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Abstract
Although traditionally post-Keynesians tackle unemployment issues through the stimulation of aggregate demand, boosting demand indefinitely is no longer possible if we consider environmental constraints. In fact, according to several ecological economists, meeting the environmental targets of the Paris Agreement will involve a halt in economic growth or even degrowth. Within this context, important interventions in the labour market will be necessary to avoid rising unemployment. In this paper, we make use of a Kaleckian autonomous demand-led growth model to analyse the dynamic stability of the labour market in a zero-growth economy (ZGE) with productivity growth. In the model, net investment responds to deviations of capacity utilization from target utilization in the short run while in the long run it adjusts to firms' sales growth expectations determined by the growth rate in autonomous government expenditures. Hence, in the long run, the growth rate of the system is determined by the autonomous growth rate of government expenditures – set equal to zero – and the rate of capacity utilization converges towards the normal rate of capacity utilization. We examine the conditions under which the long-run convergence leads to a stable employment rate. In the basic model, we consider the feedback effects between productivity, distribution, and employment. However, the long-run conditions necessary for a stable employment rate are not met, suggesting, as already pointed out by ecological economists and several post-Keynesians, that policy interventions might be necessary for the stability of the labour market in a ZGE. Therefore, we consider whether the government can stabilize the labour market through a policy of working time reduction (WTR). Our findings suggest that a stable employment rate is possible in our model as long as the negative effect that labour productivity growth has on the employment rate is compensated for by the reduction in working hours.

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1. Introduction

According to scientific evidence, it is theoretically still possible to respect carbon budgets and meet the Paris Agreement of a maximum of 1.5 or 2 degrees Celsius increase in mean global temperature above pre-industrial levels. However the door is closing quickly, especially for the 1.5 degrees scenario, and there is a large consensus that only a system-wide transformation will make it possible to meet these targets (UNEP, 2022). According to degrowth advocates, such a transformation must involve a process of degrowth in throughput. One of their main arguments is that the current levels of decoupling of economic growth from negative environmental impacts are far too low to make the required reduction in throughput compatible with ever-expanding economies (Hickel and Kallis, 2020; Parrique et al., 2019). The latter implies that at the current state of technology, a growing economy still generates more energy demand and resource use, making a rapid transition harder to achieve.

The urgency of the socio-ecological transition and the data backing up degrowth advocates highlight the importance of improving our understanding of zero-growth and degrowing economies, as well as the need to explore the conditions under which the overall macroeconomic stability of such economies can be sustained. Although green growth advocates contest the call for degrowth (Terzi, 2022), and defend that economic growth is imperative and necessary for a successful green transition, there is a growing body of literature refuting the latter. When it comes to the growth imperative,[1] for example, authors such as Richters and Siemoneit (2017) have shown that a stationary economy can be compatible with positive profits and positive interest rates. Nevertheless, for such an economy to be stable, several strict conditions must be met, which would indeed involve a transformation of capitalism as we know it. Specifically, no sector can run financial deficits or surpluses, implying that there are no retained profits in the corporate sector, governments must run a balanced budget, and saving out of household income must be compensated for by consumption out of wealth or some other autonomous consumption. In an open economy, a current account balance is also necessary. Only by meeting these conditions can systemic financial fragility and instability in the sense of rising debt-income ratios be prevented.

Similarly, in a stepwise process, Hein and Jimenez (2022) clarify that a stationary state that meets the aforementioned conditions is compatible with positive profits, endogenous credit, and a positive interest rate. Furthermore, they examine the conditions under which a stationary equilibrium is dynamically stable in a Kaleckian distribution and growth model driven by autonomous government demand. Their findings suggest that for the stability of the long-run equilibrium values, there are maxima for the propensity to consume out of wealth and for the rate of interest, under the assumption of a balanced government budget and zero retained earnings by the firm sector.

[1] We understand a growth imperative as "a system immanent mechanism that the economy has to grow to maintain economic stability" (Richters and Siemoneit, 2017, p.2)

However, the focus of these papers has been placed on the goods market and the systemic financial stability while, to our knowledge, the dynamic stability of the labour market in a zero-growth economy has not been explored. Yet the importance of tackling this issue is largely recognized. In fact, according to Richters and Siemoneit (2017, p.10), most theories of a growth imperative can be reduced to the issue of 'jobs' or in their terms, 'income through gainful work'. Moreover, the challenge of keeping employment stable in a zero-growth economy is acknowledged in the degrowth community, and in general, ecological economists have recognized the core relevance of the labour market in the socio-ecological transition. Jackson and Victor (2011, p.101) call the relationship between growth, productivity, and work central in the study of what they then called 'macroeconomics for sustainability'. Particularly for a zero-growth economy, they emphasize the importance of reconciling labour productivity growth with full employment.

Given that economic growth has often been seen as necessary to reduce unemployment levels (Rezai et al. 2013, Scrieciu et al. 2013), post-Keynesian economists have also expressed concern about the levels of employment associated with zero growth or degrowth (Fontana and Sawyer, 2022). Following post-Keynesian logic, if economies could grow indefinitely, it would always be possible to boost aggregate demand and thus tackle unemployment issues. However, if respecting planetary boundaries implies stagnating aggregate demand, the latter will come hand in hand with stagnating or even decreasing labour demand, depending on technical change and productivity growth. Such a situation can therefore lead to what Jackson and Victor (2011) call the 'productivity trap,' with rising unemployment. This problem is also recognized by post-Keynesians, who argue that market forces alone will not align the growth rate of the labour supply with the growth rate of output consistent with a sustainable use of natural capital. Therefore, just like ecological economists, post-Keynesians call for policy interventions (Fontana and Sawyer, 2015, p.17).

Within this context, this paper proposes analysing the dynamic stability of the labour market in a zero-growth economy with positive productivity growth. The key question is whether an economy with stagnant demand and increasing productivity can be compatible with a constant and stable long-run employment path. First, we will explore whether the inclusion of feedback effects between the employment rate, distribution, and productivity growth allows for a dynamically stable labour market without the need for government interventions. Second, we consider a scenario where the government takes control of the task of stabilizing the labour market through a policy of working time reduction (WTR). In section 2, after briefly clarifying how post-Keynesians treat labour market issues, we analyse the implications of zero growth on the labour market from an accounting perspective. In section 3, we discuss the integration of productivity growth into the analysis of zero-growth economies. In section 4, we present an autonomous demand-led growth model driven by government expenditures and explore if a stationary economy can be compatible with a constant and stable employment rate, and, finally, in section 5, we present our conclusions.

2. The implications of zero growth for the labour market: a post-Keynesian approach

Post-Keynesian economists have increasingly tried to integrate ecological constraints into their analytical framework (see for example Fontana and Sawyer 2013, 2015, Hein and Jimenez 2022). To do so they have resorted extensively to ecological economics, increasing the exchange between both schools of thought. At the same time, ecological economists have often considered a post-Keynesian framework for their macroeconomic models (see for example Jackson and Victor, 2019; D'Alessandro et al., 2018). Given that these approaches share a lot of common ground when it comes to the understanding of the macroeconomy,[2] the exchange of ideas is possible (Kronenberg, 2010).

To analyse the stability of the labour market in a zero-growth economy from a post-Keynesian perspective, it is important to stress that post-Keynesians concentrate on the role of aggregate demand in the determination of output and emphasize the importance of high levels of demand to keep unemployment levels low. Hence, although post-Keynesian economics is interested in issues around labour, such as structural unemployment and functional income distribution, the focus is commonly placed on the stimulation of product demand. However, if we acknowledge ecological constraints, then we know that there are potential limits to the stimulation of demand, especially at the current levels of decoupling, which will have implications for the labour market.

The latter can be illustrated from a macroeconomic accounting perspective. Assuming that economies have a target level of output (Y^T) that respects ecological constraints, as in Hein and Jimenez (2022), we can decompose this level of output in the following way:

$$Y^T = \frac{Y}{H}\frac{H}{N}\frac{N}{L}L = yneL. \quad (1)$$

where labour productivity (y) is given by the ratio of output (Y) to hours worked (H), n is the number of hours worked per employee, given by the ratio of hours worked (H) to the number of employees (N), and e is the employment rate, given by the ratio of the number of employees to the labour force (L). Rearranging, we obtain that the employment rate is equal to:

$$e = \frac{N}{L} = \frac{Y^T}{ynL} \quad (2)$$

Following equation (2), to avoid rising unemployment in a stationary economy and hence preserve the stability of the labour market in the sense of a constant employment rate, we must find ways to align the labour demand generated by stationary output with the labour supply. Expressing equation (2) in growth rates, we get that:

[2] For example the rejection of the neoclassical production theory, the consistency of post-Keynesian theory of production with the laws of nature through the consideration of constant input coefficients, the emphasis on fundamental uncertainty, path dependency, and the need of government intervention to influence the long-term growth path.

$$\hat{e} = \hat{Y} - \hat{L} - \hat{n} - \hat{y} \qquad (3)$$

From equation (3) it is evident that if the economy is fixed at the target level of output (that is, $\hat{Y} = 0$), the employment rate will fall as productivity, population, and working time per employee grow. Therefore, in a scenario of rising productivity, to avoid increasing unemployment, we must either reduce working hours or find other ways to reduce the need to work (hence a smaller labour force).[3]

Given the latter, a central argument found in the ecological economics' literature is that to achieve a stable socio-ecological transition, a substantial reform in wage labour is necessary. Thus, labour market issues and interventions play a central role in their analysis. Following Weiss and Cattaneo (2017), policies such as the reduction in working time could be the single silver bullet in the transition. An example of such a policy can be found in Jackson and Victor (2019), who develop a stock-flow consistent model of the Canadian economy. In their model, the best results in social and environmental terms are obtained in the 'Sustainable Prosperity Scenario'. According to their simulations, in this scenario the employment rate remains roughly constant thanks to a policy of WTR, and personal income inequality decreases thanks to redistributive transfers from the government. [4]

Other authors have advocated similar policies, such as basic income, and basic services as alternatives to decouple labour and income (Andersson, 2010; Zwickl et al, 2016; Howard et al, 2019). Moreover, a job guarantee scheme is also discussed as an avenue to enable full employment and target lower energy consumption (Godin, 2012; Alcott, 2013; Mastini et al. 2021).[5] The latter, however, would require a careful analysis of the distributional effects of such a scheme and whether it would actually allow for a stable long-run equilibrium stationary state. Finally, another alternative for the stability of the labour market is aiming towards a reduction in productivity or at least towards the prevention of productivity increase. Following Jackson and Victor (2011), the 'natural' slowdown in productivity growth observed in the developed world is related to a process of structural change towards the service sector, which presents an opportunity to offset the productivity trap. In the context of the socio-ecological transition, the objective should be to shrink brown sectors and promote green labour-intensive sectors.

Post-Keynesian economists, in their efforts to consider ecological constraints, have also recognized the importance of labour market interventions in the face of an ecological transition.

[3] A smaller labour force could even result from global population dynamics alone. According to population projections by the United Nations (2022), the world population growth rate is projected to be close to zero by 2100. The latter, together with further demographic changes such as population aging, will likely affect the growth rate of the global labour force negatively

[4] The authors, however, do not discuss the (potential) distributional dynamics triggered by the WTR policy. But since they assume that the wage rate follows productivity growth, functional income distribution can be constant in their model, depending on the parameter values in equation (45) (see Jackson and Victor, 2019, p.23)

[5] The job guarantee program should aim at activities of high social value, such as care and habitat restoration, which can enable full employment despite a stagnant or shrinking economic activity (Mastini et al, 2021 p. 7), Furthermore it can be instrumental to reduce working time if the public sector initiates a shorter working week and pressure the private sector to follow suit.

As mentioned, Fontana and Sawyer (2015, 2016) argue that there are no automatic market forces that align a growth rate consistent with a sustainable ecological footprint with the growth rate of labour supply, and therefore interventions are necessary to reduce the growth in the effective labour force.[6] These include for example, reductions in annual working hours and reduction in the length of working life, adjustments that can be achieved through employment legislation, trade union bargaining, and norms set by public sector employment (Fontana and Sawyer, 2022). Similarly, Lange (2018, p.242) finds that although post-Keynesian theory can be compatible with zero growth, in a scenario with technological change, reductions in working hours and compensatory wage increases will be necessary to avoid rising unemployment. However, these authors are not performing a dynamic stability analysis of the labour market, as intended in this paper. Furthermore, they do not discuss the feedback effects between the employment rate and other variables in detail, such as distribution, which could potentially help stabilize the labour market in the long run without the need for direct intervention.

3. Productivity growth in a zero-growth economy

Several post-Keynesian models dealing with zero-growth economies have assumed a non-depreciating capital stock and a constant technology (as is the case in Monserand, 2019; Hein and Jimenez, 2022). In this paper, we will introduce depreciation and capital scrapping. Replacement investment is taken as the channel that allows for the introduction of new technologies and hence productivity growth.

For our present purposes, we will assume that technical progress is labour-saving and capital-embodied. Hence, when capital is scrapped and replaced, labour productivity increases and the labour-output ratio falls. The capital-labour-ratio increases at the same rate as labour productivity, and therefore the capital-potential-output ratio remains constant. Therefore, we assume Harrod-neutral technical change as in Cassetti (2003), Dutt (2003), and Hein and Tarassow (2010). This will have important implications for the labour market in a zero-growth economy. Since labour productivity gains cannot be offset by long-run equilibrium economic growth, we expect unemployment to rise, assuming that everything else remains equal (see equation [2]). In this context, we will analyse the potential to achieve a stable employment rate.

Hence, in accordance with post-Keynesian theory, and following the previous paragraph, the growth rate of labour productivity is positively influenced by the dynamics of the capital stock. As such, we will consider (gross) capital accumulation as one of the determinants of productivity growth. Moreover, following Casetti (2003), Naastepad (2006), and Hein and Tarassow (2010), we will also consider a wage-push variable as a determinant of productivity growth. The reason for this choice is that with a low (high) level of unemployment, we expect an increasing (decreasing) bargaining power of the workers, hence nominal and real wages will speed up (slow down), generating pressure towards an increasing (decreasing) wage share and therefore a decreasing (increasing) profit share. Since in a zero-growth economy with

[6] We can understand the growth rate in the effective labour force as the growth rate of the labour force plus the growth rate of productivity (Hein, 2014, p.121).

productivity growth we expect, ceteris paribus, a falling employment rate, we will likely have a negative feedback effect from rising unemployment, and therefore an increasing profit share on productivity growth.

In the following section, we present an autonomous demand-led growth model. In the first scenario, we show that introducing feedback effects between productivity, employment, and distribution into the model is not enough to produce a stable path for the employment rate. The latter suggests that a stable labour market, in the sense of a constant and stable employment rate, requires government interventions. Thus, in a second scenario, we introduce a new mechanism into the model, where the government acts as the stabilizing force through direct intervention in the labour market by means of cutting working time, which, however, will feed back on productivity growth.

4. Autonomous demand-led growth model

Taking into account the properties of a stationary economy from the accounting perspective mentioned in the introduction and discussed in detail in Richters and Siemoneit (2017) and Hein and Jimenez (2022), we proceed to integrate them into a dynamic model for a zero-growth economy with productivity growth. We will consider an autonomous demand-led growth model to analyse the dynamic stability of the labour market in a stationary economy. An autonomous demand-led growth model is a type of model that has become popular in heterodox macroeconomics and has been recently merged with Kaleckian distribution and growth models. These models are based on Serrano's (1995a, 1995b) Sraffian supermultiplier model driven by autonomous demand and have been further developed and applied by Sraffian as well as Kaleckian authors.[7] Broadly speaking, these models have been useful to explain growth periods through the growth of an autonomous demand component, such as autonomous consumption, government expenditures, residential investment, or exports. They have also been useful to Kaleckian authors who have shown that autonomous demand growth can tame Harrodian instability under some weak conditions. Moreover, they have shown that when the economy convergences towards some normal rate of capacity utilization, the paradox of thrift and the potential paradox of costs hold for the long-run growth path, even if not affecting the long-run growth rate.

Although the models have been subject to some criticism, such as the implied full endogeneity of investment with respect to output growth in the long run, that is, fully induced investment and the full autonomy of expenditure growth from income and output in the long run (Nikiforos, 2018; Skott, 2019), an autonomous demand-led growth model is a useful starting point for the analysis of the stability of a zero-growth economy, as stressed by Hein and Jimenez (2022). Considering private investment as fully induced by demand growth allows

[7] Sraffian authors such as Such as Cesaratto (2015), Cesaratto et al. (2003), de-Juan (2005), Deleidi and Mazzucato (2019), Di Bucchianico (2021), Freitas and Christianes (2020), Freitas and Serrano (2015, 2017), Serrano and Freitas (2017), Girardi and Pariboni (2016), Pariboni (2016), and Vieira Mandarino et al. (2020) and Kaleckian authors such as Allain (2019, 2021), Dutt (2019, 2020), Hein (2018), Hein and Woodgate (2021), Lavoie and Nah (2020), Nah and Lavoie (2017, 2019a, 2019b) Palley (2019), and Fazzari et al. (2013, 2020)

us to have an endogenous adjustment of the private sector to a politically enforced zero-growth condition. Although considered a very simple mechanism by some, it is a simple solution to the problem of imposing zero net investment on the corporate sector. When it comes to the concerns about the full long-run autonomy of parts of consumption, residential investment, and exports, we follow Hein (2018) and Hein and Woodgate (2021), who argue that these concerns are less valid for government expenditures, especially in cases of a government that can issue debt in domestic currency.

We, therefore, consider a closed economy model, with taxes, as in Dutt (2020), a balanced government budget, as in Allain (2015), and depreciation and capital scrapping and replacement, as in Hein (2021). For simplicity, only taxes on rentiers' income are considered. Following Hein and Jimenez (2022), retained earnings in a stable stationary economy have to be zero, therefore rentiers receive all the profits from production (hY^T). Here, we assume that there is no government debt inherited from the past, so that rentiers' income consists of the profits from production. In the short run, characterized by a given distribution, the model can generate a goods market equilibrium with positive capital accumulation. In the long run, we first consider a scenario with endogenous productivity and distribution. The model converges toward the autonomous growth rate of government expenditures, which for this stationary economy is equal to zero. We then examine if the long-run convergence can lead to a stable employment rate. Subsequently, we consider a version of the model with an endogenous policy intervention. In this version, the duty of stabilization falls upon the government through a policy of WTR.

As usual in Kaleckian models, the pre-tax profit share in production ($h=\Pi/Y_P$) is determined by mark-up pricing of firms in an oligopolist goods market. We assume constant prices; that is, we can set the price level at p=1, such that nominal and real variables are the same. In the short run, the mark-up is fixed and therefore we have a given distribution. In the long run, we integrate distributional dynamics into the first version of the model, as will be explained in section 4.2 below. Given that retained earnings in a stable stationary economy must be zero, rentiers receive all the profits from production (hY_P). By assumption, only rentiers save a fraction of their net income, according to their propensity to save (s_R). They also consume a fraction of their wealth according to their propensity to consume out of wealth (c_{RW}), lowering their saving out of current net income [$(1-t_R)(hY_P)$] accordingly. Since we also introduce depreciation of the capital stock (δ), the gross saving rate ($\sigma = \frac{S}{K}$), after normalizing all variables by the firms' capital stock is given by:

$$\sigma = \frac{S}{K} = s_R(1 - t_R)(hu) - c_{RW} + \delta, \;\; 0 < s_R \leq 1, \; 0 < c_{RW}, \delta \geq 0 \quad (4)$$

where $u = Y_P/K$ is the rate of capacity utilization. The gross investment function (I) includes net investment and replacement investment determined by capital scrapping (ρ). Firms adjust the capital stock through net investment according to their expected trend rate of output and sales (α) and they slow down the rate of capital accumulation (g) when the actual rate of capacity utilization (u) is below the normal rate (u_n):

$$g = \frac{I}{K} = \alpha + \beta(u - u_n) + \rho,\ \ \beta > 0,\ \rho \geq 0 \qquad (5)$$

Government expenditures (G) for goods and services drive our model and grow at a rate γ. The government expenditures-capital ratio (b) is given by:

$$b = \frac{G_0 e^{\gamma t}}{K} \qquad (6)$$

Given that only rentiers' income is taxed, we have the following tax-capital ratio:

$$\tau = t_R h u \qquad (7)$$

Hence, we obtain the balanced budget condition required for stable long-run zero growth:

$$\tau = t_R h u = b \qquad (8)$$

For simplicity, we assume the condition in equation (8) to hold also in the short run. Taking into account the determinants of productivity discussed in section 3, it yields the following productivity growth function:

$$\hat{y} = f(g, h) = a_0 + \varepsilon g - \theta h, \varepsilon > 0\ \theta > 0 \qquad (9)$$

Productivity growth is thus affected positively by capital accumulation and negatively by the profit share. Furthermore, it can only take non-negative values ($\hat{y} \geq 0$), as we assume that in our one-sector economy, technologies or learned processes cannot be undone or unlearned.

4.1 Short-run equilibrium

In the short run, firms adjust output to demand by varying capacity utilization, with a given distribution. Assuming a balanced budget, the goods market equilibrium is given by:

$$\begin{gathered} \sigma + \tau = g + b \\ \sigma = g \end{gathered} \qquad (10)$$

The Keynesian/Kaleckian stability condition for the short-run goods market equilibrium is:

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \Longrightarrow s_R(1 - t_R)h - \beta > 0 \qquad (11)$$

From equations (4), (5), and (10), we obtain the short-run goods market equilibrium rate of capacity utilization with a balanced government budget:

$$u^* = \frac{\alpha - \beta u_n + c_{RW} + \rho - \delta}{s_R(1 - t_R)h - \beta} \qquad (12)$$

as well as the short-run equilibrium values for the accumulation, profit rate, and productivity growth:

$$g^* = \frac{(\alpha-\beta u_n)\, s_R(1-t_R)h+\beta(c_{RW}+\rho-\delta)}{s_R(1-t_R)h-\beta} \tag{13}$$

$$r^* = h[\frac{\alpha-\beta u_n+c_{RW}+\rho-\delta}{s_R(1-t_R)h-\beta}] \tag{14}$$

$$\hat{y}^* = a_0 + \varepsilon[\frac{(\alpha-\beta u_n)\, s_R(1-t_R)h+\beta(c_{RW}+\rho-\delta)}{s_R(1-t_R)h-\beta}] - \theta h \tag{15}$$

In the short run, firms' assessment of the trend rate of growth may deviate from the growth rate of autonomous demand. Therefore, even if we have zero net financial balances of each sector at the normal rate of capacity utilization (i.e. a balanced government budget and consumption out of wealth exactly compensating for saving out of rentiers' income), in the short run, capacity utilization can deviate from the normal rate, and capital accumulation, saving and growth may be positive. Furthermore, we can obtain the rate of utilization associated with the balanced budget condition in equation (8):

$$u = \frac{b}{t_R h} \tag{16}$$

Hence from equations (12) and (16), we obtain the tax rate required for a balanced budget:

$$t_R = \frac{(\, s_R h-\beta)b}{h(\alpha-\beta u_n+c_{RW}+\rho-\delta+b\, s_R)} \tag{17}$$

Making use of equation (17), the short-run equilibrium values for capacity utilization, the profit rate, capital accumulation, and productivity growth can be rewritten as follows:

$$u^* = \frac{\alpha-\beta u_n+c_{RW}+\, s_R b+\rho-\delta}{s_R h-\beta} \tag{18}$$

$$r^* = \frac{h[\alpha-\beta u_n+c_{RW}+\, s_R b+\rho-\delta]}{s_R h-\beta} \tag{19}$$

$$g^* = \frac{s_R h(\alpha+\rho-\beta u_n)+\beta(c_{RW}+\, s_R b-\delta)}{s_R h-\beta} \tag{20}$$

$$\hat{y}^* = a_0 + \varepsilon\left[\frac{s_R h(\alpha+\rho-\beta u_n)+\beta(c_{RW}+\, s_R b-\delta)}{s_R h-\beta}\right] - \theta h \tag{21}$$

The comparative statics of the model in the short-run are summarized in Table 1, and are as expected in a Kaleckian model; we have the paradox of thrift, positive wealth effects on all the endogenous variables, and wage-led demand. Higher taxes and government expenditures are

expansionary (balanced budget multiplier). Higher scrapping leads to higher capital accumulation and hence higher productivity growth.

Table 1: Response of the short-run equilibrium toward changes in exogenous variables

	u^*	r^*	g^*	$\hat{y}^*$
s_R	-	-	-	-
c_{RW}	+	+	+	+
h	-	-	-	-
u_n	-	-	-	-
t_R	+	+	+	+
b	+	+	+	+
δ	-	-	-	-
ρ	+	+	+	+

4.2 Long-run equilibrium without government intervention

In the long run, we follow Dutt's (2019, 2020) proposal of 'rational' or—more appropriately expressed—'reasonable' expectations on behalf of the firms, which means that expectations about the trend rate of growth of the economy adjust to the autonomous growth rate of government expenditures, equal to zero in our model economy:

$$\alpha = \gamma = 0 \tag{22}$$

Thus, in the long run, our goods market equilibrium should adjust toward the normal rate of capacity utilization ($u = u_n$) and the autonomous growth rate of government expenditures. For the long-run equilibrium, we now endogenize distribution. We follow Dutt (2012), who, based on Kalecki (1943), discusses four main determinants of the mark-up, and therefore distribution: industrial concentration, sales promotion activities, increases in overhead costs, and power of the trade unions. For studying a zero-growth economy with positive productivity growth, we will concentrate on the power of the trade unions as a determinant of distribution, and we will consider labour market dynamics as a determinant of the bargaining power of workers. Furthermore, we have to consider the effects of the change in distribution on productivity growth.

In a zero-growth economy, positive productivity growth will lead to, ceteris paribus, higher unemployment (see equation 3). Following Dutt (2012), these long-run variations in the employment rate will then affect the profit share via the change in workers' bargaining power. This implies that changes in the profit share depend negatively on the employment rate:

$$\dot{h} = \xi(e_o - e),\ \xi > 0 \tag{23}$$

where ξ is a speed of adjustment parameter, e_o is the employment rate at which the profit share is stationary, and e is the employment rate, which following Taylor et al (2016), is expressed as a positive function of capital accumulation and a negative function of productivity:

$$e(y, g*), \frac{\partial e}{\partial y} < 0,\ \frac{\partial e}{\partial g} > 0 \tag{24}$$

Furthermore, following equation (9), the time rate of change in labour productivity is given by:

$$\dot{y} = y\hat{y} = y(a_0 + \varepsilon g - \theta h) = y(a_0 + \varepsilon[\alpha + \beta(u - u_n) + \rho] - \theta h) \tag{25}$$

For the long-run equilibrium, we must set our dynamic equations $\dot{h}$, $\dot{y}$ to zero in equations (23) and (25). From $\dot{h} = 0$, we obtain the long-run equilibrium employment rate:

$$e^{**} = e_o \tag{26}$$

Setting (25) to zero ($\dot{y} = 0$), we get:

$$\hat{y}^{**} = 0 \tag{27}$$

Since in the long-run firms do not expect any net growth, they adjust the growth rate of the gross capital stock to the scrapping rate:

$$g = \rho \tag{28}$$

and capacity utilization converges to the normal rate of capacity utilization (see equations [5], [22], and [28]). Using equations (27) and (28), we can express our equilibrium in terms of the profit share:

$$h^{**} = \frac{a_0 + \varepsilon\rho}{\theta} \tag{29}$$

In what follows, we will examine the dynamic stability of the equilibria in equations (26) - (29) making use of the dynamic equations (23) and (25) and the short-run goods market equilibrium in equation (18). The corresponding Jacobian matrix is given by:

$$J = \begin{bmatrix} \frac{\partial \dot{h}}{\partial h} & \frac{\partial \dot{h}}{\partial y} \\ \frac{\partial \dot{y}}{\partial h} & \frac{\partial \dot{y}}{\partial y} \end{bmatrix} \tag{30}$$

We have that:

- $\frac{\partial \dot{h}}{\partial h} = -\xi \frac{\partial e}{\partial g}\frac{\partial g}{\partial u}\frac{\partial u}{\partial h}, \quad \frac{\partial e}{\partial g} > 0,\ \frac{\partial g}{\partial u} > 0, \frac{\partial u}{\partial h} < 0$
- $\frac{\partial \dot{h}}{\partial y} = -\xi \frac{\partial e}{\partial y}$
- $\frac{\partial \dot{y}}{\partial h} = -y[\varepsilon\beta \frac{\partial u}{\partial h} + \theta],\ \frac{\partial u}{\partial h} < 0$
- $\frac{\partial \dot{y}}{\partial y} = \hat{y}$

Therefore, substituting in the Jacobian matrix, we obtain:

$$J = \begin{bmatrix} -\xi \frac{\partial e}{\partial g}\frac{\partial g}{\partial u}\frac{\partial u}{\partial h} & -\xi \frac{\partial e}{\partial y} \\ -y[\varepsilon\beta \frac{\partial u}{\partial h} + \theta] & \hat{y} \end{bmatrix} \tag{31}$$

For the local stability of this 2x2 dynamic system, the trace of the Jacobian has to be negative and the determinant needs to be non-negative. The trace of the Jacobian matrix is equal to:

$$TrJ = \frac{\partial \dot{h}}{\partial h} + \frac{\partial \dot{y}}{\partial y} = -\xi \frac{\partial e}{\partial g}\frac{\partial g}{\partial u}\frac{\partial u}{\partial h} + \hat{y} \tag{32}$$

While the determinant is equal to:

$$DetJ = -\xi \frac{\partial e}{\partial g}\frac{\partial g}{\partial u}\frac{\partial u}{\partial h}\hat{y} - \xi \frac{\partial e}{\partial y} y[\varepsilon\beta \frac{\partial u}{\partial h} + \theta] \tag{33}$$

As we can see in equation (32), to meet the stability condition of a negative trace in this 2x2 system, productivity growth must take negative values. However, this case is excluded from our analysis, since as mentioned before, we do not expect technologies or knowledge to perish. The latter implies that the condition of a negative trace is not met and therefore that the labour market is not stabilized through the feedback effects considered. To explain the mechanisms at play, we know that in the model a positive productivity shock will affect the employment rate, which harms the bargaining power of the workers negatively. The latter leads to a redistribution effect to the detriment of the workers (a higher profit share), leading eventually to a negative feedback on productivity growth. Although these feedback effects could potentially act as a stabilizing mechanism, negative productivity growth is necessary to compensate for the initial effect on the employment rate and to guarantee the stability of the modelled system, a scenario

that we do not consider for economic reasons. In the next subsection, we consider a government that intervenes in the economy with the mission of stabilizing the labour market.

4.3 Long-run equilibrium with government intervention

As in the previous section, we still assume that expectations about the trend rate of growth of the economy adjust to the autonomous growth rate of government expenditures, equal to zero in our model economy. Therefore, equation (22) still holds; we still have an adjustment of the goods market equilibrium toward the normal rate of capacity utilization and the autonomous growth rate of government expenditures. However, given that the feedback effects between productivity growth, distribution, and the employment rate are not sufficient to maintain the stability of the labour market, in this section we consider a scenario with government intervention. Specifically, instead of endogenizing the profit share as in equation (23), in this section we concentrate on analysing whether a policy of WTR can help to stabilize the labour market, while abstracting from distributional considerations.

Cutting working hours is largely discussed by ecological economists. According to the literature, it is a policy that can potentially stabilize the labour market in a zero-growth or degrowing economy. At the same time, a common argument is that it can potentially help to mitigate environmental degradation, enhance personal welfare (Knight et al., 2013; Fitzgerald et al., 2015; King and van den Bergh, 2017; Soper, 2020), and even strengthen democracy (Weiss and Cattaneo, 2017). It is therefore a policy worth exploring for our purposes of maintaining a stable employment rate in the long run of our zero-growth economy model.

From equation (3) we know that in a zero-growth economy with a constant labour force and constant participation rate, the growth rate of the employment rate can be expressed as in equation (34):

$$\hat{e} = -\hat{n} - \hat{y} \tag{34}$$

Following equation (34), to have a stable labour market in the sense of a constant employment rate, the degrowth in working hours per person must be equal to productivity growth:

$$\hat{e} = 0 \Rightarrow -\hat{n} = \hat{y} \tag{35}$$

Taking into account the latter, the government, aiming at a stable employment rate, will react to productivity growth by adjusting working hours endogenously. Hence, if the employment rate decreases due to labour productivity growth, then the government intervenes so that working time falls accordingly. Similarly to Dafermos et al. (2022) and Jackson and Victor (2019), our policy reaction function can be expressed dynamically as follows:

$$\dot{\hat{n}} = v\hat{e} = -v(\hat{y} + \hat{n}) \tag{36}$$

The reduction in working hours, however, will have a rebound effect on productivity growth. The latter can be related to several factors. The first is that skilled people such as young educated people who are unemployed may find employment, as well as people attracted to part-time opportunities such as skilled women (Kallis et al, 2013, p.1553). A second factor is that if more leisure time leads to higher well-being, then workers can become more productive per hour worked as they might feel more energetic and motivated. Finally, if labour becomes scarce, then the firm sector can aim towards the replacement of labour by machines, speeding up technical change and leading to further productivity growth.[8] This rebound effect can be expressed dynamically as in equation (37)

$$\dot{\hat{y}} = \theta\hat{e} = -\theta(\hat{y} + \hat{n}) \tag{37}$$

The long-run equilibrium of the 2x2 system is given by equation (35), which can be obtained by setting equations (36) and (37) to zero. To analyse the dynamic stability of the system, the corresponding Jacobian matrix is given by:

$$J = \begin{pmatrix} \frac{\partial \dot{\hat{n}}}{\partial \hat{n}} = -\upsilon & \frac{\partial \dot{\hat{n}}}{\partial \hat{y}} = -\upsilon \\ \frac{\partial \dot{\hat{y}}}{\partial \hat{n}} = -\theta & \frac{\partial \dot{\hat{y}}}{\partial \hat{y}} = -\theta \end{pmatrix} \tag{38}$$

As explained in the first scenario, for the local stability of the system, the trace of the Jacobian has to be negative and the determinant needs to be non-negative:

$$Tr = -\upsilon - \theta \tag{39}$$

$$Det = \upsilon\theta - \upsilon\theta = 0 \tag{40}$$

As seen in equations (39) and (40), we have a stable zero-root model, with a continuum of locally stable equilibria, implying that the long-run equilibrium (de)growth rate in working hours is path-dependent. This finding suggests that cutting working hours can stabilise the labour market in a zero-growth economy. More specifically, our long-run equilibrium employment rate is stable and therefore can remain at a constant level in the long run, as long as labour productivity growth is compensated for by degrowth in working time. This finding is in line with the models such as Lowgrow (Jackson and Victor, 2019), and EUROGREEN (D'Alessandro et al., 2018), where according to the simulations presented, employment can stabilize due to working time reduction. [9] More generally, it resonates with the argument that for a successful and just socio-ecological transition policy interventions are necessary.

[8] In this respect, Kallis et al (2013) argue that this substitution effect will come with higher energy use, implying that this effect will also depend on the relative costs of labour and energy.

[9] According to authors such as Oberholzer (2023) if the goal goes beyond a constant employment rate and the aim is, for example, positive employment effects, further interventions must complement the WTR policy. He presents an analysis of potential instabilities associated with WTR and discusses the complementary interventions that would be necessary to make WTR compatible with stabilized output and full employment.

In this scenario, we abstracted from distributional dynamics since the focus was placed on analysing the potential of WTR in keeping the employment rate constant while assuming a constant profit share. The latter is possible under the assumption that the hourly wage rate increases in line with productivity growth, such that total wage income and income distribution remain constant. However, this depends on the relative power of labour and capital and the potential for wage bargaining. It thus requires a high political influence on the labour market, as WTR must be linked with income policies (Oberholzer, 2023, p.7).

5. Conclusions

If respecting planetary boundaries and transitioning towards environmentally sustainable economies requires a halt in economic growth, it is crucial to understand the conditions under which such economies can remain stable. This paper aims at contributing to this discussion by considering the dynamic stability of the labour market in a zero-growth economy with productivity growth. The latter is challenging within a post-Keynesian framework since usually, without consideration for ecological constraints, post-Keynesians tackle unemployment issues through the stimulation of demand. If boosting demand has limits, then we expect unemployment to surge in such an economy.

To analyse the stability of the labour market, in the sense of a stable employment rate, we consider an autonomous demand-led growth model. In the model, net investment responds to deviations of capacity utilization from target utilization in the short run but adjusts to firms' sales growth expectations determined by autonomous government expenditures growth in the long run. The autonomous growth rate of government expenditures – set equal to zero– determines the growth rate of the system in the long run and the rate of capacity utilization converges towards the normal rate of capacity utilization.

In the first scenario, we consider the feedback effects between employment, distribution, and productivity growth and examine the conditions under which the long-run convergence leads to a stable employment rate and a stable productivity growth equal to zero. According to our results, the feedback effects considered are not enough to guarantee the long-run stability of the labour market since respecting the stability conditions would require negative productivity growth, a scenario that we exclude for economic reasons. Hence, our finding suggests that state interventions in the labour market might be crucial to make the long-run convergence compatible with a constant and stable employment rate.

Therefore, we subsequently consider a version of the model where the government attempts to stabilize the labour market through a WTR policy. Our results show that with the policy intervention in place, the long-run convergence towards zero growth can be compatible with a stable employment rate. This is possible as long as the negative effect that labour productivity growth has on the employment rate is compensated for by the reduction in working hours.

Hence, according to our findings, and in line with authors such as Jackson and Victor (2019), the reduction in working hours plays an important role in preventing rising unemployment as output stabilizes. This finding fits well within the degrowth literature, given that degrowth advocates largely support WTR. The latter not only because of its role in preventing rising unemployment, but also because of its potential for improving the work/life balance and allowing more time for currently unpaid activities such as child care, elderly care, and voluntary work (Koch and Fritz 2013; Mont, 2016), as well as the environmental benefits that can arise if the reduction in working time comes hand in hand with less carbon-intensive consumption patterns (Ashford and Kallis, 2013).

Nevertheless, despite the benefits, it is important to proceed carefully with WTR. According to Oberholzer (2023), it is a policy that could also trigger rising unemployment and instability if it is not complemented with other interventions. In the second version of our model, for example, the assumption that the wage rate increases in line with productivity growth requires further interventions that help to regulate the balance of power between capital and labour, in particular income policies. Without this assumption in place, functional income distribution would not be constant. The latter leads to a scenario that lies outside the scope of this paper, and that requires an evaluation of the distributional dynamics and the potential instabilities triggered by WTR,[10] as well as a careful study of the conditions under which zero growth is still compatible with a stable and constant employment rate.

[10] See Cieplinski et al (2021) for an analysis of the interplay between wages, distribution, and the reduction in working hours.

References

Alcott, B. (2013). Should Degrowth Embrace the Job Guarantee? *Journal of Cleaner Production*, *38*, 56–60. https://doi.org/10.1016/j.jclepro.2011.06.007

Allain, O. (2015). Tackling the Instability of Growth: A Kaleckian-Harrodian Model With an Autonomous Expenditure Component. *Cambridge Journal of Economics*, *39*(5), 1351–1371. https://doi.org/10.1093/cje/beu039

Allain, O. (2019). Demographic Growth, Harrodian (In)stability and the Supermultiplier. *Cambridge Journal of Economics*, *43*(1), 85–106. https://doi.org/10.1093/cje/bex082

Allain, O. (2021). A Supermultiplier Model of the Natural Rate of Growth. *Metroeconomica*, *72*(3), 612–634. https://doi.org/10.1111/meca.12336

Andersson, J. O. (2010). Basic Income From an Ecological Perspective. *Basic Income Studies*, *4*(2), 1–8. https://doi.org/10.2202/1932-0183.1180

Ashford, N. A., & Kallis, G. (2013). A Four-day Workweek: A Policy for Improving Employment and Environmental Conditions in Europe. *The European Financial Review*, 53–58.

Cassetti, M. (2003). Bargaining Power, Effective Demand and Technical Progress: A Kaleckian Model of Growth. *Cambridge Journal of Economics*, *27*(3), 449–464. https://doi.org/10.1093/cje/27.3.449

Cesaratto, S. (2015). Neo-Kaleckian and Sraffian Controversies on the Theory of Accumulation. *Review of Political Economy*, *27*(2), 154–182. https://doi.org/10.1080/09538259.2015.1010708

Cesaratto, S., Serrano, F., & Stirati, A. (2003). Technical Change, Effective Demand and Employment. *Review of Political Economy*, *15*(1), 33–52. https://doi.org/10.1080/09538250308444

Cieplinski, A., D'Alessandro, S., & Guarnieri, P. (2021). Environmental Impacts of Productivity-Led Working Time Reduction. *Ecological Economics*, *179*, 106822. https://doi.org/10.1016/j.ecolecon.2020.106822

Dafermos, Y., Monserand, A., & Nikolaidi, M. (2022). Green Public Investment, Consumption Patterns and the Ecological Transition: A Macroeconomic Analysis. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4097746

D'Alessandro, S., Dittmer, K., Distefanol, T., & Cieplinski, A. (2018). *Eurogreen Model of Job Creation in a Post-Growth Economy*. The Greens-EFA. https://degrowth.org/2018/10/29/eurogreen-an-ecological-macroeconomic-model-to-test-degrowth-policies/

De-Juan, Ó. (2005). Paths of Accumulation and Growth: Towards a Keynesian Long-period Theory of Output. *Review of Political Economy*, *17*(2), 231–252. https://doi.org/10.1080/09538250500067270

Deleidi, M., & Mazzucato, M. (2019). Putting Austerity to Bed: Technical Progress, Aggregate Demand and the Supermultiplier. *Review of Political Economy*, *31*(3), 315–335. https://doi.org/10.1080/09538259.2019.1687146

Di Bucchianico, S. (2021). Inequality, Household Debt, Ageing and Bubbles: A Model of Demand-Side Secular Stagnation. *Institute for International Political Economy Berlin, Working Paper, No.160/2021.* https://www.ipe-berlin.org/fileadmin/institut-ipe/Dokumente/Working_Papers/ipe_working_paper_160__2_.pdf

Dutt, A. K. (2003). New Growth Theory, Effective Demand, and Post-Keynesian Dynamics. In Salvadori, N. (Ed), *Old and new growth theories: An assessment* (pp. 67–100). Edward Elgar Pub.

Dutt, A. K. (2012). Distributional Dynamics in Post Keynesian Growth Models. *Journal of Post Keynesian Economics*, *34*(3), 431–452. https://doi.org/10.2753/PKE0160-3477340303

Dutt, A. K. (2019). Some Observations on Models of Growth and Distribution with Autonomous Demand Growth. *Metroeconomica*, *70*(2), 288–301. https://doi.org/10.1111/meca.12234

Dutt, A. K. (2020). Autonomous Demand Growth, Distribution, and Fiscal and Monetary Policy in the Short and Long Runs. In Bougrine, H., & Rochon, L.P (Eds.), *Economic Growth and Macroeconomic Stabilization Policies in Post-Keynesian Economics* (pp. 16–32). Edward Elgar Publishing.

Fazzari, S. M., Ferri, P. E., Greenberg, E. G., & Variato, A. M. (2013). Aggregate Demand, Instability, and Growth. *Review of Keynesian Economics*, *1*(1), 1–21. https://doi.org/10.4337/roke.2013.01.01

Fazzari, S. M., Ferri, P., & Variato, A. M. (2020). Demand-Led Growth and Accommodating Supply. *Cambridge Journal of Economics*, *44*(3), 583–605. https://doi.org/10.1093/cje/bez055

Fitzgerald, J. B., Jorgenson, A. K., & Clark, B. (2015). Energy Consumption and Working Hours: A Longitudinal Study of Developed and Developing Nations, 1990–2008. *Environmental Sociology*, *1*(3), 213–223. https://doi.org/10.1080/23251042.2015.1046584

Fontana, G., & Sawyer, M. (2013). Post-Keynesian and Kaleckian Thoughts on Ecological Macroeconomics. *European Journal of Economics and Economic Policies: Intervention*, *10*(2), 256–267. https://doi.org/10.4337/ejeep.2013.02.09

Fontana, G., & Sawyer, M. (2015). The Macroeconomics and Financial System Requirements for a Sustainable Future. In Arestis, P. & Sawyer, M. (Eds.), *Finance and the Macroeconomics of Environmental Policies* (pp. 74–110). Palgrave Macmillan. London, UK. https://doi.org/10.1057/9781137446138_3

Fontana, G., & Sawyer, M. (2016). Towards Post-Keynesian Ecological Macroeconomics. *Ecological Economics*, *121*, 186–195. https://doi.org/10.1016/j. ecolecon.2015.03.017.

Fontana, G., & Sawyer, M. (2022). Would a Zero-Growth Economy be Achievable and be Sustainable? *European Journal of Economics and Economic Policies: Intervention*, *19*(1), 89–102. https://doi.org/10.4337/ejeep.2022.01.07

Freitas, F., & Christianes, R. (2020). A Baseline Supermultiplier Model for the Analysis of Fiscal Policy and Government Debt. *Review of Keynesian Economics*, *8*(3), 313–338. https://doi.org/10.4337/roke.2020.03.02

Freitas, F., & Serrano, F. (2015). Growth Rate and Level Effects, the Stability of the Adjustment of Capacity to Demand and the Sraffian Supermultiplier. *Review of Political Economy*, *27*(3), 258–281. https://doi.org/10.1080/09538259.2015.1067360

Girardi, D., & Pariboni, R. (2016). Long-Run Effective Demand in the US Economy: An Empirical Test of the Sraffian Supermultiplier Model. *Review of Political Economy*, *28*(4), 523–544. https://doi.org/10.1080/09538259.2016.1209893

Godin, A. (2012). Guaranteed Green Jobs: Sustainable Full Employment. *Levy Economics Institute of Bard College, Working Paper, No. 722*. http://dx.doi.org/10.2139/ssrn.2060326

Hein, E. (2014). *Distribution and Growth After Keynes: A Post-Keynesian Guide*. Edward Elgar.

Hein, E. (2018). Autonomous Government Expenditure Growth, Deficits, Debt, and Distribution in a Neo-Kaleckian Growth Model. *Journal of Post Keynesian Economics*, *41*(2), 316–338. https://doi.org/10.1080/01603477.2017.1422389

Hein, E. (2021). Harrodian Instability in Kaleckian Models and Steindlian Solutions: An Elementary Discussion. In: Basu, D., & Das, D. (Eds.), *Conflict, Demand and Economic Development: Essays in Honour of Amit Bhaduri* (pp. 44-69.). Routledge**.** Abingdon, New York.

Hein, E., & Jimenez, V. (2022). The Macroeconomic Implications of Zero Growth: A Post-Keynesian Approach. *European Journal of Economics and Economic Policies: Intervention*, *19*(1), 41–60. https://doi.org/10.4337/ejeep.2022.01.05

Hein, E., & Tarassow, A. (2010). Distribution, Aggregate Demand and Productivity Growth: Theory and Empirical Results for Six OECD Countries Based on a Post-Kaleckian Model. *Cambridge Journal of Economics*, *34*(4), 727–754. https://doi.org/10.1093/cje/bep066

Hein, E., & Woodgate, R. (2021). Stability Issues in Kaleckian Models Driven by Autonomous Demand Growth—Harrodian Instability and Debt Dynamics. *Metroeconomica*, *72*(2), 388–404. https://doi.org/10.1111/meca.12325

Hickel, J., & Kallis, G. (2020). Is Green Growth Possible? *New Political Economy*, *25*(4), 469–486. https://doi.org/10.1080/13563467.2019.1598964

Howard, M. W., Pinto, J., & Schachtschneider, U. (2019). Ecological Effects of Basic Income. In Torry, M. (Ed.), *The Palgrave International Handbook of Basic Income* (pp. 111–132). Springer International Publishing. https://doi.org/10.1007/978-3-030-23614-4_7

Jackson, T., & Victor, P. (2011). Productivity and Work in the 'Green Economy': Some Theoretical Reflections and Empirical Tests. *Environmental Innovation and Societal Transitions*, *1*(1), 101–108. https://doi.org/10.1016/j.eist.2011.04.005

Jackson, T., & Victor, P. (2019). LowGrow SCF—A Stock-Flow-Consistent Ecological Macroeconomic Model for Canada. *CUSP, Working Paper, No 16.* https://cusp.ac.uk/themes/aetw/wp16/

Kalecki, M. (1943). *Studies in Economic Dynamics*. George Allen & Unwin.

Kallis, G., Kalush, M., O.'Flynn, H., Rossiter, J., & Ashford, N. (2013). "Friday Off": Reducing Working Hours in Europe. *Sustainability*, *5*(4), 1545–1567. https://doi.org/10.3390/su5041545

King, L. C., & van den Bergh, J. C. J. M. (2017). Worktime Reduction as a Solution to Climate Change: Five Scenarios Compared for the UK. *Ecological Economics*, *132*, 124–134. https://doi.org/10.1016/j.ecolecon.2016.10.011

Knight, K. W., Rosa, E. A., & Schor, J. B. (2013). Could Working Less Reduce Pressures on the Environment? A Cross-national Panel Analysis of OECD Countries, 1970–2007. *Global Environmental Change*, *23*(4), 691–700. https://doi.org/10.1016/j.gloenvcha.2013.02.017

Koch, M., & Fritz, M. (2013). Conclusion: Non-Standard Employment: Concept, Empirical Results and Policy Implications. In Koch, M. & Fritz, M. (Eds.), *Non-Standard Employment in Europe* (pp. 229–241). Palgrave Macmillan. London, UK. https://doi.org/10.1057/9781137267160_14

Kronenberg, T. (2010). Finding Common Ground Between Ecological Economics and Post-Keynesian Economics. *Ecological Economics*, *69*(7), 1488–1494. https://doi.org/10.1016/j.ecolecon.2010.03.002

Lange, S. (2018). *Macroeconomics Without Growth*. Metropolis Verlag. https://www.metropolis-verlag.de/Macroeconomics-Without-Growth/1298/book.do

Lavoie, M., & Nah, W. J. (2020). Overhead Labour Costs in a Neo-Kaleckian Growth Model with Autonomous Non-Capacity Creating Expenditures. *Review of Political Economy*, *32*(4), 511–537. https://doi.org/10.1080/09538259.2020.1810875

Mastini, R., Kallis, G., & Hickel, J. (2021). A Green New Deal Without Growth? *Ecological Economics*, *179*, 106832. https://doi.org/10.1016/j.ecolecon.2020.106832

Monserand, A. (2019). Degrowth in a Neo-Kaleckian Model of Growth and Distribution? A Theoretical Compatibility and Stability Analysis. *Centre D'Economie de L'Université Paris Nord (CEPN)*, *Working Paper, No. 2019–01*. https://cepn.univ-paris13.fr/wp-content/uploads/2019/02/DT-CEPN-2019-01.pdf

Mont, O. (2016). The Changing Landscape of Work Time Reduction: The Past and the Future. In *Sustainability and the Political Economy of Welfare* (pp. 125–140). Routledge.

Naastepad, C. W. M. (2006). Technology, Demand and Distribution: A Cumulative Growth Model With an Application to the Dutch Productivity Growth Slowdown. *Cambridge Journal of Economics*, *30*(3), 403–434. https://doi.org/10.1093/cje/bei063

Nah, W. J., & Lavoie, M. (2017). Long-Run Convergence in a Neo-Kaleckian Open-Economy Model With Autonomous Export Growth. *Journal of Post Keynesian Economics*, *40*(2), 223–238. https://doi.org/10.1080/01603477.2016.1262745

Nah, W. J., & Lavoie, M. (2019a). Convergence in a Neo-Kaleckian Model with Endogenous Technical Progress and Autonomous Demand Growth. *Review of Keynesian Economics*, *7*(3), 275–291. https://doi.org/10.4337/roke.2019.03.01

Nah, W. J., & Lavoie, M. (2019b). The Role of Autonomous Demand Growth in a Neo-Kaleckian Conflicting-Claims Framework'. *Structural Change and Economic Dynamics*, *51*, 427–444. https://doi.org/10.1016/j.strueco.2019.02.001

Nikiforos, M. (2018). Some Comments on the Sraffian Supermultiplier Approach to Growth and Distribution. *Journal of Post Keynesian Economics*, *41*(4), 659–675. https://doi.org/10.1080/01603477.2018.1486211

Oberholzer, B. (2023). Post-growth Transition, Working Time Reduction, and the Question of Profits. *Ecological Economics*, *206*, 107748. https://doi.org/10.1016/j.ecolecon.2023.107748

Palley, T. (2019). The Economics of the Super-Multiplier: A Comprehensive Treatment with Labor Markets. *Metroeconomica*, *70*(2), 325–340. https://doi.org/10.1111/meca.12228

Pariboni, R. (2016). Household Consumer Debt, Endogenous Money and Growth: A Supermultiplier-Based Analysis. *PSL Quarterly Review*, *69*(276–279), 211–233. https://doi.org/10.13133/2037-3643_69.278_1

Parrique, T., Barth, J., Briens, F., Kerschner, C., Kraus-Polk, A., Kuokkanen, A., & Spangenberg, J. H. (2019). *Decoupling Debunked – Evidence and Arguments Against Green Growth as a Sole Strategy for Sustainability* (p. 77). European Environmental Bureau. https://eeb.org/library/decoupling-debunked/

Rezai, A., Taylor, L., & Mechler, R. (2013). Ecological Macroeconomics: An Application to Climate Change. *Ecological Economics*, *85*, 69–76. https://doi.org/10.1016/j.ecolecon.2012.10.008

Richters, O., & Siemoneit, A. (2017). Consistency and Stability Analysis of Models of a Monetary Growth Imperative. *Ecological Economics*, *136*, 114–125. https://doi.org/10.1016/j.ecolecon.2017.01.017

Scrieciu, S., Rezai, A., & Mechler, R. (2013). On the Economic Foundations of Green Growth Discourses: The Case of Climate Change Mitigation and Macroeconomic Dynamics in Economic Modeling. *WIREs Energy and Environment*, *2*(3), 251–268. https://doi.org/10.1002/wene.57

Serrano, F. (1995a). Long Period Effective Demand and the Sraffian Supermultiplier. *Contributions to Political Economy*, *14*(1), 67–90. https://doi.org/10.1093/oxfordjournals.cpe.a035642

Serrano, F. (1995b). *The Sraffian Supermultiplier*. University of Cambridge.

Serrano, F., & Freitas, F. (2017). The Sraffian Supermultiplier as an Alternative Closure for Heterodox Growth Theory. *European Journal of Economics and Economic Policies: Intervention*, *14*(1), 70–91. https://doi.org/10.4337/ejeep.2017.01.06

Skott, P. (2019). Autonomous Demand, Harrodian Instability and the Supply Side. *Metroeconomica*, *70*(2), 233–246. https://doi.org/10.1111/meca.12181

Soper, K. (2020). *Post-Growth Living: For an Alternative Hedonism*. Verso Books.

Taylor, L., Rezai, A., & Foley, D. K. (2016). An Integrated Approach to Climate Change, Income Distribution, Employment, and Economic Growth. *Ecological Economics*, *121*, 196–205. https://doi.org/10.1016/j.ecolecon.2015.05.015

Terzi, A. (2022). *Growth for Good: Reshaping Capitalism to Save Humanity from Climate Catastrophe*. Harvard University Press.

UNEP. (2022). *Emissions Gap Report 2022*. UNEP. http://www.unep.org/resources/emissions-gap-report-2022

United Nations. (2022). *World Population Prospects 2022*. Department of Economic and Social Affairs, Population Division. Retrieved January 30, 2023, from https://population.un.org/wpp/Download/Standard/MostUsed/

Vieira Mandarino, G., Dos Santos, C. H., & Macedo e Silva, A. C. (2020). Workers' Debt-Financed Consumption: A Supermultiplier Stock–Flow Consistent Model. *Review of Keynesian Economics*, *8*(3), 339–364. https://doi.org/10.4337/roke.2020.03.03

Weiss, M., & Cattaneo, C. (2017). Degrowth – Taking Stock and Reviewing an Emerging Academic Paradigm. *Ecological Economics*, *137*, 220–230. https://doi.org/10.1016/j.ecolecon.2017.01.014

Zwickl, K., Disslbacher, F., & Stagl, S. (2016). Work-Sharing for a Sustainable Economy. *Ecological Economics*, *121*, 246–253. https://doi.org/10.1016/j.ecolecon.2015.06.009

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