A Market-Financed and Growth-Enhancing Investment Plan for the Euro Area

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Abstract

In this article we analyse the problem of public debt-to-GDP stability in the Eurozone within the framework provided by Domar (1944) and Pasinetti (1997)

We suggest that a feasible solution might be the realization of a market-financed, growth-enhancing investment programme, which would be particularly welcome because of the positive short- and long-term repercussions it would have on GDP growth and the stabilising effects on interest rates. Some simulations allow us to quantify these effects.

The consequences of the COVID-19 pandemic further reinforce our policy implications in terms of public debt sustainability.

JEL Classification: E65, F34, F36

Keywords: Fiscal policy, investment plan, GDP growth, public debt-to-GDP stability, public debt sustainability.

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1. Introduction[1]

In this article we discuss the economic policies that have characterised the long crisis of the Eurozone over the last decade. In particular, we focus on the EU penchant for austerity during this period, an inclination that was also due to the fact that the EU institutions used incorrect estimates of fiscal multipliers. Within this context we analyse the problem of public debt-to-GDP ratio stability using the framework initially defined by Domar (1944) and Pasinetti (1997).

This paper extends such a framework in order to consider, together with the role of fiscal policy, interest rate and GDP growth in stabilizing public debt. In addition, we look at the role played by agents' heterogeneous expectations relative to the variables mentioned above so we can determine the public debt sustainability equation.

Within that setting it will be possible to analyse the likely effects of the adoption of a market-financed, growth-enhancing investment plan. This would have the merit of increasing GDP growth both in the short and in the long run and therefore of stabilizing, or even reducing, the public debt-to-GDP ratio. This is even more necessary after the outbreak of the Covid-19 pandemic, which will cause an unprecedented decline in GDP in 2020, accompanied by a huge national public deficit and a significant increase in public debt (European Commission, 2020; OECD, 2020). Eurozone countries cannot be left alone in their efforts to adopt the appropriate recovery policies to address this major symmetric shock (albeit with inevitable asymmetric effects). This conclusion stems also from the consideration of the growing risk of being exposed to market attacks, amplified by possible downgrades of some national public debt by rating agencies and a possible future weakening of the ECB's protective umbrella.

Marelli and Signorelli (2017a) suggest that in order to assure the survival of the euro area in the long run it would be necessary to carry out some crucial and unavoidable reforms. Thus, it would be wise to introduce a quantitatively significant market financed public investment plan for the euro area (at least 5% of Eurozone's GDP, to be realized within three years). This idea becomes even more relevant in the presence of very low interest rates on debt – such as the ones experienced in the Eurozone – suggesting that investment will certainly be capable of producing a net positive reward. This paper incorporates the proposal mentioned above in the framework for public debt stability considered by Della Posta (2018), who argues that fiscal austerity had a double negative effect on both interest rates (increasing them) and GDP growth (decreasing it).

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Such a market-financed investment plan is necessary for all Eurozone countries. In order to favour political consensus, it should be implemented according to countries' population (or GDP). We suggest financing it with Eurozone bonds whose debt service could be paid by each member State (so that only interest payments will be computed in national public deficits). We also argue that the plan that we are proposing would be particularly welcome for the stabilizing role it would play on domestic public debt. Firstly, thanks to the increasing effect on GDP growth and secondly - against the perceived common wisdom - the plan's reduction effect on the sustainable interest rate. We will also consider other favourable effects such as the provision of a much-needed euro area safe asset that would help reduce the government-banks 'doom loop' and the fact that the investment plan might also act as a catalyst for the restoration of a pro-European sentiment.

It should be stressed that the proposed plan would not imply any direct commitment of euro area (or EU) member states to support the highly indebted ones. It would just mean creating the conditions for growth-enhancing policies that will, indirectly, determine a stable (or declining) debt ratio, once well-designed investment plans could successfully be financed by the market. Such conditions will increase the overall sustainability of the Eurozone.

The recent Covid-19 crisis further increases the need for a Eurozone market-financed investment plan, i.e. the need to increase the public expenditure component with the highest multiplier to favour both recovery from a deep recession and the sustainability of public debt in the new situation of much higher public debts; in Baldwin and Weder di Mauro (2020) several economists call for rapid political action to mitigate the economic damage of the pandemic.[2]

The paper is structured as follows. Section 2 illustrates the deeply negative economic and social impact of the long crisis on aggregate demand, and especially on investment, due to fiscal austerity; Section 3 discusses the feasibility of a euro area investment plan. Section 4 presents the model we are going to use in order to discuss and quantify the stabilizing effects of such a plan. Specifically, based on previous results regarding the negative relationship between fiscal austerity and GDP growth, and the positive relationship between fiscal austerity and interest rates, it suggests that an investment plan would

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[2] The European Council meeting on 23 April 2020 agreed on a package that included several actions: a) the 100 billion euro SURE fund (Support mitigating Unemployment Risk in Emergency), aimed at subsidising European workers who have lost their jobs; b) the loans to small and medium-sized companies to be disbursed by the European Investment Bank for an amount of 200 billion euro; c) the specific loans of the European Stability Mechanism for an amount of 240 billion euro to the financing of direct and indirect health expenditure. And, the potentially most important and innovative instrument, the so-called "Recovery Fund" that could also make possible an adequate European recovery and growth and favour the sustainability of the national debt, but will depend largely on the overall amount and the detailed design, including the resources dedicated to investments "latu senso"; however, at the moment (May 7, 2020) its precise characteristics are still highly uncertain both in terms of the total amount of resources collected on the market and rules for their distribution to countries with loans and transfer.

produce a "multiplier effect" and a "real wealth effect" on GDP growth and a "sustainability effect" on interest rates. The latter being one of the main findings of the paper. Section 5 includes some concluding remarks.

2. The long crisis and the "self-defeating" fiscal austerity

A double crisis struck European countries over the last ten years, in particular the countries of the Eurozone located on the periphery: (i) the world financial crisis originating in the United States and causing the Great Recession (2008-09); (ii) the sovereign debt crisis contributing to both a second recession (2010-13) and a subsequent weak recovery. Although in 2018 the real product of most Eurozone countries returned to, at least, pre-crisis levels (except for Greece and Italy), the rate of growth has generally been much lower compared to the United States; not to mention emerging countries (see Table A1 in the Appendix).

The long crisis was also caused by the uncertain, delayed and – at least in some cases – wrong responses by the EU institutions. This approach has been dubbed "*too little too late*".[3] In the early stage of the sovereign debt crisis (2010-11) the reaction to the shock hitting Greece and other peripheral countries was cumbersome. Crisis management tools were not readily available and there were different opinions on how to tackle the difficult situation. It had taken some time to introduce the "bail out" funds (the provisional *European Financial Stability Facility*, followed by the *European Stability Mechanism*); and then the early decision on the opposite "private sector involvement" put financial markets under stress. This showed that the "risk-sharing" assumption characterizing the first decade of the euro's life was actually false. Furthermore, a new risk – additional to the one relative to default - made its appearance: the "redenomination risk", i.e. the possibility that a EMU member country could abandon the euro or that the whole monetary construction could disintegrate. This is the reason why the spreads on the interest rate of sovereign bonds of peripheral countries increased over the years 2010-12, precisely when fiscal austerity policies started being adopted (see Figure A1).

The situation seemed to improve only when monetary policy became progressively accommodative – under Draghi's presidency – with interest rates reaching the zero level (or becoming even negative in the case of overnight deposits) and with the adoption of several unconventional measures. Two of these measures are particularly of interest. Firstly the OMT (*Outright Monetary Transactions*) plan, adopted in September 2012, was fundamental in reducing the spreads on sovereign bonds of peripheral countries and in "saving the euro", as promised by Draghi in a famous speech (July

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[3] As for a discussion of the wrong European policies see also Marelli and Signorelli (2017b).

2012). Secondly the QE (*Quantitative Easing*), introduced in 2015, tried to increase the inflation rate (close to zero in 2015-16) and help the economic recovery. On looking at these, it has been President Draghi's ability to make possible the approval of such measures, despite both the opposition of the German representative in the ECB's Council (at least on some occasions) and that of statutory limits, i.e. the impossibility for the ECB to act explicitly as "lender of last resort" for the states (a key flaw of the monetary union, also according to De Grauwe, 2013).

The crucial problem was that monetary policy did not find any support from fiscal policy.[4] By reversing the causality link, the EU institutions interpreted the rise in public deficits and debt as the main cause of the crisis, while it was merely the most evident consequence. In fact, the original financial imbalances were in the private sector, with very high private debt over GDP ratios (in the United Kingdom, Ireland, Spain, etc.) and many private banks (in Germany, France, etc.) exposed to the debts of peripheral countries. In this situation, during crisis periods, sudden capital outflows may happen, causing imbalances in the Eurozone's payment system (Acocella, 2016, Beker and Moro, 2016).

EU institutions were in a state of confusion. A situation most likely fuelled by surrendering to ideological driven presumptions. For example, justifying the unconventional notion that the fiscal cheating employed by the Greeks provided evidence that the process of European monetary integration characterised by the fear for fiscal instability was fully justified. The confusion encountered by the EU institutions led them to adopt *austerity* policies, not only imposed on the countries assisted by the "troika", but on all countries of the euro area. These policies reinforced fiscal rules, including the Stability and Growth Pact, the Fiscal Compact, the Six Pack and the Two Pack. Not surprisingly the reduction of public expenditure (in particular investment) together with the increase (in some cases) of taxation, implemented in the middle of a severe economic crisis, resulted in pro-cyclical policies, thus aggravating the recession or weakening the recovery (Blyth, 2015, Holland, 2016).

The mistake was also caused by incorrect estimates of the fiscal multipliers. These are not generally low, as assumed some years ago, but – especially during recessions and when interest rates reach the zero-lower bound – they may be significantly greater than one (as explicitly recognized by Blanchard and Leigh, 2013 and IMF, 2012). Auerbach and Gorodnichenko (2012) also emphasized the high values of fiscal multipliers in the US economy.

The problem is even worse when several countries consolidate at the same time. Auerbach and Gorodnichenko (2013) showed the empirical relevance of fiscal spillovers among OECD countries, i.e.

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[4] It should be recalled that in a similar zero lower bound (or liquidity trap) situation, J.M. Keynes observed that monetary policy was ineffective and argued in favor of the adoption of expansionary fiscal policies. Recently, in some of his public speeches, also Draghi stressed a similar concept, especially for countries with "fiscal space".

they observed that fiscal stimulus in one country is likely to have large and significant effects on output in other countries; moreover, the fiscal multipliers are even larger in recessions. Empirical research is backed by theoretical models that are alternative to the neoclassical perspective (generally supportive of austerity approaches): for example, Deleidi and Mazzuccato (2019), moving from a classical/Keynesian and a post-Keynesian perspective, elaborate on the "Sraffian Supermultiplier", i.e. a model that accounts for both the multiplier and accelerator effects, in which aggregate demand influences output in both the short and long-run, so that expansionary fiscal policies generate positive and persisting effects on economic growth. Since private investment depends on effective demand and technical progress, any permanent increase in public investment causes an increase of economic growth; however, rather than generic investment (e.g. in infrastructures), "mission-oriented" public investment and innovation policies – that stimulate private investment in R&D – are the most apt to reinforce economic growth.[5]

In any case, during the crisis years the traditional Keynesian effects certainly dominated over possible – but unlikely, considering the existing situation – "non-Keynesian effects" of fiscal adjustment (Ricardian equivalence, credibility effect on interest rates, positive expectations deriving from improved public accounts). As a matter of fact, the so-called "expansionary austerity" has been an illusion.[6]

The paradox is that austerity measures produced adverse results even for the public accounts and the sustainability of public debt. Such measures were, in fact, "*self-defeating*" – as initially declared by Krugman (2010) – because the fall in the denominator of the relevant ratios (the GDP) was larger than the reduction in the numerator. Nuti (2013) showed, with a simple algebraic proof, that – assuming a value of the fiscal multipliers of 0.9 (i.e. the lower bound of the revised estimates by Blanchard and Leigh, 2013) and the 2012 public debt-to-GDP ratios for different countries – fiscal consolidation caused "perverse" outcomes (i.e. an increase in the mentioned ratios) in Japan, Greece, Ireland and Italy. By assuming the upper bound of the mentioned estimates (1.7), Nuti shows that a perverse consolidation occurred also in France, the UK, Spain, Germany, Hungary, Austria, the US, the Netherlands and Albania.[7] The latter situation would have occurred in many other countries if even greater values of the

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[5] A clear example of how public spending, in particular R&D investment, influences innovation in the broader civilian economy is provided by defence-related spending (see Mowery, 2010 and 2012 for a discussion of the significant differences among OECD economies in the structure of the defence-related R&D programs). On the supermultiplier see also Palley (2018).

[6] Even in the peripheral countries where GDP growth has accelerated over the last three or four years – such as Ireland, Spain and more recently Portugal – the recession might have been less deep and social pain less dreadful, had fiscal policy been more accommodative.

[7] That is in all countries with a public debt-to-GDP ratio over 60%. The analytical condition for a "perverse fiscal consolidation" to happen is that the multiplier is greater than the inverse of the country's public debt-to-GDP ratio. In other words, "fiscal consolidation works only in those countries that, having a sufficiently low public debt-to-GDP ratio, do not

multiplier (for example 2.6, as found by Batini et al., 2012) are assumed. Nuti stresses that what is important is the "weighted average of fiscal multipliers applicable to the composition of the fiscal package", given that investment expenditure normally has higher multipliers. The conclusion is that, although even unproductive investment would be less detrimental than fiscal consolidation, productive investment would be the best solution to achieve debt sustainability in highly indebted countries.

Rather than in the deficit-to-GDP ratios, that tended to decrease below the required 3% threshold, although with different pace in the various countries (see Table A2), the self-defeating effect is most evident in the debt-to-GDP ratios, that continued to increase until recently in most countries (Table A2). Only Germany was able to exhibit a significantly decreasing trend. Notice also that it is extremely difficult, on economic and social grounds, to increase the primary balances during either recessions or slow economic recoveries, since at least the automatic stabilizers should be allowed to act. Moreover, as already recalled above, in the initial stage of the crisis, public expenditure increased in many countries because of the public bail out of private banks.

So fiscal austerity was totally inappropriate given the severe economic crisis that was hitting Europe (austerity policies are also severely criticized, among others, by Boyer, 2012, Callinicos, 2012 and Konzelmann, 2014).

Moreover, it is not clear why it should be assumed that financial markets cannot attach more importance to the growth perspectives of a country than to the fulfilment of a numerical requirement (such as a balanced budget or the Stability Pact's 3% ceiling). Thus interest rates may well remain high in some countries, thereby exacerbating the self-defeating effect. It should be further recalled that, contrary to the usual features of central banks, the ECB is not a "lender of last resort" for states and, therefore, it has much less power to affect both interest rate levels and cross-national interest rate differentials (spreads).[8] Furthermore the reduction of the debt-to-GDP ratio depends on the growth of *nominal* GDP. Hence the situation recently experienced of low inflation, or even of deflation, makes fiscal adjustment more difficult.[9]

In this case high GDP growth might well be a solution to the debt sustainability problem (see Della Posta, 2018 for a thorough analysis of the role played by GDP growth in the euro area crisis). Some

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actually need a consolidation" (Nuti, 2013, p. 1). Similar conclusions, about the positive effects of government spending on the reduction of the debt-to-Gdp ratio, were obtained by Leão (2013).

[8] A different type of central bank would be able to keep down interest rates despite high levels/trends of public deficit and debt (see Japan as an example). However, since Draghi's Presidency, the ECB interventions on the bonds' secondary markets and other unconventional measures and key announcements were able, in an indirect way, to reduce the spreads and lower the interest rates (also thanks to a well- designed forward guidance).

[9] In many instances in the past a crucial role for the stabilization of the public debt-to-GDP ratio has been played also by the inflation rate.

previous historical examples - including the European countries after World War II, or the USA under the Clinton administration, after the deficit produced by the previous Reagan government - also make clear that growth, rather than fiscal austerity, helped redress fiscal balances. In particular, as reported by Collignon (2012), Bohn (1995, 2008) shows that in the USA, over the last 200 years, the public debt-to-GDP ratio has been kept on a non-explosive path thanks to the average GDP growth being larger than the average interest rate on it. This is also in line with what Domar argued: "the problem of the debt burden [is] essentially a problem of achieving a growing national income" (Domar, 1944, p. 822).[10] Empirical evidence of the stabilizing role of fiscal policies on the public debt-to-GDP ratio is highlighted by McCausland and Theodossiou (2016) who consider episodes of fiscal contractions in 11 OECD countries over the period 1881-2011, finding evidence that the public debt-to-GDP ratio deteriorated rather than improved.

Increasing GDP growth may require a domestic stimulus on the aggregate demand coming from fiscal policy and/or the introduction of structural reforms on the supply side. In the euro area only the second option has been followed,[11] but it could be questioned whether a long term response on the supply side[12] may be appropriate when the shock hitting the economy in the short term is relative to the demand side. Even from a long run perspective neoliberal approaches based on liberalisations and privatisations are insufficient because a more ambitious package of structural policies is needed. Such policies have to be based on investment in infrastructure, new technologies, R&D and human capital, in order to support the anaemic productivity growth (see Cappellin *et al.*, 2017, Mazzucato, 2014). Deleidi and Mazzuccato (2019), emphasize explicitly the role of "public investments targeted towards strategic sectors and focused on the promotion of innovation and mission-oriented policies" (Deleidi and Mazzuccato, 2019, p. 25). In a subsequent paper, Deleidi et al. (2019) empirically estimate fiscal multipliers for 11 Eurozone countries for the 1970-2016 period, finding values larger than 1 and showing that public investment produces a permanent and persistent effect on the level of output. As for the long-run consequences of aggregate demand shocks, many recent studies have detected significant persistence; for example,

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[10] A different view, however, is proposed by Reinhart *et al.* (2015), who argue instead that the main role in favoring the public debt-to-GDP reduction has been played by low, and quite often even negative, real interest rates.

[11] It is certainly understandable that expanding fiscal policy in the middle of a crisis that was considered as driven by a fiscal divergence (as in the case of the original Greek shock) might not appear as a reasonable solution. But in most Eurozone countries this has not been the case, as we have argued above.

[12] According to Eggertsson et al. (2014), structural reforms may even have a negative impact if they stimulate deflationary expectations.

Girardi et al. (2018)[13] discover persistence also in instances of demand *expansion*, not only of negative shocks (as found in previous literature: see, for example, Yellen, 2016).

A key macroeconomic problem experienced by several European countries is a lack of aggregate demand over a long period. This observation is confirmed by the evidence that many of these countries simultaneously endure large and persistent output gaps. Estimates of the potential growth rates, output gaps, and cyclically adjusted government accounts are presented and discussed in several European Commission reports (e.g. European Commission, 2014). Even by 2016, many countries were still handicapped by output gaps despite their economies being some years into their recoveries (not only in the peripheral countries but also in France and other countries). Additionally, in recent years some severe critiques have been raised against the model and methodology used by the EU Commission for its calculations of output gaps, which tend to underestimate the magnitude of the economic cycle by assuming pronounced hysteresis effects.[14] Notice that wrong policy implications derive from this procedure, attaching too much importance to structural policies than to aggregate demand management. Moreover, an underestimation of potential GDP produces too low an output gap, which in turn implies too high structural deficits, thus requiring an excessive budgetary adjustment (under the Fiscal Compact rules). The perverse outcome of this approach is that such tough fiscal consolidations have had permanent effects, because fiscal policy exhibits strong hysteresis effects (Fatas and Summers, 2017).

In facing the Covid-19 crisis (which is due to both a supply and a demand shock) we should not repeat the mistakes that have been made in the past. Several authors are already suggesting a coordinated fiscal stimulus (Baldwin and Weder di Mauro, 2020), including a key role for the public investment expenditure (Botta et al., 2020).

3. The need for a fiscal stimulus: a large euro area-wide, market-financed investment plan

In many Eurozone countries the repeated recessions and weak recoveries have had dramatic effects on labour markets, especially on young people. As for total unemployment rates (UR), in several countries they reached two-digit rates and have been particularly persistent; even in countries where they recently decreased, they are generally higher compared to pre-crisis levels. Of course the longer and deeper the stagnation is, the more profound is also the impact on the potential output: cyclical

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[13] The empirical investigation refers to 34 OECD countries between 1960 and 2015. Highly and significant persistent effects are found not only on the GDP level, but also on capital stock, employment and participation rates. The conclusion is that hysteresis is a pervasive phenomenon in market economies.

[14] See Cottarelli et al. (2014). For example, over the years 2008-2013 about 70% of the Eurozone's fall in GDP was considered as structural (i.e. connected to a loss of potential output) and only 30% as cyclical, an estimate that seems largely unrealistic.

unemployment is likely to become structural and persistent. Thus, fiscal stimuli on aggregate demand should be necessarily accompanied by structural policies, for instance active labour market policies to fight structural unemployment.

In any case, the adverse cyclical conditions also had profound effects on the living conditions and on the social and political environment (as we shall discuss also in the final section, devoted to the concluding remarks). In particular, the rising inequalities, also driven by an unregulated globalization process (see Fadda and Tridico, 2017), led to a growing opposition, manifested not always in social conflicts, but rather in political movements supporting populist or nationalist approaches.

As an alternative to the generalised fiscal stimulus suggested by Eichengreen (2012), Germany should play the role of "the Engine of Europe", but mostly because of Germany's high propensity to export, they do not seem willing to take on this role; conversely the USA has not shied away from being "the Engine of the World" (in fact they were prepared to take on large current account deficits). As a matter of fact, the crisis has also been worsened by a lack of macroeconomic coordination: tight austerity has been imposed on debtor (Southern) countries while creditor (Northern) countries continued to follow balanced-budget policies, with huge trade surpluses in the case of Germany (see De Grauwe, 2013, Heise, 2015).

Paradoxically, excluding 2009 i.e. the year of a large decline in world trade, in more recent years it was not external demand that caused the unsatisfactory economic growth in peripheral countries, despite the deep imbalances between the German surpluses and the current account deficits in the periphery. In fact, in recent years exports have generally improved in the Eurozone's periphery, also thanks to the "internal devaluations", i.e. reductions in (relative) prices and wages, that of course contributed to the deterioration of social conditions[15], but were a substitute for explicit devaluations (not possible within the euro area). We also notice that for low-competitive countries it would be preferable to reduce unit labour costs by increasing productivity (which requires more investments and R&D expenditure), rather than by cutting wages (that could also cause deflationary pressures). In any case, the current account of the balance of payments lastly became positive in almost all the peripheral countries of the Eurozone (the only exception is Greece, where the deficit has however largely decreased).

On the contrary, the real problems actually concerned internal demand with consumption and even more significantly investment (together with public expenditure because of the mentioned austerity) as the integral weakness. Over the crisis period, total investment has collapsed by about one third in the peripheral countries of the Eurozone, and they are still much lower than the 2008 levels. What is

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[15] Poverty has especially spread in Southern European countries (Mussida and Parisi, 2019).

unjustifiable is that even public investment has been deeply cut, thereby exacerbating the pro-cyclical behaviour of fiscal policies (see Table A4).

A reasonable way out, as we suggest in this paper, is the adoption of a large Eurozone public investment plan. Such a plan can have a double economic benefit. In the short run (with possible persisting demand effects also in the long run) it supports aggregate demand, production and employment. As a matter of fact, through the multiplier and positive expectation effects, it can also stimulate consumption and favour significantly the realisation of additional private investment, with a remarkable multiplicative effect on the overall (public and private) investment and GDP. A second economic benefit can be obtained in the long run, since it raises productive capacities, potential output and productivity[16]; thus it will be self-financed, thanks to the increase of future incomes and tax receipts (this is the motivation underlying the "golden rule" proposal for the balance of public budgets).

It should also be considered that the current encouraging monetary conditions – zero interest rates (or around 2% interest rate on the long term sovereign debt of peripheral countries) – certainly allow policymakers to find investment projects whose rate of return exceeds the cost of financing (see also Micossi, 2016, De Grauwe, 2017). We do not necessarily refer here to large infrastructure projects or public works, that are often characterized by long planning and implementation times as well as by budgets continuously revised upward. We rather mean a variety of "micro-investments" spread over the territory such as environment protection, safeguard of the territory, anti-seismic interventions, energy efficiency, social housing, hospitals and schools building and renovation, local transport, tourist infrastructures, and many others.[17]

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[16] An investment plan exhibits a much greater growth impact than structural reforms also according to De Grauwe and Ji (2016).

[17] To be more precise on the eligible sectors, we can for instance refer to the EU regulation on the "European Fund for Strategic Investments", approved by the European Parliament and the European Council on 25 June 2015 (Regulation 2015/1017) within the Juncker Plan (this plan is discussed below), that mentions explicitly the following fields: (a) research, development and innovation; (b) transport infrastructures and innovative technologies for transport; (c) energy infrastructures, energy efficiency and renewable energy; (d) information and communication technologies infrastructures; (e) environmental protection and management; (f) education and training; (g) health and medicine; (h) SMEs; (i) cultural and creative industries; (j) urban mobility; (k) social infrastructures and the social and solidarity economy. On the other hand, the proposed "InvestEU Programme" aims to provide a budget guarantee to attract private investment in the following policy areas: (i) sustainable infrastructure (sustainable energy, digital connectivity, transport, circular economy, water, waste and other environment infrastructure); (ii) research, innovation and digitisation (research and innovation, taking research results to the market, digitisation of industry, scaling up larger innovative companies, artificial intelligence); (iii) small businesses (small and medium-sized companies SMEs, small mid-cap companies); (iv) social investment and skills (skills, education, training; social housing, schools, universities, hospitals; social innovation; healthcare, long-term care and accessibility; microfinance; social enterprise; integration of migrants, refugees and vulnerable people). The previous lists are interesting because they qualify as investment even certain kinds of current spending, such as education and health (needless to say, health spending is essential also to challenge medical emergencies such as the Covid-19 pandemic); regrettably, we must remark that both of them have been cut in the last decade in many EU countries, thus hindering human capital accumulation and hence economic growth.

Of course, the EU institutions – the Commission with the help of the European Investment Bank – should prepare as detailed a list as possible of the sectors eligible for financing. Well-designed institutional arrangements at all stages of the process are essential to ensure the effectiveness of the plan. Not only should the EU institutions verify the compliance with the stated list and requirements (to exclude any sort of "creative accounting") before projects are actually carried out, but rigorous checks and assessments (*ex-ante*, *in itinere*, *ex-post*) on costs, construction times and quality of the public works should be performed. To overcome the likely opposition from Germany and Northern euro area countries, the resources available for this plan could be allocated to the Eurozone's countries in proportion to their population or even to their GDP (if the first alternative is not feasible). Some specifications can be postulated to set an incentive-based framework: for example, after the completion of the investment projects, the judgement of the EU institutions on the quality of the projects should be used as an input into the decision on future resource allocations within this plan.

After all, such an investment plan, to be realized with the active participation of euro area partner countries, might well be interpreted as a form of euro area cooperation and solidarity also from a different point of view, since it would be one possible way to provide some technical assistance to weaker euro area countries and help creating the conditions for their development (Buti et al., 2017, European Commission, 2017a).

It is worth recalling that the small "Investment Plan for Europe" (so called "Juncker Plan")[18] introduced in 2015 and the following larger "InvestEU Programme"[19], proposed for the period 2021-2027, are interesting moves in the right direction, addressing the lack of overall (private and public) investment in the EU[20]. However, they are also quantitatively insufficient in addressing the macroeconomic needs, particularly after ten years of a remarkable "cumulative investment gap"[21], not to

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[18] The so-called "Juncker Plan" has the objectives of (i) removing obstacles to investment, (ii) providing visibility and technical assistance to investment projects and (iii) making smarter use of financial resources. It consists of the following three pillars: 1) the European Fund for Strategic Investments (EFSI), which provides an EU guarantee to mobilise private investment; the Commission works together with the European Investment Bank (EIB); 2) the European Investment Advisory Hub (a joint venture with EIB) and the European Investment Project Portal which provide technical assistance and greater visibility of investment opportunities, thereby helping proposed investment projects become a reality; 3) improving the business environment by removing regulatory barriers to investment both nationally and at EU level.

[19] The "InvestEU Programme" builds on the model of the "Investment Plan for Europe" and it will bring together, under one roof, the European Fund for Strategic Investments and others 13 EU financial instruments currently available; in particular, the programme consist of (i) the InvestEU Fund, mobilising public and private investment using an EU budget guarantee; (ii) the InvestEU Advisory Hub, providing technical advice on investment projects needing financing; (iii) the InvestEU Portal, an easily accessible database that matches projects with potential investors worldwide.

[20] Notice that such plans referred to all EU countries, not only to the Eurozone.

[21] According to EU self-assessments, as for the "Junker Plan" (https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investment-plan-europe-juncker-plan/investment-plan-results_en) it provides a total guarantee of €33.5 billion (€26 billion of that guarantee comes from the EU budget and €7.5 billion from the European Investment Bank)

mention the huge impact of Covid-19 crisis. A much more powerful plan, to realize immediately, would be necessary. Marelli and Signorelli (2017a) proposed a plan of new public investments additional to the current national ones[22], for an amount equivalent to 5% of the Eurozone's GDP (i.e. worth about 500 billion euros), to be realized within three years (with a possible extension to five years). The investment plan could be financed either by Eurobonds related to the creation of a specific Eurozone budget and/or through a major involvement of the European Investment Bank, that might issue bonds to be purchased either by the market or, on the secondary market, by the ECB itself (such purchases were partially already made within the QE program). The direct involvement of the EU budget is at present not possible because of its limited size (about 1% of EU's GDP), although the principle has been accepted even by the European Commission.[23] Moreover, a budget for the Eurozone is totally absent; we recall that in the US, obviously due to a different historical context, the federal budget is more than 50% of the overall public budget (obtained by adding together the national budgets and the federal one). It is true that recently a sort of "Eurozone budget", named the Budgetary Instrument for Convergence and Competitiveness (BICC) has been approved for the first time, in view of the new Multiannual Financial Framework (2021-27), but with very limited resources (17 billion euro for the seven years starting in 2021) to be taken from the overall EU budget.

The creation of a Eurozone budget and the issue of Eurobonds (i.e. a common public debt issued at the Eurozone level) has been suggested in order to complete the Economic and Monetary Union and it is no longer considered a "taboo subject" in the European political debate. However, we have to admit that in the short run the creation of a Eurozone budget of a significant dimension appears to be politically unfeasible.

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for business and infrastructure projects, and the extended EFSI aims to unlock additional investment of at least €500 billion by the end of 2020, while as for the "InvestEU Programme 2021-2017" (https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investment-plan-europe-juncker-plan/whats-next-investeu-programme-2021-2027_en) is expected to trigger at least €650 billion in additional investment: we argue that both declared results and forecasts overestimated the impact in terms of really "additional" (private and national public) investment (it is highly probable that the realisation of a part of that private and national public investment occurred or will occur also without the "Junker Plan" or the "InvestEU Programme"); in any case, the overall amount of investment is still well below the pre-crisis amount for the whole Eurozone and especially in some countries. In addition, it should be stressed that the necessary overall level of (private and public) investment has to be well above the pre-crisis level also for compensating the huge amount of "cumulative investment gap" that occurred in the last decade; in other terms, the necessary amount for a significant GDP growth and net job creation in the Eurozone is well above the current and expected amounts and need for a significant additional role of public resources at Eurozone level.

[22] National investments should be further encouraged through the adoption of a "golden rule", advocated by many economists on several occasions (see for instance Blanchard and Giavazzi, 2004).

[23] See the Document "A Stabilization Function" within the Roadmap set in December 2017 (see European Commission, 2017a): the proposed "European Investment Protection Scheme" could get, in the proposal, some limited grant support from the EU budget; this budget can also provide some guarantees for issuing loans to provide the stabilization function. The principle to stabilize investments over time and to protect them (including infrastructure and skills development) in the event of large asymmetric shocks is suitable, but the hypothesised procedure is cumbersome and probably ineffective.

Some details in the design of the "Eurobonds" could overcome the opposition coming from Germany and Northern euro area countries. We already mentioned that the resources available for this plan could be allocated to the Eurozone's countries in proportion to their population or also to their GDP (if the first alternative is not feasible) and to increase the feasibility of the proposal, the interest expenditure on the issued bonds could be charged on the national budgets. The debt service will be limited, given the current and the future expected low interest rates; we can assume it, in a precautionary way, to be around 2% on 20-years maturity bonds. For an amount of 500 billion euros it is equivalent to 10 billion euros for the whole Eurozone.[24]

Obviously, a distribution of the collected resources according to population (or GDP) could affect the overall efficacy of the program, since investments may not reach the countries that need them most in sufficient magnitude to (permanently) boost growth and, conversely, investments in countries growing close to their potential may experience inflationary pressures.[25]

In order to reduce the disadvantages mentioned above, a simple dynamic programme design should be defined as follows: the total amount of potential resources collected from "Eurobonds" should be defined - and possibly updated – over a long time horizon (e.g. 30 years) but the proportionality to population (or GDP) of the resources distributed does not have to be respected year-by-year; in other terms, for example, in one year some specific Eurozone countries may receive more resources (compared to their share of population or GDP) than other countries;[26] however the latter countries will have more resources in the coming years when they may need them more. Therefore, the collection of resources year by year will be based on the annual agreement on the actual annual distribution, while in the long term the distribution of resources will respect the proportion of population (or GDP), unless the countries involved unanimously agree otherwise

We recall that "Project Eurobonds" were already proposed by Jacques Delors in the 1990s. Eurobonds have also been proposed more recently by many economists and politicians (for instance Juncker and Tremonti, Prodi and Quadrio Curzio) and there are different versions (see, for example, Quadrio Curzio, 2011, Frankel, 2015). It is important not to confuse the Eurobonds mentioned in our proposal with the "Stability Eurobonds" (sometimes known by different names), i.e. new bonds jointly

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[24] A more specific example could be helpful: Italy, that represents 17.5% of Eurozone's economy (this is the weight in ECB's capital), should pay 1.75 billion euro of interests each year, in front of 87.5 billion euro of new investments (to be realized within 3 to 5 years).

[25] We are grateful to an anonymous referee for raising this point.

[26] A further reason for creating a common fund is the very low and sometimes even negative interest rates on public debt, as is the case in Germany and some other countries. In any case, the introduction in the Eurozone of a safe asset, with a low but positive interest rate, could also be interesting for some German investors (e.g. insurance funds) who often complain about the negative interest rate of investments in the German Bund.

issued by Eurozone's countries with the key aim to (partly) substitute the national sovereign debt. In this instance there are several proposals and alternative versions. Almost all of them imply, in any case, at least a partial mutualisation of public debts, which is feared to weaken national fiscal discipline.

Van Aarle et al. (2018), however, shows that a "Eurobonds regime", that they compare to a "national fiscal discipline regime" would be capable of addressing the severe problem of non-linearities affecting risk premia and threatening the EMU.

The problem is that, at present, the political conditions for risk-sharing are not satisfied, since Germany and other core countries require instead a risk-reduction in the first place, namely a significant reduction of the public debt-to-GDP ratios of individual countries.

Some intermediate proposals have also been made, such as the "European safe bonds", that are formed from the senior tranche of a diversified portfolio of euro area sovereign bonds, but do not imply risk sharing[27], since a common warranty only applies to the new bonds issued at the European level (see Brunnermeier et al. 2016, Pagano, 2017). Many other more specific and (in some cases) radical proposals – such as a new Ministry of Finance of the Eurozone (supported also by the French President, Emmanuel Macron) or a new European Treasury (or also a "European Fiscal Institute" that could be an evolution of the European Stability Mechanism) – have been made within the discussion of more general reforms of the EU (and Eurozone's) governance (see among others Bénassy-Quéré and Giavazzi, 2017 and European Commission, 2017b).[28] Some possible reforms of the Eurozone are currently under discussion.

The financing of investment with new euro area bonds would have an additional quite relevant advantage, namely they would provide the euro area with a much needed "safe asset". As a matter of fact, it is recognized (Moscovici, 2017, Buti et al. 2017) that, while the European Banking Union and the implied 'bail in' would remove the risk that the imbalances of the banking system would be transferred to governments, the opposite risk, namely the one moving from government debt to banks, would be largely mitigated by the presence of a euro area-wide stabilizing safe asset. Currently any euro area stress would determine a capital flight towards the bonds that are believed to be more reliable, thereby exacerbating the problems of those who do not enjoy such a good reputation. Such an asset would also help properly structure a euro area yield curve, so as to facilitate the monetary transmission mechanism. Moreover, those bonds would become the 'financial interface' of the European economy and for that

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[27] This is also a drawback of the proposed instrument, since as Minenna (2017) puts it: "The lack of risk-sharing therefore leaves the door open for spreads to widen again in times of stress". A limited moral hazard is instead implied by the PADRE (Politically Acceptable Debt Restructuring in the Eurozone) plan, in which each Eurozone member's debt is reduced by the securitisation of its own share of ECB seigniorage (see Paris and Wyplosz, 2014).

[28] European Commission (2017a), following the well-known Report of the Five Presidents of 2015, has triggered deep discussions but also some critiques (see for example Marelli and Signorelli, 2017c).

reason they would occupy a significant position in the portfolios of international investors, who are always looking for good quality investment opportunities of different maturity structures, including long-term horizon ones.

While waiting for the more general, but difficult to realize, reforms of the euro's architecture, that are trying to make the Economic and Monetary Union more complete, including the introduction of a significant Eurozone's budget if we want the euro to survive[29], we think that macroeconomic policy should be quickly made more expansionary, by means of the proposed market-financed euro area large investment plan. We should stress once more that the Eurobonds we are proposing would be issued only to finance the (common) euro area investment plan and *not to* substitute national public debt, for which individual countries would still be fully accountable. As we have argued above, this plan not only would improve the economic and social situation, but it could also make national sovereign debts more sustainable, thanks to the improved growth prospects and the reduction of interest rates.

These positive effects will be formally shown and the improved stability area quantified in the theoretical model presented below.

4. The stability and sustainability conditions for public debt

Following Della Posta (2018), let us set the stage for the analysis of the effects that can be expected from the adoption of a euro area investment plan. The continuous time variation of the public debt-to-GDP ratio ($\frac{db_t}{dt}$) in the hands of the private sector can be described in Equation (1) as follows:[30]

$$\frac{db_t}{dt} = -s_t + (i - g)b_t. \tag{1}$$

The term s_t refers to the structural primary public surplus-to-GDP ratio at time t, given by the difference between government revenues and non-interest government expenditure. Variable i indicates

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[29] Most of the proposed reforms have been discussed in Chapter 7 of Marelli and Signorelli (2017a).

[30] Della Posta (2018) considers the more general equation:

$\frac{db_t^P}{dt} = -s_t - m_t - f_t + (i - g)b_t.$

In the equation above, $\frac{db_t^P}{dt}$ is the time variation of the public debt-to-GDP ratio which is held by the private sector, the variable $m_t = \frac{db_t^M}{dt}$ is the time variation of the public debt-to-GDP ratio which is held by the central bank, expressing then central bank's monetary solidarity (namely a situation in which the central bank is willing to play the role of lender of last resort by injecting money in order to prevent the growth of public debt-to-GDP in the hands of the private sector) and f_t is the financing coming from a possible source of federal solidarity like the European Stability Mechanism (ESM). He also shows how the stability condition reported above is obtained. Equation (1) above ignores both m_t and f_t by assuming them as equal to zero.

the nominal interest rate on public debt and g is the GDP rate of growth, that for the time being are both assumed to be constant. Variable b_t is the ratio between the existing public debt and GDP at time t, so that the term $(i - g)b_t$ is the growth-adjusted service on the debt as a ratio of GDP.[31]

For public debt to be stabilized, it must be that $\frac{db_t}{dt} = 0$. When that is the case, Equation (1) becomes, then: [32] [33]

$$s^* = (i - g)b^*, \qquad\qquad\qquad (2)$$

where the symbol * refers to the long term, steady state value of the variable on which it is applied. Any value of b^*, such that (2) is satisfied, will imply a stabilization of the public debt in the hands of the private sector, so as to avoid a public debt crisis.[34] Of course, if $g > i$, then the public debt-to-GDP ratio in the hands of the private sector would be decreasing, so that even a given primary public deficit-to-GDP ($s_t < 0$) might be fully compatible with a stable privately held public debt-to-GDP ratio. As it appears clearly from (2), the stability of the privately held public debt is under the control of both the fiscal and the monetary authority. The fiscal authority controls the primary surplus-to-GDP ratio, s, and the monetary authority (that may not necessarily be domestic, as in the case of the euro area) controls (at least partially) the interest rate on public debt, i. The latter, however, as we will discuss more thoroughly below, depends both on the reference rate, $\bar{\iota}$, chosen by the monetary authority itself and – even more significantly - on the risk premium required by the private sector.

Equation (2) says that what matters for public debt stability is not just the size of the public debt-to-GDP ratio (on which the euro area crisis literature has focused its attention), but also the interest rate,

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[31] The baseline of the simple model that we are using can be traced back to Domar (1944), Arestis and Sawyer (2008) and Hein and Detzer (2015). A similar model, although to address different questions, is also adopted by Della Posta (2017a) and Della Posta (2017b). Della Posta (2016) also studies the stability condition of public debt when analyzing the euro area crisis within a speculative attacks model. The model is also in the spirit of the approach followed by Ciccone (2002) and Nuti (2013).

[32] See also Buiter (1985) and Bohn (2008).

[33] See also the stability condition assumed by Bagnai (2018) and Nuti (2018) who, following De Grauwe (2016), ignore the role played by the interest rate and by the risk premium. Since they refer to the overall budget surplus or deficit, without distinguishing between primary deficit and service on the debt, their equation becomes: $s + ib^* = d^* = gb^*$, where d^* is the overall steady state budget deficit or surplus.

[34] It should also be noted, as observed by De Grauwe (2016), that a stabilized public debt-to-GDP is a necessary but not sufficient condition for avoiding the collapse of public debt. As a matter of fact, Collignon (2012) argues explicitly that a solvent but illiquid government, which is therefore incapable to have access to financial markets, may still be forced to default by a self-fulfilling speculative attack that pushes up the risk premium and the interest rate on its debt.

the GDP growth and the possibility to run the primary surplus which is necessary in order to repay it, s^*.[35]

A more general public debt-to-GDP *stability* condition, however, is the following:

$$s \geq s^* = (i - g)b^*. \tag{3}$$

Equation (3) suggests that in the absence of any constraints, a government would always be able to choose s in such a way that the stability of the ratio between public debt and GDP in the hands of the private sector is granted.[36] The public debt-to-GDP ratio will even decrease if $s > (i - g)b^*$. In that case, the reduction of b might also reduce i because of the possibly resulting lower default risk (Corsetti *et al.*, 2013, De Grauwe and Ji, 2013). Moreover, according to some authors, a sufficiently large primary surplus may also increase g, because the reduction of i would spread from the public to the private sector, thereby increasing investment (Corsetti *et al.*, 2013), and the lower future expected taxes resulting from the lower b might stimulate the consumption of the private sector (Giavazzi and Pagano, 1990, 1996). Both moves, namely a lower i and a larger g, would make the right side of Equation (3) flatter, thereby determining a higher critical level for the overall public debt level granting the stability of the public debt in the hands of the private sector. This is not our view, as we are going to argue in what follows.

4.1 Fiscal austerity and its effects on GDP growth and interest rates

Della Posta (2018) discusses the effects of fiscal austerity on GDP growth arguing that, contrary to what suggested above, GDP growth may become negative after a fiscal contraction for at least two reasons.

The first one is that fiscal austerity depresses the economy through the standard Keynesian multiplier, which is characterized by a value greater than 1 (Krugman, 2010, Blanchard and Leigh, 2013). This can be called the "fiscal multiplier effect".

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[35] As Della Posta (2018) recalls, the role played by the interest rate in stabilizing public debt had received a quite significant attention in the past. Pasinetti (1981, 1997), for example, referred to the concept of 'fair interest rate' meaning an interest rate that would allow the easy repayment of public debt by preserving the intertemporal distribution of income between borrowers and lenders. Needless to say, when the interest rate decreases so as to reach its zero lower bound, the central bank becomes powerless, and some additional tools have to be devised, as all central banks in the world have been doing in the recent past in order to face the crisis hitting their respective countries by adopting the so-called unconventional monetary policies.

[36] The role of the fiscal surplus in stabilizing public debt is also considered explicitly by Collignon (2012), who introduces a fiscal policy reaction function to public debt, as resulting from EMU fiscal rules.

The second suggests that when reducing public debt, the "wealth effect" on both consumption and investment decreases, thereby depressing the economy (Lerner, 1943 and 1948, Arestis and Sawyer, 2008, Eisner and Hwang, 1993, Ackley, 1951).

Both the fiscal multiplier effect and the wealth effect lead to conclude that a fiscal contraction may not be the right way to follow in order to solve a crisis.

A possible, simple way to represent the positive effect on GDP growth (g) by the fiscal multiplier and the wealth effect of a fiscal expansion realized through higher investment (I), then, can be expressed as follows in Equation (4):

$$g = \bar{g} + \delta I, \tag{4}$$

where $\bar{g}$ is the exogenous GDP growth that would obtain independently from a growth enhancing investment plan and δ is the parameter expressing the sensibility of GDP growth to investment.

Still Della Posta (2018) referring to Tamborini (2015), considers the possibility that the primary budget surplus (still as a ratio of GDP), s^*, which is required in order to stabilize the public debt-to-GDP ratio, b^* (for any given value of i and g) may go beyond the possibilities of the domestic economy, namely that the primary surplus-to-GDP ratio that a government can run meets an upper limit, that we indicate with $\bar{s}$.

In order to have a *sustainable* public debt-to-GDP ratio, then, the *sustainability* condition represented in Equation (5) below needs to be satisfied:[37]

$$\bar{s} \geq s \geq s^* = (i - g)b^* \tag{5}$$

The IMF identifies the issue of sustainability with "a situation in which a borrower is expected to be able to continue servicing its debts without an unrealistically large future correction to the balance of income and expenditure" IMF, 2002, p. 4).

The main point made by Tamborini (2015) is that the larger the primary surplus needed for debt stabilization, s^*, the larger the fraction of market participants who share the belief that such surplus nears the maximum level that a country can reasonably stand, from a social point of view, $\bar{s}$. In turn, such a widespread belief that reduces market's heterogeneity, increases the risk premium on public debt and the interest rate to service it. As Tamborini (2015) shows, this implies that the larger s^*, the larger the interest

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[37] Notice that while Equation (3) refers to a *stability* condition, Equation (5) refers to a *sustainability* condition.

rate, i, will be, so as to provide an explanation for the interest rate convex non-linearity identified by De Grauwe and Ji (2013).[38] The effect highlighted by Tamborini (2015) can be defined as "sustainability effect".

As already mentioned above, the interest rate can be thought as being composed by a benchmark risk-free interest rate (the reference interest rate that is fixed by the central bank), $\bar{\iota}$, and by a risk premium component. The resulting interest rate parity can be expressed, then, as in Tamborini (2015):

$$i = \frac{1+\bar{\iota}}{1-p} - 1 \qquad (6)$$

where $0 \leq p \leq 1$ is the probability of public debt default.

In turn, assuming that the private sector is composed by heterogeneous agents, such a probability of default would depend on the percentage of agents sharing the belief that the primary surplus required for public debt stabilization, s^*, has reached its upper feasibility limit, $\bar{s}$.

The probability of public debt default, then, depends also on the degree of uncertainty as to its sustainability. We can plausibly assume that the higher is the degree of uncertainty, the higher is the heterogeneity of market expectations, in which case there is neither a large or prevailing fraction of market participants who think that $\bar{s}$ is low, nor a large or prevailing fraction thinking that it is high.

Following Tamborini (2015), it can be assumed that the feasible upper limit $\bar{s}$ for the primary surplus is normally distributed and has a given mean (μ) and standard deviation (σ). This means that when s^* increases, the percentage of market participants who think that it has reached the feasibility limit $\bar{s}$ will also increase. The probability of default, then, varies with the difference between $\bar{s}$ and s^*. In particular, the risk premium (and the interest rate with it) will decrease when the difference between the two variables increases. A larger difference implies that agents' expectations of public debt default will become less homogenous and therefore less shared. So, the reduction of the market belief of public debt instability (thanks to the reduction of s^*) will induce a reduction of the risk premium on the interest rate. Such a variation implies a higher level of sustainable public debt.

From what precedes it can be concluded, still following Tamborini (2015), that the probability of default can be considered as determined by the cumulative distribution function of $\bar{s}$, whose value is included between a lower ($\bar{s}_{inf}$) and an upper ($\bar{s}_{sup}$) limit. Therefore, the higher s^*, the closer to 1 such

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[38] Della Posta (2017b) describes the model proposed by Tamborini (2015) in full detail.

a cumulative distribution function is, namely the larger the fraction of people who will believe that s^* is approaching $\bar{s}_{sup}$, the upper sustainability limit of $\bar{s}$.

Eq. (6) becomes, then:

$$i = \frac{1+\bar{\imath}}{1-F(s^*)} - 1,\tag{7}$$

where $F(s^*)$ is the fraction of people according to whom $\bar{s}_{inf} \leq s^*$ and which increases, then, with s^*,[39]

Eq. (7) is the market's reaction function to the value taken by s^*, to be compared with the government's reaction function to the value taken by i, given by Eq. (2) above.

From Eq. (2) above it turns out that a higher GDP growth reduces the primary surplus which is necessary to guarantee public debt stability, s^*. In turn, Eq. (7) shows that such a lower s^* plays an additional stabilizing role, due to the reduction of the risk premium on the interest rate. As a matter of fact, anything reducing s^*, by reducing the difference between s^* and $\bar{s}_{inf}$ and the agents' heterogeneity of expectations about the unfeasibility of the sustainability condition, would reduce also the risk premium on the interest rate.

This is precisely the case resulting from a euro area investment plan, as we are going to discuss below.

4.2 A simulation of the virtuous effects on both GDP growth and interest rates of a market-financed and growth-enhancing investment plan for the euro area.

The GDP growth-enhancing effect of the share of the investment plan undertaken in each single country can be represented by Equation (4), as already discussed above.[40]

By considering the "multiplier effect" and the "real wealth effect" on g, namely by substituting in Equation (2) the value of g from Equation (4) we obtain the government's reaction function:

$$s^* = [i - \bar{g} - \delta I]\, b^*.\tag{8}$$

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[39] This means that $F(s^*) = \int_{\bar{s}_{inf}}^{s^*} f(\bar{s})\, d\bar{s}$ (Tamborini, 2015).

[40] We might even consider the positive effect on the domestic country of the investments undertaken under the Plan in the other euro area countries, but doing this would not change the qualitative analysis and we don't do that, in order to keep the formalization at an essential level.

Considering jointly and simulating Equation (7) (the market's reaction function) and Equation (8) (the government's reaction function), then, we can compare the case of a high debt-low growth country (like for example Italy) with that of a low debt-high growth one (like for example Germany) and we can also show the beneficial effects of a growth-enhancing market-financed investment plan on the former.

The main idea is that the investment made possible by the market-financed emission of Europroject bonds (to be agreed and monitored at the euro area level) would increase GDP growth, thereby shifting the government's reaction function to the left. Such an increase improves the sustainability of the existing (national) public debt, as reflected by the negative component $-\delta I$ in Eq. (8). Additionally, the leftward shift of the government's reaction function, when s^* is reduced, narrows the difference between s^* and $\underline{s}_{inf}$, thereby favouring the reduction of the interest rate on public debt, as in the mechanism described by Tamborini (2015).

Our simulations show the stability areas of countries characterized by a relatively high public debt and a relatively low GDP growth, as well as for countries displaying the opposite features.

As shown in Figure 1, a high debt /low growth country like Italy, for example (as represented by $b = 130\%$, $g = 1\%$, and assuming $\mu = 7\%$ and $\sigma = 1.4$)[41] will enjoy a sustainable public debt as long as the primary surplus and the interest rate granting sustainability do not exceed respectively the values of approximately 7.358% and 6.66%. The steady state values of s^* and i, instead, are respectively about 1.3% and 2%.

On the contrary, a lower debt-higher growth country like Germany, for example (as represented by $b = 65\%$, $g = 2\%$, and assuming still $\mu = 7\%$ and $\sigma = 1.4$)[42], enjoys a government's reaction function which is both shifted to the left, namely characterized by a higher intercept (this is due to the higher GDP growth), and steeper than in the case with a higher public debt-to-GDP ratio.

In such a case, the country gets a steady state equilibrium which is characterized by values that are $s^* = 0\%$ and $i = 2\%$. It also enjoys a stability area that includes values for both the interest rate and the primary surplus that are much higher than in the case analysed before (respectively 8.216% and 14.64%), as it is easy to see still from Figure 1.

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[41] Following Tamborini (2015), to run our simulations we consider $\bar{\imath} = 2\%$, $\mu = 7\%$ and $\sigma = 1.4\%$. The choices of 130% for the public debt-to-GDP-ratio and 1% for the GDP growth are made to approximate the real data for Italy over the years 2016-18, respectively 134.8%, 134.1%, 134.8% for the public debt-to-GDP ratio (Eurostat) and 1.27%, 1.71%, 0.77% for the GDP growth (World Bank).

[42] The choices of 65% for the public debt-to-GDP-ratio and 2% for the GDP growth are made to approximate the real data for Germany over the years 2016-18, respectively 69.2%, 65.3%, 61.9%, Q4 (Eurostat), for the public debt-to-GDP ratio and 2.22%, 2.46%, 1.52% (World Bank), for the GDP growth. Thanks to an anonymous referee for helping us clarifying this point.

Figure 1 shows clearly, then, the much wider stability area in the virtuous case of lower public debt and larger GDP growth compared to the opposite one.

**Market's and government's reaction functions of
both a high debt-low growth country (Italy)
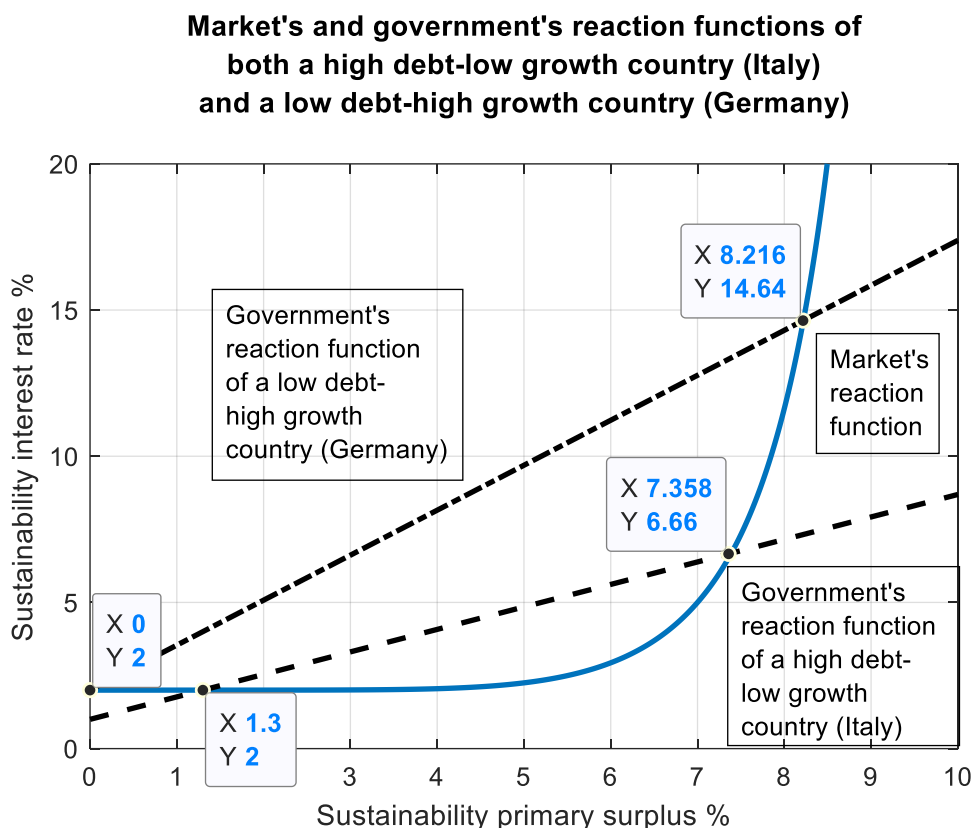and a low debt-high growth country (Germany)**

Figure 1

It is possible to see the effects of an investment plan on a high debt/low growth country by considering Figure 2, where it is assumed – for illustrative purposes only - that the overall effect of the investment plan increases GDP growth by 1%. As a result, the government's reaction function shifts to the left, thereby enlarging the stability area. The equilibrium sustainability primary surplus moves from 1.3% to 0%, while the interest rate remains unchanged at 2%. The region of sustainability, however, is enlarged significantly: it is granted for values of $s*$ and i respectively of 7.592% and 7.923%, compared to the case without investment plan of 7.358% and 6.66%. The economic intuition for such a result is easy to provide: a higher GDP growth allows public debt sustainability in steady state even when running almost no primary surplus (0% rather than 1.3%) while paying an interest rate on public debt of 2%. A primary surplus higher than 0%, then, would allow a reduction of the public debt-to-GDP ratio below 130%. Moreover, thanks to the higher GDP growth, public debt will be sustainable, and the system will converge back to the steady state even when a higher interest rate of 7.923% is charged by the market (compared to 6.66% without investment). Similarly, public debt will be sustainable even if the necessary

primary surplus to run increases to 7.592%, compared to 7.358% in the case without the investment plan. The conditions for fiscal sustainability, then, get relaxed and the economy becomes more resilient to future negative shocks.

Market's and government's reaction functions of a high debt-low growth country (Italy) with and without a growth-enancing investment plan
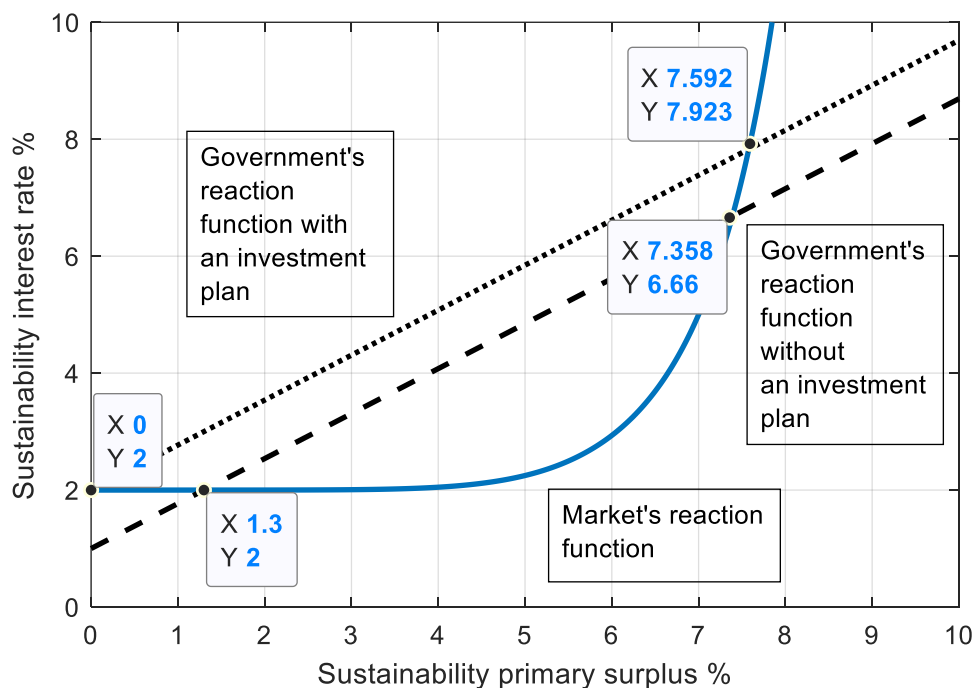
Figure 2

Tamborini (2015) considers the effects of different values of the standard deviation of the feasible primary surplus on the equilibria. He shows that greater variability leads to a higher risk premium (and thus a higher interest rate) for low values of the sustainability primary surplus. This is due to the fact that it is less certain that the government's primary surplus threshold is much higher. Similarly, he also shows that a greater standard deviation implies a lower risk premium (and interest rate) when the primary surplus takes a higher value, because it is less certain that the government is approaching the upper threshold. It might well be that an investment plan that is not well designed, inefficient or non-credible may lead to a lower standard deviation of the unknown value of the feasible primary surplus. Should that

happen, then, the effect of the investment plan could be partially or even fully offset by a shift of the market's reaction function to the left.[43]

Let us stress once more that the investment plan that we are proposing would not imply any direct commitment of euro area or EU countries to rescue high indebted countries. It would simply mean creating the conditions for some growth enhancing and interest rate reducing policies that would indirectly favour the solution to the problem of high public debt-to-GDP ratio countries. The investment projects will be monitored by euro area or EU countries. With this, the plan limits the solidarity mechanism to only the new level of euro area debt,[44] which is responsible for increasing GDP growth at the national level while also favouring the stabilization of the existing public debt without directly implying any role of lender of last resort for EU countries.

In other words, the risk for participating countries would remain on paper. This would be the case if an external institution centred around the European Commission was created, through which Northern euro area countries would supervise the quality of the market-financed investment plans. Northern euro area countries should realize that the umbrella provided by the euro area would be a costless way for them to continue making a significant part of the gains that they have been achieving so far (especially in terms of the contribution given by positive net exports to the aggregate demand on their domestic production).

Doing otherwise would imply giving up large financing opportunities that would be available from extra-European sources.

Euro area solidarity does not necessarily imply financing the investment undertaken by a "foreign" country (although belonging to the European Economic and Monetary Union) with domestic tax-payers' money. Instead, it could just mean to facilitate, or simply not to hinder, the financing facilities that would be originating in world markets and directed to a partner country.

Della Posta, Marelli and Signorelli (2019) point out that the investment plan described above will have a positive effect not only on GDP growth, interest rates and on public debt-to-GDP ratios, but also – and maybe even more importantly, thanks to the democratic consensus that they would be able to induce - on the fight against the current wave of populism - along the lines of what suggested by Rodrik (2018) and Stiglitz (2017) – and in the end on the perspectives themselves of the success of EMU and potentially of the EU. As a matter of fact, the policies of fiscal austerity discouraged euro-enthusiasts

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[43] Thanks to an anonymous referee for suggesting this point. Further research will be devoted to investigating the conditions under which this may happen.

[44] As already mentioned in Section 2, the euro area investment plan could allocate the new investments to individual countries in proportion to their GDP. Moreover, the service of such a debt could be paid by individual countries.

and increased the disaffection towards Europe of a large share of (mainly southern) European citizens. As for the citizens of northern euro area countries, they should realize that the true choice they are confronted with is not to either accept or decline growth-enhancing policies of the type we have discussed, but rather between the former and a growing probability of a breakup of the euro area, since over time no country will accept to remain in a union which imposes more costs than the benefits it provides.

5. Concluding remarks

We have discussed the deep impact of the long crisis that affected many Eurozone countries over the last decade. The long stagnation and weak recovery were also caused by the wrong or delayed policies of the EU institutions. The rate of growth has been very low and, in some countries, the real product was still below the pre-crisis levels even before the Covid-19 shock hit the whole world.

We have documented that the euro area crisis was accompanied by a collapse in aggregate demand (especially in investment, both private and public), so that structural policies are not sufficient to strengthen economic growth and something should be done to counteract the excessive austerity of the previous years.

Thus, we have discussed the effects of the implementation of a euro area, market-financed and growth-enhancing public investment plan. In using the framework proposed initially by Domar and adapted to represent the institutional setup of the euro area, we have focused on the stabilizing effects of such an investment plan. As a matter of fact, the latter would increase GDP growth and through this channel would also improve the financial conditions in the Eurozone. In particular, it will relax the constraint on the primary surplus that would be necessary to guarantee public debt stability of individual countries, thereby reducing the risk premium and exerting a further stabilizing effect on the value of the sustainable interest rate – a conclusion that runs against the common wisdom.

The political feasibility of the Eurozone investment plan that we are proposing – and that should be market-financed - an aspect that should favour its political feasibility - could be significantly favoured by a distribution of resources for public investment in member countries according to their population (or GDP) and, in addition, with the same distribution of the debt service on national budgets. In addition, an adequate assessment (*ex-ante*, *in itinere* and *ex-post*) of the investment projects and realizations would favour a better overall quality with additional positive effects on potential output dynamics and debt sustainability, also improving inter-nation confidence.

The plan that we are proposing will not only increase GDP growth, both in the short-run (aggregate demand stimulus) and in the long-run (permanent aggregate demand and supply-side effects), and enlarging the interest rate sustainability region, but – by gradually improving the overall Eurozone social situation – should also lessen the opposition towards the European integration process[45]. This will favour the introduction of further reforms in the governance and rules of the European Monetary Union, thereby making the survival of the euro possible.

The recent impact of Covid-19 pandemic crisis further increases the importance of our results and their policy implication, i.e. the need of a market financed public investment plan for Eurozone to favour a solid economic recovery and sustainable public debts in all member states.

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[45] This likely positive effect has been extensively discussed in Della Posta et al. (2019).

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Appendix

Table A1 – GDP growth rate in selected countries (2007-2020)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*
Germany	3.3	1.1	-5.6	4.1	3.6	0.4	0.1	2.2	1.7	2.2	2.5	1.5	0.6	-6.5
Ireland	5.2	-3.0	-6.4	-0.3	2.8	-0.3	0.2	8.8	25.2	3.7	8.1	8.2	5.5	-7.9
Greece	3.5	-0.4	-4.4	-5.4	-8.9	-6.6	-3.9	0.7	-0.4	-0.2	1.5	1.9	1.9	-9.7
Spain	3.8	1.1	-3.6	0.0	-0.6	-2.1	-1.2	1.4	3.8	3.0	2.9	2.4	2.0	-9.4
France	2.4	0.2	-2.9	2.0	2.1	0.3	0.3	1.0	1.1	1.1	2.3	1.7	1.3	-8.2
Italy	1.5	-1.0	-5.5	1.7	0.6	-2.3	-1.9	0.1	0.8	1.3	1.7	0.8	0.3	-9.5
Portugal	2.5	0.2	-3.0	1.9	-1.8	-3.3	-1.4	0.9	1.8	2.0	3.5	2.6	2.2	-6.8
Eurozone	3.1	0.5	-4.5	2.0	1.6	-0.7	-0.5	1.4	2.1	1.9	2.5	1.9	1.2	-7.7
U.K.	2.6	-0.3	-4.3	1.9	1.6	0.7	1.7	2.9	2.4	1.9	1.9	1.3	1.4	-8.3
EU	3.1	0.5	-4.4	2.1	1.7	-0.4	0.0	1.8	2.3	2.0	2.7	2.1	1.5	-7.4
US	1.8	-0.3	-2.8	2.5	1.6	2.3	2.2	2.5	2.9	1.6	2.4	2.9	2.3	-6.5
Japan	2.2	-1.0	-5.5	4.7	-0.5	1.8	1.6	0.4	1.2	0.5	2.2	0.3	0.7	-5.0

Note: * Forecasts.

Source: European Commission (European Economic Forecast, Spring 2020).

Table A2 – Public Budget Surplus/Deficit (as % of GDP) in selected countries (2007-2020)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*
Germany	0.3	0.0	-3.0	-4.1	-0.9	0.1	0.1	0.6	0.9	1.2	1.2	1.9	1.4	-7.0
Ireland	0.2	-7.0	-13.9	-30.4	-12.6	-8.0	-5.7	-3.6	-1.9	-0.7	-0.3	0.1	0.4	-5.6
Greece	-6.7	-9.0	-15.2	-11.1	-10.1	-8.6	-12.2	-3.6	-5.6	0.5	0.7	1.0	1.5	-6.4
Spain	2.0	-4.4	-11.0	-9.4	-9.4	-10.3	-6.8	-6.0	-5.2	-4.3	-3.0	-2.5	-2.8	-10.1
France	-2.5	-3.2	-7.2	-6.8	-5.1	-4.9	-4.1	-3.9	-3.6	-3.6	-2.9	-2.3	-3.0	-9.9
Italy	-1.5	-2.7	-5.3	-4.2	-3.5	-3.0	-2.8	-3.0	-2.6	-2.4	-2.4	-2.2	-1.6	-11.1
Portugal	-3.0	-3.8	-9.8	-11.2	-7.4	-5.5	-4.9	-7.2	-4.4	-1.9	-3.0	-0.4	0.2	-6.5
Eurozone	-	-	-	-	-4.1	-3.6	-2.9	-2.5	-2.0	-1.5	-1.0	-0.5	-0.6	-8.5

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*
U.K.	-3.0	-5.1	-10.8	-9.6	-7.6	-8.3	-5.8	-5.4	-4.6	-3.4	-2.4	-2.2	-2.1	-10.5
EU	-	-	-	-6.4	-4.5	-4.2	-3.2	-2.9	-2.4	-1.3	-0.8	-0.4	-0.6	-8.3
US	-3.5	-7.0	-12.7	-12.0	-10.6	-8.9	-5.6	-4.8	-4.6	-5.4	-4.3	-6.6	-7.2	-17.8
Japan	-2.1	-1.9	-8.8	-8.3	-8.8	-8.7	-8.5	-5.4	-3.6	-3.5	-3.0	-3.0	-2.3	-4.9

Note: Net lending (+) or net borrowing (-) general government; * Forecasts.

Source: European Commission (European Economic Forecast, Spring 2020).

Table A3 – Public Debt (as % of GDP) in selected countries (2007-2020)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*
Germany	63.5	64.0	72.4	80.3	77.6	79.0	76.9	74.5	72.1	69.2	63.3	61.9	59.8	75.6
Ireland	24.0	42.8	62.2	87.4	111.1	121.7	123.3	104.1	76.7	73.9	67.8	63.5	58.8	66.4
Greece	103.1	109.8	126.8	146.0	171.3	158.9	174.9	178.9	175.9	178.5	176.2	181.2	176.6	196.4
Spain	35.5	39.4	52.7	60.1	60.2	84.4	92.1	100.4	99.3	99.2	98.6	97.6	95.5	115.6
France	64.2	67.8	78.8	81.5	85.0	89.2	92.2	94.9	95.6	98.0	98.1	98.1	98.1	116.5
Italy	99.7	102.3	112.5	115.3	116.4	122.2	127.9	131.8	135.3	134.8	134.1	134.8	134.8	158.9
Portugal	68.4	71.7	83.6	96.7	111.1	124.8	128.0	130.6	131.2	131.5	126.0	122.2	117.7	131.6
Eurozone	64.9	68.5	78.3	89.8	86.4	90.8	93.1	94.2	93.0	92.2	89.8	87.9	86.0	102.7
U.K.	43.6	51.6	65.9	76.4	81.9	85.8	87.2	87.0	86.9	86.8	86.2	85.7	85.4	102.1
EU	57.8	60.9	72.9	78.4	81.3	84.9	87.1	88.1	86.5	85.3	83.3	81.3	79.4	95.1
US	64.0	72.8	86.0	94.7	99.0	102.5	104.6	104.4	104.7	106.8	106.0	104.3	106.6	130.6
Japan	176.6	184.6	202.4	208.2	222.3	228.6	232.8	236.1	231.3	236.3	235.0	236.8	236.2	253.7

Note: Gross debt general government; * Forecasts.

Source: European Commission (European Economic Forecast, Spring 2020).

## Table A4 – Public investment (as % of GDP) in selected countries (2007-2020)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*
Germany	1.9	2.1	2.4	2.3	2.3	2.2	2.1	2.1	2.1	2.2	2.3	2.4	2.5	2.8
Ireland	4.6	5.2	3.7	3.3	2.4	2.0	2.0	2.2	1.8	1.9	1.8	2.0	2.3	2.7
Greece	4.9	5.6	5.7	3.7	2.5	2.5	3.4	3.7	3.6	3.5	4.4	3.0	2.2	2.1

Spain	4.7	4.6	5.1	4.7	3.7	2.5	2.2	2.1	2.5	2.0	2.0	2.1	2.0	2.3
France	3.9	3.9	4.3	4.1	4.0	4.1	4.0	3.7	3.4	3.4	3.3	3.4	3.6	4.0
Italy	2.9	3.0	3.4	2.9	2.8	2.6	2.4	2.3	2.4	2.3	2.2	2.1	2.3	2.6
Portugal	3.2	3.7	4.1	5.3	3.5	2.5	2.2	2.0	2.3	1.5	1.8	1.9	1.9	2.3
Eurozone	3.2	3.3	3.6	3.4	3.1	2.9	2.8	2.7	2.7	2.6	2.6	2.7	2.8	3.1
U.K.	2.5	3.0	3.3	3.2	3.0	2.8	2.6	2.8	2.7	2.6	2.7	2.7	2.8	3.0
EU	3.2	3.4	3.7	3.5	3.3	3.1	2.9	2.9	2.9	2.7	2.8	2.9	3.0	3.3
US	3.8	4.0	4.2	4.1	3.9	3.6	3.2	3.1	3.2	3.2	3.2	3.2	3.4	3.9
Japan	3.6	3.5	3.9	3.7	3.6	3.6	3.9	3.9	3.7	3.6	3.7	3.8	3.9	4.2

Note: * Forecasts.

Source: European Commission (European Economic Forecast, Spring 2020).

Figure A.1 – Long term interest rates (January 2007 – May 2018)
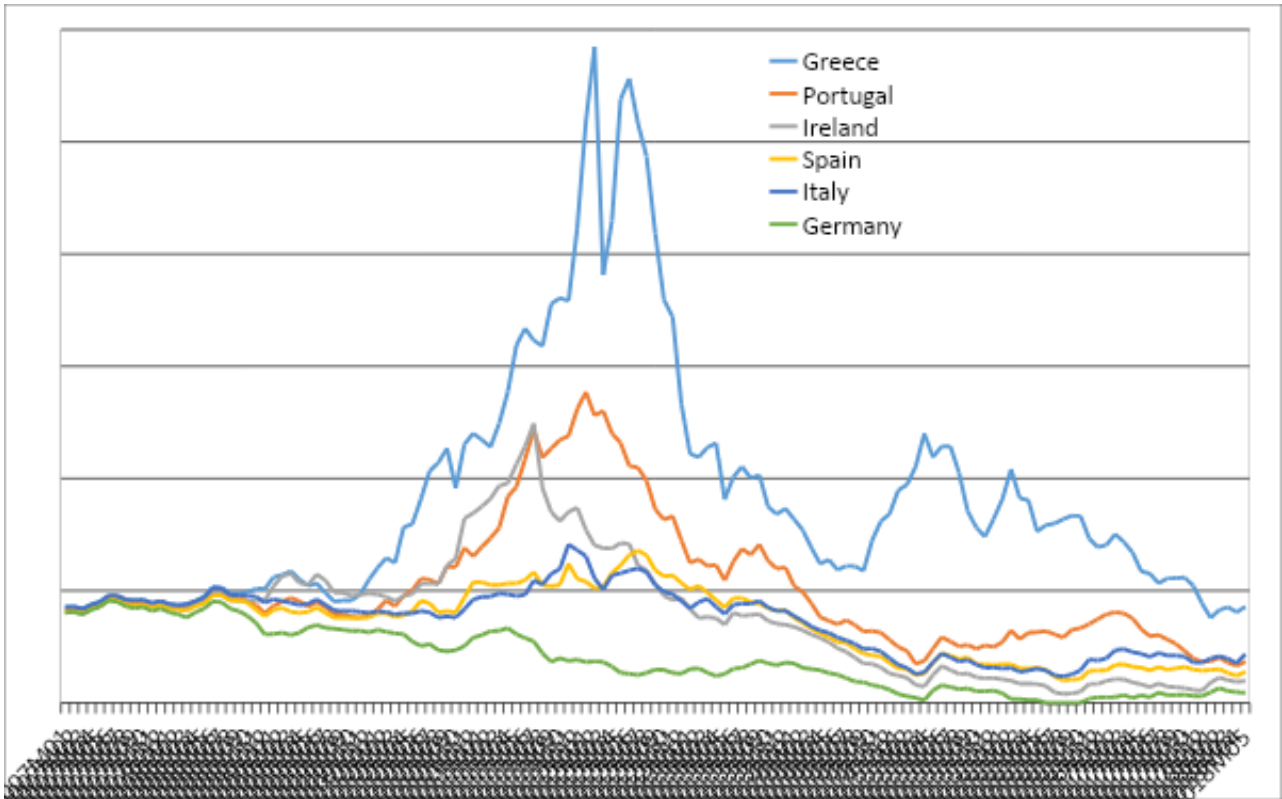
Source: Eurostat (long term interest rates as convergence criteria in the Maastricht Treaty)
Note: monthly data on annual base.