optimal fluctuations that result from the propagation of exogeneous and stochatic shocks in the economic system. However, these fluctuations do not affect the long run and natural tendency of the economy. A form of natural growth close to balanced growth therefore remains and corresponds to the intertemporal optimization of consumption implemented by a representative agent. Moreover, this type of connection between fluctuations and stochastic optimal growth has been strongly criticized on theoretical as well as empirical grounds (see, for instance, Frédéric Lordon 1991).

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A *second stage* corresponded to the emergence of *endogenous growth theory,* which allows for an explicit treatment of innovation and a better analysis of their *structural* effects. Innovations here are mostly considered to be *incremental,* as, for instance, by Wilfred J. Ethier (1982) and John E. Romer (1990). In this line of enquiry, intermediate goods owned by specialized productive units contribute to the division of labor and to productivity increases in final goods production. Thus, the new intermediate goods modify the *organization and degree of specialization of the productive structure* of the economy. Romer (1990), for instance, differentiates between research, intermediate, and final goods sectors, and, to this limited extent, some notion of *structural analysis and change* is implicitly recognized without, therefore, making this a core point of the analysis. Philippe Aghion and Peter Howitt (1992) introduced the possibility of addressing *radical* or *GPT* (general purpose technologies) innovations combining, in so-called neo-Schumpeterian fashion, different forms of obsolescence with 'creative destruction.' New products can appear in addition to older ones, but they can also replace these. Over time, all technologies eventually become obsolete and are replaced by successors. Such new technologies are the product of recent innovations that, due to their GTP characteristics, increase productivity at the macroeconomic level. In this kind of model, radical innovations and structural change are therefore closely linked to the emergence of new goods and technologies.

Endogeneous growth theory, therefore, partially contributed to revive the concept of structural change, since it welcomed the existence of many heterogeneous capital goods in the real economy, which are produced by different sectors/technologies. The simplest case is the assumption that there are physical capital and human capital and more complex cases implying more disaggregated models, referring, for instance, to the output elasticity of the respective kinds of capital. However, structural change is limited here to structural change across capital goods sectors. Such advances by endogenous growth theory, and in particular the more convincing attempts by its neo-Schumpeterian branch to inscribe structural change on its agenda, should not, however, distract from certain analytical limitations of contemporary endogenous growth theory. We may, for instance, refer to the enduring role of the representative consumer guided by constant preferences (notwithstanding the occasional introduction of some form of structural dynamics) and the use of ad hoc assumptions formally required to generate externalities, and, in this way, to account for the relevance of different forms of returns to scale; see, e.g., Neri Salvadori (2003a); Richard Arena and Alain Raybaut (2003); or Philip Arestis, John McCombie, and Roger Vickerman (2006). If the possibility of multiple equilibria is also considered and reinforces the importance of uneven economic change over time, in particular where a wider range of different types of innovation are taken into account (e.g., Bruno Amable 1996), differentiated technical progress is not sufficient to cope with real structural change implying final consumption goods, income distribution, and sectoral decline.

It should be noted, however, that there are some recent exceptions in the endogeneous growth literature where structural change as a whole is clearly investigated, such as the models by Reinhard Meckl (2002) and Reto Foellmi and Josef Zweimüller (2008), but we will consider them later. However, overall, we share the view of Maria Savona and André Lorentz: "'The modern growth theory is largely dominated by the New Growth Theory (NGT)' (Aghion and Howitt, 1998). Due to the underlying idea that short-run fluctuations are not a long-run concern, shared by both the NGT, and the

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RBC literature, little concern is drawn on the interactions between short-run fluctuations and long-run growth path. Very little can be found in the NGT on structural change either" (Savona and Lorentz 2010, p. 3).

The conclusion to this section is therefore that structural change as a whole is not really captured by optimal and endogenous growth models, and is often included in the sole framework of transitional dynamics.

III. THE THIRD STAGE: DYNAMIC EQUILIBRIUM AND STRUCTURAL CHANGE

This and the following sections focus on a *third* stage in the development of contemporary growth theory post-Solow and post-Ramsey–Cass–Koopmans models, and on the ways in which structural change has been addressed by this comparatively recent literature. In the first two stages of recent developments of modern economic growth theory, only scarce attention has been paid to structural dynamics, even if the *idea of structural dynamics* has never ceased to intrigue economists of all straits, and to captivate their interest and intellectual curiosity.

However, for a long time, growth theorists noted that structural change was compatible with balanced growth only if very specific and improbable parametric assumptions were introduced (see Piyhaba Kongsamut, Sergio Rebelo, and Danyang Xie 2001 [KRX for short]; and Jurgen Meckl 2002). Even at the end of 2000, Daron Acemoglu and Veronica Guerrieri (2008) showed why the neoclassical balanced growth path could not prevail as long as structural change took place and as long as sectors differed by output-elasticity of inputs. To a large extent, structural change was neglected by mainstream growth theorists, since it seemed to be incompatible with balanced growth theory. However, this analytical situation was not satisfactory. Structural change has always appeared to be one of the most obvious features of empirical growth, and it was impossible to continue to ignore it, restricting theory to balanced growth cases.

Cristina Echevarria (1997) can certainly lay claim to having put structural change back on the agenda of recent growth analysis. Rather than simply ignoring differing existing contributions to the theory of structural change, she distinguished two traditions of thought on structural change, and highlighted their different views on the relationship between changes in the sectoral composition of the national product, on the one hand, and aggregate growth, on the other. Specifically, she argued that a first perspective—which she labels "the neoclassical view"—held that structural change, understood as the evolution of the sectoral composition of national output, was a relatively "unimportant by-product of growth" (Echevarria 1997). The second view—attributed to "scholars associated with the World Bank, including Simon Kuznets (1971), Walt W. Rostow (1971), Hollis B. Chenery and Moshe Syrquin (1975), and William Baumol et al. (1989)"—made an original and divergent contribution in that it argued "that growth is brought about by changes in sectoral composition" (Echevarria 1997, p. 145).

Echevarria went on to propose a kind of synthesis of both approaches, based on the idea that the sectoral composition of national output affects per capita income growth rates as well as the structure of economic growth. Echevarria (1997) also provided a synthesis of the previously mentioned stages of the contemporary theory of economic

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growth by developing the methods of dynamic general equilibrium (including the use of a collective utility function) within the framework of a Solovian model of sustained growth**.** The real innovation of her paper consisted, however, in the introduction of three, different, consumption goods demanded by agents on the basis of non-homothetic preferences: primary goods, manufacturing goods, and services. Non-homothetic preferences simply implied that income elasticity differs across goods. Hence, when income increases, the demand does not increase uniformly across the three types of goods considered, and therefore it is redistributed across the three sectors that produce these goods. Moreover, each consumption good is produced with different factor intensities, which are compatible with different exogenously given sectoral rates of technological change. This diversity of sectoral productivities affects the change over time of the sectoral composition of national output, and thereby the growth rate of the economy. In Echevarria's model, the equilibrium path has an asymptotic limit in which labor in the three sectors remains constant, while capital in all the three sectors—i.e., total capital, investment, and consumption of manufactured goods—grows at the same rate. Therefore, if the proportion of inputs allocated to each sector is constant, the consumption of manufactured and primary goods and of services grows at different rates, in line with diverse forms of technical change as well as, partially, the overall increase of capital. While relative prices compensate for lower or higher growth, the proportions between the three goods or sectors change at a constant rate in real terms. Asymptotically, one sector tends to dominate the whole economy while the two other goods or sectors proportionally decline, although they grow in absolute terms. Structural change, therefore, is an explicit and core part of the analysis, even if the long-run implication is that it will eventually "vanish" to make space for the "neoclassical view" of an asymptotic steady state equilibrium. Thus, in Echeverria's contribution, no balanced growth path exists as long as structural change takes place while steady state equilibrium emerges only in the long run.

As Liwa L. Ngaï and Christopher A. Pissarides (2007) observe, Echevarria (1997) inspired a wide response, including, in particular, from John A. Laitner (2000). Laitner's model admitted the existence of non-homothetic preferences as a possibility. Consequently, he located the origin of structural change on the demand side of the economy. In Laitner's model, structural change is due to the operation of Engel's Law and its impact on the economy-wide saving rate. An increase in the average propensity to save follows naturally from an increase in per capita income, due to sufficiently pronounced technical progress. Other than in some endogenous growth models, Laitner does not explain an increase in the propensity to save by recourse to collective utility functions and optimization, but he considers the implications of Engel's Law for financial variables. He argues that, while abnormal thrift may lead to higher income levels (as in Solow's framework), causality can run the other way around: a higher standard of living can lead to a higher saving rate. In Laitner's model, there are not three, but only two, goods, an agricultural and a manufacturing good, both of which are consumption goods. Household saving follows the stages of life-cycle behavior with overlapping generations. Each household lives for two periods, is identical to all others born at the same time, and takes prices as given. While young households will save all labor earnings, retired households will deplete all wealth. This pattern will not vary over time even if incomes change, while the composition of consumption depends on changes in income. On the production side of the economy, aggregate effective

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labor supply depends on the number of young households and current technology. Finally, the economy is seen to undergo a shift from an initial specialization in agriculture to devoting more and more labor to manufacturing production.

Notwithstanding differences in the detail of their respective analyses, Echevarria and Laitner—as well as, according to Ngaï and Pissarides (2007), Francesco Caselli and Wilbur J. Coleman II (2001); and Douglas Gollin, Stephen L. Parente, and Richard Rogerson (2002)—all conceptualize some form of structural change within a *two- or three-sector economy with non-homothetic preferences*, thus locating the origin of structural change in long-run changes of consumer tastes. As did Acemoglu and Guerrieri (2008) later, these authors, however, argued that structural change and balanced growth are not compatible, but the first can in the long run lead to the second. Moreover, the structural change pointed out by them is not necessarily compatible with "Kaldor's stylized facts," which require that capital, consumption, and output grow at a constant rate; i.e., that the growth path should be balanced, while the path of structural change that leads to steady state is generally unbalanced.

IV. COMBINING BALANCED GROWTH AND STRUCTURAL CHANGE? TOWARDS A GENERALIZED BALANCED GROWTH THEORY

A different type of approach has been pioneered by Kongsamut, Rebelo, and Xie (KRX 2001) and is also present in Meckl's similar approach (Meckl 2002). Their originality is twofold. First, KRX reshape Echevarria's distinction between two views on structural change ('neoclassical' and 'scholars associated to the World Bank'). Second, the neglect of structural change in the so-called neoclassical view or, in KRX's terminology, the dominance of "balanced growth models," is now justified by the compatibility of these models with the "Kaldor facts" regarding economic growth. As KRX remind us, Nicholas Kaldor emphasized the constancy, roughly speaking, of the growth rate of output, the capital-output ratio, the real interest rate, and the labor-income share over time, in particular in the case of the long-period behavior of the US economy. These "stylized facts" are taken to provide sufficient justification for the regularities assumed by balanced growth theory and, consequently, for treating the study of structural change as secondary. Kaldor's "stylized facts" can be found in Kaldor (1961, pp. 230–231). From this, it becomes obvious that KRX's interpretation has a distinct "reductionist" flavor and differs from Kaldor's own perception. In fact, Kaldor specified these "stylized facts" in a paper prepared for the Corfu Meeting of the International Economic Association in August 1958, and developed the idea in the context of what Stephen Marglin and Juliet Schor (1991) refer to as the "golden age of capitalism": i.e., the period from 1945 to 1970, characterized by historically exceptionally high sustained growth rates and low rates of unemployment in leading Western economies.[1] Moreover, Kaldor (1961, p. 231) remarked that "none of these 'facts' can plausibly be 'explained' by the theoretical constructions of neo-classical theory."

And, KRX also argue that the "Kuznets facts" cannot possibly be ignored: that is, "the massive reallocation of labour from agriculture into manufacturing and services

[1]More recently, D. A. Jones and L. M. Romer (2009) brought out what they called "the New Kaldor Facts."

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that accompanies the growth process. This reallocation process, often called 'structural change', has been documented by authors such as John Maurice Clark (1940), Kuznets (1957) and Chenery (1960)" (KRX 2001, p. 869). As well, KRX do not refer to Echeverria's scholars "associated with the World Bank," but note that

> the macroeconomics and growth literature, which makes heavy use of balanced growth models, generally disregards the dramatic sectoral reallocation of labour experienced by all expanding economies. In contrast, there is a literature on structural change that ignores the Kaldor facts, in part because it focuses on a longer time period for which these facts may not apply (e.g. Baumol [1967], Pasinetti [1981], Park [1995], Echevarria [1997] and Laitner [2000]). (KRX 2001, p. 869)

As Acemoglu noted in his *Introduction to Modern Economic Growth,* by contrast, KRX refer to "changes in the composition of employment and production as the 'Kuznets facts'. They provide a tractable model to reconcile this type of structural change with the Kaldor facts ... that is the relative constancy of factor shares and the interest rate" (Acemoglu 2009, p. 698).

Much as Echeverria earlier, KRX propose their own synthesis of both these views in the form of a model that integrates the main features of balanced growth *and* of the dynamics of structural change in a macroeconomic trajectory described by a "*generalized balanced growth* (GBG) path" (KRX 2001, p. 870). This path features a constant real interest rate, constant relative prices, a constant aggregate labor-income share, a constant growth rate for capital and aggregate output, a constant capital-output ratio, and time-varying sectoral growth rates and employment shares in three different sectors that are similar to those of the Echevarria model. The employment share declines in agriculture (which replaces Echevarria's sector of 'primary goods'), rises in services (as in Echevarria's model), and is stable in manufacturing (again, as in Echevarria's model). The rates of change of the factor shares of both agriculture and services converge to zero in the long run. As the economy grows, the importance of these sectors declines and the economy converges to a standard balanced growth path.

Not unlike in a balanced growth model, the economy here features transitional dynamics that are reminiscent of the stability properties of the one-sector neoclassical growth model. What ensures the existence of the GBG growth path in the KRX model is a restriction imposed on the value of agent endowments with services and agricultural goods. Without this restriction, the economy can still converge asymptotically to the GBG path, provided deviations from the restricted endowment value are not too pronounced. The introduction of different sectoral production functions and rates of technical progress implies that the relative prices of the different sectoral goods will vary over time. This, in turn, requires the imposition of constraints on the GBG path stability that are far more complex and difficult to interpret. Thus, within this framework, structural change can be handled only in specific and limited ways that exclude, for example, cases in which there is a wide variety of forms of technical progress. Therefore, a GBG path combines both a growth of aggregates and unbalanced growth of disaggregated variables. That is, along a GBG path, aggregate output and aggregate capital grow at a constant rate, and at the same time structural change takes place (e.g., sectoral output shares change).

Still more recently, Ngaï and Pissarides (2007) have provided an analytical framework that they consider an improvement over both of the previously mentioned approaches.

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Thus, they are, for example, critical of the approach developed by Echevarria (1997), Laitner (2000), and Caselli and Coleman II (2001) for deriving structural change on the basis of a unique ad hoc assumption of non-homothetic preferences. In the case of the second approach, mentioned above, their criticisms are mainly directed at KRX (2001) and Foellmi and Zweimuller (2005). With regard to KRX (2001), Ngaï and Pissarides object to the fact that they have obtained their results "by imposing a restriction that maps some of the parameters of their Stone-Geary utility function onto the parameters of the production functions, abandoning one of the most useful conventions of modern macroeconomics, the complete independence of preferences and technologies" (Ngaï and Pissarides 2007, p. 429). Stone–Geary preferences are indeed very useful for generating GBG paths, since the demand dynamics, which are created by Stone–Geary preferences, can be controlled by the preference parameters in a very detailed and direct fashion, but Ngaï and Pissarides's criticism is right, since there is no clear reason why the mapping of utility parameters on production function ones is indeed arbitrary. In the same vein, Ngaï and Pissarides criticize Foellmi and Zweimuller (2005) for having obtained "their results by assuming endogenous growth driven by the introduction of new goods into a hierarchic utility function" (ibid.). Ngaï and Pissarides argue that, by contrast, their own "restrictions are quantitative restrictions on a conventional CES utility function that maintains the independence of the parameters of preferences and technologies" (ibid.). Moreover, their model considers structural change in the context of a real diversity of technical change, expressed in the form of different sectoral growth rates of total factor productivity that imply shifts in industrial employment shares over long periods of time. This diversity is shown to be compatible with the constancy of the economy's aggregate ratios. Ngaï and Pissarides's model includes various consumption goods and a single capital good supplied by a 'manufacturing' sector. Production functions are assumed to be identical across all sectors except for their rates of total factor productivity growth, and each sector produces a differentiated good that enters in the CES (constant elasticity of substitution) utility function. Under specific assumptions concerning the elasticity of substitution across final goods, the relative size of total factor productivity (TFP) growth rates and the intertemporal elasticity of substitution in the utility function lead to *structural change* combined with a constant aggregate capital-output ratio and a balanced growth path. Finally, their approach essentially derives structural change from a *"technological*" explanation mainly based on different rates of sectoral total factor productivity growth. This differs from the so-called *utility-based* explanations, "which require different income elasticities for different goods and can yield structural change even with equal TFP growth in all sectors" (Ngaï and Pissarides 2007, p. 430). Ngaï and Pissarides also emphasize the compatibility of their approach with the results of Baumol (1967) regarding the distinction between 'progressive' and 'stagnant' sectors, as well as the main long-run evidence, provided by Kuznets (1966) and Angus Maddison (1980), to show the decline of agriculture's employment share, the rise and then fall of the manufacturing share, and the rise of the service share. In spite of these new advances, it is interesting to point out that their model does not consider the structural change patterns that have been studied by Acemoglu and Guerrieri (Acemoglu and Guerrieri 2008). According to these authors, structural change arises if output-elasticity of inputs differs across sectors, within a process of capital accumulation, but this assumption is generally incompatible with GBG paths.

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It is also worth mentioning again Acemoglu's *Introduction to Modern Economic Growth* (2009) in this context. Acemoglu's ambition is to develop a *general* theory (or at least a general view) of growth and development as unified phenomena. It is in that context that structural dynamics makes its appearance under "Structural Change and Economic Growth," the opening chapter of part VII of his book devoted to the larger theme of "Economic Development and Economic Growth" (ibid., pp. 697–724). Acemoglu takes on board much of the literature discussed above and referred to as a new stage of contemporary growth theory and its treatment of structural change. Thus, regarding the 'Kaldor facts' as synonym for balanced growth, he discusses KRX (2001), noting that "they assume that production functions in different sectors are identical" (2009, p. 703), but that this assumption is "useful for isolating the demand-side sources of structural change" (p. 699).

At the same time, so Acemoglu argues, KRX badly neglect the supply side of the economy. He then praises Baumol (1967) for its emphasis on uneven growth resulting from different sectoral growth rates due to different rates of technological progress. In Acemoglu's view, the main requirement is, however, to bring both sides of the economy (demand *and* supply) together, something he regards as having been achieved by Acemoglu and Guerrieri's (2008) two-sector model of constant growth equilibrium path (CGEP), on one side, and, on the other side, by other suggestions relating to the "demand side" proposed in Acemoglu (2009) (see s. 20.1 and exercise 20.17 in ch. 20). "My first purpose," Acemoglu explains, "is to show that there are more subtle and compelling reasons for supply-side nonbalanced growth than those originally emphasized by Baumol." In particular, it is "factor proportion differences across sectors combined with capital deepening [that] lead to nonbalanced economic growth" (Acemoglu 2009, p. 703; see also p. 705). Concerning the supply side of non-balanced growth, Acemoglu and Guerrieri's "richest set of dynamics" (Acemoglu 2009, p. 714) is based on some conditions on the form of the household utility (ibid., p. 712), of the transversality condition (ibid., p. 711) (namely, rather restrictive demand conditions), and on the case of an elasticity of substitution between capital and labor less than one (namely, a supply condition), which is said to be empirically validated (see Acemoglu 2009, pp. 709–710, for the analytical explanation; and Acemoglu 2009, s. 15.6 in ch. 15, for the empirical discussion). If these conditions are simultaneously respected, the asymptotic growth rate of the model converging to the CGEP is determined by the asymptotically dominant sector: namely, the one that is growing more slowly (Acemoglu 2009, p. 712), as it was the case in old multisector growth models (see John Von Neumann [1937] 1945–46). Moreover, "this model based on technological sources of nonbalanced growth is also broadly consistent with the Kaldor facts as well as the Kuznets facts" (Acemoglu 2009, p. 714). This attempt is then combined with a purely demand-side one (s. 20.1 of ch. 20), assuming a rather abrupt consumer type of aggregation, generalized Cobb–Douglas production functions, and an exogenous and Hicks-neutral technical progress (Acemoglu 2009, p. 723).

Acemoglu also addresses the question of the sources of industrialization, making use of a wide range of models. The Acemoglu–Zilibotti model (1997) is presented as a refinement of Rosenstein–Rodan's big-push idea. The Matsuyama model (1992)—a two-sector model based on non-homothetic preferences in consumption and on learning-by-doing in manufacturing—is credited with formalizing the view (widely shared by historians) that agricultural productivity is the prime mover of economic growth.

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By contrast, the contribution made by Ngaï and Pissarides (2007) is rather played down as simply providing a modern version of Baumol's original idea. Chapter 21 of Acemoglu's book, devoted to "Structural Transformations and Market Failures in Development" (2009, pp. 725–775), explores a number of issues, ranging from finance to demography, urbanization, and dualism. For our purposes, the most interesting section within this chapter is section 21.4, which discusses growth strategies and the role of imitation-innovation processes, based on Acemoglu–Aghion–Zilibotti (2006). In his section 21.7, Acemoglu concludes the chapter on a note, but shuns the idea of providing a unified model of structural transformation and market failures in development, arguing that this kind of ambition would lead "to a framework that is complicated, whereas I believe that relatively abstract representations of reality are more insightful. Moreover the literature has not made sufficient progress for us to be able to develop a unified framework. Instead I provide a reduced-form model intended to bring out the salient common features of the models presented in this chapter" (Acemoglu 2009, p. 765). Nevertheless, he maintains that we can "approximate the growth process with an increase in the capital-labour ratio of the economy" (Acemoglu 2009, p. 765), suggesting that the Solow model should retain its role as a useful benchmark and starting point for growth analysis, which can be filled out with more recent insights from the analysis of structural change, as essentially complementary pieces of the jigsaw.

V. SHORT- AND LONG-RUN STRUCTURAL CHANGE

The preceding sections of this contribution characterized the specificities of the present state of mainstream macrodynamics. Stochastic optimal growth models relate economic growth and business cycles, but the way they do it excludes any possible explanation of structural economic change. To a large extent, recent models of structural change revive the Solovian theoretical tradition, extending the notion of balanced growth and giving birth to the notion of generalized balanced growth (GBG). It is not surprising that, following this tradition, these models do not leave any room to short-run changes or business cycles: business cycles and growth are still assumed to belong to two different and autonomous fields, and no interaction is supposed between both phenomena. It is therefore very uneasy to combine short-run and long-run structural changes within the framework of mainstream economics. Some exceptions, however, exist and help to highlight why mainstream macrodynamics do not provide easy solutions to build a possible coexistence of structural change and business cycles.

Take, for instance, the significant example of the contribution by James Bullard and John Duffy (2004) to the literature, and contributions such as those of Hans-Martin Krolzig (1997a, 1997b, 2000, 2001), Michael R. Pakko (2002), or Julio J. Rotemberg (2003). Not surprisingly, Bullard and Duffy observe that most of the stochastic optimal growth or the real business cycle models consider the economy "as essentially following a given balanced growth path, deviating from that path only because of temporary shocks which drive the business cycle. The path itself never changes. If it did, the agents in the model would want to react to such movements" (Bullard and Duffy 2004, p. 1). In order to avoid this analytical scheme, which requires the rather restrictive assumptions of rational expectations, short-run instantaneous behavioral adjustments, and invariant long-run equilibrium, our coauthors replace the rational expectations

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assumption with a recursive adaptive learning assumption. Learning is a reaction to two types of shocks: usual standard business cycle shocks to total factor productivity, but also unexpected and persistent shocks to the factors driving growth (Bullard and Duffy 2004, p. 2). When these two forms of shock occur, the agents adjust to a *new* balanced growth path and learn the new rational expectations equilibrium. In other words, agents are able to converge towards "a balanced growth path that is sometimes changing, while simultaneously reacting to ordinary business cycle shocks" (ibid.). Therefore, the usual long-run trend is replaced by a *multivariate* trend. This attempt of 'detrending' macroeconomic data has to be based, however, at least partially on empirical shocks sufficiently rare but substantial and unexpected. The authors mention, for instance, "postwar U.S. events such as changing attitudes concerning women in the workforce, the 'productivity slowdown,' and the 'new economy'" (ibid.). Bullard and Duffy's model presents two essential characteristics. First, their model describes an economy that follows a balanced growth path influenced by usual business cycle shocks, but "this balanced growth path itself changes course infrequently" (Bullard and Duffy 2004, p. 10). Second, this change occurs "infrequently" and is therefore unexpected by agents, who have to learn which is the new balanced growth path. This model is a good example of a literature that tried to introduce structural change in RBC or DGSE models, and can be useful to better understand some empirical phenomena. However, structural economic change is here reduced to the mere consequences of the adaptive behavior of agents confronted with a new balanced growth path. Before shocks, a balanced growth path is prevailing, and, after shocks, agents adapt to a new process dedicated to the convergence towards the new balanced growth. Structural change therefore excludes *permanent* changes in technology, consumption, or the structure of the GDP.

This characterization of economic structural change shows the limited choice that the modern mainstream literature is confined to when it has to explain the combination of short-run business cycles and long-run structural change. Either the models explain structural change in a Solovian way, and, in line with this theoretical framework, structural change has to be considered independently from economic fluctuations. Or, they choose the solution of stochastic optimal growth models, but the type of structural change that is considered is poor compared with what it is in the real world. The reason for this disappointment is the analytical necessity of using the general scheme of optimal growth: namely, a scheme that is fundamentally inadequate to explain economic structural change.

Most of the models considered in the previous sections of this contribution are clearly rooted in what was called the tradition of neoclassical dynamics for several reasons we will now recall.

First, prices considered in these models are all based on the assumptions of market clearing and perfect mobility of factors. They are all long-run models in which these assumptions guarantee the existence of self-equilibrating tendencies. Therefore, a conception of growth based on cumulative causality, as in the Kaleckian or the Kaldorian traditions (see, for instance, Ricardo Azevedo Araujo 2013; Ricardo Azevedo Araujo and Andrew B. Trig 2015; Richard Arena and Alain Raybaut 2003), is clearly excluded. Price rigidities or imperfections are also absent. Growth and structural change cannot be based on an accumulation of cumulative short-term changes, and, to remember an old paper of Pasinetti (Pasinetti 1960), short-tem adjustments, business cycle, and

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growth theories are at least partially assumed to be independent. Moreover, as we noted, when growth and fluctuations are connected, they do not, however, generate structural change as such. This is why still, most of the time, understanding short-run and long-term economic changes and their connections presupposes the partial distinction and autonomy of these three theories. Therefore, business cycles are not interpreted as the "consequences" of economic growth (Pasinetti 1993, p. 177). Pasinetti's remarks, formulated twenty years ago, which concerned the Solovian view of economic growth, are still valid if we consider the previous sections; balanced growth and business cycles models are respectively based either on "a theory of equilibrium growth (which excludes business cycles) or on a theory of business cycles (which excludes equilibrium growth), according to the range of variation in which parameters are defined. It is indeed surprising that this incompatibility between growth and business cycles in macroeconomic models is generally neglected" (Pasinetti 1993, p. 177).

These first features of the models considered in the previous sections also imply that economic growth is seen in the long run as a process, the issue of which is a balanced path, even if it is not always unique or stable, or if it takes the specific form of a GBG path. This is obviously the result of the neoclassical assumptions we recalled and the microfoundations we will now mention. Formally, models of structural change or of optimal growth are generally based on dynamic optimization: that is, on a Hamiltonian function that allows the determination of the sufficient conditions of the optimality of the dynamic equilibrium solution. The possible occurence of economic endogeneous instability is therefore excluded from the framework of economic growth and structural change. Most of the models considered—especially GBG or optimal growth models—assume the existence of a representative household that seeks to maximize its lifetime utility by consuming and investing its wealth according to its time preferences. The reference model is clearly the Ramsey–Cass–Koopmans model and its microfoundations and assumptions concerning aggregation of agent behavior. Investment is directly related to capital accumulation and thus to the growth of future production/consumption possibilities. This choice clearly implies the issue of optimal control we just mentioned.

This representative consumer has a perfect foresight of the future, even if she is confronted with many heterogeneous, and not just one homogeneous, sectors of consumption goods, and if stochastic shocks are possible in an optimal model. This explains the necessity of a debate concerning the choice of the form of preferences (non-homothetic, multiple elasticities, Stone–Geary, CES, Cobb–Douglas, Engel's Law, etc.) within the growth model.

VI. DO CONTEMPORARY THEORIES OF STRUCTURAL DYNAMICS QUESTION PASINETTI'S 'ALTERNATIVE' APPROACH?

Let us now observe if so-called alternative or critical models have to be reconsidered in relation to the models of the previous sections, and to what extent they still differ from this renewed version of what is called the neoclassical tradition. Among the alternative approaches, Luigi Pasinetti's one is certainly the oldest and the most famous (see Pasinetti 1965, [1960] 1974, 1981, 1993, 2007; Carlo Panico and Neri Salvadori 1993; Heinrich Bortis 1996; Davide Gualerzi 1996; Izumi Hishiyama 1996; Roberto

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Scazzieri 1983, 1996, 2009; Pier-Luigi Porta 2007; Angelo Reati 1998; Moshe Syrquin 2010; Arena and Porta 2012).

According to Pasinetti, a first point of difference concerns the interpretation of the 'Kaldor facts.' For him, one of the main defenders of an alternative theory of structural change—Nicholas Kaldor —never interpreted these 'facts' as an empirical justification for the construction of a theory of balanced growth:

> Kaldor, who often repeated in his own words Keynes's phrase ["When the facts change, I change my mind"], used to begin many of his works with an accurate list of "stylised facts", that needed to be explained, as he repeatedly stressed (Kaldor, 1961); the term "stylised facts" meaning some empirical regularities that were sufficiently general and persistent, so as to "capture some objective features of reality." (Pasinetti 2003, p. 11)

In other words, Pasinetti regards the 'Kaldor facts' as a specific application of the Cambridge School idea of "reality (and not merely abstract rationality) as the starting point of any economic theory" (ibid., p. 10). The foundations of economic dynamics should not be located in an a priori conception of agent rationality, even if this provides a logically coherent framework. Rather, such foundations must be based *from the start* on some kind of 'stylization' or 'typification' of 'facts.' This first point of difference is not new and remains the same when we consider contemporary mainstream theory of structural change as well as Solovian theory of economic growth; opposite points of view persist, since the methodological foundations of both approaches continue to be incompatible.

Beyond this appeal to realism, a second point of contention refers to what, in his latest book, Pasinetti called "the separation theorem" (Pasinetti 2007, p. 274). This theorem states that "we must make it possible to disengage those investigations that concern the foundational bases of economic relations—to be detected at a strictly essential level of basic economic analysis—from those investigations that must be carried out at the level of the actual economic institutions" (ibid., p. 275). Analyses of the former type consider fundamental economic relationships that can be uncovered independently of specific behavioral patterns and institutional settings. This level of investigation, which Pasinetti calls 'natural,' allows the determination of economic magnitudes "at a level which is so fundamental as to allow us to investigate them independently of the rules of individual and social behaviour to be chosen in order to achieve them" (ibid., p. 275). In Pasinetti's view, this stage of analysis identifies the domain of pure economic theory and should be kept distinct from "a second stage of investigation, which concerns how the economic magnitudes are actually determined, within the bounds and constraints of the institutions characterising the economy at the time it is investigated" (ibid.).

We first consider the stage of 'pure economic theory.' At this stage, in accordance with Pasinetti's emphasis on 'reality' as a starting point, "the focus is on those objective elements of reality that have a high degree of persistence through time. The relationship between these elements should be studied carefully and through an exercise of abstraction organized in a logically coherent theoretical framework. The result, as yet, will not reach an all-comprehensive theoretical framework, but it will provide an essential—and in this sense, a general—economic theory" (Pasinetti 2003, p. 20). A core concept of 'pure economic theory' is the notion of the 'natural system' (Pasinetti 1993, ch. VIII).

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This notion is incompatible with the "exchange paradigm"—central, of course for Pasinetti, to the neoclassical tradition—in which the basic analytical reference is assumed to be a pure exchange model: given a set of individual and arbitrary endowments, individual agents maximize their utilities by exchanging the goods with which they have been endowed on the basis of a set of equilibrium prices simultaneously determined in the market. By contrast, Pasinetti's view of structural change is based on an alternative model, which the author calls the "pure production model." At the heart of this model "is the technological process of production, with division and specialisation of labour. Prices and costs arise from the fact that each individual specialises in producing only one or service … " (Pasinetti 2007, p. 19). The basic production model does not require any assumptions about specific agent behavior, and deals only with those elements of the analysis that are sufficiently persistent over time to abstract from the behavior of economic agents. To arrive at a "full economic analysis," a second stage of "institutional analysis" is required that now necessitates some conceptualization of the economic agent. This stage of the analysis addresses a range of hypotheses about individual and social behaviors, and consequently introduces different institutional settings and related forms of organization. This is warranted because a real economic system is a much more complex entity than the essential, objective, and coherent core of the logically interconnected elements represented by the *natural* system. *Real* economic systems are subject to various mutable and sometimes unpredictable events that cannot be ignored.

Pasinetti's approach to structural change consequently clearly contrasts with the corresponding contemporary mainstream theory, as it differed in the past from the Solovian perspective. This conclusion is far from surprising. Three main considerations can, however, be added.

First, Pasinetti stresses that his approach is *macro-* and not *micro*founded. He refers to the Cambridge tradition that, according to him:

> always avoided starting from subjective behaviour (or preferences) and from the study of single individuals. The Cambridge economists, from Keynes (1936a, especially Ch. 19) to Piero Sraffa (1960, especially Ch. 12) showed very clearly that the behaviour of the economic system as a whole is not reducible—except under very restrictive conditions—to the sum of its single individual parts. This does *not* mean a denial of the role of microeconomics as a field of economic investigation, but it *does* mean the impossibility of explaining crucial economic phenomena on the sole basis of "microeconomic behaviour." (Pasinetti 2003, p. 15)

Moreover, for Pasinetti, trying to capture with simple rationality assumptions the complexity and variety of reality seems an impossible task. Such complexity and variety are compatible with *various* forms of rationality embedded in different institutional settings.

If a natural system, free from any institutional constraints, is conceivable, one may wonder why this would not also be true for the analysis of economic behavior. In Pasinetti's theory of pure production, human beings are, above all, agents who learn—from past experience but also from social communication and interaction with other agents (Pasinetti 1981, p. 22). This is why, in his latest book, Pasinetti contrasts two "social philosophies," corresponding to the pure exchange and the production models, respectively.

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> It might also be said that the theoretical choice that is implied in the formulation of the pure exchange model springs, so to speak, from a particular 'social philosophy', that relies on each individual's self-interest as the basis of rational behaviour.… By contrast, the pure production model springs from another particular way of looking at society, that through division of labour, stresses the necessarily *cooperative aspects* of any organised society. (Pasinetti 2007, pp. 10–11)

This opposition, however, leads one to question the idea that natural systems are entirely independent from any type of economic rationality. Is it not the case that the pure production model implicitly presupposes an alternative assumption of cooperative individual rationality, also required by social learning? According to Pasinetti, the answer is clearly in the negative. His theory of structural change is not assumed to be based on any kind of behavioral assumption. The concept of the natural system is founded on the "production paradigm," but, strictly speaking, does not rely on any a priori notion of individual rationality about learning or cooperative behavior. It is a theory of the *structural macro*-constraints, which any productive system must address in order to ensure that all its labor is fully employed and all income spent. These constraints are summed up by "a single truly macroeconomic relation," the aggregate condition of full employment and of full expenditure (Pasinetti 2007, pp. 283, 285), which is *not* microfounded *at all*. The comparison between Pasinetti's point of view and the new mainstream literature on economic optimal growth and structural change, however, suggests that the levels of technical progress and social learning in the various sectors could be related to sectoral forms of cooperative individual rationality (a rationality that is advocated by Pasinetti himself). This is why the stress put by modern mainstream approaches of structural change on microfoundations and rationality may question Pasinetti's theory: Are the notion of "natural system" and the insistence on cooperation and learning really and totally independent from any specific concept of 'productive' and individual rationality? Can Pasinetti's approach be founded only on pure macro-constraints? This, for us, remains an open question.

The second main consideration that places Pasinetti's approach at a long distance from the predominant mainstream growth theory concerns the fact that a natural system is not a stable equilibrium model: "Note now that the fulfilment of condition (13) [i.e., the above aggregate condition on employment and expenditure] by no means entails an automatic self-adjusting process. The spontaneous forces operating behind it are in fact tending to make it *not* satisfied" (Pasinetti 2007, pp. 285–286). In accordance with Kaldor's views on capitalist instability, the natural system exhibits "normative properties" (Pasinetti 2007, p. 296), but their probability of realization strongly depends on the nature of the institutional environment of the economy. This is why Pasinetti always defended the prevalence of "disequilibrium and instability (not equilibrium) as the normal state of the industrial economies" (Pasinetti 2007, p. 229). It also explains why Pasinetti's central condition has not been easily amenable to standard stability analyses *per se*. In order to consider stability in Pasinetti's framework of *natural* structural change, it is, first, necessary to realize that the probability of reaching a stable system that respects "'condition (13)' (just retrieved) permanently is extremely low because of the complexity of the main movements affecting the structure of the economy and the absence of their coordination" (Pasinetti 2007, p. 286). Second, it is also necessary to interpret Pasinetti's central condition as a *normative relation,* which

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economic policy should strive to attain through specific macroeconomic decision making. This is not far removed from Kaldor's views on the Harrodian "knife-edge" problem. But we are obviously very far from the new neoclassical views of stochastic optimal growth and of structural change where dynamic optimal control, perfect foresight or rational expectations, price flexibilty and capital mobility always ensure the prevalence of stable and steady paths, to which transitional dynamics always *positively* lead. Pasinetti's central condition is not the only normative condition to emphasize within the theory of structural change. For instance, monetary policy may require the definition of other normative conditions (concerning, for instance, the quantity of money or the level of interest rates) within the *institutional* context of economic growth. But it is *the only condition* that is possible to define within a framework of the *natural part* of structural change, which is also why it is accorded such a central place in Pasinetti (2007). However, it remains that, here again, mainstream theory of structural change leads to questioning of Pasinetti's approach. Is the normative and Harrodian interpretation of Pasinetti's "central condition" sufficient to avoid the investigation of stability and transition problems? Is the reference to economic policy sufficient as a substitute to self-organized adjustment behaviors? This is again an open issue that has to be more systematically investigated.

A third consideration concerns the relation between the short-run and the long-run aspects of structural change. In contrast with mainstream contemporary theories of structural change, as soon as 1960 (Pasinetti [1960] 1974), but also in most of his subsequent contributions (Pasinetti [1960] 1974, ch. III; 1981, ch. X; and 1993, ch. 7), Pasinetti always contested the idea that economic growth or structural change had to be dealt with independently from economic fluctuations. On the one hand, because of permanent technical progress and changing consumer preferences over time due to structural change, in the short term, sectoral disequilibria may happen and generate economic fluctuations. On the other hand, short-term disequilibria can affect structural dynamics and therefore are not independent from long-run changes. Therefore, in his approach Pasinetti clearly relates short- and long-run structural changes. This provides a stimulating program for future research, but in Pasinetti's contributions, according to us, there is not a real complete theory of the relations between short-run and long-run structural change.

Our remarks on rationality, stability, and short-run issues mainly highlight the perhaps core difference between Pasinetti's and the post-Solovian approaches to structural change: while, for the latter, structural change always remains a step towards balanced growth, even if this step can last for a very long time, Pasinetti's approach persistently emphasizes disequilibria and instability as the main characteristics of the "normal" state of affairs.

Pasinetti's approach does not, however, provide the unique alternative way to cope with economic structural change. During the last decade, modern 'evolutionary' economists also tried to investigate structural change in connection with business cycles or short-term changes.

VII. DO CONTEMPORARY THEORIES OF STRUCTURAL DYNAMICS QUESTION MODERN 'EVOLUTIONARY' APPROACHES?

Within so-called modern evolutionary economic dynamics, we will refer to two significant examples.

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The first is provided by André Lorentz and Maria Savona's contributions (Lorentz and Savona 2008 and 2010). The target of these authors "is to account for both sides of the coin: On the one hand, we aim at investigating the imprint left by short-run fluctuations on the long run mechanisms of structural change. On the other hand, we aim to account for the effect of changes in the structure of economies on the amplitude of the short-run fluctuations" (Lorentz and Savona 2010, p. 4). We are close, therefore, to Pasinetti's preoccupations. From this perspective, two main mechanisms are combined. On the labor market, short-run fluctuations emerge through the coevolution of employment and wage dynamics represented by a modified Phillips curve. These fluctuations are not exogeneous, but endogeneous and analogous to a Goodwinian growth cycle model. The difference is that the significant relation concerns the coevolution of wages and effective demand and not the relation between the rate of unemployment growth and the level of prices. Moreover, this coevolution also affects both employment and investment capacities of the various industries, and therefore exerts consequences on the *short-run* structural change of productive and technological activities and resources. Related to firm activities and evolutionary changes of routines, technological progress or innovations take the forms of changes in the production structure (intermediate coefficients) and changes in labor productivity. These changes are obviously adopted by firms to increase their efficiency and survive market selection. This process of selection and 'creative destruction' in its turn contributes to industrial as well as macroeconomic structural change reflecting technological innovations, and therefore, *in the long run,* technological structural change.

This dynamic model of business cycles and structural change is clearly "in direct line with the recent attempts to embrace both Neo-Schumpeterian and Post-Keynesian lines of thought in analysing macroeconomic dynamics" (Lorentz and Savona 2010, p. 4), which today prevail in the field of modern evolutionary economics. It shares with Pasinetti's approach a point of view that excludes the concept of equilibrium as the foundation of the analysis of structural change or business cycles. It clearly deals with both the short-run and the long-run aspects of structural dynamics, even if the theoretical assumptions privileged in the model could be sometimes better justified, as, for instance, for the kind of Phillips curve used by both authors.

A second example taken from the modern evolutionary approach is given by the so-called Keynes + Schumpeter (K+S) model (see, for instance, Giovani Dosi et al. 2013). This model does not employ equilibrium, but agent-based models, to explore the properties of macroeconomic structural dynamics during normal as well as crisis times (see Dosi et al. 2010, and Dosi et al. 2013). In this approach, agents are assumed to be heterogeneous, and therefore entirely differ from optimizing agents privileged by contemporary modern mainstream theories of structural change. Markets do not always clear at any point of time, an assumption that totally differs from the market-clearing assumption welcomed by new mainstream dynamics. The K+S model combines a rather traditional "Keynesian" mechanism of aggregate demand generation with a "Schumpeterian" innovation-supported process of growth. Therefore, it combines Keynesian theories of demand fluctuations and Schumpeterian theories of economic growth and change. It provides a unified analytical framework jointly accounting for long-term structural dynamics and higher frequencies fluctuations. It indeed generates endogenous, self-sustained growth patterns characterized by the presence of persistent fluctuations. The K+S model thus tries "to throw deep doubts on the traditional

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dichotomy between variables impacting the long-run (typically, technology-related changes) and variables with a short-term effect (traditional demand-related variables)" (Dosi et al. 2010, p. 1765). In other terms, this dichotomy disappears, and this new approach avoids a simple juxtaposition of short-term demand variation and long-term technical progress, especially when economic policy is taken into account. For instance, demand-management policies do not only affect production and employment levels, encouraging entrepreneurs, but they also contribute to remove the economy from a stagnant growth trend and therefore favor technological innovation and investment.

In conclusion, much work has still to be done by evolutionary economists in order to increase analytical simplicity and consistency, and avoid ad hoc assumptions. The evolutionary approach, however, built a theory of structural change that is totally different from mainstream modern structural dynamics, since it *related* short-term and long-term aspects of structural dynamics.

Modern evolutionary models thus provide an alternative view that clearly relates short- and long-run structural change, which is promising, but has still to be developed to prove its robustness and to check if it can compete with modern mainstream developments.

VIII. CONCLUDING REMARKS

The new contributions of the neoclassical tradition to the realm of the theory of economic growth, business cycles, and structural change showed their ability to cope in an improved way with the real world and to generate—often indirectly—new types of issues or debates with the various 'critical' or 'alternative' approaches. The emergence of the concept of the GBG path, for instance, offers an excellent example of the intellectual flexibility of this tradition. In our view, this recent tendency implies two main consequences. On one side, this new face of the neoclassical tradition is more complex than one would think at first sight. This complexity requires a more thorough investigation of the nature, the objectives, and the meaning of new neoclassical developments in the theory of economic growth, in order to valuate their degree of novelty. On the other side, it will be useful to organize a dialogue—as uneasy as it might be—between this new literature and non-mainstream theories of structural change. This dialogue could help to foster a better understanding of the analytical and the methodological differences between them, but above all to raise *new issues* that might have been neglected otherwise. In particular, it would be crucial to first investigate what is at stake when economic structural change is considered. Does economic structural change refer to a specific empirical phenomenon, or does it also suppose the introduction of an adequate and new research program focusing on radical economic changes in economic dynamics, as the ones that we have to face nowadays?

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