CEPN Centre d'économie
de l'Université Paris Nord
CNRS UMR n° 7234

Document de travail N° 2020-02
Axe : Dynamiques du Capitalisme et Analyses Post-Keynésiennes

Growth without Full Capacity Utilization And Full Capacity Utilization Without Growth

Federico Bassi,
federico.bassi@univ-paris13.fr
CEPN, UMR-CNRS 7234, Université Sorbonne Paris Nord

March 2020

Abstract: Despite empirical evidence of permanent damages to GDP after the 2008 global financial crisis, there is little theoretical consensus about the impact of the crisis on the unobservable rate of capacity utilization. In this paper, we investigate how the rate of capacity utilization reacts to shocks by testing the hypothesis that the normal rate of capacity utilization is exogenous and constant, against the alternative hypothesis that it is endogenous to demand and can vary with time. We find that the normal rate is more likely to be a shifting attractor or a time-varying trend instead of a fixed center of gravity. Hence, temporary shocks do not necessarily translate into permanent losses of productive capacity but they can also translate into lower degrees of utilization of the capacity in place. We show indeed that the effects of the 2008 financial crisis on EU countries were highly heterogeneous, and we find three different trajectories. A first cluster of countries recovered the pre-crisis rate of capacity utilization and accumulation, despite a permanent destruction of productive capacity. A second cluster of countries absorbed the shock through a lower rate of capacity utilization and accumulation with no permanent destruction of productive capacity; a third cluster of countries absorbed the shock through a massive destruction of productive capacity and a negative rate of growth, despite an increasing rate of utilization.

Keywords: Normal rate of capacity utilization, Hysteresis, Secular stagnation

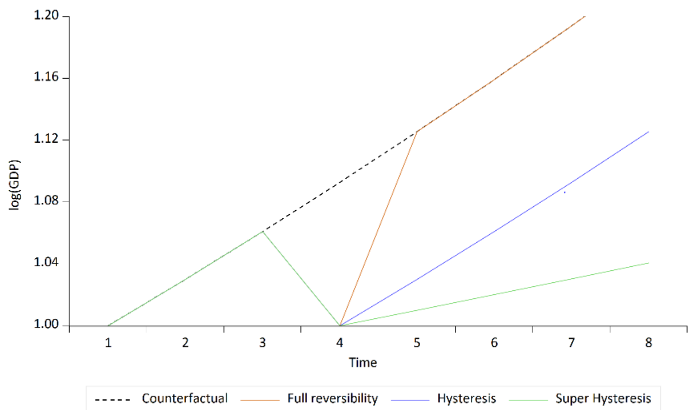
JEL Codes: C32, C51, E12, E22, E32

Note: This paper is part of a research project hosted by the Centre de recherche en économie de l'Université Paris-Nord (CEPN) and financed by the AXA Research Fund. Early versions were presented at the AFEP-IIPPE 2019 annual conference in Lille, at the EAEPE 2019 annual conference in Warsaw and at the FMM 2019 annual conference in Berlin. The whole project benefited of a fruitful visiting period at the Complexity Lab in Economics (CLE) of the Catholic University of Milan. I would like to acknowledge the CLE and the CEPN for hosting the project, and the AXA Research Fund for providing the necessary financial means. The usual disclaimers apply.

1. Introduction

There is clear empirical evidence that the cumulative shocks of the 2008' Global financial crisis and the 2012' European crisis created permanent damages to GDP and to the rate of unemployment in most European countries (Ball, 2014). There is also clear empirical evidence that permanent damages to GDP and unemployment, following large crisis, are the norm rather than the exception (Cerra & Saxena, 2008). In particular, we can identify three types of post-crisis trajectories (see also Cross et al, 2012).

Figure 1
Taxonomy of post-crisis trajectories



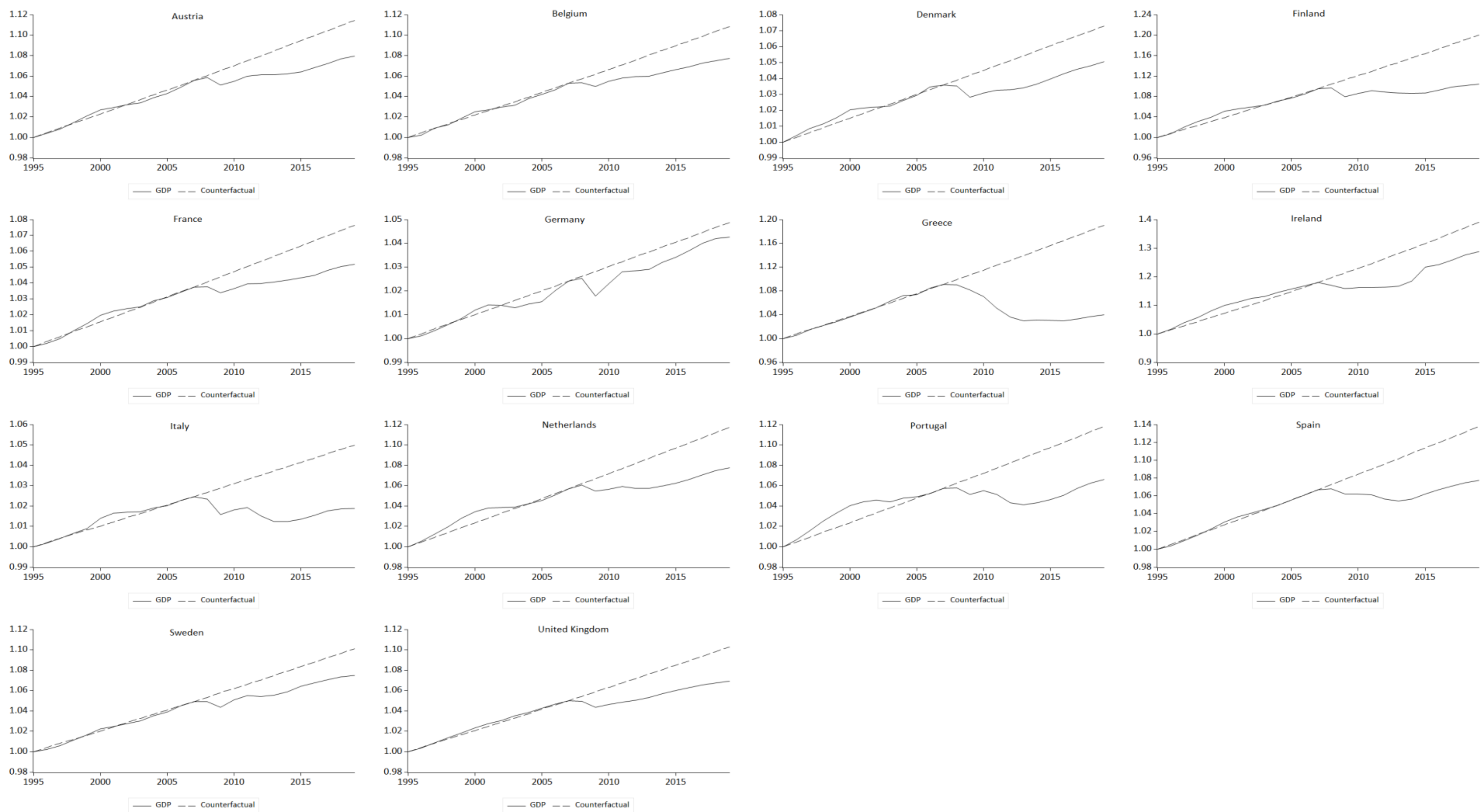
In the first scenario, labelled "full-reversibility", the effect of the crisis is temporary, as the trajectory fully reverts to the counterfactual path and the economy keeps growing at the same pre-crisis pace. This scenario is purely theoretical and does not seem to apply to any real economy hit by a sizeable shock. In the second scenario, labelled "hysteresis", the effect of the crisis is a permanent fall in the level of output although the economy keeps growing at the same pre-crisis pace, parallel to the counterfactual scenario. This scenario applies to few countries in Europe. In the third and most likely case, after the crisis the economy keeps growing along a deteriorated path at a deteriorated pace. This last scenario characterized by *super hysteresis* applies to most EU countries after the 2008' crisis (see Figure 2).

What we cannot observe, however, is whether this permanent damage to GDP (in level and/or growth rate) reflects a permanent damage to the productive capacity of the economy, a permanent damage to the degree of utilization of the productive capacity in place, or both. The dominant approach in the academy and in international institutions consists of assuming that real output naturally gravitates around full capacity output. A temporary negative shock would imply only a temporary underutilization of productive capacity leading firms to lower prices along a negative spiral. This would thus push the central bank, which is targeting a constant inflation rate, to lower the interest rate in order to allow a return towards full capacity output, which is the only level of output consistent with inflation stability (Taylor, 1993; Clarida et al, 1999). Consequently, to explain a permanent damage to GDP without a constantly decelerating inflation, conventional models refer to exogenous and permanent shocks to the productive capacity of the economy, which is nevertheless fully used (Havik et al, 2014).

In the heterodox tradition, there is little consensus on whether permanent damages to GDP reflect permanent damages to the productive capacity, to the degree of utilization, or both. Despite the consensual endorsement for demand-led models that explain adjustments of supply to demand through changes in productive capacity, whether *full adjustment* towards a fixed *normal* rate[2] of capacity

[2] The *normal*, or *target*, or *desired* rate of capacity utilization usually refers to the rate of capacity utilization that minimizes costs (Kurz, 1986), or to the optimal engineered-rated capacity, which is the maximum use of plants taking account of necessary breaks for maintenance and repair of regular wear and tear (Eichner, 1976). See Lavoie (2014) for a broader discussion about the different definitions of *normal capacity*, and their implications.

Figure 2
Real GDP and counterfactual GDP in 14 EU countries



Note: Counterfactual GDP represents the value that GDP would have had if its average rate of growth between 1995 and 2007 (12 years before the crisis) had continued until 2019 (12 years after the crisis). Both GDP and counterfactual GDP are log-linearized and normalized to 1 in 1995.

utilization is a regularity or merely a possibility is still an open debate. More precisely, the stability of the normal rate and its explanatory power as an equilibrium concept are at the core of the debate.

In this article, we aim at estimating the normal rate of capacity utilization using the time series of the rate of capacity utilization and the rate of capital accumulation estimated in Bassi (2019), in order to analyze whether it is indeed stable or not. In particular, we want to analyze whether the permanent damages to GDP observed in EU countries a decade after the 2008 global financial crisis reflect permanent damages to *full capacity output* or also a persistent under-utilization of the productive capacity in place, leading to a slower rate of accumulation. The paper is organized as follows. In section 2, we review the reference literature. In section 3, we estimate the normal rate of capacity utilization in 14 EU countries. In section 4, we discuss results and policy implications. In section 5, we conclude.

2. Normal capacity utilization and hysteresis

2.1 Capacity utilization and capital accumulation in post-Keynesian/Kaleckian theories

In the Post-Keynesian/Kaleckian tradition, the rate of capacity utilization is the endogenous variable that ensures the equality between investments and savings. A simple model can help to clarify this argument and capturing its implications (Dutt, 1984, 1990; Amadeo, 1986; Lavoie, 1996). Let assume, in line with the literature, that the pace of accumulation of capital (I/K) – hence, of productive capacity – depends on the rate of utilization of the productive capacity in place u, and on firms' *animal spirits,* which at first approximation might take the form of an exogenous parameter α. The exogenous parameter β reflects the sensitivity of the rate of capacity accumulation to changes in capacity utilization:

$$g^k \equiv \frac{I}{K} = \alpha + \beta u \tag{1}$$

Let also assume, in line with the literature, that aggregate savings (normalized for the capital stock in place, *K*) necessary to finance investment decisions depend on capitalists' savings out of profits:

$$\frac{S}{K} = s\frac{P}{K} = s\frac{P}{Y}\frac{Y}{Y^p}\frac{Y^p}{K} = s\pi u v \tag{2}$$

Where *s* is a fixed and exogenous propensity to save, P stands for aggregate profits, Y for aggregate output and Y^p captures the productive capacity in place. If we make the "heroic assumption" (Domar, 1946) that Y^p is a linear function of the capital stock, the ratio of productive capacity to capital stock, *v*, is also a fixed and exogenous parameter. The coefficient π reflects the (exogenous) profit share.

Because savings converge to investments through endogenous fluctuations of the rate of capacity utilization, which increases if investments are larger than savings and falls if savings are larger than investments, the rate of capacity utilization will gravitate around an endogenous equilibrium u^* characterized by the strict equality between investments (1) and savings (2):

$$u^* = \frac{\alpha}{s\pi v - \beta} \tag{3}$$

The main take-home message of this model is that the rate of capacity utilization is an endogenous variable that depends on entrepreneurs' *animal spirits* (α), on capitalists' propensity to save out of profits (*s*) and on functional income distribution (π), given the unique, ontological constraint that $u^* \in [0,1]$.

2.2 Normal capacity utilization and disequilibrium adjustments

The extreme assumption that the rate of capacity utilization is only constrained by its ontological boundaries ($u^* \in [0,1]$) has been subject to number of critiques (Committeri, 1986; Auerbach & Skott, 1988; Duménil & Lévy, 1999; Shaikh, 2009). Namely, opponents argue that firms typically target a *desired* rate of capacity utilization that minimizes costs, and there is no reason to believe that the rate of capacity utilization may stabilize on an *undesired* rate without triggering prompt reactions by firms aiming to restore their desired target. Hence, positive or negative gaps between actual and desired utilization should lead to permanent instability in the rate of accumulation, as formalized in equation (4), where Δ stands for variation:

$$\Delta g^k = \beta(u - u^n) \tag{4}$$

Hence, if we followed this strand of critiques, we should concentrate theoretical investigations on the endogenous mechanisms leading the equilibrium rate of capacity utilization (3) to gravitate around its exogenous normal equilibrium u^n. According to Duménil & Lévy (1999), the adjustment mechanism lies in the fixed parameter α, which no longer reflects exogenous entrepreneurs' *animal spirits*, but rather entrepreneurs' expected growth rate of demand, which, if properly estimated, would lead to a steady rate of capital accumulation and a normal utilization of the productive capacity in place. The mechanism is relatively mainstream, as it relies upon the central bank's reaction to an acceleration or deceleration of prices triggered by, respectively, a positive or negative *utilization gap*, which is the gap between current and normal capacity utilization. We summarize this mechanism in four linear equations.

$$\begin{cases} g^k = \alpha + \beta(u - u^n) \\ \hat{p} = \zeta(u - u^n) \\ \hat{\imath} = \delta\hat{p} \\ \hat{\alpha} = -\gamma\hat{\imath} \end{cases} \tag{5}$$

p is output price, ζ is the sensitivity of inflation to positive or negative utilization gaps, *i* is the interest rate, δ captures the reactivity of the central bank to positive or negative inflation rates, γ captures the speed at which entrepreneurs adjust expectations of demand growth to changes in the interest rate and α captures entrepreneurs' expected growth rate of demand. Here and hereafter, the *hat* on top of variables denotes the rate of change. Suppose that the equilibrium rate of capacity utilization is initially equal to the normal rate, and that investments are growing at a steady rate with zero inflation. A sudden decrease in the profit share or in the propensity to save out of profits would generate a positive utilization gap, triggering price inflation. The Central bank, which commits to ensure a zero inflation rate, will thus raise the interest rate in order to stop inflation. This will affect negatively entrepreneurs' expectations about demand growth, α, and lead to deceleration of investments with a consequent fall in aggregate demand, until the equilibrium rate of capacity utilization (3) goes back to its normal rate.

Although it is difficult to reconcile this model with a demand-led theory of growth (a positive demand shock leads to a *lower* secular rate of growth, in this model), it is possible to reconcile a demand-led framework with a stable normal rate of capacity utilization, by identifying adjustment mechanisms within the savings function (Setterfield & Avritzer, 2019). A typical adjustment mechanism relies on changes in the price mark-up – thus, in the profit share – when *normal* capacity output is defined as the level of output that minimizes costs. We summarize this mechanism in a simple dynamic process

$$\Delta\pi = \eta(u - u^n) \tag{6}$$

Suppose firms are initially producing at *normal* capacity and a fall in the propensity to save out of profits raises current output beyond *normal* capacity. Because firms are not able to accommodate the larger demand through a larger supply without a substantial increase in costs, they will raise prices by charging a higher mark-up. This will lead to an increase in the profit share as much as necessary to bring the equilibrium rate of capacity utilization in equation (3) to its *normal* rate. Thus, both the rate of capacity utilization and the rate of capital accumulation revert asymptotically to their normal level, although *normal capacity output* will be now permanently higher because of the larger productive capacity.

An alternative adjustment mechanism relies on endogenous changes in aggregate propensity to save out of profits (Shaikh, 2009). In this case, the *normal* rate is defined as the level of output such that firms have enough internal liquidity to finance investment plans.

$$\Delta s = \theta(u - u^n) \tag{7}$$

Hence, if the rate of capacity utilization raises beyond the normal rate – because of a fall in the profit share, for example – firms will be forced to increase their retention ratio in order to finance the larger accumulation rate implied by the *abnormal* rate of utilization. This will lead to an increase in the aggregate propensity to save out of profits until the equilibrium rate of capacity utilization (3) reverts to the normal rate.

A third adjustment mechanism to explain gravitation of actual utilization to *normal* utilization relies on the stabilizing effect of autonomous, non-capacity creating expenditures[3] (Serrano, 1995; Lavoie, 2014). Let assume that savings out of business profits finance both capacity-creating investments I, and non-capacity-creating expenditures I^Z. By normalizing for K, we obtain the following equilibrium condition:

$$\frac{S}{K} = \frac{I}{K} + \frac{I^Z}{K} \quad (8)$$

Replacing equations (1) and (2) into (8) leads to the short-run equilibrium rate of capacity utilization:

$$u^* = \frac{\alpha + z}{s\pi v - \beta} \quad (3')$$

With $z \equiv I^Z/K$. Because autonomous, non-capacity-creating expenditures I^Z grow at a steady rate $\bar{g}^z$, z is stable only if the rate of growth of K, g^k, is equal to the rate of growth of I^Z, $\bar{g}^z$. Since $\bar{g}^z$ is constant (by definition of autonomous expenditures) and g^k is governed by the monotonic[4] equation (1), there is one and only one value of the rate of capacity utilization, which we label u^{**}, ensuring the strict equality $g^k = \bar{g}^z$. Rearranging equation (1) by imposing $g^k = \bar{g}^z$ leads to the medium-run equilibrium rate of capacity utilization:

$$u^{**} = \frac{\bar{g}^z - \alpha}{\beta} \quad (3'')$$

By comparing equation 3' and 3'', we can observe that the propensity to save out of profits and the profit share affect the short-run equilibrium rate u^* but they do not affect the medium-run equilibrium rate u^{**}, suggesting that this latter is stable with respect to distributional and demand shocks. However, although stable, u^{**} is not yet necessarily equal to the desired rate u^n, which is exogenous and constant. To ensure that the equilibrium rate of capacity utilization is stable and equal to the normal rate ($u^{**} = u^n$), consistently with the definition of *full-adjusted position*, Allain (2012) assumes that firms adjust their expected secular rate of growth based on the gap between actual and normal capacity utilization:

$$\Delta\alpha = \lambda(u^* - u^n) \quad (9)$$

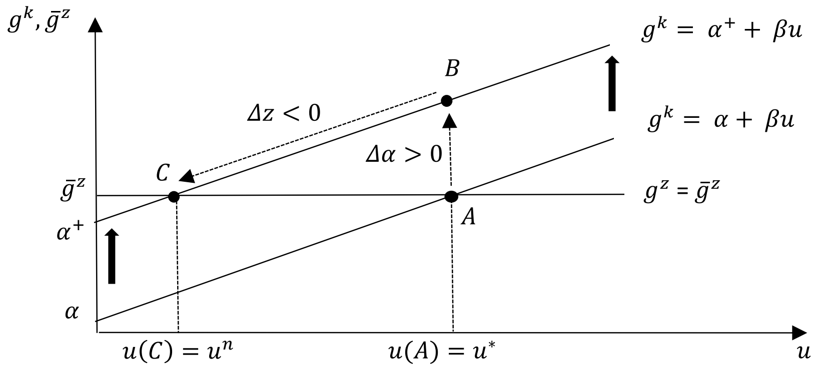
According to equation (9), firms invest at a steady rate only if the rate of capacity utilization is equal to the normal rate. Hence, if firms start producing persistently above the normal rate, and their rate of capital accumulation is thus higher than the previously expected secular rate ($g^k(u^*) > g^k(u^n)$), they will revise upwards their expectations about future demand growth and accelerate their rhythm of accumulation α[5]. Because autonomous expenditures keep growing at their constant and exogenous rate, the rate of growth of capacity will thus outpace the rate of growth of autonomous spending. Hence, aggregate demand will lag behind aggregate capacity and the rate of utilization will fall (consistently with equation (3'')) until reaching the normal rate ($u^{**} = u^n$), which ensures investments stability[6]. We provide a graphical representation of this adjustment mechanism in figure 3.

---

[3] Autonomous, non-capacity creating expenditures include residential investments, government expenditure, total exports and other components of final demand that are treated as independent from current output (Serrano, 1995).
[4] A standard equation $y = f(x)$ is monotonic increasing or decreasing if the derivative, y'_x, is always respectively positive or negative. Monotonicity implies that to each value of Y corresponds one and only one value of x.
[5] Note that this mechanism goes in the opposite direction with respect to Duménil & Lévy (1999), as a positive gap between actual and *normal* utilization implies an upwards adjustment of secular expectations.
[6] See Freitas & Serrano (2015) for an alternative adjustment mechanism based on changes in β, instead of α.

Figure 3

Adjustment towards the normal rate of capacity utilization in presence of autonomous spending.



We start from the initial equilibrium A, with $u = u^*$, which in the short run is consistent with steady z, as $g^k = g^z$. Nevertheless, because $u(A) > u^n$, firms revise upwards their expectations about the secular rate of growth, according to equation (9), until they reach point B. In B, the rate of capacity accumulation is higher than the exogenous rate of growth of autonomous spending ($g^k > g^z$), and *z* will thus gradually fall. Since the equilibrium rate of capacity utilization in equation (3') depends positively on *z*, firms will observe a fall in the equilibrium rate of capacity utilization, until they reach point C where $u(C) = u^n$. In C, the expected secular rate of growth α will stop increasing, since the new rate of capacity utilization is equal to the normal rate ($u(C) = u^n$). Moreover, the rate of capacity utilization will stop falling, because the rate of capacity accumulation is now equal to the exogenous rate of growth of autonomous spending ($g^k(C) = \bar{g}^z$)[7].

2.3 Normal rate or normal corridor of capacity utilization?

There are two common assumptions in the models presented in section 2.2. The first assumption is that capacity adjusts to demand, rather than the opposite way round[8]. Hence, the paradoxes of costs and thrift sill hold if we concentrate on the *level* of output rather than its *rate of growth*. For instance, a fall in the propensity to save out of profits or in the profit share have both a positive impact on the *level* of productive capacity, despite the rate of capacity utilization *fully adjusts* to the normal rate (and the rate of growth of productive capacity fully adjusts to the exogenous rate of growth of autonomous spending). The second assumption, which is more controversial, is that firms always react to a positive or negative gap between actual and normal capacity utilization, until the rate of capacity utilization fully adjusts to the exogenous normal rate. In other words, if the original post-Keynesian model was blamed for an excessive *libertinage* of the rate of capacity utilization, its critiques might be blamed for supporting the right opposite position of an excessive *straightness* of the rate of capacity utilization.

Counter-critiques oppose that the normal rate of capacity utilization, if any, might be endogenous. The intuition is that what is *normal* is a historical convention that can change through time, according to the gap between actual positon and expected normal position (Lavoie, 1996; Cassetti, 2006).

$$u^n = u^n{}_{-1} + \mu(u_{-1} - u^n{}_{-1}) \quad (10)$$

Hence, firms do react by changing investment decisions according to changes in the rate of capacity utilization, but they also update regularly what they consider a normal position given the actual conditions. Consequently, a temporary negative demand shock might imply a permanent drop in the rate of capacity utilization without triggering a permanent deceleration of investment decisions, if firms

[7] Refer to Lavoie (2014) for a detailed analysis of the model and its stability properties.
[8] As already mentioned, Duménil & Lévy (1999) represents an exception.

consider that the lower business activity is a new historical norm. Thus, instead of scrapping idle capacity, firms might try to compensate the larger costs of a lower-than-normal rate of utilization through alternative channels. Surveys among firms' accounting managers reveal, for instance, that most firms compute normal activity as a moving average of past business activity, consistently with equation (10), and that they compensate the lower normal activity with higher prices (Brierley et al, 2006).

An alternative objection to the idea that firms straightly target a fixed and stable rate of capacity utilization states that the normal rate of capacity utilization is only one out of multiple goals pursued by firms' managers. This is because of an inherent conflict of interests between shareholders, who aim at maximizing profits, and managers, who rather aim at maximizing the scope and the size of the firm (Jensen, 1993; Schoenberger, 1994; Hein et al, 2012). In this framework, managers are willing to accept to maintain idle capacity in order to avoid extreme and painful decisions such as shutting plants, which would create uncertainty, interrupt careers and create long-lasting conflicts with workers and unions. Hence, so long as they have cash flows to finance investments, managers prefer to buy peaceful relationships and delay conflictual downsizings despite the positive costs required to keep capital idle (Jensen, 1993). Moreover, fear of losing the pace in a global competitive market, and thus be kicked out of the market by more efficient competitors, justifies undesired *coerced investments*, which create idle capacity but look like necessary costs to win the *struggle for survival* (Crotty, 2002).

Other explanations rely on lack of information in a context of radical uncertainty, or in social and psychological costs related to mobilizing this information. Managers might procrastinate downsizing decisions because of radical uncertainty about future demand. So long as premature and unplanned obsolescence of fixed capital can generate large and *sunk* costs, waiting for clearer signals might be a rational strategy (Dixit, 1989; 1992). Nevertheless, even if managers had the correct information at disposals, they might still fail to mobilize it correctly so long as this would imply recognizing that past business models and practices, which define their own identity, are obsolete (Schoenberger, 1994). It might also imply recognizing that a large share of the money invested was wasted. Laboratory experiments show that the larger the amount of money invested in a project, the more investors will keep investing in these projects even if current business activity is lower than expected, because they are convinced that the crisis is only temporary and that their initial expectations in the end will prove correct (Arkes & Blumer, 1985; Garland, 1990). Not surprisingly, when managers are asked why they keep investing and accumulating capacity despite current conditions are rather favorable to downsizing, they provide answers that sound like "This business is going through some rough times. We have to make major investments so that we will have a chair when the music stops" (Jensen, 1993, p. 847).

Hence, instead of assuming that firms target a normal rate, a more flexible strategy would consist of assuming that firms target a *normal corridor* (Dutt, 1990, 2010; Setterfield, 2019). Within the corridor, firms would rather accept lower profits or adjust other variables than the capital stock to recover desired profit margins. Radical changes in investment plans and firms' size would rather take place outside of this corridor, because the costs of keeping idle capacity are larger than the costs implied by scrapping idle capacity. Hence, within the corridor, the rate of capacity utilization is fully endogenous and does not show any convergence towards a fixed center of gravity, while outside the corridor it would move counter cyclically and step back towards the safe normal corridor[9].

Discussing the theoretical soundness of each argument raised in section 2 is beyond the scope of this paper. Section 2 aims rather at illustrating the debate confronting the two alternative and conflicting hypothesis about the cyclical behavior of the rate of capacity utilization: the hypothesis that the rate of capacity utilization is stable around a fixed and normal attractor against the alternative hypothesis that it is endogenous and unstable (within a more or less broad corridor). In next sections, we confront these two opposite views by estimating the normal rate of capacity utilization in 14 EU countries, using empirical time-series provided by Bassi (2019). The method proposed by Bassi (2019) has the advantage

[9] Refer to Skott (2012) and Girardi & Pariboni (2019) for a critical discussion of the *corridor* hypothesis.

of estimating the rate of capacity utilization without imposing prior stability constraints, which is not the case for standard empirical time-series produced with business surveys (Shapiro, 1989; Nikiforos, 2016). Moreover, it provides simultaneously the series of the rate of capacity utilization and the rate of capital accumulation, which are both necessary to estimate the normal rate of capacity utilization.

3. Normal capacity utilization in EU

3.1 Normal rate of capacity utilization

We first define the variation of the rate of capital accumulation as a function of the gap between actual and normal capacity utilization, consistently with equation (4). Then, we seek to identify the unobserved normal rate of capacity utilization, which is the rate of capacity utilization that corresponds to a steady rate of capital accumulation. To do that, we estimate an extended version of equation (4) that captures the effects of both the distance between actual and normal rate of capacity utilization and the variation of the rate of capacity utilization, net of a white noise, uncorrelated residual:

$$\Delta \frac{I}{K_t} = \beta(u_t - {u^n}_t) + \gamma(\Delta u_t) + \xi_t \tag{11}$$

In order to identify the value of ${u^n}_t$, which is the only unknown in equation (11), we test three sequential hypothesis. The first hypothesis is that the normal rate of capacity utilization is a constant and exogenous value (${u^n}_t = u^n$). We thus estimate the following linear model:

$$\Delta \frac{I}{K_t} = \alpha + \beta u_t + \gamma(\Delta u_t) + \xi_t \tag{12}$$

With $\alpha = -\beta u^n$. If this hypothesis is empirically sound, we should expect to find a significant and negative value of α, and a significant and positive value for β. Table 1 shows the results of the estimates.

Table 1

Normal rate of capacity utilization in 14 EU countries

	Austria	Belgium	Denmark	Finland	France	Germany	Greece
α_1	-0.106***	-0.069***	-0.009*	-0.018**	-0.124***	-0.019	-0.027***
	(0.002)	(0.0015)	(0.089)	(0.017)	(0.000)	(0.407)	(0.001)
β	0.083***	0.063***	0.007*	0.014**	0.114***	0.016	0.019***
	(0.002)	(0.0015)	(0.078)	(0.019)	(0.000)	(0.425)	(0.002)
R^2	0.677	0.606	0.676	0.765	0.790	0.457	0.754
	Ireland	Italy	Netherlands	Portugal	Spain	Sweden	UK
α_1	-0.03	-0.09***	-0.185***	-0.05***	-0.010***	-0.106***	-0.002
	(0.140)	(0.000)	(0.001)	(0.007)	(0.001)	(0.000)	(0.483)
β	0.016	0.071***	0.167***	0.028***	0.006***	0.097***	0.002
	(0.153)	(0.000)	(0.0015)	(0.009)	(0.001)	(0.000)	(0.5285)
R^2	0.404	0.767	0.628	0.697	0.857	0.725	0.748

Note: p-values in parenthesis, *** $p < 0.01$; ** $0.01 < p < 0.05$; * $0.05 < p < 0.1$

In 11 out of 14 countries (Austria, Belgium, Denmark, Finland, France, Greece, Italy, Netherlands, Portugal, Spain and Sweden), the hypothesis of a constant and unique normal rate of capacity utilization finds empirical support, as both parameters are significantly different from 0 at 10% level, and the sign is consistent with expectations. In only 3 out of 14 countries (Germany, Ireland and UK), the estimated parameters are not significantly different from 0 at 10% level, suggesting that the hypothesis of a constant and stable normal rate of capacity utilization should be rejected in these three countries.

3.2 Normal rates of capacity utilization

We now test the second hypothesis of a variety of rates of capacity utilization that are consistent with steady accumulation. If this hypothesis is empirically sound, we should expect to find significant breaks to the intercept α while estimating equation (12):

$$u^n{}_m = \begin{cases} -\frac{\alpha_1}{\beta} & if \quad t_0 < t \leq t^*{}_1 \\ -\frac{\alpha_2}{\beta} & if \quad t^*{}_1 < t \leq t^*{}_2 \\ & (\dots) \\ -\frac{\alpha_m}{\beta} & if \quad t^*{}_2 < t \leq t^*{}_m \end{cases} \tag{13}$$

Instead of imposing the break dates *ex-ante*, we let the model identifying the statistically significant breaks – if any – according to the Bai & Perron (1998) selection method. Table 2 shows the results.

Table 2
Normal rates of capacity utilization in 14 EU countries

	Austria	Belgium	Denmark	Finland	France	Germany	Greece
α_1	-0.106***	-0.153***	-0.035***	-0.018	-0.217***	-0.019	-0.027***
	(0.002)	(0.000)	(0.000)	(0.017)	(0.000)	(0.407)	(0.001)
β	0.083***	0.146***	0.025***	0.014	0.207***	0.016	0.019***
	(0.002)	(0.000)	(0.000)	(0.019)	(0.000)	(0.425)	(0.002)
α_2		-0.166***	-0.031***		-0.230***		
		(0.000)	(0.000)		(0.000)		
		1981	2003		1982		
α_3		-0.157***	-0.028***		-0.216***		
		(0.000)	(0.000)		(0.000)		
		2003	2012		2003		
α_4		-0.148***					
		(0.000)					
		2011					
R^2	0.677	0.819	0.829	0.765	0.919	0.457	0.754
	Ireland	Italy	Netherlands	Portugal	Spain	Sweden	UK
α_1	-0.03	-0.133***	-0.185***	-0.05***	-0.012***	-0.126***	-0.002
	(0.140)	(0.000)	(0.001)	(0.007)	(0.000)	(0.000)	(0.483)
β	0.016	0.103***	0.167***	0.028***	0.006***	0.119***	0.002
	(0.153)	(0.000)	(0.0015)	(0.009)	(0.000)	(0.000)	(0.5285)
α_2		-0.122***			-0.010***	-0.139***	
		(0.000)			(0.0005)	(0.000)	
		2002			2002	1991	
α_3		-0.131***				-0.125***	
		(0.000)				(0.000)	
		2012				2006	
R^2	0.404	0.864	0.628	0.697	0.890	0.829	0.748

Note: p-values in parenthesis, *** p < 0.01; ** 0.01 < p < 0.05; * 0.05 < p < 0.1

In Austria, Finland, Greece, Netherlands and Portugal there is no empirical evidence of statistically significant breaks to the normal rate of capacity utilization, suggesting that the hypothesis of a unique and constant normal rate of capacity utilization is still empirically reasonable. Nevertheless, in Belgium, Denmark, France, Italy, Spain and Sweden there is empirical evidence of several structural breaks to the intercept α. This suggests that there is a variety of rates of capacity utilization consistent with steady accumulation in these countries, and that accounting for breaks in the normal rate allows explaining a larger variability in the relationship between capacity utilization and capital accumulation, as shown by the larger R^2 with respect to table 1. In Germany, Ireland and UK, however, there is still no statistically significant normal rate of capacity utilization, even accounting for possible structural breaks.

3.3 Normal trend of capacity utilization

We now test the third hypothesis that $u^n{}_t$ is a time-varying trend of the actual rate of capacity utilization rather than a constant – although shifting – rate. To do that, we first de-trend the actual rate of capacity utilization through a Hodrick-Prescott filter (Nikiforos, 2016; Setterfield & Avritzer, 2019):

$$HP = \min_{u^n}\left[\sum_{t=0}^{n}(u_t - {u^n}_t)^2 + \lambda \sum_{t=0}^{n}(({u^n}_{t+1} - {u^n}_t) - ({u^n}_t - {u^n}_{t-1}))^2\right] \quad (14)$$

Then, we plug the filtered series of the rate of capacity utilization in place of u^n in equation (11), which we re-estimate to identify the new value of the parameter β. If this hypothesis is empirically sound, we should expect to find a significant and positive value for β. In order to account for different shapes of the time-trend, we estimate equation (14) using different values of λ. For instance, with low values of λ, the filtered series will capture most of the volatility of the actual rate, while for high values of λ, the filtered series will smooth the actual rate and reflect its trend properties. Table 3 shows the results.

Table 3

Time-varying *normal* rate of capacity utilization

	Austria	Belgium	Denmark	Finland	France	Germany	Greece
				λ=0,1			
β	0.41***	0.144	0.052	0.075	1.555***	-0.696**	0.277**
	(0.019)	(0.451)	(0.242)	(0.347)	(0.001)	(0.037)	(0.020)
R^2	0.635	0.498	0.656	0.731	0.704	0.5285	0.6985
				λ=1			
β	0.224	0.494***	0.079**	0.054*	0.818***	-0.295**	0.214***
	(0.006)	(0.001)	(0.015)	(0.057)	(0.000)	(0.0335)	(0.002)
R^2	0.653	0.605	0.692	0.749	0.789	0.532	0.729
				λ=6,25			
β	0.149***	0.444***	0.081***	0.050***	0.529***	-0.166	0.095***
	(0.01)	(0.000)	(0.000)	(0.004)	(0.000)	(0.108)	(0.008)
R^2	0.646	0.728	0.758	0.777	0.872	0.492	0.710
				λ=25			
β	0.124***	0.293***	0.0705***	0.044***	0.374***	-0.112	0.045**
	(0.008)	(0.000)	(0.000)	(0.001)	(0.000)	(0.229)	(0.048)
R^2	0.648	0.756	0.801	0.791	0.887	0.4665	0.687
				λ=100			
β	0.1***	0.2***	0.056***	0.036***	0.276***	-0.093	0.029*
	(0.009)	(0.000)	(0.000)	(0.001)	(0.000)	(0.2935)	(0.090)
R^2	0.647	0.745	0.805	0.795	0.873	0.459	0.679
	Ireland	Italy	Netherlands	Portugal	Spain	Sweden	UK
				λ=0,1			
β	0.284***	0.384**	0.624**	-0.010	0.032104	0.612**	0.027
	(0.001)	(0.0145)	(0.024)	(0.946)	(0.6284)	(0.038)	(0.644)
R^2	0.515	0.626	0.576	0.627	0.813342	0.616	0.736
				λ=1			
β	0.189***	0.398***	1.062***	0.189*	0.006794	0.525***	0.035*
	(0.0005)	(0.000)	(0.000)	(0.054)	(0.7952)	(0.000)	(0.089)
R^2	0.532	0.707	0.742	0.66	0.812572	0.738	0.753
				λ=6,25			
β	0.192***	0.318***	0.625***	0.152***	0.001529	0.406***	0.026**
	(0.000)	(0.000)	(0.000)	(0.004)	(0.9029)	(0.000)	(0.022)
R^2	0.5665	0.7975	0.7215	0.697	0.812329	0.833	0.767
				λ=25			
β	0.176***	0.245***	0.506***	0.1***	0.002	0.3225***	0.018**
	(0.000)	(0.000)	(0.000)	(0.004)	(0.771)	(0.000)	(0.027)
R^2	0.567	0.838	0.7235	0.695	0.813	0.879	0.765
				λ=100			
β	0.092***	0.173***	0.4405***	0.079***	0.003	0.228***	0.012*
	(0.005)	(0.000)	(0.000)	(0.006)	(0.577)	(0.000)	(0.057)
R^2	0.4825	0.8235	0.727	0.691	0.814	0.858	0.757

Note: p-values in parenthesis, *** p < 0.01; ** 0.01 < p < 0.05; * 0.05 < p < 0.1

Most countries have a significant and positive value of β for at least one value of λ. Hence, in these countries there exists at least one time-varying rate of capacity utilization that is consistent with a normal utilization of the productive capacity in place, which means that the investment rate is globally stable despite more or less ample fluctuations in the rate of capacity utilization. The two exceptions are Germany, which has a significant although negative estimated β, and Spain, which has no significant β for any value of λ. In figure 4, we plot the actual rate of capacity utilization and the three alternative normal rates of capacity utilization for all 14 EU countries (to select one out of the multiple significant time-varying trends, we use the R^2 as measure of significance and we retain the most significant λ).

4. Full capacity utilization without growth and growth without full capacity utilization.

4.1. Hysteresis in the normal rate of capacity utilization

The reason why we analyzed the stability or instability of the normal rate of capacity utilization is to understand if temporary demand shocks may have permanent effects on the rate of capacity utilization. Hence, we want to test the hypothesis of *hysteresis*. There is hysteresis if we observe an output variable that changed permanently, and we are simultaneously able to identify an input variable – which *causes* or is anyway associated to the output variable – that changed only temporary. For example, let us take the *vertical* Phillips curve, which suggests a linear relationship between variations of inflation $\hat{p}_t$ on one hand, and the gap between actual and *equilibrium* rate of unemployment $(U_t - U^n)$ on the other hand.

$$\pi_t = \hat{p}_t - \hat{p}_{t-1} = \omega(U_t - U^n{}_t) + \varepsilon_t \quad (15)$$

If the *equilibrium* rate of unemployment, also called Non-accelerating inflation rate of unemployment (NAIRU), is constant $(U^n{}_t = C)$, the main implication of (15) is that temporary changes of the rate of inflation $(\pi_t = 0, \pi_{t+1} > 0, \pi_{t+2} = 0)$ should be associated to temporary changes of the rate of unemployment $(\Delta U_t = 0, \Delta U_{t+1} > 0, \Delta U_{t+2} = 0)$. Empirical studies rejected this linear relationship after observing that temporary changes of the inflation rate in the 80s – caused by oil shocks and subsequent deflationary policies – where associated to permanent changes of the unemployment rate, suggesting *hysteresis* in the relationship between unemployment and inflation (Blanchard & Summers, 1986; Ball, 1999, 2009). Because this could be explained, within equation (15), by assuming that the NAIRU follows a random walk, hysteresis was associated to the existence of a unit root in the NAIRU:

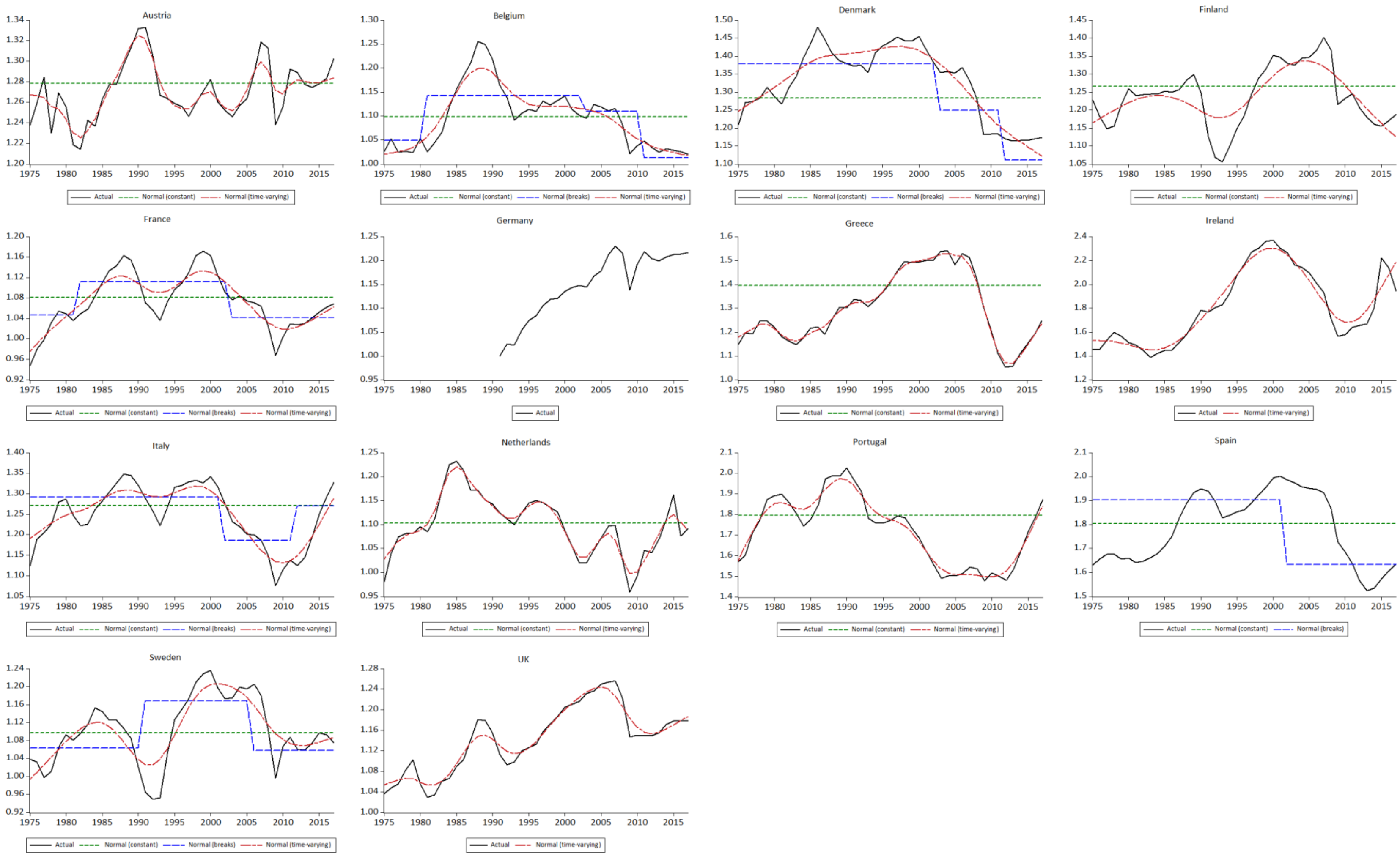
$$U^n{}_t = \alpha U^n{}_{t-1} + \xi_t \quad (16)$$

With α equal, or "very close" to 1[10]. Now, the relationship between capacity accumulation and capacity utilization in equation (4) is equivalent to the relationship between inflation and unemployment in equation (15). Therefore, if we trust equation (4) and we assume that the normal rate is a constant term, we should observe temporary changes in the rate of capacity accumulation together with temporary changes in the actual rate of capacity utilization. If we observe, instead, that a temporary change in the rate of capacity accumulation goes with a permanent change in the rate of capacity utilization, we should conclude that there is hysteresis and that temporary demand shocks may have permanent effects on the *normal* rate of capacity utilization. Since random walk processes and stationary processes with structural breaks are observationally equivalent (Perron, 1989), and stationary processes with structural breaks imply that "temporary shocks may have permanent effects", the *hysteresis hypothesis* (HH) is consistent with both random walks and stationary processes with structural breaks (see also footnote 10).

[10] The concept of *hysteresis* is associated to non-linear models characterized by the property of *remanence*, which implies that temporary shocks have permanent effects (Krasnosel'skii & Pokrovskii, 1989; Mayergoiz, 1991). Nevertheless, since unit-root processes and non-linear models of hysteresis are observationally equivalent (Amable et al, 2004), and linear processes with unit-roots (random walks) also generate permanent effects after temporary shocks, the hypothesis of *hysteresis* can be easily confronted with standard parametric unit-root tests. Distinguishing between unit-root *persistent* processes and non-linear *remanent* processes is nonetheless useful, given the different analytical properties of these processes and their different implication.

Figure 4

Actual and *normal* rates of capacity utilization in EU



Note: the rate of capacity utilization in Bassi (2019) is normalized for the initial value in 1965 ($u_{t=1965} = 1$)

Hence, the econometric analysis that we performed in section 3 allows us to conclude in favor of the HH either if we find significant structural breaks (Belgium, Denmark, France, Italy, Spain and Sweden), or if we find a significant time-varying normal rate which has a unit root. Table 4 shows the results of unit-root and stationarity tests on the normal time-varying trends computed through equation (14) (for each country, we only run the test on the most significant time-varying trend, the one with the larger R^2).

Table 4
Unit-root and stationarity tests on the rate of capacity utilization

	Austria	Belgium	Denmark	Finland	France	Germany	Greece
ADF	S**	NS	NS	NS	NS	/	NS
with break		S***	NS	NS	S*	/	NS
KPSS	S	S	NS*	S	S	/	S
	Ireland	**Italy**	**Netherlands**	**Portugal**	**Spain**	**Sweden**	**UK**
ADF	NS	NS	NS	S***	/	NS	NS
with break	S**	NS	S*		/	S***	NS
KPSS	NS	S	S	NS*	/	S	NS

Legend: S = Stationary; NS = Non-stationary; Note: *** p < 0.01; ** 0.01 < p < 0.05; * 0.05 < p < 0.1

In 10 out of 12 countries, the Augmented Dickey-Fuller (ADF) test fails to reject the null-hypothesis of unit-root, suggesting that the series are likely non-stationary. By accounting for a structural break, the ADF test rejects non-stationarity in 5 countries (Belgium, France, Ireland, Netherlands and Sweden). The Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test rejects the null hypothesis of stationarity in 4 out of 10 countries (Denmark, Ireland, Portugal and United Kingdom), while simultaneously failing to reject stationarity in the other 8 countries. Hence, except in Austria, unit-root's and stationarity tests' conflicting results do not allow discarding the hypothesis of *hysteresis* in the normal rate of utilization, which the empirical evidence of significant structural breaks in some countries further supports.

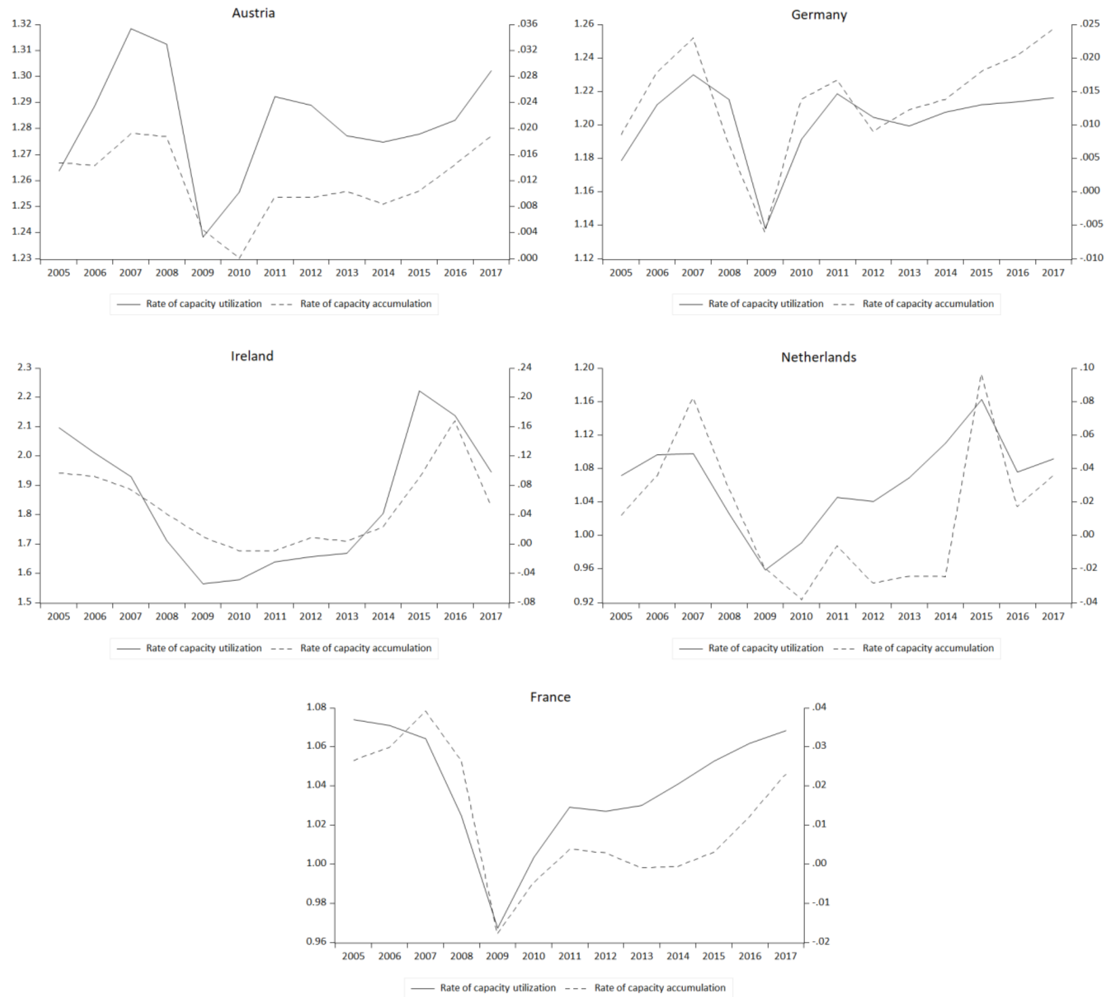
4.2 Changes in the rate of capacity utilization Vs changes in productive capacity

The observed instability of the normal rate of capacity utilization in many EU countries allows us to reject the hypothesis that *temporary* demand shocks can only have *temporary* effects on the rate of capacity utilization, and that the productive capacity absorbs entirely these shocks. For instance, if we concentrate on the last ten years after the 2008' financial crisis, we can observe three different trajectories of the rate of capacity utilization and the rate of capacity accumulation in EU countries. In particular, we are able to identify three different clusters.

4.2.1 Stable utilization of productive capacity and stable growth

The first cluster of countries includes European continental countries, namely Germany, Austria, Netherlands and France, plus Ireland (Figure 5). These countries recorded a temporary fall in the rate of capacity utilization accompanied by a more or less severe destruction of productive capacity, but they eventually recovered the pre-crisis rates of utilization and accumulation. In particular, in Austria and Germany, the shock was extremely short lasting, and the rate of capital accumulation fell without reaching severe negative rates. In France, Ireland and Netherlands, on the other hand, we observe net negative rates of capital accumulation for several periods before slowly converging towards the pre-crisis rate of capacity utilization and capacity accumulation. If we compare with figure 2, we can observe that these countries show indeed a trajectory that is equivalent or very close to the hysteresis scenario described in figure 1, suggesting that although they recorded a permanent shift below their pre-crisis growth path, they already recovered, or are on the way to recovering the pre-crisis growth pace.

Figure 5
Continental countries



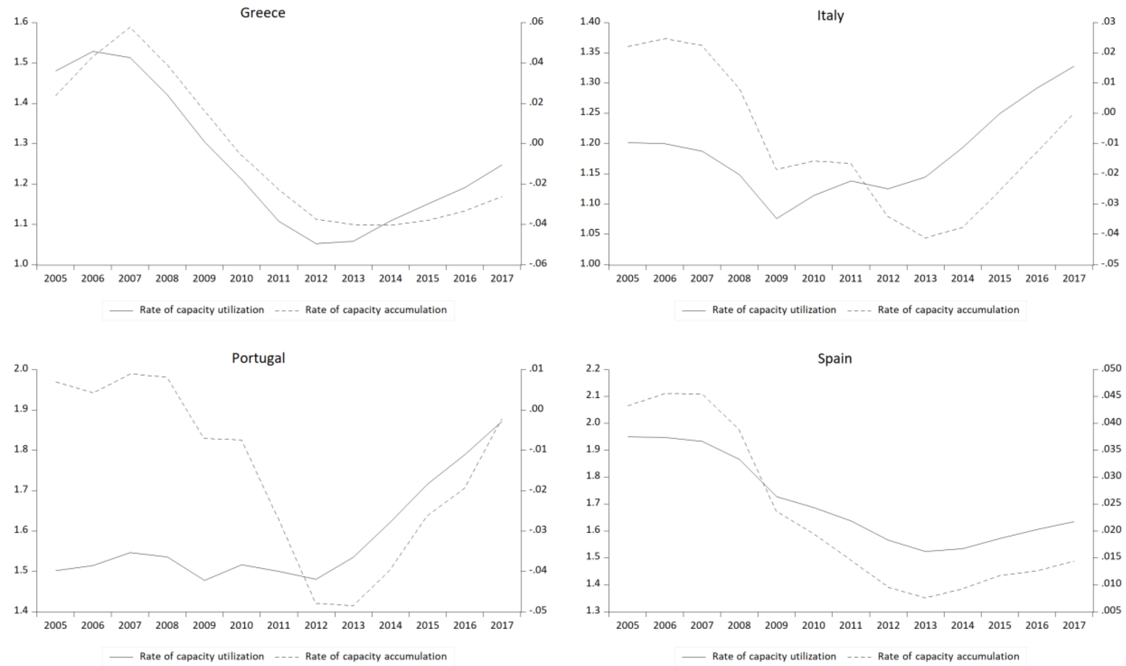
Note: the rate of capacity utilization in Bassi (2019) is normalized for the initial value in 1965 ($u_{t=1965} = 1$). The rate of capacity utilization is on the left scale, while the rate of capacity accumulation is on the right-scale.

4.2.2 Convergence towards full utilization, destruction of productive capacity and zero growth

The second cluster is composed of the Mediterranean countries, namely Greece, Italy, Portugal and Spain (Figure 6). These countries (except Greece) already experienced a substantial fall in the rate of capacity utilization in the early 2000s. Therefore, they were already largely underutilizing productive capacity before the burst of the global financial crisis (see figure 4). When the crisis exploded in 2008, the low rate of capacity utilization could not absorb the shock, leading to a massive destruction of productive capacity, as shown by the negative accumulation rates. Nevertheless, unlike France and Netherlands – which also experienced a process of destruction of idle capacity and also converged to the pre-crisis rates of capacity utilization –, the *Mediterranean* countries did not recover the pre-crisis rates of accumulation, and they are still stuck in a zero or close to zero growth rate. If we compare with figure 2, we can observe that these countries follow trajectories that are consistent with the "super-hysteresis" scenario described in figure 1, suggesting that they recorded permanent damages both in the path and in the pace that they had before the crisis. What we observe, 10 years after the crisis, is an increasing rate of capacity utilization due to a massive destruction of productive capacity and stagnant accumulation rates, revealing an ongoing process of de-industrialization in key sectors of the economy and the seeds for a secular stagnation.

Figure 6

Mediterranean countries



Note: the rate of capacity utilization in Bassi (2019) is normalized for the initial value in 1965 ($u_{t=1965} = 1$). The rate of capacity utilization is on the left scale, while the rate of capacity accumulation is on the right-scale.

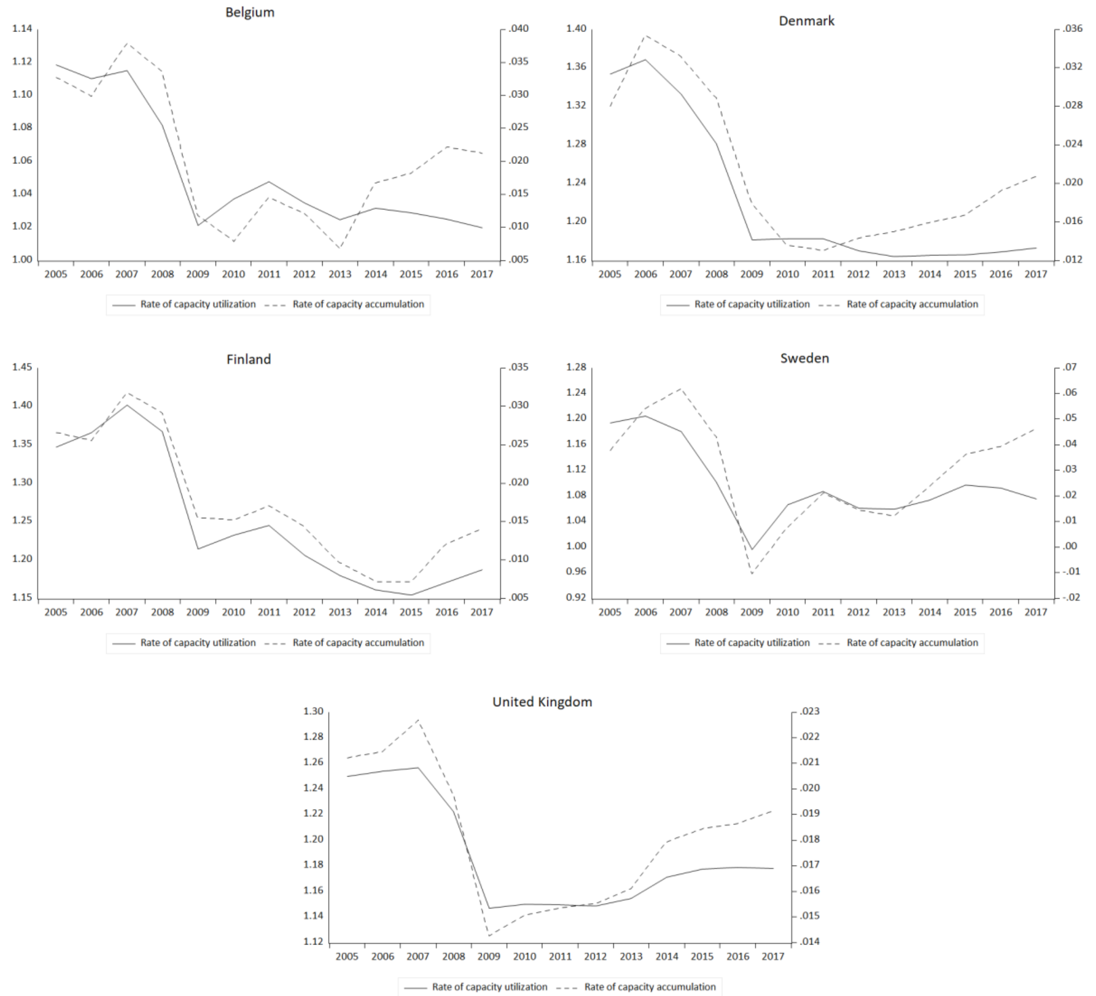
4.2.3 Unstable utilization with stable productive capacity and positive growth

The third cluster of countries is composed of Northern European countries, namely Denmark, Finland, Sweden and UK, plus Belgium (Figure 7). Here, the demand shock triggered by the 2008' financial crisis left permanent traces on the rate of capacity utilization, in line with the hysteresis hypothesis. For instance, both the rate of capacity utilization and the rate of capacity accumulation fell permanently below the pre-crisis rate, without recording permanent damages to the productive capacity in place. Only in Sweden, we can observe a temporary negative rate of accumulation, followed by a sudden and sharp increase in both the rate of utilization and the rate of accumulation, although the former is still below the pre-crisis rate. Hence, in these countries the rate of capacity utilization absorbed entirely the shock, by preventing a permanent destruction of productive capacity yet slowing down its rate of accumulation. If we compare with figure 2, we can observe that these countries follow the "super-hysteresis" trajectories described in figure 1. Nevertheless, unlike Mediterranean countries, they might well return towards the pre-crisis growth pace as they still have unused capacity and positive rates of accumulation.

4.3 Discussion and policy implications

The identification of three different clusters raises some relevant issues in terms of which policies to implement. Continental countries recorded a permanent fall in the level of GDP, although the rate of capacity utilization and the rate of capacity accumulation reverted, or is reverting to the pre-crisis rates. Northern and Mediterranean countries, however, deserve a separate analysis. For instance, although both groups of countries show a permanent fall in both the level and the rate of growth of GDP, and are still stuck in super-hysteresis trajectories, we can clearly distinguish different growth perspectives. Northern countries absorbed the demand shock through a lower rate of capacity utilization and a lower rate of accumulation, without triggering a process of destruction of idle productive capacity. In these countries, expansionary demand policies might thus contribute to foster a sustainable recovery towards higher rates of capacity utilization, so long as an important share of the productive capacity in place is still unutilized and able to accommodate an increased demand.

Figure 7
Northern countries



Note: the rate of capacity utilization in Bassi (2019) is normalized to 1 in 1965 ($u_{t=1965} = 1$). The rate of capacity utilization is on the left scale, while the rate of capacity accumulation is on the right-scale.

In Mediterranean countries, however, the sizeable fall in the rate of capacity utilization could not prevent a massive destruction of productive capacity. Moreover, these countries are still recording negative or stagnant rates of growth despite the increasing rates of capacity utilization. In this context, expansionary fiscal policies might eventually crash through a lack of productive capacity to accommodate the larger aggregate demand, slowing further the recovery. For instance, except for Spain, which is still consistently below the rates of capacity utilization recorded in the early 2000s, in Italy, Portugal and Greece the rate of capacity utilization is more or less rapidly converging towards historical peaks (see figure 4), despite the lower productive capacity and the stagnant rates of accumulation. In order to get out of this *impasse*, industrial policies aiming at recovering the productive capacity destroyed should be preliminary to any sustainable and credible demand expansion. This would likely require massive government's investments in leading sectors aiming at restructuring capacity and stimulating new private investments. Recent attempts by the European Union to avoid governments' intervention by rather stimulating private investments through market and fiscal incentives have proven largely insufficient, as the failure of the Junker Plan and Industry 4.0 reveal (Celi et al, 2018). In addition, the massive implementation of structural reforms, aiming at making flexible labor markets even more flexible, conflicted with the weak industrial policies implemented (Guarascio & Simonazzi, 2016).

What we observe in Europe ten years after the crisis is an ongoing process of polarization, leading to de-industrialization in Southern peripheral countries and technological expansion in core countries.

5. Conclusion

Conventional wisdom suggests that the rate of capacity utilization should fluctuate around a constant *normal* rate. Indeed, in periods of *abnormally* high capacity utilization, firms would accumulate idle capacity, while in periods of *abnormally* low capacity utilization, firms would scrap unutilized capacity, or reduce the rhythm of accumulation below the rate of growth of demand. Hence, there is only one rate of capacity utilization (the normal rate) consistent with a stable capacity accumulation. Although the positive relationship between capacity utilization and capacity accumulation is consensual and largely acknowledged, convergence towards a fixed normal rate is a controversial issue. An alternative hypothesis suggests that investments react only partially to fluctuations in the rate of capacity utilization if these fluctuations take place within a more or less broad *normal corridor*. This implies that the actual rate of capacity utilization can fluctuate more or less persistently without generating a permanent instability in the rate of capital accumulation. Hence, the normal rate is endogenous to the actual rate.

In this paper, we test the hypothesis that the rate of capacity utilization is stable around a fixed normal rate against the alternative hypothesis that the normal rate of capacity utilization is endogenous, by estimating an investment function that relates changes in the rate of capacity accumulation to changes in the rate of capacity utilization. The existence of a fixed and unique normal rate of capacity utilization would translate into a permanent acceleration or deceleration of the rate of capacity accumulation whenever the rate of capacity utilization deviates from a constant and flat trajectory. A direct implication of the existence of a constant normal rate of capacity utilization is that demand shocks are entirely absorbed by changes in the productive capacity rather than by changes in the degree of utilization of the productive capacity in place.

By focusing on 14 EU countries, we show that in most countries the normal rate of capacity utilization is more likely to be an endogenous trend or a shifting attractor rather than a fixed center of gravity. In particular, our results support the hypothesis of hysteresis in the rate of capacity utilization, which implies that temporary demand shocks might have permanent effects on the rate of capacity utilization, without necessarily translating into a permanent rise or fall of productive capacity. This does not imply, however, ruling out the possibility of adjustments through the productive capacity. In particular, by focusing on the decade following the 2008' financial crisis, we are able to identify three clusters of countries according to their reaction to the financial crisis. The first cluster includes those countries that could absorb the demand shock by temporary reducing the rate of capacity utilization without recording permanent effects. The second cluster includes those countries that could not absorb the crisis through a lower rate of capacity utilization and underwent a process of massive destruction of productive capacity. In these countries, ten years after the crisis, the rate of capacity utilization is converging towards historical peaks despite negative, or close to zero rates of accumulation. The third cluster includes those countries that could absorb the demand crisis through lower rates of capacity utilization without recovering the pre-crisis rates. These countries are still stuck in lower rates of capacity utilization and lower (although still positive) rates of capacity accumulation with respect to the years before the crisis.

The policy implications are thus different for all these countries. While the third cluster of countries needs expansionary demand policies to recover high rates of capacity utilization, the second cluster of countries will hardly recover positive rates of growth without massive industrial policies and public investments in key sectors.

References

Allain O. (2012) Growth, income distribution and autonomous public expenditures, *European Journal of Economic and Social Systems*, Vol. 25, No.1-2, p. 59-72

Amable B., Henry J., Lordon F., Topol R. (2004) Complex Remanence vs. Simple Persistence: Are Hysteresis and Unit Root Processes observationally equivalent?, in Barnett W.A., Deissenberger C., Feichtinger G. (eds) Economic Complexity (International Symposia in Economic Theory and Econometrics, Vol. 14), Emerald Group Publishing Limited, pp. 67-89

Amadeo E.J. (1986) The Role of Capacity Utilization in Long Period Analysis, *Political Economy*, Vol.2, No.2, pp. 147-160

Arkes H.R., Blumer C., (1985) The Psychology of Sunk Cost, *Organizational Behaviour and Human Decision Processes*, Vol. 35, No. 1, pp 124-140

Auerbach P., Skott P. (1988) Concentration, Competition and Distribution, International Review of Applied Economics, Vol. 2, No. 1, pp. 42-61

Bai J., Perron P. (1998) Estimating and Testing Linear Models With Multiple Structural Changes, *Econometrica*, Econometric Society, Vol. 66, No. 1, pp 47-78

Ball L. (1999) Aggregate Demand and Long-Run Unemployment, *Brooking Papers on Economic Activity*, No. 2, pp. 189-251

Ball L. (2009) Hysteresis in Unemployment: Old and New Evidence, NBER Working Paper, No. 14818

Ball L. (2014) Long Term Damage from the Great Recession in OECD Countries, *European Journal of Economics and Economic Policies: intervention*, Vol. 11, No 2, pp 149 -160

Bassi F. (2019) Capacity Utilization and the NAIRCU. Evidences of Hysteresis in EU Countries, CEPN Working Paper, No. 9, pp. 1-32

Blanchard O., Summers L. H. (1986) Hysteresis and the European Unemployment Problem, *NBER Macroeconomics Annual*, Vol. 1, pp.15-89

Brierley J.A., Cowton C.J., Drury C. (2006) Reasons for Adopting Different Capacity Levels in the Denominator of Overhead Rates: A Research Note, *Journal of Applied Management Accounting Research*, Vol. 4, No 2, pp. 53-62

Cassetti M. (2006) A Note on the Long-Run Behaviour of Kaleckian Models, *Review of Political Economy*, Vol. 18, No. 4, pp. 497-508

Celi G., Ginzburg A., Guarascio D., Simonazzi A. (2018) *Crisis in the European Monetary Union. A Core-Periphery Perspective*, Oxford, UK: Routledge

Cerra V., Saxena S.C. (2008) Growth Dynamics: The Myth of Economic Recovery, *American Economic Review*, Vol. 98, No. 1, pp. 439-457

Clarida R., Gali J., Gertler. M. (1999) The Science of Monetary Policy: A New Keynesian Perspective, *Journal of Economic Literature*, Vol. 37, No. 4, pp 1661-1707

Committeri M. (1986) Some Comments on Recent Contributions on Capital Accumulation, Income Distribution and Capacity Utilization, *Political Economy*, Vol. 2, No. 2, pp. 161-186

Cross R., McNamara H.,Pokrovskii A. (2012) Memory of recessions, Journal of Post Keynesian Economics, Vol. 34, No. 3, pp 413-430

Crotty J. (2002) Why There is Chronic Excess Capacity, *Challenge*, Vol. 45, No. 6, pp 21-44

Dixit A. (1989) Entry and Exit Decisions Under Uncertainty, *The Journal of Political Economy*, Vol. 97, No. 3, pp. 620-638

Dixit A. (1992) Investment and Hysteresis, *Journal of Economic Perspectives*, Vol. 6, No. 1, pp. 107-132

Domar E.D. (1946) Capital Expansion, Rate of Growth, and Employment, *Econometrica*, Vol. 14, No 2, pp. 137-147

Duménil G., Lévy D. (1999) Being Keynesian in the Short Term and Classical in the Long Term. The Traverse to Classical Long-Term Equilibrium, *Manchester School*, Vol. 67, No.3, pp. 684-716

Dutt A.K. (1984) Stagnation, Income Distribution and Monopoly Power, *Cambridge Journal of Economics*, Vol. 8, No. 1, pp. 25-40

Dutt A.K. (1990) *Growth, Distribution and Uneven Development*, Cambridge University Press

Dutt A.K. (2010). Equilibrium, Stability and Path Dependence in Post Keynesian Models of Economic Growth, In Birolo A., Foley D., Kurz H.D., Schefold B. and Steedman I. (Eds), Production, Distribution and Trade: Alternative Perspectives. Essays in Honour of Sergio Parrinello. London: Routledge.

Eichner A.S. (1976) *The Megacorp and Oligopoly: Micro Foundations of Macro Dynamics*, Cambridge: Cambridge University Press.

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*, Vol. 27, No. 3, pp. 258-281

Garland H. (1990) Throwing Good Money After Bad: The Effect of Sunk Costs on the Decision to Escalate Commitment to an Ongoing Project, *Journal of Applied Psychology*, Vol. 75, No. 6, pp 728-731

Girardi D., Pariboni R. (2019) Normal Utilization as the Adjusting Variable in Neo-Kaleckian Growth Models: A Critique, *Metroeconomica*, Vol. 70, No. 2, pp. 341-358

Guarascio D., Simonazzi A. (2016) A polarized country in a polarized Europe: an industrial policy for Italy's renaissance, *Economia e Politica Industriale: Journal of Industrial and Business Economics*, Vol. 43, No. 3, pp. 315-322

Havik K., Mc Morrow K., Orlandi F., Planas C., Raciborski R. Roger W., Rossi A., Thum-Thysen A., Vandermeulen V. (2014) The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps, ECFIN Economic Papers N.535

Hein E., Lavoie M., Van Treeck T. (2012) Harrodian Instability and the `Normal Rate' of Capacity Utilization in Kaleckian Models of Distribution and Growth- A Survey. Metroeconomica, Vol. 63, No. 1, pp. 139-169

Jensen M.C. (1993) The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems, *The Journal of Finance*, Vol. 48, No 3, pp. 831-880

Krasnosel'skii M.A., Pokrovskii A.W. (1989) *Systems with Hysteresis*, Berlin: Springer Verlag

Kurz H. (1986) 'Normal' Positions and Capital Utilisation, *Political Economy: Studies in the Surplus Approach*, Vol. 2, No. 1, pp. 37-54

Lavoie M. (1996) Traverse, Hysteresis, and Normal Rates of Capacity Utilization in Kaleckian Models of Growth and Distribution, *Review of Radical Political Economics*, Vol. 28, No 4, pp. 113-147

Lavoie M. (2014) *Post-Keynesian Economics: New Foundations*, Edward Elgar (Eds), Cheltenham: UK

Mayergoiz I.D. (1991) *Mathematical Models of Hysteresis,* Berlin: Springer Verlag

Nikiforos M. (2016) On the 'Utilisation Controversy': A Theoretical and Empirical Discussion of the Kaleckian Model of Growth and Distribution, *Cambridge Journal of Economics*, Vol. 40, No. 2, pp. 437-467

Perron P. (1989) The Great Crash, The Oil Price Shock, and the Unit Root Hypothesis, *Econometrica*, Vol. 57, No. 6, pp. 355-85

Schoenberger E. (1994) Corporate Strategy and Corporate Strateists: Power, Identity and Knowledge Within the Firm, *Environment and Planning*, Vol. 26, No 3, pp. 435-451

Serrano F. (1995) Long Period Effective Demand and the Sraffian Supermultiplier, *Contributions to Political Economy*, Vol. 14, pp. 67-90

Setterfield M., Avritzer D.J. (2019) Hysteresis in the Normal Rate of Capacity Utilization: a Behavioural Explanation, NSSR Working Paper, No 7, pp. 1-33

Setterfield M. (2019) Long-Run Variation in Capacity Utilization in the Presence of a Fixed Normal Rate, *Cambridge Journal of Economics*, Vol. 43, No. 2, pp. 443-463

Shaikh A. (2009) Economic Policy in a Growth Context. A Classical Synthesis of Keynes and Harrod, *Metroeconomica*, Vol. 60, No. 3, pp. 455-494

Shapiro M.D. (1989) Assessing the Federal Reserve's Measures of Capacity and Utilization, *Brookings Papers on Economic Activity*, No 1, pp. 181-241

Skott P. (2012) Theoretical and Empirical Shortcomings of a Kaleckian Investment Function, *Metroeconomica*, Vol. 63, No.1, pp.109-138.

Summers L.H. (2014) U.S. Economic Prospects: Secular Stagnation, Hysteresis and the Zero Lower Bound, *Business Economics*, Vol. 49, No 2, pp. 65-73

Taylor J.B. (1993) Discretion Versus Policy Rule in Practices, Carnegie-Rochester Series on Public Policy, Vol. 39, No. 1, pp 195-214