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*Fiscal policy and public debt in the wake of the Covid-19 crisis: an
examination of the PIGS' public finances*

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Abstract:

Following the Covid-19 crisis, all European debt-to-GDP ratios have soared. This was especially true for the PIGS, namely Portugal, Italy, Greece, and Spain. This paper examines whether their debt-to-GDP ratios represent a source of concern in terms of debt sustainability, as of today. I focused on their ability to run primary surpluses, that is the main policy variable over which governments have control when dealing with the dynamics of the debt-to-GDP ratio. The first step is a review of the classic debt dynamics theory and the application of a recent formula introduced by Blanchard et al. (2021) to determine whether the countries under consideration still have fiscal space. Subsequently, the recent economic and fiscal trends of the PIGS are examined to determine whether their ability to achieve primary surpluses will be hampered in the coming years as a result of the Covid-19 crisis. I show that the sustainability of the PIGS' debt-to-GDP ratios, in terms of their ability to run primary surpluses, is threatened not by the consequences of the coronavirus itself, but rather by political constraints limiting fiscal consolidation planning and long-term trends of population ageing and climate change. Therefore, I developed a three-pronged policy recommendation to strengthen their budgetary resilience to these issues in the long-term. In particular, my advice is to strengthen the Independent Fiscal Institutions and alter the numerical debt criteria in the SGP to achieve fiscal consolidation that is growth-friendly and does not exacerbate income inequality.

TABLE OF CONTENTS

1. Introduction	4
2. Theoretical Framework	6
2.1. Main functions of the public debt.....	6
2.2. Determinants of the public debt ratio dynamics.....	7
2.3. Relationship between interest and growth rate: what are the implications of $r-g \geq 0$?.....	8
2.4. The upper bound of the PBR: Maximum Fiscal Effort	10
2.5. Do the PIGS have still fiscal space?.....	11
2.5.1. The circumstances that permitted the maximum fiscal effort to be achieved	14
2.5.2. Sensitivity scenarios	15
2.5.3. Limitations	18
3. Did the Covid-19 crisis jeopardise the countries' capacity to generate primary surpluses? An analysis of the short-term trends	19
3.1. Preventing the scarring effects of the Covid-19 crisis or improving fiscal positions?.....	19
3.1.1. The case of Italy.....	21
3.1.2. The case of Greece.....	23
3.1.3. The case of Portugal.....	25
3.1.4. The case of Spain.....	26
3.1.5. The overall picture	28
4. Long-term trends affecting public finances	29
4.1. The impact of population ageing.....	29
4.1.1. The overall picture	30
4.2. The impact of extreme climate-related events and the green transition.....	32
4.2.1. Physical risks from climate change: a heterogenous impact.....	33
4.2.2. Financial risks from climate change: a work in progress.....	35
4.2.3. Transition risks to zero-emission economy: a blurry picture	36
5. Policy Recommendations	39
5.1. First recommendation: strengthening of the Independent Fiscal Institutions.....	40
5.2. Second recommendation: a revision of debt numerical criteria.....	42
5.3. Third recommendation: avoid increasing inequality and slowing growth	44
References	46
Appendix A - Inflation	53
Appendix B – Exposure of PIGS to population ageing: results by country	55
Italy	55
Greece	56
Portugal	57
Spain	58
Appendix C – Economic growth and decarbonisation	60

1. Introduction

The outbreak of the Covid-19 crisis, along with all the containment measures that accompanied it, resulted in one of the largest recessions in the EU since the end of World War II (OECD, 2021). As a result of this crisis, as well as the phenomenon of the zero lower bound¹, which constrained conventional monetary policy in dealing with the Covid-19 crisis, most European countries were forced to combat the economic downturn through the implementation of various expansionary fiscal policies such as income support programmes, subsidies to the hardest hit sectors, tax relief and so on. Even if they were successful in reviving the economy, these policies certainly had the consequence of increasing the debt-to-GDP ratios (from now on, “debt ratio”) of most European countries, raising worries about the long-term sustainability of public debt financing.

The pandemic had an uneven effect on the GDP of the European countries (Muggenthaler et al., 2021). The countries with the greatest drop in GDP were those whose economies rely heavily on tourism, such as Italy, Spain, Greece, and Portugal (Muggenthaler et al., 2021). In fact, they experienced the most dramatic drop in GDP at the end of 2020 and the beginning of 2021 as a result of travel restrictions imposed to combat the Covid-19 (Muggenthaler et al., 2021). On the other hand, certain nations, such as Ireland, Luxembourg, Estonia, and Lithuania, were able to recover to pre-crisis levels as early as the beginning of 2021 (Muggenthaler et al., 2021). Not only that, also financial support to the economy across the EU has been asymmetrical in its generosity, impacting debt ratios unevenly across Europe (Muggenthaler et al., 2021). Not surprisingly, the nations with the highest GDP losses are also the same that experienced the largest increase of their debt ratios. For instance, Italy's debt ratio has climbed by 21.3 percentage points (“ppt” from now on) since 2019, reaching a debt ratio of almost 155% (EU Commission, 2022). Similar trends were observed in Greece, which increased its debt ratio by more than 20 ppt during the Covid-19 crisis, surpassing a debt ratio of 200%, as well as in Portugal and Spain, where debt ratios are significantly higher than 100% (128% and 120%, respectively) (EU Commission 2022). Despite the different impact of the Covid-19 crisis on European countries, the current situation shows that the relevance of debt interest payments in the European public spending mix is significantly increased. This emphasises the importance of addressing this new policy challenge.

The use of public debt has been crucial to the development of modern economies, providing for the funding and preservation of public investments, such as infrastructure projects (Eichengreen et al., 2021). Indeed, sovereign debt enabled governments to fund the welfare system even during economic downturns, to protect aggregate demand, to fund military expenses during wars, to save the banking system in the aftermath of the Great Recession, to deal with natural disasters, and so on (Eichengreen et al., 2021). However, when used excessively, public debt can create harm. In fact, its use can cause governments to evade unpleasant decisions, such as continuing to run deficits rather than implementing contractionary fiscal policies (Eichengreen et al., 2021). Furthermore, it is deeply entwined with politics, since it is a potent tool for increasing public expenditures prior to elections in order to acquire political consent, posing a risk of moral hazard on the part of politicians (Eichengreen et al., 2021). This might lead to high debt levels, which would damage future generations who would have to repay it. Not only that, but excessive debt levels can have a negative influence on investment due to higher interest rates linked with greater public debt, as well as create concerns about a country's ability to service its debt, compromising its financial stability (Eichengreen et al., 2021). This also raises the risk of sovereign default, which, if it occurs, would result in a loss of confidence in the government, making future debt access more expensive and difficult. As a result, this would restrict the government's ability to deal with adverse events (Eichengreen et al., 2021). To avoid this, countries typically implement fiscal consolidation strategies, which have historically resulted in an economic slowdown and harm to citizens (Eichengreen et al., 2021).

¹ This phenomenon occurs when the nominal interest rate is equal to or close to zero, limiting Central Banks' ability to decrease it in order to promote economic growth.

Given all of the ramifications of using public debt, it is important to investigate its dynamics and sustainability in the current scenario in order to determine what the next challenges and consequences will be in the future.

The goal of this paper is to discuss the challenges to the sustainability of European debt ratios in the context of the additional debt incurred during the Covid-19 crisis, and to determine whether this increase poses a threat to it in the long-term. Specifically, the analysis will be focused not on all the European Member States, but on a set of four countries: Portugal, Italy, Greece and Spain. The basis for this selection is that these are the countries that were dubbed PIGS during the European sovereign debt crisis to denote their less-than-virtuous fiscal positions. For this reason, it will be interesting to see if, in the context of the Covid-19 crisis, these countries' debt ratios are again a source of concern for the EU.

To conduct such an evaluation, the main focus will be to describe the current economic condition of the countries under consideration in light of their different capacities to generate primary surpluses, which is the major variable of interest. The term primary surplus refers to when the government is able to raise more revenue than non-interest expenditures in a given year, resulting in a surplus to service its debt. The decision to focus on this variable is determined by the fact that, when dealing with debt ratio dynamics, governments can only regulate the achievement of primary surpluses as a means of improving debt sustainability. Indeed, as will be demonstrated in the following section, governments have minimal influence over the dynamics of the interest and growth rates. As a result, because primary surpluses are the dominant policy variable, focusing on it is more policy relevant. In particular, I will show how the Covid-19 crisis impacted these countries' ability to generate primary surpluses, as well as how this will evolve in the future, in order to provide a picture of debt dynamics today and in the foreseeable future. This will enable me to identify the best policy measures to meet the issues provided by the Covid-19 situation as well as other long-term developments, such as population ageing and climate change, that may endanger debt sustainability through their impact on public finances. Throughout, the paper illustrates that the increase of public debt incurred as a result of the Covid-19 crisis does not represent a problem per se, if accompanied by substantial primary surpluses in the short-term. This will be illustrated specifically by looking at a new formula proposed by Blanchard et al. (2021) that allows for the calculation of the remaining fiscal space of the countries under consideration, as well as drawing from the EU Commission's debt sustainability analysis in the *Fiscal Sustainability Report 2021*. In fact, the issue with the PIGS' post-Covid fiscal reality appears to be the political constraints that limit the implementation of credible and ambitious fiscal consolidation strategies to expand their limited budgetary space to cope with future adverse trends, such as population ageing and climate change. Consequently, the analysis will then shift to these main long-term trends, which will limit countries' ability to maintain primary surpluses and, as a result, will exacerbate the debt ratio dynamics. Particularly, I will show that, while the PIGS moved toward pension reforms to improve the resilience of the public finances to population ageing, much more needs to be done to combat climate change.

As a result of this analysis, it appears that the PIGS will need to increase their fiscal space by undertaking fiscal consolidation, which will have not to hinder economic growth or enhance income inequality, as this would limit its effectiveness. To that purpose, in this paper's final section, I will advocate for the strengthening of the Independent Fiscal Institutions and a revision of the debt numerical requirements contained in the Stability Growth Pact.

The paper is organised as follows. Section 2 will illustrate the theoretical framework that I will use to assess the sustainability of the public debt as well as the ability to run primary surpluses. In this section, I will also address the question of whether there is a debt ratio ceiling that governments should strive towards in order to ensure the sustainability of public debt. Following that, in section 3, I will investigate the repercussions of the Covid-19 crisis on the ability of the PIGS to run primary surpluses in order to determine whether this poses a challenge for the debt sustainability. In Section 4 I will then examine the impact of population ageing and climate change on the countries' ability of running primary surpluses. Finally, in section 5, I will develop three policy recommendations based on the arguments gathered in the preceding sections.

2. Theoretical Framework

In this section, I will draw on theoretical literature to provide the main significant findings on public debt, not only in terms of its main functions to better understand why it is so essential, but also in terms of its main determinants to better explain its current and future dynamics.

The remainder of this section will shift the attention to one of the debt ratio determinants, namely the primary balance ratio, since it is the major variable in this paper's analysis to evaluate the debt sustainability of the countries under review. Furthermore, in the concluding part of this section, I will implement a recent formula used by Blanchard et al. (2021) to derive a debt ceiling above which the serviceability of the public debt is called into question, and I will answer the question of whether the countries under consideration should consider it when evaluating their fiscal positions.

However, before delving into such analysis, it is necessary to establish the concept of debt sustainability, which frequently eludes a simple definition. As a matter of fact, there are multiple definitions of this notion. The IMF attempted to define it in 2002, when it linked the sustainability of public debt to the state of solvency. They described it specifically as “debt is sustainable if it satisfies the solvency condition without a major correction [...] given the costs of financing” (Wyplosz, 2007). Nevertheless, such a concept is difficult to operationalize because it is hard to define what constitutes a “major correction,” as well as the fact that “costs of financing” are not stable over time and are difficult to forecast (Wyplosz, 2007). As a result, a particular debt ratio may be sustainable at one time but not at another (Wyplosz, 2007).

Because debt sustainability is a forward-looking notion fraught with uncertainty, as we will see later more in depth, its definition must incorporate this aspect. Blanchard's (2022) definition comes in handy because it encompasses such a concept: “Debt sustainability is fundamentally a probabilistic concept [...] Debt is sustainable if the probability of a debt explosion is small”. Yet, this definition is insufficient on its own to be deemed operational. Indeed, it is critical to define the terms “debt explosion” and “small probability.” The downside of this approach is that it provides too much opportunity for subjective interpretation, which increases the possibility that different evaluations will offer conflicting views of whether a specific debt ratio is sustainable. Nonetheless, in this circumstance, such a definition is useful. In fact, it enables it to be built in a way that is more focused on the primary balance. For this reason, when I refer to “debt explosion,” I mean the circumstance in which the government is no longer able to run large enough primary surpluses to service its outstanding debt, forcing it to embark on an uncontrollable ever-increasing trajectory. Furthermore, by “small probability,” I mean a circumstance in which a country's primary surplus required to service its debt ratio is not greater than its maximum fiscal effort, which will be better defined in paragraph 2.4. In fact, if the required primary balance exceeds this limit, there is a high likelihood that the country under consideration will be unable to service its debt, resulting in the aforementioned “debt explosion.”

When I use the term “debt sustainability” throughout the remainder of this paper, I refer to this definition, even though it is primarily concerned with fiscal policy sustainability.

2.1. Main functions of the public debt

The public debt is the amount owed by a country to its lenders, who could be individuals, businesses, or foreign governments (Amadeo et al., 2021). It is the result of the accumulation of annual budget deficits, which are caused by decades of government non-interest expenditures exceeding government revenues (Amadeo et al., 2021). As a result, a country's deficit increases its debt, whereas a country's surplus decreases it, as will be demonstrated in greater detail in the following of this Section.

The public debt is a critical component of the expansionary fiscal policy. Indeed, the major purpose is to give to the government an alternative method of funding public investments rather than raising distortionary taxes. This represents a powerful additional instrument for the government to stimulate economic growth by funding

infrastructure projects and investing in strategic sectors such as education, healthcare system, and so on (Eichengreen et al., 2021). This infusion of money into the economy encourages consumers to spend more, thus stimulating the economic growth in the short term (Amadeo et al., 2021).

Furthermore, funding infrastructure projects through public debt gives the possibility of spreading their cost among generations who will benefit from them in the future, because the debt incurred today must be repaid in the future through tax increases. As a result, we can assert that government debt promotes intergenerational fairness, but only if the benefits of the investments are shared by future generations (Catrina, 2013). Not only that, but the public debt serves also as a form of intergenerational insurance. Indeed, since it is frequently refinanced and passed on to future generations, similar to a pay-as-you-go pension system, it allows to support those who are vulnerable today by taxing the wealthy in the future (Bohn, 2005).

Another effect of using public debt to support government expenditures is to smooth citizens' consumption. By supporting government expenditures through debt issuance rather than using distortive taxes, citizens' spending rises, as previously stated, allowing for consumption smoothing, for example, during recessions (Arreaza et al., 1998).

Finally, in recent years, expansionary fiscal policy has been utilised as a macroeconomic stabiliser by providing funds for countercyclical fiscal policy when monetary policy has been rendered ineffective due to the zero lower bound (Debrun et al., 2021). Indeed, when the nominal interest rate is equal to or close to zero, expansionary monetary policy fails to respond to severe shocks, since it has limited leeway to lower the nominal interest rate further and stimulate the economy. As a result, expansionary fiscal policy is required to combat the economic slowdown in this situation, as was the case in the recent Covid-19 crisis, where governments increased public spending to combat the economic implications of containment measures by enacting cash transfers, tax deferrals, and so on (Uhide, 2019).

With having clear what are the main functions and advantages of using public debt, we can move now to look more closely the determinants of its dynamics.

2.2. Determinants of the public debt ratio dynamics

When discussing public debt sustainability, we usually do not look at the public debt alone, but rather compare it to the GDP of the country under consideration. More specifically, we usually refer to the public debt-to-GDP ratio (henceforth, "debt ratio"), which is defined as: $b_t = \frac{B_t}{Y_T}$. This ratio compares the amount of a country's public debt B_t to the country's ability to raise fiscal revenues, which is approximated by the country's GDP (Y_T), to determine how likely the country is to service its debt (Amadeo et al., 2021). However, focusing just on this ratio does not allow for any conclusions about the sustainability of government debt. Indeed, as stated at the outset of this section, debt sustainability is an assessment that necessitates an understanding of the debt ratios' future dynamics. As a result, Blanchard et al. (2021) propose that the starting point for approaching debt sustainability is to examine the debt accumulation equation, which is:

$$b_{t+n} - b_{t+n-1} = \left(\frac{r_{t+n} - g_{t+n}}{1 + g_{t+n}} \right) b_{t+n-1} - s_{t+n} \quad (1)$$

At the start of each period, the country under consideration has a particular debt ratio b_{t+n-1} , the amount of which is the outcome of earlier debt issuances. To this amount of debt is associated a certain interest rate r_{t+n} . Moreover, during the analysis period, the country may experience a rise (reduction) in output at the growth rate of g_{t+n} , which will have a positive (negative) influence on the GDP of the country Y_T . Finally, the country can run a primary deficit or surplus s_{t+n} , where the former need to be funded by an additional issuance of debt (Baudetto et al., 2022). Depending on the size and direction of this dynamics, the debt ratio will change over

time (Baudetto et al., 2022).

Examining these factors in greater depth:

- *The debt ratio of the previous period b_{t+n-1}* : the public debt B_{t+n-1} is the sum of the debt issued during the analysis period and the debt issued in preceding periods at a certain interest rate: $B_{t+n} = (1 + r_{t+n})B_{t+n-1} - S_{t+n}$. This implies that the higher is the prior debt ratios, the larger will be the interest payments on debt (Amighini et al., 2016).
- *Real interest rate r_{t+n}* : It specifies the amount that the government must pay on its outstanding debt every year (Amadeo, 2022). Because the calculation employs the real interest rate rather than the nominal interest rate, it accounts for swings in inflation. Moreover, because investors are risk averse, such interest rates are frequently subject to a risk premium. Even though government bonds are typically seen as secure investments with low risk-premia, this is less true for some countries than for others, which are regarded as riskier investments. Finally, it is proportional to the amount of total debt interest payment that must be repaid. Hence, the higher the interest rate, the larger the overall debt interest payment, resulting in a higher chance of default (Drudi & Giordano, 2000).
- *Real growth rate g_{t+n}* : it is the growth rate of the GDP of a country and can be defined as $g_{t+n} = \frac{Y_{t+n}}{Y_{t+n-1}} - 1$. The greater it is, the faster the country's GDP will rise, boosting the country's ability to raise fiscal revenues. This indicates that the debt ratio b_{t+n} is decreasing because its denominator (Y_{t+n}) is increasing (Amighini et al., 2016). Finally, because the calculation employs the real growth rate rather than the nominal one, it accounts for swings in inflation
- *Primary Balance Ratio s_{t+n}* : it is the ratio between the primary balance (S_t) run by the government of a country on its GDP over a certain period: $s_{t+n} = \frac{S_{t+n}}{Y_{t+n}}$. The primary balance is the difference between government revenues (T) and government spending (G) excluding the interest debt payments: $S_{t+n} = T_{t+n} - G_{t+n}$. A negative primary balance (primary deficit) necessitates the issuance of new debt, thus raising the debt-to-GDP ratio, while a positive primary balance (primary surplus) permits debt repayments, thus lowering the debt-to-GDP ratio (Checherita-Westphal, 2019). This latter case is only true if the primary surplus is large enough to cover the interest payments. In fact, if the primary surplus is lower than the total interest payments, additional debt must be issued.

If the debt ratio is on an increasing path, meaning $b_{t+n} > b_{t+n-1}$, it will eventually become unsustainable, implying that the government will no longer be able to maintain large enough primary surpluses to service its debt (Debrun et al., 2019). However, the second stage in analysing debt sustainability is to further characterise the link between interest and growth rate, which has different implications for how the primary balance ratio (from now on, "PBR") must behave in order to keep the debt ratio constant over time.

2.3. Relationship between interest and growth rate: what are the implications of $r-g \geq 0$?

When addressing debt viability, it is critical to consider the link between interest rate and growth rate in order to differentiate two major scenarios, both of which have substantial implications for the fiscal policies that a government has to implement in order to cope with its public finances. In fact, if the government aims at maintaining a steady debt ratio over time, then solving equation (1) yields the PBR required to do so:

$$s_{t+n} = \left(\frac{r_{t+n} - g_{t+n}}{1 + g_{t+n}} \right) b_{t+n} \quad (2)$$

The sign and size of the needed PBR to stabilize the debt ratio is given by the difference between the interest rate and growth rate:

- **Interest rate greater than growth rate ($r_{t+n} - g_{t+n} > 0$)**

This indicates that the interest rate is higher than the country's economic growth rate, meaning that the left-hand side of equation (1) is positive. In practise, this implies that a country's public debt is growing faster than its economy. As a result, in order to maintain a steady debt ratio, the government must run a primary surplus ($s_{t+n} > 0$) to counterbalance the debt ratio increase caused by the unfavourable interest-growth rate difference, which will be utilised to service the outstanding debt. Hence, as long as the PBR responds enough to the debt ratio, then any debt level is sustainable (Blanchard et al., 2021). However, such finding is overly optimistic for reality, because obtaining specific PBRs is frequently hampered by economic and/or political constraints, as will be demonstrated in greater detail later. As a result, such conclusion is merely theoretical.

A more realistic approach would be to employ the maximum fiscal effort (\bar{s}), which is the maximum PBR a country can achieve. Then, using \bar{s} , it is possible to retrieve the debt ceiling at which a country cannot keep its debt under control by achieving an adequate primary surplus (Blanchard et al. 2021), which is:

$$b_{t+n}^* = \frac{1 + g_{t+n}}{r_{t+n} - g_{t+n}} \bar{s} \quad (3)$$

As a result, b^* is the debt ratio beyond which its dynamics become unsustainable. Such a debt ceiling is strongly dependent on a country's maximal fiscal effort, which will be discussed in greater detail in the following paragraph.

- **Interest rate lower than growth rate ($r_{t+n} - g_{t+n} < 0$)**

This indicates that the interest rate is lower than the country's economic growth rate, meaning that the left-hand side of equation (1) is negative. This suggests that the economy of a country is growing faster than its sovereign debt. As a result, the government can run primary deficits ($s_{t+n} < 0$), meaning additional debt issued, in order to maintain a steady debt ratio throughout time. In this way, the debt ratio decrease caused by the favourable interest-growth rate difference is counterbalanced. The consequences of this result appear to ensure that, regardless of the fiscal policies adopted by the government, any debt ratio level will always be sustainable as long as the interest rate is lower than the growth rate (Blanchard et al. 2021).

However, once again, this result is too good to be true. Indeed, debt sustainability remains an issue even in this instance, for two reasons:

1. *Positive relationship between the size of the public debt and the interest rate.* Many economists, as Gamber & Seliski (2019) and Blanchard et al. (2021) have proposed that the debt ratio level influences the interest rate. Particularly as the sovereign debt grows, so does the attached interest rate. There are two components that determine this interaction. First, it is the effect of capital crowding out², which indicates an increase in the marginal product of capital and, as a consequence, an increase in the interest rate (Blanchard et al., 2021). Secondly, if the supply of government bonds increases relative to the total supply, then the interest rate will rise (Blanchard et al., 2021; Baudetto et al., 2022). However, there is no consensus on the right magnitude of this effect (Blanchard, 2022).

2. *Uncertainty:* in this Section, I assumed that we knew the dynamics of all the variables affecting the debt ratios (r , g and s) with certainty, but as previously said, analysing the sustainability of public debt

² According to economic theory, the crowding out effect indicates that increasing governmental spending reduces private sector spending.

is a forward-looking exercise fraught with uncertainty. Consequently, the relationship between the interest rate and the growth rate is known now but not in the future (Blanchard et al., 2021). Indeed, the interest-growth rate difference may change sign in the future, rendering a particular debt ratio not sustainable anymore.

This paragraph demonstrates that the link between interest and growth rates is critical in determining the criteria for assessing the dynamics of public debt. Governments, on the other hand, have little control on their trends (Blanchard et al., 2021). For this reason, governments should prioritise policies targeted at affecting the PBR, which, as seen in this paragraph, is a critical factor in influencing the debt ratio and determining its sustainability (Blanchard et al., 2021).

2.4. The upper bound of the PBR: Maximum Fiscal Effort

In practice, any debt ratio could be considered sustainable in the sense that interest payments can always be met by tax increases, spending cuts, or the central bank's ability to generate money (Sawyer, 2021). As a result, the examination of debt sustainability should focus on the dynamics of the primary balance in terms of the implications for the debt ratio's trajectory if a certain PBR is maintained (Sawyer, 2021).

As previously stated, any debt ratio level might be regarded sustainable if the PBR was always reactive enough to fluctuations in debt ratio. However, achieving primary surpluses is not always an easy task due to economic and/or political constraints that impede achieving the necessary surplus to stabilise the debt ratio (Blanchard et al., 2021). The capacity to run primary surpluses varies between countries depending on how these restrictions vary. Furthermore, as the debt ratio rises, the primary surpluses required to put the country back on a more sustainable path rise as well, making it impossible for governments to achieve them at some point. Three kinds of restrictions can limit a country's capacity to meet particular PBRs:

1. *Political structure and credibility of the government.* A coalition government, for example, may be unable to make the required adjustments to attain the desired primary surplus due to its weak political position (Blanchard, 2022). This is especially true for countries with already high tax rates, as it suggests less room to raise them (Blanchard, 2022). Furthermore, even when justified by worries about the sustainability of the public finances, fiscal reforms aimed at cutting spending or raising taxes can affect voters, who are then motivated to punish the government that adopts them by not voting for it in the elections (Alesina & Passalacqua, 2015). As a result, governments in weak positions are often motivated to defer improving their deficit positions (Alesina and Passalacqua, 2015). Therefore, governments with large majorities are better able to adopt sound fiscal measures (Alesina & Passalacqua, 2015). Moreover, a politician's reputation can be crucial in reassuring markets about a country's fiscal position, lowering the risk premium demanded by investors on sovereign debt and, consequently, lowering the primary surplus required to stabilise or reduce the debt ratio. The election of Mario Draghi in Italy is an example of the impact of a politician's credibility (Blanchard, 2022).
2. *Demographics:* the age structure of the population has a significant impact on a country's fiscal balance. An ageing population raises the costs associated with it, such as pensions, healthcare, and long-term care (Boone et al., 2022). This type of expenditure accounts between 40 and 50% of government expenditures in most OECD nations, and an increase in them would be a considerable impediment to running greater primary surpluses (Boone et al., 2022). Furthermore, an ageing population has ramifications for a country's labour force. Indeed, in the absence of reforms, it will damage the effective labour force, causing the growth rate to slow (Boone et al., 2022; Guillemette and Turner, 2021). As a result, the debt ratios will rise quicker.
3. *Adverse events:* they reduce a country's ability to generate primary surpluses due to the increased necessity of raising government expenditures to address them (e.g., Covid-19 crisis). As a result, they

exacerbate the debt ratio dynamics, raising the likelihood of default.

Climate change cannot be regarded as an adverse event because its nature is not uncertain, but rather a well-known tendency. However, natural disasters caused by climate change are unpredictable, making it difficult to foresee both the amount of the damages and their occurrence (EU Commission, 2022). For this reason, they will be thoroughly explored in this paper, as they are a good example of a negative occurrence that has a significant impact on the country's ability to run primary surpluses (Boone et al., 2022). As a matter of fact, extreme climate events are already causing infrastructure damages, necessitating new expenditures supported by additional debt (EU Commission, 2022). Finally, also the effects of the Russian-Ukraine conflict can have an impact on a country's public finances, since it is likely to increase not only military expenditures, but also investments to improve Europe's energy autonomy and support measures to counteract increases in food and energy costs (Blanchard & Pisany-Ferry, 2022).

In the following Section, these constraints will be examined in relation to the PIGS to see how they will affect their ability to run primary surpluses and, consequently, how they will affect the sustainability of their debt ratios.

However, before proceeding to the following Section, I will attempt to retrieve the debt ceiling for the foreseeable future for the countries under analysis. This will be useful to determine whether they still have fiscal space in the short term or if contractionary fiscal policies must be implemented immediately. To do so, I will implement the formula suggested in Blanchard et al. (2021).

2.5. Do the PIGS have still fiscal space?

According to Blanchard (2022), the interest rate drop is a long-term trend that began at the end of 1980. Several reasons have been cited as determinants of this tendency, including the slowing of productivity growth, rising savings, population ageing, and monetary policy (EU Commission, 2022; Blanchard, 2022). On this last issue, it is particularly necessary to emphasise the implementation of the quantitative easing instrument known as the Pandemic Emergency Purchase Programme (PEPP) implemented during the Covid-19 emergency. Such unconventional monetary policy entails purchasing both private and public bonds, which adds liquidity to the economy while also lowering interest rates (ECB, 2009). All of these developments have resulted in near-zero or negative real interest rates in almost all EU countries, some even before the Covid-19 crisis (Darvas, 2019). Given the negative real interest rate, regardless of the reduced growth rate caused by the pandemic's economic implications, the interest-growth rate differential is now negative. As observed in paragraph 2.3, this implies more favourable debt dynamics. However, such a circumstance does not eliminate all concerns about debt sustainability, because of the positive relationship between debt level and interest rate, as well as the uncertainty in future developments, which can decide less sustainable trajectories. For this reason, it is still important to determine how much fiscal space remains to the countries in analysis, meaning how much leeway they have in expanding their debt ratios before raising concerns about their sustainability. To that end, a formula devised by Blanchard et al. (2021) can be used to provide a sense of the PIGS' remaining fiscal space. The advantages of this formula are that it is also suitable in finding a debt ceiling under the $r - g < 0$ condition and that account for the positive relationship between debt and interest rate. Furthermore, the formula employs the maximum fiscal effort, thus setting restrictions on the implementation of specific PBRs, which makes it more realistic. However, it has also some limitations. First, it assumes that the trends of r , g and \bar{s} are known with certainty, which is not the case. Second, it assumes a linear relationship between the interest rate and the debt ratio, which, however, is not supported by empirical evidence. Nevertheless, the formula is effective in providing the maximum debt ceiling in the foreseeable future, over which the ability of a country in servicing its debt is called into question. This will be beneficial in evaluating the remaining fiscal space of the countries under consideration, as well as offering a quantitative view on how primary surplus realisation is critical in

establishing the sustainability of given debt ratio levels.

The formula is the following:

$$\frac{(r_0 + cb^* - g)}{1 + g} b^* - \bar{s} = 0 \quad (4)$$

Where the actual real interest rate is equal to:

$$r_t = r_0 + cb^* \quad (5)$$

To compute this formula is now necessary to define the value of each parameter and to make assumptions where necessary.

- *Effect of the own-country debt on the interest rate (c)*. This parameter defines the slope of the positive linear relationship between debt ratio and real interest rate (see paragraph 2.3), as well as the magnitude of the effect. In the literature there is no consensus on the appropriate value to assign to this parameter. Nevertheless, Blanchard et al. (2021) contend that the value of c is likely to be between 0.02 and 0.04 for closed economies and may be lower for open ones. Furthermore, Gamber & Seliski (2019) found out that the magnitude of this effect in the US ranges between 0.02 and 0.03. As a result, in order to achieve a conservative estimate, I assumed $c = 0.02$, which seems to be a good compromise between the findings of Blanchard et al. (2021) and Gamber & Seliski (2019) (Baudetto et al., 2022).
- *Adjusted Real Interest Rate (r_0)*. From equation (5) we can see that the adjusted real interest rate follows the relationship $r_0 = r_t - cb$, showing the positive link between the debt ratio and the real interest rate. It can be considered as the rate that a country would have if the "own-country debt" effect, as calculated by cb , did not exist (Baudetto et al., 2022). In other words, it is the interest rate that a country would have if there were no positive link between the interest rate and the level of debt (thus having $c = 0$), whereas r_t is the actual interest rate that is the outcome of this positive relationship. To determine r_0 , one must utilise the actual values for the debt ratio (b_t) and the real interest rate (r_t), which will be retrieved from the *Fiscal Sustainability Report 2021* of the EU Commission. Moreover, it is also needed the parameter c whose value is assumed above.
- *Real growth rate (g)*. The real growth rate has the same meaning as before (see paragraph 2.2). Since the formula retrieves the maximum sustainable debt in the foreseeable future, it is best to use a growth rate that can be attained in the medium-term, so beyond the immediate recovery from the crisis. For this reason, I will not use the actual growth rate of this year. Instead, drawing from the EU Commission's *Fiscal Sustainability Report 2021* forecasts, I will employ the average growth in the period 2021-2032, which is a valuable metric for gaining a more realistic understanding of future growth trends (Baudetto et al., 2022).
- *Maximum Fiscal Effort (\bar{s})*. As stated previously, it indicates the largest primary surplus that a country can achieve. It is determined not by making forecasts, but by examining historical data on the primary surpluses achieved by the countries under consideration (Baudetto et al., 2022). The most appropriate assumption is the maximum historical primary surplus achieved by the considered countries. However, in order to establish a fairer comparison among nations, the historical period evaluated to determine \bar{s} will be from the entry into the European Monetary Union (EMU). The reason for selecting this time period is because the creation of the EMU had an impact on the fiscal policies of the European countries. According to Von Hagen & Wyplosz (2008), the EMU strengthened national fiscal policies by making them more countercyclical and responsive to restore competitiveness. Furthermore, the

European Council in 1997 designed the Stability and Growth pact (SGP)³ to enforce fiscal discipline following the introduction of the EMU, which influenced how European countries approach their fiscal policies. Hence, in order to retrieve the main assumption on the maximum fiscal effort, I will look at the highest primary surplus recorded by the countries under consideration from 1997 to the present. The data are retrieved from the dataset used by Mauro et al. (2013).

Blanchard et al. (2021) provided an example of Italy improving its fiscal situation in order to join the EMU, achieving its maximum fiscal effort of $\bar{s} = 6.5\%$ in 1997. As a result, $\bar{s} = 6.5\%$ is a good assumption for Italy's greatest fiscal effort, even if it was able to produce it only under strong market pressure (Baudetto et al., 2022). Following this logic, the assumptions for the maximum fiscal efforts of the countries under considerations are: $\bar{s}_{IT} = 6.5\%$, $\bar{s}_{PT} = 3.1\%$ reached by Portugal in 2018, $\bar{s}_{GR} = 4.37\%$ reached by Greece in 1998 and $\bar{s}_{ES} = 4\%$ reached by Spain in 2006.

- **Debt ratio ceiling (b^*).** It is the parameter to be obtained by solving equation (4). It specifies the maximum amount of sustainable debt that a country can reach in the foreseeable future without raising concerns about debt sustainability. When such a ceiling is breached, it casts doubt on the country's ability to service its debt because the country's maximal fiscal effort is no longer sufficient. This debt ceiling is determined by the actual and assumed values of the aforementioned parameters.

Now that all of the assumptions have been specified, the debt ratio ceilings for each country can be obtained. However, before doing so, one must first obtain the adjusted real interest rate. The data utilised for this purpose are obtained from the EU Commission (2022).

- **Italy r_0 :** we have that $b = 154.4\%$, $r = 1.3\%$ and $c = 0.02$ as assumed above. Then:

$$r_0 = r_t - cb = 1.3\% - 0.02(154.4\%) = -1.79\%$$

- **Greece r_0 :** we have that $b = 202.9\%$, $r = 1.4\%$ and $c = 0.02$.

$$r_0 = r_t - cb = 1.4\% - 0.02(202.9\%) = -2.66\%$$

- **Portugal r_0 :** we have that $b = 128.1\%$, $r = 1\%$ and $c = 0.02$.

$$r_0 = r_t - cb = 1\% - 0.02(128.1\%) = -1.56\%$$

- **Spain r_0 :** we have that $b = 120.6\%$, $r = 0.5\%$ and $c = 0.02$.

$$r_0 = r_t - cb = 0.5\% - 0.02(120.6\%) = -1.9\%$$

We now have all of the pieces in place to compute b^* . The parameters' values and the resulting debt ceiling are summarised in the table below.

	r_{2021}	b_{2021}	r_0	c	$g_{2021-2032}$	\bar{s}	b^*
ITALY	1.3%	154.4%	-1.79%	0.02	1.8%	6.5%	292.6%
GREECE	1.4%	202.9%	-2.66%	0.02	2.1%	4.37%	310%
PORTUGAL	1%	128.1%	-1.56%	0.02	1.6%	3.1%	227.3%
SPAIN	0.5%	120.6%	-1.9%	0.02	1.8%	4%	262.5%

Table 2.1: Debt ratio ceilings for Italy, Greece, Portugal, and Spain using 2021 data

A country's fiscal space can be described as the residual space that a government has to expand its own debt ratio by supporting public expenditures, without compromising its fiscal position or economic stability (Heller, 2005). In this analysis, such a term can be operationalized as follows: a country's fiscal space is defined as the gap between its debt ratio ceiling and actual debt ratio (Baudetto et al., 2022). This indicates whether the

³ It is the EU regulation intended to ensure that EU countries pursue solid fiscal position and harmonize their fiscal policies. To achieve this goal, the EU established the following rule: with a growth rate (g) of 3%, an inflation rate of 2%, and a primary deficit of 3%, the stable level of public debt-to-GDP is 60%. Countries that violate the criteria for three consecutive years face a fine of up to 0.5% of their GDP.

country has sufficient fiscal room for manoeuvre to implement corrective actions if necessary. According to this criterion and the results in the preceding table, it appears that all of the countries under examination still have an ample fiscal space, as illustrated in graph 2.1. This implies that they may all grow their debt ratios without raising worries about their debt sustainability.

However, there is one key takeaway from this analysis. This is an extremely optimistic situation. Matter of fact, such a formula presents the best conceivable scenario in which the difference between the interest rate and the growth rate is certain, thus still negative, and fluctuates solely due to the positive influence that an increase in the debt ratio has on the interest rate. Furthermore, it is assumed that the countries under consideration will always be able to attain their utmost fiscal efforts. However, some of the conditions under which the countries under consideration reached their maximum fiscal effort were particular to the time period in which they happened, complicating their achievement today, as I will show in the following subparagraph. Nonetheless, such findings show that, assuming no severe shocks to interest and growth rates, and that the PIGS are able to commit to their greatest fiscal effort, their debt ratios are still sustainable, beyond having a significantly wide fiscal space. Such a conclusion looks too good to be true, both because the future direction of interest and growth rates is unpredictable, and also because the countries under examination are unlikely to be able to maintain such big primary surpluses. Moreover, when governments are provided with optimistic scenarios, they usually come at the conclusion that they could continue to run deficits without worrying about debt sustainability (Wyplosz, 2022). For these reasons, it is critical to smooth this last finding by offering a set of sensitivity scenarios that account for potential negative shocks to the interest rate, growth rate, and, more significantly, maximum fiscal efforts.

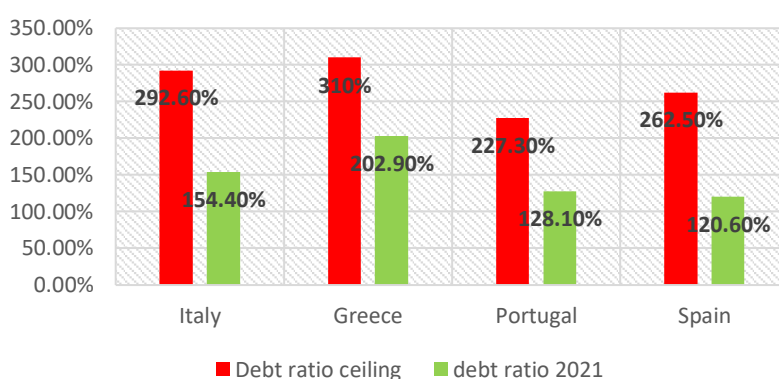


Figure 2.1: Comparison of the PIGS' actual debt ratios with their debt ceilings to illustrate the size of their fiscal space

2.5.1. The circumstances that permitted the maximum fiscal effort to be achieved

Both Italy and Greece exerted their greatest fiscal effort in order to achieve the requirements for membership in the European Monetary Union (EMU). When the EMU was founded in 1993, both Greece and Italy had extremely high debt ratios and failed to meet the so-called "Convergence Criteria"⁴, particularly the one requiring resilient and sustainable fiscal conditions (EU Council, 2020). For this reason, both Italy and Greece engaged in major fiscal consolidation, mostly through austerity programmes, in order to improve their budgetary conditions and gain membership into the EMU (Eichengreen et al., 2021; Herz & Kotios, 2000). Due to considerable market pressure, Italy was able to demonstrate a strong desire to converge towards the SGP numerical targets and so enter the EMU by running significant primary surpluses from 1993, reaching a peak in 1997 with $\bar{s} = 6.5\%$ (Blanchard et al., 2021). Because of these fiscal efforts, Italy was able to reduce its debt ratio from 121.8% in 1994 to 113.7% in 1999, obtaining membership to the EMU despite failing to

⁴ Conditions that European countries must meet in order to join the EMU.

meet the 60% debt ratio target (Eichengreen et al., 2021). Greece was in a similar situation to Italy, as it had a debt ratio of more than 100%. However, Greece's entry into EMU was made complicated by the EU's mistrust of the country as a result of its economic and political poor management (Herz & Kotios, 2000). Nonetheless, it was announced in 1993, with the election of a new government, a convergence programme projecting a fiscal consolidation strategy for the period between 1994 and 1999 (Herz & Kotios, 2000). Such a strategy allowed Greece to achieve its maximum fiscal effort of $\bar{s} = 4\%$ in 1998. In this case, too, debt reduction was accomplished through austerity measures and even if all the prerequisites were not met, Greece entered the EMU in 2001 due to the fiscal efforts demonstrated (Herz & Kotios, 2000). Nevertheless, after joining the EMU, both countries eased their fiscal restrictions, allowing for more public spending and for debt ratios to rise again (Eichengreen et al., 2021).

Spain and Portugal, on the other hand, did not reach their maximum fiscal efforts trying to enter the EMU. Indeed, they both hit their peak fiscal efforts after joining it. This was because they were not subject to the same market pressures as Italy and Greece since they had significantly lower debt ratios (67.4% for Spain and 59.2% for Portugal in 1995) and, consequently, did not have to undertake considerable fiscal consolidation (Eichengreen et al., 2021). Both their maximum fiscal efforts were the result of fiscal reforms and favourable economic conditions. Fiscal consolidation was already underway in Spain in 1996 in order to meet the Convergence Criteria for entry into the EMU, although it resulted in limited primary surpluses (EU Commission, 2007). The reforms adopted from 1996 to 2005, along with a stronger economic expansion due to the housing boom, established a favourable climate for Spain to accomplish its maximum fiscal effort of $\bar{s} = 4\%$ in 2006 (EU Commission, 2007). The increase in growth rate, in particular, allowed for a more cyclical fiscal policy, which resulted in an increase in tax revenues due to economic expansion, reduction in government spending, and favourable financing conditions (EU Commission, 2007). Portugal, on the other hand, has only recently hit its utmost fiscal effort (2018). This was made feasible by the election of Antonio Costa, who has demonstrated success in establishing fiscal restraint, owing to a favourable economic environment (Fitch Ratings, 2022; OECD, 2019). The fiscal consolidation strategy begun in 2015 paid off in 2018, enabling a maximum fiscal effort of $\bar{s} = 3.1\%$ to be achieved. The accomplishment of fiscal consolidation was also made possible by the revision of the budgetary framework, which brought it more in line with the EU's fiscal surveillance criteria (OECD, 2019).

The conditions that permitted the PIGS to achieve their maximum fiscal efforts are difficult to replicate today. In particular, both Italy and Greece would need strong market pressures, as well as political support, to attain those levels of primary surpluses. Furthermore, given the consequences for the population, achieving these high levels of primary surplus in the aftermath of the pandemic would be challenging, as I shall demonstrate in Section 3. In the case of Portugal and Spain, one can argue that their maximum fiscal efforts are more feasible, not only because they are lower than Italy's, but also because the economic and political conditions that enabled them are not impossible to replicate. Nonetheless, the post-pandemic period's sluggish growth rate and political divisions make its realisation challenging, particularly for Spain. This will be covered in further detail in the following Section.

2.5.2. Sensitivity scenarios

As previously stated, because assessing debt sustainability is a forward-looking exercise, reaching a definitive conclusion is impossible. Wyplosz (2007) refers to this concept as the "impossibility principle". As a consequence of this principle, the most one can do is provide more or less precise approximations, but it is critical to acknowledge the limitations of assessing debt sustainability.

The likelihood of a particular debt ratio being sustainable changes over time. For example, a country with a high debt ratio that can generate primary surpluses would see its debt sustainability improve over time, whereas a country that starts with a low debt ratio, but consistently runs significant deficits, will see a worsening of its sustainability (Wyplosz, 2007). Furthermore, deviations from the predicted trajectories for the interest rate and

growth rate can alter the estimated debt ceilings. As a result, while attempting to examine the sustainability of public debt, one crucial aspect to employ is the use of sensitivity scenarios, which, in this case, will also soften the optimistic results produced by the initial analysis.

Because the PBR is the primary focus of this study, the first set of sensitivity scenarios will be built on it:

- *Milder scenario.* Instead of taking as the utmost fiscal effort the biggest primary surplus recorded by a nation since the establishment of the SGP, it will be assumed that the countries under consideration will retain their recent PBR trends. It will be assumed, in particular, that their maximum fiscal effort equals the average of the last five years' PBRs. This appears to be a milder scenario than the baseline and it also better reflects a country's recent potential to run primary surpluses while accounting for its latest economic and political constraints. The exact timeframe for calculating the average will be between 2015 and 2019, because accounting for 2020, when most European nations ran big deficits, would have reflected a downward bias.

The data for the last five years PBRs achieved by the countries under consideration are retrieved from ECB (2020). The maximum fiscal efforts assumed for each country are: $\bar{s}_{IT} = 1.56\%$, $\bar{s}_{PT} = 1.84\%$, $\bar{s}_{GR} = 2.66\%$ and $\bar{s}_{ES} = -1\%$.

- *Pessimistic scenario.* In this case, a more extreme scenario is imagined in which, due to the effects of the Covid-19 on the countries' economic and political positions, they are unable to achieve a primary surplus and must settle for a budget draw. Therefore, in this eventuality it is assumed that $\bar{s} = 0\%$ for all the PIGS. However, it is important to note that this is a more desirable scenario for Spain, as it has only run primary deficits in recent years, and thus represents an improvement over the milder scenario (where $\bar{s}_{ES} = -1\%$).

An additional set of sensitivity scenarios is also performed on the interest and growth rates:

- *Negative shock to the interest rate.* The ECB's recent termination of the PEPP, as well as its announcement of an interest rate increase at the end of this summer to combat inflation, prompted debt sustainability concerns for the countries under consideration, which have high debt ratios (Benigno et al., 2022). In particular, the ECB intends to raise policy interest rates⁵ by 50 basis points this summer and another 50 basis points at the end of the year, meaning a 1 ppt increase in interest rates by the end of the year (Benigno et al., 2022). This may cause concerns in some nations, such as the PIGS (Whelan, 2022). In fact, a rise in the PIGS' debt interest payments would put further pressure on the attainment of substantial primary surpluses, which could be politically difficult to achieve (Whelan, 2022). Consequently, investors' perceived risk may rise, causing a rise in the required risk premium and, as a result, a further increase in the PIGS' funding costs (Whelan, 2022). However, it looks unlikely that the repercussions of this contractionary monetary policy would result in an increase in interest rates similar to the one seen during the Great Recession (Whelan, 2022). This was also confirmed by Isabel Schnabel, board member of the ECB, in an interview in April. Indeed, she emphasized that the ECB will guarantee to avoid jump in bond yields that are not justified by "fundamental factors"⁶, echoing Mario Draghi's slogan "whatever it takes" (Whelan, 2022; Look et al., 2022). Nonetheless, a 1% increase in interest rates by the end of this year is extremely plausible, and it may be even higher for the countries under consideration given their fragile fiscal positions. To account for this risk, I will assume a negative shock to the interest rate of 2 ppt above its initial level.
- *Negative shock to the growth rate.* It is assumed an exogenous shock to the growth rate, which could be attributable to a slowdown in the economy caused by the recent spike in inflation, for example. The magnitude is assumed to be a 0.5 ppt decrease in the original level of growth rate, which is a commonly used magnitude in debt sustainability analysis.

⁵ It is the interest rate established by a financial institution for a nation, which influences the cost of borrowing money from a central bank.

⁶ The fundamental factors affecting interest rates are profitable opportunities, temporal preferences for consumption, risk of the investment and inflation rate (Borad, 2018).

- *Negative shocks to g_t and r_t .* It combines the occurrence of the interest and growth rate shocks.
- *Intermediate scenario.* The shocks to the growth and interest rate are combined with the milder scenario for the maximal fiscal effort. As a result, it will be displayed the debt ceiling that will be reached when coping with both shocks and the previous five-year average maximum fiscal effort.
- *Worst-case scenario:* In this case, the occurrence of shocks to both the interest rate and the growth rate is paired with the pessimistic scenario for the maximum fiscal effort to demonstrate how the debt ratio ceiling alters when the worst-case scenario is realised.

	Milder scenario for \bar{s}	Pessimistic scenario for \bar{s}	Negative shock to r_t	Negative shock to g_t	Negative shocks to g_t and r_t	Intermediate scenario (shocks to g_t and r_t + milder scenario)	Worst-case scenario (shocks to g_t and r_t + pessimistic scenario)
ITALY	216.2%	179.5%	225.9%	274.8%	210.7%	120.2%	54.4%
GREECE	285.5%	238%	233.5%	289.6%	215.8%	185.7%	133%
PORTUGAL	203.8%	158%	157.8%	208.2%	142.8%	114.3%	33%
SPAIN	151.4%	185%	191.7%	243.3%	175.8%	/ ⁷	60.5%

Table 2.2: Debt ratio ceilings in sensitivity scenarios.

Legenda: **Green** indicates a fiscal space larger than 50%, **Yellow** indicates a fiscal space lower than 50% and **Red** indicates no fiscal space.

What emerges from the table above is that the ability to generate a regular sizable primary surplus allows for a large fiscal space, regardless the debt ratio level. Indeed, it appears that Italy, the country under consideration with the largest fiscal effort, has a significant fiscal space even in the event of a shock to interest and growth rates, or to both at the same time. This appears to be true for Spain as well, even if owing mostly to the fact that it has the lowest interest rate ($r_t = 0.5$, see table 2.1). On the other hand, in the event of a shock, Greece and Portugal's fiscal spaces are more limited due to lower levels of maximum fiscal efforts and/or higher interest rates attached. However, all of the countries share the fact that as each country's ability to run primary surpluses declines, so does their fiscal space. This is already visible in both sensitivity scenarios for \bar{s} , but it becomes evident when they are combined with the shocks to r_t and g_t (milder and worst-case scenarios). In fact, in these two latter cases, all the PIGS end up not having fiscal space, emphasising the need of maintaining significant primary surpluses when dealing with severe shocks and high debt ratios. As a result, if the shocks materialise and the countries in analysis are unable to maintain substantial primary surpluses, they will have all already exceeded their debt ratio ceilings, raising questions about the sustainability of their debt.

The lesson we can derive from this analysis is twofold. To begin, it is now evident that the size of a debt ratio is not the most essential factor in determining its sustainability. Rather, we must consider the country's capacity to maintain primary surpluses. The second lesson is that there is no unique debt ratio ceiling above which the public debt's serviceability is called into doubt. This is due to the previously mentioned "impossibility principle" of Wyplosz (2007). Indeed, as we observed from this analysis, even large debt ratios such as those under discussion, can be regarded as sustainable. This makes the term "high debt ratios" a relative concept, particularly for advanced nations (Wyplosz, 2007). Consequently, defining a unique debt ceiling becomes problematic. Table 2.2 further demonstrates how the concept of debt ceiling is relative to the expected condition for the parameters driving the dynamics of the debt ratio. Indeed, the likelihood of debt sustainability

⁷ The results cannot be retrieved in this scenario since having a deficit $\bar{s}_{ES} = -1\%$ implies that there is no solution in the equation (4). However, as previously stated, this would be a worse scenario for Spain than the worst-case scenario because its five-year average PBRs would not reach the budget draw, as is projected in the worst-case scenario.

depends on the macroeconomic picture (g_t and r_t), as well as, most crucially, the soundness of political and economic systems (\bar{s}) (Wyplosz, 2007). Hence, depending on the characteristics of the country under consideration, a single universal debt ceiling would be either too stringent or too liberal (Wyplosz, 2007). Therefore, a debt ceiling can only be defined for each country based on its economic and political characteristics. This approach, however, do not eliminate the uncertainty, making a precise estimate of it still impossible.

Before moving on to Section 3, it is necessary to define the limitations of this analysis in order to smooth the fiscal policy implications that might be derived from the above results. Indeed, such an analysis attempts to be more of a benchmark of the PIGS' fiscal conditions than a comprehensive debt sustainability analysis.

2.5.3. Limitations

To perform a debt sustainability analysis, a baseline forecast of the variables affecting debt ratio dynamics over a specific period is required, which is five years for the IMF and ten years for the EU Commission (Wyplosz, 2007). Then, a series of shocks are applied to these variables in order to generate sensitivity scenarios for the debt ratios and determine whether their long-term sustainability is in doubt (Wyplosz, 2007). The analysis performed here is not a debt sustainability analysis because it lacks the forecasts of r , g and \bar{s} in the future. In fact, such variables are treated here as though they were set in stone, resulting in a quite static picture. Nonetheless, the goal of this assessment was not to provide a thorough debt sustainability analysis, but to provide a sense of the PIGS' remaining fiscal space, as well as an understanding that the sustainability of debt ratios is inextricably linked to the ability to generate sufficiently large primary surpluses. Indeed, the analysis shows that, despite high debt ratio levels, there are no major sustainability issues as long as governments have room to control them. Hence, rather than focusing just on debt ratios, their fiscal policies should strive to increase their ability to maintain primary surpluses in order to improve fiscal sustainability. However, the debt ratio ceilings calculated by Equation (4), and hence the size of the fiscal spaces, should be viewed with caution because the formula is not flawless. Some limitations were already highlighted at the start of paragraph 2.5. The following are the primary issues with applying the formula of Blanchard et al. (2021):

1. Equation (5) assumes a positive linear relationship between the interest rate and the debt ratio, which empirical evidence does not support. In fact, it is impossible to rule out the possibility that such a relationship has a different functional form (quadratic, logarithmic, and so on) (Baudetto et al., 2022).
2. There is no widespread consensus on the extent to which the debt ratio level influences the interest rate (parameter c). In fact, Blanchard (2022) defines attempts to calculate the magnitude of this link as "not much better than back of the envelope computations," suggesting that the estimates of c are not very reliable (Baudetto et al., 2022).

Therefore, the PIGS should regard the size of the fiscal spaces shown here with caution and only use them as a benchmark to grasp how policies aimed at large primary surpluses can provide them with large fiscal spaces.

3. Did the Covid-19 crisis jeopardise the countries' capacity to generate primary surpluses? An analysis of the short-term trends

The outbreak of the Covid-19 health emergency, as well as the economic implications of the containment measures put in place, prompted a large increase in debt issuance across Europe to cope with it. The speed and scope with which such fiscal measures have been implemented has been astounding. This is due to three major factors. First, governments have learnt from the Great Recession of 2008 that the longer they wait to intervene, the bigger the costs in the future. This lesson has also been embraced by countries who have previously been hesitant to use debt financing, such as Germany (Eichengreen et al., 2021). Second, financing conditions have greatly improved in recent years as interest rates have fallen as a result of slower productivity growth, increased savings, population ageing and monetary policy (EU Commission, 2022). For this reason, despite Europe's high debt ratio trend, interest payments continued to fall due to the negative interest-growth rates gap, allowing for further debt issuance (EU Commission, 2022). Finally, the increase in debt to support huge stimulus packages in Europe was substantially greater than in emerging nations, and this is not due to the latter being less affected by the pandemic (Eichengreen et al., 2021). The rationale for this is that investors believe that developed countries, such as those in Europe, can handle an increase in their debt ratios by reducing them in the future through a mix of primary surpluses, inflation management, and economic development support (Eichengreen et al., 2021). On the other hand, such reasons are weaker for emerging markets, particularly when it comes to political stability and the potential to maintain primary surpluses (Eichengreen et al., 2021).

For all of these factors, it appears that the increase in debt ratios occurred during the Covid-19 emergency is not a cause for alarm in terms of sustainability. Indeed, some influential economists in the field, such as Blanchard (2019), have suggested that high debt ratios can be maintained in such a favourable climate. However, in the past, similar circumstances did not prevent the emergence of sustainability concerns and debt crises (EU Commission, 2022). This was also demonstrated in the preceding Section. The occurrence of severe shocks, along with the inability to maintain significant primary surpluses, might result in unsustainable debt dynamics. As a result, even when conditions appear to be favourable, debt sustainability issues persist. The main concern now is whether the Covid-19 crisis impacted the nations under consideration's ability to run primary surpluses in the future, as this will influence the PIGS' ability to deal with future shocks.

3.1. Preventing the scarring effects of the Covid-19 crisis or improving fiscal positions?

To support the numerous fiscal measures to tackle the implications of the Covid-19, the European governments were forced to run large deficits, as illustrated in Figure 3.1. Italy, in particular, ran the highest deficits in the EU in 2020, followed by Spain in 2021 (Haroutunian et al., 2020). This was made feasible by the SGP's escape clause, which was invoked in this extraordinary circumstance. The escape clause permits European countries to depart from the SGP's fiscal adjustment rules in order to allow higher expenditures to combat economic downturns, as long as debt sustainability is maintained (Gern et al., 2020). Nonetheless, the escape clause will not be in effect indefinitely. On the contrary, the EU Commission proposed that, once the economic crisis has passed, EU nations undertake fiscal policies aimed at strengthening their fiscal positions and debt sustainability (Haroutunian et al., 2020). The SGP's escape clause, specifically, is scheduled to remain in effect until the end of 2022, as notified by the European Commission on the 3rd of March 2021 (Pianta, 2021). The next natural question is whether the prerequisites for implementing fiscal consolidation are currently in place or if it is too soon.

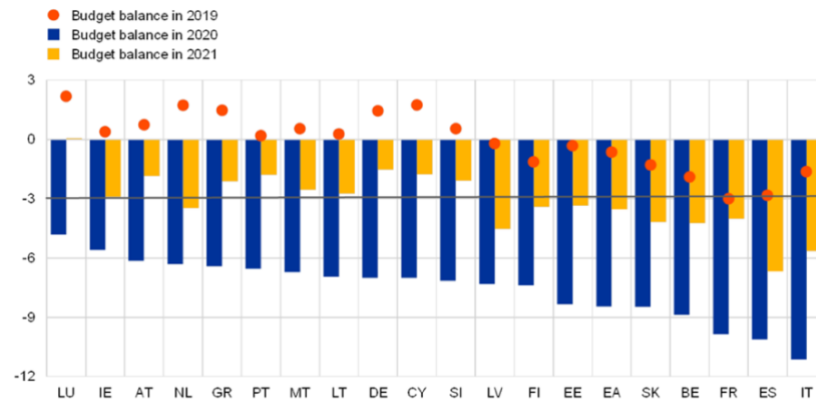


Figure 3.1: European PBRs between 2019 and 2021.

Source: (Haroutunian et al., 2020).

https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202004_07~145cc90654.en.html

Although the Covid-19 health emergency appears to be latent, it is impossible to declare it over given the uncertainties surrounding the emergence of new variants (Cuerpo, 2022). However, the economy's recovery is outperforming original expectations not only in terms of scale, but also of consistency over time (Cuerpo, 2022). Such remarkable achievements are the consequence of a successful vaccination campaign, which allowed for the easing of containment measures and the return to regular economic activity, as well as national and European policy responses that laid the groundwork for the quickest possible recovery (Cuerpo, 2022). Therefore, it is possible to be more optimistic about the European economy's future, and this should be true even if Covid-19 infections rise again. Indeed, as many economists, including Pieter Hasekamp, director of the CPB, have observed, the economy has adapted to the crisis, becoming less susceptible to new waves of infection. This is mostly due to the reduced uncertainty provided by vaccines and a better awareness of the hazards and consequences of a new wave of coronavirus, as well as the fact that there is already a broad set of policy instruments available to deal with it (Hasekamp, personal communication, March 29, 2022). This does not, however, imply that all economic measures implemented can be instantly phased away. The challenge now is to ensure that this is not just a short-term rebound, but a relaunch of the European economy that will encourage more sustainable and robust growth from an economic, environmental, and social standpoint (Cuerpo, 2022).

However, the European countries' public finances are still burdened by the economic Covid relief measures they undertook, which are not being phased out yet. More crucially, not all of them are still required or regarded efficient but removing them presents challenges (Hasekamp, personal communication, March 29, 2022). Namely, these challenges are (Hasekamp, personal communication, March 29, 2022):

- *Path dependency.* Subsidies granted to assist enterprises and households can create a dependency on continuing to provide such support. This is due to the fear that the government's efforts will be futile if such economic measures are abandoned too quickly.
- *Lobbying and rent-seeking behaviour.* In this situation, interest groups try to persuade the government not to eliminate such fiscal measures (cash transfers, tax cuts, and so on) in order to boost their revenue through government favours rather than through economic activity (Craig & Madland, 2014).
- *Moral hazard/ Adverse Selection.* These undesired behaviours are the result of governments' economic assistance initiatives. The government is not always able to target the population to which the programme was intended by leaving out some of it or including others who do not need it (adverse selection). Furthermore, some people tend to change their behaviours in order to qualify for financial assistance (moral hazard).
- *Credibility issues.* They are the result of the multiple adjustments that governments had to make as a result of the Covid-19 crisis. They are the result of the multiple adjustments that governments had to

make as a result of the Covid-19 crisis. There are also credibility issues with economic assistance, with governments pledging to halt it but then failing to do so, which is also connected to the path dependency factor.

Such an issue, along with the uncertainties surrounding future macro-financial developments, such as the spike in the inflation rate and the Russia-Ukraine conflict, will have an impact on the PIGS' debt dynamics (EU Commission, 2022). Indeed, this latter development may have an influence on their public budgets through increased military spending, investments to boost Europe's energy autonomy, and efforts to offset rises in food and energy costs (Blanchard & Pisany-Ferry, 2022). Appendix A discusses the impact of the inflation rate increase in further detail.

The exact impact of the Russia-Ukraine conflict, of the spike in inflation, and of the continuation of the Covid-19 assistance measures, however, is difficult to predict with accuracy. What is feasible to examine are the fiscal plans of the countries under consideration in order to comprehend the future trajectory of their PBRs and, as a result, get a sense of the sustainability of their debt. Not only that, but it is also critical to determine if they will have the political stability and credibility to carry out ambitious plans to relaunch their economies and improve their financial conditions. This is especially important to consider because large improvements in public finances are likely to be difficult in fragmented societies such as those recovering from the Covid-19 crisis (Eichengreen et al., 2021). Indeed, the pandemic's impacts have been borne primarily by the poor segment of society, increasing inequality and, as a consequence, the requirement for the public sector to offer more social services (Eichengreen et al., 2021).

The scenarios outlined in the European Commission's *Fiscal Sustainability Report 2021* will be used to undertake this research. In particular, the baseline scenario will be considered as the primary one in this study. It presents a situation in which there is no change in fiscal policy, allowing us to comprehend the PIGS's prospects in the absence of a change in direction. The following are the assumptions provided by the EU Commission to represent such a scenario:

- The *growth rate* is that forecasted in the EU Commission's Autumn forecast for 2021, adjusted for the impact of the Next Generation EU funds (EU Commission, 2022).
- *Inflation and long-term interest rates* are assumed to converge linearly from current values to market-based expectations within 10 years (EU Commission, 2022).
- The *PBR* is assumed to act as though fiscal policy has not changed (EU Commission, 2022).

The PIGS' most recent fiscal budget plans, which are intended to set a course for their fiscal policy in the following years, will also be examined in order to present a complete picture of the direction of their public finances.

3.1.1. The case of Italy

	<i>Growth rate 2021</i>	b_{2021}	<i>Credit rating by Fitch Ratings</i>	b_{2032} in the baseline scenario	<i>Probability of $b_{2026} > b_{2021}$</i>	<i>Primary balance needed to reach 60% debt in 2038</i>
ITALY	6.5%	154.4%	BBB	161.6%	41%	8.2%

Table 3.1: Main figures of the medium-term sustainability analysis of Italy's debt ratio.

Source: Fiscal Sustainability Report 2021, EU Commission (2022). https://ec.europa.eu/info/sites/default/files/economy-finance/dp171_en_vol1.pdf

According to the economic forecasts, the economy of Italy grew by 6.5% in 2021, recouping the majority of the output losses experienced during the pandemic (EU Commission, 2022). Nonetheless, the Italian

economy's and the EU's short-term future are still clouded by the lengthy supply disruptions created by the Covid-19 and the high spike in energy prices observed since the end of 2021 (EU Commission, 2022). However, given the favourable financial market conditions (namely, $r - g < 0$), the EU Commission believes that the short-term threats to Italy's debt level are modest. This enabled it to receive a credit rating of "BBB," which is just above investment grade (Fitch Ratings, 2022). Still, given its high debt ratio and lower projected growth, such a position remains weak (Fitch Ratings, 2022). Conversely, the medium-term budgetary sustainability risks are rated significant (EU Commission, 2022). This is already true when examining the baseline scenario presented by the EU Commission. Indeed, the forecasts are that, following a period of debt stabilisation until 2026 due to the favourable conditions of the interest-growth rate difference, debt would begin to rise until it will reach 161.6% in 2032, implying a further erosion of Italy's fiscal space (EU Commission, 2022). Nonetheless, the baseline scenario is fraught with uncertainty, necessitating the use of sensitivity scenarios. To do so, EU Commission (2022) simulated combined shocks to r , g and s based on their historical volatility in Italy. The findings of this simulation show that there is a 41% possibility that the debt ratio in 2026 will be larger than in 2021, suggesting a significant risk given the elevated current level of the Italian debt ratio (EU Commission, 2022).

According to this picture, Italy needs to adjust its fiscal policy direction in order to improve its budgetary positions while not jeopardising economic growth. This does not appear to be an easy assignment, but the nomination of Mario Draghi, former director of the ECB and trusted figure in the EU, as the leader of the newly formed government, reassured financial markets (Blanchard et al., 2021). Before the fall of its government, Mario Draghi's strategy was to borrow more to help the Italian economy recover from the crisis, but he also intended to reduce the country's large debt load by decreasing the deficit to the European Union's maximum within three years (Albanese et al., 2022). According to Draghi's plan, this would have resulted in a 5.6% deficit in 2022, with a portion of it aimed at protecting households and firms from the increase in energy prices (Albanese et al., 2022). The deficit was then expected to decline, finally falling below the EU's 3% threshold by 2025, lowering Italy's debt ratio to 141% (Albanese et al., 2022). Nonetheless, even with this programme, Italy's debt ratio is not anticipated to fall below 100% in the medium term. Indeed, in order to reduce its debt ratio to 60%, the SGP limit, Italy would need to sustain an 8.2% surplus until 2038, which appears unrealistic both because it is higher than any fiscal effort ever undertaken by Italy and because of its fractured political situation (EU Commission, 2022). Furthermore, such a significant primary surplus would most likely impede its economic recovery (EU Commission, 2022).

Nevertheless, Draghi's government fell on July 21st as the populist party "Movimento 5 Stelle" withdrew their support, followed by the two other populist parties of Italy, "La Lega" and "Fratelli D'Italia", sparking another government crisis and increasing Italy's political instability. Italy's political picture has been in a state of political insecurity for some time. It is enough to know that Italy has had eight different governments in the previous fourteen years, which is impressive when compared to countries like Germany, which only had four governments, or Spain, which only had five. In addition, even if Draghi's government had persisted, it is extremely probable that its plan to provide Italy more budgetary space would have faced political opposition. Indeed, many politicians campaigned for bigger deficits in order to support the economy at the expense of improving public finances (Albanese et al., 2022).

This last government fall occurred at a critical juncture. Matter of fact, Italy is caught between the recovery from the Covid-19 crisis and the economic downturn induced by the spike in inflation, as well as having a massive debt that, as previously stated, must be reduced (Le Monde, 2022). The EU saw Mario Draghi, who assumed office in February 2021, as the guarantee of restoring trust through steps aimed at putting Italy back on the right path (Le Monde, 2022). This shift in the political landscape casts doubt on Italy's fiscal outlook. First, political insecurity and the loss of a key figure such as Mario Draghi may frighten markets, raising the risk premiums required on Italy's public debt (John & Koranyi, 2022). Second, the next elections are scheduled for September 25th, but given the country's high level of historical political fragmentation, a cohesive administration is unlikely to emerge from them. On the contrary, a new coalition government is likely to arise, which might distance itself from Draghi's budget plan and focus more on short-term issues, expanding public

spending to garner consensus. No one can predict with certainty what Italy's political outlook will be or how it will adjust its strategy to reducing the national debt. However, what is most crucial now is that Italy will be able to meet the 55 targets set by the EU by the end of 2022 in order to have access to a 19-billion-euro benefit tranche contained in the NextGenerationEU (Mangiapane, 2022). Clearly, without Mario Draghi and with all the political upheaval caused by the fresh elections, the mission will be tough to complete, but a failure to do so may have serious implications on the economic recovery of Italy and, consequently, on the sustainability of its public debt (Mangiapane, 2022).

3.1.2. The case of Greece

	<i>Growth rate 2021</i>	b_{2021}	<i>Credit rating by Fitch Ratings</i>	b_{2032} in the <i>baseline scenario</i>	<i>Probability of $b_{2026} >$ b_{2021}</i>	<i>Primary balance needed to reach 60% debt in 2038</i>
GREECE	7.1%	202.9%	BB	155%	18%	7.2%

Table 3.2: Main figures of the medium-term sustainability analysis of Greece's debt ratio.

Source: Fiscal Sustainability Report 2021, EU Commission (2022). https://ec.europa.eu/info/sites/default/files/economy-finance/dp171_en_vol1.pdf

The Greek economy looks to have rebounded rapidly from the Covid-19 crisis, and the outlook for its economy remains favourable, but clouded by uncertainties (Economic and Financial Affairs, 2022). The economy grew by 7.1% in 2021, spurred by domestic demand and a better-than-expected tourism season, as well as economic support measures put in place to help mitigate the consequences of the pandemic (EU Commission, 2022). The Greek economy's impressive recovery is likely to continue at a slightly slow rate in 2022, due to a surge in energy costs and the economic impact of the Russia-Ukraine conflict, as well as long-term pandemic uncertainty (Economic and Financial Affairs, 2022).

Despite the economic recovery, looking at the forecasts of its debt ratio trends, the scenario predicted by the EU Commission raises serious concerns. Indeed, EU Commission (2022) signals an elevated risk for the debt sustainability of Greece already in the short-term. This risk is primarily caused by the elevated debt ratio and by the gross financing needs⁸, which are predicted to remain significant in the short-term (EU Commission, 2022). Nevertheless, given the favourable interest-growth rate differential, the perception of sovereign risk decreased, even though the rating is BB, which is still below the investment grade⁹ (EU Commission, 2022). Being below the investment grade suggests that the country's bonds are deemed "junk" bonds, implying that the country's ability to repay its debt is questioned, signalling a substantial credit risk (Baird, 2021). This has a far-reaching consequence. It implies a rise in bond yields, indicating the country's difficulty in issuing debt at a low cost in comparison to other countries with higher credit quality (Baird, 2021). For this reason, investors prefer to avoid investing in these countries, unless they are looking for risky investments, making it more difficult for them to issue debt (Baird, 2021). Nevertheless, even though Greece's ratings have been confirmed at "BB," the outlook remains favourable (Fitch Ratings, 2022). Indeed, Greece has a high per capita income, governance scores, and human development indexes among countries with below investment grade ratings (Fitch Ratings, 2022). However, these good features are offset by high levels of non-performing loans¹⁰ and a very high debt ratio (Fitch Ratings, 2022). Still, the outlook remains positive because Greece is likely to

⁸ These are the financial requirements needed for rolling over maturing debt. They are defined as the primary deficit plus any additional transactions that require funding plus amortisation.

⁹ It indicates whether a government or corporate bond has a low or high risk of default. A debt is indicated as investment grade if it has a credit rating of BBB or higher, according to Standard & Poor ratings.

¹⁰ Non-performing loans are those in which the borrower has failed to make interest payments for more than 90 days. When this occurs, the bank is compelled to save additional capital on the presumption that the loan would not be repaid. This reduces its capacity to provide loans.

significantly reduce its debt ratio while also lowering the levels of non-performing loans (Fitch Ratings, 2022). As a result, if Greece is able to improve its fiscal position, its credit rating may increase in the future, with positive implications for its debt dynamics. Moving on to the medium-term outlook, the concerns about Greece's debt sustainability remain significant. This holds true even in the baseline scenario, which predicts a large drop in Greece's debt ratio. As a matter of fact, in the baseline scenario is forecasted that, aside from maintaining favourable financing conditions, Greece's primary balance will average approximately +1.9% between 2024 and 2032, lowering debt to around 155% if no fiscal changes are made (EU Commission, 2022). As did before for Italy, since the baseline scenario is characterized by uncertainty, the EU Commission simulated combined shocks to r , g and s based on their historical volatility in Greece. The results of these simulations reveal that the Greek debt ratio is 18% more likely to be greater than its actual figure in 2026, indicating a medium risk given its high level (EU Commission, 2022). The baseline scenario demonstrates that Greece's fiscal policy in previous years was already directed at enhancing its financial positions, and if it was not for the outbreak of the Covid-19 crisis and the need to run deficits that resulted, it would have most likely continued on an improving path of debt ratio dynamics.

Greece, on the other hand, is an outlier since its fiscal improvements can be considered less tied to the political context. Indeed, since 2018, Greece's economic developments and policies have been overseen not just by the European Semester, but also by the Enhanced Surveillance framework (Economic and Financial Affairs, 2022). This increased scrutiny arose from a recognition of the necessity for Greece to continue taking steps to address the root causes of its economic and financial issues, while simultaneously implementing structural reforms to enable robust and sustainable economic growth (Economic and Financial Affairs, 2022). Furthermore, improved surveillance allowed for frequent assessments of current economic and financial developments in Greece, as well as assessing sovereign funding conditions and updating debt sustainability evaluations (Economic and Financial Affairs, 2022). Greece agreed to such a commitment since it allows for the granting of debt relief measures, which are needed given the country's difficult fiscal situation. This also ensured improvements in its financial stability (Economic and Financial Affairs, 2022). Yet, it is unlikely that such a situation will continue for a long time. In fact, the executive vice president of the EU Commission, Valdis Dombrovskis, suggested that there is a possibility that Greece could exit from the enhanced surveillance already by the end of August (Chrysolora, 2022). This is due to the rigorous implementation of the requested reforms, even during the Covid-19 crisis, as well as the policy commitment to continuing to strengthen the country's financial stability (Chrysolora, 2022; Economic and Financial Affairs, 2022). Consequently, this has greatly decreased the risks of negative spill over effects on other eurozone countries, resolving the requirement that underpins the use of enhanced surveillance (Economic and Financial Affairs, 2022). As a result, it is likely that already from the next years, the fiscal policy plan of Greece will go back to be influenced by the political context, as it is for all the other countries. This could result in poorer fiscal performances than those recorded under the Enhanced Surveillance Framework.

The Enhanced Surveillance framework registered a deficit of 5.5% for Greece in 2021, which is 2 ppt less than the one anticipated by the EU Commission in the Autumn 2021 forecasts. This reduction was caused by quicker GDP growth as well as more favourable tax base dynamics (Economic and Financial Affairs, 2022). Moreover, nearly all of the economic support measures provided in 2021 are planned to be phased out by 2022, relieving pressure on Greece's public finances (Economic and Financial Affairs, 2022). Nevertheless, also Greece will implement temporary measures (subsidies and tax cuts) to mitigate the consequences of the energy price surge on consumers and businesses. The impact of these policies will be limited to 1.1% of GDP (Economic and Financial Affairs, 2022). As a result, Greece will still run a 1.9% deficit in 2022, but the EU Commission predicts that by 2023, it would be able to achieve a primary surplus of 1.3%, resuming its path of debt reduction (Economic and Financial Affairs, 2022). Despite better-than-expected 2021 prospects, concerns regarding Greece's fiscal position remain, due to the country's high debt ratio and uncertainty about future macroeconomic events (IMF, 2022).

As previously stated, the EU's tighter supervision over Greece's economic and financial developments makes the improvement of its public finances less dependent on the political environment. However, even if such

rigorous management continues in the future years, it is extremely unlikely that Greece will be able to return to the SGP's 60% debt ratio threshold in the next fifteen years. Indeed, in order to implement such an ambitious plan by 2038, Greece would need to run a primary surplus of 7.2%, which would be difficult to achieve in the post-Covid environment, as well as in a social atmosphere hostile to austerity measures (EU Commission, 2022; Karakatsani, 2022). On the contrary, the fiscal adjustment is planned to be progressive and growth-oriented, based on credible measures that do not jeopardise the benefits made by public investments during the pandemic in favour of a too harsh fiscal consolidation (IMF, 2022).

3.1.3. The case of Portugal

	<i>Growth rate 2021</i>	b_{2021}	<i>Credit rating by Fitch Ratings</i>	b_{2032} in the baseline scenario	<i>Probability of $b_{2026} >$ b_{2021}</i>	<i>Primary balance needed to reach 60% debt in 2038</i>
PORTUGAL	4.9%	128.1%	BBB	126%	36%	5.9%

Table 3.3: Main figures of the medium-term sustainability analysis of Portugal's debt ratio.

Source: Fiscal Sustainability Report 2021, EU Commission (2022). https://ec.europa.eu/info/sites/default/files/economy-finance/dp171_en_vol1.pdf

Portugal was one of the countries hardest hit by the pandemic due to the importance of the tourism sector. Nonetheless, swift and thorough policy intervention, bolstered by measures implemented at the EU and national levels, helped to limit the effects of the Covid-crisis on households and businesses, resulting in a 4.9% GDP growth in 2021 (IMF, 2022; EU Commission, 2022). Furthermore, the strong vaccination campaign allowed for the release of containment restrictions, promoting economic growth as the tourism sector recovered (IMF, 2022). Nonetheless, as with all European countries, the future economic picture for Portugal is clouded by the uncertainty caused by the Russia-Ukraine conflict (IMF, 2022).

Moving on to the examination of debt dynamics in Portugal, the picture appears to be bleaker than the economic forecast. Nevertheless, given the favourable financing conditions, the overall short-term risk appears to be negligible for Portugal, allowing it to be rated at investment grade (BBB) by the major credit rating agencies (EU Commission, 2022). Regarding the medium-term risk, on the other hand, Portugal is rated as a high-risk country by the EU Commission (2022). Under the baseline scenario, Portugal's debt ratio is predicted to fall until 2026 due to the favourable interest-growth rate differential, but then to rise to 126% in 2032, which is comparable to the current level (EU Commission, 2022). Moreover, the sensitivity scenario analysing the joint macroeconomic shocks to r , g and s indicates a likelihood of 36% of its debt being higher in 2026 than the current level, indicating a considerable risk given Portugal's high debt ratio (EU Commission, 2022). Hence, the Portugal's fiscal picture emphasises the necessity to pursue a direction of sound fiscal policies. Nevertheless, Portugal was already on a more prudent fiscal track before the pandemic. Portugal's primary deficit reached 2.8% in 2021, which is much lower than the government's earlier prediction (4.3%) and also lower than the EU average (Fitch Ratings, 2022). Furthermore, the decline in the debt ratio between 2020 and 2021 was the third largest in the eurozone, falling from 135% in 2020 to 128% in 2021 (Fitch Ratings, 2022). Portugal's budget proposal aims to achieve a deficit of 1.9% in 2022, while also including one-time measures to support the economy, targeted to vulnerable households and sustainable companies to help them cope with rising energy prices (IMF, 2022). In the meantime, it also aims at phasing out the support measures implemented during the pandemic (IMF, 2022; Fitch Ratings, 2022). The implementation of gradual budgetary reforms aimed at expanding the Portuguese fiscal space is projected to begin in 2023 (IMF, 2022). In particular, several specific fiscal policies have already been declared, backed by the implementation of the Budgetary Framework Law, which aims to improve the budgetary process, spending management, and cost efficiency of these measures, thereby boosting their credibility (IMF, 2022). The fiscal recommendations aimed at

promoting a growth-oriented fiscal adjustment are:

- *Tax reforms*, targeted at increasing efficiency and broadening the tax base. For example, it is proposed to increase the VAT rates as well as improve less distortive mechanisms (e.g., environmental taxes) (IMF, 2022).
- *Rationalization of the expenditures*. For instance, by better targeting the economic support measures as subsidies and tax cuts (IMF, 2022).
- *Implementation of growth-oriented investments*, which is planned to be achieved by promoting a transparent and efficient budgetary process. Initially, the goal is to employ Next Generation EU funding and impose stricter fiscal policies between 2023 and 2026 to ensure that such efficient investments continue beyond the implementation of the Recovery Resilience Plan¹¹ (IMF, 2022).

This fiscal adjustment procedure appears to be achievable and credible, owing to the political stability of Portugal. Indeed, political uncertainty has diminished dramatically after the January election, following the fall of the previous government in October 2021 (ING, 2022). Indeed, political stability allows the government of the Prime Minister Antonio Costa to more readily execute fiscal adjustments to reduce the debt ratio. Moreover, Antonio Costa has been the head of the government already twice, both times as a minority government, and he has proven to be successful in implementing fiscal discipline (Fitch Ratings, 2022). Indeed, he was able to create regular primary surpluses, allowing him to reduce the debt ratio by about 15 ppt between 2015 and 2019 (Fitch Ratings, 2022). Such favourable context allows for optimistic forecasts on Portugal's future debt ratio trends, with Fitch Ratings (2022) estimating that its debt ratio will return to pre-pandemic levels (101%) in 2024.

Nonetheless, also Portugal is unlikely to return to a debt-to-GDP ratio of 60% by 2038. To do so, it would need to maintain a 5.9% primary surplus, which would be bigger than any fiscal effort recorded by Portugal since 1980 (EU Commission, 2022). In conclusion, even if still classified as a high-risk country by the EU Commission (2022) due to its high debt ratio, it is possible to be partially optimistic about its future debt trends given the definition of the abovementioned reforms and the political stable climate. Nonetheless, the future remains uncertain due to the risk of adverse events affecting its public finances and political stability.

3.1.4. The case of Spain

	<i>Growth rate 2021</i>	<i>b₂₀₂₁</i>	<i>Credit rating by Fitch Ratings</i>	<i>b₂₀₃₂ in the baseline scenario</i>	<i>Probability of b₂₀₂₆ > b₂₀₂₁</i>	<i>Primary balance needed to reach 60% debt in 2038</i>
SPAIN	5%	120.1%	A-	126%	57%	3.6%

Table 3.4: Main figures of the medium-term sustainability analysis of Spain's debt ratio.

Source: Fiscal Sustainability Report 2021, EU Commission (2022). https://ec.europa.eu/info/sites/default/files/economy-finance/dp171_en_vol1.pdf

With a 10.8% decrease in GDP in 2020, Spain is the advanced country most harmed by the economic consequences of the Covid-19 (IMF, 2022). This is attributable not just to the Spanish economy's heavy reliance on tourism, but also to the prevalence of small and medium-sized firms (IMF, 2022). The economic outlook began to improve in the second half of 2021 reaching a growth rate of 5%, but output remains below pre-pandemic levels, which is expected to fully recover by the end of 2022 (IMF, 2022). However, the burst of the war in Ukraine has clouded the future economic prospects also for Spain, hampering its growth but not

¹¹ Instrument contained in the Next Generation EU targeted at assisting the nations most affected by the pandemic in mitigating its social and economic impact, as well as encouraging more sustainable and robust growth to face the green and digital transition.

disrupting it (Gonzalez et al., 2022).

Concerning the dynamics of the Spanish debt ratio and its associated risk, the EU Commission anticipated no significant problems in the short term, owing to favourable financing conditions that allowed the major credit rating agencies to assign Spain a "A-" rating (EU Commission, 2022). The medium-term risk, on the other hand, is anticipated to be substantial. Indeed, the baseline scenario predicts that, under no-fiscal policy change, debt will raise from now to 2032, reaching a level of 126%. Moreover, also the sensitivity scenario, which simulates shocks to r , g and s , indicates a probability of 57% of the Spanish debt ratio being greater than its actual value by 2026, suggesting a significant risk (EU Commission, 2022). As a result, given such projections, it appears that fiscal consolidation is required to avoid significant pressures on public finances in the future. The Spanish budget proposal for 2022 aims to achieve fiscal consolidation through economic recovery and the deployment of automatic stabilisers, with fiscal adjustments limited to the phase-out of Covid-19 support programmes (IMF, 2022). Nonetheless, depending on future developments, particularly the pandemic, some aid measures are designed to remain flexible enough to be adopted quickly, if necessary, but being more targeted to the most vulnerable households and businesses (IMF, 2022). After 2022, when the Spanish economy is expected to have fully recovered from the Covid-19 crisis, debt restructuring must be implemented progressively but consistently in order to establish a balanced situation within a decade (IMF, 2022). The structure of the planned fiscal consolidation entails increasing revenues and rationalising government expenses. The former will be accomplished through reforming the tax system, as Spain's tax-to-GDP ratio is quite low in comparison to other countries (IMF, 2022). To that end, it is proposed to expand VAT collection, improve environmental levies, and make the taxing system more efficient (IMF, 2022). The rationalisation of expenditures, on the other hand, is intended to be accomplished by increasing the spending review process in order to improve transparency (IMF, 2022). The adoption of a credible medium-term fiscal plan is critical to restoring investor trust and avoiding a spike in debt servicing costs, which would further restrict Spain's limited fiscal headroom (IMF, 2022). However, the political environment does not appear to be conducive to the easy implementation of such a fiscal plan. Indeed, the political landscape of Spain has become increasingly fragmented since the start of the Great Recession, owing mostly to the emergence of nationalist parties and the Catalan independence movement (Nogueira Pinto, 2022). This resulted in the establishment of a political climate in which achieving compromises is extremely difficult, and this trend became even more apparent in the recent Covid-19 crisis (Nogueira Pinto, 2022). The fundamental disagreement is between the left and right parties about how to achieve economic recovery, with the left party advocating for increased government spending and the right party advocating for lower taxes and less government engagement. Not only that, but there are disputes also about how the Next Generation EU subsidies should be spent, raising concerns about their mismanagement (Nogueira Pinto, 2022). The most likely scenario for Spain's political future is that the government coalition of the left party will complete its term in 2023, and in the meanwhile, Spain will experience greater instability and fragmentation, given the parliament's lack of support for this government (Nogueira Pinto, 2022). These dynamics are likely to have an impact beyond 2023 because, regardless of election results, instability will persist, making difficult the implementation of sound policies (Nogueira Pinto, 2022). As a result, if Spain is unable to strengthen its political stability and credibility, public debt is likely to become a major cause of concern once favourable financing conditions reverse (Nogueira Pinto, 2022). Finally, under these conditions, it is very implausible that Spain would be able to return to a debt ratio of 60% by 2038, because it would need to run a primary balance of 3.6%, which is already unlikely given Spain's PBRs history, and it is considerably more difficult given the unpredictable political atmosphere (EU Commission, 2022).

3.1.5. The overall picture

As illustrated in the subparagraphs above, once the economies will fully recover, the emphasis will move to the stabilization of the debt ratios. Historically, large debt ratios caused by these types of crises have been addressed by achieving primary surpluses, enduring mild inflation, and promoting economic growth (Eichengreen et al., 2021). The combination of these three factors is critical. Indeed, relying solely on inflation or on primary surpluses over long periods of time did not work in the past. The former erodes trust in both the government and the economy, as happened in Germany in the aftermath of WWI, whereas the latter is frequently confined by political and economic constraints, as happened in Greece's sovereign debt crisis (Eichengreen et al., 2021). Governments appear to have learned this lesson since the PIGS' fiscal adjustment strategies tend to be directed toward a mix of these three elements. Nonetheless, it is unlikely to be an easy undertaking given the post-Covid economic environment. This is especially true for Spain and Italy, both of which have unstable political situations, but also for Greece, which has the highest debt ratio. Notwithstanding, this is not the only reason why substantial budget consolidations appear to be difficult to attain. First, the Russian-Ukraine conflict and the spike in inflation rate have cast doubt on the European countries' short-term recovery while also increasing the need for public expenditures to address these additional issues (Blanchard & Pisany-Ferry, 2022). Second, pushing for greater fiscal adjustments would have significant repercussions for citizens' well-being that must be considered. Indeed, harsher austerity measures would show a decline in aggregate demand, implying lower tax collections than usual (Sawyer, 2021). Hence, even if it meant obtaining lower deficits, it would come at the expense of economic activity and an increase in unemployment (Sawyer, 2021). In turn, primary deficit reduction would be hampered, while the most vulnerable populations would suffer (Sawyer, 2021). This would be even more detrimental because the pandemic's consequences have already been borne disproportionately by the poorer levels of society, emphasising the need for further redistribution (Eichengreen et al., 2021). As a result, not only does this create demand for additional social services, but it also limits tax increases to reduce primary deficits (Eichengreen et al., 2021). This creates grounds to raise taxes just on the rich to redistribute wealth, but this is difficult given the ease with which they can transfer their high earnings and capitals to evade taxation (Eichengreen et al., 2021). Consequently, even if such an increase in taxation on the wealthy is adopted, it is unlikely to have a major impact on the countries' revenues (Eichengreen et al., 2021).

The scenario portrayed does not appear to advocate for more drastic fiscal adjustments than those envisioned in the budget projections depicted above. However, long-term trends such as population ageing and climate change will have significant impacts on the capacity to run primary surpluses in the future, and if the countries under consideration are unable to significantly expand their fiscal space before these factors kick in, their debt ratios may undertake a less sustainable path. As a result, it is too early to say if the PIGS' fiscal plans are sufficient. Indeed, it is necessary to first examine the extent to which the countries under consideration are vulnerable to these long-term trends in terms of their impact on their public finances. This is what will be done in the following Section.

4. Long-term trends affecting public finances

In this section, the effects of the two key long-term trends identified by the EU Commission as endangering European countries' debt sustainability will be studied: population ageing and extreme climate-related events.

4.1. The impact of population ageing

It is no longer a secret that the population of most European countries is rapidly ageing. The drop of the fertility rate, the rise in life expectancy, and migration flow patterns all contribute to this trend (EU Commission, 2021). As a matter of fact, the Old-age Dependency Ratio ("ODR" from now on), which is the ratio of persons aged 65 and up on to those aged 20 to 64, is expected to rise by about 25 ppt by 2070, reaching a level of 59.2% (EU Commission, 2021). As a result, the proportion of persons working in the EU will decrease relative to the proportion of retirees (EU Commission, 2021). This ageing trend has a dual influence on debt dynamics. First, because the percentage of workers will be smaller, it will have an influence on the GDP growth rate through its impacts on labour supply and Total Factor Productivity (TFP) (Boone et al., 2022). Second, an ageing population has an impact on a country's public finances and, consequently, on its capacity to sustain primary surpluses. First and foremost, this occurs because an older population implies higher expenditures to fund the pension system, long-term care, healthcare and education system (EU Commission, 2021). In addition, this occurs because an ageing population implies a decrease in tax revenues on labour income and social security contributions due to a lower labour force, which has a negative influence on a country's public finances (Brys & Colin, 2020). To investigate such a factor and its implications for countries' ability of running primary surpluses, I will rely on two analyses of the EU Commission: the *Ageing Report 2021* and the *Fiscal Sustainability Report 2021*. The former evaluates how the effects of population ageing will impact the growth rate and the public finances of the European countries from now to 2070. Given the subject of this paper, the emphasis will be on the consequences of population ageing on public finances rather than on growth rate. Nonetheless, despite demographic shifts, the EU growth rate is not expected to vary considerably from now until 2070 in the baseline scenario¹² (EU Commission, 2021). Concerning the fiscal impact of population ageing, the EU Commission (2021) anticipated that, in the baseline scenario, costs in the four aforementioned sectors would be higher at the European level. Yet, the increase in these costs will be heterogenous between European countries not only in terms of size, but also of timing (EU Commission, 2021). In fact, some countries will experience the peak of these expenditures at the end of the forecast period, while others will see a peak sooner and a fall after that. What nearly all EU countries have in common is that the increase in expenditures will be mostly concentrated in the healthcare system and funding long-term care, while spending for the pension system will decline in some countries as a result of previously imposed adjustments (EU Commission, 2021). However, as before, such projections are fraught with uncertainty and, consequently, EU Commission (2021) implemented some sensitivity scenarios. In this analysis, I will consider the following ones:

- A scenario in which the TFP is assumed to be lower, and hence also the growth rate.
- A scenario in which rising healthcare costs are caused by factors other than an ageing population, such as advances in medical technology. Such sensitivity scenario is the one who produces the largest average raise in expenditures across the EU (EU Commission, 2021).

Finally, the analysis of the EU Commission (2022) combines two indicators to determine the EU countries' exposure of the public finances to the impact of population ageing:

1. *DSA Risk Assessment*, which is the assessment of the medium-term fiscal situation described in Section 3, based on the debt ratio level and its future dynamics.

¹² It is the same baseline scenario mentioned in section 3, where it is assumed "no-fiscal policy changes".

2. *S2 indicator*, which represents the required PBR to keep the debt ratio steady over time (EU Commission, 2022). The efforts that a government must make to modify its fiscal policy from its current stance determine whether the country under consideration is characterised by high or low risk (EU Commission, 2022). Furthermore, to better identify the entity of the risk, the PBR revealed by the S2 indicator is then compared to the country's previous fiscal efforts to assess its feasibility.

Appendix B contains a full assessment of the impact of population ageing on the PIGS' public finances, including all tables of results. A summary of the main outcomes of the PIGS, which share common elements in their susceptibility to demographic dynamics, can be found below.

4.1.1. The overall picture

None of the countries under consideration appear to face major long-term risks as a result of the projected negative population dynamics. In fact, in the baseline scenario, total expenditures associated to population ageing are predicted to decline for all PIGS by 2070. This appears to be because they made considerable adjustments to their pension system in order to boost their sustainability (EU Commission, 2021). The key pension reforms shared by all of the countries under discussion are aimed at the following areas:

- *Coverage ratio*¹³. Policies aimed at making early retirement more difficult or, simply, raising the required age to enter the pension system reduce the coverage ratio and, as a result, the pension system's spending (EU Commission, 2021).

- *Benefit ratio*¹⁴. Policies aimed at lowering the generosity of the pension system (EU Commission, 2021). For example, adopting sustainability elements such as determining pension payments based on life duration (as done in Italy, Spain, and Portugal) or imposing less favourable indexation rules (EU Commission, 2021)

- *Labour market*. Policies aimed at boosting the employment rate, especially through market active policies, are advantageous to the pension scheme's sustainability since they stimulate economic growth as well as the expansion of the tax base, resulting in an increase in revenues to support it (Brys & Colin, 2020; EU Commission, 2021). The overall consequences of these labour market reforms are minimal in practically all EU nations, although for the PIGS they appear to have a significant impact (EU Commission, 2021).

However, pension reforms take time to become fully effective, and as a result, the pension expenses-to-GDP ratio will sharply rise in the middle of the forecast period (2019-2045), putting the PIGS' public finances to the test (EU Commission, 2021). The reason behind the spike in pension spending between 2019-2045 is due to the substantial increase of the ODR caused by the retirement of the so-called “baby-boom generation” (EU Commission, 2021). Following that, the impacts of the reforms will take effect, and pension expenditures for all PIGS will fall. Nonetheless, it is crucial to note that, while a drop in pension expenses indicates an improvement in the sustainability of the retirement system, the overall expenditures to support it must also be considered in order to get a whole picture of its sustainability (EU Commission, 2021). In fact, after the pension reforms, only Spain and Portugal will have lower overall pension expenditures than the EU average, while Italy and Greece will still have higher total pension expenditures (EU Commission, 2021). This suggests that there is still room for pension expenditure optimization in the latter countries, especially for Italy.

Moving on, for all the PIGS, the healthcare system is the sector whose expenditures will increase the most. This is due to several reasons. For example, as people's lifespans and incomes improve, so will their willingness to spend to gain access to the healthcare system, as well as advances in medical technology, which have previously accounted for large increases in health expenditures (EU Commission, 2021). This rise is also due

¹³ The coverage ratio shows the proportion of retirees to the total number of people over the age of 65. Hence, it provides an insight on the degree to which a country provides pension payments to those under the age of 65.

¹⁴ It expresses how generous a pension system is by providing the ratio of the value of the pension fund's assets to the value of its obligations. The higher the number, the more generous the pension scheme.

to the Covid-19 health crisis, which not only increased healthcare spending during the pandemic, but also highlighted the importance of having a strong and resilient healthcare system when dealing with such catastrophic events (EU Commission, 2021). As a result, rather than lowering spending as happened because of austerity measures after the Great Recession, it is planned to boost spending to enhance the healthcare systems (Cylus et al., 2014). Yet, it is important to point out that, given the significant uncertainty surrounding demographic projections, the figures in the tables of Appendix B are intended to be a broad indicator rather than an exact estimate of the growth in healthcare spending (EU Commission, 2021). Furthermore, expenditures in the education system are predicted to fall for all the PIGS, reflecting past spending trends, since no change in government policies is assumed in the baseline scenario (EU Commission, 2021).

Despite a drop in total expenditures in the baseline scenario shared by all PIGS, only Greece has a reduction in ageing-related costs that is robust to both sensitivity scenarios. Italy, Spain, and Portugal would all see a rise in overall expenditures as a result of a lower growth rate scenario or an increase in healthcare expenses induced by reasons other than demographics. In fact, while the contents of the policy reforms are similar for all the PIGS, the size of the Greek ones is more substantial in terms of benefit ratio reduction and labour market consequences, with Greece witnessing the highest decline in expenditures as a result of the latter.

Finally, looking at the EU Commission (2022) analysis and the S2 indicator, we have the following situation:

	<i>Required PBR to keep the debt ratio steady over time</i>	<i>S2 indicator attached risk</i>	<i>DSA risk assessment</i>	<i>Overall long-term risk</i>
ITALY	It needs to reach a budget draw (0%)	Medium	High	High
GREECE	It can run a deficit of max. -2%	Low	High	Medium
PORTUGAL	It can run a deficit of max. -0.8%	Low	High	Medium
SPAIN	It needs to reach a budget draw (-0.3%)	Medium	High	High

Table 4.1: PIGS' overall sustainability risks in the long-term.

Source: Fiscal Sustainability Report 2021, EU Commission (2022). https://ec.europa.eu/info/sites/default/files/economy-finance/dp171_en_vol1.pdf

Given the overall reduction in pension expenditures as well as the results in table 4.1, it appears that the PIGS' vulnerability to population ageing is limited because they do not need to make large budgetary changes to stabilise their debt ratios. This is especially true for Greece and Portugal, where fiscal adjustments are not required. Nonetheless, such findings must be nuanced to provide a more realistic depiction rather than an overly optimistic one. First and foremost, as emphasised by the DSA risk assessment in Section 3, all PIGS should try to improve their fiscal situation by lowering their debt ratios rather than leaving them constant. Second, it is worth noting that the baseline scenario assumes no policy changes and the continuation of the key macroeconomic trends, which is an optimistic assumption. In fact, when considering the sensitivity scenarios, they show a rise in long-term overall demographic spending, making the debt sustainability prognosis less hopeful, except for Greece. Moreover, given the uncertainty surrounding such projections, the expected population ageing trend may be more severe, endangering the viability of the countries' public finances. As a result, it is vital that the countries under consideration do not rest on their laurels and instead endeavour to increase the resilience of the ageing-related spending sectors, particularly healthcare. This latter will be the primary sector in which expenditures will rise, putting strain on national budgets. As a result, policy changes to make it more sustainable will be necessary. Furthermore, it is critical that the PIGS maintain their pension reforms on track. Nonetheless, a credible and stable political environment is essential. Indeed, dealing with pension reforms aimed at lowering benefit ratios can be challenging due to the political costs involved, which might heighten the risks of a reverse trend in pension spending (EU Commission, 2021). This must be avoided in order to maintain a limited exposure of the countries' public budget to population ageing in the long run.

4.2. The impact of extreme climate-related events and the green transition

There has recently been speculation that the large debt incurred during the Covid-19 crisis will be extremely difficult to repay because of the long-term implications of climate change (Dibley et al. 2021). Indeed, the climate change will not only have an economic impact, but will also have major fiscal implications (Zenios, 2021). In particular, it can have a detrimental influence on debt sustainability in two ways: directly by influencing a country's public finances, raising the demand for public spending, or indirectly by negatively affecting economic growth and consequently, reducing the revenues from taxation (EU Commission, 2022). There are three sorts of threats that climate change will pose to countries' public finances:

1. *Physical risk*. It includes damages caused by extreme phenomena linked to climate change, such as fires, floods, and harsh weather, among others (Zenios, 2021). Another distinction must be made between "acute" physical risks, which refer to one-time dramatic events, and "chronic" physical risks, which refer to progressive but immutable environmental changes that entail long-term consequences, such as decreased productivity owing to higher temperature, for example (EU Commission, 2022). The main impact of physical risks on public finances is the enhanced need for public spending to either substitute, repair, or improve infrastructures affected by extreme climate events or to assist the most affected households through the use of subsidies (EU Commission, 2022). Furthermore, because of the loss of output connected with the economic implications of these types of climate extreme occurrences, the effects can also be indirect through a fall in tax revenues (EU Commission, 2022). Finally, other costs resulting from physical risks are those linked with the adaptation process (EU Commission, 2022). They cover all expenditures related to increasing the economy's ability to absorb climate shocks. They have a short-term negative impact on public budgets due to the higher investments required, but they have a long-term positive benefit since they mitigate the effects of extreme climatic events (Zenios, 2021).
2. *Financial risk*. Only in recent years has susceptibility to major climatic disasters been factored into sovereign bond pricing (Zenios, 2021). The primary criteria that investors consider when calculating risks are the level of exposure to climate change as well as the level of preparation in dealing with it (Zenios, 2021). As a result, the greater a country's exposure to climatic shocks and the less prepared it is to deal with them, the higher its borrowing costs will be due to a worse credit rating (Zenios, 2021). At the time, no country's rating has been lowered due to climate-related factors yet, but both Moody's and S&P have emphasised the relevance that climate change will have on credit ratings in the coming years (Zenios, 2021). Therefore, if the country under consideration is assessed to be at high risk of climate change, debt servicing costs are likely to rise in the not-too-distant future.
3. *Transition risk*. It concerns with the effects of the transition to a zero-emission economy on a country's public finances. This is expected to have a considerable influence on public budgets (EU Commission, 2022). First of all, a significant portion of government spending will be devoted to compensating harmed households and companies as a result of the asymmetric effect of such a transition through the use of cash transfers (EU Commission, 2022). Furthermore, the green transition will necessitate additional investments in infrastructure and research, which will most likely be financed by public debt (Pisani-Ferry, 2021). Indeed, the ability of carbon taxation to fund the entire process has recently been called into question. The fundamental reason for this is that the carbon tax is regressive, resulting in an unbalanced impact on EU citizens (Pisani-Ferry, 2021). For example, the suburban middle class, whose lifestyle is more dependent on the usage of carbon and whose income is relatively modest, is more vulnerable to an increase in the carbon price than city dwellers and those with higher incomes (Pisani-Ferry, 2021). Consequently, a major portion of the revenues generated by carbon taxation will be redistributed to the most vulnerable segments of the population in order to counteract the income effects that these taxes will have on them, leaving limited funds to finance the green transition projects (Pisani-Ferry, 2021). Therefore, there is room for the use of public debt, especially since there would

be no intergenerational conflict. In fact, it would be preferable for future generations to be left with a safe and protected climate with a bigger debt to be serviced, rather than having more sustainable public finances but long-term environmental devastation (Pisani-Ferry, 2021). Consequently, the utilisation of public debt will be critical in the decarbonization process.

The assessment of these risks is not an easy undertaking because they are all intertwined and interact with one another, making precise measurement of their effects on a country's public finances difficult (Zenios, 2021). For this reason, even if the implications of climate change on debt sustainability appear to be significant, they have never been accounted for in most fiscal sustainability assessments, with few exceptions (EU Commission, 2022; Zenios, 2021). However, there has been some progress recently, thanks to strong recommendations from several economists, Zenios (2021) among others, to include a methodology for evaluating climate risk in light of fiscal sustainability. Matter of fact, for the first time, the EU Commission included a preliminary assessment of the EU countries' public finances' exposure to physical risk from climate change.

4.2.1. Physical risks from climate change: a heterogenous impact

The EU Commission incorporated for the first time in the *Fiscal Sustainability Report 2021* an evaluation aimed at examining the implications of "acute physical risks" on the public finances of the EU countries. As previously stated, research on this effect offers limited empirical results, making evaluation more difficult due to the lack of benchmarks to relate to (EU Commission, 2022). Therefore, EU Commission (2022) resolved to analyse the sensitivity of EU countries to previous and present extreme climate events in terms of economic damages and consequences on public budgets. The findings of this historical trend study, which looked at all extreme climate events that occurred in Europe between 1980 and 2020, reveal that countries' susceptibility to physical risks varies greatly (EU Commission, 2022). The countries at higher risk are those in East Europe, as well as those in the South, which are the countries under consideration (EU Commission, 2022). In fact, aside from France, which is the most susceptible, Italy and Spain rank second and third in terms of exposure to climate shocks, followed by Greece and Portugal, which have comparable levels of vulnerability (EU Commission, 2022). Looking at the past trends of the countries under consideration, Italy has had the most extreme climatic occurrences as well as floods, while Spain and Portugal, followed by Greece, have had the most fires due to high temperatures (EU Commission, 2022). Future occurrences are based on historical trends, but they are plagued with uncertainty because it is difficult to predict how much the frequency and severity of these extreme events will rise, resulting in a significant margin for error (EU Commission, 2022). Nevertheless, because of climate change, they are expected to become more common (EU Commission, 2022).

A similar approach applies when seeking to quantify economic losses caused by natural disasters. Indeed, also GDP losses in recent years have been highly disparate between nations, with Spain experiencing an 8% GDP loss, Portugal suffering a 5% GDP loss, and Greece and Italy suffering a total of about 3% GDP loss between 1980 and 2020 (EU Commission, 2022). These estimates, however, are likely to be underestimated due to the possibility of governments misreporting the true economic impact of these occurrences (EU Commission, 2022). In terms of the future dynamics of economic losses, they are likewise predicted to rise. Specifically, they are most likely to triple under the most favourable scenario, which is compliance with the Paris Agreement, with a maximum temperature increase of 1.5°C (EU Commission, 2022). Of course, the harsher the scenarios assumed, the bigger the losses, which are already eight times greater when assuming a 2°C increase (EU Commission, 2022). To complete the examination of the exposure to economic losses, EU Commission (2022) examines also each country's degree of insurance coverage to these types of catastrophic events. In fact, having insurance helps mitigate economic losses by providing a support structure and a cushion for climatic shocks, as well as raising awareness of these risks (Cebotari & Youssef, 2020; EU Commission, 2022). However, all the countries under consideration have the lowest insurance coverage, confirming their high level of vulnerability.

The EU Commission (2022) evaluation starts with the debt ratio predictions in the baseline scenario described in Section 3 and then runs two different scenarios to observe how the debt ratios react. The first scenario assumes a 1.5°C increase in temperature, whereas the second assumes a 2°C increase. Both scenarios will have a direct influence on the countries' public budgets and an indirect impact on their growth rates, and the consequences will be examined only in the medium run (10 years) (EU Commission, 2022). It is important to note that the climate shocks assumed in each scenario are regarded as one-time shocks in 2024 to determine how they will change the debt ratio dynamics through their impact on the PBR (EU Commission, 2022). Only the countries of interest will be examined here, and the results are displayed in the table below.

	Debt Ratios Forecasts				
	2021	2023	2024	2032	Δ to baseline scenario
ITALY					
<i>Baseline</i>	154.4%	151%	150.6%	161.6%	
<i>1.5°C</i>	154.4%	151%	153%	163.9%	+2.2%
<i>2°C</i>	154.4%	151%	153.3%	164.1%	+2.5%
GREECE					
<i>Baseline</i>	202.9%	192.1%	185.9%	154.7%	
<i>1.5°C</i>	202.9%	192.1%	188.8%	157.3%	+2.6%
<i>2°C</i>	202.9%	192.1%	189.2%	157.5%	+2.8%
PORTUGAL					
<i>Baseline</i>	128.1%	122.7%	121.8%	126.2%	
<i>1.5°C</i>	128.1%	122.7%	124.5%	128.6%	+2.4%
<i>2°C</i>	128.1%	122.7%	124.9%	129%	+2.8%
SPAIN					
<i>Baseline</i>	120.6%	116.9%	120.3%	126.1%	
<i>1.5°C</i>	120.6%	116.9%	125.4%	130.6%	+4.5%
<i>2°C</i>	120.6%	116.9%	126.2%	131.3%	+5.2%

Table 4.2: Reactions of PIGS' debt ratios to raise in temperature compared to the baseline scenario
Source: Fiscal Sustainability Report 2021, EU Commission (2022). https://ec.europa.eu/info/sites/default/files/economy-finance/dp171_en_vol1.pdf

As shown in the table, Spain is the most sensitive country to a one-time acute physical shock, implying an increase of nearly 5 ppt in its debt ratio in 2032 compared to the results of the previously outlined baseline scenario. Following Spain, Greece is the second most susceptible country, followed by Portugal and Italy. Even though the magnitude of these shocks appears to be modest, the data in the table show that these types of climate events have a visible influence on debt ratios that can last until at least 2032. Furthermore, to explain the modesty of these effects, it is important to remember the one-time nature of the shocks, as well as the fact that a negative interest-growth rate difference is still assumed in all of these scenarios (EU Commission, 2022). Not only that, but the methodology used by the EU Commission (2022) is not perfect. Indeed, given the possibility of government economic losses being misreported, the results may indicate a lower estimate of the true consequences (EU Commission, 2022). Finally, such an approach considers just one of the three consequences of climate change on debt sustainability, and it does not take into account either the "chronic physical risks." As a result, it only delivers a partial picture. Despite these limitations, the findings emphasise the importance of these effects on the worsening of debt ratio dynamics, highlighting the need to address these risks through the implementation and reinforcement of not only climate policies and an expansion of insurance coverage to create a cushion for these disasters, but also of fiscal policies aimed at improving these countries' fiscal stances (EU Commission, 2022). Indeed, if the latter are not implemented, a significant physical shock with the related impact on the country's public finances may place the debt ratio on an unsustainable trajectory.

4.2.2. Financial risks from climate change: a work in progress

As indicated in paragraph 4.2, the countries' ratings have not yet been downgraded due to their vulnerability to climate change, but according to Moody's and S&P, this will happen in the not-too-distant future (Zenios, 2021). For this reason, estimating the extent of such an effect is required in order to comprehend the scale of the influence of climate financial risks on the dynamics of debt ratios and their sustainability. The model created by Agarwala et al. (2021) is a very useful starting point in providing a broad overview of the overall effect. Indeed, their model is the first to simulate the consequences of climate change on the credit ratings of 108 countries, including Italy and Portugal. To do this, Agarwala et al. (2021) use a machine-learning model used to predict S&P credit ratings for the years going from 2030 to 2100. Then, they combine economic climate models with S&P's models for evaluating natural calamities to obtain "climate-adjusted macroeconomic data" to be used in the first model under two climatic scenarios: the first expects a 2°C increase by 2100, while the second assumes a 4.2°C increase by 2100 (Agarwala et al., 2021). Finally, they utilise the data to quantify the rise in sovereign costs caused by a credit rating downgrade. Regardless of the model's nature, making predictions that far in the future is problematic, and the projections are likely to be subject to limitations. To generate such far-future forecasts, the authors had to make various assumptions, which may be plausible today but not in the future. For this reason, the results shown below should be viewed with caution, especially when considering their magnitude. Nonetheless, they provide a good starting point for examining the relationship between climate change and financial risk.

Figures 4.1 and 4.2 depict the major findings of the impact of climate change on credit ratings.

The first effects are expected to appear in 2030, supporting Moody's and S&P's prognosis of this trend increasing in the not-too-distant future. These consequences, however, will become more prevalent by 2100. Looking at the first scenario in Figure 4.1, the EU countries will only be degraded by a notch¹⁵ or less, which also applies to Italy and Portugal (Agarwala et al., 2021). The second scenario depicted in Figure 4.2 appears to be bleaker. Indeed, credit ratings will deteriorate significantly across Europe, with Portugal reduced by 1.51 notches while Italy by only 0.3 notches (Agarwala et al., 2021). Furthermore, it is worth noting that the South-European countries appear to be less affected by a credit rating deterioration than other countries, because it is easier to be downgraded when starting from a high credit rating (AAA, for example) than when starting from a lower rating, as is the case of Italy and Portugal (Zenios, 2021; S&P, 2022).

Greece and Spain are not included in this study but, given their fiscal conditions and sensitivity to extreme weather occurrences similar to Italy and Portugal, it is reasonable to expect a similar tendency for them as well.

The deterioration in credit rating appears to be minor, and as a result, the rise in debt servicing should be minor as well. However, this increase in interest rates can be seen as modest only by countries with extensive fiscal flexibility, but for countries with little fiscal space, such as the ones under consideration, this may raise serious doubts about their ability to service the debt (Zenios, 2021). This may entail a further lowering of their credit ratings and, as a result, an additional increase in debt servicing, raising the risk of being locked in an unsustainable loop for the debt ratio dynamics (Zenios, 2021).

Given the ambiguity surrounding the precise dynamics of climate change in terms of distribution and frequency of the climatic shocks, the size of the results must likewise be regarded with caution. Nonetheless, such findings validate and strengthen some of the policy actions indicated in the preceding paragraph. First, it is necessary to take action to comply with the Paris Agreement in order to reduce vulnerability to climate disasters and thus avoid a less favourable situation like the one illustrated in Figure 4.2. Second, it is critical that credit rating agencies incorporate countries' climate risk exposure and readiness as soon as possible. If the reality remains uncertain, risk-averse investors might begin to demand greater risk premiums ahead of time, potentially resulting in even higher borrowing costs than the ones resulting with full credit agency information.

¹⁵ It signifies that the credit rating has been lowered by eliminating or swapping a modifier or number qualifier. Using S&P ratings, for example, we get a notch downgrade when the rating drops from AA+ to AA or from B- to CCC.

Third, improving fiscal positions is once again a must in order to avoid a deterioration of the credit rating and, as a result, an increase in the refinancing rate, which might result in the unsustainable dynamics described above. Finally, it is critical not to isolate financial risks from physical risks. Indeed, the implementation of mitigation and adaptation strategies would benefit a country's credit rating since they would reduce the country's exposure to physical risks while simultaneously strengthening its preparedness to deal with them (EU Commission, 2022).

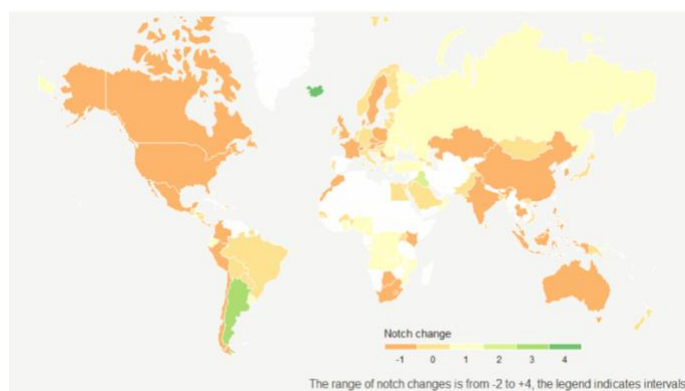


Figure 4.1: Change in credit ratings due to an increase of 2°C in 2100.

Source: Agarwala et al. (2021). <https://www.econ.cam.ac.uk/research-files/repec/cam/pdf/cwpe2127.pdf>

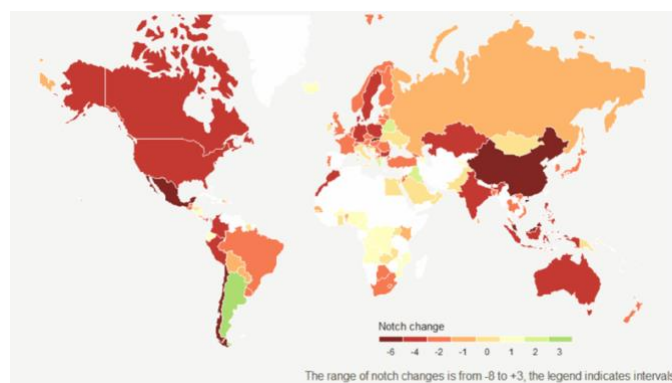


Figure 4.2: Change in credit ratings due to an increase of 4.2°C in 2100.

Source: Agarwala et al. (2021). <https://www.econ.cam.ac.uk/research-files/repec/cam/pdf/cwpe2127.pdf>

4.2.3. Transition risks to zero-emission economy: a blurry picture

The transition risk is created by the increase in mitigation policy expenditures as well as decarbonisation efforts, which represents an additional cost to be borne by a country's public finances in the short and medium run (EU Commission, 2022). However, such efforts will improve environmental protection, with positive side effects on extreme climate events, whose occurrence will decrease, as well as on refinancing rates due to a positive effect on credit rating (Zenios, 2021). Furthermore, the shift to a zero-emission economy will be beneficial also to human well-being. Climate change, in fact, has an impact on both physical and mental health (Abrams et al., 2022). There is lots of evidence demonstrating the effect of climate change on physical health. Not only does air pollution worsen respiratory and cardiac disorders, but excessive temperatures can also cause chronic illnesses (Abrams et al., 2022). Moreover, extreme weather occurrences like floods and hurricanes contribute to injuries as well as other negative consequences including an increase in the number of people

losing their homes and disruptions in education (Abrams et al., 2022). In turn, this has a negative indirect influence on health (Abrams et al., 2022). The impact of climate change on mental health, on the other hand, is more difficult to identify and quantify (Abrams et al., 2022). It is proved, however, that greater exposure to climatic shocks is associated with higher levels of anxiety, depression, and other psychological disorders (Abrams et al., 2022). As a consequence, climate change will raise the costs of the healthcare system, which, as we saw in Section 3, is already a sector where expenses are expected to rise (Abrams et al., 2022).

As a result of all of the aforementioned effects, addressing climate change and transitioning to a zero-emission economy will have long-term positive implications for public finances, even if it needs additional public spending in the short and medium term (EU Commission, 2022). Therefore, when discussing transition risk, it is important to emphasise this trade-off. The transition risk, in the model proposed by Zenios (2021) to explain the transmission mechanism between climate change and public finances, incorporates also adaptation policies in addition to mitigating ones. However, even if these latter ones have a positive influence on building resilience to climate change, they are likely to result in higher public expenditures because they are geared at living with climate change rather than combating it (Zenios, 2021). Nonetheless, they will be necessary to deal with the negative effects of climate change that we are already witnessing now, such as wildfires, floods, extreme weather, and so on.

Given the behaviour of climate change, the transition to a more sustainable economy will take place through many mechanisms. In fact, the main economic policies addressing the long-term effects of climate change will have to deal with progressive soil deterioration, resource shortages and the subsequent reallocation of them to develop new technologies aimed at adapting or mitigating climate change, reallocation of labour force from less sustainable industries to more sustainable ones, and the repercussions for the social fabric caused by increased temperature (Zenios, 2021). According to Zenios (2021), there is a distinction between discretionary and non-discretionary public spending in this case. The former refers to monetary transfers to the most vulnerable households during the transition period, as well as the establishment of a government-backed insurance mechanism against climatic calamities (Zenios, 2021). The latter, on the other hand, denotes the costs associated with achieving a zero-emission economy, such as infrastructure investments or research funding to build a more sustainable energy system (Zenios, 2021).

The EU Commission predicted that an investment of roughly 520 billion euros per year until 2030 (EU Commission, 2022) will be required to realise the green transition throughout the EU, representing an additional spending of 260 billion euros from the current one (EU Commission, 2019). Such an endeavour will be required through both public and private resources (Zenios, 2021). The public sector will be the main coordinator of the transition by outlining the investments required, but it will also need to collaborate and assist the private sector in the transition to a cleaner energy, because if private investments fall short of expectations, this may result in additional liabilities (EU Commission, 2022; Zenios, 2021).

The necessary decarbonisation process will be especially unpleasant for countries with considerable earnings and/or economies that depend heavily on polluting energies (Zenios, 2021). Even though nations with substantial earnings from oil and gas extraction are rare in the EU, there are many of them whose economies are highly dependent on their use, implying a more painful green transition (Zenios, 2021). We can see how dependent the countries in the analysis are on fossil fuels in Figure 4.3 below.

In particular, there are two indexes in the graph. The first, known as "Energy Intensity," examines a country's reliance on fossil fuels by calculating consumption per dollar contributed to GDP (Zenios, 2021). The second, on the other hand, is an index that analyses a country's sensitivity to climate change and ability to cope with it (Zenios, 2021). As indicated in the graph, Greece is the most reliant on fossil fuels of the countries under consideration, making it more susceptible to the transition risk. Italy, Portugal, and Spain, the latter being the least dependent, have a low Energy Intensity Index, indicating the prospect of a smoother transition to decarbonization (Zenios, 2021). Nonetheless, the Vulnerability Index shows that all of the countries under consideration have similar levels of susceptibility to climate change as well as preparedness to deal with it, as already suggested in paragraph 4.2.1. This also implies that there is no clear association between the two

indexes, which is not surprising given that the use of fossil fuels is only one of several factors influencing vulnerability to climate change (Zenios, 2021).

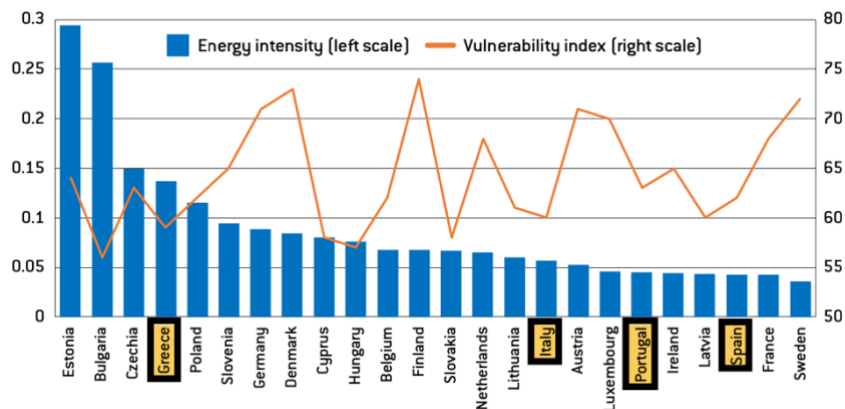


Figure 4.3: Dependency of EU countries on fossil fuels

Source: Zenios (2021). <https://www.bruegel.org/2021/07/the-risks-from-climate-change-to-sovereign-debt-in-europe/>

To summarise, it is safe to anticipate that the transition to a low-emission economy will place additional strain on the public finances of the countries under discussion, but the exact amount of the effect is unknown at this time. This is owing to a lack of climate assessment in the financial sustainability literature, the difficulty in defining the exact path of the transition in both economic and political terms, and the interaction between the green transition's short and medium-term pressures on public finances and their relief in the long-term, making such analysis much more ambiguous than the study of other climate hazards. Nonetheless, based on the analysis of Zenios (2021), it is possible to confirm that the transition risks will be higher for Greece than for the other countries, given the high Energy Intensity Index, but given the similar level of vulnerability among all the countries under consideration, the magnitude of the impact on public finances is likely to be not significantly different. Furthermore, even without precise estimates, the required annual investment described by the EU Commission (2019) shows that the transition risk would imply an increase in public debts, posing hurdles to the sustainability of the PIGS' fiscal position. For this reason, it appears that, also in this case, the PIGS' fiscal stance will need to be adjusted in order to establish enough room to deal with this additional risk.

Finally, a mention on the decarbonisation process of the economy and its impact on growth is required. Economic expansion is the primary cause of greenhouse and gas emissions, as well as environmental harm (Lenaerts et al., 2021). As a result, can economic growth and decarbonization coexist? When it comes to this question, there are two main opposing schools of thought.

Throughout this paragraph, I adopted the same perspective as the EU, which sees decarbonization as a means of reviving Europe's economic growth (Lenaerts et al., 2021) As a result, I adopted the "green growth" perspective, which contends that technological advancements can support economic expansion while decarbonizing the economy (Lenaerts et al., 2021). The "degrowth" school of thought, on the other hand, contends that the only way to decarbonize the economy is to slow down the economic growth and make structural changes to how we perceive the economy (Lenaerts et al., 2021). If the latter is the most plausible scenario, and thus economic development and decarbonisation are incompatible, this will have a detrimental impact on the funding of the welfare system, creating challenges for the sustainability of public debts, pensions, and social assistance (Lenaerts et al., 2021). It is difficult to predict which of the two scenarios will occur, but the one favoured by "green growth" supporters is the most politically realistic and desirable, particularly in terms of debt sustainability. Because of this, and because it embodies the EU's point of view, I chose to adopt the "green growth" stance as well.

Clearly, the relationship between growth and decarbonization, as well as the viewpoints of the two previously mentioned schools of thought, is more complex. Appendix C contains a more thorough examination of them.

5. Policy Recommendations

Given the high level of uncertainty that characterises the future, not only as a result of the Russia-Ukraine war, surge in inflation, population ageing, and climate change, which are the challenges to debt sustainability examined here, but also as a result of other challenges such as the possibility of a prolonged productivity slowdown, rising inequalities, digitalization, and so on, accurate predictions of the debt dynamics in the future are impossible. It is only possible to look at the current situation and form conclusions about what might happen in the future. For this reason, it appears unattainable to outline in detail what the fiscal policies of each country under consideration should look like since their definition is bound by what the global macroeconomic outlook will be in the next years. Therefore, a fiscal plan that works today may not in the following year, requiring adjustments along the way. Nonetheless, given the analysis proposed in this paper, it is still conceivable to establish what, at the very least, should be the direction of the PIGS' fiscal policies, even if its scale is difficult to define.

Drawing from the analysis of Section 2 and 3, it is possible to affirm that, despite the large increase in debt ratios due to the Covid-19 crisis, the PIGS' rising debt have not yet prompted serious concerns. However, this is not because the debt ratio levels reached are not still significant enough to cause apprehension, but because of the favourable financing conditions ($r - g < 0$) maintained, in part, due to the quantitative easing programme (Pandemic Emergency Purchase Programme) implemented by the ECB (Eichengreen et al., 2021). Furthermore, the SGP's escape clause, which is still in effect, has delayed the need to confront the rising debt ratios for at least another year.

Nonetheless, this does not absolve the countries under consideration of any obligation to implement fiscal consolidation. On the contrary, they will be required to. However, according to the EU and many economists, before embarking on fiscal consolidation, they must aim to achieve full recovery from the impacts of the Covid-19 crisis. This approach contrasts from that adopted during the Great Recession. The hurried austerity measures imposed on the PIGS in the aftermath of the Great Recession, in order to run primary surpluses to service their debts, resulted in significant economic damages (Eichengreen et al., 2021). As a result, it is now clear that fiscal consolidation techniques that are linked with growth are significantly more effective (Eichengreen et al., 2021). Nevertheless, the SGP's Severe-Economic-Downturn ("SED") clause will not be in effect for long; rather, it is scheduled to be reinstated by the end of 2022 (Pianta, 2021). Following that, the PIGS will have to implement contractionary fiscal policies in order to reduce their debt ratios and return to the 60% threshold, which will remain unreachable for a long time, as illustrated in Section 3. Trying to attain the 60% debt cap at the rate of one-twentieth of the excess debt, as outlined in the SGP, may have the unintended consequence of abandoning efficient investments, as happened in the aftermath of the Great Recession (Beetsma, 2022).

Putting aside the 60% target for a moment, what appears important is that the PIGS expand their fiscal spaces to deal with future risks to their public finances, regardless of EU fiscal rules. Indeed, if the PIGS do not enhance their fiscal space, future trends, such as population ageing and climate change, will further impair their ability to run primary surpluses, as shown in Section 4, and make their debt dynamics less sustainable. Because of this, once fully recovered from the Covid-19 crisis, it is critical that they embark on debt consolidation intended at building enough fiscal room to deal with future adverse events without sacrificing economic growth, which will represent a turning point for every country (Wyplosz, 2007).

Fiscal consolidation can be painful for citizens, as we have seen in the past. However, the benefits of being able to run large deficits to combat all of the risks associated with climate change and to undertake all of the expenditures required for the green transition are likely to outweigh the losses associated with fiscal consolidation, especially if designed to place the majority of the burden on the wealthy rather than the poor. This latter point is particularly critical to the fiscal consolidation's effectiveness because an increase in inequality leads to an increase in demand for social services, which further burdens state resources (Eichengreen et al., 2021).

Finally, the key constraints to implementing a credible and successful fiscal consolidation are those linked

with government political stability and credibility. As a result, finding a solution to them is the first priority.

5.1. First recommendation: strengthening of the Independent Fiscal Institutions

Fiscal policy is the economic tool that is the most closely linked with politics. This is because fiscal policy is mainly concerned with redistribution, which is at the heart of the political dispute (Alesina & Passalacqua, 2016). When governments are in a weak position, such as coalition governments, the dispute can stymie fiscal initiatives, especially when they are geared at decreasing deficits rather than expanding public spending (Alesina & Passalacqua, 2016). Given the importance of implementing effective and credible budgeting plans aimed at reducing the PIGS' debt ratios, finding a solution to this issue is crucial.

During the Covid-19 emergency, some European governments, especially the Italian one, depended on scientific committees to develop policy solutions to address the situation. The goal was to avoid political quarrels and gave way to a timely and solid policy response based not on political reasoning, but on scientific evidence targeted at resolving the situation as quick as possible. Aside from the effectiveness in streamlining the political process in Italy, which can be debated, the intention behind this choice stands to reason. Even so, given the extraordinary nature of the crisis, this was conceivable. Indeed, normal circumstances would make it more difficult to implement such solution. Nonetheless, the budgetary challenges that the countries under consideration will face will be critical in determining their resilience to the adverse events that will occur. This will have a significant impact on the lives of all citizens, particularly in light of climate change, opening the door for an extraordinary intervention such as the one carried out during Covid-19. For this reason, many economists believe that it is now more important than ever to strengthen the function of national Independent Fiscal Institutions ("IFI" from now on). They are governmental institutions entrusted with managing various aspects of fiscal policy, such as performing forecasts, ensuring conformity to fiscal regulations, and analysing other aspects of the country's fiscal condition (Barnes, 2022). The IFI of a nation has a greater understanding of the country in comparison to the EU fiscal institutions, which could help to design more appropriate fiscal policies not just to meet EU objectives, but also to establish the essential fiscal resilience (Barnes, 2022). Given the high-risk fiscal positions of the countries under consideration, as well as the political polarisation that characterises them, it would be critical to provide the IFIs with a position from which they could advise on the direction that each country's fiscal policy should take in accordance with EU directives (Beetsma, 2022). This might be accomplished by assigning them to conduct debt sustainability analyses in accordance with a common criterion established by the European Fiscal Board in order to arrive at a credible and defined debt target (Beetsma, 2022). Furthermore, in addition to IFIs doing more accurate analyses given their expertise of the country, enhancing their ability to monitor and influence the country's fiscal policy could enhance fiscal rules compliance as well as fiscal consolidation implementation (Barnes, 2022).

To ensure that the strengthening of the IFIs represents an improvement, the following conditions must be met, as stated by EUIFIs (2021):

- IFIs must be able to approach the government directly in order to share the results of their analysis and recommendations on how fiscal policy should be implemented. (EUIFIs, 2021).
- The IFI's integrity should be ensured by guaranteeing the independence of its budgets from political influence. This might be accomplished by giving them large budgets and the ability to manage them independently (EUIFIs, 2021).
- IFIs should be supported by ensuring constant and unfettered access to all necessary information from governments, national statistical institutes, and the EU Commission (EUIFIs, 2021).
- Ensure that the "Comply or Explain" principle is followed, which should be clearly specified in national regulations. This means that if the government does not intend to pursue the IFI's advise, it must explain wherefore (EUIFIs, 2021).
- Protect the IFIs from any political influence that could jeopardise their credibility. This could be accomplished by implementing a fair recruiting process for directors, avoiding employing people with

potential conflicts of interest in working for the IFI. Furthermore, they should be able to conduct analyses on their own initiative as long as they follow their mandate (EUIFIs, 2021).

If all of these requirements are met, expanding the function of the IFIs could be a critical turning point in overcoming the political constraints preventing the execution of solid and credible fiscal policies. For this reason, such a strategy may be extended throughout the entire EU.

However, for nations characterised by high risk, such as those under consideration, the function of IFIs in setting fiscal policy direction could be akin to that undertaken by the scientific committee in Italy during the Covid-19. As a result, when the EU Commission designates a European country as having a high risk of debt sustainability, it should make it mandatory for the country to rely on IFI advice to form fiscal plans in order to meet a predetermined objective set in accordance with the EU Commission. Thus, fiscal plans would be more trustworthy and independent of political quarrels. In turn, this may have the added benefit of reassuring investors of the country's debt dynamics and, consequently, avoiding an increase in debt interest rates due to higher required risk premiums (Pappas & Kostakis, 2020). Additionally, as indicated in Section 4, this should make it easier also to maintain the reforms required to reduce public spending in the pension system that the PIGS pledged to implementing, which may be limited by political constraints.

This would involve significant changes to the structure and implementation of the EU framework for fiscal policy, which might be time-consuming and politically challenging. Yet, the relevance of IFI strengthening and the benefits associated with it have become clear to most, particularly in the post-Covid-19 climate and in the context of the green transition (Capraru et al., 2021).

Empirical evidence of the IFIs' effectiveness

There are numerous studies on IFIs, but the number of papers is limited when we look at studies that employ empirical models to analyse the influence of IFIs on fiscal performance. Even so, there are empirical evidence suggesting that IFIs have a clear and considerable beneficial impact on public finances (Capraru et al., 2021). The literature on this relationship is separated into categories depending on the variable used to reflect the countries' fiscal performance (Capraru et al., 2021). There are five indicators that can be used: general government budget balance, primary balance, cyclically adjusted balance, cost of borrowing, and fiscal projection precision (Capraru et al., 2021).

Beetsma et al. (2018), for example, discovered evidence that the inclusion of IFIs suggests more precise, but also less optimistic, budgetary projections. As a result, fiscal estimations are less likely to be biased, and PBR projections are more accurate (Capraru et al., 2021). This finding is consistent with the results of another study, that of Beetsma et al., (2017), who discovered that properly informed voters and the involvement of veto participants in the budgeting process can drive legislators to adopt more solid fiscal programmes and, consequently, lower government deficits (Capraru et al., 2021). Furthermore, as previously mentioned, it has been observed that IFIs have a favourable influence on borrowing costs. Indeed, Pappas & Kostakis (2020) empirically validated this link, demonstrating that the presence of IFIs and the resulting superior fiscal performances boost investors' confidence, lowering the risk premium required (Capraru et al., 2021). Finally, Capraru et al. (2021) demonstrates that the presence of the IFIs have a positive effect on all types of fiscal balances, thus proving an overall positive effect on the countries' public finances.

However, other studies, such as the one of Debrun & Kinda (2014), conclude that the simple presence of IFIs is not sufficient to promote greater fiscal performances (Capraru et al., 2021). In fact, the IFIs' abovementioned conditions for their well-functioning are crucial. Additionally, Debrun & Kinda (2014) suggest that having a significant role in public debates and an explicit involvement in overseeing the fiscal rules are two additional conditions to ensure the improvement of the countries' fiscal performances (Capraru et al., 2021).

Yet, the strengthening of the IFIs does not fix the problem on its own. Indeed, such a policy recommendation should be complemented also by a change of the EU fiscal regulations outlined in the SGP, as proposed not only by many economists but also by the European Fiscal Board in 2019 (Beetsma, 2022).

5.2. Second recommendation: a revision of debt numerical criteria

Given the consequences that a country's fiscal policy can have on other European countries, the EU has always been concerned about its regulation. Indeed, the externalities between EU countries caused by the use of public debt warranted the adoption of European fiscal laws (Blanchard et al., 2021). When a country's public debt becomes unsustainable, it can have an impact on other EU members, either through spill overs from the sovereign debt crisis or by pushing the ECB to intervene by monetizing the debt, resulting in higher inflation (Blanchard et al., 2021). The EU established the SGP to manage this risk, with the key numerical limits being a maximum primary deficit-to-GDP ratio of 3% and a debt-to-GDP ratio of 60%. Yet, the EU never gave a convincing explanation of the economic reasoning behind the choice of these two numerical criteria, especially regarding the debt target (Priewe, 2020). The primary reason for choosing this debt level was that it represented the average debt level of EU countries at the time of SGP implementation (Priewe, 2020). Hans Tietmeyer, a German negotiator and member of the Ministry of Finance, suggested that the 60% objective was chosen because it was the sustainable level of debt with a nominal growth rate of 5%, a deficit of 3%, and an inflation rate of 2% (Priewe, 2020). However, Tietmeyer eventually recognised that such economic reasoning was not accurate (Priewe, 2020). Nonetheless, due to its simplicity and transparency, this rule has been preserved until the present day, albeit with some modifications (Blanchard et al., 2021).

The SGP has not always been followed by EU Member States. Indeed, debt ratios of more than 60% exist throughout the EU, and in the case of the PIGS, debt ratio levels are substantially higher. Not only are they beyond the 60% limit, but efforts to lower them have been insufficient, even during prosperous periods, as underlined by EU Commission ex-president Juncker in 2019 (Beetsma, 2022). The reason for the numerous SGP rule infractions is that they were too strict in some circumstances and too forgiving in others (Blanchard et al., 2021). In the former example, they compelled governments to engage in fiscal consolidation during recessions, such as in the Great Recession, whereas in the latter situation, they failed to limit public spending during expansionary periods, such as the economic boom of the 2000s (Blanchard et al., 2021). For these reasons, the SGP rules have undergone a few changes throughout the years, yet despite them, they continue to have unfavourable impacts. In particular, they had the unintended consequences of restricting efficient public investments, which hindered economic growth, and of reducing the extent of fiscal support, as witnessed during the Great Recession (Blanchard et al., 2021). Furthermore, the SGP rules were still not strictly enforced. As a result, even prior to the Covid-19 crisis, there was wide consensus that the SGP rules needed to be reviewed and modified, as indicated also by the EFB (2019) (Blanchard et al., 2021).

The advent of the Covid-19 crisis and its implications for debt ratios reawakened support for their reassessment, with Blanchard et al. (2021) being the main proponent of the SGP adjustments. Blanchard et al. (2021) and several others call for a shift from rules to fiscal standards, which would allow for greater flexibility. However, standards have limits. First, even if the numerical criteria are not determined by economic reasoning, as Blanchard et al. (2021) and many others assert, they have been successful in controlling government overspending (Beetsma, 2022). Second, regulations work ex-ante, allowing for rapid detection of a country's divergence, whereas standards work post-hoc, giving too much space for interpretation (Beetsma, 2022). Indeed, what will be proposed here is not a shift from rules to standards, but rather a revision of the SGP's numerical requirements to achieve fiscal consolidation aimed at increasing fiscal space and resilience while not putting too much pressure on the public finances, which may result in harming the poor segment of society and sacrificing efficient investments.

The purpose of modifying the numerical debt requirements is to set less stringent but more achievable targets, making debt consolidation more credible (Beetsma, 2022). In fact, the SGP rules were frequently violated, and the situation that arose during the Covid-19 crisis, particularly for the Mediterranean countries, made clear that the 60% target will not be met for a long time. Indeed, it is quite difficult, both politically and economically, to expect these countries to maintain significant primary surpluses in order to achieve the 60% goal in the medium term. Because there is no such thing as a unique and optimal level of debt, as mentioned in Section 2, it is best to concentrate on what can be accomplished with the EU fiscal framework. Beetsma (2022) offered

four potential solutions to reform EU fiscal rules in the aftermath of the Covid-19 crisis:

1. Leave the rules unchanged and accept the more frequent deviations.
2. Decrease the speed of convergence towards the 60% target.
3. Leave the speed of convergence unchanged but increase the 60% target for all the EU countries.
4. Determine a distinct debt ceiling for each country based on its characteristics.

Given the current economic and fiscal situation, combining the second and fourth alternatives is the best way to expand the PIGS' fiscal flexibility without losing economic growth. This would involve keeping the 60% debt objective as a long-term reference number but allowing for varying debt ceilings over a specific time horizon, such as ten years, which is the same forecast period adopted by the EU Commission when analysing the medium-term sustainability of the EU countries (Beetsma, 2022). After attaining the set debt target in ten years, the debt ceiling can be adjusted downward and must be fulfilled within the next ten years under the supervision of both the EU Commission and the IFI, until reaching the long-term target of 60%. This would allow the government to attain the 60% debt objective in the long term at a flexible rate of convergence, which is modified based on the country's features in order to improve its fiscal condition without losing growth and harming citizens. Such a policy solution would address the mismatch between the complexity of the debt sustainability dynamics depicted in Section 2 and the simplicity of the numerical requirements contained in the SGP (Blanchard et al., 2021). Indeed, the medium-term debt target would be defined based on the countries' economic and political characteristics, moving away from the unrealistic rule of "one-size-fits-all" and accepting the idea that there is no single debt level that ensures fiscal sustainability, but that it varies by country. Moreover, this would enable for the medium-term debt objective to be adjusted based on the macroeconomic circumstances, i.e., looking at the $r - g$ condition. Matter of fact, the EU legislation is built on the situation in which $r - g > 0$ and so the fiscal rules were also developed on this premise (Priewe, 2020). Allowing for a flexible medium-term debt target enables for less restrictive debt caps if macroeconomic conditions permit ($r - g < 0$). Finally, and most importantly, this will remove the traditional SGP rules' austerity bias. This is essential to ensuring that countries with high debt ratios or that are more vulnerable to asymmetric shocks may raise public spending to both recover from the Covid-19 crisis and address the climate change issue (Priewe, 2020). Finally, such change would be more realistic to undertake by the end of 2022, when the SED clause is expected to be withdrawn and countries must draw their budgets, as opposed to shifting to fiscal standards, which would take much more time (Beetsma, 2022).

Nonetheless, adjusting only these numerical debt criteria is insufficient to prevent EU nations, especially the PIGS, from abandoning effective public investments, notably those required for the green transition. It is also necessary to modify the expenditure rule. The SGP already includes a "golden rule" that excludes public investments from the primary deficit calculation to leave greater room to meet the 3% deficit-to-GDP objective (Beetsma, 2022). However, due to the severe conditions that must be met in order to apply such a clause, it has not been used much in the past (Beetsma, 2022). The reason for this is that governments are prone to justifying some expenditures as public investments even when they are not. To address this issue, it would be best to modify the "golden rule" as recommended by the EFB in 2019 (Beetsma, 2022). The modification would entail applying such a rule only to investments funded and supervised by the EU, as long as the sustainability of the public debt is not jeopardised (Beetsma, 2022). Furthermore, such a rule could be quite beneficial in dealing with the green transition. Indeed, many economists urge for a "green golden rule" that would exempt from the deficit calculation the expenditures made to combat climate change and to build transition infrastructure (Beetsma, 2022). Nonetheless, to be effective, the monitoring mechanism should be tightened to eliminate the potential of greenwashing, which would be harmful to both the environment and the country's public budget (Beetsma, 2022). To avoid such a problem, the IFI might be the primary player responsible overseeing such a procedure.

Such fiscal rule revision represents an essential step toward making future fiscal policies driven by rigorous appraisals of the countries' current and future macroeconomic characteristics rather than dogmas.

5.3. Third recommendation: avoid increasing inequality and slowing growth

Finally, it is critical that the necessary budgetary consolidation have the least impact on the poorest segments of society to avoid an increase in inequality. This is critical not only to prevent a rise in demand for social services, which would burden the public finances once fiscal consolidation is complete, but also to avoid a loss of society's overall utility. Furthermore, while attempting to identify the best policy measures for implementing fiscal consolidation without significantly increasing inequality, the effect of these measures on economic growth¹⁶ will be also considered, which has important effects on debt dynamics and, if it decreases, could worsen debt sustainability, as explained in Section 2.

Numerous empirical evidence indicate that fiscal retrenchment has a detrimental impact on a country's income equality, hence increasing societal imbalances. In particular, it has been discovered that fiscal austerity has an effect on the income level of the two poorest quintiles of the wealth distribution, raising issues about how the gains and losses of these policies must be apportioned (Christensen et al., 2013). However, the scale of this effect has not been properly defined yet (Christensen et al., 2013).

I will draw on the research of Christensen et al. (2013), which focuses on the influence of fiscal retrenchment on the static income distribution, to find the optimum policy approaches to accomplish fiscal consolidation without losing income equality and economic growth. This only provides a partial picture of the impact of fiscal consolidation on inequality levels, where a more dynamic perspective would be required, as well as the reality that different consolidation strategies may interact with one another and with other policy measures (Christensen et al., 2013). Nonetheless, it serves as a useful guide for assessing the efficacy of proposed policy initiatives.

In general, both transfers and household taxes have the effect of redistributing wealth and thereby diminishing income disparity. However, in most countries, the redistribution effect of transfers is stronger than that of taxes, making fiscal consolidation based on transfer cuts more effective at increasing wealth disparity than fiscal consolidation based on tax increases (Christensen et al., 2013). However, such an effect is contingent on the type of policy implemented.

Following are the primary policy instruments that can be used to achieve fiscal consolidation while avoiding further harm to income inequality and economic growth. The instruments under consideration will also be chosen based on their practicality, implying that they do not involve time-consuming structural modifications. The range of policy instruments appropriate for these objectives is separated into two categories: those based on decreasing public expenditures and those based on increasing government revenues.

Lowering public spending:

- *Pension reforms.* As indicated in Section 4, the nations under consideration have already implemented measures that will reduce the burden of pension expenditure on public finances in the long run. Yet, there are reforms that are preferable in terms of equality and growth. For instance, raising the retirement age is the ideal pension reform to fulfil the goal of fiscal consolidation without increasing income disparity and lower growth (Christensen et al., 2013). On the contrary, such a strategy enhances income equality by promoting labour participation, which boosts income for certain individuals who would receive a salary instead of a pension (Christensen et al., 2013). The rising employment rate benefits also economic growth and, as a result, the revenue side of the public budget (Christensen et al., 2013). Reforms aiming at decreasing the pension replacement rate, on the other hand, have a negative impact on equity (Christensen et al., 2013).

- *Reduction of unemployment benefits.* Such a strategy has been proven to have almost no effect on equity, because its effect is compensated by an increase in employment over time, which also has a favourable effect on economic growth (Christensen et al., 2013). However, this should not be applied during periods of severe unemployment since it would exacerbate inequality without compensating with an increase in employment (Christensen et al., 2013). As a consequence, this further suggests that budgetary consolidation should be

¹⁶ When I refer to economic growth in this paragraph, I mean sustainable economic growth, which implies the aforementioned concept of "green growth" that the EU is aiming for. See Appendix C.

conducted once the economy has fully recovered.

- *Increase the fees in the tertiary education.* This would benefit both public budgets and fairness, but it would also demand support measures to safeguard disadvantaged households from financial barriers to higher education participation (Christensen et al., 2013).

Increase in government revenues:

- *Increase in wealth and property taxes.* It is likely to boost equity because wealth and property ownership are disproportionately concentrated in wealthy households (Christensen et al., 2013). Furthermore, property taxes, particularly those on real estate properties, have the least negative influence on the growth rate when compared to all other types of taxes (Christensen et al., 2013). For this reason, it is the most practical tax rate to raise due to its minor impact on GDP and low impact on equity.

- *Increase of capital taxes.* Capital income is also more likely to be held primarily by the wealthy part of society, making an increase in its taxation favourable for redistribution (Christensen et al., 2013). Furthermore, capital taxes are far lower than labour income taxes, benefiting high-income households with a bigger share of capital (Christensen et al., 2013). One rationale for the lower capital tax rate is that it is thought that greater capital taxes would discourage investments, firm formation, and foreign investment, negatively impacting the growth rate (Christensen et al., 2013). However, the lower tax rate in comparison to the one on labour income allows households to engage in tax arbitrage between the two types of income, which is undesirable (Christensen et al., 2013). In general, such a measure has the ability to boost equity and increase government income while having no major negative consequences on growth rate (Christensen et al., 2013), making it a suitable choice for contributing to debt retrenchment.

By putting these types of policies into a fiscal consolidation plan based on the premise of not damaging economic growth and exacerbating income inequality, we may avoid repeating the same mistakes committed with consolidation in the aftermath of the Great Recession. The IFI would then play a critical role in shaping the fiscal plan to minimise the consequences on income inequality and economic growth while also removing political hurdles to its execution. Finally, revisions to the SGP's numerical rules would allow for the implementation of a fiscal consolidation plan that take into account the aforementioned objectives rather than being only focused on reducing the public debt, allowing for a smoother creation of fiscal space for the PIGS.

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Appendix A - Inflation

When considering the effects of inflation on debt ratio dynamics, it is natural to believe that an increase in the inflation rate is favourable because it reduces the real value of debt ratios (De Vijlder, 2022). Furthermore, because taxes are imposed on nominal quantities, government revenues from taxation rise when there is inflation, increasing the contribution to debt servicing (De Vijlder, 2022). Secondly, inflation has a beneficial effect on the nominal GDP growth rate, thus increasing the denominator and decreasing the debt ratio, but only if it has no influence on the real economy or government spending (De Vijlder, 2022). Yet, inflation has also negative effects on the debt ratio dynamics. Indeed, although certain expenditures are indexed to inflation, others are not, implying a loss in the actual worth of public spending (Darvas, 2022). As a result, the government may raise nominal spending to maintain the same level of commodities given, partially offsetting the gain in government revenues (Darvas, 2022). More importantly, inflation can raise interest rates because investors may demand higher risk premiums, implying also a negative impact on investments and growth rates (Darvas, 2022). They demand higher risk premiums as compensation if inflation continues to fluctuate (Reis, 2022). Nevertheless, the effects of inflation on state finances are strongly contingent on whether the rise in inflation was foreseen by financial markets and how long this rise will remain (De Vijlder, 2022). In fact, an expected rise in inflation would have a detrimental effect on debt ratio dynamics since it would imply an increase in the nominal interest rate before the growth rate and inflation rate scoop up (De Vijlder, 2022). This implies that an unexpected inflation shock will have a more positive impact on the debt ratio's trajectory, because bondholders do not have time to adjust their expectations and to require higher risk premiums, thus preventing a quick and early spike in interest rates (De Vijlder, 2022).

In any case, the persistence of inflation is more essential in determining its overall impact. Indeed, if inflation is predicted to persist, this will raise inflation expectations and, as a result, raise the nominal interest rate on government bonds, increasing the costs of issuing debt (De Vijlder, 2022). Given the prevalence of sovereign obligations with long maturities, it will be some time before this effect is completely reflected in the average cost of public debt (De Vijlder, 2022). Nonetheless, financial markets may begin to focus on the cost of newly issued debt rather than the overall cost, demanding higher risk premiums (De Vijlder, 2022). The persistence of inflation is mainly determined by the ECB's response. In fact, if the ECB's commitment to maintaining stable inflation is questioned, financial markets will begin to demand inflation risk premiums, aggravating the debt ratio dynamics (De Vijlder, 2022). For this reason, the more credible the ECB is in controlling inflation, the better it is for debt dynamics, even if it may aggravate them in the short term due to the contractionary monetary policy required to combat inflation (De Vijlder, 2022). This may appear counterintuitive given that I previously stated that an unexpected inflation shock has a beneficial influence on the debt ratio's trajectory, given the benefits indicated above. However, the advantages of an unexpected inflation shock remain only as long as economic agents do not adapt their expectations to the higher inflation levels (Reis, 2022). Hence, the more persistent the inflation shock the worse it is for the debt ratio dynamics.

It may be argued that the present inflationary rise was mostly unforeseen (De Vijlder, 2022; Furman, 2022). Indeed, it was only partially expected, as a result of pandemic economic ramifications such as fiscal stimulus to recover from the pandemic, shift in spending, supply chain disruption, and so on, but the consequences of the Russia-Ukraine war made such a jump in inflation more abrupt, larger and more persistent (Agarwal & Kimball, 2022).

To combat rising inflation and keep inflation expectations in check by anchoring them at the 2% target, the ECB announced that it will begin raising interest rates at the end of July (Darvas, 2022). This, however, raises worries about the sustainability of the public budgets of EU nations with high debt ratios, such as the PIGS (Darvas, 2022). Indeed, an increase in interest rates makes public debt more expensive, reducing its sustainability and, as a result, eroding investor trust, which might increase the required risk premiums. This will further increase the cost of the national debt, triggering in an unsustainable debt spiral.

Despite this, the EU Commission recently revised downwards their predictions for debt ratios in 2023 for all EU nations except Poland, compared to their November 2021 forecast (Darvas, 2022). Furthermore, the IMF

also recently revised downwards its 2021 debt ratios forecasts for 2026 for all the EU countries except for Germany, the Netherlands and Romania (Darvas, 2022). According to Darvas (2022), this is because the negative impact of interest rates on debt ratio dynamics will be more than compensated by its devaluation caused by inflation. Nonetheless, these findings could be explained by an underestimation of the extent of the contractionary monetary policy required to restore inflation to its target. Indeed, if the interest rate hike persists in the long run, it may determine an increase in the average cost of public debt beyond 2026, putting the PIGS debt ratios on a considerably less sustainable path (Darvas, 2022). Notwithstanding, the increase in the expenses of new debt issuance should be more than offset in the short run by the favourable impacts of inflation. Still, it is critical that the ECB retains its credibility in following the 2% inflation objective in order to prevent a further raising on the inflation expectations, which would result in far less favourable debt dynamics. In fact, prior to the Great Moderation, managing inflation entailed persistently raising the interest rate substantially above the inflation rate, which frequently resulted in a slowdown or even a downturn (Wyplosz, 2022). If this less optimistic scenario occurs, sovereign debts are likely to grow rapidly and become unsustainable unless the public finances are quickly restored to balance (Wyplosz, 2022).

To avoid such an unfavourable outcome for high-debt countries, as well as interest rate fragmentation between high-debt EU Member States (PIGS) and low-debt ones (Germany and the Netherlands, for example), the EU implemented a new tool (Nelson, 2022). Matter of fact, borrowing costs have been already rising in recent months, particularly in Italy (Nelson, 2022). For this reason, the EU focused on whether bond market fluctuations reflected changes in a country's economic fundamentals or were unexpected and a threat to monetary policy success (Nelson, 2022). Because the increase in Italian interest rates was only partially due to changes in economic fundamentals, the EU sought a solution (Koranyi, 2022). In fact, on July 21st, the EU introduced the so-called Transmission Protection Instrument ("TPI" from now on), which strives to avoid bond market movements that are not caused by changes in countries' economic fundamentals (Nelson, 2022). The TPI is a new ECB asset purchase programme aimed at nations whose funding situations are suddenly deteriorating (Nelson, 2022). The size of the bond purchase will be determined by the importance of the associated risks, and the bond acquired can have a maturity period ranging from one to ten years (Nelson, 2022). Furthermore, there are some requirements for access to such an instrument, including adherence with the EU fiscal framework, the absence of significant macroeconomic imbalances, having a sustainable public debt according to EU Commission analysis, and, finally, having economic policies that are consistent with the Recovery and Resilience Plan and EU Commission advice (ECB, 2022; John & Koranyi, 2022). It remains to be seen how strictly these standards will be implemented, as the countries most likely to require the TPI, primarily the PIGS, may fail to meet all these eligibility criteria. Nonetheless, what it is important is that the TPI will ensure the seamless implementation of the EU's anti-inflationary monetary policy, without putting the public finances of the high-debt countries on an unsustainable path (ECB, 2022; John & Koranyi, 2022).

Appendix B – Exposure of PIGS to population ageing: results by country

Italy

	Pension system			Healthcare system			Long-term care			Education			Total expenditures		
	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070
Baseline scenario	15.4	1.9	-1.8	5.9	1.2	1.2	1.7	0.7	1.0	3.5	-0.4	-0.4	26.5	3.4	-0.1
Lower growth scenario	15.4	2.5	-1.2	5.9	1.2	1.2	1.7	0.7	1.0	3.5	-0.4	-0.4	26.5	4.0	0.5
Non-demographic costs scenario	15.4	1.9	-1.8	5.9	1.5	1.9	1.7	1.1	2.0	3.5	-0.4	-0.4	26.5	4.2	1.6

Table B.1: Forecasted change in population ageing expenditures, expressed as % change in GDP, in Italy between 2019-2070
Source: The 2021 Ageing Report, EU Commission. https://ec.europa.eu/info/sites/default/files/economy-finance/ip148_en.pdf
Legenda: Green indicates a decrease in the expenditures, while red indicates an increase of them.

Looking at the baseline scenario, it is possible to see that ageing-related expenditures in Italy are likely to rise and peak (+3.4 ppt of GDP) around the middle of the forecast period, thus between 2019 and 2045, before falling slightly (-0.1 ppt of GDP) in the long run. The cause of this tendency must be researched into the impact of pension system expenses. Indeed, reforms aimed at restructuring pension system expenditures, such as reducing benefits or raising the retirement age, take time to become fully effective, and as a result, the pension expenses-to-GDP ratio will sharply rise (+1.9 ppt of GDP) between 2019 and 2030 before falling (-1.8 ppt of GDP) in the long run as the reforms take effect (EU Commission, 2021). The reason behind the spike in pension spending between 2019-2030 is due to the substantial increase of the ODR caused by the retirement of the so-called “baby-boom generation” (EU Commission, 2021). The negative impact of population ageing will persist beyond 2030, but it will be offset by pension system adjustments aimed at strengthening its sustainability (EU Commission, 2021). The amendments are focused on the three areas mentioned in paragraph 4.1.1. First, according to the EU Commission's predictions, Italy's coverage ratio is expected to fall in the coming years as a result of changes to the retirement age (EU Commission, 2021). Second, the benefit ratio is expected to rise in Italy between 2019 and 2030, coinciding with the peak in pension spending, but then it is expected to fall significantly after that, accounting for the majority of the depressing effect on the pension expenditures-to-GDP ratio (EU Commission, 2021). This is owing to the pension system adjustments. Finally, Italy also implemented labour market reforms aimed at boosting the employment rate, which will benefit to the pension scheme's sustainability by stimulating economic growth as well as the expansion of the tax base (EU Commission, 2021).

Despite this predicted slight decline in the baseline scenario, Italy's pension-funding expenses will remain substantially higher than the European average also in 2070 (EU Commission, 2021), indicating that there is still much room to reduce pension spending.

Moving on, the spending sector related to demographics who will experience a robust increase throughout the forecast period is the one related to the healthcare system. A thorough presentation of the features of the analysis performed by the EU Commission is beyond the scope of this paper. However, in order to understand whether there is room for policy intervention, it is important to remember the drivers of such spending

increases, which are mentioned in paragraph 4.1.1. Furthermore, as shown in the table, the scenario in which healthcare expenditures are not increased due to population ageing is the most troublesome, resulting in a substantial increase in total spending even in 2070 (+1.6 ppt of GDP).

Finally, expenditures in the education system are predicted to fall, reflecting past spending trends, since no change in government policies is assumed in the baseline scenario (EU Commission, 2021).

It is now important to evaluate whether these trends will cause Italy to have long-term debt sustainability issues. According to the S2 indicator contained in the EU Commission (2022), Italy must improve its PBR to reach a budget draw in order to keep its debt ratio stable over time, which is not an impossible goal considering Italy's previous fiscal efforts (EU Commission, 2022). Consequently, population ageing does not appear to be a major problem for Italy's future debt ratio dynamics. Nonetheless, given Italy's precarious financial condition as a result of its rising debt ratio, as mentioned in paragraph 3.1.1, the long-term risk remains significant (EU Commission, 2022). To lower its sustainability concerns, Italy should try to improve its fiscal space rather than maintain it constant.

Greece

	Pension system			Healthcare system			Long-term care			Education			Total expenditures		
	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070
Baseline scenario	15.7	-2.0	-3.8	4.4	0.7	0.8	0.2	0.0	0.0	3.2	-0.6	-0.6	23.6	-1.9	-3.7
Lower growth scenario	15.7	-1.7	-3.1	4.4	0.7	0.8	0.2	0.0	0.0	3.2	-0.6	-0.6	23.6	-1.6	-3.0
Non-demographic costs scenario	15.7	-2.0	-3.8	4.4	1.3	1.6	0.2	0.3	2.4	3.2	-0.6	-0.6	23.6	-1.0	-0.4

Table B.2: Forecasted change in population ageing expenditures, expressed as % change in GDP, in Greece between 2019-2070

Source: The 2021 Ageing Report, EU Commission. https://ec.europa.eu/info/sites/default/files/economy-finance/ip148_en.pdf

Legenda: Green indicates a decrease in the expenditures, while red indicates an increase of them, and orange indicates no change.

The Greek government's exposure to population ageing is substantially smaller than that of Italy. Indeed, the reduction in overall expenditures associated to ageing is not only greater, but also robust to the sensitivity scenarios. Such favourable dynamics are driven by the fact that Greece will be the European country with the highest long-term decline in pension expenses (-3.8 ppt of GDP) (EU Commission, 2021). Nonetheless, it is crucial to note that, while a drop in pension expenses indicates an improvement in the sustainability of the retirement system, it is also important to consider the total expenditures to support it in order to get the whole picture of its sustainability (EU Commission, 2021). Indeed, the reduction in Greek pension expenses constitutes a significant improvement, but its expenditures remain higher than the EU average also in 2070, even if they will be more aligned with it (EU Commission, 2021).

The forces underlying the decline in pension spending in Greece are similar to those seen in Italy, resulting in the pension reforms above listed. Yet, Greece is unlikely to see an increase in pension spending in the middle of the projected period (2019-2045) as it is predicted for Italy. This could be because, unlike Italy, Greece did not experience already an increase in retirement spending before to 2019 (EU Commission, 2022). Additionally, despite the negative impact of "baby-boom generation" retiring will hit also Greece, its impact is expected to be milder. These dynamics, together with the economic prudence exercised by Greece in recent years as a result of the EU Commission's extra supervision through the Enhanced Surveillance Framework,

result in a lesser susceptibility of the public finances to unfavourable demographic trends (EU Commission, 2021). In fact, according to the EU Commission (2021), even though the contents of the policy reforms are similar to that of Italy, the size of the Greek ones is more significant in terms of benefit ratio reduction and labour market effects, with Greece experiencing the largest drop in expenditures as a result of the latter.

In Greece too, the sector with the greatest increase in population ageing expenditures is the healthcare system. However, the statistics offered for this sector's expenses are laden with a high degree of uncertainty, and as a result, their magnitude should be taken with caution (EU Commission, 2021). Finally, expenditures in the education system are predicted to fall, reflecting past spending trends, since no change in government policies is assumed in the baseline scenario (EU Commission, 2021).

Moving on to the examination of the Greek debt ratio's vulnerability to such long-term trend, the S2 indicator is even negative, indicating that there is no need to change the PBR in relation to the baseline scenario in order to keep the debt ratio stable (EU Commission, 2022). However, this does not imply that Greece is safe in the long run. Indeed, given Greece's extremely high debt ratio, its fiscal position is fraught with risk, as highlighted by the DSA risk assessment in paragraph 3.1.2. Combining these two indicators, the S2 suggesting low risk and the DSA signalling high risk, results in Greece having a medium risk in terms of long-term debt sustainability (EU Commission, 2022). Still, Greece requires additional fiscal consolidation to enhance its fiscal space and should try to reduce its debt ratio rather than maintain it constant.

Portugal

	Pension system			Healthcare system			Long-term care			Education			Total expenditures		
	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070
Baseline scenario	12.7	1.0	-3.2	5.7	1.4	1.6	0.4	0.3	0.4	4.3	-0.1	-0.1	23.1	2.5	-1.3
Lower growth scenario	12.7	1.3	-2.4	5.7	1.4	1.6	0.4	0.3	0.4	4.3	-0.1	-0.1	23.1	2.8	-0.6
Non-demographic costs scenario	12.7	1.0	-3.2	5.7	2.0	2.6	0.4	1.8	7.8	4.3	-0.1	-0.1	23.1	4.6	7.0

Table B.3: Forecasted change in population ageing expenditures, expressed as % change in GDP, in Portugal between 2019-2070

Source: The 2021 Ageing Report, EU Commission. https://ec.europa.eu/info/sites/default/files/economy-finance/ip148_en.pdf

Legenda: Green indicates a decrease in the expenditures, while red indicates an increase of them, and orange indicates no change.

The patterns in ageing-related expenses for Portugal are fairly similar to those shown for Italy in all of the reported items, albeit with differing magnitudes. In fact, Portugal will witness a sharper long-term fall in overall costs due to a more substantial decrease in pension expenditures. However, similar to Italy, Portugal will see a rise in retirement spending between 2019 and 2045, peaking to 14.5% of GDP in 2035 due to an increase in ODR induced by the "baby-boom generation" retiring (EU Commission, 2021). Pension expenditures are expected to fall following such a rise, as Portugal made reforms to make the system more viable (EU Commission, 2021). The adjustments that have the largest impact on pension spending are those that targeted the reduction in the benefit ratio, which is expected to fall the most across the EU between 2030 and 2050 and will drive the decrease in pension system funding (EU Commission, 2021). Portugal also enacted reforms to reduce the coverage ratio and improve labour market dynamics, but the extent of these reforms appears to be less than that of Greece and Italy. Furthermore, even though Portugal currently spends more on pensions than the EU average, this position will improve in 2070, with Portugal spending becoming lower than

it (EU Commission, 2021).

Even in Portugal, the biggest expense item that will expand in the coming years is healthcare, with a magnitude bigger than in Italy and Greece. This implies that Portugal's population is expected to age quicker than the two countries examined above. Indeed, increased longevity will stress the public budget not only through increased demand for healthcare, but also through decreased revenues to sustain it, due to the decline in social security payments from working people (EU Commission, 2021). Nonetheless, as previously stated, the amount of this effect is complicated to foresee because it is tricky to estimate the increase in demand for healthcare due to uncertainty about the population's future health status (EU Commission, 2021). Furthermore, non-demographic factors will play a role in increasing healthcare expenditures also in Portugal, as can be seen in the sensitivity scenario for a further increase in non-demographic costs, which would cause Portugal's total expenditures to rise significantly even in the long run (+7.0 ppt of GDP). The scenario assuming reduced growth, on the other hand, has a weaker effect on overall expenditures. Nonetheless, economic growth remains a key prerequisite for keeping age-related expenditures under control, because all of the data supplied are expressed as a share of GDP, and if it falls, the estimates will show a less sustainable picture.

Finally, also for Portugal, expenditures in the education system are predicted to fall, reflecting past spending trends.

Moving on to the assessment of the Portuguese public finances' exposure to the population ageing trend, the S2 indicator, like in Greece, indicates that there is no need to adjust the PBR in the long run to maintain the debt ratio steady, given the expected decrease in total expenditures related to population ageing (EU Commission, 2022). Therefore, the S2 indicator suggests a low risk for Portugal in the long term, but as seen in paragraph 3.1.3, the DSA indicator displays a high risk due to Portugal's less-than-virtuous fiscal position. As a result of combining these two indicators, Portugal is classified as medium risk in the long run (EU Commission, 2022). In this case too, Portugal should strive to improve its fiscal situation by lowering its debt ratio rather than maintaining it constant.

Spain

	Pension system			Healthcare system			Long-term care			Education			Total expenditures		
	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070	2019 Level	Δ 2019-2045	Δ 2019-2070
Baseline scenario	12.3	0.8	-2.1	5.7	1.2	1.3	0.7	0.4	0.8	3.6	-0.5	-0.4	22.3	2.0	-0.4
Lower growth scenario	12.3	1.2	-1.2	5.7	1.2	1.3	0.7	0.4	0.8	3.6	-0.5	-0.4	22.3	2.3	0.5
Non-demographic costs scenario	12.3	0.8	-2.1	5.7	1.8	2.2	0.7	1.0	2.8	3.6	-0.5	-0.4	22.3	3.1	2.4

Table B.4: Forecasted change in population ageing expenditures, expressed as % change in GDP, in Spain between 2019-2070

Source: The 2021 Ageing Report, EU Commission. https://ec.europa.eu/info/sites/default/files/economy-finance/ip148_en.pdf

Legenda: Green indicates a decrease in the expenditures, while red indicates an increase of them, and orange indicates no change.

Finally, Spain is also one of the countries that has adopted pension reforms, and as a result, its total demographic expenditures will reduce in the long run because of the decline in pension payments. However, as in Italy and Portugal, pension-related spending will rise in the middle of the forecast timeframe before falling below the starting point. The growth in pension expenditures between 2019 and 2030 is driven by the "baby-boom generation" retiring, although the effects of ageing will continue to rise between 2030 and 2040,

peaking before beginning to reduce (EU Commission, 2021). The main effects of the Spanish reforms are aimed at lowering the benefit ratio, and Spain, after Portugal and Italy, is the country with the most ambitious reduction (EU Commission, 2021). Furthermore, Spain undertook labour market reforms that, after Greece and Italy, will have the greatest impact on pension costs (EU Commission, 2021). Finally, unlike the other nations studied, the coverage ratio is expected to rise in the long run, reflecting weaker changes to limit early retirement and raise the retirement age (EU Commission, 2021). As a result, this will partially offset the positive effects of the other reforms on pension spending. Nonetheless, Spain, like Portugal, currently spends more on pensions than the EU average, but this will change in 2070, with Spain pension spending becoming lower than it (EU Commission, 2021).

The healthcare sector spending will rise the greatest in the long run, as in all of the countries studied above, somewhat offsetting the decline in pension spending. Furthermore, the scenario predicting a further growth in non-demographic costs shows a major influence not only on increasing healthcare costs, but also on costs associated with long-term care, which will have a strong impact on total expenditures (+2.4 ppt of GDP). The lower growth scenario, on the other hand, has a weaker effect, but it still results in an increase in total expenditures. Finally, education spending is expected to fall, like in other nations, mirroring previous spending trends (EU Commission, 2021).

Moving on to the examination of the Spanish public finances' susceptibility to the ageing population trend, the S2 indicator implies that Spain would need to achieve nearly a budget balance to keep its debt ratio stable in the long run, which is realistic given Spanish past fiscal efforts (EU Commission, 2022). However, considering the recent trends of Spain's PBR, Spain has primarily run fiscal deficits in recent years, indicating a medium risk on the S2 indicator. This result, when combined with the high risk provided by the DSA risk assessment in paragraph 3.1.4, shows that Spain faces a high risk in the long run (EU Commission, 2022). As a result, Spain should strive to improve its fiscal situation by lowering its debt ratio rather than maintaining it constant.

Appendix C – Economic growth and decarbonisation

Economic expansion, as has been clear for many years, is the primary cause of greenhouse and gas ("GHG" from now on) emissions, as well as environmental harm (Lenaerts et al., 2021). Consequently, the question naturally arises: can we still afford economic growth? When it comes to this question, there are two main opposing schools of thought. On one side, there is the "green growth" school of thought, which believes that the relationship between growth and decarbonization is positive (Lenaerts et al., 2021). Indeed, they claim that climate-change policies accompanied by technological advancements will allow us to achieve the net-zero emission target while simultaneously contributing to economic growth (Lenaerts et al., 2021). This is essentially the EU's point of view, as it refers to the EU Green Deal as a means of relaunching Europe's economic growth (Lenaerts et al., 2021). On the other side, there is the "degrowth" school of thought, which contends that the only way to decarbonize the economy is to slow it down and make structural changes to how we perceive it (Lenaerts et al., 2021).

However, the debate on whether we can still afford economic growth is difficult to be applied to the reality. Emerging economies will want to continue expanding and will implement policies in this direction, while also reducing substantially the GDP growth in advanced economies is difficult to be applied (Lenaerts et al., 2021). In fact, economic growth is crucial for funding the welfare system and consequently, a reduction of it would create problems for the sustainability of public debts, of pensions and social assistance (Lenaerts et al., 2021). Furthermore, a slowdown of the economy may intensify the aforementioned distributional consequences of decarbonisation (Lenaerts et al., 2021).

When addressing the relationship between economic development and GHG emissions, the most important goal is to achieve their "decoupling" (Lenaerts et al., 2021). This requires breaking the link between higher economic growth and higher GHG emissions (Lenaerts et al., 2021). This process has been already started, but the decoupling rate¹⁷ required to achieve a zero-emission economy by 2050 is still a long way off. Indeed, at the global level, the decoupling rate is relative rather than absolute, implying that GHG emissions are increasing less than GDP growth in proportion (Lenaerts et al., 2021). Nonetheless, they still continue to rise because global economic expansion has been too rapid to reduce emissions (Lenaerts et al., 2021). In advanced economies, in particular, the decoupling rate is insufficient (Lenaerts et al., 2021). For example, the EU Commission estimated that since 1990, GHG emissions have decreased by 25% while growth rates have climbed by 62%, implying that absolute decoupling is possible, but it is still not sufficient to fulfil the zero-emission target by 2050 (Lenaerts et al., 2021). Yet, it is worth noting that the global commitment to combating climate change has been quite poor until now, which helps to explain the low decoupling rate (Lenaerts et al., 2021).

What is the best solution for accelerating the decoupling rate? Degrowth vs. Green growth

The primary distinction between the two schools of thought is their faith in technological progress. Degrowth researchers say that the technologies necessary to attain the required decoupling rate do not yet exist and that we should not rely on them as the final solution (Lenaerts et al., 2021). For them, the only realistic solution is to bring the economy to a lower-growth steady state in order to achieve the zero-emission target (Lenaerts et al., 2021). To counteract the negative consequences of an economic slowdown, they created some guidelines, emphasizing the importance of redistribution, political engagement, and social fairness (Lenaerts et al., 2021). One of their most well-known policy recommendations, for instance, is to limit the supply of labour in order to decrease the rate of growth through the consumption channel (Lenaerts et al., 2021). This, in turn, will improve welfare since people will have more leisure and employment rates will be higher (Lenaerts et al., 2021). Nevertheless, as previously stated, such policy options are unlikely to be implemented in both emerging

¹⁷ It is classified into two categories of rates. First, the absolute decoupling rate displays the absolute decrease in GHG emissions or as being steady while GDP increases. Second, the relative decoupling rate, which means that the increase of emissions is slower than the rise of GDP (Chen et al., 2021).

and developed economies. In fact, the majority of them are incompatible with the capitalist system and would be difficult to accept in a democracy (Lenaerts et al., 2021).

Green growth researchers, on the other hand, have more faith in technical advancement and, as a result, in the feasibility of meeting the zero-emission target without sacrificing growth. They think that through enhancing energy efficiency, encouraging people to shift their consumption from manufactured goods to less energy-intensive services (e.g., from buying cars to using public transportation more frequently), and adapting the economic system to a less energy-dependent structure, the economy can be completely decarbonised (Lenaerts et al., 2021). Clearly, the key adjustment required to create a zero-emission economy is a shift away from fossil fuels and toward renewable energy sources (Lenaerts et al., 2021).

The four pillars for supporters of green growth are as follows:

1. Subsidization of R&D efforts to improve both energy efficiency and access to renewable energy sources (Lenaerts et al., 2021).
2. Carbon pricing that can be used to accelerate decarbonization while also cutting labour taxes and therefore raising employment levels (Lenaerts et al., 2021).
3. Increase investments in GHG removal technologies to accelerate the rate of decoupling (Lenaerts et al., 2021).
4. Provide assistance measures to the households most impacted by the transition process (Lenaerts et al., 2021).

The EU shares this perspective on combating climate change, as evidenced also by the fact that the four pillars of green growth are essentially incorporated in the EU Green Deal proposal (Lenaerts et al., 2021). Furthermore, the EU has decarbonised its energy industry more than the rest of the world. Nonetheless, its decoupling rate is still one-third of what is required to achieve zero-emissions, implying that considerably more effort is required (Lenaerts et al., 2021).

The scenario presented by green growth supporters appears to be the most politically realistic, but also the most socially desirable. This is especially significant in the context of this paper, because economic growth is crucial to debt sustainability. In fact, if the degrowth scenario becomes a reality, the debt sustainability of nations such as the PIGS will very likely be jeopardised. For this reason, the next challenge will be to maintain the commitment to meet the targets set to achieve a zero-emission economy by implementing appropriate policy solutions not only to decarbonize the economy, but also to avoid sacrificing growth, which would otherwise have catastrophic effects on the countries' public debt sustainability and the funding of their welfare systems. It is hard to predict whether the green growth scenario would be realistic or not, but it is essential to go in this direction by establishing all of the required conditions for its success.