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Analysis

Sustainability in a post-Keynesian growth model for an open economy

Giulio Guarini [a,*], Gabriel Porcile [b]

[a] Tuscia University, Department of Economics and Management, , Viterbo, Italy
[b] Economic Commission for Latin Americana and the Caribbean (UN-ECLAC) and Federal University of Parana, Brazil

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ABSTRACT

The paper expands the BOP-constraint growth model and Kaldorian regimes (productivity and demand regimes) in order to include some of the concerns raised by ecological economics in post-Keynesian models for open economies. The demand regime is modified by taking into account Porter's hypothesis, which suggests that environmental innovations, spurred by environmental policies, can foster competitiveness. As a result, the equilibrium BOP-constrained rate of growth increases, leading to a different version of Thirlwall's Law, which opens room for analyzing the impact of environmental innovations on convergence between developing and developed economies. The productivity regime in turn considers the growth and employment implications of innovations in labor productivity (standard innovations) and environmental efficiency (environmental innovations). It is argued that the fiscal policy and composition of public expenditure matter for long run growth, employment and sustainability.

1. Introduction

In recent years there has been a surge of papers which sought to build bridges between post-Keynesian (PK) and ecological economics (e.g. Gowdy, 1991; Jackson and Victor, 2011; Kronenberg, 2010; Stern, 2006; Victor, 2008, 2012). They stress the convergence and complementarities that exist between these two schools of thought. As highlighted by Kronenberg (2010) and Rezai et al. (2013), areas of convergence are the perception of the production process as one in which there is little room for substitution between factors; a similar view of the consumers' demand function; emphasis on dynamics, particularly on irreversibility and path dependence; the relevance of considering various social actors instead of assuming a single rational actor as in mainstream economics.[1]

Along these lines, some contributions have successfully explored environmental themes within a PK framework.[2] They confirm the potential for a fruitful conversation between ecological and PK economists—combining the concern with sustainability of the former with the focus on employment and income distribution of the latter.[3] These themes have also gained relevance in the policy agenda as international organizations embraced what has been labeled "inclusive green growth".[4] In September 2015 the United Nations formally launched the Objectives of Sustainable Development (ODS), which expresses a broad international consensus that should guide cooperation and development policies until 2030. The emerging consensus—based on inclusiveness and sustainability—represents a significant opportunity for PK and ecological economics to inform economic policy with new theoretical insights.[5]

However, there is an important part of the theoretical PK tradition that has so far not been included in this dialog, the Balance-of-Payments-constrained growth (BOPCG) model, which is the workhorse of the PK school for studying long run growth in open economies (Thirlwall, 2011; Blecker, 2013). In particular, the BOPCG model has been extensively used to address the problems of development and

* Corresponding author.

[1] A discussion of the shortcomings of the neoclassical approach to ecological economics can be found in Gowdy and Erickson (2005).

[2] Guarini (2015); Guarini et al. (2016); Fontana and Sawyer (2015); Taylor and Foley (2015).

[3] See Harris (2013) and Antal (2014). Early contributions are Schefold (1985) and Roncaglia (2003).

[4] ECLAC (2012) set forth the concept of "structural change for equality" to define a growth path which is sustainable from an economic, social and environmental point of view. See also the work of OECD (2012) and Word Bank (2012) on inclusive green growth.

[5] For instance, ECLAC and the OECD co-organized a Conference at the OECD headquarters in May 2014, *Workshop on New Tools and Methods for Policy-Making*, in which Schumpeterian and Keynesian scholars were invited to discuss how new theoretical perspectives could be used to devise new policy tools.

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convergence in GDP per capita between advanced and laggard countries in the international economy.[6] However, there has been almost no attempt to include environmental variables in the BOPCG models. Such absence is particularly unfortunate for three reasons: i) key environmental issues as climate change or the exhaustion of natural resources are by definition long-run issues, which is precisely the time horizon for which these models are valid; ii) economic development and sustainability cannot be separated: developing countries aspire reduce the gap in GDP per capita with respect the developed world and hence for many of them to accelerate growth is a major concern; and iii) the relevance of the environmental impact of globalization and the complex interaction between international competitiveness and sustainability need to be more systematically discussed in open-economy models. It is therefore crucial to discuss paths of world convergence based on absolute decoupling (Jackson, 2009) in order to make development, inclusion and sustainability compatible.

This paper aims to make a contribution to this dialog between PK and ecological economics discussing sustainable convergence and long run growth in open economies, expanding the canonical BOPCG model in order to address the challenges posed by greenhouse emissions and absolute decoupling. The paper does not intend to cover the key contributions of these two fields, but to suggest a way in which environmental variables can be included in the structure of BOPCG models.

The paper consists of 4 sections. Section 1 develops a modified version of the BOPCG model in order to include the effect of environmental innovations on the equilibrium rate of growth. Section 2 expands the analysis of technical change to include both standard and environmental innovations. In Section 3 equilibrium outcomes and policy implications are discussed, focusing on the role of fiscal policy in making compatible growth, employment and sustainability. The conditions that give rise to a pattern of growth consistent with higher levels of employment and lower levels of emissions per unit of output are identified. Section 4 concludes. In order to make the narrative clearer, most technical details are presented in an appendix at the end of the paper.

2. 2. The Modified Kaldorian Demand Regime and the Green PK Model

2.1.1. Export-led Growth and the Equilibrium Rate of Growth

Using the Kaldorian terminology, growth emerges from the interaction between the demand and the productivity regimes. The demand regime is driven by the growth of exports and by the BOP constraint; the productivity regime is driven by static and dynamic economies of scale. The export-led tradition suggests that economic growth (y) depends on the rate of growth of autonomous expenditure (a) plus the rate of growth of exports, weighted by the share of each class of expenditure in total income.[7] Assuming that the real exchange rate is in equilibrium in the long run (see Appendix), the Kaldorian effective rate of growth is:

$$y = \frac{\alpha a + \beta_1 \varepsilon y^*}{1 + \beta_2 \pi}. \quad (1)$$

Small letters are proportional rates of growth. In Eq. (1) $a$is the rate of growth of autonomous expenditure ($a \equiv \dot{A}/A$), $\varepsilon$is the income elasticity of exports, $\pi$is the income elasticity of imports, $\alpha = A/Y$is the share of autonomous expenditure in total income and β_1, β_2 are the shares of exports and imports respectively, in total income. According to Eq. (1), a Keynesian fiscal policy pursuing full employment (that raises a) would be effective in raising aggregate demand and the effective rate of economic growth. However, there are different constraints on growth that limit the ability of the government to spur growth in the long run.

The first is the external constraint: the rate of growth of Eq. (1) must be consistent with equilibrium in current account. Otherwise, the external debt would steadily increase and at some point the country's rate of growth would have to fall to correct the external disequilibrium. Other constraints emerge from the supply side. If there is shortage of labor or capital in the economy, demand growth will fail to elicit a response in supply. Another supply-side constraint arises from the carrying capacity of the ecosystem (Arrow et al., 1995), i.e. the capacity of the ecosystem to provide a wide variety of services without degrading and compromising material production in the future. These different types of constraint are discussed in the paper.

The first constraint (external equilibrium) gives rise to the BOP-constrained equilibrium growth rate—the so-called Thirlwall's Law (for a derivation of the equation, see the mathematical Appendix)[8]:

$$y^E = \frac{\varepsilon}{\pi} y*. \quad (2)$$

Eq. (2) is the simplest version of the BOPCG model. The economic intuition of this equation is straightforward: the rate of growth of the developing economy which is consistent with external equilibrium (y^E) depends on the ratio between the income elasticity of exports and the income elasticity of imports (ε/π) and the rate of growth of the world economy (y^*). While Eq. (1) gives the effective rate of growth at a certain point in time (y), Eq. (2) gives the long-run equilibrium rate of growth (y^E). The effective rate must move towards the equilibrium rate; the mechanism that allows for this convergence is discussed later.

For the relative rate of growth of the country with respect the rest of the world (y/y^*) equals the income elasticity ratio (ε/π), convergence requires$y/y^* = \varepsilon/\pi > 1$ (i.e. for the developing economy to grow at a higher rate than the developed economy in equilibrium, the income elasticity ratio should be higher than unity). Otherwise, convergence would bring about a growing deficit in current account as a percentage of GDP—imports will grow faster than exports if the developing economy grows faster than the developed economies—which would then stop the convergence process. The model assumes a North–South economy in which the North issues the international currency and is not BOP-constrained, while the South is the technological laggard which faces a competitiveness challenge, which requires having equilibrium in current account in the long run.

The income elasticity of exports and imports are a function of the pattern of specialization.[9] More precisely, the income elasticity ratio (ε/π) depends on whether the country produces goods whose demand grows at high rates in the domestic and world markets—the "growth efficiency" of the production pattern (Dosi et al. (1990); see also Ocampo et al., 2009). The pattern of specialization, in turn, depends on technological capabilities.[10] To be able to compete in the long run in sectors with high demand growth, the country should be able to innovate, develop sophisticated technological skills and close the gap with the technological leaders. Technical change is the ultimate driver of competitiveness in a world in which market shares are shaped by leads and lags in innovation and diffusion of technology. Eq. (2) implies that innovation can affect growth by changing the pattern of specialization and the income elasticity ratio (ε/π). The different directions that

[6] See among others Dosi et al. (1990); Verspagen (1993); Botta (2009); Cimoli and Porcile (2011 and 2014); Lavopa (2014).

[7] Pioneer works are Kaldor (1966, 1970) and Dixon and Thirlwall (1975). For a recent revision see Blecker (2013).

[8] See on this Thirlwall (2011).

[9] The literature that addresses this point is already large. See for instance Araujo and Lima, 2007; Ciarli et al., 2010; Gouvea and Lima, 2010; Cimoli et al., 2010.

[10] The analysis of the industrial and technological policies driving structural change is beyond the scope of this paper. The reader is referred to the rich literature in this field, in particular Fagerberg and Verspagen (2002); Fagerberg and Srholec (2006); Metcalf (2001) and Narula (2004), who highlight the interplay between economic, political and institutional variables in shaping the pattern of specialization.