Institute for Innovation and Public Purpose

Putting Austerity to Bed:

Technical progress, aggregate demand and the supermultiplier

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Putting Austerity to Bed:
Technical progress, aggregate demand and the supermultiplier

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Abstract
This paper investigates the determinants of private investment and economic growth from a theoretical perspective. We start with a critical analysis of the crowding-out effect and we present a new version of the Sraffian Supermultiplier, i.e. a model that accounts for both the multiplier and accelerator effects. We show that aggregate demand influences output in both the short and long-run, so that expansionary fiscal policies generate positive effects on economic growth. Furthermore, as business investments in the model are induced by (and dependent on) effective demand and technical progress, any permanent increase in public investment generates a positive effect on the accumulation of capital. We focus on different types of fiscal policies: generic ones (e.g. on bridges and roads) and "mission-oriented" ones that set a new direction for the economy (e.g. the ICT direction in the US during the 80s and 90s, or the German Energiewende direction in the 2000s). We show that mission-oriented innovation policies have the potential to generate the largest supermultiplier and the highest expectations of future growth opportunities by business – thus, generating the largest effect on investments and long-run output. Moreover, such policies – by facilitating the development and the diffusion of innovations in the economic system – generate positive effects on other components of aggregate demand, such as consumption and net exports.

Keywords: Sraffian Supermultiplier, mission-oriented policy, austerity, Keynes

JEL codes: E12; E60; O30

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1. Introduction

After the 2007 financial crisis and the ensuing sovereign debt crisis across Europe, EU policy was steered by austerity measures, especially in the peripheral Eurozone countries (Italy, Greece, Spain, and Portugal). Austerity, defined mainly as a reduction in government spending to stimulate private investment through reductions in the interest rate, is based on the notion that the government is like a household, that during bad times it should tighten its belt. Post-crisis austerity policies were also accompanied by labour market policies focused on increasing competitiveness through a reduction in unit costs. While the assumption was that, besides restoring economic growth and competitiveness, austerity policies would also mitigate financial market speculation and decrease sovereign debt bond spreads, the reality soon became clear: growth did not return, financial markets remained vulnerable, spreads depend on the latest news, and labour market policies fuel inequality without resulting in higher investment.

Indeed, over the last two years, there has even been a change of heart in the International Monetary Fund (IMF), which has historically been one of the greatest proponents of austerity and wage cuts, or what some have called neoliberalism. In a paper called "*Neoliberalism: oversold*?" (Ostry et al., 2016), the IMF questioned the foundations of austerity, showing how it has led to weak growth and rising inequality. Indeed, the chief economist of the IMF, Olivier Blanchard, claimed that austerity had failed because the fiscal multiplier was higher than economists assumed (Blanchard and Leigh, 2013). Low interest rates have led many to argue that governments should be spending on areas like infrastructure to bring growth back, rather than continued spending cuts (IMF, 2014).

But why has this eureka moment not led to a fundamental shift in policies? In this paper, we argue that while different economists and the media, have questioned austerity, its theoretical pillars remain alive and well. If austerity is to be retired, we must debunk these pillars. We embark on this through focusing on the variables affecting the dynamics of business investment. While traditional austerity theory assumes that business investment is sensitive to the interest rate, which changes according to government spending, we focus on its exogenous determination by the monetary authorities. Investment is strongly affected instead by expectations of future growth opportunities, which are positively related to expansionary fiscal policies. Furthermore, we argue that, rather than positing austerity versus generic public investment, it is essential to understand different types of fiscal policy: tax incentives, government spending, government investment, etc.

The paper is divided as follows. Section 2 provides the theoretical basis for austerity, from both a *Neoclassical* perspective, where public spending is seen problematically throughout the business cycle, and a *New-Keynesian* perspective, where it is viewed as necessary only in the downturn under conditions of "sticky prices" and market rigidities. Section 3 critiques austerity from a *Classical-Keynesian* and a *Post-Keynesian* perspective, where investment is driven by aggregate demand (not by the interest rate), and where the interest rate is set exogenously by the monetary authority. Section 4 presents an alternative, positive view on

the recipes needed for growth. This addresses the notion of a supermultiplier, looking at the effects of autonomous components of aggregate demand on private investment and GDP growth. Section 5 complements this perspective by looking at the effect different types of fiscal policies – such as innovation policies, and mission-oriented policies in particular – on business expectations, investment, and cross-sector synergies, requiring a more directional push than a simple infrastructure panacea. Section 6 concludes by discussing the implications of the results for future policies.

2. The theoretical basis of austerity

Economic growth fostered by a cut in public expenditure through a reduction of the interest rate and in unit labour costs is referred to as expansionary austerity (henceforth, EA) (Giavazzi and Pagano, 1990). EA is also described as a non-Keynesian effect of a fiscal adjustment (Giavazzi and Pagano, 1996; Alesina et al., 2002). In fact, according to the EA narrative, the government spending multiplier will assume values equal to zero or even negative (Giavazzi and Pagano, 1996; Alesina and Ardagna, 2010; Perotti, 2012). To put it simply, a one-euro increase in public expenditure is supposed to be inconsequential or even recessive on total output. In case of a negative multiplier, the EA narrative assumes that public expenditure destroys value since the one-euro increase is more than offset by a reduction of other aggregate demand components.

2.1 Expansionary austerity

The EA measures are supposed to affect output through investment, consumption, and net exports. We focus on the determination of investment, disregarding the effects of fiscal policy on consumption patterns and external competitiveness.[3]

According to EA supporters, an increase in public expenditure increases the interest rate and then crowds out private investment (Giavazzi and Pagano, 1990; Bertola and Drazen, 1993; Alesina et al., 2002). Conversely, a reduction of public spending is assumed to stimulate business investment by means of a decrease in the interest rate and a substitution mechanism that occurs between private investment and public expenditure. The endogenous decrease of the interest rate should, according to this perspective, increase profitability by allowing entrepreneurs to increase investment and the amount of capital goods employed in production. By directly reducing (permanently) government spending rather than increasing taxes, this is supposed to stimulate growth more rapidly and extensively.

A permanent government spending cut is supposed to affect agents' expectations, thus causing a fall in the expected interest rate (Alesina and Perotti, 1997; Alesina and Ardagna, 2010). In particular, a credible decrease of public expenditure should lead to a stabilization or even a reduction of the debt-to-gross domestic product (GDP) ratio, making a future default

[3] For EA literature review on the consumption effect of an expansionary fiscal policy, see, among others, Alesina and Ardagna, 2010; Perotti, 2012. On the issue related to the external competitiveness, see, among others, Alesina and Perotti, 1997; Ardagna, 2004; Alesina and Ardagna, 2010; Perotti, 2012.

on government debt less likely. This would reduce the risk premium requested by economic agents, which, in turn, would reduce the long-term interest rate and increase the corresponding asset price (Ardagna, 2004). Subsequently, both the wealth effect generated by the rise in asset prices of government bonds and the corresponding fall in the interest rate should trigger an investment boom (Alesina and Ardagna, 2010).

According to EA supporters, the interest rate is a real phenomenon that equates investment with the full-employment savings both in the short- and long-term. The flexibility of the interest rate combined with a downward investment demand curve allows an economy to reach a full-employment equilibrium. Especially in cases of unemployment of the factors of production, a full-employment equilibrium is achieved by means of an endogenous decrease of real interest rate and real wage, determined by the well-known principle of scarcity and subsequently by the neoclassical market clearing mechanism. In other words, distribution changes are necessary to the EA theory to ensure the return to full employment.

2.2 The New Keynesian view

New Keynesian (henceforth, NK) economists maintain a different short-run perspective concerning the role played by fiscal policy. According to the NK view, the government is supposed to intervene in the market in order to reduce frictions hampering the achievement of natural full employment equilibrium. In this theory, sticky prices and wages (Romer, 2000; Benigno, 2015), imperfection and asymmetric information (Snowdon and Vane, 2005), market failures (Stiglitz, 1989), a monetary policy constrained by a zero lower bound (Eggertsson, 2011; Summers, 2014, 2015), and the liquidity trap (Krugman, 1998; Benigno, 2015) are the main obstacles to equilibrium.

These issues justify government intervention since these barriers are supposed to create a Keynesian problem of insufficient aggregate demand by not allowing the economic system to be in full-employment equilibrium. Thus, the implementation of expansionary fiscal and monetary policies increases output and employment in the short run through their effects on aggregate demand.[4] Subsequently, in contrast also with the EA theory, fiscal stimulus influences the level of output by having a large multiplier effect. However, when these frictions are solved, the neoclassical market-clearing mechanism, which is fully compatible with the EA view, leads to a natural full-employment equilibrium both in the capital and labour markets (Galí, 2015). In particular, assuming the standard downward-sloping investment and labour demand curve, a decrease in real interest rates and wages leads investment and labour demand to adapt to full-employment savings and labour supply respectively[5]. As a consequence, the role played by the aggregate demand and then by expansionary fiscal

[4] In the case of a negative natural interest rate under a zero lower bound condition or a liquidity trap situation, NK authors recognize that monetary policy is ineffective to stimulate aggregate demand since the interest rate cannot sufficiently decrease and any increase in the money supply does not affect the level of the rate of interest (Benigno, 2015).

[5] In the long-run, the path to reach a full-employment equilibrium is unhindered by rigidities, frictions, imperfect information, and lack of confidence of economic agents.

policies seems to be relegated to a short-run analysis or to a study of the economic cycles, recessions, and depressions (Tobin, 1975) by leaving the long-run output determination and the economic growth regulated by price flexibility and supply-side forces, as truly supposed by the neoclassical view (Woodford, 2003).[6]

NK authors, by having a vertical long-run aggregate supply curve, argue that neither fiscal nor monetary policies affect the output and employment in the long run, but only influence the price level. Thus, in the long run, money becomes neutral and expansionary fiscal policies fully crowd out private investment by increasing the real interest rate. In particular, the central bank reacts to fiscal policy and to demand shocks by raising the real interest rate (Taylor, 1999), which, by crowding out investment and consumption, leads to the same long-run natural equilibrium characterized by a higher inflation rate (Snowdon and Vane, 2005). Furthermore, NK, by reviving the Wicksellian theory (Woodford, 2003), maintains that monetary policy, in order not to engender inflation pressure, has to adjust the money/market interest rate set by the central bank to the natural interest rate, that is, the rate that pegs investment to full-employment savings. In the long run, the natural interest rate becomes a centre of gravitation toward which the money rate has to converge in order not to engender any cumulative pressure on prices (Woodford, 2003; Galí, 2015).

The idea of expansionary policy measures relevant in the short, but not the long run, allows NK economists to reconcile with the pure neoclassical view. Assuming that the Keynesian view is valid in short run means that, in the long run, aggregate demand stimulus does not affect output, but prices and full-employment savings determine the investment level.

2.3 The economic theory behind the policy institutions: recent developments

The NK perspective also seems endorsed by the IMF, which has criticized the EA narrative. Episodes of fiscal consolidation have led to falls in output rather than expansions, as well as increases in the unemployment rate, both in the short and long run. Moreover, restrictive fiscal policies have caused welfare costs, rises of inequalities by decreasing real wages and increasing debt-to-GDP ratio (Leigh et al., 2010; Ball et al., 2013; Ostry et al., 2016).

[6] A recent stream of literature in macroeconomics, by rehabilitating the concept of “Secular Stagnation” (Summers, 2014, 2015), affirms that protracted and prolonged falls in output can influence also the potential output (Fatás and Summers, 2016). In particular, cyclical conditions – for instance, a fall of aggregate demand – lead to permanent effects on both aggregate supply and potential output by means of a mechanism that is typically termed «hysteresis» (Yellen, 2016). Although the Secular Stagnation hypothesis shows that effective demand does affect the speed of accumulation and potential output (Fatás and Summers, 2016; Yellen, 2016), the positive role played by expansionary fiscal policies is relegated to particular economic phases. Such periods are characterised by a negative natural rate of interest and by the inability of monetary policy to target a money rate compatible with the natural interest rate or, more generally, during recessions and depressions (Tobin, 1975), when the profitability of investment is too low. However, the theoretical framework on which the Secular Stagnation hypothesis is based is fully compatible both with the long-run NK view as well as with the EA view. The similarities become clear when the natural rate of interest is in positive territory. The presence of a downward sloping IS curve (Summers, 2015) and a money rate of interest set through the Taylor rule, make expansionary fiscal policies leading to: a rise in the inflation rate, an automatic increase in the rate of interest set by the central bank, and eventually to a crowding-out effect.

According to IMF economists, EA policies have led to a fall in real GDP in the short term and increased unemployment (Leigh et al., 2010 and Guajardo el al., 2011). More specifically, Leigh et al. (2010) have found that cutting the public budget by 1 percent of GDP lowers aggregate demand by 1 percent and increases the unemployment rate by three-tenths of a percentage point. Guajardo et al. (2011), by making use of the total budgetary impact of changes in taxes and spending, have shown in their baseline model that a 1 percent of GDP fiscal consolidation decreases consumption by 0.75 percent, private investment by 1.48 percent, and real GDP by 0.62 percent. Moreover, they also found that a fiscal consolidation has a recessive impact even when countries experienced a high debt-to-GDP ratio.

A further critique of EA was carried out by estimations of the fiscal multiplier size. In a more recent empirical study, Blanchard and Leigh (2013) showed that the fiscal multipliers estimated in the forecast were lower than the actual ones. In particular, forecasters assumed that fiscal multipliers were about 0.5. Through their estimations, based on panel data for 26 European countries, Blanchard and Leigh suggested that during the economic crisis the multiplier assumes a positive value equal to 1.5, meaning that a one-euro public expenditure decrease leads to a fall in real GDP of EUR 1.5. In other words, Blanchard and Leigh's findings suggested that a fiscal consolidation generates a Keynesian effect, thus causing an economic recession rather than an expansion.[7]

Even though IMF economists support the positive Keynesian effects of an expansionary fiscal stimulus in the short run,[8] they simultaneously maintain that a fiscal consolidation is beneficial in the long run since this reduces public debt and subsequently generates a reduction of the interest rate and a cut of distortionary taxes (Leigh et al., 2010). As with the NK authors, IMF economists support the idea that a long-run increase in aggregate demand leads to a rise in prices without engendering any changes in output and employment. Hence, the monetary policy is supposed to raise the interest rate (Taylor, 1999), which, in turn, crowds out private investment.

In a nutshell, the IMF view and the NK perspective can be summarized as follows: in the short run, changes in the level of output pegs savings to investment. By contrast, in the long run, when price flexibility is restored, changes in the real interest rate allow investment to adjust at full-employment savings, making fiscal policies ineffective in terms of output growth.

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[7] In addition to these above-mentioned studies, several papers have provided empirical results concerning both the inconsistency and weakness of EA measures and the alleged positive effect of a cut in public spending in terms of GDP growth and reduction in the debt-to-GDP ratio and unemployment rate; see, among others, Auerbach and Gorodnichenko (2012), Fatás and Summers (2016), Girardi and Pariboni (2016), and Jordà and Taylor (2016). From a theoretical standpoint, EA was criticized by several works; see, among others, Boyer (2012), Kelton (2015), and Paternesi Meloni (2016).

[8] Within this stream of thought, a lively debate concerning the size of fiscal multipliers exists. Leigh et al. (2010) and Guajardo el al. (2011) have shown that although a fiscal consolidation has a negative effect on output, a spending-based adjustment is less recessive than a tax-based consolidation. Implicitly, they are maintaining that the tax multiplier is larger than the spending multiplier, considered in absolute value. On this issue, an empirical and theoretical literature provide an opposite view: the spending multiplier is larger than the tax multiplier. This second view, restoring the properly Keynesian view, can be found in several recent works (see, among others, Leeper et al., 2010; Eggertsson, 2011). Moreover, Auerbach and Gorodnichenko (2012), disaggregating government spending, showed that military spending has the largest multiplier and public investments generate a greater multiplier than public consumptions.

3. The crowding-out effect: a theoretical inconsistency

According to the NK view, as well as EA propositions, in the long run an increase in public spending leads to an upward pressure on prices and on the real interest rate that, in turn, crowds out private investment (Taylor, 1999; Romer, 2000).[9] The two main theoretical pillars through which the NK view can justify the crowding-out mechanism are (i) an endogenous interest rate set by the central bank positively related to the public spending (Clarida et al., 1999; Taylor, 1999 and Woodford, 2003), and (ii) a downward-sloping investment demand curve incorporated in the aggregate demand curve (Romer, 2000; Snowdon and Vane, 2005).

In order to criticize these views, we discuss the crowding-out effect's theoretical underpinning, providing a background through which the principle of effective demand can be extended to a long-run analysis. To do so, we base our reasoning both on a monetary and a real analysis.

3.1 A first critique: a monetary analysis

The NK view seems to accept some of the fundamental insights provided by the post-Keynesian (henceforth, PK) endogenous money theory (Moore, 1988; Fontana and Setterfield, 2010; Lavoie, 1996, 2014; Wray and Nersisyan, 2016; Deleidi and Mazzucato, 2017), but relevant distinctions still exist.

According to the PK perspective, the money supply is driven by borrowers' demand for loans, with monetary reserves being a residual of this process. The interest rate is not a market phenomenon, that is, dependent on the supply of and demand for money, but an exogenous policy variable set by the central bank (Eichner, 1987; Moore, 1988; Lavoie, 1996) that affects a set of real interest rates both in the short and long run, as with those applied by commercial banks on loans and even those determined on securities (McLeay et al., 2014).

This understanding is distinct from NK perspective in the following ways:

1. The NK perspective considers money endogeneity as an historical accident caused by central bank decisions. By contrast, PK authors believe that endogenous money is an intrinsic peculiarity of the capitalist economy (Kaldor, 1989; Fontana and Setterfield, 2010; Deleidi, 2016).
2. Although in the NK theory the interest rate is set by the central bank, it cannot be properly regarded as an exogenous variable independent from the supply of and demand for monetary reserves. According to the NK view, the central bank is

[9] The rise of the real interest rate occurs by means of a growth of the nominal interest greater than the inflation rate (Taylor, 1999).

supposed to target the interest rate by manipulating the monetary reserve (Romer, 2000). In these terms, the supply of money appears determined by the central bank and simultaneously the interest rate could be treated as an endogenous variable determined by the supply of and the demand for money. This contradicts the PK view according to which the interest rate is not a market phenomenon and the central bank is able to set the interest rate without needing any predetermined changes in the monetary reserves (Moore, 1988).

3. Furthermore, in the NK view, the money interest rate has to converge toward its natural value since it is considered as a centre of gravitation that attracts the market rate. Any deviation between the two rates engenders a cumulative inflation process.[10] In light of this, the money rate appears in the long run as an endogenous variable dependent on the natural interest rate determined by the savings and investment market. This idea is fully refused by the supporters of the PK endogenous money theory since they maintain that the central bank can control the real interest rate in both the short and long run (Moore, 1988; Lavoie, 1996, 2014). Therefore, the interest rate is considered as a distributional variable determined by the central bank (Eichner, 1987), rather than in the savings investment market.[11]

An initial critique of the crowding-out mechanism could be summarized as follows: endorsing the PK view, there is no automatic mechanism according to which an increase in public spending, and then in aggregate demand, leads to an automatic rise in the interest rate.

3.2 A second critique: a real analysis and the Classical-Keynesian approach

A further critique to the NK view has to be grounded on the real analysis and based on elements ascribable to the notion of a natural interest rate and a decreasing investment demand curve. These theoretical assumptions have allowed incorporating the pure standard neoclassical view into the long-run NK view, thus relegating to a short-run analysis the novel argument of the Keynesian revolution, namely the idea of investment capable of creating an equal volume of savings by means of changes in the output level (Garegnani, 1979).

A decreasing investment demand curve can be justified by means of the neoclassical concept of marginal productivity of capital and therefore grounded on the direct substitution mechanism between the factors of production, namely labour and capital (Garegnani, 1979). According to neoclassical theory, a fall in the interest rate should lead firms to shift toward capital-intensive methods of production. The preservation of the direct substitution mechanism would ensure the return to the neoclassical theory in which the interest rate is seen as an instrument capable of generating an investment level compatible with full

[10] The cumulative process of inflation is a way to show that NK authors, in the long run, believe in the old-fashioned principle of the neutrality of money. This concept is fully rejected by the PK theory since money affects the output level both in the short and long run without engendering any influence on the level of prices (Fontana and Setterfield, 2010)

[11] The exogeneity of the rate of interest is also supported by Sraffian scholars who make claims for a central bank able to control the distribution by setting the real interest rate through changes in the money rate (Pivetti, 1990; Stirati, 2001).

employment (Garegnani, 1979).[12] Moreover, the existence of this automatic adjustment would limit the principle of effective demand to a short-run analysis or to the study of economic cycles. In addition, in the long term, when prices are flexible and the psychological and subjective factors weaken compared to objective elements, the interest rate is considered sufficient to restore full employment and to allow investment to adjust to savings. Such a tendency can only draw on a theory in which the demand for investment is elastic with respect to the interest rate (Garegnani, 2015).

Consequently, if we want to extend the role played by aggregate demand in determining output also in the long run, we have to criticize the substitution mechanism on which the long-run NK models are based. In particular, we have to untie the link between interest rates on the one hand and the level of investment and the process of accumulation on the other. In this regard, the "Capital Controversy" provides the theoretical background to refute the existence of a decreasing marginal productivity of capital, a demand for investment elastic with respect to the interest rate, and a natural interest rate that equates investment to full-employment savings. According to Sraffa (1960) and Garegnani (1970), when we assume several production techniques and heterogeneous capital goods, the re-switching of techniques undermines the neoclassical assumption based on the direct substitution mechanism. To be clear, different interest rate levels can allow producers to use the same method of production and therefore the same factor intensity (Garegnani, 1970). Subsequently, we cannot sketch a downward-sloping investment demand schedule summarizing a general negative relationship between the interest rate and the level of investment since no automatic mechanism ensures that firms adopt a more capital-intensive production technique when the interest rate decreases. As a consequence, the crowding-out mechanism is no longer feasible. Although the central bank might increase the interest rate as a reaction to an expansionary fiscal policy, a decrease in investment would not occur, given the non-existence of a downward-sloping investment demand curve.

The "Capital Controversy" represents the cornerstone through which the Classical-Keynesian approach (henceforth, CK) has extended the principle of effective demand to a long-run analysis. In particular, the CK framework, by refusing the traditional theory of distribution,[13] a

[12] The idea of a decreasing investment demand could be found also in the *General Theory* (Keynes, 1936) with the theoretical concept of a decreasing marginal efficiency of capital. In particular, according to Keynes "the inducement to invest depends partly on the investment demand-schedule and partly on the rate of interest" (p. 136). Keynes' notion of a decreasing marginal efficiency of capital curve has facilitated the rehabilitation of the neoclassical theory for a long-run analysis. Although Keynes criticized the neoclassical theory of the rate of interest by means of the liquidity preference theory, he was unable to explain similarly the determinants of the long-term or normal interest rate, thus endorsing the traditional theory of distribution. Subsequently, "the price which Keynes has to pay for the traditional strand in his thought becomes clear with respect to the schedule of the marginal efficiency of capital. […] Admitting an elastic investment demand schedule leads to maintaining, on the one hand, the existence of a full-employment level of the rate of interest and, on the other, the presence of inflation, or deflation and unemployment, when the actual rate of interest is not the full employment one; the idea that the market rate of interest tends to gravitate towards its full employment level then acquires plausibility" (Garegnani, 1979, p. 77–79).

[13] In the CK framework, the distribution of income and the trend growth rate are discussed and analysed in two different logical stages since a general relationship between the rate of output growth and the distribution of income cannot be assumed. Consequently, extending the long-term role played by aggregate demand does not

downward investment demand schedule, and the neoclassical substitution mechanism, affirms that the investment is independent of savings both in the short and long run. On the contrary, investment determines savings through changes in the output level both in the short and the long run.[14] The CK is "essentially based on the recognition of the elasticity with which output responds, in the long no less than in the short period, to changes in aggregate demand. Such elasticity, which is at the core of Keynes's contribution, in the short period is related to the varying utilization of installed capacity, while in the long period is further increased by the possibility of creating new resources, or destroying the existing ones, at different possible speeds." (Trezzini and Palumbo, 2016, p. 504).

Within the CK approach, some authors have developed the Sraffian Supermultiplier model (henceforth, SSM) to describe the long-term relationship between the level of demand and the level of output. In particular, this model, proposed by Serrano (1995) and then developed also by Bortis (1997), Cesaratto et al. (2003) and Freitas and Serrano (2015)[15], shows the existing positive relationship between the autonomous components of aggregate demand and the level of output, combined with a function in which investment is endogenously determined by the level of actual and expected demand.[16]

In the next section, we present a new SSM development, in particular, the role played by monetary policy, different social classes, and alternative fiscal policies, such as taxes, transfers, and different types of government spending. Furthermore, we will show that the interest rate does not directly affect the investment level, but the monetary policy can have a certain degree of influence on other macroeconomic variables, such as consumptions and net export.

4. The Sraffian Supermultiplier and the endogenous money theory

Initially, we need to classify the components of aggregate demand, distinguishing between (i) autonomous and induced, and (ii) capacity- or non-capacity-creating. Figure 1 shows this classification where government spending, net export, total consumption, and business expenditures are non-capacity-creating, and only gross investment is able to create productive capacity. We consider public expenditure, exports, autonomous consumption, and autonomous business expenditures as exogenous variables, that is, independent of current income (Serrano, 1995; Cesaratto et al., 2003). Moreover, business expenditure has both

require any changes in distribution, such as changes in real wages and profits. Indeed, in the long term, when productive capacity varies, investment generates a corresponding volume of savings. Subsequently, a change in the normal rate of profits and in the real wage rate is not required (Trezzini and Palumbo, 2016).

[14] Extending the role played by aggregate demand was attempted by several schools of thought. For a literature review on this issue, see, among others, Lavoie (2014), and Pariboni (2015).

[15] A debate on the role played by autonomous components has been developed by Allain (2014), Lavoie (2016) and Nah and Lavoie (2017).

[16] Within the SSM, in the short term, the process of adjustment of savings to investment occurs by a change in the degree of capacity utilization, being the productive capacity fixed in the short period. On the contrary, in the long term, when productive capacity can change, a persistent higher degree of capacity utilization above normal leads firms to increase their investment in order to adapt the level of productive capacity to demand and producing at a desired degree of capacity utilization.

exogenous and endogenous components, positively influenced by a specific type of public expenditure.

Figure 1: Components of aggregate demand

	Capacity Creating	Non–Capacity Creating
Exogenous		Government expenditures, Export, Autonomous consumption, Autonomous business expenditure, Autonomous taxes and Autonomous transfers
Endogenous	Gross Investment	Induced consumption, Induced import, Induced business expenditure

Let us consider an open economy with a government sector and two social classes (workers and capitalists). The current level of output (Y) is equal to aggregate demand, which is the sum of consumption (C), business expenditure (BE), gross investment (I_i), public expenditure (G), and net export ($E - M$). This is represented in equation (1):

$$Y = C + BE + I_i + G + E - M \quad (1)$$

The consumption function is developed and implemented starting from equations presented by Pariboni (2016). Equations (2) and (3) represent respectively the total consumption of workers (C_w) and of capitalists (C_Π), which include an autonomous and an induced component. The former is independent of current income and is financed in the credit market via an endogenous money creation process. The latter is an induced component dependent on the disposable income of workers (Y_{Dw}) and capitalists ($Y_{D\Pi}$).

$$C_w = C_{aw}(i; X_w) + c_w * Y_{Dw} \quad (2)$$

$$C_\Pi = C_{a\Pi}(i; X_\Pi) + c_\Pi * Y_{D\Pi} \quad (3)$$

C_{aw} and $C_{a\Pi}$ represent autonomous consumption financed out of bank loans that are negatively influenced by the level of the interest rate (i) – set exogenously by the central bank – and by bank lending policy instruments (X_w and X_Π).[17] In particular, a fall in interest

[17] How the central bank changes the interest rate also influences a set of interest rates in the economy, as those applied by commercial banks on loans (McLeay et al., 2014). The interest rate set by commercial banks is determined by applying a mark-up on that set by the central bank. For a given mark-up, a decrease (increase) in the short-term interest rate set by the monetary authority causes a fall (rise) in commercial interest rates.

rates reduces borrowing costs to finance the purchase of autonomous consumption and it can be seen by borrowers as an increase in their purchasing power, or as a decrease in the price of consumption goods.[18] Therefore, the amount of loans demanded by borrowers to finance household expenditures could increase when the interest rate falls (Garegnani, 2015).[19] Autonomous consumptions are also negatively affected by a range of bank lending policy instruments that can influence the level of the effective demand for loans. In equations (2) and (3), such policy instruments are represented by variable X. This variable varies between 0 and 1 and it is a proxy for the assessment by banks of borrowers' creditworthiness or, rather, it measures the ability of the banking system to provide loans to different categories of borrowers (Wolfson, 1996).[20] X_{Π} and $X_{w}$are respectively the assessment of capitalists' and workers' creditworthiness. c_{w} and c_{Π} are respectively the marginal propensity to consume of workers and capitalists, and we assume that $c_{w} > c_{\Pi}$ (Kaldor, 1955). The total consumption function, is shown by equation (4). For the development of equation (4), please see Appendix 1.

$$C = C_{a}(i; X_{w}; X_{\Pi}) + c_{w} * (TR_{aw} - T_{aw}) + c_{\Pi} * (TR_{a\Pi} - T_{a\Pi}) + \\ + [c_{w} * \omega * (1 - t_{w} - t_{rw}) + c_{\Pi} * (1 - \omega) * (1 - t_{\Pi} - t_{r\Pi})] * Y \qquad (4)$$

where TR_{aw} and $TR_{a\Pi}$ are the government autonomous transfers to wage- and profit-earners. T_{aw} and $T_{a\Pi}$ are the autonomous taxes to workers and capitalists. ω is the wage share and $1 - \omega$ is the profit share. t_{w} and t_{Π} are respectively the workers' and capitalists' tax rates (please see Appendix 1, equations 1.8 and 1.9). t_{rw} and $t_{r\Pi}$ represent the workers' and capitalists' transfers coefficients (please see Appendix 1, equations 1.11 and 1.12).[21]

$$I_{i} = v * (d + g_{e}) * Y \qquad (5)$$

The gross investment function is represented in equation (5). In the SSM, gross investment (I_{i}) is fully induced and is positively affected by the normal capital-output ratio (v)[22] that represents technical conditions of production and by the replacement coefficient, also termed the rate of depreciation of capital (d). Furthermore, the actual level of effective demand and

[18] Changes in the rate of interest could affect the multiplier by influencing the level of distribution between profit and wages (Pivetti, 1990; Stirati, 2001). However, for sake of simplicity, we do not consider the effect of the interest rate on the multiplier.

[19] Although in the national account the purchase of houses is considered an investment, here we deal with it as a component of autonomous consumption.

[20] When X is equal to 0, the banking system does not credit-constrain borrowers. Conversely, the closer X is to one, the more the banking system tends to constrain borrowers. The trustworthiness of borrowers can be measured in terms of, for example, banks' collateral request. Hence, when the banking system increases its demand for collaterals, X tends to 1; when the demand for collaterals decreases, X is closer to 0. As maintained by Keynes (1930, vol. I, p. 212), there is "always a fringe of unsatisfied borrowers" since the banking system is able to restrict credit by means of non-price mechanisms, e.g. the collateral request. For these reasons, "banks hold the key position in the transition from a lower to a higher scale of activity" (Keynes, 1937, p. 668) through their ability to define the borrowers' eligibility criteria.

[21] As can be noted, both total taxes and the total transfers depend both on an autonomous component and on an endogenous component related to wage and profit shares.

[22] Following Girardi and Pariboni (2016), we assume that actual degree of capacity utilization is equal to the ratio between the actual level of output and the normal level of output. Hence, the normal degree of capacity utilization is equal to one. Subsequently $v = K/y^{n}$, where K is the actual capital stock and y^{n} is the normal level of output desired by entrepreneurs.

the expected rate of growth of the normal level of effective demand (g_e) have a positive influence on the level of investment. In other words, firms increase their capital stock by increasing the level of their investment in order to satisfy a greater demand for goods and services and when technical innovations occur, as summarized in equation (5) by v and d (Garegnani, 2015).[23]

Furthermore, the investment function (equation 5) does not imply that the actual degree of capacity utilization is equal to the normal or is desired by entrepreneurs (u_n), but a continuous process of adjustment toward the latter is operational. Especially in the short run, the investment function allows a flexible degree of capacity utilization determined by the current level of demand. In the long run, a slow and gradual adjustment of the capital stock is driven by changes in long-term expectations (g_e) and by a flexible accelerator mechanism. Such changes occur by means of reconsiderations by entrepreneurs about the expected growth of the effective demand (g_e) in light of the current rate of growth of output (g_y), with the former moving toward the latter. However, as firms know that demand fluctuates, entrepreneurs do not consider any changes in demand as a stable and permanent change. Further, they adjust their capital stock by increasing (when $g_y > g_e$) and decreasing (when $g_y < g_e$) investment gradually over time rather than in one single period through a flexible accelerator process (Cesaratto et al., 2003).[24] This change in expectations and then in investment allow the actual degree of capacity utilization to gravitate toward the normal degree, where the latter is considered as a centre of gravitation to which entrepreneurs would like to produce.

$$G = G_1 + G_2 \tag{6}$$

Equation (6) represents government spending, which is composed of two types of public expenditure. The former is based on the purchase of goods and services (G_1) and the latter is oriented to promoting structural change, namely stimulating technical progress by means of industrial policies (G_2). For instance, among the latter, we can include mission-oriented spending, which has led to major technological advances, such as the DARPA (Department of Defense) investment on ARPANET which became the modern-day internet, the ARPA-E (Department of Energy) investments in renewable energy, or the National Institutes of Health investments in the biotechnology sector (Block and Keller, 2011; Mazzucato, 2013).[25]

[23] Garegnani (2015, p. 113) argued that "in the long period the stock of productive equipment can change, it can do so in such a way as to adjust itself to the level of demand" and he considered that "the most important factors in determining private investment are the growth of final demand and technical innovations." (Garegnani, 2015, p. 132)

[24] Since some fluctuations of demand could not be considered permanent, entrepreneurs do not immediately undertake a full adjustment of productive capacity to effective demand; rather, such adjustments occur by a flexible accelerator process (see equation 13). Notwithstanding, a flexible degree of capacity utilization allows firms to meet all peaks of demand with the current installed capacity (Ciccone, 1986).

[25] G_2 is also termed as strategic investment, but a specification concerning this type of investment has to be made. G_2 cannot be considered as investments specified in equation (5) since they do not immediately create productive capacity capable of producing other commodities demanded by firms and workers.

$$\mathrm{BE} = \mathrm{BE_a} + \gamma * \mathrm{G_2} \quad (7)$$

Equation (7) shows the business expenditure (BE). In BE, we can include managerial expenses, for example, unproductive consumption, and R&D (Cesaratto et al., 2003). However, we split BE into exogenous and endogenous components. Particularly, we consider as autonomous $\mathrm{BE_a}$ the above-mentioned unproductive consumption, such as the purchase of a company car, executive jet, marketing expenditure, etc., and a share of R&D due to an intrinsic capitalist competition. However, firms' R&D is also composed of an endogenous component driven by public expenditure oriented to promote innovation. In other words, specific types of public spending, for example, military expenditure, are able to induce and positively influence R&D of private firms (Mazzucato, 2013, 2016) by generating spin-offs through which research and innovation are developed and diffused to other sectors (Pivetti, 1992). In each of the above cases, public investment created a new landscape (rather than simply fixing market failures), which increased the expectations of business, resulting in an increase in private expenditure (Mazzucato, 2016). From an analytical standpoint, we introduce in equation (7) γ – a reaction coefficient greater than zero – that shows how an increase of $\mathrm{G_2}$ leads to an endogenous rise of firms' BE. In particular, the size of γ depends on the capacity of industrial policy to capture and involve more sectors in the economy. For instance, an industrial policy focused on one specific sector will show a lower γ compared to a policy that involves several sectors across the economy, as in the case of mission-oriented spending (Mazzucato, 2017).

Finally, equations (8) and (9) represent export and import. For equation (8), export is positively influenced by foreign demand ($\mathrm{Y_{frn}}$) and by a depreciation of the exchange rate (ε), which decreases national prices compared with foreign prices. In this regard, the central bank can entail considerable changes of the exchange rate by varying the interest rate (i) (Arestis and Sawyer, 2004). In particular, a decrease of the domestic interest rate makes domestic deposits less attractive compared to those denominated in foreign currencies. This leads to an outflow of capital and a depreciation of the domestic currency. The lower value of the national currency allows national goods to be less expensive than foreign goods, thus increasing exports ($\mathrm{E_{ela}}$) (Mishkin, 1995).[26]

$$\mathrm{E} = \mathrm{E_A}(\mathrm{Y_f}) + \mathrm{E_{ela}}[\varepsilon(\mathrm{i})] \quad (8)$$

At the same time, the depreciation of the exchange rate reduces imports ($\mathrm{M_{ela}}$) since foreign goods become more expensive compared to national goods. Moreover, following equation (9), if there is an increase in national output (Y), imports increase since the marginal propensity to import (m) assumes a value greater than zero.

[26] In order to increase net exports by means of an exchange rate devaluation, the Marshall-Lerner condition has to be satisfied: the sum of export and import price elasticities has to be greater than 1.

$$M = m * Y + \varepsilon * M_{ela}[\varepsilon(i)] \quad (9)$$

Although, on the one hand, the exchange rate can be considered an instrument able to help the domestic net export $(E - M)$, on the other hand, the expansionary effect of an exchange rate devaluation could be partially or fully offset by an expansionary monetary policy carried out in foreign countries. Additionally, the technological advantages driven by innovation processes, enriching the productive matrix of a country, become factors that determine the growth of exports and the fall of import penetration (Cesaratto et al., 2003; Simonazzi et al., 2013).

Equation (1), along with equations (4) – (9), together allow us to obtain the output supermultiplier. Equation (10) shows that the level of output is determined by an autonomous component of aggregate demand (numerator of equation 10) and by the supermultiplier (denominator of equation 10).[27]

$$Y = \frac{C_a(i;X_w;X_\Pi)+c_w*(TR_{aw}-T_{aw})+c_\Pi*(TR_{a\Pi}-T_{a\Pi})+BE_a+G_1+(1+\gamma)*G_2+E_A(Y_f)+E_{ela}[\varepsilon(i)]-\varepsilon*M_{ela}[\varepsilon(i)]}{1-[c_w*\omega*(1-t_w-t_{rw})+c_\Pi*(1-\omega)*(1-t_\Pi-t_{r\Pi})]-v*(d+g_e)+m} \quad (10)$$

The numerator of equation (10) is characterized by autonomous components of aggregate demand that, for sake of simplicity, we call Z in equation 11

$$Z = C_a(i; X_w; X_\Pi) + c_w * (TR_{aw} - T_{aw}) + c_\Pi * (TR_{a\Pi} - T_{a\Pi}) + BE_a + \\ + G_1 + (1+\gamma) * G_2 + E_A(Y_f) + E_{ela}[\varepsilon(i)] - \varepsilon * M_{ela}[\varepsilon(i)] \quad (11)$$

Moreover, in equation (12), we can denominate the marginal propensity to save as s

$$s = 1 - [c_w * \omega * (1 - t_w - t_{rw}) + c_\Pi * (1 - \omega) * (1 - t_\Pi - t_{r\Pi})] + m \quad (12)$$

Subsequently, we can substitute equations (11) and (12) in equation (10) and the output supermultiplier can be represented as shown in equation (10.1)

$$Y = \frac{Z}{s - v*(d+g_e)} \quad (10.1)$$

As shown in equation (10.1), a rise in the autonomous components of aggregate demand, as well as a rise in the marginal propensity to spend, leads to an increase in total output. However, whereas the output trend growth rate is driven by the trend growth rate of the autonomous components (Z), a change in marginal propensity to consume causes a permanent level effect (Freitas and Serrano, 2015). For instance, a single increase in the marginal propensity to spend (a decrease in s in equation 10.1), for example, determined by

[27] In order to have an economically significant solution, the denominator of equation 10 has to be positive.

an increase in wages, generates a higher rate of growth of output only in the period immediately after the change of distribution. Notwithstanding, when the supermultiplier effect vanishes, the economy resumes growing at the autonomous components rate (g_z).[28]

As already mentioned, the output level represented by equation (10.1) is not necessarily combined with a normal degree of the capacity utilization (u_n). However, u_n has to be considered as a centre of gravitation toward which the actual degree of capacity utilization (u_n) is presumed to be attracted. This occurs by a continuous tendency of productive capacity to adjust to the trend of effective demand by means of slow and gradual changes of the marginal propensity to invest grounded in the flexible accelerator effect (Cesaratto et al., 2003). Such changes occur by means of reconsiderations by entrepreneurs about the expected rate of growth of the effective demand (g_e), based on the current rate of growth (g_y). As suggested by Pariboni (2015), the long-term expectations about the growth of effective demand could be estimated by equation (13)[29]

$$\dot{g_e} = x * (g_y - g_e) \tag{13}$$

where x is a reaction coefficient. If x is equal to 1, equation (13) shows a rigid accelerator process. However, since some fluctuations of demand could not be considered by firms as permanent, a gradual adjustment driven by a flexible accelerator is operative. Hence, x assumes positive values less than 1 ($0 < x < 1$).

Analysing dynamically equation (10.1), we can represent the rate of growth of output in equation (14)

$$g_y = g_z + \frac{\dot{v} * (d + g_e) + v * (\dot{g_e} + \dot{d})}{s - v * (d + g_e)} \tag{14}$$

where g_z is the current rate of growth of the autonomous components of aggregate demand. $\dot{v}$ and $\dot{d}$ represent respectively the change of the capital-output ratio and the depreciation rate over time, for example, driven by the technical progress and the adoption of a new technique of production.

Analysing dynamically investment function (5), the rate of growth of investment (g_I) can be summarized in equation (15)

[28] Since a fully adjusted position is not the focus of this paper, we refer to other theoretical works demonstrating the process of gravitation according to which the actual degree of capacity utilization converges toward a normal degree. For a deepened review on this issue, see, among others, Serrano (1995), Cesaratto et al. (2003), Freitas and Serrano (2015), and Pariboni (2016). Additionally, for a review of the static and local dynamic stability conditions of the SSM, see Freitas and Serrano (2015).

[29] For the sake of simplicity, we assume that expectations are based on the current discrepancies between the actual and expected rate of growth of effective demand. More realistically, the actual expected rate of growth should also relate with lagged gap between g_y and g_e. For a more complicate relationship between g_y and g_e, see Cesaratto et al. (2003, p. 44, fn. 19).

$$g_I = g_y + g_v + \frac{\dot{d}+\dot{g}_e}{d+g_e} \quad (15)$$

meaning that the rate of growth of investment depends on the growth rate of current output and expected demand. Furthermore, the change over time of the capital-output ratio and of the depreciation rate positively influences investment by changing the production techniques adopted in the economy and by accelerating the replacement of the old means of production.

In light of this model, we can understand that the rate of output growth and investment is strictly related to the rate of growth of autonomous components of aggregate demand passing through a multiplier and an accelerator effect. Therefore, stimulating aggregate demand becomes necessary in terms of output and investment growth, not only during a period of economic slowdown or only in the short-term, but in the long term when the possibility of creating new resources and new productive capacity increases and it becomes particularly relevant (Trezzini and Palumbo, 2016). Subsequently, contrary to EA and NK supporters, endorsing a CK view based on the SSM, expansionary fiscal policies generate an expansionary effect on output throughout the business cycle. Furthermore, if such policies are sufficiently persistent to change entrepreneurs' current long-term expectations of growth (g_e), gross investment also has to increase in order to satisfy a greater expected demand for goods and services. As shown by this model, interest rates do not influence the entrepreneurs' investment decisions, but monetary policy could affect the size of loans demanded by borrowers for the purchase of houses and consumption goods, as well as the net export by means of the effect of the interest rate on the exchange rate.

5. Schumpeter meets Keynes: fiscal policies, technical progress and the supermultiplier

Following the SSM model and the line of reasoning developed by Mazzucato (2013, 2016), in the next subsections we analyse how different types of fiscal policies can influence the level of output and investment. In addition, we show how specific government spending can stimulate innovation and how the latter affects both autonomous and induced components of aggregate demand.

5.1. Fiscal policies: a comparative static analysis

In advanced countries, there is a lively debate on which fiscal policy stimulus is more effective in terms of output and investment growth. In order to shed light on this issue, we use the SSM model by assessing how different decisions of fiscal policy influence the level of output and private investment by changing the level of output and the expectations of growth of effective demand. In particular, we analyse the effects of autonomous taxes and transfers as well as the change of tax rates and the transfers coefficients, also considering the opposing social classes (workers or capitalists) to which these alternative fiscal policies are oriented. Furthermore, the same analysis will be carried out on the two types of public expenditure considered in the SSM.

Following equation (10), a decrease in autonomous taxes levied on workers (T_{aw}) and capitalists ($T_{a\Pi}$), as well as a rise of exogenous transfers (TR_{aw} and $TR_{a\Pi}$), generate a positive effect on output by increasing the disposable income of workers and capitalists, thus causing an increase in total consumption. However, since workers' marginal propensity to consume is greater than capitalists' propensity ($c_w > c_\Pi$) and both are less than 1, the impact of a decrease in taxes or an increase in transfers generates a greater level of total consumption if such fiscal policies are targeted towards workers rather than capitalists. In other words, autonomous transfers and taxes, by affecting the disposable income of workers (Y_{Dw}) and capitalists ($Y_{D\Pi}$), influence total consumption in a different manner since the capitalists' propensity to hoard is greater than workers' ($s_w < s_\Pi$). A similar reasoning can be made for what concerns a change in the tax rates (t_w and t_Π) or in the transfers coefficients (t_{rw} and $t_{r\Pi}$). A decrease in t_w and t_Π, as well as a reduction in t_{rw} and $t_{r\Pi}$, changes the disposable income of both social classes affecting the total consumption. As before, due to a different marginal propensity to consume ($c_w > c_\Pi$), the SSM model shows that a decrease in workers' tax rate (t_w) or transfers coefficient (t_{rw}) causes a larger expansionary effect compared to a reduction of capitalists' tax rate (t_Π) and transfers coefficient ($t_{r\Pi}$). Analytically, as shown by equation (10), the supermultiplier assumes a larger value and then a higher level of output is experienced whether the workers' tax rates and the transfers coefficient decrease rather than capitalists'. We can thus affirm that a decrease in autonomous taxes or an increase in exogenous transfers generates a greater level of output if resources are targeted to increase workers' disposable income rather than capitalists', since the former shows a larger marginal propensity to consume than the latter. Similarly, a decrease workers' tax rate (t_w) and transfers coefficient (t_{rw}) generates a larger supermultiplier than a fall of capitalists' tax rates (t_Π) and transfers coefficient ($t_{r\Pi}$).

Considering now the role played by public expenditure, a rise in G_1 and G_2 generates a greater effect on output compared with a change of the same size in autonomous transfers or taxes. Public expenditure (G_1 and G_2) acts directly on total output while autonomous transfers or taxes affect the production passing through the disposable income of workers and capitalists. Workers and capitalists, saving part of the new amount of resources bestowed by government, reduce the effect in terms of output of a fiscal policy based on taxes and transfers compared to a fiscal policy based on a rise in government spending. In other words, we can affirm that the government spending supermultiplier is larger than the tax and transfer multipliers.[30]

Moreover, in our analysis, we also consider different types of public expenditure (G_1 and G_2). The former is supposed to finance the purchase of final goods for the direct fruition, while the latter is supposed to concentrate resources in strategic or new economic areas. Among G_2,

[30] For the sake of simplicity, in order to demonstrate such a relationship, we assume a single marginal propensity to consume (c) and exogenous transfers (TR), taxes (T) and government spending (G). The output is represented by the following equation $Y = (1/1 - c) * [G + c * (TR - T)]$. The government spending multiplier is equal to $1/1 - c$ and the tax and transfer multiplier is equal to $c/1 - c$. Since the marginal propensity is less than 1 ($c < 1$), part of transfers and taxes is absorbed by savings. Subsequently, $1/(1 - c) > c/(1 - c)$, meaning that the spending multiplier is larger than the transfer and tax multiplier.

we can include public spending toward the military and aerospace sector, as well as energy and clean-tech sectors, biotechnology and nanotechnology, and information technology. This kind of public expenditure is based on a precise and forward-looking industrial policy, especially grounded in the will to find solutions for technical problems (Pivetti, 1992). Hence, the state carries out a fruitful role by creating a new vision, and new opportunities by coordinating efforts of different actors (private and public) and directing their behavior to sectors and fields beyond existing paradigms (Mazzucato, 2016). In this framework, government expenditure (G_2) leads to new technological opportunities establishing a direction for technical change (Mazzucato, 2013). Historically, these types of public expenditures have financed both applied and basic research in high-risk areas, creating technological and market opportunities into which the business sector injected new resources only after the public sector has independently tackled high risks and troubles (Mazzucato, 2016). In these terms, government spending (G_2), allocating resources strategically, is capable of positively stimulating and leveraging private business expenditures in these areas.

We can therefore affirm that alternative types of public fiscal policy, based on the change of autonomous components of aggregate demand, generate different effects in terms of output. As shown in the following inequality (16), the supermultiplier assumes different values depending on which exogenous components of fiscal policies change:

$$\frac{1+\gamma}{s-v*(d+g_e)} > \frac{1}{s-v*(d+g_e)} > \frac{c_w}{s-v*(d+g_e)} > \frac{c_\Pi}{s-v*(d+g_e)} \qquad (16)$$

As shown by inequality (16), the supermultiplier related to G_2 assumes the largest value since $\gamma > 0$. By contrast, the supermultiplier related to autonomous capitalists' transfers and taxes is the lowest value since $c_\Pi < c_w < 1$.

The comparatively static analysis developed in this section does not regard the change in the expectation of growth of the aggregate demand. In the next section, we deal with this topic focusing on the role played by expansionary fiscal policies.

5.2. Fiscal policies and expectations of growth

In order to show the role played by expectations of growth of aggregate demand (g_e), we have to assume that the government exogenously decides to pursue a permanent expansionary fiscal policy. In fact, only a permanent change in the rate of growth of the autonomous components can vary the expectation of growth. On the contrary, a temporary expansionary fiscal policy is supposed to increase the output through a provisional increase in the degree of capacity utilization without engendering any changes in expectations of growth (g_e) and then in the level of investment. For these reasons, we assume that the state – alternatively and permanently – changes the rate of growth of one of the above-mentioned

autonomous components: taxes, transfers, and two types of public expenditure.[31] Moreover, we suppose an economy in an expansionary phase with abundant labour and the modification of the rate of growth of fiscal autonomous components, albeit alternative due to different decisions of fiscal policy, has to be of the same entity among the considered variables.

A permanent change in the rate of growth of the autonomous components of aggregate demand generates both different level effects (see inequality 16) and simultaneously modifies the economy's trend growth rate. Subsequently, a modification of the autonomous components' trend growth rate alters the expectations of growth of aggregate demand ($\mathrm{g_e}$) and therefore affects the value assumed by the supermultiplier. Especially, changes in $\mathrm{g_e}$ modify the value of the accelerator and then the denominator of the supermultiplier.

Alternative types of fiscal policy not only create a different output level but, if considered permanent by entrepreneurs, generate different expected rates of growth of the aggregate demand during the phase of transition toward a new fully adjusted position.[32] Consequently, following equation (5), we can affirm that investment is affected both by a different output level and by different expectations concerning the growth rate of the aggregate demand. In order to explain this influence, we focus on $\mathrm{G_1}$ and $\mathrm{G_2}$ and later introduce the effect of a change in the rate of growth of autonomous transfers and taxes. An increase in the rate of growth of different types of public expenditure ($\mathrm{G_1}$ and $\mathrm{G_2}$) raises both the trend growth rate of the economy and also generates two different level effects on output. As summarized by equations 10 and 10.1, $\mathrm{G_2}$ leads to a greater effect on the output level than $\mathrm{G_1}$ due to a larger induced effect on the firms' business expenditure (BE) that guarantees a greater supermultiplier (see inequality 16). Starting from equation 10 and 10.1, we can represent different effects of alternative public expenditure by means of the following relationship (17):

$$\Delta \mathrm{G_1} \frac{1}{\mathrm{s-v*(d+g_e)}} = \Delta \mathrm{Y_{G1}} < \Delta \mathrm{Y_{G2}} = \frac{1+\gamma}{\mathrm{s-v*(d+g_e)}} \Delta \mathrm{G_2} \qquad (17)$$

In relationship (17), we can show such inequality only in the period immediately after the increase of the growth rate of $\mathrm{G_1}$ and $\mathrm{G_2}$. In particular, during the transition toward a new adjusted position, a larger supermultiplier generates a greater output growth rate, whether the public spending is targeted towards $\mathrm{G_2}$ rather than $\mathrm{G_1}$.[33] However, as noted above, although in a fully adjusted position the output growth rate and the expected effective demand growth rate are equal to growth of exogenous components of the aggregate demand, during the adjustment process toward a normal equilibrium position, the expected rate of growth of the effective demand ($\mathrm{g_e}$) diverges from the trend growth rate of

[31] In order to have a permanent expansionary fiscal policy, autonomous taxes have to decrease. However, different from other exogenous components controlled by the government, a permanent decrease in the rate of growth of autonomous taxes leads to a zero lower bound.

[32] In a fully adjusted position, capacity follows the trend of effective demand and the degree of capacity utilization is equal to the planned utilization rate. (Cesaratto et al., 2003, p. 44).

[33] In a fully adjusted position where $g_e = g_z$, the trend growth rate generated by alternative government spending will be the same: $\Delta \mathrm{G_1} \frac{1}{s-v*(d+g_z)} = \Delta Y_{G1} = \Delta Y_{G2} = \frac{1+\gamma}{s-v*(d+g_z)} \Delta \mathrm{G_2}$. Only a further change in the growth rate of autonomous components can generate the inequality shown in (17).

autonomous components (g_z). In particular, changes in g_e are influenced by the realized output growth rate (g_y), which in turn depends on the effect of alternative public spending. Hence, focusing on the role played by the fiscal policy, a different g_y is experienced only in the period immediately subsequent to the implementation of a permanent fiscal policy shock and it depends on which kind of fiscal policy is pursued by the government. Subsequently, different effective rates of growth of output (g_y) determine several expectations concerning the expected rate of growth of effective demand (g_e) (see equation 13). However, an increase in g_e does not allow a permanent increase in the growth rate of output since the economy experiences a faster growth compared with the growth of the exogenous components of aggregate demand only in the period immediately after the rise of g_e (Cesaratto et al., 2003). Although initially the economy shows a higher growth due to different supermultipliers, the output growth rate plummets toward the autonomous components growth rate (g_z) during the adjustment process, as well as in the fully adjusted position the expected growth of effective demand will be equal to the growth rate of the autonomous components ($g_e = g_z$).

Hence, during the process of adjustment toward a new equilibrium position, alternative fiscal policies generate different growth rates of output through different values assumed by the supermultiplier. Considering the analysis developed above concerning the effects in terms of output growth of alternative fiscal policies, we can summarize the results of alternative fiscal policies by means of the following inequality (18):[34]

$$g_{y\Delta G_2} > g_{y\Delta G_1} > (g_{y\Delta TR_{aw}} = g_{y\Delta T_{aw}}) > (g_{y\Delta TR_{a\Pi}} = g_{y\Delta T_{a\Pi}}) \qquad (18)$$

The subscript presented in each component represents the implementation of alternative fiscal policies by the government. Only during the transition toward a new fully adjusted position does an increase in the rate of growth of G_2 generate the greatest effect in terms of output growth compared with the remaining variables controlled by the government. Moreover, following equation (13), a continuous process of confirmation of expectations takes place. That makes firms reconsider the expected rate of growth of the effective demand (g_e) based on the realized rate of growth of the output (g_y). Thus, combining the process summarized in equation (13) with the several effects of alternative fiscal policies, we can represent the expectation revision in the following system of equations (19):

[34] Here a twofold issue has to be highlighted. First, compared to the remaining variables presented in inequality (18), exogenous taxes have to decrease in order to generate a positive effect on output (see equation 10); second, for the sake of simplicity, we do not consider any affects in the change of the tax rate and of transfers coefficient. However, it is easy to understand that changes in both above-mentioned components generate exclusively a level effect by changing the value of the supermultiplier.

$$\begin{cases} \dot{g_{e\Delta G_2}} = x * (g_{y\Delta G_2} - g_e) \\ \dot{g_{e\Delta G_1}} = x * (g_{y\Delta G_1} - g_e) \\ \dot{g_{e\Delta TR_{aw}}} = x * (g_{y\Delta TR_{aw}} - g_e) \\ \dot{g_{e\Delta T_{aw}}} = x * (g_{y\Delta T_{aw}} - g_e) \\ \dot{g_{e\Delta TR_{a\Pi}}} = x * (g_{y\Delta TR_{a\Pi}} - g_e) \\ \dot{g_{e\Delta T_{a\Pi}}} = x * (g_{y\Delta T_{a\Pi}} - g_e) \end{cases} \quad (19)$$

Furthermore, starting from relationships presented in (18) and (19), we can also represent changes in the expectations of growth corresponding to alternative fiscal policies through the following inequalities (20):

$$\dot{g_{e\Delta G_2}} > \dot{g_{e\Delta G_1}} > (\dot{g_{e\Delta TR_{aw}}} = \dot{g_{e\Delta T_{aw}}}) > (\dot{g_{e\Delta TR_{a\Pi}}} = \dot{g_{e\Delta T_{a\Pi}}}) \quad (20)$$

Subsequently, following equation (15), we can show that alternative fiscal policies, having different impacts in terms of output and expectations during the transition towards a new fully adjusted position, affect the growth of investment in a different way. Especially, starting from relationships presented in (18) and (20), we can represent the rate of growth of investment related to the alternative fiscal policies by means of the following inequality (21):

$$g_{IG_2} > g_{IG_1} > (g_{ITR_{aw}} = g_{IT_{aw}}) > (g_{ITR_{a\Pi}} = g_{IT_{a\Pi}}) \quad (21)$$

As shown, government spending, targeted towards strategic sectors (G_2), generates the greatest effects in terms of output and expectations and then investment growth. On the contrary, the rate of growth of autonomous capitalists' transfers and taxes shows the lowest effect in terms of output, expectations, and thus investment growth.

5.3. A demand-led technical progress

Now, we analyse the influence of the process of innovation on several components of the SSM. G_2, along with private business spending (BE), compared to the other autonomous components of aggregate demand, have to be considered the premise for generating a process of innovation. These expenditures are grounded on the will to find solutions to technical problems (Pivetti, 1992).

However, while G_2 stimulates and facilitates the technical progress, on the other hand, due to intrinsic difficulties in the process of innovation, G_2 and then also BE are not synonymous with innovation. In particular, an increase in public spending or in business expenditure does not create *per se* technical progress, but it increases the probability that an innovation is

discovered and diffused in the market. As a consequence of this line of reasoning, the technical progress appears as endogenously determined and driven by specific demand-led government policies, which, in turn, are also able to foster and stimulate private business expenditure. These accelerate and facilitate the development of innovation and its diffusion into the economy.

Although the technical change is usually interpreted as a supply-side factor that causes an upward shift of the schedule of the marginal productivity of capital, we try to deepen this issue by focusing on the relationship between innovation and demand-side factors. Endorsing the view presented in the SSM, the technical progress is capable of generating effects both on the level of output and on the rate of growth of effective demand. The former is supposed to influence the value of the supermultiplier whereas the latter is assumed to change the trend growth rate of the exogenous components of aggregate demand.

In particular, innovation has a persistent effect on gross investment by changing the capital-output ratio (v) and the depreciation rate (d). Consequently, a change in marginal propensity to invest (see equation 5) influences the supermultiplier and then the level of output. In particular, technical progress increases the obsolescence of installed capital goods and thus grows the depreciation rate (d) and then accelerates the process of investment and of replacement of old machineries (Garegnani, 2015). In addition, technical progress could influence the capital-output ratio, or rather, the adopted techniques of production.[35] Based on which technical progress is introduced in the economy, the capital-output ratio (v) could increase, decrease, or even remain constant. In particular, if the technical progress is capital-using, a larger v positively influences both the investment level and the value of the supermultiplier. On the contrary, a capital-saving technical progress reduces v, the supermultiplier, and investment. Finally, if the innovation is Harrod-neutral, v remains constant, as well as the investment and the supermultiplier (Cesaratto et al., 2003).

Nevertheless, the innovation might also engender a positive effect on the trend of economic growth by affecting the autonomous components of aggregate demand, as with consumptions and net exports. As underlined by Cesaratto et al. (2003), product innovation, by continuously creating new consumption needs, increases the obsolescence of old commodities.[36] This could positively stimulate the autonomous consumption financed out of the credit market through an endogenous money-creation process (Pariboni, 2016). However, although innovation might stimulate borrowers' demand for loans, an increase in

[35] If the new production technique, which has been discovered by the process of innovation, is dominant for all distribution combinations compared to the old techniques, then the new technique will be adopted. That occurs since it allows firms to generate a greater rate of profit for every possible wage rate. Conversely, if the new technique is dominant, but not for all distribution combinations, it will only be adopted under certain distributive arrangements. Especially for a given profit rate, the chosen technique will have to be so to maximize the wage rate. In that case, either the new or an old production technique could be adopted.

[36] The technical progress could lead to changes in the marginal propensity to consume by means of changes in the distributive shares. Such modifications could occur in both directions, leaving the change of the marginal propensity to consume undetermined. However, if the marginal propensity to consume decreases due to an increase in profit share, the stylized fact of the constancy of average propensity to consume in advanced countries (Cesaratto et al., 2003) could be explained by an increase in autonomous consumptions financed through the credit market.

the interest rate, and a rise in the value of collateral requested by commercial banks, as well as a sudden institutional restrictive regulatory policy, could limit the positive effect of an innovative wave.

Concerning countries' external relations, technical change generates technological advantages in terms of productive capacity that represent one of the main factors that stimulate the export growth of a country. Enriching the productive matrix through technical specialization in capital and consumption goods, countries are able to satisfy a wide external demand and simultaneously reduce import penetration. As in the case of autonomous consumption, monetary policy could influence the net export growth rate through its control over the exchange rate by setting alternative interest rates. In particular, a depreciation of the exchange rate accelerates the net export growth rate, while its appreciation slows down the net export growth rate. Moreover, due to its easy diffusion in foreign countries, innovation has to be permanent and continuous in order to generate positive technological advantages, and then a positive effect on the net export growth rate.

Therefore, technical progress is able to increase the output trend growth rate by affecting the growth rate of autonomous demand, as the net export and the autonomous consumption. Subsequently, a permanent process of innovation, by increasing the output trend growth rate, rises the expected growth of aggregate demand (g_e) and therefore the level of investment. In addition to this, an innovation also determines level effects by changing the value of the supermultiplier, by means of modifications of the propensity to invest, that is, by changing the output-capital ratio and the replacement coefficient. Nevertheless, the trend effect could be more limited compared to the level effect since the former could be influenced by a range of institutional factors, for example, the monetary policy measures, the commercial bank lending policies, and the diffusion of innovation in foreign countries.

6. Concluding remarks

The present paper critically analyses the theoretical underpinnings of austerity measures which were implemented after the 2007 financial crisis in order to stimulate investment and foster GDP growth. First, we analyse the theoretical assumptions on which these austerity measures are based. Secondly, we propose an alternative framework which we believe to stand on stronger grounds—both theoretically and empirically.

We argue that both New-Keynesians and the supporters of Expansive Austerity (EA) wrongly assume that an increase in public spending generates a negative effect on investments and output. By evoking the well-known crowding-out mechanism, they claim that a rise of public spending leads to an automatic increase of the rate of interest that in turn generates a decrease in the volume of private investment.

We discuss how this crowding-out reasoning is based on two problematic assumptions: (i) an endogenous rate of interest positively affected by public spending; and (ii) a downward-sloping investment demand curve. We propose a twofold critique based on monetary

analysis and an analysis of the 'real' economy. The former is grounded on post-Keynesian endogenous money theory, according to which the interest rate is an exogenous variable set by monetary authorities and that is independent of the supply of and demand for money. The latter is based on the Classical-Keynesian approach and on the concept of *re-switching of techniques* that allows us to deny a general negative relationship between the interest rate and the level of investment.

As a consequence of such critiques, we propose a new version of the Sraffian Supermultiplier model to explain the determinants of investment and output. In this alternative model, the growth rate of output depends on the growth rate of the autonomous components of the aggregate demand. Private investments, in this framework, are fully induced by and depend on the level of effective demand and technical progress. Consequently, aggregate demand matters for output determination both in the short and the long run, and expansionary fiscal policies increase output both in the short and the long run without crowding out private investments. In fact, in the long run, when productive capacity can change, a higher level of output, driven by expansionary fiscal policies, determines a higher level of investments.

Then, focusing on what types of fiscal policies are more efficient in terms of output and investment growth, we demonstrate that a permanent change in taxes and transfers generates the lowest influence on output and thus on investments.

On the contrary, a permanent change in the rate of growth of public investments – targeted towards strategic sectors and focused on the promotion of innovation and mission-oriented policies – generates the largest effect in terms of output and investment growth. In particular, such public policies – by directly stimulating private business expenditure in R&D – engender the largest supermultiplier, which in turn produces the highest expectations (by business) of opportunities for growth and thus the largest effect on private investment. Moreover, such public policies – by stimulating key areas that promote innovation – facilitate the diffusion of technical progress in the economic system. When that occurs, innovation generates additional effects on the components of aggregate demand – that is, on consumption and net-exports.

Our findings suggest that governments should carry out expansive fiscal policies, since they generate positive effects on output and on investments throughout the business cycle. However, differently from what the IMF (2014) has affirmed in a paper entitled "*Is It Time for an Infrastructure Push? The Macroeconomic Effects of Public Investment*", we believe that fiscal policies targeted towards the financing of mission-oriented policies are the most efficient in terms of output and investment growth, as they generate the largest supermultiplier and the highest expectations of future growth opportunities – the key driver of *animal spirits* and hence private investment.

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Appendix 1.

The present appendix aims to show how the consumption function (equation 4) was built.

Equation (1.1) shows the total consumption (C) as the sum of the workers' (C_w) and capitalists' (C_Π) consumptions (equations 1.2 and 1.3).

$$C = C_w + C_\Pi \quad (1.1)$$

$$C_w = C_{aw}(i; X_w) + c_w * Y_{Dw} \quad (1.2)$$

$$C_\Pi = C_{a\Pi}(i; X_\Pi) + c_\Pi * Y_{D\Pi}. \quad (1.3)$$

Identity (1.4) shows the total disposable income (Y_D) as a sum of the disposable income of workers (Y_{Dw}) and capitalists ($Y_{D\Pi}$). Y_{Dw} and $Y_{D\Pi}$ are affected by the wage share ($\omega * Y$) and by the profit share ($(1 - \omega) * Y$), negatively by taxes imposed to workers (T_w) and to capitalists (T_Π), and positively by transfers provided to workers (TR_w) and those provided to capitalists (TR_Π) (please see identities 1.5 and 1.6).

$$Y_D \equiv Y_{D\Pi} + Y_{Dw} \quad (1.4)$$

$$Y_{Dw} \equiv \omega * Y - T_w + TR_w \quad (1.5)$$

$$Y_{D\Pi} \equiv (1 - \omega) * Y - T_\Pi + TR_\Pi \quad (1.6)$$

(T) is total taxes (equation 1.7). T_w and T_Π are composed of autonomous (T_{aw} and $T_{a\Pi}$) and induced components. t_w and t_Π are the tax rates applied by government to wages and profit-shares (see equations 1.8 and 1.9).

$$T = T_w + T_\Pi \quad (1.7)$$

$$T_w = T_{aw} + t_w * \omega * Y \quad (1.8)$$

$$T_\Pi = T_{a\Pi} + t_\Pi * (1 - \omega) * Y. \quad (1.9)$$

(TR) is total transfers (equation 1.10). TR_w and TR_Π are composed of autonomous transfers to wage (TR_{aw}) and profit ($TR_{a\Pi}$) earners. t_{rw} and $t_{r\Pi}$ are the transfers coefficients applied by the government to wages and profit-shares (see equations 1.11 and 1.12).

$$TR = TR_w + TR_\Pi \quad (1.10)$$

$$TR_w = TR_{aw} - t_{rw} * \omega * Y \quad (1.11)$$

$$TR_\Pi = TR_{a\Pi} - t_{r\Pi} * (1 - \omega) * Y. \quad (1.12)$$

Substituting (1.8) and (1.11) in (1.5) and, in turn, (1.5) in (1.2), we can write workers' consumption function through the equation (1.2.1),

$$C_w = C_{aw}(i; X_w) + c_w * (TR_{aw} - T_{aw}) + c_w * [\omega * (1 - t_w - t_{rw})] * Y. \qquad (1.2.1)$$

Simultaneously, substituting equations (1.9) and (1.12) in (1.6) and, in turn, (1.6) in equation (1.3), we can represent the capitalists' consumption function by means of the equation (1.3.1),

$$C_\Pi = C_{a\Pi}(i; X_\Pi) + c_\Pi * (TR_{a\Pi} - T_{a\Pi}) + c_\Pi * [(1 - \omega) * (1 - t_\Pi - t_{r\Pi})] * Y. \quad (1.3.1)$$

Substituting equation (1.2.1) and (1.3.1) in (1.1) and, for the sake of simplicity, assuming the condition shown in equation (1.13),

$$C_a(i; X_w; X_\Pi) = C_{aw}(i; X_w) + C_{a\Pi}(i; X_\Pi), \qquad (1.13)$$

we can write the total consumption (C) as follows in equation (4):

$$C = C_a(i; X_w; X_\Pi) + c_w * (TR_{aw} - T_{aw}) + c_\Pi * (TR_{a\Pi} - T_{a\Pi}) +$$
$$+ [c_w * \omega * (1 - t_w - t_{rw}) + c_\Pi * (1 - \omega) * (1 - t_\Pi - t_{r\Pi})] * Y \qquad (4)$$

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