



Taxation, income redistribution and debt dynamics in a seven-equation model of the business cycle



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ABSTRACT

In this paper we investigate the economic dynamics of a seven-equation model of the business cycle. The main distinctive features of the model are related to: (a) the role played by the public sector in redeploying income between workers and capitalists, since it is assumed that the bargaining power of the two classes affects tax rates and transfers levied upon them; (b) the influence that past events have on the agents' current behavior, with particular regard to consumption patterns; (c) the specification of firms' investment function, which incorporate Keynesian and Harrodian elements by assuming that investments are a function of both the difference between interest and profit rate and the discrepancy between actual and desired capital to output ratio. Since all these assumptions imply possible balance sheets disequilibrium, particular regard is dedicated to the analysis of macroagents' debt dynamics. Special emphasis is placed on the analysis of the destabilization of equilibria via Hopf bifurcations, which leads to the emergence of an interesting and rich cyclical dynamics.

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1. Introduction

Various models of the business cycle, which incorporate elements of Keynes, Harrod, Kalecki and Goodwin's contributions, have been proposed in recent times.¹ In the present paper we move along this line of research, advancing a number of extensions aimed at investigating some fundamental aspects that have not been fully taken into account yet. First of all, we argue that the role played by the public sector as a redeployer of income via changes in tax rates and transfers deserves closer investigation. Actually, our working assumption is that the conflict over income distribution is not simply confined to the labor market, but extends also to the State sphere: the main idea is that the bargaining power of firms and workers directly affects fiscal policy variables.² Secondly, we maintain that the history of agents – and then their memory – strongly affects their current behavior. We will investigate this nexus with particular regard to consumption demand, showing how the discrepancy between past and current level of consumption may lead workers (and families) to go into debt with the banking system. This view may help to explain the high private debt to GDP ratios peculiar to some industrialized countries. Other assumptions characterizing this model concern capitalists' behavior, with a particular regard to their investment

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¹ See, among others, Asada (2006), Asada et al. (2009), Barends et al. (2010), Bischi et al. (2001), Keen (2013), Sportelli (2000), Yoshida and Asada (2007).

² A seminal contribution on this matter is of course: O'Connor (1973).

decisions. We propose an investment function that incorporates both Keynes', Harrod's and Kalecki's elements, assuming that investments are a function of both the difference between profit and interest rate and the desired and actual capital to output ratio: as a consequence, investment demand will normally be different from internal savings, leading firms to accumulate positive (or negative) debt with the banking system. Since in this system the aggregate demand will generally differ from the aggregate supply – i.e., Say's law is not operating – we add a dynamic equation describing the adjustment process on the goods market, according to which firms will try to match the aggregate demand through variation of actual capital to output ratio.

The paper is organized as follows. In the next section, after the list of variables and parameters used in the text, we describe the main assumptions concerning economic agents' behavior. Section 3 is devoted to the local stability analysis of the seven-equation model which defines the framework of the economic system. In Section 4 we investigate the destabilization of the equilibria, via Hopf bifurcations, taking a closer look at the main dynamical proprieties of the model. The analysis performed in Section 4 is further extended in Section 5, where we deal with the effects on the economic cycle of changes in some relevant parameters. Section 6 discusses the main results of our investigation, while an Appendix focuses on some more technical aspects of the paper.

2. The model: basic assumptions and the general framework

In what follows we assume a one-commodity closed economy composed of four interacting macroagents: workers, firms (also referred to as “capitalists”), the public sector and the banking system.³ The bargaining on the labor market, described by a standard augmented Phillips curve, determines the money wage which in turn, according to a mark-up rule, determines the price level. The public sector levies taxes – that should be intended as “net” taxes, including also transfers, benefits, subsidies, etc. – on both workers and firms, and spend these receipts as “public expenditure”. Not only money wages, but also tax rates are affected by the bargaining power of the two classes: specifically, we assume that the current and past (weighted) levels of the employment rate⁴ play a role in determining both money wages and tax rates, in a sort of economical–political cycle.⁵ We point out that this view is consistent with the recent findings about the role played by the bargaining power of socio-economic groups in the explanation of changes in tax system (see, for instance, [Burke and Epstein \(2002, 2007\)](#), [Facundo et al. \(2013\)](#)).⁶ Furthermore, this view is also in line with the so called *power resources theory*, which links the class-based political power with income distribution and redistribution (see, for instance, [Bradley et al. \(2003\)](#), [Volscho and Kelly \(2012\)](#)). Note that, as we have already said, we refer to taxation in a broad sense, albeit for the sake of brevity in what follows we will only make mention to “tax rate”. As a consequence, a decrease in the tax rate, for instance on labor income, must be intended as the outcome of a decrease in the “genuine” (direct) tax rate and/or of an increase in the values of transfers, subsidies, publicly provided services, etc. What really matters here is the crucial distinction between pre-tax and transfer and post-tax and transfer income, where the latter is nothing but the “adjusted” disposable income (see for instance [OECD \(2011, p. 26\)](#)). We admit that, according to some Keynesian (or “Classical”) target rule, public expense may be higher (or lower) than tax receipts, this discrepancy being covered through the issue of public bonds which, for the sake of simplicity, we assume are bought only by capitalists.⁷ We depart from the “Classical” view according to which workers simply spend their whole income, since their consumption pattern is assumed to be determined not only by current income but also by consumption levels reached in the past. The main consequence of this assumption – that, as will be clear in the following, turns alternative explanations, such as those based on permanent income or on life cycle hypotheses, upside down – is that workers' consumption demand may be higher or lower than their current income: this discrepancy will be financed by the banking system (clearly, this difference may be positive or negative: the latter case, i.e., the case for a negative debt, may be considered as an increase in workers' bank deposits⁸). Capitalists consume part of their earnings according to a specified propensity to consume: the rest of their earnings represents firms' internal saving devoted to investments. We assume that investments are a function of both the difference between the profit and the interest rate and the deviation of the actual capital to output ratio from the “desired” one, thus allowing investment demand to differ from internal savings. Once more, capitalists' expense in excess over their internal savings will be financed by the banking system (once again the difference may be positive or negative: the latter case may be seen as an increase in capitalists' bank deposits). With regard to the

³ We advise the reader that, for the sake of brevity, in the following we will sometimes refer to workers and firms as “the two classes”.

⁴ For the precise formulation, see below, Section 2.3.

⁵ Note that in the present paper we will not explicitly consider the other factors which affect the bargaining power of the two classes, think for instance to globalization and off-shoring, labor market and regulatory reforms, and so on. One can say that in what follows we use the current and past values of the employment rate as a “proxy” for all these factors.

⁶ In particular, [Burke and Epstein \(2002, 2007\)](#) discuss how off-shoring and more in general globalization have (positively) affected the bargaining power of corporations, with a consequent cuts in tax rates (and increase in subsidies) levied upon them. [Facundo et al. \(2013\)](#) focus instead on tax cuts in top income shares. See also [Felix and Hines \(2009\)](#), who show how workers in unionized firm – that is, with a higher bargaining power – are more able to capture the benefits of low corporate tax rates. On these matters the reader is also referred to [ILO \(2013, pp. 63–64\)](#) and [OECD \(2012, pp. 147–148\)](#).

⁷ For the sake of simplicity we do not explicitly consider workers employed in the public sector.

⁸ [Charpe et al. \(2009\)](#) investigate, in a Goodwin-type model, the case of workers' overconsumption thanks to the *a priori* assumption of a marginal propensity to consume greater than one. Instead, in the present paper we consider a variable workers' marginal propensity to consume, endogenously determined by past consumption patterns. In addition, we point out that workers' savings, both positive and negative, are nothing but the consequence of consumption decision, i.e., there is not an intentional workers' saving function in our model.

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