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FISCAL POLICY OF THE SOUTHERN EU COUNTRIES BETWEEN 2000–2019 AND GOVERNMENT DEBTS RESOLUTION PROSPECTS

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Supervisor: Ing. Mgr. et Mgr. Michaela Ševčíková, Ph.D.

Date: Prague, October 2020

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Declaration

I hereby declare that I am the sole author of this doctoral dissertation entitled "*Fiscal Policy of the Southern EU Countries Between 2000–2019 and Government Debts Resolution Prospects*" and that I have not used any sources other than those identified as references.

Prague, 19 October 2020

Prohlášení

Prohlašuji, že jsem disertační práci s názvem „*Fiskální politika zemí jižního křídla EU mezi lety 2000–2019 a možnosti řešení vládních zadlužení*" vypracoval samostatně, pouze na základě uvedených pramenů a literatury.

V Praze, dne 19. října 2020

Ing. Milan Bednář

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Abstract

The aim of this work is to evaluate the fiscal policies of selected Southern European Union (EU) countries between 2000–2019, provide an overview of possible debt resolution options, and formulate economic policy recommendations. It examines arguably the most problematic countries in the Euro Area, which are Italy, Spain, Portugal, and Greece. In short, they are referred to as the EU4 countries. The work focuses on different fiscal perspectives, describes key mechanisms of debt transmission, identifies numerous implications, and connects the fiscal positions of the EU4 countries with other factors, namely with the structural flaws of the Euro Area and the common monetary policy of the European Central Bank. The presented work offers new theoretical and empirical insights within a complex and coherent analysis of the debt crisis in the Euro Area. The used methods include both qualitative and quantitative approaches. The latter include cluster analysis, estimation of structural budget balances and related indicators, debt dynamics framework, unobserved component models, error correction models, and Bayesian vector autoregressive models.

The work identifies five main systemic flaws of the Euro Area and present evidence that the EU4 countries suffer from a constant debt accumulation. In this regard, it describes eight channels which increase the indebtedness of the EU4 countries over time. Moreover, it analyses the effects of the common monetary policy and concludes that it worsens the situation in the medium- and long-term horizon. The theoretical analysis also shows that a fiscal union would not solve the systemic problems. The empirical part demonstrates that the EU4 countries should be concurrently analysed because they create a relatively stable cluster within the EU. The larger economies of Italy and Spain show slightly better fiscal positions; however, the situation is alarming nonetheless. The EU4 countries destabilised their economies through prohibitive structural budget

deficits. The empirical analysis suggests that the effects of accession to the euro area were detrimental to the EU4 countries, especially to Greece. Moreover, the presented estimates also show a total inefficiency of the supranational fiscal regulation within the Euro Area. According to the analysis, the smaller countries (Greece and Portugal) were able to exploit the high degree of the socialisation of risks in the Euro Area. They played the role of the so-called black passenger in relation to their indebtedness to some extent. Nevertheless, in the end, they were forced to significantly improve their fiscal discipline as a result of the financial crisis of 2008–2009 when compared to the larger countries. The work also shows estimates of relevant fiscal multipliers, and on their basis, it is concluded that the borrowed fiscal resources were used extremely inefficiently before the financial crisis. The fiscal efficiency improved after 2014. However, it is a result of expansionary economic policies and adverse situation of the EU4 countries. After the recession, the relative indebtedness of the EU4 countries was further stabilised by positive real GDP growth. Nevertheless, I provide long-term debt projections and show that the fiscal situation of the EU4 countries is unsustainable. According to the projections, it cannot be expected that the EU4 countries to reduce their indebtedness to 60% of their GDPs in at least 50 years if a debt restructuring or a major structural reform does not take place. Given the presented findings, the most appropriate solution to the debt crisis is a fiscal consolidation combined with structural reforms which must be based on supporting long-term economic growth. However, the structural reforms must necessarily include a return to country-specific currencies in the EU4 countries due to the systemic instabilities in the Euro Area. All in all, a return to basic market principles is needed.

Keywords: Southern EU countries, Euro Area, European sovereign debt crisis, debt mechanisms, fiscal policy, debt resolution prospects

JEL Classification: E60, E62, F45, H30, H60

Abstrakt

Cílem této práce je zhodnotit fiskální politiku vybraných zemí jižního křídla Evropské unie (EU) mezi lety 2000–2019, poskytnout přehled možných variant řešení dluhů a zformulovat hospodářsko-politická doporučení. Práce zkoumá jedny z nejproblematičtějších zemí eurozóny, kterými jsou Itálie, Španělsko, Portugalsko a Řecko. Zkráceně je na ně odkazováno jako na země EU4. Práce se zaměřuje na podrobnou fiskální analýzu, popisuje klíčové dluhové mechanismy, identifikuje značný počet implikací a propojuje fiskální pozice daných států s dalšími faktory, zejména se strukturálními nedostatky eurozóny a společnou měnovou politikou Evropské centrální banky. Předložená práce obsahuje nové teoretické a empirické poznatky v rámci komplexní a koherentní analýzy dluhové krize v eurozóně. Použité metody zahrnují kvalitativní i kvantitativní přístupy. Druhá zmíněná skupina se skládá ze shlukové analýzy, odhadů strukturálních rozpočtových bilancí a souvisejících ukazatelů, rámce dluhové dynamiky, modelů nepozorovaných komponent, modelů korekce chyb a bayesovských vektorových autoregresních modelů.

Tato práce představuje pět hlavních systémových nedostatků eurozóny a ukazuje, že země EU4 soustavně kumulují dluhy. V tomto ohledu popisuje osm kanálů, které v čase zvyšují zadluženost daných zemí. Dále analyzuje dopady společné měnové politiky a dochází k závěru, že tato politika dále zhoršuje situaci ve střednědobém a dlouhodobém horizontu. Teoretická analýza rovněž naznačuje, že zavedení fiskální unie by systémové problémy eurozóny nevyřešilo. V empirické části práce ukazuje, že země EU4 by měly být analyzovány společně, protože tvoří relativně stabilní skupinu v rámci EU. Větší ekonomiky Itálie a Španělska vykazují mírně lepší fiskální pozice, situace je nicméně alarmující. Země EU4 destabilizovaly své ekonomiky prostřednictvím nepřiměřených strukturálních rozpočtových schodků. Empirická analýza naznačuje, že dopady přis-

toupení k eurozóně byly pro země EU4 škodlivé, zejména pro Řecko. Předložené odhady ukazují naprostou neefektivnost nadnárodní fiskální regulace v eurozóně. Analýza naznačuje, že menší země (Řecko a Portugalsko) byly schopny využít vysokého stupně socializace rizik v eurozóně a do určité míry plnily roli tzv. černého pasažéra ve vztahu k jejich zadlužení. Nakonec však tyto země byly nuceny v důsledku finanční krize, která se plně projevila v letech 2008–2009, výrazně zlepšit svou fiskální disciplínu ve srovnání s většími zeměmi. V práci jsou dále odhadnuty relevantní fiskální multiplikátory a na jejich základě je vyvozen závěr, že vypůjčené finanční zdroje byly před krizí použity velmi neefektivně. Účinnost vládních výdajů se po roce 2014 zlepšila. Jedná se však spíše důsledek expanzivních hospodářských politik a nepříznivé situace zemí EU4. Po recesi byla relativní zadluženost zkoumaných zemí dále stabilizována pomocí růstu reálného HDP. Nicméně, dlouhodobé dluhové projekce v této práci naznačují, že fiskální situace zemí EU4 je neudržitelná. S ohledem na výsledky těchto projekcí nelze očekávat, že země EU4 sníží svou zadluženost na 60 % svých HDP za méně než 50 let, pokud nedojde k restrukturalizaci dluhů či k významné systémové reformě. Vzhledem k prezentovaným poznatkům se nejvhodnějším řešením dluhové krize jeví fiskální konsolidace spojená se strukturálními reformami, které musí být založeny na podpoře dlouhodobého hospodářského růstu. Dané strukturální reformy však musí nutně zahrnovat návrat k vlastním měnám z důvodu systémových nestabilit v eurozóně. Celkově vzato je nutný návrat k základním tržním principům.

Klíčová slova: Země jižního křídla EU, eurozóna, evropská dluhová krize, dluhové mechanismy, fiskální politika, možnosti řešení vládních zadlužení

JEL klasifikace: E60, E62, F45, H30, H60

Contents

Introduction

The financial crisis, which manifested between 2008-2009,[1] has uncovered significant economic issues of the Euro Area as it hit the economies and transformed into the European sovereign debt crisis. Many economists, including Milton Friedman or Martin Feldstein, claimed that the monetary union is not suitable for many countries in the European Union (EU) due to their economic, political, and cultural differences. However, the EU policymakers ignored these claims. The constant push into deeper and deeper integration resulted in the creation of monetary union. Unfortunately, it currently consists of countries which, arguably, do not belong there. Understandably, the politicians, who are short-term oriented or lack proper information, continuously try to improve the situation by introducing various regulatory packages. These packages, including the Stability and Growth Pact, the Fiscal Stability Treaty, or various monitoring procedures such as the Macroeconomic Imbalance Procedure, are a result of political compromises and are presumably not very useful. Furthermore, the role of the common monetary policy of the European Central Bank (ECB) is equally important. The policy is expansive and based on prohibitively low interest rates since its beginnings. The fact was reinforced by introducing quantitative easing programmes by the ECB in 2010. In my opinion, the Euro Area's issues are systemic and cannot be solved by imposing an additional regulatory burden or conducting an expansive monetary policy.

The financial crisis shock was crucial because it showed which countries exhibit structural disparities that are not compatible with the membership in the monetary union. Many economists consider that the crisis ended after 2014 because the relevant countries began

[1] Literature refers to the so-called global financial crisis or GFC. However, the crisis mostly hit the EU and the USA; hence, the term "*global*" is disputable. Therefore, this work refers to it as to the "*financial crisis*" of 2008–2009. Finally, some authors also refer to it as the 2007–2008 financial crisis due to early speculations with financial assets.

to show positive economic growth again. Nevertheless, these statements are misleading because the recession ended, not the systemic economic and debt crisis.[2] Therefore, I refer to the post-recession period instead of the post-crisis period in the whole text.

The crisis hit the Southern wing of the EU the hardest. Some of the Southern EU countries show extremely high levels of indebtedness and are currently among the most indebted countries in the world. The fact represents one of the most complicated challenges regarding modern fiscal policy-making. Policymakers often claim that the basic macroeconomic policies (including fiscal policy) can solve many economic issues, including structural flaws. However, many of these statements can be considered as a result of the political process or unintentional ignorance. It is arguably the case of the EU and the Euro Area. Therefore, the problematics require a positive economic analysis based on theoretical and empirical evidence.

The topic is relatively broad, and it has been discussed in a large number of books, studies, and analyses. However, I was not able to find a comprehensive work that would evaluate the issue from all major economic perspectives. It should be noted that sole fiscal analysis is not sufficient due to the broad nature of the topic. According to my knowledge, the relevant literature lacks a coherent and sufficiently broad analysis which also combines an overview and evaluation of possible solutions to the problem of the unsustainable fiscal policies in the Euro Area. Furthermore, few studies attempted to summarise all the relevant debt mechanisms and implications in the monetary union. Finally, the literature lacks comprehensive quantitative research which would be comparable among the Southern EU countries.[3]

Main Objectives and Hypotheses

The presented work focuses on the analysis of fiscal policies of selected Southern EU countries between 2000–2019. In particular, the work examines Italy, Spain, Portugal,

[2] These two terms are often used as synonyms but, in this case, it is crucial to distinguish between recession and economic crisis. The latter is a more broad term.

[3] Different studies often use vastly different methodologies regarding complex research topics. Therefore, the results are not comparable.

and Greece. I refer to them as the EU4 countries.[4] Moreover, it aims to provide an overview of possible debt resolution options and propose relevant economic policy measures. The work focuses on different fiscal perspectives, describes key mechanisms of debt transmission, identifies numerous implications, and connects the fiscal positions of the EU4 countries with other factors, namely with the structural flaws of the Euro Area and the common monetary policy of the ECB. In my opinion, this work presents new theoretical and empirical insights within a complex and coherent analysis of the debt crisis in the Euro Area.

The presented research evaluates two main hypotheses:

- The general government debts of the EU4 countries are unsustainable in a medium- and long-term horizon.
- The current institutional design of the Euro Area is not suitable for the examined countries.

Furthermore, the text provides answers to these research questions:

A. Theoretical research questions:

- What are the consequences of prohibitively high debt-to-GDP ratios?
- What are the systemic flaws of the Euro Area concerning debt accumulation?
- What are the relevant debt channels and mechanisms regarding the EU4 countries?
- What is the effect of the common monetary policy of the ECB on the fiscal positions of the examined countries?
- Would an establishment of a fiscal union solve the issues of the Euro Area?

B. Empirical research questions:

- What is the structural position of the EU4 countries in the EU, the Euro Area, and to each other?
- What was the state of the fiscal policies and public finance of the examined countries in short-, medium-, and long-term horizon?
- Are the European Commission's estimates of the EU4 structural budget balances consistent? What are the main issues?

[4] The term "*Southern EU countries*" is not entirely accurate because it may also include France, Cyprus, Malta, or other countries belonging to Mediterranean Europe.

- Which were the most critical factors driving debt dynamics in the EU4 countries?
- What are the prospects and relevant debt projections regarding the past behaviour of the EU4 countries?
- Will the EU4 countries be able to decrease their debt ratios to 60% of their GDPs within 50 years without a debt restructuring or a fundamental reform?
- What were the main determinants of the EU4 fiscal policies? How did the Euro Area accession affect the fiscal behaviour of the countries?
- How efficient were the examined fiscal policies? What was the size of government expenditure multipliers in the EU4 countries? How did the values of the multipliers change after the recession?
- What are the general government debt resolution possibilities and prospects for the EU4 countries?

Scope of Research

The work analyses Italy, Spain, Portugal, and Greece because these countries belong together and should be concurrently analysed.[5] The other Southern EU countries either do not belong to the group (France and others) or exhibit very low economic significance due to their size (Cyprus, and Malta). Moreover, it analyses the period of 2000–2019 for three reasons. First, it is a period which represents the beginnings and the current development in the Euro Area,[6] including the effects of the financial crisis of 2008–2009. The research is valuable because it provides insights into the implications and consequences of the coronavirus crisis which happened in Europe in early 2020. The work concludes the so-called pre-coronavirus period. Second, the time frame is sufficiently long while it is still manageable to provide an elaborate analysis of the issues. Third, the availability of macroeconomic data is considerably better after 1999. In addition, the text often distinguishes between the pre-crisis, crisis, and post-recession period. The term "*crisis*" in the text refers to the financial crisis of 2008–2009 if it is not indicated otherwise.

[5] The evidence for this statement is provided in the fifth chapter (Section 5.2).

[6] Italy, Spain and Portugal entered the Euro Area in 1999. Greece is a member since 2001.

The research primarily focuses on macroeconomic aspects due to the broad nature of the topic.[7] For example, it means that it does not examine the detailed structure of government budgets, but I focus on the relevant budgetary aggregates in the form of revenue and expenditure. In particular, it deals with fiscal policy rather than budget policy.[8] Moreover, it strictly distinguishes between short and long term macroeconomic effects.

Furthermore, the work analyses general government sector data. It is theoretically more fitting to analyse public sector data which also include public corporations. However, these data are not available or the length of the available time series is insufficient.[9] I use primarily gross debt data because of the uncertainties regarding government assets which affect their size or liquidity. In addition, the work utilises consolidated data if it is not indicated otherwise.[10] Finally, I do not analyse external debt separately due to data unavailability and its lower relevance for developed countries.

Methodological Apparatus

The methodological procedure is based on the use of an empirical-analytical approach. I focus on providing a positive and most notably transparent[11] analysis which is based on scientific findings of other authors.

The methodological structure of the work is as follows. First, I provide a general theoretical outlook regarding all the necessary implications connected to the topic. Second, I present empirical research which utilises the theoretical insights and provides an interpretation of the events. It should also be mentioned that the theoretical part is focused solely on the topic of this work. The empirical part also contains some theoretical insights, but these are connected primarily to the used econometric and statistical estimation procedures.

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[7] The inclusion of microeconomic analysis would not be manageable within a reasonable range of the text.

[8] These terms are in the first chapter.

[9] Nonetheless, I present some of the public sector data, where it is relevant.

[10] I use non-consolidated data in some cases due to data unavailability.

[11] For instance, I provide descriptive statistics and relevant tests for each estimation in Appendices.

The work utilises both qualitative and quantitative research methods. The qualitative methods include traditional techniques including analysis, description, comparison, analogy, synthesis, induction, and deduction. Furthermore, I use a wide range of quantitative methods and procedures. The presented analyses often require relatively sophisticated methods because the EU4 countries exhibit serious economic instabilities and show significant structural breaks in the data.[12] Therefore, I employ both econometric, statistical,[13] and simulation methods. These include cluster analysis, estimation of structural budget balances and related indicators, debt dynamics framework and debt projections, unobserved component models, error correction models, and Bayesian vector autoregressive models. The estimations were performed by using the following statistical and programming software: R 3.5.2 (RStudio 1.2.1502), MATLAB R2019a, and EViews 11.

Text Structure

The work consists of four theoretical and four empirical chapters. Each empirical chapter contains a summary of the findings in last section.

The first chapter presents fundamental concepts which are connected to the topic. These are basic principles considering fiscal policy-making, relevant definitions which include the distinctions between general government and public debt, the interaction between fiscal and monetary policy, effects of excessive debt accumulation, and approaches to sovereign debt sustainability assessment. I describe the basic framework of the analyses which are primarily focused on general government debt and related fiscal balances. In addition, the work presents theoretical insights regarding the influence of the common monetary policy of the ECB to the country-specific fiscal policies of the EU4 countries. Moreover, I discuss debt sustainability assessments and consider this section to be very beneficial because it summarises the theoretical and empirical expertise in this area.

The second chapter briefly mentions the financial crisis of 2008–2009 and the sovereign debt crisis in the Euro Area, including implicit and explicit bail-out mechanisms. The text is followed by a concise introduction of the Optimum Currency Area (OCA) theory and related implications. The main added-value of this chapter is the last section which

[12] For example, the use of the traditional Hodrick-Prescott filter in output gap estimations is not sufficient.

[13] I use both traditional (frequentist) and Bayesian approach to statistics and econometrics.

summarises all the relevant systemic flaws in the Euro Area. According to my knowledge, few authors attempted to make a sophisticated analysis of the issue.

The third chapter identifies eight factors which foster the debt accumulation of the EU4 countries in the Euro Area. I refer to them as the sovereign debt channels. In my opinion, this issue has not been sufficiently described in the literature so far.

The fourth chapter discusses the potential establishment of a fiscal union. According to some analysts, the fiscal union would solve the issue of debt accumulation in the Euro Area. Nevertheless, I provide a positive economic analysis, list the potential costs and benefits, and identify 14 assumptions which should be met for the fiscal union to be able to provide a systemic solution to the debt accumulation. Moreover, I discuss the possible interaction of centralised fiscal decision-making and economic shocks in the Euro Area.

The fifth chapter provides an overview of the structural characteristics of the EU4 economies and their development. I show both quantitative and qualitative data, including various economic and social indices. Furthermore, I perform a cluster analysis and show the positions of the EU4 countries in the EU27, the EU19, and to each other. In my opinion, the chapter is essential for the subsequent analyses because the work examines four different countries.

The sixth chapter contains the principal analysis of fiscal policies of the EU4 countries. First, I show the basic fiscal indicators and compare some of them to the standardised fiscal benchmarks used by international institutions. The indicators are either calculated or obtained from various sources. According to my knowledge, there is no other single work which would contain and describe all of them. Second, I provide estimations of fiscal stances and fiscal efforts. The issue is connected to the estimation of structural budget balances. It is possible to obtain the balances from international institutions; however, the approach is less transparent due to potential conflicts of interests of these institutions. Nevertheless, I compare the estimates with the European Commission's estimates and evaluate them accordingly. The last section build on the analysis of debt dynamics and sustainability. I use the standardised debt dynamics framework augmented by the assumption of an open economy (foreign currency-denominated debt)

and stock-flow adjustment to achieve high accuracy of the relevant debt decompositions. Finally, I use the estimates to provide long-term debt projections using two scenarios and evaluate government debt sustainability in the EU4 countries.

The seventh chapter presents econometric models which evaluate the determinants and efficiency of the relevant fiscal policies. I estimate fiscal reaction functions and employ error correction models to study the fiscal determinants. In particular, I use macroeconomic data starting from 1884 to obtain a sufficiently representative benchmark for the 2000–2019 period. The efficiency evaluation is done by estimating government expenditure multipliers for the 2000–2019 period and its sub-periods. I employ Bayesian vector autoregressive models for this purpose. In addition, I briefly discuss all the possible issues of the presented models.

The last chapter builds on the previous analyses and provides an overview of the possible sovereign debt resolution options, including its effects and implications. I analyse the effects of debt monetisation in the Euro Area, possible fiscal consolidation, structural reforms in the EU4 countries, and government default. Finally, I provide relevant economic policy recommendations.

1 Fundamental Concepts

> *He who loves practice without theory is like the sailor who boards ship without a rudder and compass and never knows where he may cast.*
>
> **— Leonardo da Vinci**
> (Italian polymath, 1452–1519)

The first chapter focuses on the definitions and the implications of the most fundamental concepts related to various fiscal analyses which are used in the other parts of this work. However, many of the issues are very complex and can fill a whole book. Therefore, the text provides only a brief overview which deals with the most crucial aspects regarding the topic of this work. The presented concepts serve as a baseline for a detailed description of other, more sophisticated, notions which are used in the following chapters. Furthermore, the theoretical knowledge presented in this chapter is essential for a proper understanding of the issues and the implications of the presented analyses.

The chapter is structured into five sections. First, it defines the basic principles of fiscal policy. Then, it follows with basic definitions of government debt and related concepts which are used throughout this work. It also identifies the interaction between fiscal and monetary policy. In particular, it focuses on the influence of monetary policy over the fiscal setting. In addition, it briefly summarises the adverse effects associated with excessive debt accumulation. Finally, it discusses the approaches which deal with sovereign debt sustainability assessments.

1.1 Basic Principles of Fiscal Policy

The concepts presented in this section are well-known and, for example, Barwell (2016), Cottarelli, Gerson, and Senhadji (2014), and Langdana (2016) provide an up-to-date overview of the issues.

Fiscal policy is one of the key macroeconomic stabilisation policies (sometimes called demand-driven or short-term economic policy).[1] Fiscal policy can be defined as a systematic effort of a government[2] to influence the country's economy. For this purpose, the government uses budget revenues (primarily tax collection) and expenditures (secondary redistribution) in the broadest sense. In addition, it is appropriate to separate terms which are sometimes wrongly used as synonyms, these are budget policy and budgetary policy. The former focuses on financial aspects of the realisation of government objectives. It is a narrower view, which can be considered less macroeconomic and more microeconomic oriented. The latter term refers to budget balances which should be either balanced or in a surplus. This work focuses on fiscal policy which is a strictly macroeconomic view.

The basic functions of fiscal policy include redistribution, allocation of resources, macroeconomic stabilisation (for example, see Cangiano and Mottu, 1998). A regulation function could also be mentioned separately. However, it is an umbrella term because it includes the other main functions. The redistribution is essential for the implementation of social policies, prevention of poverty, and the maintenance of social peace. The allocation function aims to improve efficiency in the given economy. Nevertheless, it is often abandoned at the expense of inefficient redistributive policies which serve the interests of politicians and maintain social peace. Finally, the stabilisation function is often referring to the Keynesian approach[3] to economic policy of aggregate demand stimulation. The concept may seem appealing in economic theory, but it is intrinsically problematic in policy-making practice.

The main objective of fiscal policy consists of the traditional macroeconomic objectives, including economic growth, price stability, and low unemployment. It is essential to distinguish between different policy stances: expansionary, restrictive, and neutral. However, the practical determination of these stances, which are based on systematic government efforts, is complicated in practice.[4] The analysis of fiscal policy is conducted

[1] However, the adjectives in the brackets are not precise. Fiscal policy is able to influence both economic supply and long-term outcomes. Therefore, it is necessary to refer to specific concepts such as fiscal sustainability.

[2] I neglect the political dimension and use the term "*government*" solely.

[3] The term is connected to a theoretical economic framework inspired by the work of John Maynard Keynes (1883–1946).

[4] The issues are discussed in the sixth chapter (Section 6.2.1) in the context of the presented analyses.

using both flow (e.g. budget balances) and stock (e.g. accumulated debt) indicators. Keynesian economists argue that expansionary fiscal policy should be used during recessions to smooth the business cycle[5] (decrease its volatility). The expansionary fiscal policy boosts economic growth through increased government spending or lower tax rates. Nevertheless, the recommendation combined with the political process[6] led to prolonged government deficits and debt accumulation in the modern advanced democratic economies (for instance, see IMF, 2020b).

As it was mentioned, the practice of fiscal policy is problematic. First, a government may be subject to information asymmetries, including a lack of precise data or inappropriate assessment of the current state of the economy. The latter can be considered as a government failure[7]. The failures are results of various issues, including principal-agent coordination problem, regulatory capture, corruption, and others. Second, fiscal policy practice suffers from data lags, including data, recognition, legislative, implementation, and effectiveness lag. Third, the literature often emphasises the pro-cyclical nature[8] of fiscal policy which is problematic[9] (refer to Barhoumi, Cherif, and Rebei, 2018). Finally, the current monetary policy in the EU is employing quantitive easing programmes which significantly influence the redistribution processes and interact with fiscal policies. The issue is discussed in Section 1.3.

1.2 Government Debt and Related Definitions

The definition of government debt is often subject to misinterpretations or specific country characteristics[10]. In my opinion, the most critical distinctions include the composition of the relevant economic (sub-)sectors, debt items, and the gross vs net debt issue.

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[5] The business cycle is the downward and upward movement of gross domestic product (GDP) around its long-term growth trend (potential GDP). It usually lasts between 4-8 years. However, its length is changing over time and is country-specific. Currently, it is longer than in the past due to expansionary economic policies.

[6] The political process can be defined as all the circumstances connected with the processes taking place in the political markets where voters elect politicians while politicians seek funding for their election campaigns and fulfil their individual goals.

[7] As opposed to market failure, which is often identified as the problem. However, this is often not the case.

[8] It can be defined as fiscal stimulation during economic expansion.

[9] Fiscal policy aimed at macroeconomic stabilisation should be anti-cyclical by definition.

[10] For example, specific levels of a political system of the given country.

Theoretically, the most precise fiscal analysis needs to include the whole public sector which comprises of the general government sector and public corporations (refer to Bloch and Fall, 2015). Nevertheless, the fiscal data are usually analysed on the level of general government only. The data about the whole public sector are scarce and historical values are often unavailable (see Eurostat, 2020a). Hence, I use data from the general government sector primarily. According to Eurostat (2013, p. 44), the general government sector consists of: "*institutional units which are non-market producers whose output is intended for individual and collective consumption, and are financed by compulsory payments made by units belonging to other sectors, and institutional units principally engaged in the redistribution of national income and wealth*". It incorporates four subsectors: central government, state government, local government, and social security funds. However, it is dependent on the individual country.[11] Furthermore, general government debt is usually different from "*state*" debt. The latter is then a narrower definition related to the state budget (Vebrová & Rybáček, 2014).

According to Eurostat (2016), the relevant general government debt within the Excessive Deficit Procedure (EDP)[12] is defined as the total consolidated gross debt at face value. It consists of the following government liabilities: currency and deposits, debt securities, and loans (refer to Eurostat, 2013). Note that the values are reported and should be analysed on a consolidated basis when the "*internal*" portion of debt held by a unit within the government sector is not included.[13] In addition, the debt measures exclude certain financial instruments, such as financial derivatives or contingent liabilities. The last item may be important, although it only consists of potential liabilities.[14] The contingent liabilities are obligations of the government, whose timing and magnitude depend on the occurrence of some uncertain future events outside the government's control (Ceborati, 2008). For example, they may include government guarantees to public-private partnerships, depositors, or other arrangements.

The distinction between gross and net debt is vital for the overall economic interpretation of any relevant fiscal analysis. From the theoretical perspective, it would be suitable to

[11] For example, many countries do not have state governments.

[12] It is one of the key supranational fiscal regulations in the EU.

[13] Certain items are not available on a consolidated basis. In these cases, it is mentioned in the text.

[14] The available data for contingent liabilities are shown in the sixth chapter (Section 6.1).

analyse net debt stock (net position) which is defined as the difference between relevant assets and liabilities. However, this broader definition is subject to further uncertainties. It is often difficult to evaluate the price of government assets. In addition, some portion of the assets is usually illiquid — it cannot be sold promptly. Therefore, gross debt measures are usually examined, and this work follows the practice. According to the International Monetary Fund (IMF, 2014), the gross debt includes all liabilities held in debt instruments. The instruments include all financial claims that require future payments of interest and / or principal by the debtor to the creditor (ibid.).

1.3 Interaction Between Fiscal and Monetary Policy

The standard notion is that monetary authority (central bank) aims to control inflation[15] while fiscal authority (government) controls government debt through budget balances. However, when a country shows high government debt levels, then the central bank assumes a somewhat more dominant position to confront the fiscal problem (Afonso, Alves, & Balhote, 2019). Hence, there is evidence of a substitutional relationship between the two macroeconomic policies. On the one hand, the effects were pronounced by the quantitative easing regime. The policy implies redistributive effects as the ECB buys both private and public financial instruments in large amounts. On the other hand, the effects are more complicated in the Euro Area due to the common currency. It creates a variety of interactions across countries due to country-specific fiscal policies (ibid.). In an ideal scenario, both macroeconomic policies should create "*optimal policy mix*", but it is often not the case in practice. Regarding the examined topic, the text examines the case when monetary policy influences fiscal policy. Arguably, this channel is more robust while the inverse causality is not relevant for the topic of this work.

In order to understand which relevant fiscal variables are influenced by monetary policy, I analyse the debt dynamics equations which are described in the sixth chapter (Section 6.3.1). In general, monetary policy influences four main variables which are relevant

[15] A more accurate term is "*rate of price level change*". Nevertheless, the term "*inflation rate*" or "*inflation*" is considered as a standard in economic literature.

for fiscal policy, these are economic growth, interest rates, inflation, and exchange rates. The standard economic theory suggests that expansive monetary policy lowers nominal as well as real interest rates,[16] — contributing to a more favourable fiscal position.[17] Lower interest rates then usually boost economic growth which may stimulate inflation[18]. Furthermore, lower interest rates usually lead to exchange rate depreciation through uncovered interest parity mechanism.[19] The depreciation may stimulate economic growth through higher net exports provided that the Marshall-Lerner condition is satisfied.[20] Nevertheless, the effect of depreciation may be ambiguous because it raises the value of debt denominated in foreign currencies.[21] The exchange rate channel is functioning only partially in the Euro Area, meaning that the changes in the exchange rate are not fully country-specific and can be seen as a "*weighted average*". Arguably, the channel also contributes to the relaxed fiscal conditions in the Euro Area due to the expansive monetary policy of the ECB.

In short, the current expansive monetary policy of the ECB contributes to relaxed fiscal conditions and improved budget balances.[22] It helps to make the current fiscal situations of some countries sustainable. However, it paradoxically brings adverse effects in the medium and long term. In general, the common monetary policy of the ECB exacerbates the economic and structural inefficiencies in the Euro Area. The precise mechanism is described in the second chapter (Section 2.3). Furthermore, the current monetary policy of the ECB also monetises the government debts — lowering them directly. In my opinion, the approach is also associated with prohibitively high adverse effects in the

[16] It may not apply for a long-term interest rate which could be higher due to inflation expectations. However, I neglect the possibility due to the current low-inflationary environment in the Euro Area.

[17] However, note that these are rather short-term effects. Monetary policy cannot solve structural problems in the economy.

[18] As it was mentioned, the inflation channel is neglected.

[19] Exchange rate movements compensate for the interest rate differences. In this case, investors are shifting funds out of domestic assets to foreign assets because those offer a higher return. This approach is widely used in general equilibrium models. Nevertheless, note that this is the traditional balance of payments (flow) approach. In contrast, the monetary approach provides the opposite conclusion. It claims that decreased interest rate would appreciate the domestic currency because it would raise the domestic speculative demand for money, decrease domestic prices, and decrease imports (Jimoh, 2004).

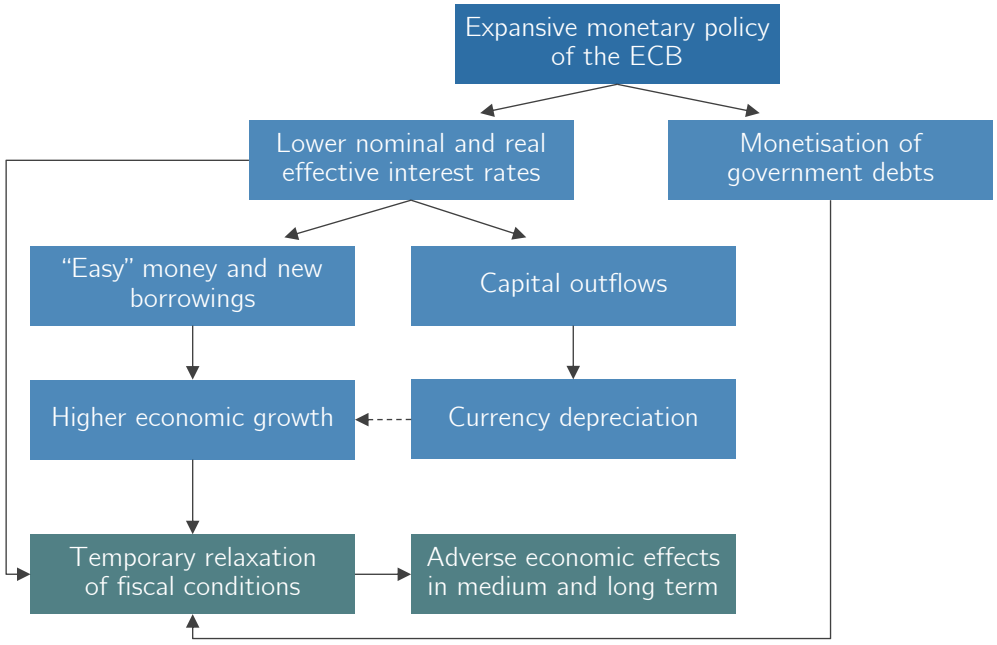
[20] The absolute sum of the country's price elasticities of demand for imports and exports must be higher than one. It is usually satisfied in the long term.

[21] However, this is not the case of the EU4 countries because they hold negligible levels of foreign currency-denominated debts. It is shown in the sixth chapter (Section 6.1).

[22] Fiscal conditions are relaxed through lower real effective interest rates while budget balances are improved through higher revenues and lower expenditures.

medium and long term.[23] The effects of the common monetary policy in the Euro Area to the country-specific fiscal policies is summarised in Figure 1.1.

Figure 1.1: Common monetary policy of the ECB and its effects on the country-specific fiscal policies in the Euro Area



Note: This figure is a simplification. Some transmission channels and ambiguous effects are neglected because they are not relevant. Refer to the text above.

Source: own processing.

1.4 Effects of Excessive Debt Accumulation

Historically, government debt has played a significant role in the development of modern economies. It has been dramatically increased since the Second World War as a result of various factors. The first-level causes may be seen as a result of preferences or information asymmetry. The upward trend is also connected to a given institutional setting. Historically, some portions of debt were created as a result of wars or political conflicts. However, the trend in the last two decades have diverged from the earlier experience, and many countries are showing peacetime deficits. These are shown to be linked to the expansion of social programs, unmatched by tax revenue increases (Mussa & Masson, 1995). Moreover, the current deficits could also be seen as a consequence

[23] The adverse effects are discussed in the last chapter of this work.

of economic crises. This work examines the last possibility, which occurred after the recession in the Euro Area.

The problems associated with high debt levels are well-known. It should be noted that the debt issues promote negative "*vicious*" circles or spirals in the economy.[24] In other words, the effects are self-reinforcing, which makes the effects even more problematic. First, concerns about debt sustainability lead to higher country risk premium, which results in higher debt service and capital outflows[25]. Second, it creates another vulnerability in the economy which may promote another type of crisis, for example, a banking crisis. Third, it is promoting economic instabilities because of the overall consumption and investment volatility[26]. Fourth, higher government spending may crowd-out private investment.[27] Fifth, the negative externalities may spread out in the case of integrated country groups which is the case of the Euro Area. Sixth, high debt service represents an inter-generational burden — making the current generation better-off at the cost of the next generation. Finally, it is associated with a loss of policy flexibility when a government cannot afford to raise spending in recessions due to a prohibitively high debt level. As a result, it leads to lower government revenues, a higher chance of default, and lower economic growth. The effect on economic growth has been a subject of various studies and is examined in the following section.

1.4.1 Sovereign Debt and Economic Growth

The economic theory differentiates between three main approaches to the effects of public indebtedness to economic growth. The Neoclassical theory finds macroeconomic impacts of budget deficit to be negative because it promoted economic instabilities. The Keynesian approach finds the impact positive, however, mostly in the cases of low demand. Finally, the Neo-Ricardianism states that there is no impact due to individual rationality (Strecha, 2015). The evidence and beliefs about the Ricardian equivalence are

[24] Refer to the following chapter (Section 2.1).

[25] These are especially problematic for developing countries.

[26] A high debt burden may provide a strong disincentive to the overall investment or consumption.

[27] It is necessary to distinguish between the basic IS-LM model conclusion and other explanations. The basic IS-LM model associates the crowding-out effect with an increase in the overall interest rate in the economy. In reality, the interest rates are significantly manipulated by the central bank. However, the crowding-out effect may also be thought of as a depletion of resources that could have been invested by the private sector. Furthermore, government investment may eliminate some business opportunities.

mixed. Despite its brilliance, the concept does not have a strong theoretical background, especially when considering new insights of behavioural economics made in recent decades. David Ricardo himself did not believe that the theorem holds. In contrast, he supported debt-illusion explanation (Brennan, 2012). Stanley (1998) concludes in his meta-study that there is no evidence of the equivalence. Therefore, the debate is whether there exist some exceptional circumstances, as suggested by the Keynesian approach.

Authors who are in favour of indebtedness usually mention its long-term growth effects when making appropriate investments, and the fact that in times of crises, depressed economies may need a "*push*". Unfortunately, there is evidence that due to the political process, profitable investments are rarely made, the resources are usually wasted on political campaigns. The second reason is not valid either because of its unsustainability. By postponing a recession, the adverse long-term effects are becoming only worse. The Euro Area and its design is a clear example of unsoundness of the attitude. Hishow (2011) explains the rationality of policymakers' fear from fiscal discipline as they are likely to be punished by voters who lost their jobs in the wake of budget reforms. The fact was strengthened by the design of the Euro Area when the socialisation of risk and losses is possible. Nevertheless, I argue that there is no need to get rid of the debt entirely because of the costs being prohibitive.[28] As it was mentioned earlier, comprehensive studies which are listed below found the relevant threshold of debt to GDP ratio to be between 85% to 100%. It would probably be sufficient for the EU4 countries to comply with the Maastricht criterion of 60% for two reasons. First, it provides a sufficient buffer when an economy is having problems. Second, these countries formally pledged to follow the rule.

Gál and Babos (2014) summarise the results of nine comprehensive empirical studies from 2010–2013 concerning the impacts of high debt. They recommend new EU member states to avoid high debt levels due to its negative influence on GDP growth and problems connected with deleveraging. All the mentioned papers present adverse growth effects of high debt to GDP ratio (usually between 85% and 100%), with only one exception, the study of Herndon, Ash, and Pollin (2013). The authors criticise the well-known work of Reinhart and Rogoff (2010), arguing that the negative effect is not present in every case

[28] There is a difference between a "*limited-living*" individual and arguably "*infinitely-living*" government. However, many of the implications remain similar except for certain thresholds.

of high debt. Égert (2015) joins the criticism and mentions lapses in the original study of Rogoff and Reinhart; however, his results also suggest the negative impact of high debt which is kicking in at already moderate public debt levels in some cases. A newer study of Woo and Kumar (2015) confirms the hypothesis as well. The authors claim that there is a slowdown in labour productivity growth mainly due to reduced investment and slower growth of capital per worker. In addition, a state of high debt may not only increase uncertainty in an economy but also raise its vulnerability to crises, leading to higher macroeconomic volatility (ibid.). It is possible that it does not matter whether these empirical studies really uncovered the real relationship. Even if there is no definite statistical proof, history indicates that episodes of high debt growth in the EU were not successful in the mid-term or the long-term because the resources were usually spent inefficiently.

According to the economic theory, and the empirical studies, adverse effects of high debt on GDP growth are indisputable. Nevertheless, the effects are probably different in time and space; they are highly volatile and country-specific[29]. It is also necessary to address the concerns that excessive indebtedness in the Euro Area[30] may be lowered by raising inflation and GDP growth. Output growth usually plays a significant role in determining fiscal balances in both downturn and recovery episodes (Icaza, 2018). Moreover, it increases the country's likelihood of a significant debt reduction (Nickel, Rother, & Zimmermann, 2010). Arguably, under the current institutional design of the Euro Area, this is not a possibility. The Euro Area countries are among the slowest growing regions in the world (see IMF, 2020b).

1.5 Sovereign Debt Sustainability Assessment

An important aspect of fiscal policy-making is the long-term view or sustainability evaluation. Unsustainable level of government debt exhibits many adverse effects, including lower GDP growth or lower "*manoeuvring*" space for discretionary fiscal policy, and may ultimately lead to government default. Two essential concepts can be

[29] Advanced economies are able to defy the adverse effects of the burden better than developing economies because of the associated risk premiums and the investment environment.

[30] And especially in the EU4 countries.

distinguished, and these are liquidity and solvency. The former is rather short-term oriented, while the latter is used in a long-term perspective. Liquidity is defined as the ability to honour liabilities payable at the current point in time or the ability to roll over the debt. It is often measured by gross financing needs indicator, which consists of debt service (interest and principal payments) and budget balance at a given time. Solvency means for the country to be able to repay its debt at some point in time fully. It should be noted that the two concepts are linked together, even though they focus on different time frames. Insolvency necessarily implies illiquidity at some point in time. However, illiquidity does not necessarily imply insolvency — the opposite is not true. Hence, there is an argument to save an entity which is temporary illiquid while still solvent. This was the case of some companies during the financial crisis of 2008–2009, and it can also apply to government finance. The notion of sovereign debt sustainability is also connected with the analyses of various risks including market perception of the sovereign, debt maturity structure, currency composition of the debt, availability of liquid assets, and other factors.

According to Sturzenegger and Zettelmeyer (2007, p. 308): "*debt sustainability is one of the most used and abused concepts in the recent discussions on preventing and resolving sovereign debt crises*". The reason is that sustainability of sovereign debt can be defined from various perspectives as it involves a large number of alternative methodologies. Wyplosz (2007, p. 3) states that the sustainability analysis asks the following question: "*When is a country's debt becoming so big that it will not be fully serviced?*". This is possibly the most general definition of debt sustainability; however, it is necessary to be more specific. Debt sustainability is based on the notion of solvency. Economists often derive formal intertemporal solvency conditions which can be adjusted so that it implies that the debt cannot exceed the net present value of future primary surpluses. The problematics have been described by many authors. Most notably, the IMF has published many manuals and guidelines – see IMF (2013) and Escolano (2010). I also draw from Piscetek (2019) who summarised the problematics within the New Zealand Treasury. For simplicity, the following derivations assume a closed economy. Moreover, the framework does not distinguish between various interest rates or consider debt denominated in foreign currencies.

To obtain the formal solvency condition, the derivation needs to start with the flow budget constraint. Then, I derive the intertemporal budget constraint and impose the Transversality condition. The flow budget constraint is expressed in Equation 1.1:

$$G_{t+1} + i_{t+1}D_t - R_{t+1} + OT_{t+1} = D_{t+1} - D_t \ , \tag{1.1}$$

where:

- D is the stock of government debt,
- R is government revenue,
- G is non-interest government expenditure,
- i is the interest rate on government debt stock,
- OT are other flows which are not included in the government revenues or expenditures but affect the overall debt level.[31]

Furthermore, under the assumption of zero other flows, the primary budget balance (PB) is defined as overall budget balance adjusted for the interest payments which are not included:[32]

$$PB_{t+1} = R_{t+1} - G_{t+1} \ . \tag{1.2}$$

In the subsequent step, the two equations are put together and solved for D_{t+1}. The rearrangement of the budget constraint provides a formula of debt dynamics (or debt law of motion):

$$D_{t+1} = (1 + i_{t+1})\, D_t - PB_{t+1} \ . \tag{1.3}$$

Furthermore, I derive the intertemporal budget constraint from the flow budget constraint. It is reasonable to derive the intertemporal budget constraint for the subsequent periods — $t = 2$, $t = 3$, and proceed to infinity.[33] The intertemporal budget constraint for N periods is as follows:

$$D_N = (1 + i)^N D_0 - \sum_{t=1}^{N} (1 + i)^{N-t} PB_t \ . \tag{1.4}$$

[31] These flows may represent bank recapitalisation expenditures, privatisation revenues, and other factors.

[32] Therefore, the primary budget balance is higher when the interest expenditures are positive because the government expenditure is lower by the amount.

[33] It is based on the assumption of a constant interest rate over time.

The previous equation states that the debt in final period N is the sum of the future value of the initial debt level and all the primary balances up to the period N (with t being the first period). However, this is still not a sufficient solvency condition because it does not impose any real constraint on the government. Higher deficits will simply translate into higher debt. Therefore, I need to impose the Transversality (No-Ponzi[34] Scheme) condition. The condition prohibits the government from issuing more debt without ever repaying principal and interest on the previously accumulated stocks:

$$\lim_{N\to\infty}\left(\frac{1}{1+\mathrm{i}}\right)^{N} D_N = 0 \quad . \tag{1.5}$$

Note that it does not rule out the existence of the debt in the final period and does not even rule out growing debt. Nonetheless, the debt stock has to grow at a slower rate than the nominal interest rate paid on the government debt.[35] In the final step, I divide both sides of Equation 1.4 by $(1+i)^N$, solve for D_0 and impose the Transversality condition in Equation 1.5. The formal solvency condition is as follows:

$$D_0 \leq \sum_{t=1}^{\infty}\left(\frac{1}{1+i}\right)^{t} PB_t \quad . \tag{1.6}$$

Equation 1.6 implies that the debt has to be covered by the present (discounted) value of the future primary surpluses. It imposes a constraint on the government. If the initial debt stock is positive, then the government needs to run primary surpluses in the future. In practice, the assumption of an infinite time horizon may be overly abstract. Hence, Equation 1.6 may also be calculated for a finite time horizon, for instance, 50 years. Nevertheless, the formal definition of solvency is characterised by a high level of uncertainty regarding the future values of interest payments and primary balances. Hence, alternative ways of debt sustainability analysis have been proposed.

The formal solvency condition does not state how primary balances should be improved when it is needed. Arguably, there are appropriate and inappropriate ways of how to do

[34] Charles Ponzi (1882–1949) was an Italian swindler and con artist. He became known in the early 1920s in North America for his money-making scheme. He was paying earlier investors using the investments of later investors, making it an unsustainable fraud.

[35] In a Ponzi Scheme, new debt is issued to cover interest payments which make the debt grow at the same speed as the rate of interest. Therefore, the Transversality condition rules out this type of financing.

it (Wyplosz, 2007). For instance, a government default would reduce current liabilities, but it cannot be considered as an appropriate solution due to adverse economic effects. The same principle applies to the concept of hyperinflation. Furthermore, it is necessary to take into account the potential political feasibility of sustainability adjustments and the realism of macroeconomic assumptions regarding sustainability evaluation. As a result, debt sustainability analysis necessarily involves probabilistic judgments, including the possible occurrence of economic shocks. In this context, the sustainability concept is significantly more demanding than the concept of solvency (ibid.).

Therefore, the IMF uses a different definition which incorporates all the requirements. The institution defines that "*a sovereign debt can be regarded as sustainable when the primary balance needed to at least stabilize debt under both the baseline and realistic shock scenarios is economically and politically feasible,*[36] *such that the level of debt is consistent with an acceptably low rollover risk and with preserving potential growth at a satisfactory level*[37]" (IMF, 2013, p. 4). In other words, the assessment focuses on debt level and its trajectory, feasibility of the fiscal adjustment, debt profile, and rollover risks. As it was mentioned, the assessment needs to examine the country's capacity to repay the debt. Hence, I also examine the relevant GDP ratios. An alternative approach claims that the debt is unsustainable if projected debt ratios either increase or remain high (Piscetek, 2019). However, this definition may neglect important details.

Finally, it should be mentioned that debt sustainability forecasts are subject to significant uncertainty. Hence, many of the approaches to sustainability evaluation are based on a rather static view (partial equilibrium principles). The relationships between the examined variables are not considered. However, note the potential endogeneity because fiscal policy affects the economic environment and vice versa.

Taking all the facts into account, this work presents a multicriteria analysis based on various approaches. These include theoretical mechanisms, descriptive statistics of relevant fiscal variables, traditional analysis of fiscal efforts and positions, debt projections based on the framework of debt dynamics, and the feasibility of various approaches to sovereign debt reduction of the EU4 countries.

[36] It means that unrealistically large adjustments from both perspectives are not being considered.

[37] These other requirements imply that the government should not default.

2

Sovereign Debt Crisis and Flaws of the Euro Area

> *Political leaders in Europe seem to be prepared to ignore adverse consequences because they see the Euro Area as a way of furthering the political agenda of a federalist European political union.*
>
> **— Martin Feldstein**
> (US economist, 1939–2019)

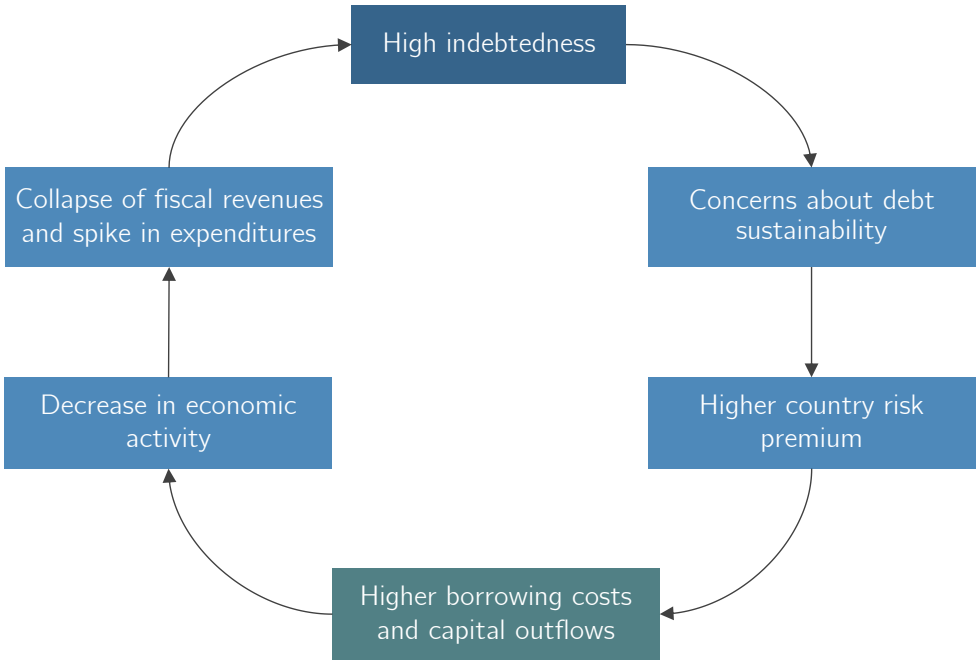
This chapter focuses on a brief description of the financial crisis of 2008–2009 and the relevant implications for the EU4 countries. The second theme is an identification of structural flaws of the Euro Area, which lead to the unfavourable situation of the EU4 countries. The aim of this section is not an elaborate analysis of the financial crisis. However, it is essential to briefly summarise and discuss the event because of its significance regarding the topic of this work. Furthermore, note that the level of government debt is both the cause and the consequence of the problems in the Euro Area.

The structure of the chapter is designed to provide a clear theoretical explanation of the occurring and the related implications. First, it briefly mentions the financial crisis and underlying mechanisms. Second, it describes the effects of high government debts. Third, it focuses on the Optimum Currency Area (OCA) Theory which provides a positive theoretical framework for identifying structural flaws of the Euro Area. Finally, it analyses the most critical factors which lead to the fiscal deterioration of the countries.

2.1 Financial Crisis of 2008–2009 and European Debt Crisis

A sovereign debt crisis can be defined as government default, involuntary debt restructuring, or belief that this is about to occur (see Reinhart and Rogoff, 2013). It is often combined with a banking crisis (ibid.). Furthermore, it is appropriate to also distinguish between internal and external debt crisis. The latter case can be more strongly accompanied by "*sudden stops*" following capital inflows episode. However, the distinction is more problematic in the Euro Area due to the sharing of risks. The mechanism of a sovereign debt crisis is illustrated in Figure 2.1.

Figure 2.1: Vicious debt circle mechanism



Source: own processing.

Two phases of the crisis should be distinguished. The roots of the financial crisis have the beginning in the USA, which can be considered as the first phase. In 2006, the US real estate house prices bubble burst, and soon after that, the US banking sector collapsed. One of the milestones was the failure of Lehman Brothers on 15 September 2008 which triggered the worst financial crisis since 1929. In my opinion, the US crisis was a result of multiple causes. However, the primary reasons were arguably sub-optimal

economic policies which promoted economic instabilities. These included prohibitively expansionary fiscal and monetary policies combined with inappropriate regulations. Two regulatory measures were crucial. It was the Housing for Everyone initiative (Housing and Community Development Act) and the significant deregulation in the financial sector (Gramm–Leach–Bliley Act). Both of the legislative packages were promoted in the era of the 42nd US president Bill Clinton in the 1990s.

The second phase was the transmission of the financial crisis to Europe through banking sector linkages. The crisis uncovered deep structural flaws in the Euro Area as the most fragile Southern European countries were hit the hardest. Moreover, it showed that governments bonds cannot be considered as strictly safe assets. The causes of the sovereign debt crisis in the Euro Area are connected to its institutional flaws and the inability to fulfil the OCA criteria by many countries[1]. It is discussed in detail in a separate section. In total, eight EU countries had received financial help (explicit bail-out[2]) through various rescue mechanisms. Italy was the only EU4 country which did not receive any help. Spain received 41 billion euros between 2012–2014, Portugal 78 billion euros between 2011–2014, and Greece approximately 257 billion euros between 2010–2018 (see European Commission, 2020d). It should be noted that that Article 125 of the Lisbon Treaty contained a "*no-bail-out clause*", the regulation was violated.

In my opinion, the crisis did not end because the structural problems and the accumulated debts of the EU4 countries were not eliminated. The expansionary policy of the ECB helped mitigate the worst short- and mid-term effects, but it was not able (by definition) to solve the issues. Two main approaches used to deal with the situation can be identified. The first approach is considered the current political mainstream and is based on federalist ideology. The approach arguably does not offer any sound economic solutions, it is focusing on "*repairing*" the existing structural issues but it does not deal with their causes. It is connected to various propositions including the promotion of fiscal discipline, political unification, the establishment of a fiscal union,[3] and other factors. The second approach is based on the idea of intergovernmentalism based on

[1] Most prominently, these are the EU4 countries.

[2] Simply put, the term "*bail-out*" refers to external help.

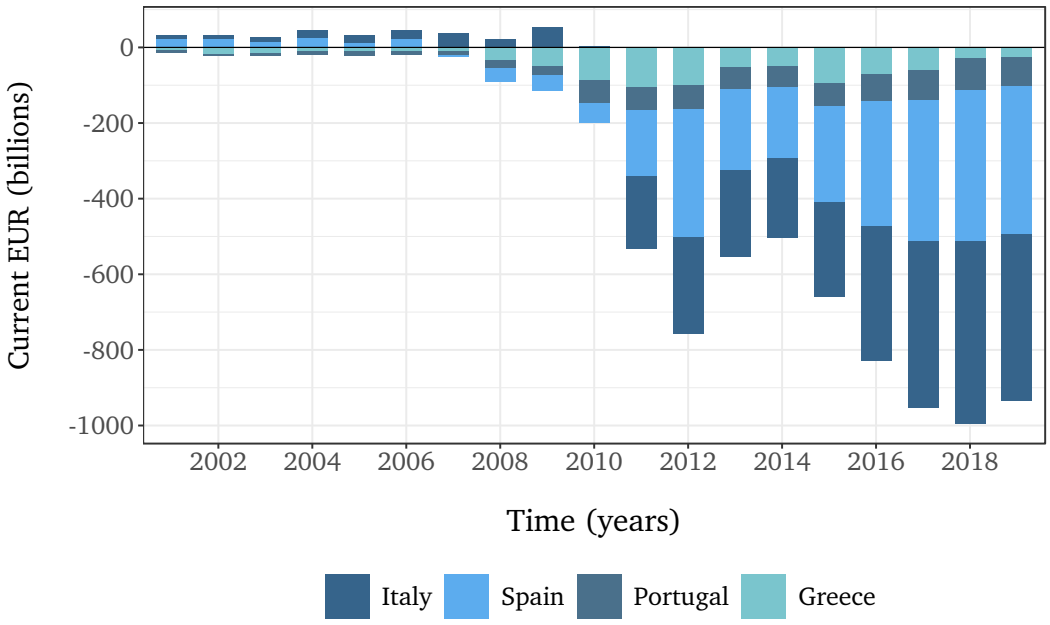
[3] A theoretical reasoning and evidence that a fiscal union cannot solve the structural issues is provided in Chapter 4.

a sound economic theory connected to the OCA theory[4]. The approach focuses on the causes of the structural inefficiencies and identifies significant heterogeneity among the EU countries. As a result, the proposed solutions are less ambitious and focus on, for example, a restructuring of the Euro Area regarding its country composition.

2.1.1 Implicit Bail-Out in the Euro Area

Furthermore, economists are also aware of a possible implicit bail-out mechanism. The issue was initially identified and discussed by German economist, and a President of the Ifo Institute for Economic Research at that time, Hans-Werner Sinn (2012). Figure 2.2 shows the TARGET2[5] balances for the EU4 countries as of December of each year.

Figure 2.2: TARGET2 (im)balances — EU4, 2001–2019



Note: The data show current prices because it is not clear which deflator to use. Moreover, the inclusion of current prices does not bias the general trends and implications.

Source: Institute of Empirical Economic Research (2020), own processing.

The data show that (approximately) since the financial crisis of 2008–2009, all the countries are net lenders, which is represented by negative values. The EU4 countries accounted for more than 91% of the total lender position value as of December 2019.

[4] The OCA theory is explained in a separate section.

[5] TARGET2 is a real-time gross settlement system owned and operated by the Eurosystem.

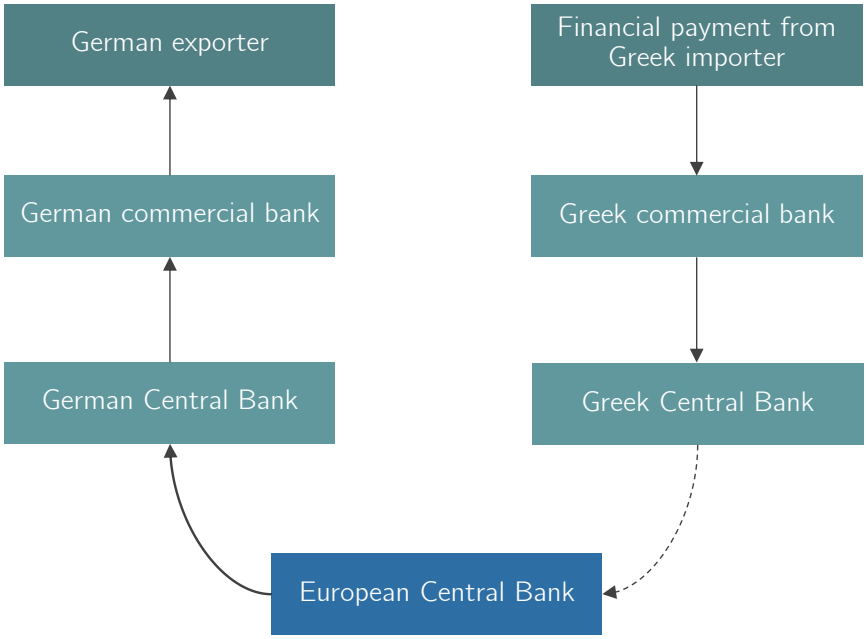
The values for the EU4 countries show double-digit percentages of the respective GDP ratios. The net borrowers consisted primary of Germany, Luxembourg, Netherlands, Finland, France, and Ireland[6]. These six countries accounted for more than 97% of the total borrower position value as of December 2019. At the same time, Germany alone accounted for more than 70% of the total value.

There are possibly multiple causes of the occurring, including comparatively higher risk premiums of the countries, significant structural inefficiencies, lack of profitable investment opportunities, and other factors. The movements are considered to be a demonstration of a capital flight from the Southern countries to the Northern or core countries of the EU (see Cheung, Steinkamp, and Westermann, 2020). The ECB (2016) attributed the movements to the redistribution effects of its quantitative easing programmes. However, Minenna, Dosi, and Roventini (2018) showed that such an explanation is not consistent for Italy and Spain. The authors claim that the deterioration in the countries' balances is mainly due to a shift of private-sector financial wealth from government securities to foreign assets — the capital flight. The implicit bail-out mechanism is illustrated in Figure 2.3.

Note the dashed line coming from the Greek Central Bank to the ECB. In some cases, the Greek Central Bank does not have enough monetary reserves; hence the ECB plays a guarantor role. The ECB creates monetary reserves on its own and provides them to the German Central Bank, and they are credited to the exporter's commercial bank account. Therefore, the ECB has outstanding claims on the future Greek reserves. However, the implicit bail-out will occur if these claims are not paid. The emission of new reserves will ultimately be "*paid*" by the Euro Area citizens in the form of "*unfair*" and inefficient redistribution effects and higher inflation. Furthermore, the interest rate policy of the ECB does not take into account the intrinsic country risks of the EU4; it is lending them very "*cheaply*".

[6] The case of Ireland is compelling because the country was also hit hard by the financial crisis. Moreover, it was considered to be a part of the Southern group countries in the past. Nevertheless, the country successfully recovered and is in the position of net borrower since 2017.

Figure 2.3: Chain of transactions in the TARGET2 system — Example of Greek importer and German exporter



Source: own processing.

2.2 Optimum Currency Area Theory

To be able to perform a positive economic analysis of the Euro Area, a theoretical framework, which fits the purpose, needs to be employed. In the 1960s, Mundell (1961) pioneered a concept of the OCA Theory. Later, the theory was further developed by other economists. The most notable contributions include the works of McKinnon (1963) and Kenen (1969).

The OCA theory can be used to evaluate whether a particular monetary union (common currency area) meets the requirements for its efficient functioning. The framework cannot provide a definitive answer because some of the viable assumptions are of a qualitative and normative nature — for instance, the political issues. Nevertheless, the OCA Theory is able to analyse and evaluate the necessary requirements. Table 2.1 summarises the essential criteria.[7]

[7] The list of all the possible criteria would be significantly longer. For instance, refer to Broz (2005, p. 72). However, the presented list focuses only on the essentials for a transparent and coherent analysis.

Table 2.1: Optimum Currency Area theory — Main criteria

Mechanisms to deal with asymmetric shocks	
1	Labour and capital flexibility (or wage and price flexibility)
2	Fiscal transfers
Characteristics that help absorb asymmetric shocks	
3	Production diversification
4	Economic openness
5	Business cycle synchronisation
6	Homogeneous preferences

Source: Broz (2005) and Kunroo (2015), own adjustments and processing.

The central argument is that the member countries within a monetary union should be as homogeneous as possible. The problem is when the group is relatively heterogeneous, which is the case of the Euro Area. The mechanisms to deal with asymmetric shocks are not properly working. Moreover, the Euro Area also lacks business cycle synchronisation[8] and homogeneous preferences among the countries (for example, see Monteverdi, 2016). Furthermore, when a monetary union has a faulty design, it produces asymmetric shocks by itself, making the system unsustainable.[9] Nobel laureate Milton Friedman summarised the situation in 1997: "*By contrast, Europe's common market exemplifies a situation that is unfavourable to a common currency. It is composed of separate nations, whose residents speak different languages, have different customs, and have far greater loyalty and attachment to their own country than to the common market or to the idea of 'Europe'. Despite being a free trade area, goods move less freely than in the United States, and so does capital.*" (Friedman, 1997, [p. 2).

Finally, it should be mentioned that Frankel and Rose (1998) proposed the idea of OCA endogeneity. It states that fulfilling the criteria may not be necessary because membership in the Euro Area may adjust the country's characteristic to fit the criteria

[8] The measurement of this criterion is problematic. A simple correlation is not sufficient. In my opinion, the analysis needs to be conducted in a time-frequency domain. For example, by using a wavelet framework.

[9] This issue is discussed in the next chapter, using an example of fiscal centralisation.

over time. In my opinion, the argument is correct for international trade, but it is not sufficient. According to the data, the Euro Area likely did not promote homogeneity over the years (Eurostat, 2020a).[10] In fact, the financial crisis of 2008–2009 has furthered the discrepancies among the countries as the EU4 countries were hit the most. The next section provides a detailed overview of the Euro Area's issues.

2.3 Systemic Flaws of the Euro Area

Statistical evidence shows that the dynamics of general government gross debt is significantly different between countries within and outside the Euro Area. According to Coccia (2018), the economic policy within the Euro Area is deteriorating and increasing sovereign debts and fiscal deficits of the member countries. Therefore, the following text focuses on the analysis of the possible factors. The cause of almost all the issues is the heterogeneity of the countries combined with results of normative political ideologies. The EU and the Euro Area consists of countries with different cultures, interest, opinions, and policies. Nevertheless, the establishment of the common currency is not a fundamentally flawed project. The Euro Area is not sustainable under the current policies and the country composition.

2.3.1 Overly Ambitious Integration Ideology

There has been a strong emphasis on a deeper integration within the EU over the years.[11] The idea was put forward by Germany and France, the two of the most powerful countries which are, arguably, trying to control the integration as much as possible and gain benefits. The benefits are not necessarily in a monetary form. The countries are net payers to the EU's common budget; however, they are able to significantly influence many decision-making processes within the EU and the Euro Area. Their abilities have been reinforced by the Lisbon Treaty of 2009, which gave more power to richer and

[10] See the basic macroeconomic variables of the EU19 which are provided by Eurostat (2020a). For a detailed discussion, refer to Mody (2018) or Loužek (2015).

[11] For instance, refer to the statements of French President Emmanuel Macron or German Chancellor Angela Merkel.

larger countries.[12] The central argument of this part is as follows: the more specific policies or regulatory burden a policymaker implements, the more likely it is that the measures will not fit all the countries. It creates both economic and political tensions within the integration process. The political tensions are directly observable as there is a lack of homogeneous preferences among the countries.[13] Furthermore, even if there was a perfect homogeneity of preferences, it is not possible to follow strictly political and normative ideology without some level of economic alignment. Sooner or later, the economic issues, arising from the mismatch between ideology and reality, manifest and create significant instabilities which also shape the political sphere. For instance, this was the case of the financial crisis of 2008–2009.

2.3.2 Country Composition of the Euro Area

Political decisions should always follow the economic fundamentals at least to some extent. The Euro Area, arguably, consists of some countries which should not be its members. For example, it is widely known that Greece falsified some of its statistics to be able to join the Euro Area in 2001.[14] These lapses in the country composition of the Euro Area have manifested during the financial crisis.

The central issue is that the main parameters of the common currency in the Euro Area simply does not fit all the countries.[15] This is the case of the uniform interest rate set by the ECB, and most notably the Euro exchange rate. Economists consider exchange rate to be one of the essential prices in an economy. It acts as a vital balancing mechanism in the economy; it helps align external demand with internal supply and vice versa. Nevertheless, the balancing mechanism cannot properly work when the Euro Area countries share uniform exchange rate[16] and the monetary union has inadequate country composition. It is possible to identify countries for which the uniform exchange rate is

[12] This is apparent when analysing the voting process and voting weights of the countries in the Council of the European Union. The EU representatives used the argument that this is for the sake of the efficiency in the voting processes. The processes are now arguably more efficient but at the expense of the sovereignty of smaller countries.

[13] For instance, refer to the discussions about the common asylum policy of the EU or the current debate about the coronavirus financial packages.

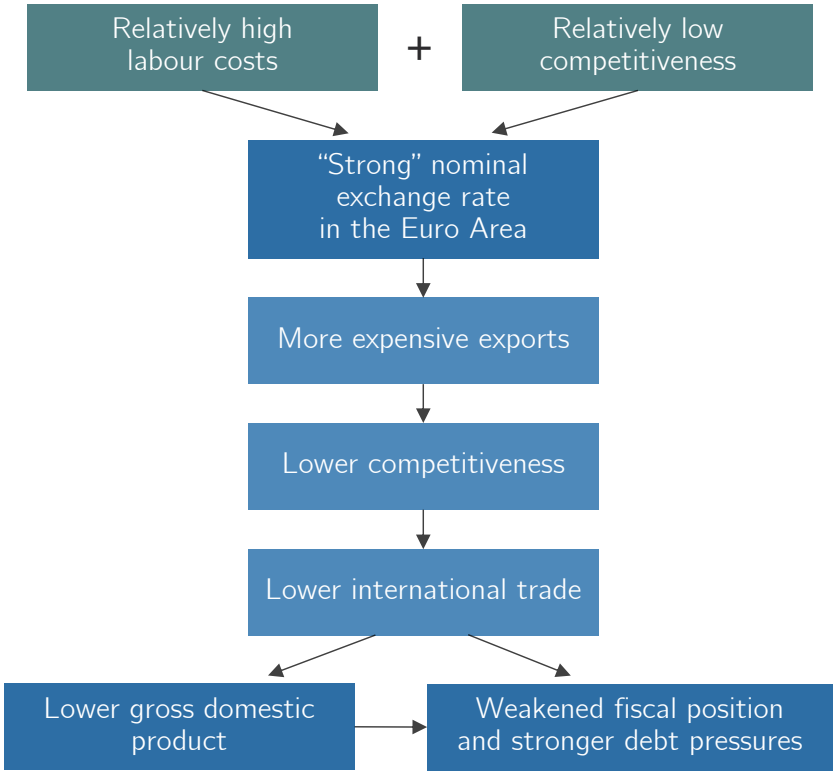
[14] Refer to Berend (2017).

[15] This was also amplified in recent years by implementing various political decisions regarding the socialisation of risks in the EU. The argument is also mentioned by Feldstein (2012).

[16] It can be seen as a "*weighted average*", where the weights are economic performances of the countries.

"*overly strong*". These are, most notably, the EU4 countries which show lower economic performance, and lower overall competitiveness. When an exchange rate shows real appreciation, it usually leads to lower competitiveness of a country because its exports are "*more expensive*".[17] The effects of the common currency on the less competitive countries in the Euro Area are illustrated in Figure 2.4. However, note that the diagram is a simplification. It neglects many channels and dynamic relationships, most notably the role of the inflation rate.

Figure 2.4: Effects of the common currency in less competitive countries



Note: This figure is a simplification. Many transmission channels and ambiguous effects are neglected. Refer to the text below.

Source: own processing.

If the other balancing mechanisms are weak, the disproportionate functioning of the exchange rate mechanism may lead to higher inflation and internal devaluation, which should lower real labour costs and promote competitiveness. However, the devaluation may also lead to lower wages, which decrease aggregate demand, GDP and competitiveness due to sub-optimal allocation of production factors and resources. In addition,

[17] It can be argued that imports are "*cheaper*", but their significance is usually much lower. Export performance is connected to domestic companies which provide employment.

the effects of low interest rates and budget deficits offset the mechanism. For example, Baumgarten and Klodt (2010) and Stiglitz (2016) provide a detailed discussion.

As a result, the EU4 economies are permanently destabilised while functioning less efficiently at the same time. In the case of a significant economic shock, which was the financial crisis of 2008–2009, a vicious (self-reinforcing) circle of a decline in competitiveness occurs. There is never a "*free lunch*" in economic matters, and the same notion applies for macroeconomic transmission channels. Hence, the exchange rate channel is partly blocked as the common currency cannot properly depreciate and reflect the country's position. It leads to lower GDP through the income channel, which may also be accompanied by higher debt pressures, internal devaluations, and capital outflows. Furthermore, economic recovery mechanisms are also working inefficiently. In my opinion, the fact has not been recognised by many economists. The evidence could have been seen during the financial crisis and after the recession. The EU4 countries still struggle to reach a robust and sustainable economic growth. The main lesson is that the economic stability loss from the foregoing exchange rates and national monetary policies is greater than monetary efficiency gains (see Jager and Hafner, 2013).

2.3.3 Dependence of the European Central Bank

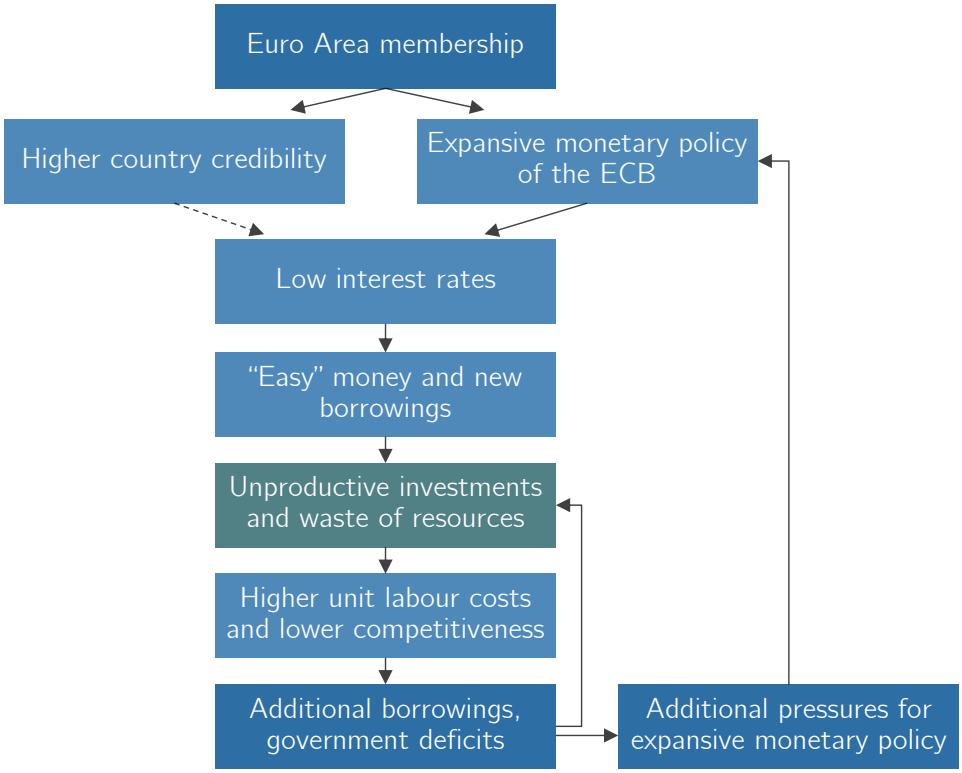
The independence of a central bank is considered as an essential characteristic of the current central banking because of historical evidence of frauds in the form of government debt monetisation, which was linked to high inflation[18]. This text elaborates on the argumentation of Wyplosz (2016) who claims that the situation in the Euro Area is complicated because the ECB is governing currently 19 constituencies that have different views of what a central bank should do and their interests often clash with one another. Various EU policies are a result of political compromises; hence, the EU legislation consists of many exceptions accompanied by country-specific opt-outs. In my opinion, the situation is even more complicated when the system is fundamentally unstable.[19] The policy of the ECB cannot be independent when the system needs constant interventions in order to be functioning. This is a result of a political ideology. Therefore,

[18] High inflation can be seen as a form of an implicit tax burden or as a demonstration of sub-optimal spending which is promoting economic inefficiencies.

[19] The arguments for this claim are presented in this chapter and the following two chapters.

the ECB is dependent on these circumstances by definition. In addition, the monetary policy cannot solve the structural issues. It can only mitigate adverse short-term effects. The policy of the ECB is directly connected to the problems with the composition of the monetary union. The mechanism is illustrated in Figure 2.5.

Figure 2.5: Effects of the common monetary policy of the ECB



Note: The figure does not claim that all of the new borrowings are wasted. It describes only one of the possible economic mechanisms.

Source: own processing.

Inadequately low (non-equilibrium) interest rates imply substantial borrowing motivations under the idea that "*we should borrow while it is cheap*". These borrowings then may lead to investments which are profitable under the current policies and EU regulations. Nevertheless, some of them are, in fact, unproductive.[20] Moreover, it supports a moral hazard which further reinforces the mechanism.

Unproductive investments should lead to higher borrowing costs (higher interest rates). However, the common monetary policy of the ECB does not let such occurring. The reason is, again, political. Higher borrowing costs would lead to major deterioration of

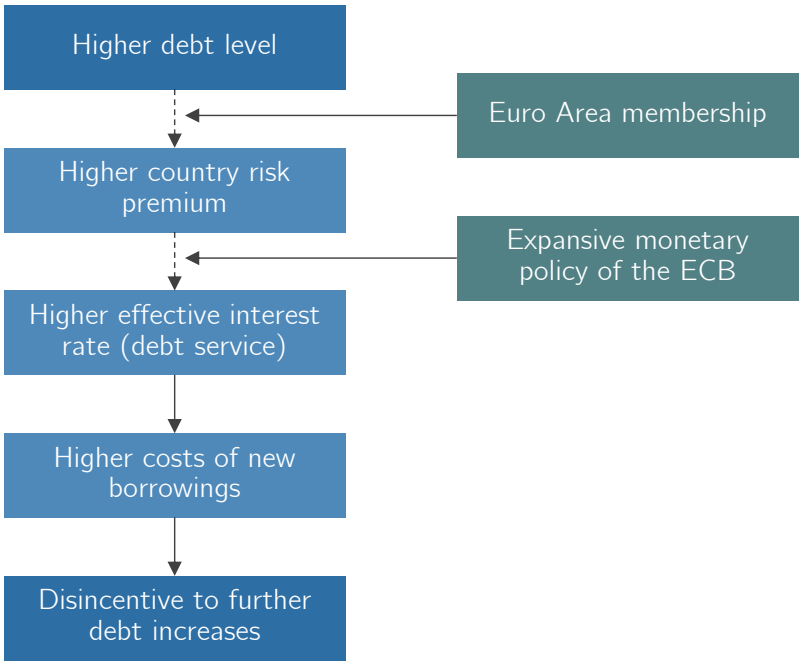
[20] The other possibility is that investors are motivated to make riskier investments (or even speculations) due to low interest rates in the economy. Arguably, the fact also promotes economic instabilities.

the situations of some economies (mainly the EU4 countries). In my opinion, such a result is not politically feasible under the current mainstream ideology of the EU.

2.3.4 Socialisation of Risks and Moral Hazard

A large number of economic bail-outs occurred during the financial crisis of 2008–2009 and after the recession.[21]. This lead to a widespread moral hazard among the countries. It was especially the case of the EU4 countries which were able to significantly boost their spending before the financial crisis as a result of low interest rates.[22] Hence, one of the main problems regarding fiscal discipline in the Euro Area is the risk-sharing combined with expansive monetary policies of the ECB and lack of fiscal discipline[23].

Figure 2.6: Interest rate effects related to a debt level — incomplete pass-through in the Euro Area connected to weakened fiscal discipline



Source: own processing.

In my opinion, relatively high interest rates should not necessarily be considered as a problem. They have a disciplining effect on the behaviour of economic agents, including

[21] Refer to the beginning of this chapter.

[22] However, these were mostly short-term gains. The costs significantly outweigh the benefits in the long run. This "*irrationality*" may be partly attributed to the political process and its cycles.

[23] One of the fiscal "*solutions*" is usually considered the establishment of a fiscal union. The issue is analysed in the next chapter.

the government. If this were the case, the EU4 countries would, arguably, not destabilise their economies through significant deficits. Nevertheless, the Euro Area membership and the expansionary policies of the ECB promote low interest rates and the so-called socialisation of risks. Figure 2.6 below illustrates the issue. The dashed lines denote weakened or even non-existing effects.

Furthermore, the Eurosystem does not distinguish between the riskiness of government securities. The EU4 and non-EU4 debt securities are equally accepted as collateral which fosters the socialisation of risks. Ultimately, the costs of macroeconomic instabilities and deficits in one of the Euro Area countries is undertaken by all users of the euro currency in the form of reduced purchasing power of the monetary unit.

2.3.5 Snowball Effects and Systemic Inertia

As it was presented, the various mechanisms are self-reinforcing and necessarily lead to worsening of the situation. In addition, the more time is wasted, the higher are the adverse effects. Sinn (2014, 2018) compares the situation of the public monetary flowings to drug addiction or the Dutch Disease[24]. Once individuals get used to a certain living standard, it is not politically feasible to deprive them of it. When such living standard is not covered by the country's productivity, it leads to high government deficits and further deterioration of the macroeconomic fundamentals (Sinn, 2018). As a result, the countries gradually lose their national sovereignty and are increasingly dependent on centralised policy-making in the EU.

I believe that this section provided evidence that political integration cannot be successful without the proper alignment of macroeconomic fundamentals of all the member countries. The current mainstream ideology could produce major economic and political crises which could lead to the collapse of the integration process. Alternatively, the policymakers will "*conserve*" the situation and the EU and the Euro Area countries will show significant economic stagnation in the next decades. Nevertheless, the possible stagnation cannot be maintained indefinitely and could ultimately lead to social unrests and other crises.

[24] The "*disease*" occurred in the 1960s when the Netherlands had found a giant natural gas field in their territory. The sales of gas ultimately undermined the competitiveness of other economic sectors due to a wage contagion.

3 Sovereign Debt Channels in the Euro Area

> *I am not worried about the deficit.*
> *It is big enough to take care of itself.*
>
> **— Ronald Reagan**
> (40th US president, 1911–2004)

A proper analysis of possible debt channels in the Euro Area is crucial for three main reasons. First, the previous chapter has demonstrated that the current Euro Area environment is highly unstable. The validity of various analyses depends on the identification of debt channels which are existing within the monetary union. Unfortunately, no study tried to identify the debt channels in a systemic manner, according to my knowledge. Second, austerity policy measures are often heavily criticised due to its poor results (for instance, see Prisecaru, 2013). In the case of high debt accumulation inertia, fiscal regulation and austerity measures are inefficient, the countries are bound to be less competitive, and the welfare of the citizens is lower. Finally, the analysis is of high importance in a low-inflationary (or even deflationary) environment where the debt accumulation effects are not limited.

The findings obtained from this chapter will further contribute to the creation of a solid theoretical background which will underlie the subsequent analyses. The focus on institutional features should help in finding an optimal policy and institutional mix, which would support the efficiency of the fiscal measures. Furthermore, the findings may help answer the question if there is a finite horizon of debt accumulation in the Euro Area. The analysis should also indicate whether the institutional setting is sustainable. Each section of this chapter contains one debt channel and the related discussion.

In my opinion, there is no finite debt accumulation horizon in the Euro Area. Thus, austerity measures are inefficient if they are not combined with structural changes in

the Euro Area. The supranational powers of the EU should be reconsidered, and the structure of the Euro Area should, arguably, be changed. It is evident that the situation cannot be solved politically to make the debt environment efficient and sustainable in the long-term. The debt-accumulation mechanism in the Euro Area is making the situation progressively worse over time. I have identified eight key mechanisms of debt accumulation in the Euro Area, which are elaborated below to support the reasoning. I propose distinguishing between debt mechanisms that are working under the condition of full information, under information asymmetry, or the combination of both factors.

3.1 Institutional Characteristics of the Euro Area

The institutional flaws of the Euro Area were discussed in the previous chapter (Section 2.3). However, the following text focuses on the most important characteristics or flaws regarding debt accumulation. Policymakers and analysts need to recognize that the origin of debt crises is not always strictly fiscal. Fiscal austerity is a necessary but not sufficient condition for the prevention of a debt crisis (Panizza, 2013). Masuch, Moshammer, and Pierluigi (2017) claim that the quality of institutions is an important determinant of long-term growth in European countries. Moreover, the authors mention that sound institutions can mitigate the negative impacts of high indebtedness. The institutional design of the Euro Area plays an important role in deficit tendencies and debt accumulation, significantly influencing the overall debt trend. According to Coccia (2018), statistical evidence shows that the dynamics of gross debt is significantly different between countries within and outside the Euro Area. Moreover, the results suggest that divergence is increasing.

The Euro Area suffers from a significant heterogeneity between the member countries, and the fact has many consequences. In short, one measure cannot fit all, which poses problems for both the functioning of the Euro Area and policy-making decisions. For instance, the ECB is not an independent entity because its national constituencies have different interest and do not share a common understanding of central banking (Wyplosz, 2016). Moreover, the fiscal regulations in the Euro Area are in direct conflict with the current situation and practices. On the one hand, the ECB‘s monetary policy is expansive, and the EU pursues policies of unemployment reduction and GDP growth.

On the other hand, the EU's constitutional balanced-budget amendment, the Stability and Growth Pact (and the so-called Fiscal Compact) aim for countries to keep their budget deficits and overall indebtedness in the appropriate range. The approach seems schizophrenic at first sight, but it is, again, a result of compromises within a highly heterogeneous entity.[1]

The Euro Area does not form an optimum currency area.[2] The countries' economies are not resilient against asymmetric shocks, which was revealed during the financial crisis of 2008–2009 and led to the sovereign debt crisis in the Euro Area. Another direct consequence of this mechanism is that the system requires constant interventions,[3] making it unsustainable in this regard. Moreover, the recovery mechanisms of many economies are significantly weakened. Notably, this is the case of the EU4 countries where the common currency is not suitable.[4] The fact further escalates the institutional and political problems.

Another critical institutional characteristic of the Euro Area is the socialisation of risks.[5] The same notion applies to rescue mechanisms. Without costs being fully internalised, there will always be motivations for some countries not to run sustainable fiscal policies and adhere to debt accumulation. The issue is the so-called Common Pool Problem, where agents do not fully internalise the tax burden of spending decisions (Alesina & Passalacqua, 2016). Some researchers, for example, Claeys (2017), propose that Europe should ultimately pursue the US model of federalism. However, even if this was done, the result would be unsustainable as some parts of Europe would permanently finance others. It is a demonstration of the fact that political unification cannot be forced without economic and social ties between the regions. All in all, the institutional design and the composition of the current Euro Area are forming the possibly strongest channel of debt accumulation.

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[1] Another direct consequence of the fact is that the fiscal rules are, historically, not taken very seriously.

[2] The well-known issue is also explained, for example, by Jager and Hafner (2013).

[3] The creation of offset mechanisms, such as forming a fiscal union in the Euro Area, would not solve the core of the problem. Direct interventions would still be necessary. Nevertheless, the option is not politically achievable.

[4] The real exchange rate is "*too strong*" for the countries, rendering them less competitive due to their comparatively weaker economic fundamentals, for example, relatively high unit labour costs compared to the respective profits or value-added. Nevertheless, some countries (for example, Germany or the Netherlands) benefit from the common currency per se due to their comparatively higher competitiveness and economic level.

[5] This factor would not be a problem if the Euro Area consisted of a relatively homogeneous group of countries.

3.2 Nature of Democracy and Political Cycles

According to Posner (2015), some researchers claim that democracy is bound to debt hoarding. When government policies have a significant distributional impact, various interest groups attempt to influence the outcome in line with their aims. Smaller and coordinated interest groups are often more powerful than the majority. More specifically, there is a case when a stabilisation may have significant impacts as well, especially in the Euro Area. Various groups may try to shift the burden of stabilisation onto other groups; the process is called the "*War of Attrition*". As a result, the groups may try to wait the others out, prolonging the period without stabilisation (Alesina & Drazen, 1991). Arguably, these groups may consist of the financial sector and large companies who face prospects of fallen demand. The theory cannot explain how deficit or debt reduction arises; however, it describes how the solution is postponed. A possibly balancing democratic mechanism is represented by influential leaders who can push uncomfortable policies (Posner, 2015). Nevertheless, most of the current Euro Area's leaders are not able to make such a change. The characteristics of democracy and the competition between interest groups in the Euro Area may provide another significant channel of debt accumulation.

Political cycles may also influence the debt situation. Debt may be used as a strategic variable. For instance, if the current government is not sure of its reappointment, it may want to choose to run budget deficits in order to influence the fiscal choices of future governments (Alesina & Tabellini, 1990). In addition, the debt is being snowballed as the next government may want to use the expenses to make the economy perform the same or even better than the previous government. Finally, the so-called political budget cycles consider the role of government deficits (and possible debts) before elections as a tool for the representatives to be re-elected. Yet, this proposition may explain only a relatively small departure from optimal policy. It cannot explain the long-lasting trend of debt accumulation (Alesina & Passalacqua, 2016).

3.3 Information Asymmetries

Many economic decisions would not be made with complete information; the fact also applies to the emergence of high government debts. The transmission mechanisms in the political market are arguably slower and less elastic. However, the outcomes are always demonstrated by the elections. It will always be easier trying to maintain the current status quo by claiming that we are living in prosperous times and that a significant change could be harmful. This fallacy, directly connected to the effect of fiscal illusion, represents the *argumentum ad antiquitatem* (appeal to tradition). It completely ignores how a situation has evolved and neglects proper analysis of the problem.

The issue is very apparent in the Euro Area. Most of the politicians completely ignore the relevant structural problems of the monetary union. In my opinion, the strategy of the current president of the European Commission Ursula von der Leyen follows the principle. The strategy follows the so-called "*green deals*", equalitarian and gender-oriented movements, and other agendas which are currently very popular (see Leyen, 2019). These topics should not be the priorities[6] when considering the most critical institutional flaws of the EU and the Euro Area. Nevertheless, it can be argued that Leyen's strategy is well thought out, and its ultimate purpose is not to serve the people of the EU, which is a valid argument. Politicians have individual motivations to act accordingly to the political cycle. The fallacy is problematic, and, debatably, was escalated by the "*Keynesian*" policy stand over time. The information asymmetry can affect both politicians and voters.

3.4 Keynesian Stabilisation Efforts

The Keynesian practice aims to smooth the economic cycle with the argument that it is promoting economic efficiency. Notably, during periods of recession, higher government spending or lower taxes may help economic recovery. However, the idea is accompanied by many issues. First, it poses characteristics of central planning the economy which is intrinsically problematic, and, in reality, hardly achievable. This is due to many factors; for example, to interpret the economic data correctly, take into account the issue of time

[6] Arguably, some of these arrangements should not be pursued at all.

lags, the efficiency of such policies, and other factors. Second, structural factors are often misinterpreted in economic practice. Structural factors are those which are not connected to the Keynesian idea of sub-optimal demand. Paradoxically, such characteristics are taken as a support to the central idea of fiscal stimulus. It is very apparent in the current Euro Area as its structural and institutional faults are often overlooked. Third, the argument of stabilisation lacks seriousness when the policies continue to be highly expansive even in "*better times*" of higher economic growth.

The Keynesian approach is also connected to many issues arising from political motivations. This is the problem of the misuse as the policies should be countercyclical, and the debt to GDP ratio should not follow an upward trend (Alesina & Passalacqua, 2016). Politicians are eager to implement Keynesian stimulus in recessions. However, they do not counter-balance it in times of expansion by creating budget surpluses (ibid.). In this case, some theoretical explanations were also used to support the fact of rising government debt. For instance, the Barro's tax smoothing hypothesis, which implies a distribution of tax burden across generations (see Barro, 1979).[7] Nevertheless, the proposition of government as a strictly rational central planner pursuing overall welfare seems not to be plausible because of the reasons mentioned above. In addition, the motivations in the current Euro Area follow a different objective of preserving the current status quo by using "*all that it takes*".[8]

3.5 Reputation and Expectations

A good reputation of an entity helps to maintain large amounts of sovereign debt by inducing a better reaction from lending subjects (Cole & Kehoe, 1998). The same concept concerns groups of countries (or a monetary union) as well. However, in the case of major structural problems in the Euro Area, the reputation is diminishing, progressively putting more pressure on the most indebted countries. It can be argued that the structure of the debt is changing over time, as more of the debt is now being "*internal debt*".

[7] Even though the basis of this idea is strictly non-Keynesian.

[8] This is a reference to the famous 2012 statement of Mario Draghi (former president of the ECB) who declared that "*We will do whatever it takes to save the euro*". It also serves as a reference to the, arguably misleading, 2010 statement of the current ECB's president Christine Lagarde (IMF's managing director at that time): "*We violated all the rules because we wanted to close ranks and really rescue the euro zone*".

Nevertheless, it does not support the standard definition of what internal debt is because the Euro Area is not a single country, but an entity made of different countries.

Lenders' expectations about the politico-financial outcome are self-fulfilling and can increase the likelihood of financial and political crises (Vaugirard, 2005). As a result, they may be willing to lend less and require higher interest rates. The former is mitigated by the current monetary policies, keeping the interest rates low. However, negative expectations of the general public could weaken aggregate demand, putting even more pressure on public stimulus — raising indebtedness. These two channels represent another debt channel, making the situation worse over time.

3.6 Strict Preferences

Arguably, a particular debt level is the cause of national preferences. The argument is compelling and is possibly one of the debt channels. A simple explanation is that people are willing to be better off in the short term at the expense of long-run problems because their life is finite, and they have a strong short-time preference. Additionally, the motivation is strengthened in the Euro Area due to the socialisation of risks. This may be the case of Greece which received significant external help during the financial crisis of 2008–2009.

Fochmann, Sadrieh, and Weimann (2014) conducted a behavioural experiment and found that the main behavioural force behind public debt is an intergenerational transmission of the tax burden. Even though a massive portion of the accumulated debt in the experiment was explicitly connected to serious risks of a financial meltdown, followed by penalty taxations, the individuals did not vote for a debt reduction. It was also the case of small groups with strong social ties. The authors concluded that they observed much less sense for intergenerational fairness or altruistic concerns than expected. As long as it is in individuals' selfish interest, they do not hesitate to shift the heavy burden of public debt to the next generation. Without the transmission possibility, the individuals voted for a prudent debt policy and wanted to avoid excessive indebtedness by all means (ibid.). The observation follows the debt trend of many developed economies and puts into question the standard economic rationale.

3.7 Current Economic Conditions

Most of the Euro Area countries have already accumulated a substantial portion of debts, which is challenging to maintain and lower. The sovereign debt crisis has not been solved, and, in the case of another crisis episode, the indebtedness would probably grow even more. In early 2020, the European countries were significantly hit by the coronavirus episode. During the writing of this text, the crisis is not over yet, but it is possible that the debt ratios will drastically increase as it was the case during the financial crisis of 2008–2009. The issue is linked to the non-optimality of the currency area; another significant asymmetric shock will trigger the same mechanism and consequences which were seen in the years 2008–2009 — the vicious circle of decreases of economic growth and overall competitiveness. Furthermore, high initial indebtedness along with institutional dysfunctionality of the Euro Area creates a stronger demand for a more politically controlled union and for more expansive economic policies (Bordo & James, 2008).

3.8 Future Prospects

The future may bring both unexpected and expected economic shocks. While the unexpected events cannot be predicted, there is already indisputable evidence of a factor which will consistently put more and more pressure on government finance. The aspect is a population ageing.[9] The phenomenon has various channels of influence over the indebtedness of the countries. First, it encourages more public spending on social benefits and pensions as the population structure will be older. Second, there is evidence that older people prefer an increase in government debt to rise in tax rates. The problem was theoretically evaluated by Brennan (2012) and empirically validated by Fochmann, Sadrieh, and Weimann (2014). In addition, there is currently the ever-increasing competition between the "*old Western advanced democracies*" (the group of countries including the EU and the Euro Area) and the rising superpowers such as China. It represents another significant debt incentive as the countries try to improve their positions.

[9] See, for example, Auerbach (2016).

4 Fiscal Union as a Dysfunctional Solution

> *We cannot solve our problems with the same thinking we used when we created them.*
>
> **— Albert Einstein**
> (German theoretical physicist, 1879–1955)

Immediately after experiencing the worst effects of the financial crisis of 2008–2009, many economists shared the idea that the Euro Area can only survive if it is complemented by a fiscal union (Fuest & Peichl, 2012). In particular, some analysts claim that the financial crisis has shown that the Euro Area needs to be complemented with a high degree of centralisation of fiscal transfers. Otherwise, the system is unsustainable (Bénassy-Quéré, Ragot, & Wolff, 2016). The creation of a fiscal union would help the Euro Area to get closer to the optimal currency area because it could deal with asymmetric shocks and other issues which challenge the stability of the monetary union. The idea is being discussed up to this day. Therefore, the chapter examines if a deeper fiscal integration would solve the issues of the Euro Area. Nevertheless, it does not deal with normative political aspects meaning that it does not assess whether it is politically realistic or feasible to establish a fiscal union.[1]

The chapter is structured in accordance with logical reasoning. First, it defines what a fiscal union is. Second, it lists potential costs and benefits associated with the possible creation of a fiscal union within the Euro Area member countries. Third, it provides an overview and discussion about implicit assumptions which are needed for the fiscal union to work properly. Finally, it analyses an issue of symmetric shocks which is rarely examined.

[1] In other words, it provides a strictly economic analysis.

4.1 Definition of a Fiscal Union

A fiscal union or robust centralisation of fiscal transfers between some regions would represent another step in the European integration process. It needs to have two important aspects: a mechanism for pooling resources to provide for expenditure, and governance of such a mechanism (Iara, 2016). In addition, a fiscal union in the case of the Euro Area may but does not have to include five elements: fiscal rules, policy coordination and supervision, a crisis resolution mechanism, joint guarantee for government debt, fiscal equalisation and other mechanisms for transfers between countries, and a larger common budget and European taxes (Fuest & Peichl, 2012). A fiscal union can be achieved in many ways, for example, by creating a single finance ministry and finance minister, or even by emissions of euro-bonds (Hallett, 2017). It should be noted that the current integration architecture of the Euro Area (or even the EU) already contains some elements of a fiscal union: the common budget, supra-national regulatory rules, the EU's own revenue sources, harmonisation of indirect taxes, and relevant monitoring practices.

4.2 Potential Benefits and Costs

Allard et al. (2013) argue that a robust centralisation of fiscal transfers would decrease the likelihood of future crises, their magnitudes, and systemic spillovers. If one country would experience a severe depression while other countries would have the capacity to help, then they could simply shift their resources through fiscal transfers and solve the issue. Other benefits may include gains from better coordination of policies within the Euro Area (the system may be less prone to externalities arising from different policies) or increasing returns to scale. It may also help to strengthen the fiscal discipline within the Area. Furthermore, some of the member countries may experience reputation gains. A fiscal union may also help to make labour markets of the member countries more homogeneous through centralisation of unemployment benefits and pension systems (Cottarelli, 2016).

Nevertheless, it has been both theoretically and empirically showed that a robust centralisation suffers from the issue of asymmetric information, as mentioned by Hayek (1988). Therefore the management would be rather rigid. Other potential cons include political costs (disputes), social costs (regulatory changes), and moral hazard (Allard et al., 2013). There would be no guarantee that a fiscal union would strengthen the overall financial discipline. Moreover, history shows that citizens will not accept taxation without representation. The union would suffer from a democratic deficit which is an issue for the whole EU.[2] It could lead to even worse government failures than those which can be currently observed on the national level. In addition, an introduction of new taxes could lead to a higher financial and bureaucratic burden. The snowball effect, which is already in place in the case of many EU institutions, could be even more substantial. Paradoxically, a further instability of the Euro Area could occur.

Some analysts also overlook the fundamental problem of fiscal policy as it suffers from various time lags. The statistical delay could be mitigated under the assumption that the member countries share a high degree of homogeneity in macroeconomic imbalances (Alessandrini & Fratianni, 2016). However, this assumption is not fulfilled. Other delays include a lag in recognition of a problem, decision lag, legislative implementation issues, and a delay when policymakers can observe the desired effects of a specific policy. Not surprisingly, demand shifts are complicated to manage in practice properly. Finally, the concept of a fiscal union is problematic when a monetary union has systematic flaws and is prone to recurring instabilities.[3] The overview of benefits and costs is provided in Table 4.1.

The idea that the current Euro Area can be "*repaired*" through the creation of a fiscal union is unlikely to be correct. The costs presumably outweigh the potential benefits of the centralised fiscal transfer system. Furthermore, some of the potential benefits would possibly be non-existent.

[2] The officials claimed that they were trying to make the decision-making "*more efficient*". The argument was made by the EU officials when adjusting the voting system and voting weights after the 2009 Lisbon Treaty. The efficiency gains are at the expense of the sovereignty of smaller countries.

[3] The issue was discussed in the second chapter.

Table 4.1: Potential benefits and costs of a fiscal union

Potential benefits	Potential costs
Better OCA criteria alignment	Breach of national sovereignty
Improvement in fiscal discipline	Centralisation costs, information asymmetries
Coordination gains, economies of scale and scope	Even worse government failures, the problem of moral hazard
Correction of negative externalities	Constant interventions within a faulty monetary union
	Political and social costs (disputes, social unrests)

Source: own processing.

4.3 Implicit Assumptions of a Viable Fiscal Centralisation

The path to a working monetary union by establishing robust centralisation of fiscal transfers lies on many implicit assumptions which are rarely discussed; therefore, the analysis deals with this issue. According to my research, the assumptions are as follows:

- appropriate size of the common budget,
- sustainability of the common budget,
- satisfactory efficiency of fiscal transfers which could compensate lower labour, price, and wage flexibility,
- democratic principles of the policy,
- learning from past mistakes,
- appropriate quality of fiscal governance,
- compliance with the no-bailout clause in the fiscal policy decisions,
- ability to manage a high degree of centralisation,
- precise and duly information,
- no negative spillovers of the common fiscal policy,

- similar initial situation of the member countries,
- independence between fiscal revenues and expenditures,
- high efficiency of fiscal regulations when determining rights and obligations,
- stabilisation effects of the common fiscal policy.

First, the common budget of the EU and the relevant fiscal transfers would have to be significantly larger than in history. It could mean that the sufficient values of budget revenues and expenditures could reach tens of GDP percentage points. For instance, fiscal transfers in the USA are enormous (see Dreyer and Schmid, 2015). Whether it would be possible to gather so many resources or not is an open question. Another assumption is concerning high efficiency of fiscal policy which would require fiscal multipliers to be quite high across the Euro Area. There is a large body of evidence (see Hagen, 2014) which has concluded that the response of fiscal transfers to instabilities in the existing federations is rather weak. In the USA, such transfers offset approximately 10% of asymmetric shocks between the countries. In the case of Germany, the number is even lower (ibid.). If the multipliers were not high enough, the EU common budget would have to be even more expanded.[4] In addition, Vranceanu and Besancenot (2013) showed that multipliers are negatively affected by the amount of public debt, especially when the ratio of public debt to GDP exceeds 150%. The more significant the common budget would be, the more problems it could create. For example, higher-income earners should oppose fiscal union while low-income earners should support it because of the redistributions. However, these views among member countries are distorted due to their political leaders. Left-wing political parties are more inclined to support the creation of the fiscal union because of comparatively higher benefits for low-income earners, underemployed and unemployed individuals (Franchino & Segatti, 2019).

Moreover, the more the decision is centralised, and the farther is the decision-making from individuals or member countries, the less accountable it is, and the higher the potential democratic deficit is. According to Iara (2016), GNI-type contributions would be most suitable to get the appropriate budget revenues, which would also mean that the

[4] I provide evidence that the multipliers were prohibitively low before the financial crisis in the seventh chapter (Section 7.2).

connection between tax collection and specific fiscal policy would be very loose. It would possibly create political disputes among the countries.

Furthermore, a fiscal union can be seen as a way of sharing risks. However, it works with the assumption of no moral hazard. The creation of fiscal union would practically (and again) break the no-bailout rule as it is evident that the policy-makers would use it for such purpose. The situation would be the same as before the crisis when there was a uniform interest rate for all of the Euro Area and the countries with usually higher interest rates exploited the situation for their short-term benefit. It should be mentioned that the price of freedom is individual risk and responsibility.

The main purpose of fiscal unions should not be risk-sharing (Hagen, 2014). Instead, they should promote fiscal responsibility and the sustainability of public finances through its system of responsibilities and assignments. However, I am not aware of such evidence that a fiscal union would promote sustainability. Politicians usually make short-term decisions due to the political cycle. For instance, the solutions to the financial crisis were of such nature and did not lead to any significant progress. Politicians are often not willing to learn from past mistakes. In addition, the common monetary policy in the Euro Area shares these aspects, even though it should be independent of politics. Furthermore, I believe that the quality of fiscal governance could be lower because there would exist stronger motivations for politicians to pursue their self-interest. Also, rewards would possibly be available in the form of money and influence.[5] At the same time, the budget constraint would be weaker as the decisions would be less accountable because of the distance from the affected regions. The current EU budget is made sustainable; however, I argue that this evidence is insignificant as it accounts only for approximately 1% of the EU's GNI. Therefore, no economist should argue that this form of governance would definitely exhibit returns to scale.

Moreover, it has been both theoretically and empirically proved that massive centralisation is impossible to manage. Countries such as the Czech Republic experienced the dysfunctionality of communism (socialism in practice) at first hand. In addition, there are many data and policy lags. Moreover, fiscal policy tends to exhibit adverse spillovers

[5] In addition, particular interest groups are more influential on the supra-national level as the incentives are also more pronounced.

as it may influence other countries apart from the target region. The situation is even more complicated when taking into account the differences in the basic socio-economic variables of the Euro Area member countries. Drea (2016) mentions that "*retrofitting*" a higher level of political and fiscal integration to a monetary union that is already in place will be very difficult. The situation is problematic due to public antipathy towards greater integration, notable differences in current debt levels, relatively low economic growth and high youth unemployment in some of the EU member countries — most notably in the EU4 countries. Furthermore, there is evidence that the European fiscal rules have become over-complicated, inefficient and open to widespread manipulation (ibid.). The EU decision-makers failed in this area as the Euro Area countries must deal with an increasingly complex set of fiscal rules[6] and their inconsistent implementation. In addition, the fiscal rules, in the situation of low GDP growth, possibly serve as a barrier to further expansion in terms of GDP and employment (ibid.). These rules break national sovereignty, deny the functionality of automatic stabilizers, act as a pro-cyclical policy in recessions, and do not incorporate future trends such as population ageing. Woźniakowski (2017) mentions how problematic is the current state of the Euro Area. The member countries cannot use independent exchange rates to deal with the shocks. However, they also cannot flexibly use the fiscal policy as they are constrained by the EU's rules for national fiscal policies. Finally, the common fiscal governance arguably cannot replace the need for production factor, price, and wage flexibility when taking all of the arguments into account.

It is evident that seeking the creation of the fiscal union is not a viable answer to the structural problems of the Euro Area. The EU should maintain national fiscal autonomy and simplify its budgetary rules (Drea, 2016). Logically, the countries which do not sufficiently fulfil the OCA criteria are left with only fiscal policy to stabilize their national economies; the policy needs to be kept decentralised. In addition, the causes of the economic crisis were national. Therefore, the solutions should also be national (Cózar, 2017). I conclude that there is not a single assumption which would not be seriously challenged. In fact, many of them would not be fulfilled.

[6] Such as the Fiscal Stability Treaty or other rules which are trying to correct various imbalances within the region.

4.4 Economic Shocks and Centralised Fiscal Policy

In my opinion, the very design of the Euro Area is producing asymmetric shocks, which is an issue that is rarely analysed. The fiscal union discussion is about making the Euro Area more stable. Nevertheless, the idea is neglecting the development of potential product and other main variables in periods of relative stability. Analysts are afraid of asymmetric shocks according to the OCA theory. However, economists usually do not mention how these asymmetric shocks occur. Consider the example of the financial crisis which started the European public debt crisis and led to the discussions about the creation of a fiscal union. It is evident that the initial shock (lower demand, higher unemployment, or a challenge for public finance, among other factors) was mostly symmetric as it hit all the Euro Area countries. Nevertheless, it later produced the asymmetric responses among the member countries. Analysis of symmetric shocks bears the same or even higher importance when the monetary union is not functioning properly. The conclusion is that a focus on the very design and structure of the monetary union is needed when assessing the feasibility of establishing mechanisms for centralised fiscal transfers. This way, it would be possible to deal with some of the asymmetric shocks and promote competitiveness at the same time. Arguably, there is no emphasis on competitive advantages. A higher degree of integration – "*stronger union*" does not necessarily mean higher competitiveness. I argue that the design of the monetary union should be as transparent as possible, which means that the less the need to regulate it, the better it is. The more interventions, the higher is the risk of failure, and the more significant are the implicit assumptions of a viable fiscal centralisation.

The "*strong*" euro has been a concern for many analysts and policy-makers. Strong exchange rate contributes to low inflation and low GDP growth rates, making the reduction of public and private debt more painful and also longer (Belke & Volz, 2015). It helped the inflation to get lower through its negative effect on import prices, which is an issue for the ECB and its target. Furthermore, countries suffering lack of competitiveness were not able to properly recover from the recession. Therefore, these exporters are not in a good position and GDP growth has been dampened (ibid.). Stronger euro undoubtedly

worsens the competitiveness of some members, especially the EU4 countries. Exporters from the EU4 currently find themselves in a tight spot as their exports are more expensive due to the strong currency. Moreover, the symmetric shocks produced by the uniform exchange rate affect the sectoral structure of the countries because export and import capabilities significantly differ across individual industries. In addition, the governments of the countries, which are negatively affected, may be encouraged to run expansionary policies. A common mechanism of fiscal transfers is unlikely to solve this problem.

According to Hagen (2014), it is a mistake to think that a fiscal union would compensate for the loss of control over monetary policy at the national level. Such a mechanism would stabilise the individual economies around the average cyclical position of the monetary union. Technically speaking, it does not necessarily mean that this would lead to more stable output and employment in the member countries. In addition, the potential benefits of a fiscal union would depend on the nature of the shocks, which makes the monetary union unstable. Moreover, as the situations of various member countries differ, the common fiscal policy would not be neutral and would have to be frequently used. Such characteristics tell that the system would not be sustainable. A devaluation is not a solution to the problem.

The macroeconomic imbalances of the Euro Area should be resolved primarily by structural adjustments. The EU should focus on competitiveness, not on how to "*tweak*" and "*repair*" the dysfunctional system. The establishment of a fiscal union would represent a permanent redistribution mechanism from the Northern to the Southern countries. This does not mean the end of the euro. However, it would mean a fundamental change in the structure of the Euro Area, where only the well-performing economies with similar characteristics should belong. The solutions need to focus on the long term. Furthermore, the endogeneity argument, which asserts that by reinforcing the integration process, the group of countries will become OCA, is shaky in its foundations and represents a utopian ideal. Policies should follow smaller steps when the final destination is uncertain. Finally, I believe that the current Euro Area should focus on competitive advantages, long-term policies and transparent system design rather than trying to fix the system by establishing a fiscal union which would require constant government interventions.

5 Structural Characteristics of Economies and Their Development

> *If you do not know how to ask the right question, you discover nothing.*
>
> **— W. Edwards Deming**
> (US statistician, 1900–1993)

As it was mentioned in the Introduction, four Southern EU countries were selected for the analysis. These include Italy, Spain, Portugal, and Greece. However, it is needed to evaluate the overall macroeconomic position (both in absolute and relative terms) of the countries as the first part of the analysis. The reason is that fiscal indicators are strongly interconnected with the real economy. Therefore, the findings will help assess the fiscal conditions and macroeconomic linkages of the countries in time and space.

The chapter has three parts from the point of view of used indicators. First, it examines the positions of the countries in the world and to each other using basic macroeconomic variables and composite indices. The indices contain some qualitative measures which are also desirable for the analysis. Second, it presents a summary of the developments in the economies by analysing the developments of key macroeconomic indicators, including their estimated potential (equilibrium) levels. Third, a cluster analysis is performed to obtain a representative estimate of the countries' positions. The cluster analysis is done for different sample sizes and time frames to capture the economic dynamics.

5.1 Main Country Characteristics

Currently, the countries are considered to be democratic and relatively well developed mixed[1] economies. Table 5.1 shows that Italy and Spain are by far the largest economies which are also important in the world context. Hence, economic instabilities of the two countries are much more pronounced in the EU. The structural characteristics of the countries differ to some extent. However, the common sectors include agriculture, tourism, and shipping due to their favourable geographical location (see Eurostat, 2020a). According to GDP per capita measure, which is used as an approximation of living standards, Italy and Spain are the most developed economies. Nevertheless, Portugal and Greece are not significantly behind. The two other variables of Table 5.1, located on the next page, disclose some of the most problematic issues in the EU4 countries. Italy, Spain, and Greece suffer from prohibitively high unemployment rates, even in the world context. Concurrently, all the four countries exhibit considerably high levels of indebtedness.[2] It is important to mention that the latter two variables are both causes and consequences of their macroeconomic imbalances.

Table 5.1: Selected macroeconomic variables — EU4, 2019

	Total GDP (PPP)		GDP per capita (PPP)	
Country	Year 2019	World position	Year 2019	World position
Italy	2 443	12 / 192	40 470	36 / 191
Spain	1 941	15 / 192	41 592	33 / 191
Portugal	346	54 / 192	33 665	47 / 191
Greece	324	57 / 192	30 252	54 / 191
EU27 average	728	35 / 192	44 889	32 / 191
EU19 average	837	31 / 192	48 231	26 / 191
World average	738	-	22 395	-

[1] In my opinion, the designation "*market economies*" would be imprecise because of the existence of a significant amount of regulations in the economies.

[2] A more detailed debt analysis will be conducted in the subsequent chapters.

Table 5.1 — Continued

	General unemployment rate		General government gross debt	
Country	Year 2019	World position	Year 2019	World position
Italy	10.32%	86 / 103	133.15%	181 / 186
Spain	13.94%	96 / 103	96.41%	170 / 186
Portugal	6.11%	57 / 103	117.55%	179 / 186
Greece	17.80%	99 / 103	176.64%	184 / 186
EU27 average	6.25%	61 / 103	63.65%	128 / 186
EU19 average	6.82%	66 / 103	72.31%	145 / 186
World average	6.97%	-	57.02%	-

Notes: Simple arithmetic averages are used. Other standard indicators such as inflation and current account balance are not shown due to their lower importance in the current period, and complicated interpretability of world standings.

Source: IMF (2020b), own calculations and processing.

The EU4 countries went through their "*golden ages*" in history. For Italy and Greece, it was the period of Ancient Rome and Greece. In the case of Spain and Portugal, it was the European colonial era. The countries experienced dynamic development during the 20th century, in line with the development in Europe. In 1999, they joined the Euro Area and adopted the common currency.[3] This action was arguably one of the roots of the ongoing European debt crisis. The financial crisis, which began to show its negative effects in the 2nd quarter of 2008 in the EU, has uncovered deep inefficiencies in the economies.[4] In general, the EU4 countries suffer from structural flaws in their economies and low competitiveness. The arguments for the disbursements of financial resources from other countries[5] may offer more insights. Greece received financial help between 2010–2018 to eliminate structural disparities, mainly in the general government

[3] Except for Greece which joined the euro area in 2001 and was suspected of reporting falsified government accounts afterwards (see OECD, 2005).

[4] It has turned into the European debt crisis. However, I believe that this crisis has not ended yet. The economic policy measures and "*rescue*" packages were primarily focused on mitigating the worst consequences in the short and medium term. The countries did not solve their structural issues. For instance, Ševčíková (2015) provides an analysis of the problematics.

[5] The EU can be mentioned as a single supranational institution. However, the resources came (mainly) from other countries through payments to the institution. In addition, a part of the financing was also provided by the IMF.

sector (the size of social expenditure), and to be able to finance its growing debt service at that time (European Commission, 2020c). Portugal received financial help between 2011–2014 to restructuralise its banking sector, undergo structural reforms, and restore its competitiveness (ibid.). Spain received financial help between 2012–2013 to restructuralise its banking sector (ibid.). Italy did not need financial help.

The positions of the countries should also be analysed by using composite indicators which incorporate various measures. Some of the indicators utilise qualitative data.[6] Table 5.2 shows 10 selected composite indices[7] of the countries.

Table 5.2: Selected composite indices — EU4, 2019

Country	Human Development Index	Index of Economic Freedom	Economic Freedom of the World	Ease of Doing Business	Sovereign Bond Ratings
Italy	29 / 189	74 / 171	46 / 162	58 / 190	Adequate
Spain	25 / 189	58 / 171	36 / 162	30 / 190	Strong or Adequate
Portugal	40 / 189	56 / 171	39 / 162	39 / 190	Adequate
Greece	32 / 189	100 / 171	102 / 162	79 / 190	Less or more vulnerable

Country	World Competitiveness Index	Global Competitiveness Index	Corruption Perceptions Index	Global Innovation Index	Economic Complexity Index
Italy	44 / 63	30 / 141	51 / 180	30 / 129	13 / 133
Spain	36 / 63	23 / 141	30 / 180	29 / 129	32 / 133
Portugal	39 / 63	34 / 141	30 / 180	32 / 129	34 / 133
Greece	58 / 63	59 / 141	60 / 180	41 / 129	53 / 133

Notes: Sovereign bond ratings are taken from Moody's, Standard & Poor's, and Fitch agencies. The Economic Complexity Index data are from 2017.

Source: CID (2020), CU (2020), FI (2020), HF (2020), IMD (2020), TI (2020), TE (2020), UN (2020), WB (2020), and WEF (2020), own calculations and processing.

[6] Most prominently the Corruption Perceptions Index and sovereign bond ratings.

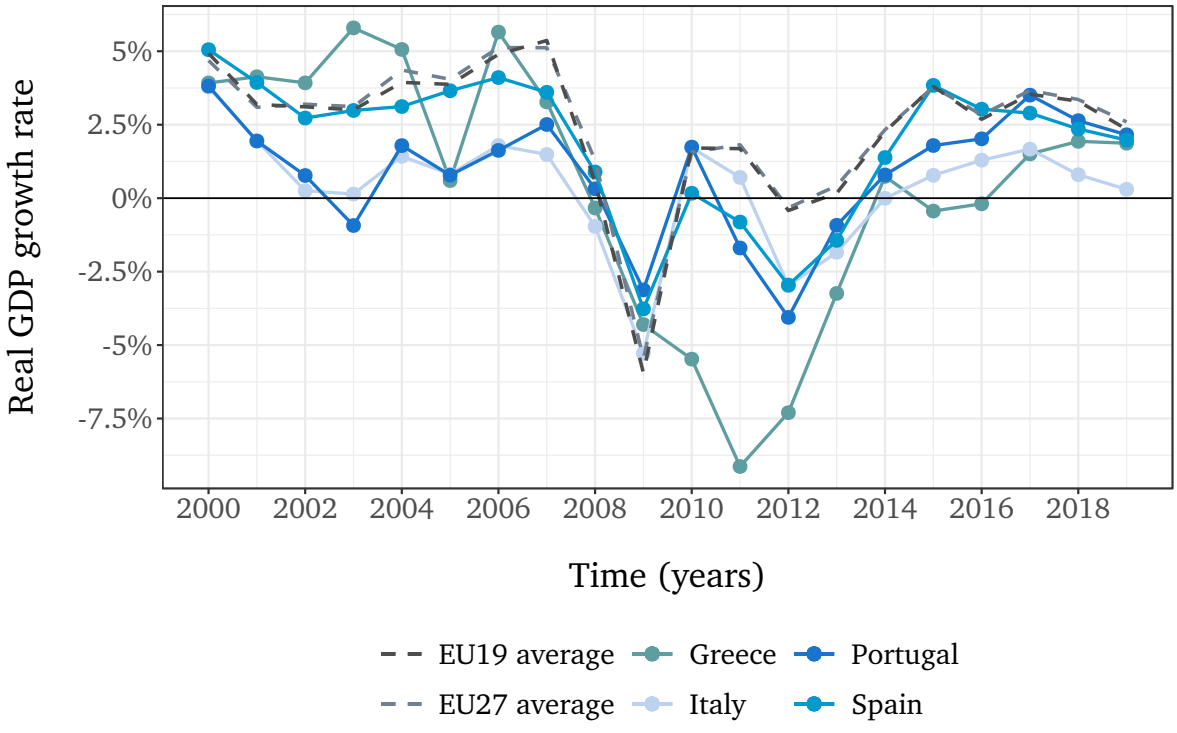
[7] There are numerous problems with these indices. First, the names of their versions usually do not correspond to the year when the data were obtained. Second, their sample sizes differ, making the assessments of relative position in the world more difficult. Third, the used methodologies vary over time in some cases, making the values of the indices not fully comparable in time.

According to the data, Spain has the most efficient economy. The next place is split between Italy and Portugal depending on the used index. Greece is placed last in all the indicators except the first one.

The aim is not to address all the country characteristics in detail. However, the developments of basic macroeconomic indicators should be discussed. In addition, I show estimates of potential values of the macroeconomic indicators. These variables are estimated by a trivariate components model which is presented in the sixth chapter.

Figure 5.1 shows real GDP growth rates of the EU4 countries compared to the average values of the EU19 and EU27. The countries' developments significantly diverged between 2008–2014, with the exception of Italy and Portugal. The two mentioned countries recorded systematically lower growth values even before 2008. Unfortunately, the overall economic performance of Italy did not significantly change in the examined period.

Figure 5.1: Real GDP developments — EU4, 2000–2019



Note: Simple arithmetic averages are used. These values are higher than the weighted average values reported by the Eurostat.

Source: IMF (2020b), own calculations and processing.

Furthermore, it is useful to compare the real GDP growth with estimated output gaps. It is depicted in Figure 5.2. I conclude that the countries were significantly overheated prior to the financial crisis of 2008–2009. The crisis hit was a significant macroeconomic shock for the countries. Moreover, economic recovery mechanisms were weakened due to structural inefficiencies of the countries.[8] As a result, the countries experienced sizeable and negative output gaps. Low GDP growth is detrimental to fiscal policies and the overall indebtedness through various transmissions channels. Arguably, low GDP growth is connected to lower government revenue (mainly tax revenue) and higher expenditure (through the political process and implied incentives). Furthermore, it prevents the country to "*grow out*" of the debt when the accumulated debt values are compared to the GDP level. In the case of its lower growth, the latter is also lower in its absolute values.

Figure 5.3 shows the development of general unemployment rates along with estimates of non-accelerating inflation rate of unemployment (NAIRU). Unemployment rates of all the examined countries exhibited a sharp increase. The fact puts pressure on government expenditure through the payments of social benefits and restricts government revenue both directly and indirectly.[9] In addition, the results show stagnation or an increase in the NAIRU estimates depending on the country. The observation is at odds with the global trend of decreases in the NAIRUs in advanced economies. The fact can be interpreted as both cause and consequence of the significant decrease in economic efficiency and competitiveness of the countries. Nevertheless, the NAIRU estimates are subject to the changing economic environment and are directly influenced by prolonged periods of expansionary economic policies.[10]

Figure 5.4 depicts average annual changes of harmonised index of consumer prices (HICP) along with optimal trend inflation rates[11]. It should be noted that the environment has been disinflationary during the examined period.

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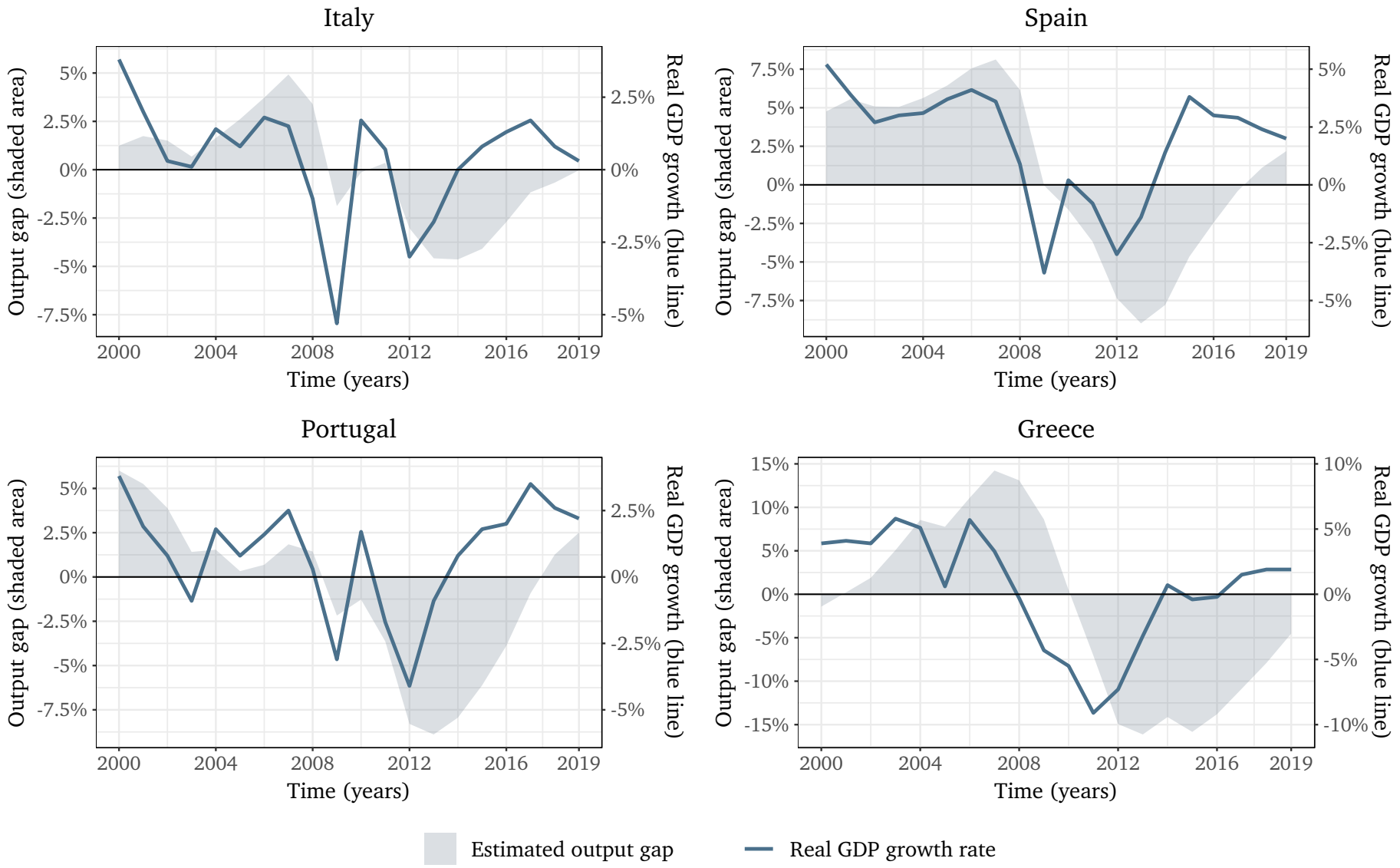
[8] I refer to the sub-optimality of the uniform exchange rate.

[9] The direct effect means lower income tax revenues, while the indirect effects are connected to lower economic efficiency due to the sub-optimal use of resources in the economy.

[10] In my opinion, this issue is often overlooked.

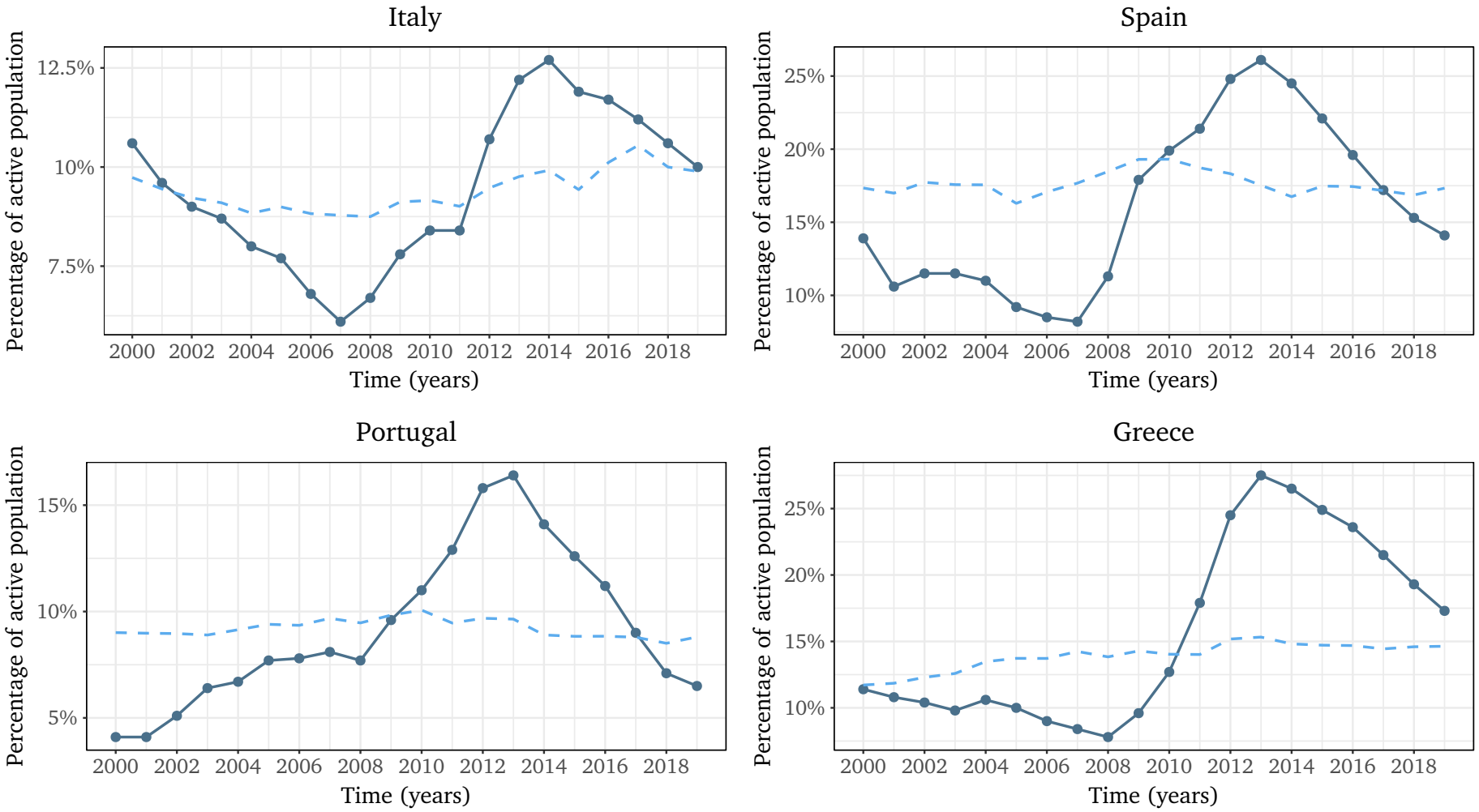
[11] This type of inflation rate is defined as the measure which is maximising steady-state economic welfare. Nevertheless, the notion of "*optimal*" inflation rate is inherently problematic due to complex relationships of the inflation rate with other main macroeconomic variables. It is presented for illustrative purposes only.

Figure 5.2: Real GDP growth rates and output gaps — EU4, 2000–2019



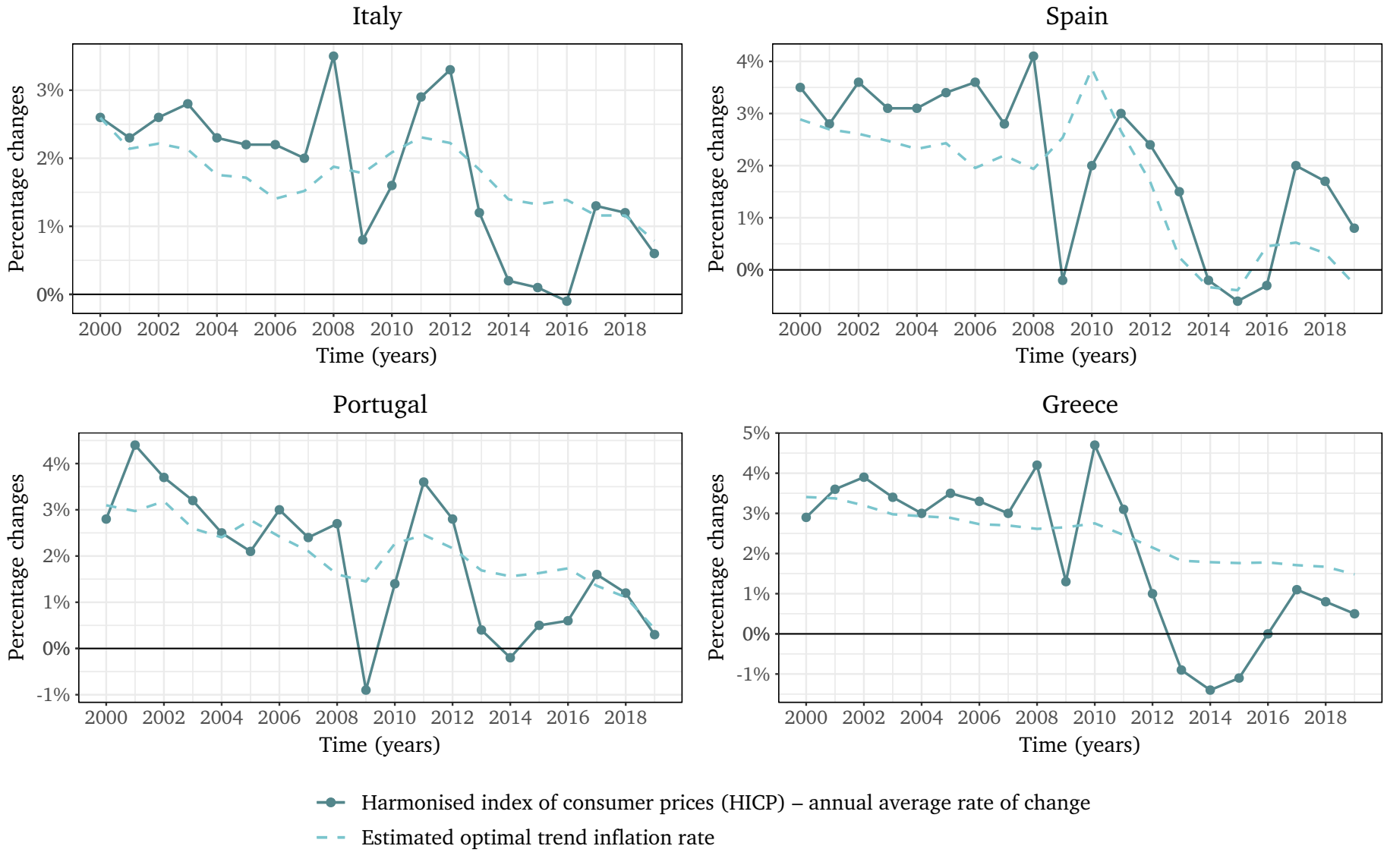
Note: The output gaps are estimated by a trivariate unobserved components model presented in the sixth chapter (Section 6.2.1).
Source: Eurostat (2020a), own calculations and processing.

Figure 5.3: General unemployment rates and NAIRU estimates — EU4, 2000–2019



Note: The NAIRUs are estimated by a trivariate unobserved components model presented in the sixth chapter (Section 6.2.1).
Source: Eurostat (2020a), own calculations and processing.

Figure 5.4: Price level developments and optimal trend inflation rates — EU4, 2000–2019



Note: The optimal trend inflation rates are estimated by a trivariate unobserved components model presented in the sixth chapter (Section 6.2.1).
Source: Eurostat (2020a), own calculations and processing.

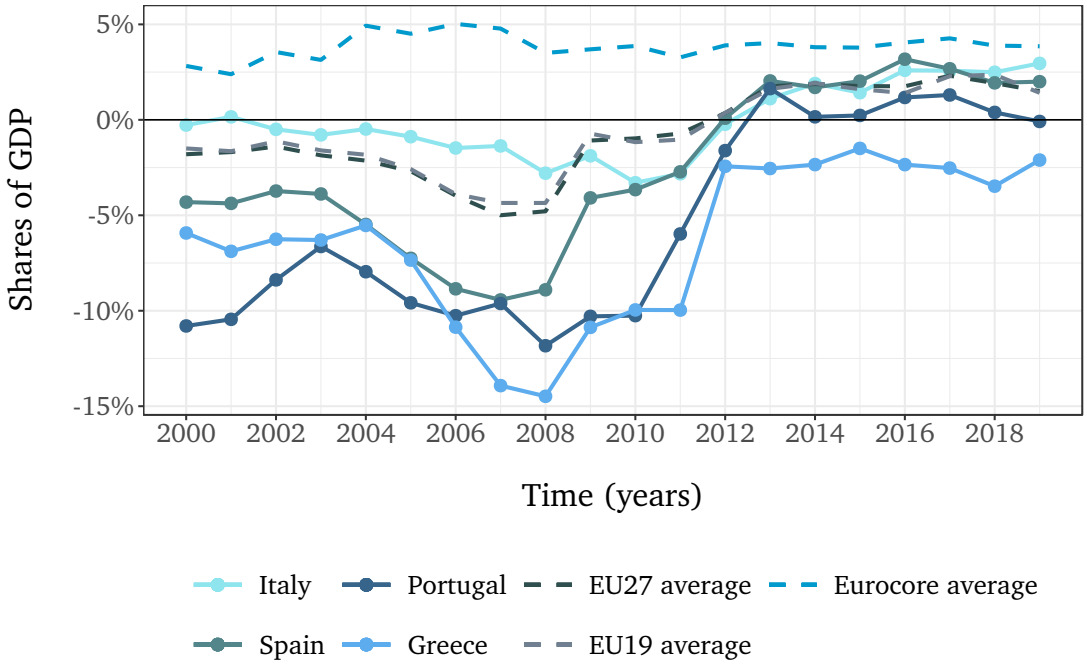
Arguably, the fact has been caused by various factors. These include the current economic situation of the countries,[12] tightenings of financial regulation, loss of competitiveness, market competition in the EU27, overall technological progress, low oil prices, relatively high demand saturation when compared to the past, increased risks or uncertainty, and liquidity trap conditions.

The last indicators which should be analysed are external flows of the countries. It can be shown that the current account balance (CAB) is the difference between savings (S) and investments (I) in an open economy (refer to Eurostat, 2013):

$$CAB = S - I \,. \tag{5.1}$$

Current account balances are shown in Figure 5.5 and represent one of the stylised facts of the past. The values confirm the twin deficit hypothesis[13] in the EU4 countries.

Figure 5.5: Current account balances — Selected EU countries, 2000–2019



Note: Simple arithmetic averages are used.
Source: IMF (2020b), own calculations and processing.

[12] High indebtedness with less space for aggregate demand to further stimulate inflation.

[13] The hypothesis claims that there is a strong causal link between a nation's government budget balance and its current account balance.

The EU4 countries exhibited acute deficits of their current accounts, hence, destabilising their economies.[14] The imbalances were mainly caused by the euro-debt mechanism, moral hazard, and expansionary macroeconomic policies. The structural difference in the EU is directly observable when the EU4 countries are compared to the average values of the eurocore countries[15], the EU19, and the EU27.

Furthermore, it is crucial to identify the institutional sector developments in the case of external balances. A more exact measure of the external situation is net lending / net borrowing[16] which is used as the overall budget balance measure in the case of the general government sector. The net lending / net borrowing (NL/NB) is defined as the current account balance (CAB) adjusted for net capital transfers (NCT)[17] realised in the economy (refer to Eurostat, 2013):

$$NL/NB = CAB + NCT\,. \tag{5.2}$$

A sectoral decomposition of total economy's net lending / net borrowing can be made using the national accounts.[18] It is shown in Figure 5.6 below. I separate general government sectors and compare with the aggregates of all the other sectors (households and companies). The results show that the general government sector was a source of severe economic instabilities in all the examined countries. It puts pressures on the current level of government debt, and it restricts[19] economic growth — magnifying its effects over time. The highest negative values (lending) of the general government sectors were recorded in Greece, Spain, and Portugal. Even though Italy is showing chronic governments deficits, its sizes were relatively small during the examined period. All of the values are captured in the stock indicator – net investment position. Finally, debt analyses are presented in Chapter 6.

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[14] A more detailed analysis should be focused on the structural development of the current accounts. However, the aim is to present the essential facts in a concise manner.

[15] I consider the following countries as the eurocore: Germany, France, the Netherlands, Belgium, Austria, and Luxembourg.

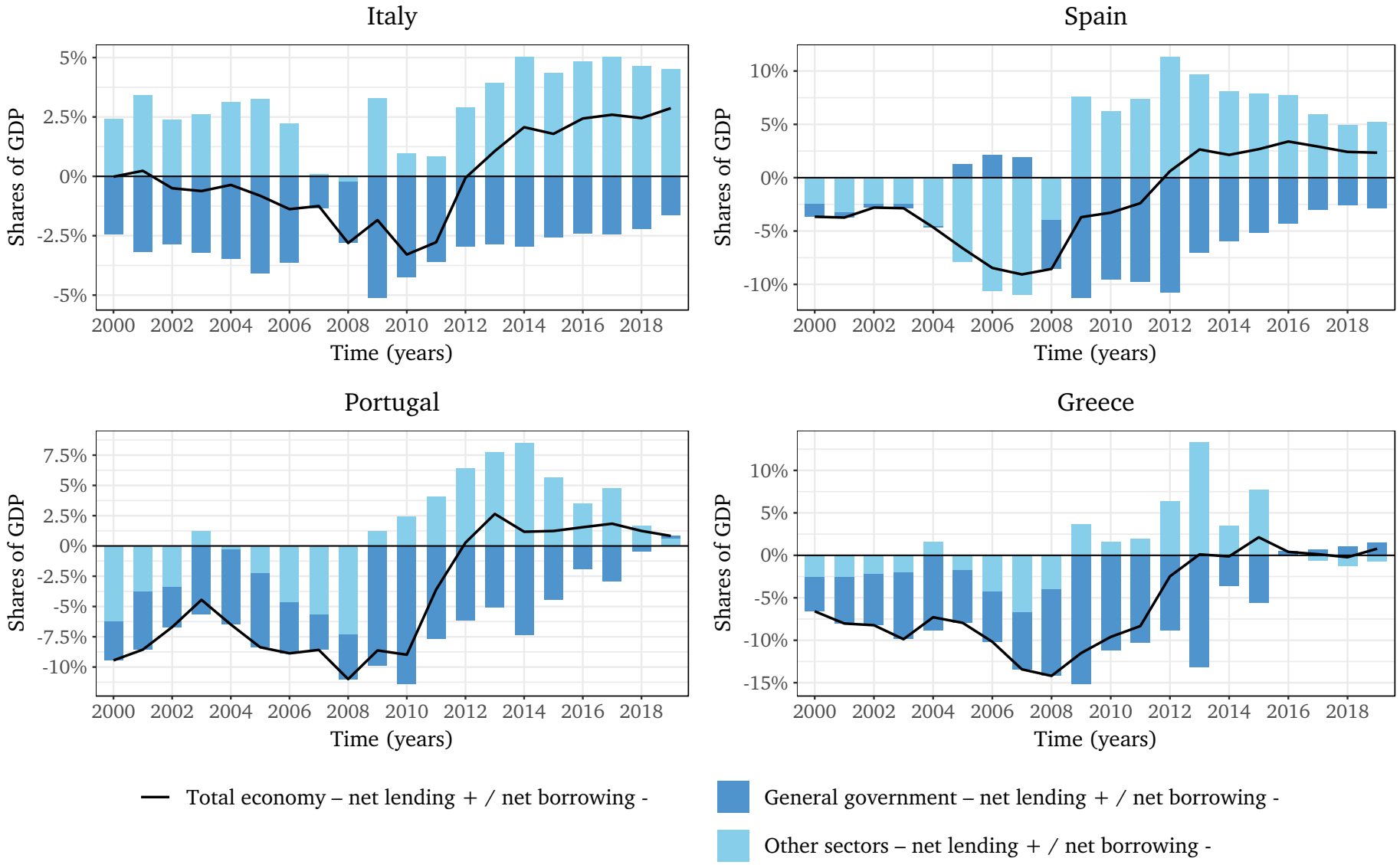
[16] Capital transfers differ from the current transfers by covering the acquisition or transfer of assets.

[17] To be precise, the acquisitions less disposals of non-financial non-produced assets should also be added. However, the size of this item is negligible.

[18] The EU countries use the European System of National and Regional Accounts (ESA 2010) framework, which is a derivative of the System of National Accounts (SNA 2008).

[19] Under the assumption of a considerably high debt level.

Figure 5.6: Sectoral decomposition of net lending / net borrowing in the selected economies — Shares of GDP — EU4, 2000–2019



Source: Eurostat (2020a), own calculations and processing.

5.2 Positions of Countries in the EU

In the following text, I employ cluster analysis to obtain a more broad view of the countries' positions. Cluster analysis (or clustering) is a useful tool to examine complex relations among countries without imposing any a priori restrictions on the interrelationships.[20] As a result, the method may serve as a complementary analysis to various regression models (functions) which need to be specified (Kok and Puigvert Gutiérrez, 2006).

The literature dealing with cluster analysis of the EU countries is extensive. The analyses are determined by the used methodology, types of variables, sample size, and time frame.[21] For example, Belke, Domnick, and Gros (2016) and Ahlborn and Wortmann (2018) focused on European business cycles, Burian and Frydrych (2017) examined economic convergence, Zwick and Syed (2017) dealt with labour markets, Cesaroni, D'Elia, and Santis (2019) examined income inequality, and Kok and Puigvert Gutiérrez (2006) focused on the banking sector. The research of Artis and Zhang (2002) or Wortmann and Stahl (2016) can be mentioned as it deals with general characteristics among the Euro Area countries. The results of the analyses mostly confirmed the hypothesis that EU4 countries form a separate cluster.

I use probably the most applied clustering method in economics, which is agglomerative hierarchical cluster analysis.[22] The approach is based on a distance matrix used for (dis)similarity evaluation of all pairs of objects. The process gradually builds up from the bottom, merging countries into separate clusters, until all the countries are agglomerated into a single cluster. Moreover, the data need to be transformed before the clustering algorithm processes them. Variables with a larger scale would have a greater impact in each cluster without data standardisation. Instead of a z-score, however, I use the standardisation expressed in Equation 5.3. The applied standardisation[23] is a more

[20] The results are driven by the data in the context of used methodology. Nevertheless, the clustering exercise may be done using various methods. Furthermore, no method is able to grant full objectivity in social sciences.

[21] It also implies that the analyses may be outdated as new data are available.

[22] There are two main reasons for the claim. First, the number of final clusters is often unknown. Second, agglomerative methods are widely implemented in statistical software.

[23] It converts the indicators to unitless variables.

robust measure because its denominator is more sensible to observations far away from the centre (Kok and Puigvert Gutiérrez, 2006, p. 10):

$$X_s = \frac{X - X_{min}}{X_{max} - X_{min}} . \tag{5.3}$$

Then, I calculate medians for all the indicators in a particular time frame for each country. I have decided not to use average values because of inconsistent fluctuations in the data. Furthermore, I use Euclidean distance regarding the cluster (dis)similarity evaluation because it places greater emphasis on outliers to generate distance patterns. I presume that distinctions in the data should be formed on the basis of outliers. The Euclidean distance is defined in Equation 5.4 (Gan, 2007, p. 71):

$$D_E(X_i, X_j) = \sqrt{\sum_{l=1}^{t} (X_{il} - X_{jl})^2} . \tag{5.4}$$

Finally, a linkage method regarding the clustering algorithm needs to be chosen. No single approach can be considered as the "*most appropriate*". Therefore, I have chosen Ward's clustering procedure because it produces empirically plausible results. The procedure is seeking to form partitions in a manner that minimises the loss of information associated with each merging, hence the Ward's method is often referred to as the "*minimum-variance method*". An intragroup sum of squares of differences of values from cluster average is used as the measure of homogeneity, which is called the Ward's criterion. It is denoted G_1 and calculated as follows (Ward, 1963, p. 237):

$$G_1 = \sum_{h=1}^{k} \sum_{i=1}^{n_h} \sum_{j=1}^{t} (X_{hij} - \bar{X}_{hj})^2 , \tag{5.5}$$

where:

- k is the number of clusters,
- n_h is the number of objects in the h^{th} cluster,
- t is the number of variables describing objects.

The Ward's criterion then minimises the subsequent expression, to facilitate that there is a minimal increase in G_1 in each clustering step[24] (Ward, 1963, p. 237):

$$\Delta G_1 = \sum_{i=1}^{g}\sum_{j=1}^{t}(X_{gij} - \bar{X}_{gj})^2 - \sum_{i=1}^{h}\sum_{j=1}^{t}(X_{hij} - \bar{X}_{hj})^2 - \sum_{i=1}^{h'}\sum_{j=1}^{t}(X_{h'ij} - \bar{X}_{h'j})^2 . \tag{5.6}$$

The outputs of the analysis are presented in the form of dendrograms which illustrate the arrangement of produced clusters. Finally, I conducted formal tests[25] for each clustering exercise using 19 different indices which should indicate the optimal number of clusters.[26]. Overview of the test indices can be found in Appendix A.

The main goal is to identify outliers (country groups) in the EU27, EU19, and EU4, with an emphasis on the EU4 countries and their structural development between 2000–2019. I examined different combinations of 40 variables which should representatively describe the economies.[27] In the end, I selected 29 variables[28] which provide plausible results regarding the chosen methodology[29]. I presume that the clustering algorithm must be able to separate less and more developed countries, and possibly identify the Southern wing of the EU as one of the outliers. All the variables are described in Table 5.3.

[24] It should be mentioned that certain statistical software packages were working with unclearly specified Ward's algorithm in the past, which was producing different results. Following Murtagh and Legendre (2014), I use their "*Ward2 algorithm*" which implements a procedure in which dissimilarities are squared before cluster updating. The inputs are provided in the form of standard euclidean distances as opposed to commonly used squared euclidean distances. In addition, the clustering scale is in the form of ordinary distances which are not squared, making it easier to interpret the units. The scaling does not affect the final results regarding the cluster arrangement.

[25] I tested optimal cluster numbers being between 2-10 clusters for EU27 and EU19. In the case of EU4, I tested a number of 1-3 clusters.

[26] Nevertheless, the test indices methodologies vary and can provide only recommendations. There is not a test which is always correct. The same issue exists with the choice of the clustering algorithm, as it was already mentioned.

[27] Both internal and external factors are included.

[28] Some of the original 40 variables were not fit for the analysis because they were not able to identify specific country characteristics (for instance, ratios of primary, secondary, and tertiary sectors). In addition, I was limited by data availability, for example, in the case of current account structure. Moreover, some observations are missing, but the values are negligible. These are 0.69% in the case of EU27, 0.63% in the case of EU19, and 0.39% in the case of EU4 regarding the overall sample size. It is reported in descriptive statistics in Appendix A.

[29] The outcome is then mainly determined by the selection of variables (the number of variables or their weighting), types of used indicators, and their transformation.

I have purposely selected indices which are not strictly determined by the size of the economies.[30] The focus of the analysis is on the structural characteristics of the countries which are mainly represented by relative values. The need for including these structural characteristics is evident when evaluating the EU4 countries, which significantly differ in economic sizes, but share common characteristics, as presented in Table 5.1. Moreover, the analysis puts relatively more emphasis on GDP structures and their development. Note that the analysis may also indicate the fulfilment of the OCA criteria when comparing the individual countries to the core countries – for example, the German cluster. I have empirically identified three main periods (2000–2009, 2010–2016, 2017–2019) between which the structural characteristics of the countries, mainly the EU4, were shifting significantly.[31] Finally, I have used an identical methodology for each sample size and period combination to keep the research outcome as robust as possible.[32]

[30] It does not mean that the economic size has no effect. However, it is arguably not the primary factor in the case of most of the selected variables.

[31] It may be confusing why the financial crisis period clustering did not begin in 2009. It is logical that the EU4 countries identified as outliers later. It is because the first year of the financial crisis was characterised by a strong co-movement in all the countries.

[32] It should also be mentioned that, by definition, the cluster organisation is unstable in the cases of highly volatile changes. I needed to make two expert adjustments regarding the position of Denmark in 2000–2019 and the Czech Republic and Slovakia in 2000–2009.

Table 5.3: Cluster analysis — Used variables

	Indicator	Units		Indicator	Units
1	**GDP per capita**	2018 constant PPS (based on GDP deflator, absolute values)	16	**General unemployment rate**	Unemployed persons aged 15–74 to economically active population aged 15–74 (% values
2	**Government final consumption expenditure**	Shares of GDP (% values)	17	**Youth unemployment rate**	Unemployed persons aged 15–24 to total active population aged 15–24 (% values)
3	**Household and NPISH final consumption expenditure**	Shares of GDP (% values)	18	**GDP deflator**	Average annual rates of changes (% values)
4	**Gross capital formation**	Shares of GDP (% values)	19	**Price level index (PLI)**	PPS of GDP to nominal exchange rate (EU27=100)
5	**Exports of goods and services**	Shares of GDP (% values)	20	**General government gross debt**	Shares of GDP (% values)
6	**Total GDP**	Real changes based on implicit price deflator (% values)	21	**General government budget balance (net lending/borrowing)**	Shares of GDP (% values)
7	**Government final consumption expenditure**	Real changes based on implicit price deflator (% values)	22	**Long–term interest rate**	10y government bond yields – EMU convergence criterion (% values)
8	**Household and NPISH final consumption expenditure**	Real changes based on implicit price deflator (% values)	23	**General government revenue**	Shares of GDP (% values)
9	**Gross capital formation**	Real changes based on implicit price deflator (% values)	24	**General government expenditure**	Shares of GDP (% values)
10	**Exports of goods and services**	Real changes based on implicit price deflator (% values)	25	**Real effective exchange rate (REER)**	Based on 42 trading partners, deflated by HICP, annual average rates of changes (% values)
11	**Aggregate productivity**	GDP to total working hours – real changes based on GDP deflator (% values)	26	**Current account balance**	BPM6 concept Shares of GDP (% values)
12	**Intramural research & development expenditure**	Shares of GDP (% values)	27	**Real unit labour costs (RULC)**	Average compensation of employees (COE) to aggregate productivity – based on employment and GDP deflator (absolute values)
13	**Labour force participation rate**	Economically active aged 15–64 to total population aged 15–64 (% shares)	28	**Intra–EU27 trade**	Trade in goods, shares of total trade value (% values)
14	**Old–age dependency ratio**	Population aged 65+ to total population aged 15–64 years (% shares)	29	**Import intensity of exports**	Trade in goods, total value of imports to exports (% values)
15	**Compound tax quota**	Tax revenue including social contributions to GDP (% values)			

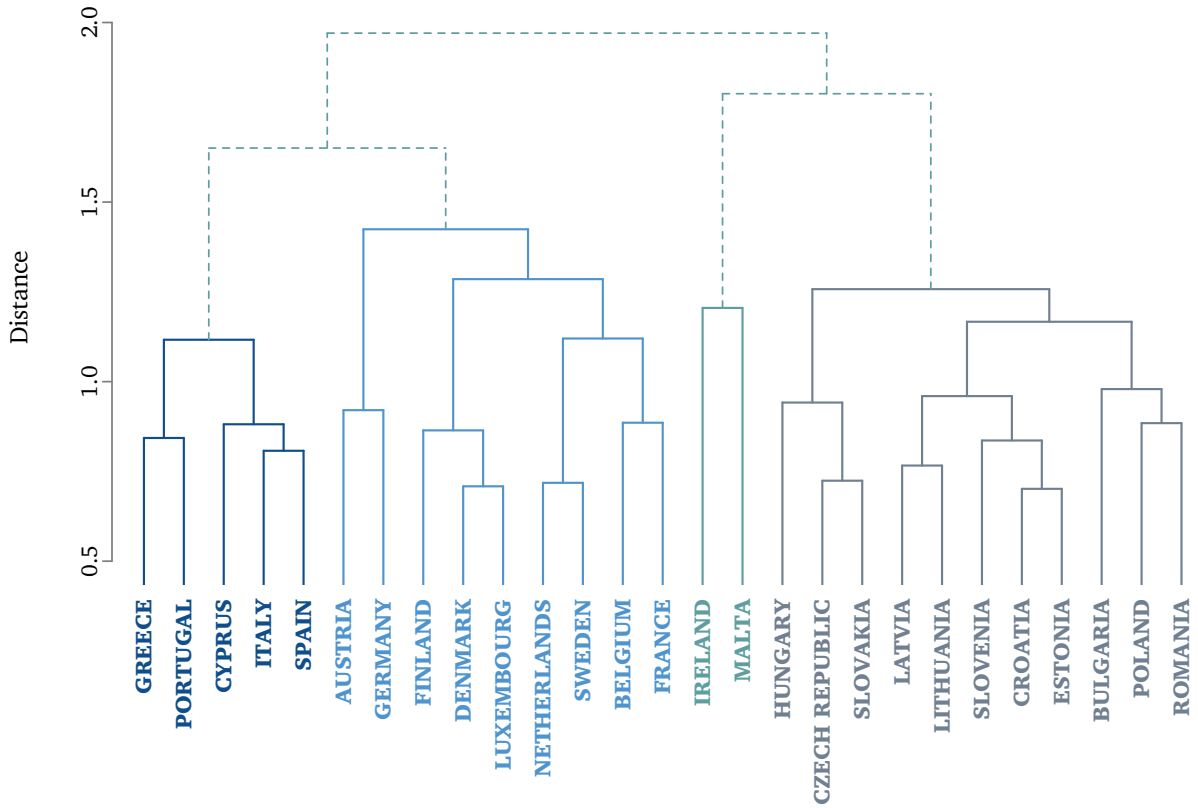
Note: The common problem is that Estonia has not issued any government bonds which could be used for the interest rate indicator. Therefore, the yield was calculated as a simple average of post-communist EU countries during each year.

Source: Eurostat (2020a), own calculations and processing.

5.2.1 Positions in the EU27

Figure 5.7 shows a cluster analysis of all the EU countries between 2000–2019. The algorithm distinguishes highly developed economies, less developed economies, and selected Southern countries (wing) of the EU. Moreover, it put together countries which are geographically and culturally similar. The "*German*" and the "*French*" wing within the more advanced EU countries is apparent in many cases. Furthermore, the test criteria indicate that four clusters are optimal, which is described by different colours. The main information is that Italy, Spain, Portugal, Greece, and Cyprus[33] were identified as a separate cluster within the more advanced EU countries between 2000–2019. It indicates that the countries form a relatively distinct region.

Figure 5.7: Cluster analysis (Ward's method) — EU27, 2000–2019



Source: own calculations and processing.

[33] The economic size of Cyprus is negligible, and it experiences political clashes on the island. For this reason, the country was not included in the analysis.

Cluster analysis of different periods, represented by Figure 5.8, provides other meaningful insights. The formal tests indicate that the optimal number of cluster is between 2–4.[34] It is clear that the EU4 countries form a relatively stable cluster because it held even in the pre-crisis, and financial crisis period.[35] Nevertheless, the period of 2017–2019 shows some changes. First, the EU4 countries formed the cluster with additional countries in this case. Second, Portugal and Spain were relatively further away from Greece, Italy, and Cyprus. The economic recovery fostered the changes, which made the distinctions less clear. However, I expect the situation after 2020 to follow the crisis (2010–2016) structure of clusters due to the coronavirus pandemic which can be considered as another significant economic shock which should promote economic differences.

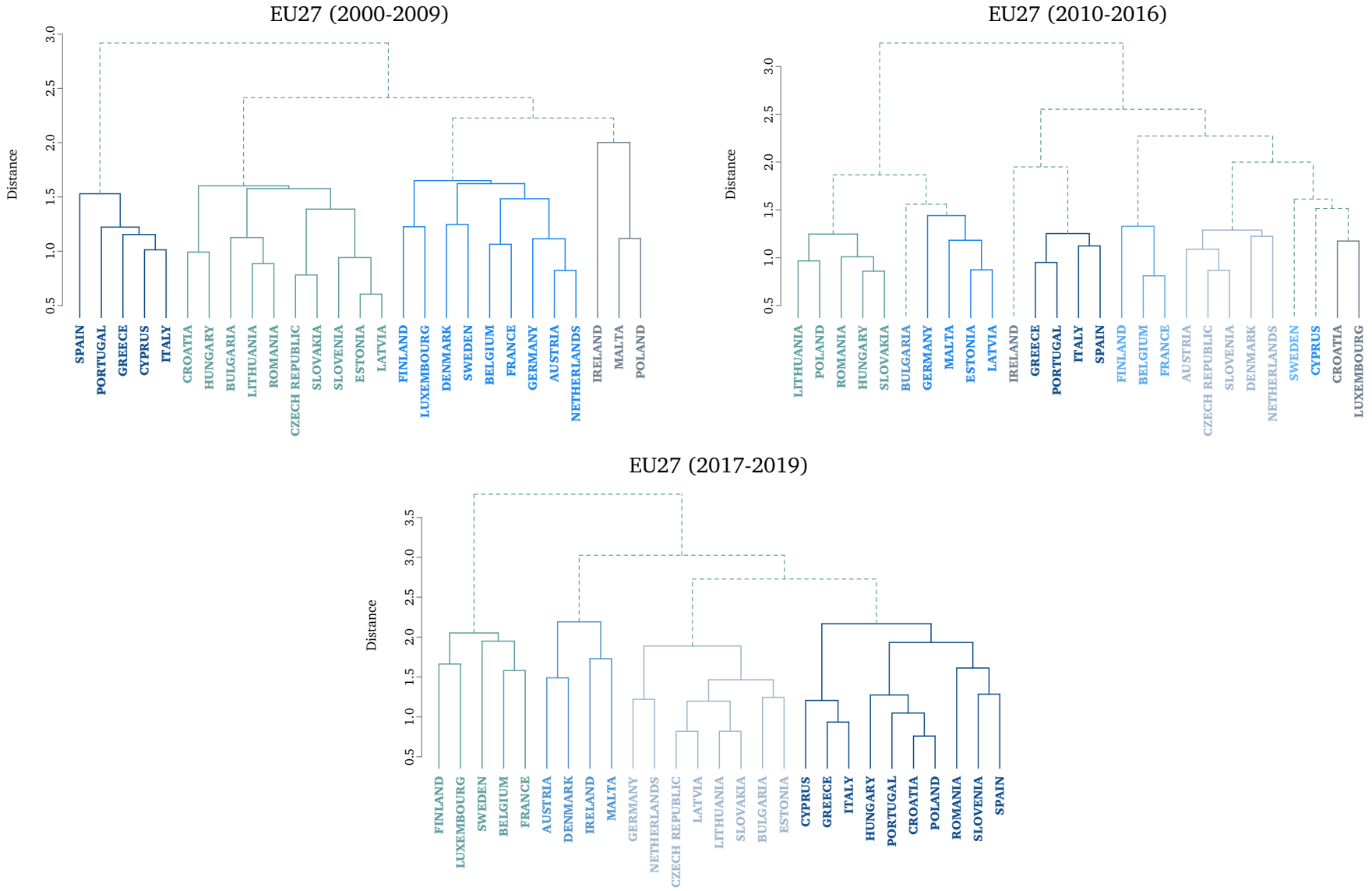
Finally, it should be mentioned that another Southern country — France, which is not examined in this work, clearly does not belong to the group of the four examined countries. I suspected such a result; therefore, I did not include this country in the analysis. The are several possible implications connected to the structural difference of France: disparate linkages to the other countries, different historical development, cultural specifics, and other factors.[36]

[34] With the exception of 2010–2016 where the number is possibly higher.

[35] A sizeable economic shock offers robust evidence as it forces economic specifics to show up. In other cases, however, considerably different countries (under normal circumstances) may show higher similarity due to a common negative external shock.

[36] The distance between France and the other countries is apparent in the subsequent cluster analyses.

Figure 5.8: Cluster analysis (Ward's method) — EU27 in different periods of 2000–2019

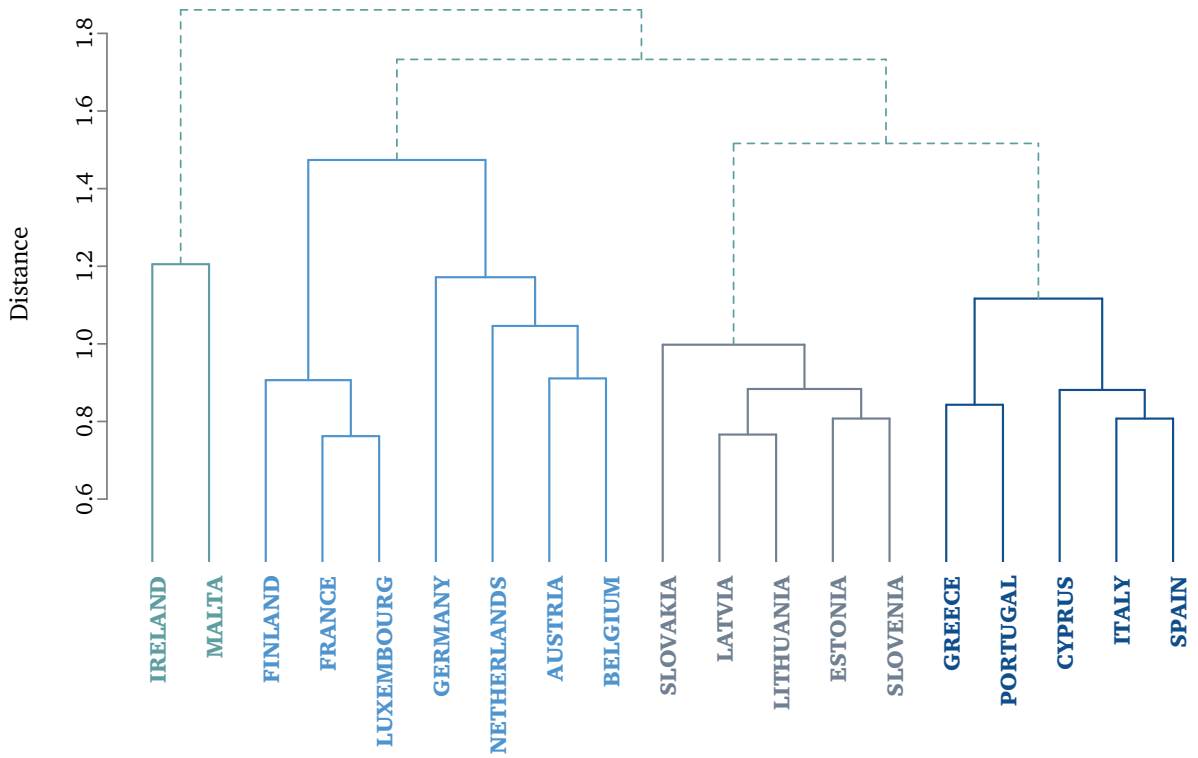


Source: own calculations and processing.

5.2.2 Positions in the EU19

The analysis of the Euro Area (EU19 or EMU) between 2000–2019 leads to the same conclusion as in the previous case. The algorithm distinguishes between advanced and less advanced economies. Surprisingly, the EU4 countries are closer to the less advanced economies within the Euro Area.

Figure 5.9: Cluster analysis (Ward's method) — EU19, 2000–2019

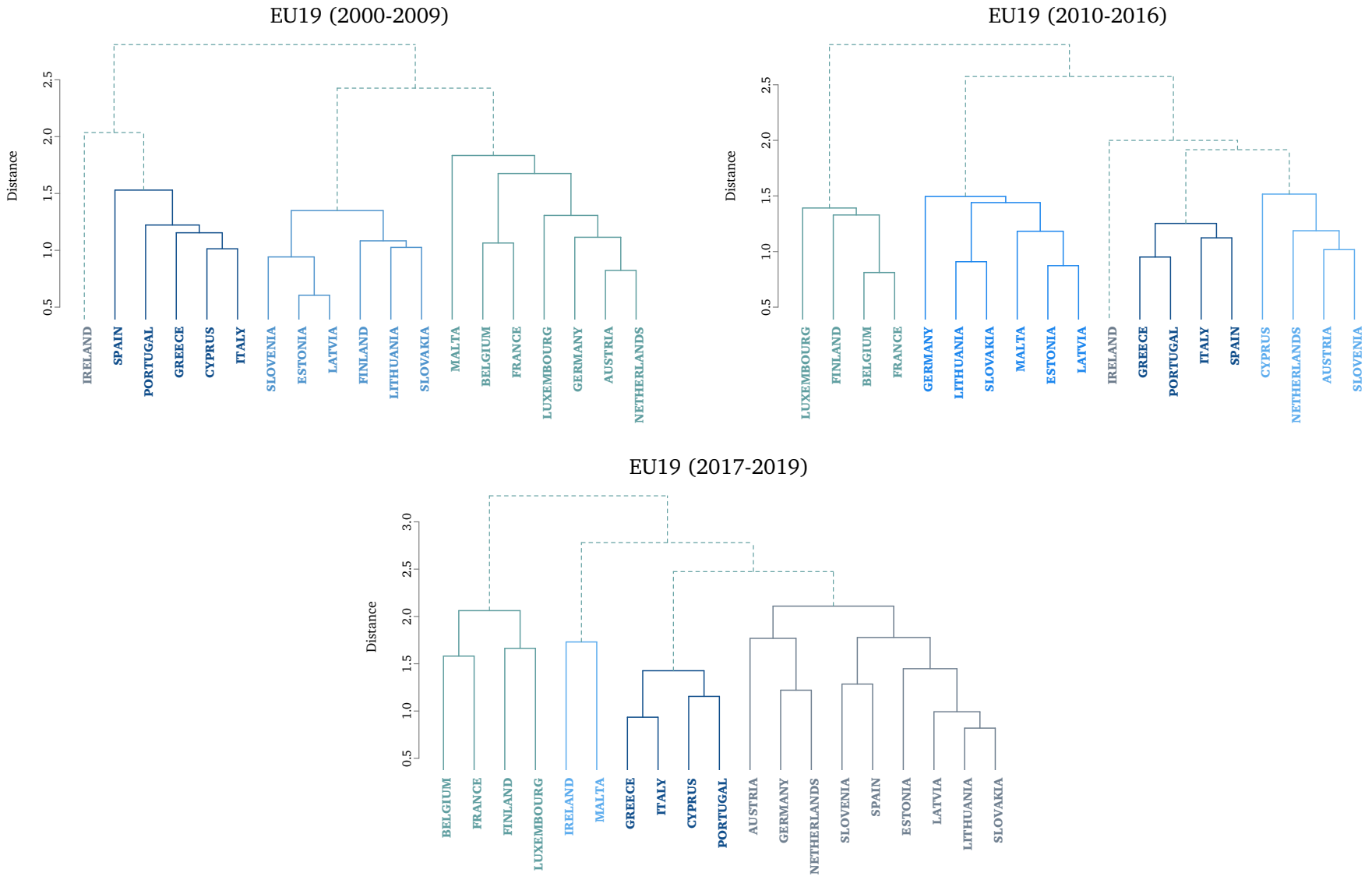


Source: own calculations and processing.

The tests of the optimal number of clusters indicate similar or slightly lower fragmentation of the EU19 countries when compared to the EU27. According to the tests, the Euro Area was more fragmented before the financial crisis. The EU4 countries formed a distinct cluster during all of the sub-periods of 2000–2019, except for Spain in 2017–2019. The fact is reinforcing the initial conclusion.[37]

[37] It is also worth mentioning that the algorithm was able to put Ireland close to the EU4 countries for the period 2000–2009 and 2010–2016. The country was also significantly hit by the crisis. However, the country has recovered, which is shown in the subsequent cluster arrangement (2017–2019).

Figure 5.10: Cluster analysis (Ward's method) — EU19 in different periods of 2000–2019

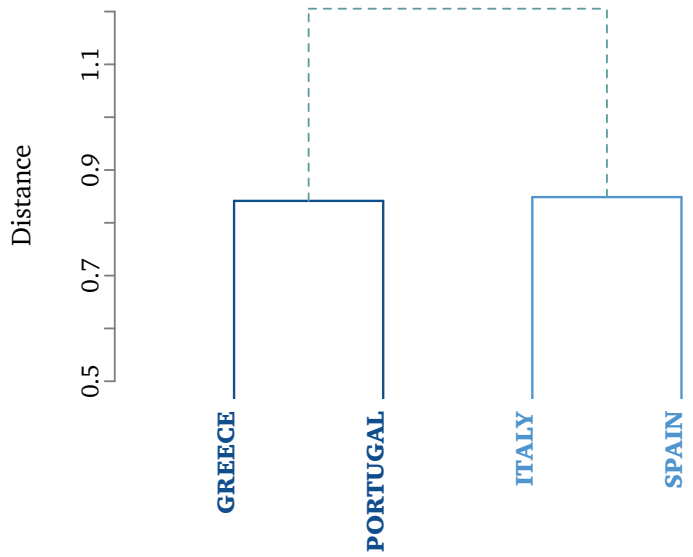


Source: own calculations and processing.

5.2.3 EU4 Positions in Relation to Each Other

The cluster analysis of EU4 between 2000–2019 produced two separate clusters. The results are presented in Figure 5.11. Greece is connected with Portugal, while Italy and Spain are more distinct. The separation follows the logical reasoning about the size and the development of the economies as presented in Section 5.1.

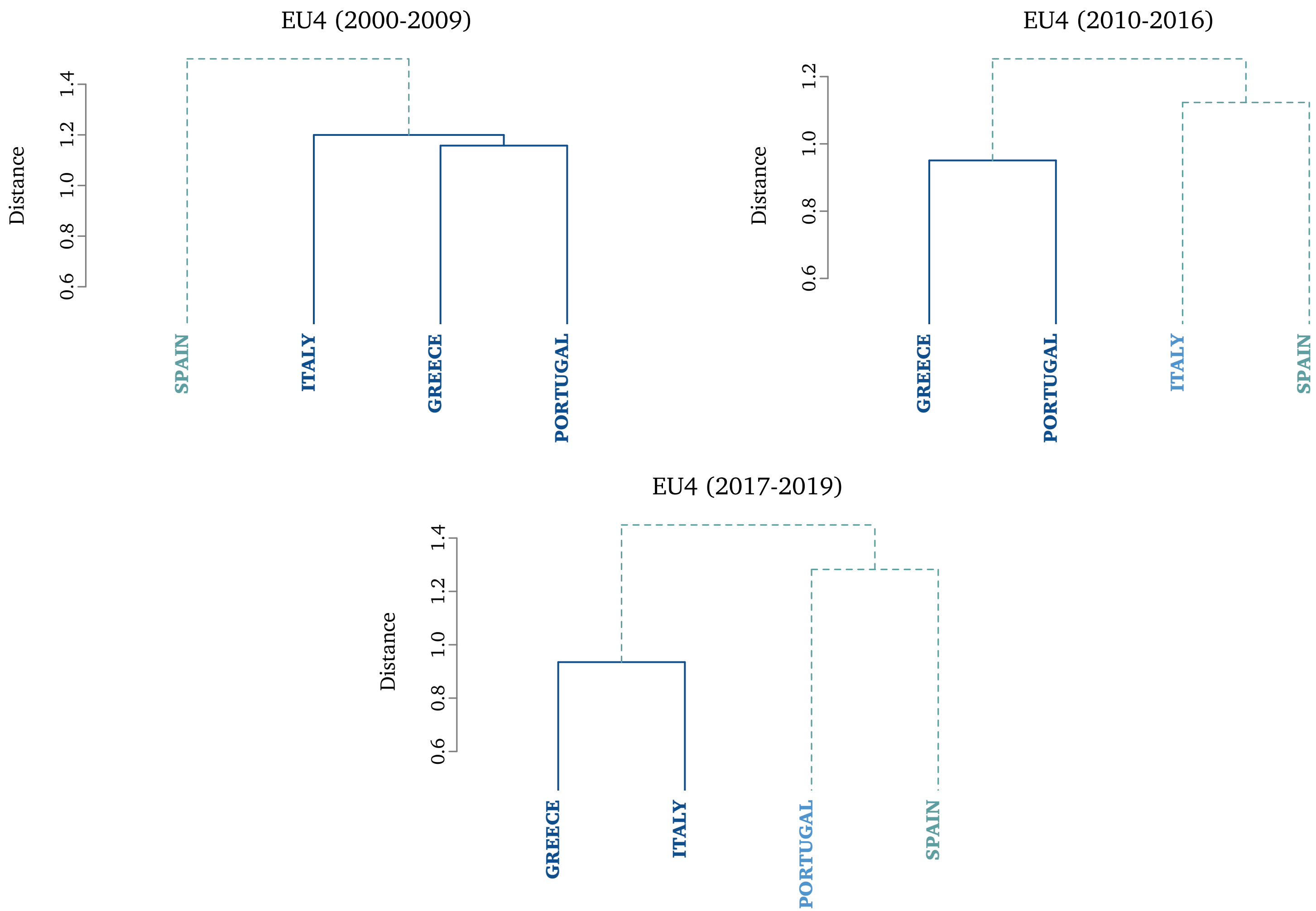
Figure 5.11: Cluster analysis (Ward's method) — EU4, 2000–2019



Source: own calculations and processing.

The time development, depicted in Figure 5.12, provides additional information. The formal tests initially recommended two clusters, but the situation changed since the financial crisis. The tests currently recommend three clusters indicating a higher fragmentation of the EU4 countries. Greece, Portugal, and Italy were initially in the same cluster between 2000–2009. However, Italy was put into a separate cluster during 2010–2016 due to the financial crisis. The fact is in a slight contrast with the occurring in the EU27 and the EU19. They showed a higher fragmentation during the financial crisis, but it decreased after 2016. Finally, the newest data of 2017–2019 indicate that Italy has changed position with Portugal and now belongs to a separate cluster with Greece.

Figure 5.12: Cluster analysis (Ward's method) — EU4 in different periods of 2000–2019



Source: own calculations and processing.

5.3 Key Findings

The EU4 countries are considered democratic and relatively well developed mixed economies. Italy and Spain are by far the largest economies of the four examined countries. Hence, their economic instabilities affect the EU much more significantly. The countries were going through significant economic turbulences after the recession, partly caused by inappropriate macroeconomic policies. It was reflected in sizeably negative output gaps, high unemployment rates, external disbalances, and accumulated debt levels. According to the composite indices, Spain is probably the most efficient economy of the EU4 countries,[38] followed by Italy and Portugal, while Greece is last.

Structural characteristics of the countries were rapidly developing during the examined period. Nevertheless, I verified that the EU4 countries should be concurrently analysed because of their structural similarities.[39] The four examined countries form a separate group within the EU27 and the EU19.[40] Moreover, the 2008–2009 financial crisis shock further promoted the distinction. I identified 2010 as the "*cut-off*" year.

The EU4 cluster was evident in all the sub-periods of 2000–2019.[41] The larger countries (Italy and Spain) form one group of EU4 countries while the smaller countries (Greece and Portugal) form the other group, according to the size and the economic development of the countries. Nevertheless, the EU4 group became more fragmented after the financial crisis.

[38] It is also indirectly suggested by the cluster analysis, refer to Figure 5.12.

[39] Moreover, it is shown that another significant Southern EU country — France, does not belong to the group.

[40] Cyprus can also be considered as a member of the group in some cases. However, the economic size of Cyprus is negligible, and it experiences political clashes on the island. For this reason, the country was not included in the analysis.

[41] However, the period of 2017-2019 within the EU27 showed some changes. The EU4 countries formed a separate cluster with additional countries, while Portugal and Spain were relatively further away from Greece, Italy, and Cyprus. Also, the position of Spain changed between 2017 and 2019 within the EU19. The country was located further away from the other EU4 countries.

6 Principal Analysis of Fiscal Policies

> *One of the great mistakes is to judge policies and programs by their intentions rather than their results.*
>
> **— Milton Friedman**
> (US economist, 1912–2006)

The starting point for any fiscal analysis is the historical development of fiscal policies and their implications. The examination has several dimensions. First, both flow and stock indicators need to be examined. Second, the analyses utilise estimated and actual data. The analysed factors are considerably volatile. However, this chapter focuses on identifying relatively stable patterns. The findings will provide general information about fiscal conditions of the selected countries.

The chapter has three main parts. First, it shows the main fiscal indicators of the EU4 countries. The measures have limited explanatory power but are based on directly observed data. Second, it presents estimates of structural budget balances, examines their development, and derives characteristics of the EU4 fiscal policies. Several estimates need to be performed to be able to extract relevant information. Hence, the text provides a detailed description of the used procedures. Third, it evaluates the countries' positions from a long-term view using a fiscal sustainability analysis. I acknowledge that this chapter contains a great deal of information about each country and the depth of the analysis makes it difficult to track all the implications. Therefore, a complex overview of the findings is provided in the last section.

6.1 Main Fiscal Indicators

The starting point of the analysis is the examination of various descriptive measures capturing the fiscal situation of the countries. I start with the broadest measures and proceed to more detailed indicators. It should be noted that some data, especially for Greece, are not publicly available. Therefore, I approximated the values or used alternative sources when it was possible. Moreover, the following text presents three groups of the examined measures: headline indicators, variables capturing debt structure, and selected benchmark indicators. Finally, it focuses on both the frequency (flow vs stock indicators) and time dimension (short- vs long-term indicators).

6.1.1 Headline Indicators

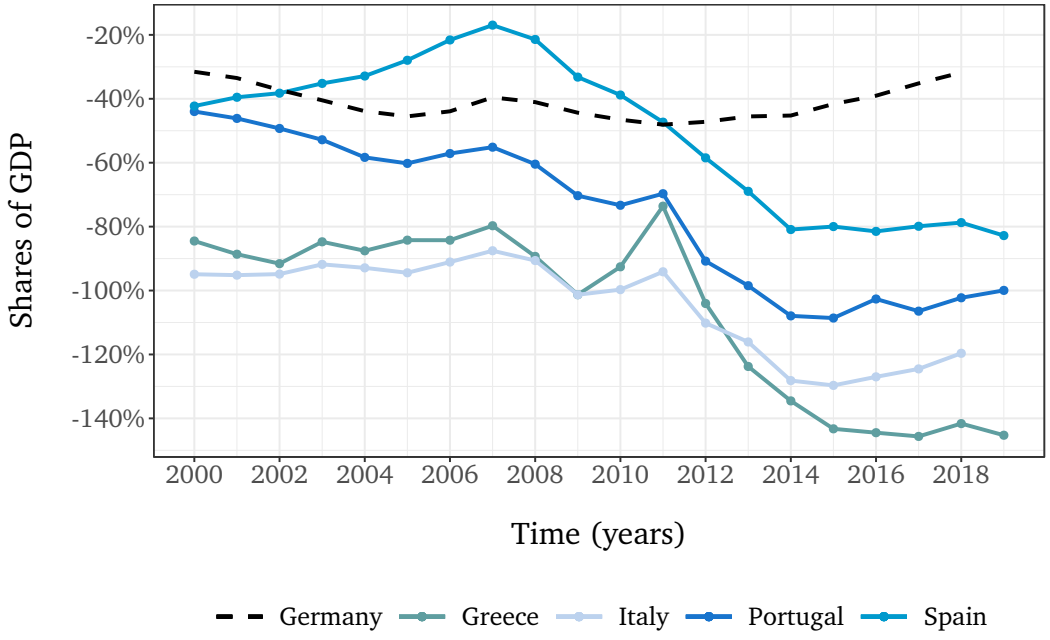
Possibly one of the broadest measures is general government net wealth (or net worth) indicator which shows the differences between financial assets and outstanding liabilities held by the government. It summarises the government's ability to fully honour its obligations, and it can also be viewed as a broad measure of net government debt (OECD, 2017). Worsening of this indicator is directly connected to worsening of the government's fiscal position in terms of sustainability. Nevertheless, the vast majority of countries show negative values because they are significantly indebted (OECD, 2020), meaning that their liabilities are higher than their assets.[1] The average value for the Organisation for Economic Co-operation and Development (OECD) countries were −16.3% in 2019. Figure 6.1 shows the situation of the EU4 countries, along with Germany[2] which can be considered as the EU's most powerful and stable economy. First, the initial positions of Spain and Portugal were relatively favourable until 2008 when they started to sharply decline. After the recession, the EU4 countries showed a significant worsening of the indicator. Second, the positions of Greece and Italy were already unfavourable in 2000. Hence, the countries showed a much sharper decline after the recession as a result of a negative snowball effect. In contrast, the position of Germany was gradually improving since the financial crisis of 2008–2009. Finally, the

[1] There are few exceptions, for example, Norway showed a positive value of 333% of its GDP in 2019 because of its relatively low indebtedness and significant financial assets stemming from the possession of natural resources.

[2] The reason is that aggregated data for the Euro Area are not available.

EU4 countries are showing the worst values in the OECD's sample. Greece with −145.2% placed last (OECD, 2020).

Figure 6.1: General government net financial wealth — Shares of GDP — EU4, 2000–2019

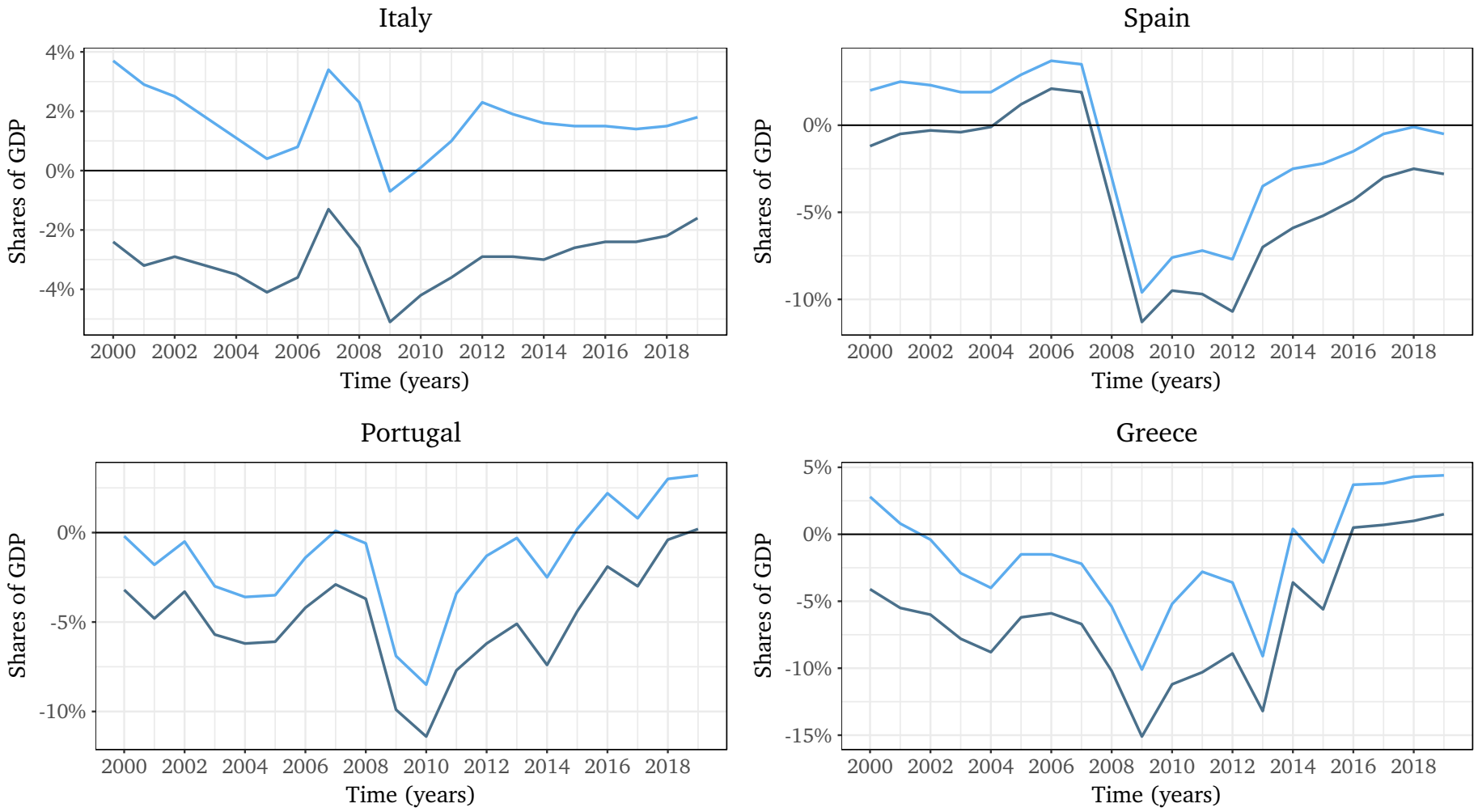


Source: OECD (2020), own processing.

It was already shown in Section 5.1 that the EU4 countries' government balances were sources of significant economies instabilities when compared to the other economic sectors. The overall budget balances, along with primary balance indicators, are presented in Figure 6.2. The two measures are crucial for a proper interpretation of the occurring. The data show that, on average, all of the countries ran non-negligible budget deficits. It should be mentioned that Spain was able to reach roughly balanced overall budget measure until the financial crisis. In addition, Italy was characterised by chronic budget deficits for all the examined period. However, the deficits were relatively small when compared to the other countries. Note that the position of Italy could have been misinterpreted if it was based only on the interpretation of the overall budget balance indicators. The country suffered from relatively high interest payments on government debt. The country was running budget surpluses after deducting the payments from the overall budget balance measure.[3] The developments in Portugal and Greece were conceptually similar. Nonetheless, the latter country showed higher volatility.

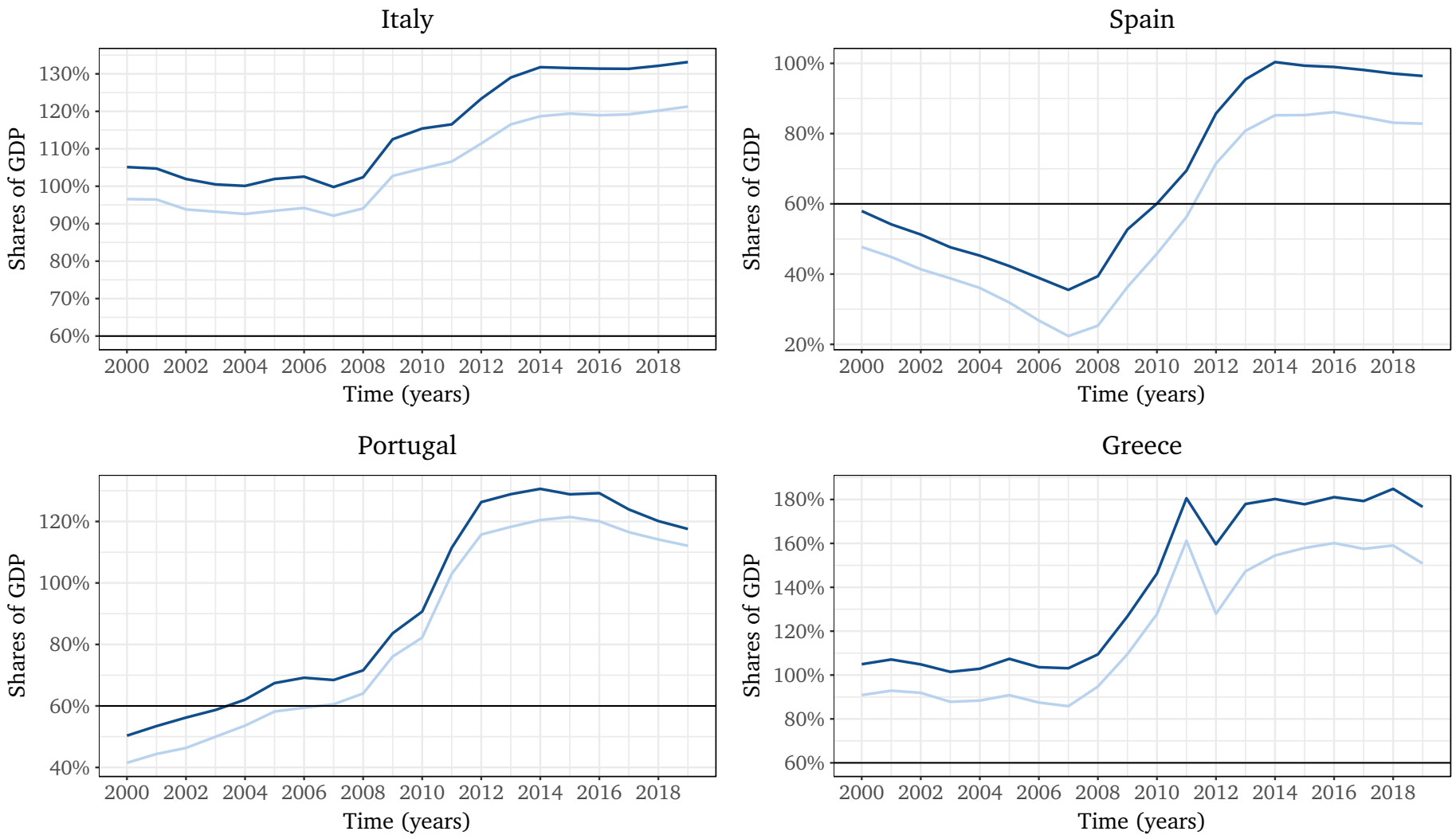
[3] It is represented by the primary budget balance measure. Note that the deduction of payments is a double minus which translates into arithmetic addition.

Figure 6.2: Overall and primary balance of general government sector — Shares of GDP — EU4, 2000–2019



Source: Eurostat (2020a), own calculations and processing.

Figure 6.3: General government gross and net debt — Shares of GDP — EU4, 2000–2019

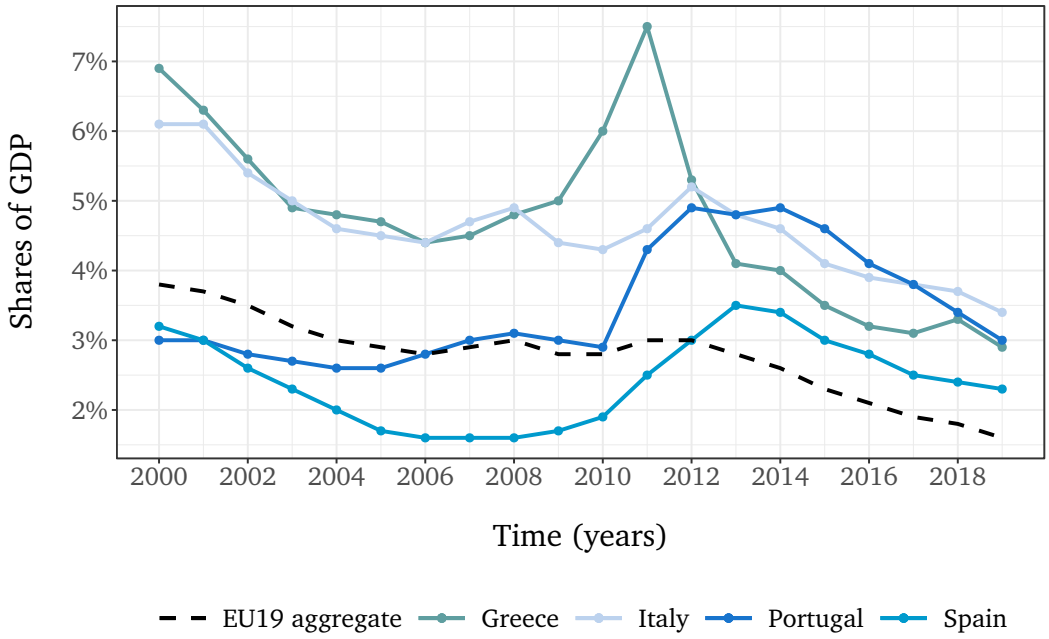


Note: The values for the general government net debt of Greece are not available. However, they were approximated by deducting half of general government gross financial assets from the gross indicator. Based on the actual data of the three other countries, it is an adequate approximation.

Source: ECB (2020) and OECD (2020), own calculations and processing.

The interest payments on general government debt are shown separately in Figure 6.4 below. The measure is more precise than the Maastricht long-term interest rate criterion because it is a broader indicator. The interest payments on debt were more significant in Greece and Italy than in the other two examined countries. The discrepancies were a result of the differences in risk profiles of the countries to some extent.

Figure 6.4: Interest payments on general government debt — Shares of GDP — EU4, 2000–2019



Source: ECB (2020), own processing.

There is a noticeable divergence in the developments between 2008 and 2013 as a result of the financial crisis. Nevertheless, the quantitative easing programmes (among others) of the ECB pushed the interest rates together, and the countries showed relatively small differences when compared to past development. These levels, without any doubt, do not reflect the macroeconomic fundamentals of the countries.[4] They rather represent the result of the socialisation of risks in the Euro Area.

Figure 6.3 depicts the overall general government gross and net debt to GDP ratios. The EU4 countries are among the most indebted countries in the world. In 2019, Greece was 3rd the most indebted country in the world, measured by general government gross debt to GDP ratios, after Sudan and Japan (see IMF, 2020b). Moreover, Italy was 6th, Portugal was 8th, and Spain was 17th the most indebted country (ibid.).

[4] Refer to the previous sections.

I included a horizontal line marking 60% debt to GDP ratio in Figure 6.3 to capture the corresponding Maastricht criterion limit. The data show that the debt ratios sharply increased after 2008 and stabilised since 2014. All of the countries significantly exceeded the Maastricht criterion limit. Furthermore, the differences between gross and net debts are relatively small and do not influence the interpretation of the occurring.

Lastly, the total outstanding liabilities of government-controlled entities are depicted in Table 6.1. The liabilities influence the level of public debt and are not captured within the general government sector. Unfortunately, the data are not consolidated, the respective values which would cover the whole examined period are not available.

Portugal and Spain showed lower values than the EU19 aggregate. Portugal was able to reduce the level of outstanding liabilities significantly. In addition, Italy's liabilities slightly changed and are above the EU19 average by approximately 13 percentage points. Greece can be considered as an outlier. The country's outstanding liabilities were practically non-existent in 2013. However, they reached a prohibitive level of approximately 120% in 2017 and were dramatically increasing the Greek risk premium.

Table 6.1: Total outstanding liabilities of government-controlled entities classified outside general governments (non-consolidated) — GDP ratios — EU4, 2013–2018

Year	EU19 aggregate	Italy	Spain	Portugal	Greece
2013	48.12%	45.45%	12.46%	51.79%	6.82%
2014	50.08%	44.30%	37.80%	79.30%	15.40%
2015	50.16%	47.41%	29.57%	72.83%	91.37%
2016	53.17%	51.87%	25.71%	66.22%	144.25%
2017	48.79%	55.64%	23.00%	38.23%	119.56%
2018	40.07%	52.78%	20.99%	34.33%	119.90%

Source: Eurostat (2020a), own processing.

6.1.2 Debt Structure and Related Indicators

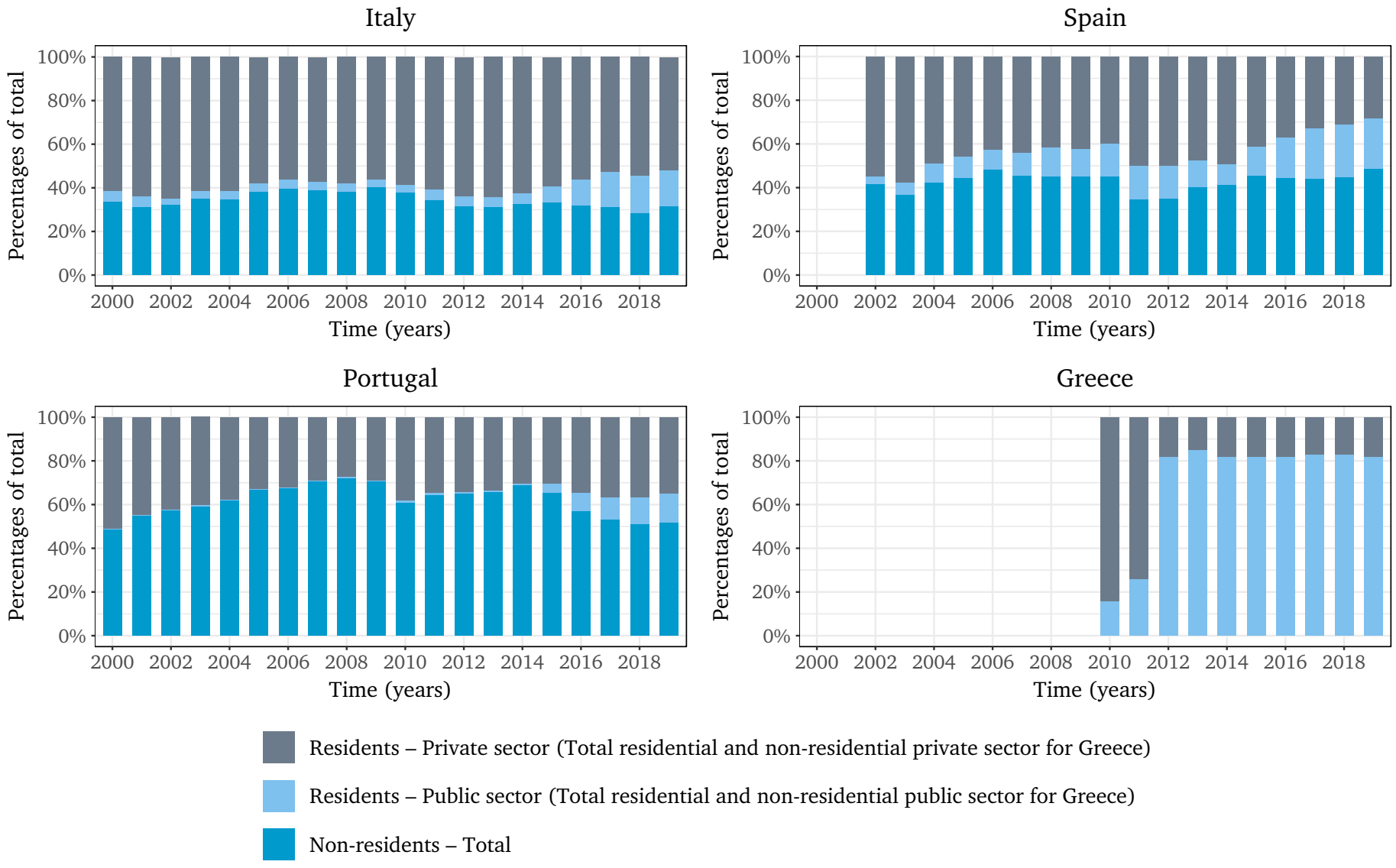
One of the most critical indicators regarding debt structure is the composition of debt holders. It provides information about perceived risks or government interventions. The data are more demanding on the input information; therefore, it is often difficult to obtain them. In this case, they were collected from the respective EU4 national sources. Nevertheless, it was not possible to obtain the same division for Greece. The Greek Public Debt Management Agency (PDMA) is the only official source that provides relevant information publicly, but it does not distinguish between residents and non-residents. Hence, the data for Greece reflect the private-public sectoral composition only.

Eurostat (2020a) provides values for most of the EU countries. The EU average may serve as a benchmark. In 2019, the EU26 countries (without Greece due to data unavailability) showed that non-residents held 49.3% of their general government gross debts. However, the values were diverse throughout the countries. For instance, Cyprus recorded that 80.1% of its debt was held by non-residents, while Malta showed only 15.2% (ibid.).

The data for the EU4 countries are depicted in Figure 6.5. First, Spain and Italy are below average when considering non-residential debt holders which can be considered as a positive contribution to their situation. Nevertheless, the residential public sector holdings have increased since 2014. Second, the data show some changes after 2008. However, most of them have been pronounced solely in Greece. Since 2012, the Greek general government gross debt is held predominantly by the public sector as a result of government interventions. It can be argued that this indicator already suggests that the country de facto bankrupted because the private sector perceived the risks prohibitively high and decided not to participate in the new debt emissions (or holdings). The private sector shares are much higher in the other EU4 countries.

Another crucial characteristic is the share of foreign currency-denominated debts. High foreign currency-denominated debt shares are problematic when a serious domestic currency depreciation takes place. Figure 6.6 shows that these shares are negligible, except the period of 2011–2017 in Portugal. Nevertheless, Portugal's foreign currency-denominated debt share has gradually declined since 2014 because the country preferred to issue new debt in the domestic currency (euro).

Figure 6.5: General government gross debt decomposition — Debt holders by residency, shares of total — EU4, 2009–2019

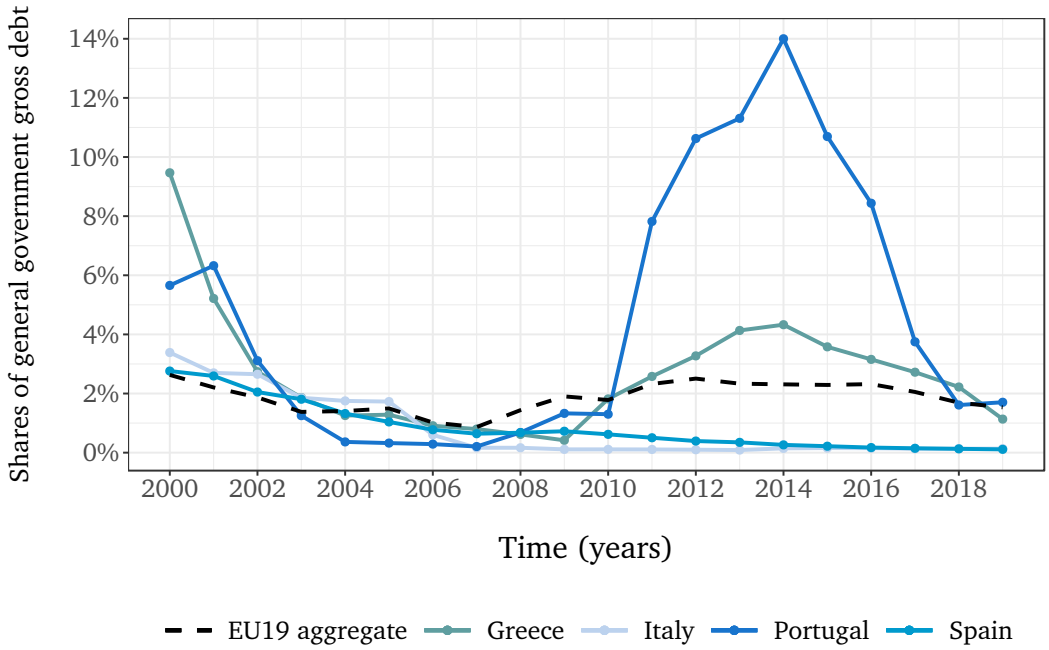


Note: The data for Greece reflect the private-public sectoral composition only due to data unavailability.

Source: Bank of Italy (2020), Bank of Portugal (2020), PDMA Greece (2020), and Spanish Ministry of Finance (2020), own calculations and processing.

It should be noted that this is possible because the EU4 countries are members of the Euro Area, hence, sharing the same currency.

Figure 6.6: General government gross debt denominated in foreign currencies — Shares of total — EU4, 2000–2019

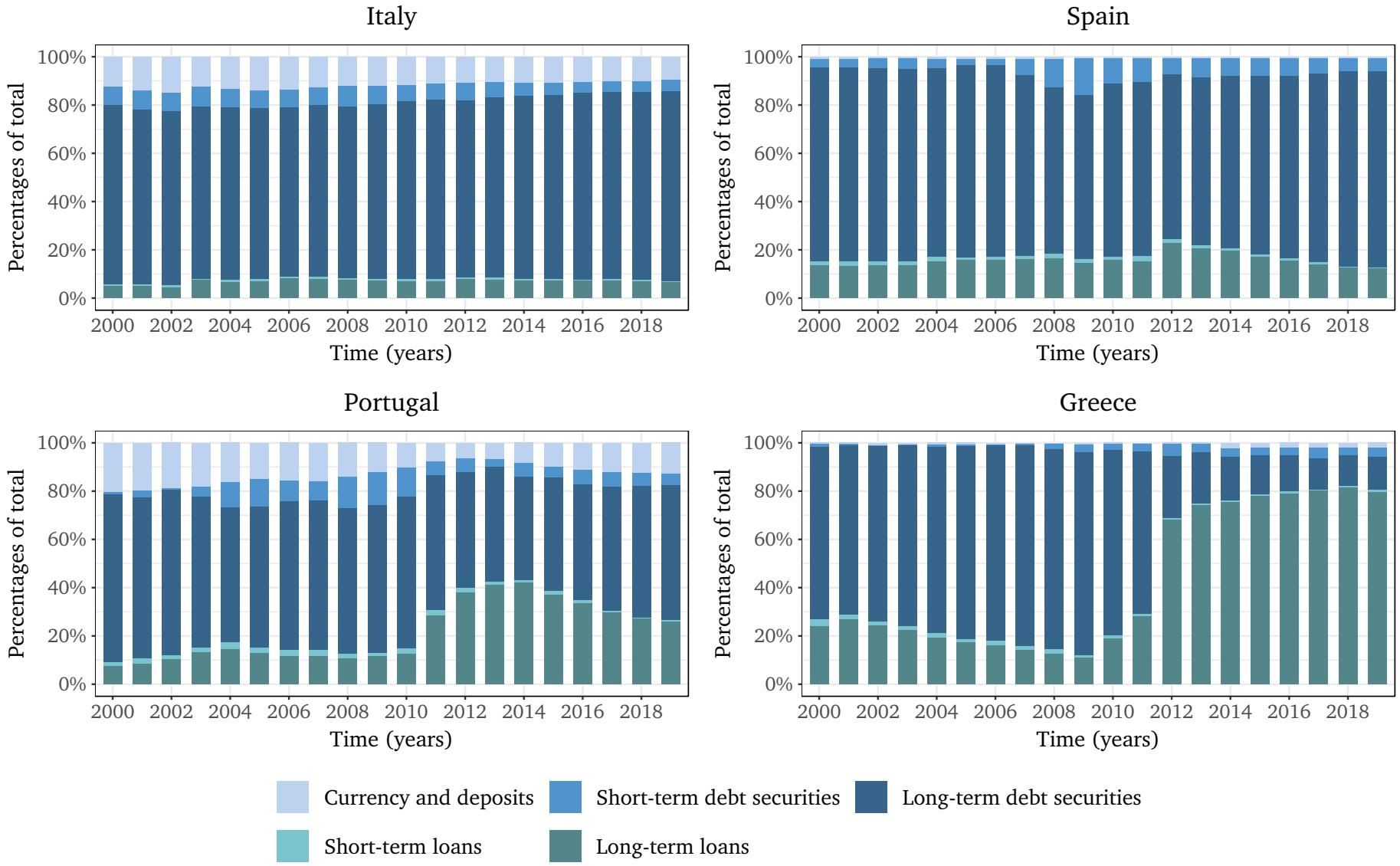


Source: ECB (2020), own calculations and processing.

Figure 6.7 shows the structure of the debts regarding financial instrument composition. It represents a first step in analysing the government financing needs in terms of the short-term and long-term funding of its liabilities. Italy, Spain, and Portugal have the majority of their general government debt in long-term debt securities. The ratio is similar to the Euro Area countries. According to Eurostat (2020a), the EU19 countries had 76.3% of their general government debts in long-term debt securities. Since 2012, Greece has transformed most of its debt into long-term loans making their financing needs more spread in time, making it easier to repay. The similar occurring was in Portugal; however, the magnitudes were much lower, and the shares have started to decline since 2014.

Table 6.2 shows the residual maturities of government debt securities between 2009–2019. The shorter the maturity is, the more liquidity (short-term financial funds) the country needs to have. All the countries' values were rather close to the EU19 aggregate for the examined period with few exceptions.

Figure 6.7: General government gross debt decomposition — Financial instruments, shares of total — EU4, 2000–2019



Source: Eurostat (2020a), own calculations and processing.

First, the EU19 countries managed to, on (weighted) average, increase their residual maturities from 2009 to 2019 by 1.1 years. Second, Greece had more than average residual maturity for the whole period, which was a positive occurring per se. Finally, Portugal had a comparatively shorter residual maturity. From this point of view, the country needs to have more prompt financial resources.

Table 6.2: Average residual maturity of government debt securities (non-consolidated, outstanding amounts) in years — EU4, 2009–2019

Year	EU19 aggregate	Italy	Spain	Portugal	Greece
2009	6.4	7.3	6.5	6.1	7.9
2010	6.4	7.4	6.7	6.1	7.3
2011	6.3	7.2	5.9	6.0	6.8
2012	6.3	6.8	5.7	5.5	7.8
2013	6.3	6.6	5.3	5.1	7.9
2014	6.5	6.5	5.9	5.8	8.5
2015	6.6	6.6	6.2	6.6	8.5
2016	6.9	6.8	6.6	6.4	8.0
2017	7.1	7.0	7.0	6.1	8.3
2018	7.3	6.9	7.4	6.1	7.7
2019	7.5	6.9	7.6	6.3	8.0

Source: ECB (2020), own processing.

Figure 6.8 shows the structure of the debt service for the EU4 countries. The shares are very similar; most of the debt service consists of principal repayments. Moreover, the respective GDP shares are relatively high. For illustration, the debt service for the EU19 aggregate was 12.2% of its GDP (Eurostat, 2020a). Italy consistently showed the highest values for all the examined period. In 2019, it was roughly 20% of its GDP, which may be considered alarming.

The total general government gross financing needs and their structures are shown in Figure 6.9. The data show that most of the financing needs consists of debt service. Therefore, the conclusions are similar. The gross financing needs to GDP ratios decreased from 2009 to 2019 in all the EU4 countries. However, the values were considerably high

(especially those of Italy) when compared to the EU19 aggregate which showed 12.8% in 2019. The fact indicates significant liquidity pressures.

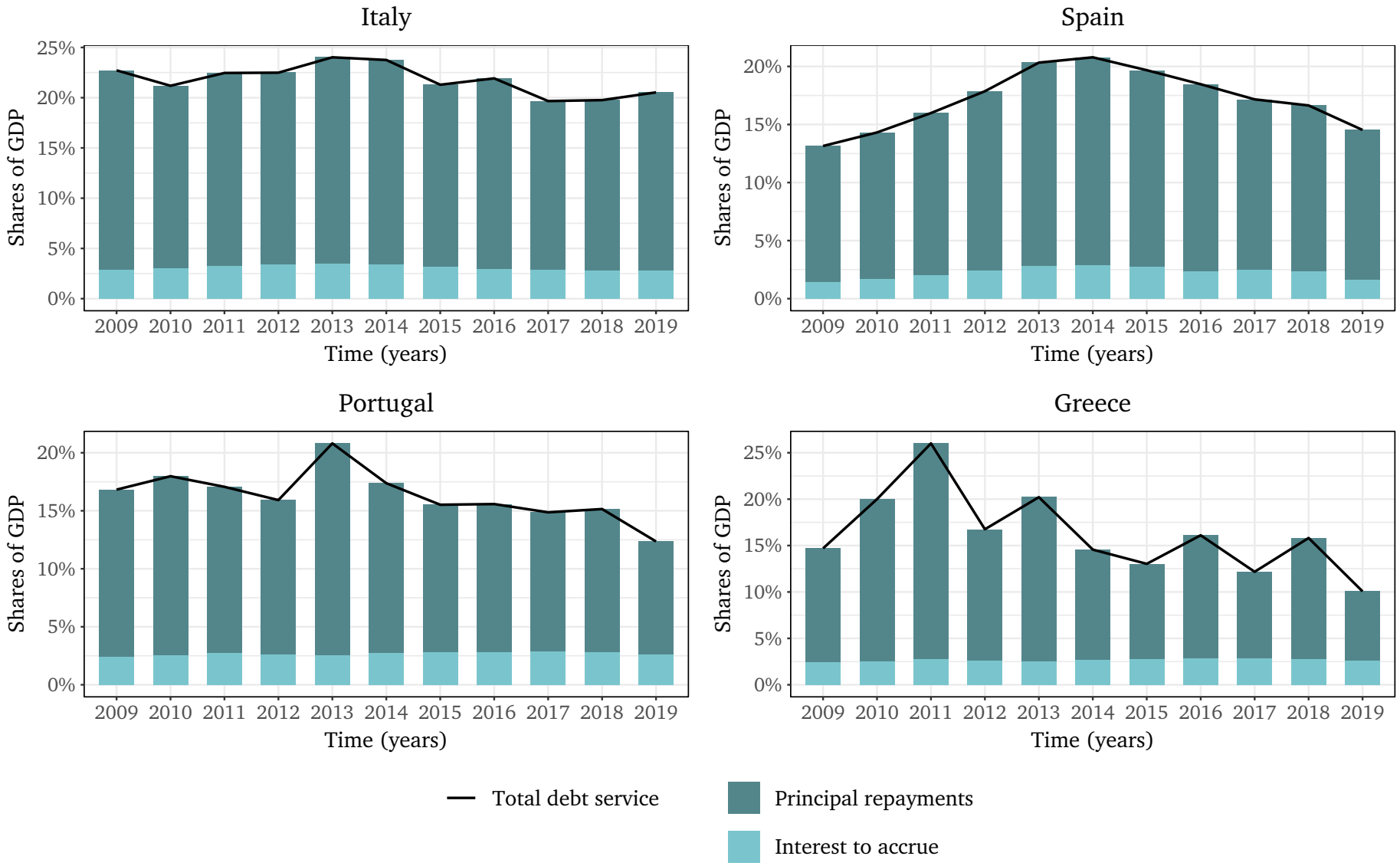
The levels of private-sector debts need to be also examined. The values are crucial because higher private indebtedness lowers the capacity to fund the public debt. According to Eurostat (2020a) and own calculations, the simple average of the consolidated private sector debt to GDP ratios for the EU19 countries was 144% in 2018. Italy, Spain, and Greece recorded below-average values of 115.5%, 134.4%, and 107% respectively. At the same time, Portugal showed a significantly higher value of 155.4%.

Finally, it is necessary to take into account that changes in the total debt stock usually does not reflect the changes in the overall budget balances perfectly. This is shown in the so-called stock-flow adjustment indicator, which is covering transactions that affect the overall level of debt stock but are not recorded in the budget balances. The transactions may include privatisation receipts, debt relief, bank recapitalization expenditures, and other factors.

The stock-flow adjustments are usually significant and can be a subject to various practices which may show the debt level in a more positive outlook than it deserves. The values for the EU4 countries are shown in Figure 6.10 further below. Positive values increase the overall debt stock, while negative values decrease the level of debt.

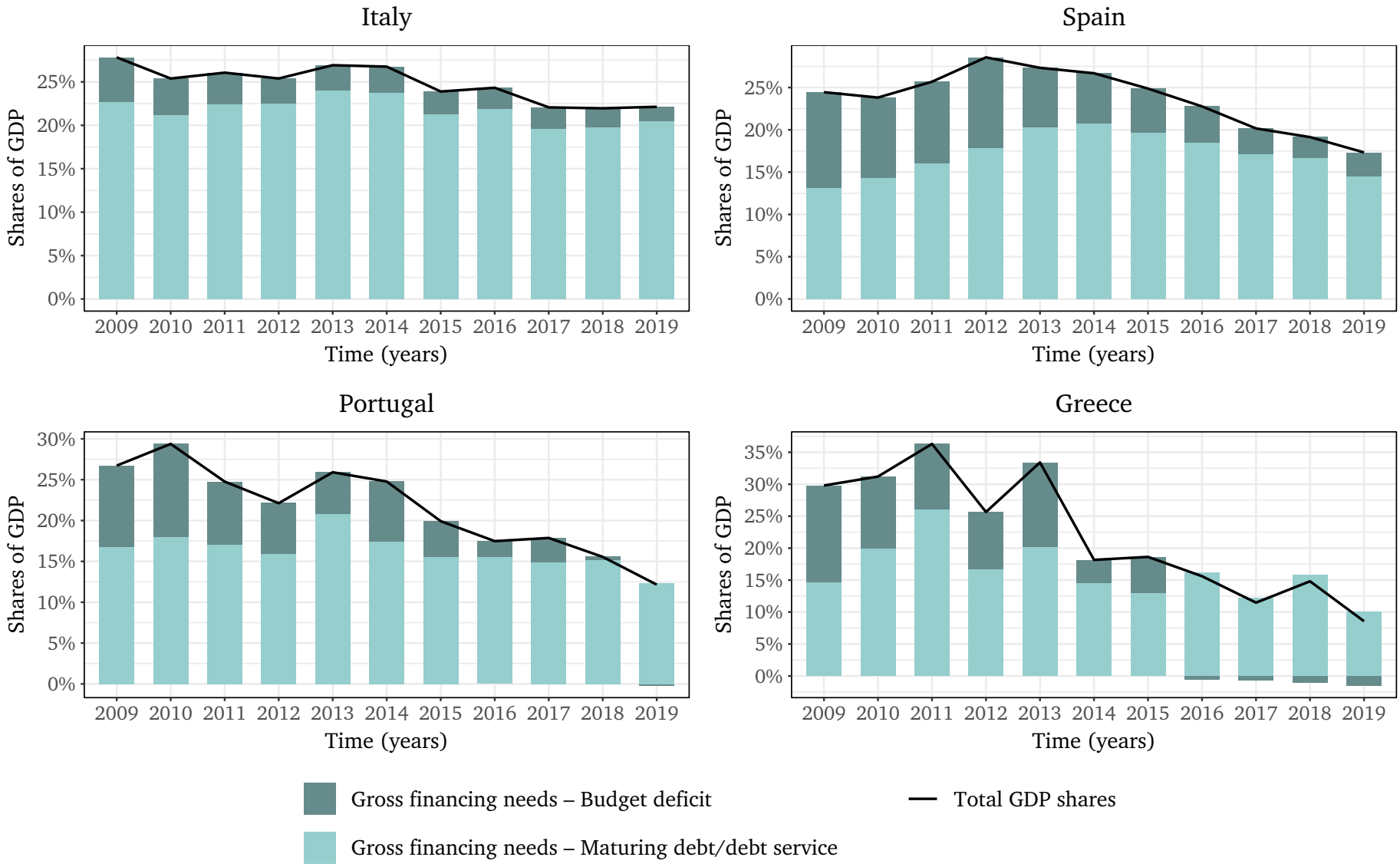
First, the values were relatively high in the EU4 countries. Second, the countries showed significant volatilities during the financial crisis (between 2010-2014). Third, Greece has recorded a substantial decrease in its debt level in 2012. According to Xafa (2014), it was the largest debt restructuring in the history of sovereign defaults, and the first within the Euro Area. The Greek debt relief of 2012 was amounting to roughly 60% of its GDP. Nevertheless, it was arguably "*too little too late*" in terms of restoring the debt sustainability of Greece (ibid.).

Figure 6.8: General government debt service (due in 1 year) decomposition — Shares of GDP — EU4, 2009–2019



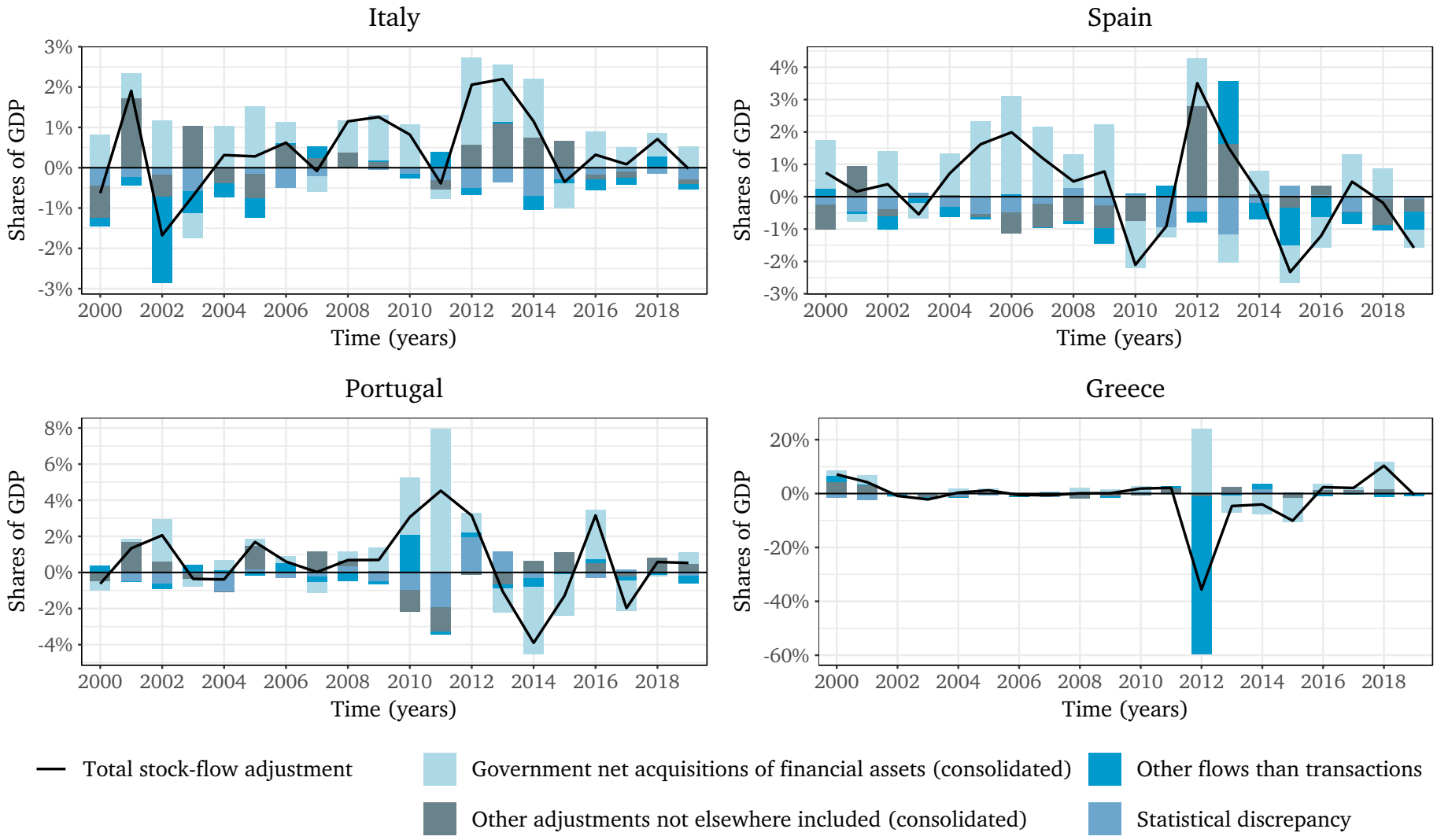
Source: ECB (2020), own processing.

Figure 6.9: General government gross financing needs decomposition — Shares of GDP — EU4, 2009–2019



Source: ECB (2020) and Eurostat (2020a), own calculations and processing.

Figure 6.10: General government debt — Stock-flow adjustment decomposition — Shares of GDP — EU4, 2000–2019



Source: ECB (2020), own calculations and processing.

6.1.3 Selected Benchmarks

Table 6.3 shows selected fiscal benchmarks which are based on empirical works of international institutions. The European Commission's indicators were obtained from the Macroeconomic Imbalance Procedure Scoreboard (Eurostat, 2020b) and the IMF's benchmarks from their relevant fiscal guidelines[5] (see IMF, 2013). It shows average values between 2014–2019 because the period represents an economic recovery after the financial crisis.[6]

Table 6.3: Selected benchmark indicators — Average values — EU4, 2014–2019

Country / Benchmark	Gross gen. gov. debt / GDP	Debt share of non-residents	Private sector debt / GDP	Short-term gov. debt share (Δ)
Benchmark – EC	60%	-	133%	-
Benchmark – IMF	60% – 70%	30% – 45%	-	1.5% – 2%
Italy	134.87%	31.55%	112.30%*	−5.40%
Spain	98.47%	44.82%	145.83%	−6.39%
Portugal	126.92%	57.89%	167.77%	+4.78%
Greece	177.87%	N/A	120.85%	+2.23%

Country / Benchmark	Gov. gross financing needs / GDP	Bond spread vs Germany (bps)**	Current account balance / GDP	Net intern. investment position / GDP
Benchmark – EC	-	-	+6% to −4%	−35%
Benchmark – IMF	15% – 20%	400 – 600	- or +−5%	-
Italy	23.52%	176 bps	+2.33%	−11.10%
Spain	21.83%	121 bps	+2.25%	−85.00%
Portugal	17.96%	213 bps	+0.53%	−111.75%
Greece	14.54%	592 bps	−1.55%	−140.00%

*Due to data unavailability, an average value for the period of 2014–2018 is used.

**Long-term government bond yields are used (≈ 10-year maturity, EMU converg. criterion).

Source: own calculations and processing.

[5] The IMF provides a broad spectrum of possible benchmark values. Therefore, the table uses intervals which are denoting either medium- or high-risk values.

[6] Refer to the previous chapter (Section 5.1).

In my opinion, the situation of the EU4 countries is alarming. Possibly, the most favourable values were achieved (on average) by Italy and Spain. However, the countries suffer from large gross financing needs. The most distressed country, according to the benchmarks, is Greece.

6.2 Fiscal Stances and Fiscal Efforts

The character of government fiscal policies is evaluated by budget balance measures. The overall budget balance (OB) is defined as the difference between government revenue (R) and expenditure (G). Considering GDP (Y) ratios, the following expression is obtained:

$$\frac{OB}{Y} = \frac{R-G}{Y} \quad . \tag{6.1}$$

Nonetheless, directly observable fiscal measures are influenced by various factors. As a result, it is not possible to interpret them properly when examining government fiscal efforts. The problem can be illustrated by two cases when the state of the economy is not in equilibrium — when the actual output does not equal potential output.[7]

Let Y be actual output, R government revenue, and X government expenditure. Moreover, let the individual items be denoted by * when they refer to the potential levels of the variables. Equation 6.2 below depicts when the economy is in expansion.[8] In this case, the actual government revenue is higher than potential government revenue. At the same time, the actual government expenditure is lower than its potential level:

$$Y > Y^* \;\rightarrow\; \frac{R}{Y} > \frac{R^*}{Y^*} \;\wedge\; \frac{G}{Y} \leq \frac{G^*}{Y^*} \quad , \tag{6.2}$$

$$\rightarrow \text{Overall budget balance} > \text{Cyclically-adjusted budget balance.}$$

[7] Note that it abstracts from other effects due to simplicity. It focuses on business cycle effects which are dominant.

[8] There can be situations when the propositions about government expenditure do not hold. However, such situations are rare.

As a result, the overall budget balance is higher than the cyclically-adjusted measure. In other words, the fiscal situation is looking better than it is. The public may mistakenly compliment the government for its consolidation efforts when, in fact, the budget balance was significantly influenced by economic expansion. The opposite case, when the economy is in recession, is depicted below:

$$Y < Y^* \rightarrow \frac{R}{Y} < \frac{R^*}{Y^*} \wedge \frac{G}{Y} \geq \frac{G^*}{Y^*}, \tag{6.3}$$

$\rightarrow$ Overall budget balance $<$ Cyclically-adjusted budget balance.

The estimation of various factors which affect the overall budget balances needs to be transparent because it can significantly influence the interpretation of government efforts. Therefore, I dedicate the following section to the estimation of structural budget balances and related interpretations.

6.2.1 Estimation of Structural Budget Balances

The principle behind obtaining structural budget balance is to adjust the overall balance for effects which cannot be interpreted as a result of a systematic government effort. A widely accepted practice is to adjust the overall budget balance for business cycle effects (cyclically-adjusted balance[9]) net of one-off transactions and other temporary measures.[10] It should be noted that some institutions[11] adjust the overall balance also for effects other than the business cycle fluctuations. However, they are not used in the estimations. I discuss the rationale in the relevant section below. The used definition is depicted in the following equation (Kremer et al., 2006, p. 9):

$$X_s = X - X_c - X_m, \tag{6.4}$$

where:

- X_s is the structural indicator,

[9] The cyclically-adjusted budget balance is sometimes incorrectly referred to as the structural budget balance. The latter excludes effects of one-off and other temporary measures, in addition to the cyclical adjustment.

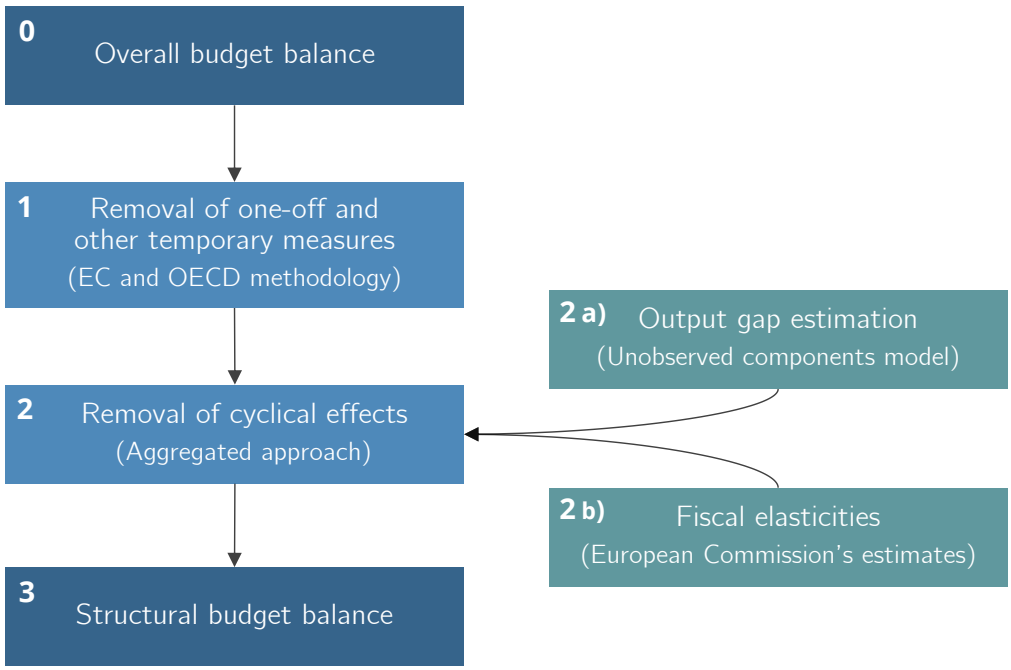
[10] Alternatively, one may also subtract the effects of interest payments and work with primary budget balances.

[11] For example, the IMF.

- X is the unadjusted indicator,
- X_c is the cyclical component (business cycle effects),
- X_m is the size of one-off and other temporary measures.

Equation 6.4 does not explicitly state the used methods and the order of the adjustment steps, which is crucial. In particular, the size of one-off and other temporary measures needs to be deducted from the budget balance before a cyclical adjustment is made to avoid biased estimates.[12] The applied procedure is summarised in Figure 6.11 below.

Figure 6.11: Structural budget balance estimation procedure



Source: own processing.

The cyclically-adjusted budget balance ($CAOB$) is working with potential levels of the variables and is defined as follows (see Bornhorst et al., 2011):

$$CAOB = \frac{OB^*}{Y^*} = \frac{R^*}{Y^*} - \frac{G^*}{Y^*} = \frac{R}{Y^*}\left(\frac{R^*}{R}\right) - \frac{G}{Y^*}\left(\frac{G^*}{G}\right) . \tag{6.5}$$

[12] If the cyclical adjustment were applied first, the one-off and other temporary measures would be taken into account during the process.

Considering constant revenue elasticity (η_R), constant expenditure elasticity (η_G), solving differential equations of order one, and multiplying each equation by the individual budget item gives the definitions of cyclically adjusted budget components:

$$R\left(\frac{R^*}{R}\right) = R\left(\frac{Y^*}{Y}\right)^{\eta_R}, \tag{6.6}$$

$$G\left(\frac{G^*}{G}\right) = G\left(\frac{Y^*}{Y}\right)^{\eta_G}. \tag{6.7}$$

Estimation of fiscal elasticities[13] is crucial for cyclical adjustment of the government budget balances. Fiscal elasticities are defined as the elasticities of absolute values of relevant budget items to output gap (business cycle). They refer to the percentage change in one variable (budget item) to a one-percentage-point change in another variable (output gap). The individual parts of the procedure are thoroughly explained in the subsequent sections.

6.2.1.1 One-Off and Other Temporary Measures

The first step of the process is to subtract measures which do not represent systematic government intentions. The size of these deductions is small under normal circumstances — in the episodes without significant crises or change in government interventions. However, one-off measures were one of the tools of the so-called "*creative accounting*"[14] in the past (see Koen and Noord, 2005). Although the measures are non-recurrent, they can significantly influence government budget balances. Therefore, the measures need to be closely examined.

There are no universally accepted criteria for identifying one-off or temporary fiscal measures. Hence, the procedure requires a considerable amount of judgment (see Bornhorst et al., 2011). I decided to use the European Commission's estimates because of direct comparability. However, the Commission's AMECO database (2020a) does not

[13] The European Commission is also working with fiscal semi-elasticities which are defined as the elasticities of GDP ratios of relevant budget items to output gap. The cyclically adjusted budget balance can be approximated using the overall budget semi-elasticity. The European Commission is using this simplified definition when informing policymakers. See Mourre, Astarita, and Princen (2014, p. 9).

[14] The term refers to malpractices used for improving basic economic indicators.

provide historical values before 2010 for three of the four countries – Spain, Portugal, and Greece. I was able to obtain estimates from the OECD's Economic Outlook database (OECD, 2020).[15] The most suitable approach would be to obtain a consistent time series from one source. However, the OECD does not provide disaggregated data of the measures for government revenue and expenditure in their latest versions of Economic Outlook. The disaggregation is crucial for transparency and calculation of structural budget balances while using the presented definitions.[16] Nevertheless, I was able to obtain the data from an older version of the database (OECD's 2015 Economic Outlook No. 2) by deducting the underlying balances[17] from the unadjusted balances of capital transfers.

Finally, the time series of Italy is obtained from the European Commission because the institution offers a consistent time series for the whole examined period. In addition, the time series of Spain, Portugal, and Greece before 2010 are taken from the OECD, while newer values consist of European Commission's estimates. I believe that this is the most feasible approach due to the data limitations. The differences between the European Commission's and the OECD's estimates are small regarding the three mentioned countries. The comparison is presented in Figure 6.12 below.[18]

The size of one-off and other temporary measures, which is used in the calculations, is shown in Figure 6.13 and compared to the actual budget balances of the EU4 countries. The values are rather insignificant except for specific data points which need to be explained. The one-offs of Italy contributed to a lower (worse) structural budget balance compared to the actual balance between 2000–2005. The Italian government benefited from one-off real estate sales, tax amnesties revenues, and one-off tax revenues which should not be included in the structural budget balances (IMF, 2005).

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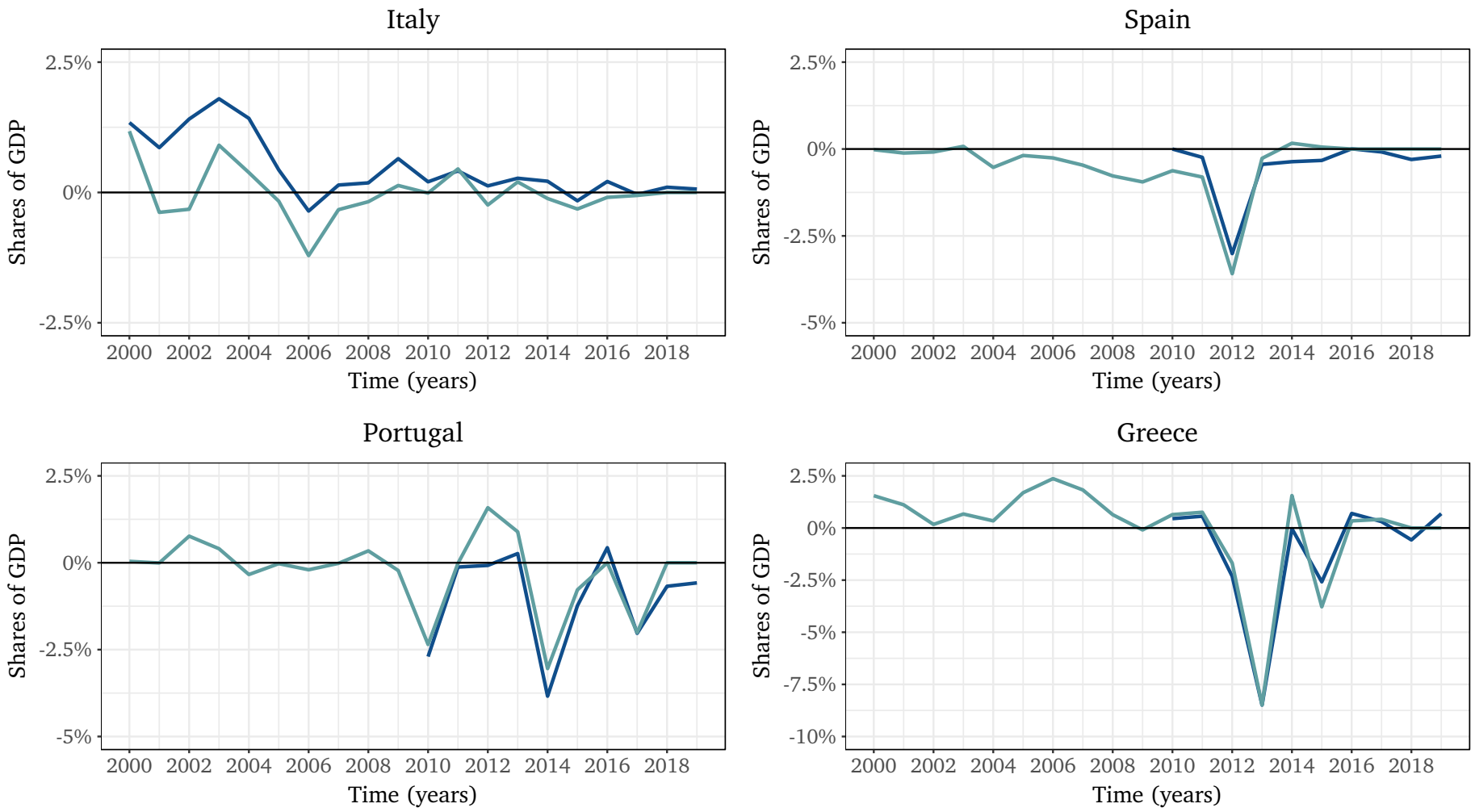
[15] At the same time, I was not able to get estimates of the IMF because these are not publicly available. Nevertheless, the IMF is often working with cyclically adjusted primary balances — not excluding the one-off effects.

[16] However, the level of disaggregation is still low. Therefore, I use the so-called aggregated approach in calculating structural budget balances. A further explanation is provided in the subsequent section regarding fiscal elasticities.

[17] The "*underlying balance*" is the OECD's definition of budget balance adjusted for one-off and other temporary measures. It is also taking into account the economic cycle of the transactions by hp-filtering the time series (see Joumard et al., 2008).

[18] The OECD's estimates are aggregated one-off measures taken from the 2019 version of the Economic Outlook. Because of data revisions, they slightly differ from the 2015's estimates which are used in the calculations. The differences are small and are presented in Appendix B in the form of absolute disaggregated values. Figure 6.12 is used to show similarities between the two sources. If the 2015 OECD's data were used solely, it would produce a lower number of observations, and the comparison would be more problematic.

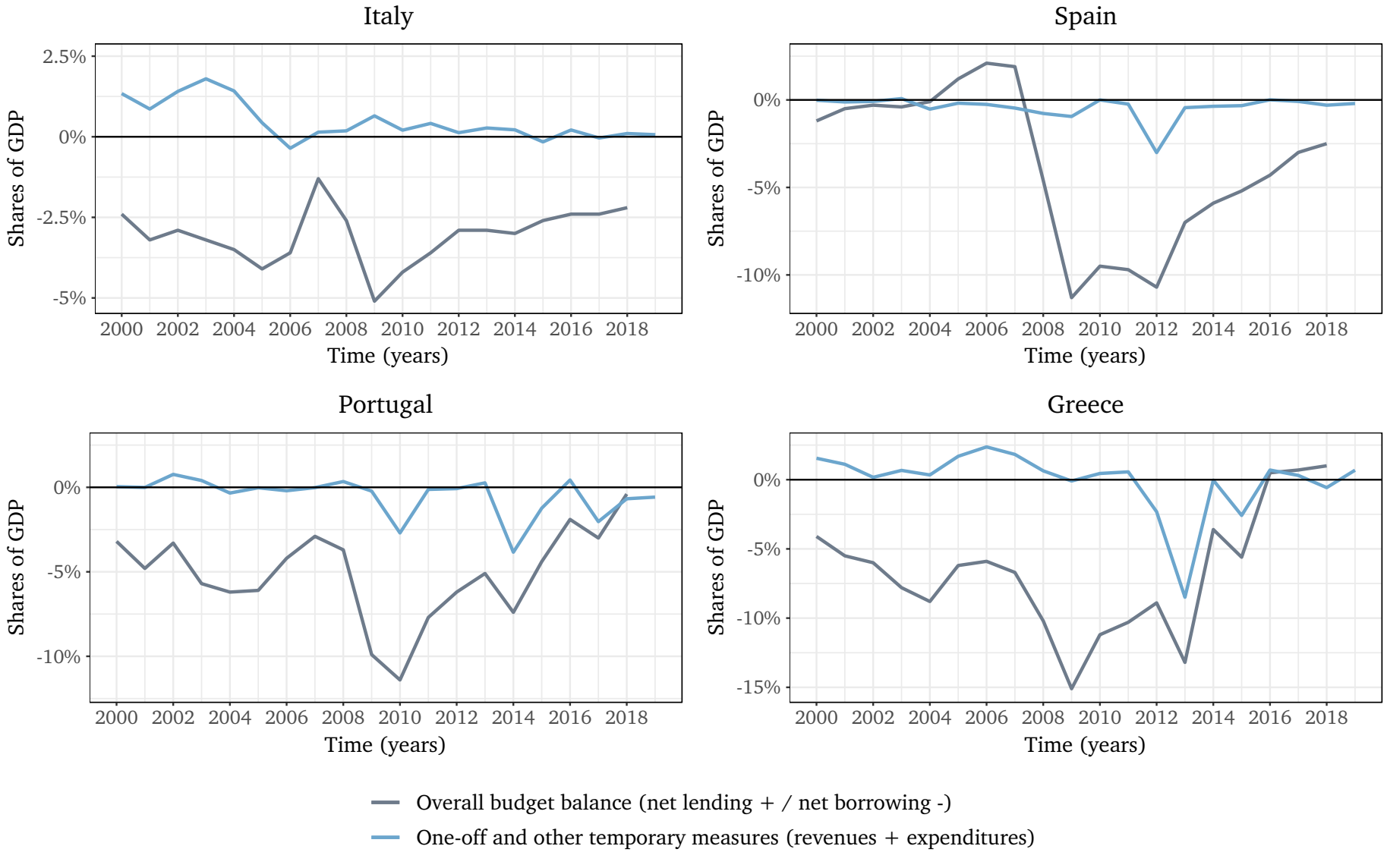
Figure 6.12: Size of one-off and other temporary measures — European Commission vs OECD — EU4, 2000–2019



Notes: The European Commission offers a full and consistent time series for Italy. Therefore, only their estimates are used in this case. The comparison for Italy is shown for illustration purposes. A minus sign means a positive effect on the structural budget balance. It indicates a lower deficit or a higher surplus.

Source: European Commission (2020a), Eurostat (2020a), and OECD (2020), own calculations and processing.

Figure 6.13: Size of one-off and other temporary measures and actual budget balances — EU4, 2000–2019



Note: A minus sign means a positive effect on the adjusted budget balance measure. It indicates a lower deficit or a higher surplus.

Source: European Commission (2020a), Eurostat (2020a), and OECD (2020), own calculations and processing.

The structural budget balance of the country does not significantly benefit from one-off measures conducted during the outbreak of the financial crisis, which is in contrast to the other examined countries. The fact need to be taken into account in the structural budget analysis.

Spain, Portugal, and Greece showed a significant positive impact of the measures on the structural budget balances between 2010–2017. Most of the non-recurrent transactions were realised because of the effects of the financial crisis. The 2012 one-off measures of Spain mostly consisted of expenditure used for bank recapitalisation (OECD, 2012). The measures of Portugal consisted of one-off bank recapitalisation expenditure and pension fund transfers (IMF, 2016). Finally, the measures of Greece consisted of a broad range of one-off and other ad-hoc adjustments, including bank recapitalisation expenditure (IMF, 2017).

6.2.1.2 Estimation of Output Gaps

The most critical component of a structural budget balance is the estimation of business-cycle effects. I use the output gap measure for this purpose. A positive value indicates economic expansion, while a negative value indicates an economic recession. The standard definition of the output gap (Y^{GAP}) is as follows:

$$Y^{GAP} = \frac{(Y - Y^*)}{Y^*} \quad . \tag{6.8}$$

It is possible to simply take and analyse the estimates of international institutions such as the European Commission, the IMF, or the OECD. Nevertheless, the approach is not advisable due to a variety of reasons. First, there is no unified methodology on how the estimates should be made. The output gap is an unobserved variable, and the outcomes significantly differ depending on the used estimation method.[19] Second, although the methodologies of the international institutions are very detailed, the institutions may suffer from serious biases, including conflicts of interests[20]. In this case, their

[19] The fact makes the estimation procedure normative to a large extent.

[20] For example, the European Commission uses the estimates when evaluating fiscal compliance in the EU according to the Medium-Term Budgetary Objectives within the Stability and Growth Pact. In addition, the IMF also participated in addressing fiscal issues in the past. It was lending money to Greece as a response to the effects of the financial

interpretation of the events would be taken implicitly. Third, I believe that the output gap estimates of the European Commission might be underestimating the amplitude of output gaps. The EU4 countries belong in the Euro Area. Hence, the work focuses primarily on the European Commission's estimates because these estimates are used in the EU's fiscal regulations.

Output gaps can be estimated through various methods[21], and there is no consensus on which approach is the most suitable one. Hence, I use a variety of methods complemented by good judgment. The used methods consist of three main types: traditional filtration techniques, unorthodox techniques, and unobserved components (UC) models. In addition, I employ commonly used parameters. All the estimates need to be examined as a starting point of the analysis. At the same time, it is necessary to choose only one method and use it in the structural budget estimations. Such a method should take into account both theoretical and empirical considerations. Therefore, I do not describe all the used methods in detail because of their lower relevance. The list of the used methods, relevant literature, and used data is provided in Appendix C.

The models are estimated using the longest available time-series data. The univariate approaches work with real quarterly GDP data starting from 1960.[22] Moreover, the multivariate estimates incorporate general unemployment rate and consumer price index (CPI) data. The length of the used time series of unemployment rate and inflation rate is relatively shorter; the starting year is ranging from 1983 to 1990. The length is dependent on the particular time series and country.[23] All the variables are seasonally adjusted.[24] In the end, the quarterly estimations needed to be converted to annual data, therefore, I selected 3rd quarter of each year as the relevant annual observation

crisis of 2008–2009. It should also be noted that a delegation of certain powers to a decentralised unit does not solve the issue since the agent is financed by the principal.

[21] The methods are either purely statistical or are partly based on economic theory.

[22] It should be mentioned that there is a change in GDP estimation methodology before 1995. Eurostat provides GDP data, based on the ESA 2010 methodology, starting from 1995. However, the OECD provides GDP growth estimates of the countries starting from 1960. Therefore, I used a backward extrapolation of the quarterly growth rates to obtain GDP values in levels starting from 1960.

[23] The European Commission's AMECO database (2020a) has annual data of all the variables starting from 1960. Nonetheless, the total number of used observations would be significantly lower. At the same time, the estimation of quarterly data from annual time series (alternative approach) could be misleading and imprecise. Hence, I decided to use the available quarterly data series.

[24] The used data source provided the adjustment, or I used the standardised X-13-ARIMA procedure by the US Census Bureau.

because the quarter is very close to the annual average. The aim is to work with the actual estimated values, not with artificially centred values. The relevant comparison is available in Appendix C.

Figure 6.14 presents 12 different model estimates of output gaps for each country. As it was mentioned, it utilises relatively long time series which should produce more accurate results. However, this work focuses only on the period of 2000–2019 according to the main hypothesis. Thus, the other values are not depicted in the relevant figures. The estimated output gaps of the countries are shown in Figure 6.14.

According to the previous analyses, the EU4 economies were significantly overheated before the primary effects of the financial crisis occurred. After this period, however, the countries were running far below their potential level. In the latest years, some of the countries began to overheat again. Furthermore, Greece experienced the largest shock to the output gap dynamics. The difference between actual and potential GDP was ranging from approximately 20% before 2008 to −20%, depending on the used method. The second largest output gap dynamics was in Spain, followed by Portugal. Italy has experienced a relatively weaker shock. Moreover, a plausible benchmark in evaluating the estimates is inflation rate development. According to Buti et al. (2019), there is a significant correlation between the output gap and inflation.[25] Sample standard deviations of the corresponding HICPs between 2007–2019 confirms the country order. Greece showed the highest value, followed by Spain, Portugal, and Italy (Eurostat, 2020a).

The decision of which method produces the most favourable results is not straightforward. However, traditional filtering techniques such as the HP filter[26] suffer from serious biases.[27] Possibly the two most important facts are their inability to separate trend from cycle in the case of significant shocks – economic instabilities,[28] and end-point bias.

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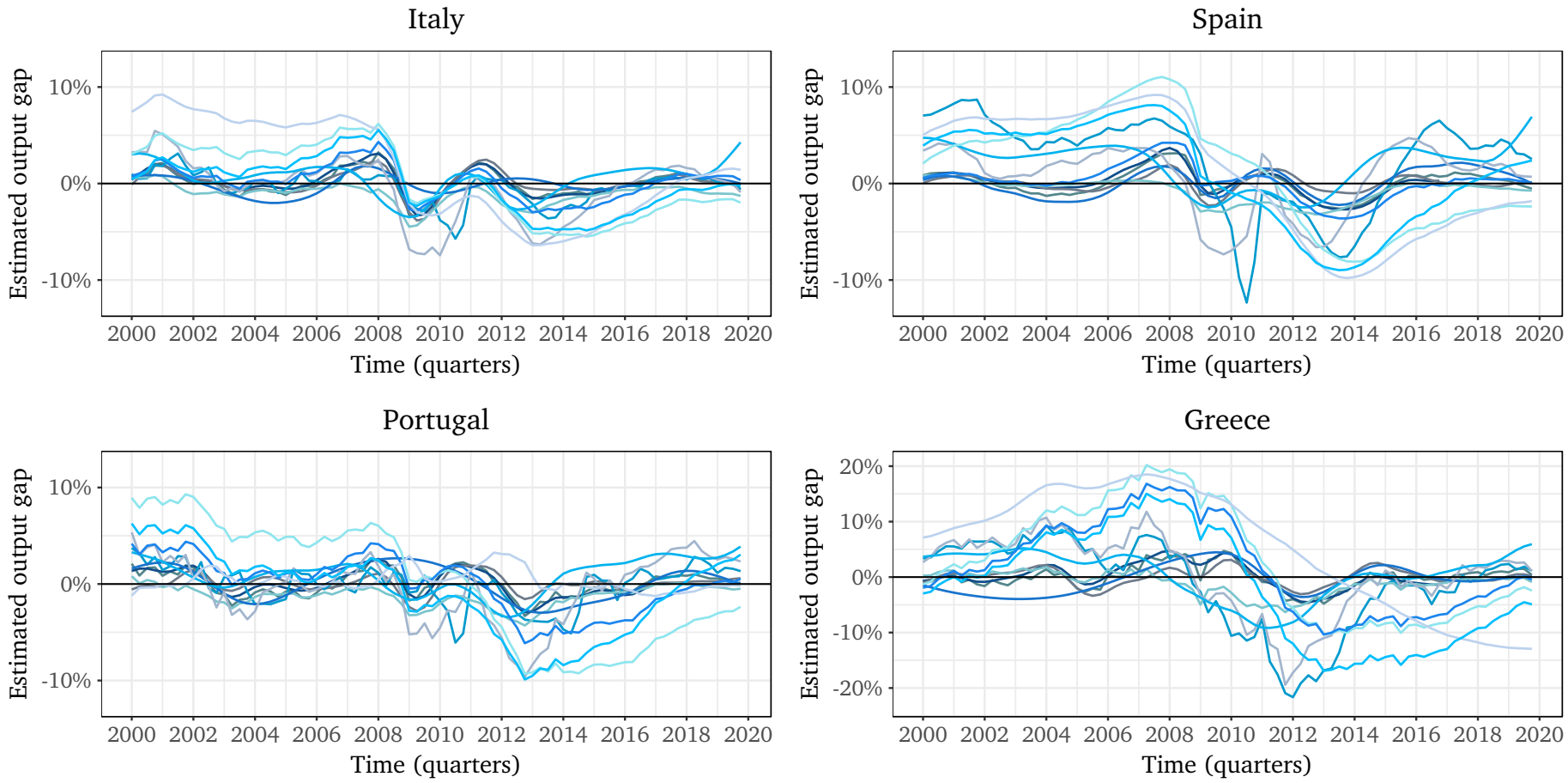
[25] However, the authors mention that a one-to-one relationship between inflation rate and the output gap should not be expected. The issue is more complicated as inflation is not only driven by demand pressure but also by external supply shocks (for example, low raw material and oil price inflation) which are not directly influenced by output gap dynamics.

[26] HP filter was widely used in the past. However, large economic shocks such as the financial crisis of 2008–2009 showed its problems.

[27] Nevertheless, the fact does not disregard the previous conclusions because I analyse general trends.

[28] For example, a significant instability may be depicted by a double-dip recession which was experienced by Italy, Spain, and Portugal in the selected period. Greece experienced one but significantly larger shock, which may distort the estimates.

Figure 6.14: Output gap estimates — EU4, 1Q 2000 – 4Q 2019



Notes: Specifications of the used methods are provided in Appendix C. The figure purposely uses the same scale, except for Greece, which is an outlier, to be able to compare the magnitudes of the output gap dynamics.

Source: own calculations and processing.

Both traditional and unorthodox techniques did not produce plausible results.[29] Thus, I focus on the models of unobserved components. The presented univariate UC model shows rather low dynamics which is not a valid assumption regarding the EU4 countries in the examined period. The bivariate model, which is based on GDP and unemployment time series, seems to fit the data poorly. I needed to specify various structural breaks to obtain reasonable estimates. The fact makes the cross-country comparisons problematic. The augmented HP filter gives plausible results. However, the estimated output gap dynamics is very high and unstable. In my opinion, the most appropriate model[30] for all the countries is the trivariate UC model which is presented in the following paragraphs.

I employ a trivariate unobserved components model methodology developed by Chan and Grant (2017). The structural model employs three time series. These are: output (GDP), the inflation rate (CPI, quarterly change), and the general unemployment rate (15+ years). The model implements a stochastic specification search based on Bayesian model averaging. It means that some degree of individual flexibility is introduced while keeping full transparency of the process without external interference. The model takes the following form (Chan & Grant, 2017, p. 5):

$$\pi_t - \pi_t^* = \rho^{\pi}(\pi_{t-1} - \pi_{t-1}^*) + \delta_{\lambda^u}\lambda^u(u_t - u_t^*) + \delta_{\lambda^y}\lambda^y(y_t - y_t^*) + \varepsilon_t^{\pi}, \tag{6.9}$$

$$y_t - y_t^* = \delta_{\gamma^u}\gamma^u(u_t - u_t^*) + c_t, \tag{6.10}$$

$$u_t - u_t^* = \rho_1^u(u_{t-1} - u_{t-1}^*) + \rho_2^u(u_{t-2} - u_{t-2}^*) + \varepsilon_t^u, \tag{6.11}$$

$$c_t = \rho_1^c c_{t-1} + \rho_2^c c_{t-2} + \varepsilon_t^c, \tag{6.12}$$

where:

- y_t is output measure, y_t^* is potential output,
- π_t is inflation rate, π_t^* is natural rate of inflation,
- u_t is unemployment rate,
- u_t^* is the non-accelerating inflation rate of unemployment (NAIRU),
- ρ is autoregressive component,
- c_t is cyclical component of output,

[29] Especially when compared to the estimates of international institutions.

[30] The model which estimates are consistent with economic fundamentals.

- δ is binary (dummy) variable used for stochastic specification search,
- ε is independent innovation (error term).

The inflation gap Equation 6.9 states that the deviation of inflation from its underlying trend depends on both the unemployment gap and the output gap. When inflation and output are at trend levels, inflation equals its underlying trend plus a transitory AR(1) component. The output gap Equation 6.10 relates the output gap to the unemployment gap where γ^u is the Okun's coefficient. Finally, the unemployment gap Equation 6.11 and the cyclical component of output described by Equation 6.12 are assumed to follow a stationary AR(2) process.

The stochastic specification search reflects three specification choices: model dimension (sets of variables), trend output specifications, and distributional assumptions, all represented by binary variables δ. I use code which employs eight binary variables used for stochastic specification search, as opposed to the specification presented in Chan and Grant (2017) where the authors use 11 binary variables.[31] Therefore, the stochastic specification search is based on $2^8 = 256$ models or possible combinations of the binary variables. The resulting parameters are averages of the various model estimates weighted by posterior model probabilities. The estimation utilises normal priors with zero mean for the standard deviations. Furthermore, the posterior sampler consists of 11 blocks and is based on band matrix algorithms.[32] The implied gamma prior for the variance of a parameter, which determines if the trend output has a time-varying growth rate, provides shrinkage, and a priori favours a more parsimonious model without time-varying growth rate of potential output. More detailed information about the used binary variables, distributions, priors, sampling algorithm, and other specifications are available in Chan and Grant (2017).

Another important dimension of the analysis is a comparison with the estimates of international institutions. The output gaps are regularly estimated by the European Commission, the OECD, and the IMF. The mentioned institutions use a production

[31] I do not use the two structural break variables and the variable which determines if the innovations to unemployment equation follow a t distribution.

[32] The presented estimates are based on 100 000 posterior draws after a burn-in period of 10 000 draws.

function approach,[33] and the potential output is a function of trend capital, labour, and total factor productivity. The main differences lie in the determination of trend unemployment. The European Commission is calculating its estimates on the basis of non-accelerating wage rate of unemployment – NAWRU (Mourre, Astarita, & Princen, 2014). In contrast, the OECD is using non-accelerating inflation rate of unemployment – NAIRU (Chalaux & Guillemette, 2019). The IMF methodology differs from country to country, but a production function approach predominates for advanced economies (Bornhorst et al., 2011). Furthermore, the OECD and the IMF allow for more judgment shaping the officially reported output gaps (Hristov, Raciborski, & Vandermeulen, 2017). The approach produces less comparable estimates among the examined countries. There is a trade-off between international comparability and flexibility. The main argument for international comparability is that the European Commission is using its estimates in fiscal policy monitoring which is connected to the fiscal regulations in the EU.[34] As it was mentioned, there is no solid evidence to see the estimates of these institutions as superior to other estimates for a variety of reasons. The two most prominent reasons are conflicts of interests and methodological biases.

The European Commission has been facing intense criticism from international experts regarding their output gap estimations.[35] According to the EU Independent Fiscal Institutions Network (2018), the estimates may be influenced by technical parameters such as the Cobb-Douglas' alpha coefficient, the choice of Bayesian priors, post-estimation adjustments, or other factors. The criticism led the authors of the European Commission's methodology to revise it. In an unofficial statement, they claimed that an element of flexibility and judgement had been introduced into the fiscal surveillance process to deal with specific circumstances (see Buti et al., 2019). These include situations where the potential output estimates depart from plausible estimates based on other cyclical indicators. In addition, a range of country-specific changes have been approved (ibid.). However, these model adjustments were implemented primarily due to the initiative of individual EU Member States (EUIFIN, 2018). It indicates that fiscal policy decisions in

[33] In my opinion, the approach is rather a (dis)aggregation method. The approaches to the estimation of the individual components drive the final estimates.

[34] For example, I refer to the Excessive Deficit Procedure (EDP) or the Macroeconomic Imbalance Procedure (MIP). More broadly, the regulations are set in the Stability and Growth Pact and the so-called "*European Fiscal Compact*".

[35] However, the issue has not been as strongly pronounced in academia.

the EU in recent years have significantly influenced by technical details. As a consequence, seemingly innocent technical assumptions have become objects of political demands (EUIFIN, 2018).[36]

A comparison of output gap estimates of the trivariate UC model and the selected international institutions is depicted in Figure 6.15. In my opinion, the estimates of the European Commission are not consistent. They seem to underestimate the magnitude of the output gaps when compared to the other model estimates. The issue was recently stressed by the Italian Minister of Economy and Finance, Roberto Gualtieri, who sent a letter to the European Commission's officials in October 2019 regarding the problem (Gualtieri, 2019). The possible bias is noticeable in the magnitudes of output gaps of the EU4 before the financial crisis. The EU's fiscal regulation[37] was inadequately loose before the financial crisis.

The EU4 countries were, arguably, gradually overheating as a result of low interest rates in the Euro Area before 2008. For example, final consumption expenditure to GDP ratio of Greece was 91.4% in 2009, by far the largest in the EU (Eurostat, 2020a). At the same time, the European Commission's estimates show that these countries were "*overheated*" by approximately 2.5% to 5% above potential GDP in their peaks. For illustration, the weighted average (aggregate indicator) for the EU27 showed a positive gap of 2.6% in 2007 (European Commission, 2020a). The European Commission's estimates assume that countries like the Czech Republic, Slovakia, or Latvia were overheating much more significantly.[38] The value of Greece was 5.2% while the Czech Republic showed 5.5%, Slovakia 5.9%, and Latvia even 11.2% (ibid.). Furthermore, it is necessary to take into account that Greece showed the highest number out of the four examined countries. The estimates of Italy (2.8%) and Spain (2.9%) were near the EU average while the estimate of Portugal (1.2%) was below the average (Eurostat, 2020a). I do not find the results to be consistent and economically plausible.

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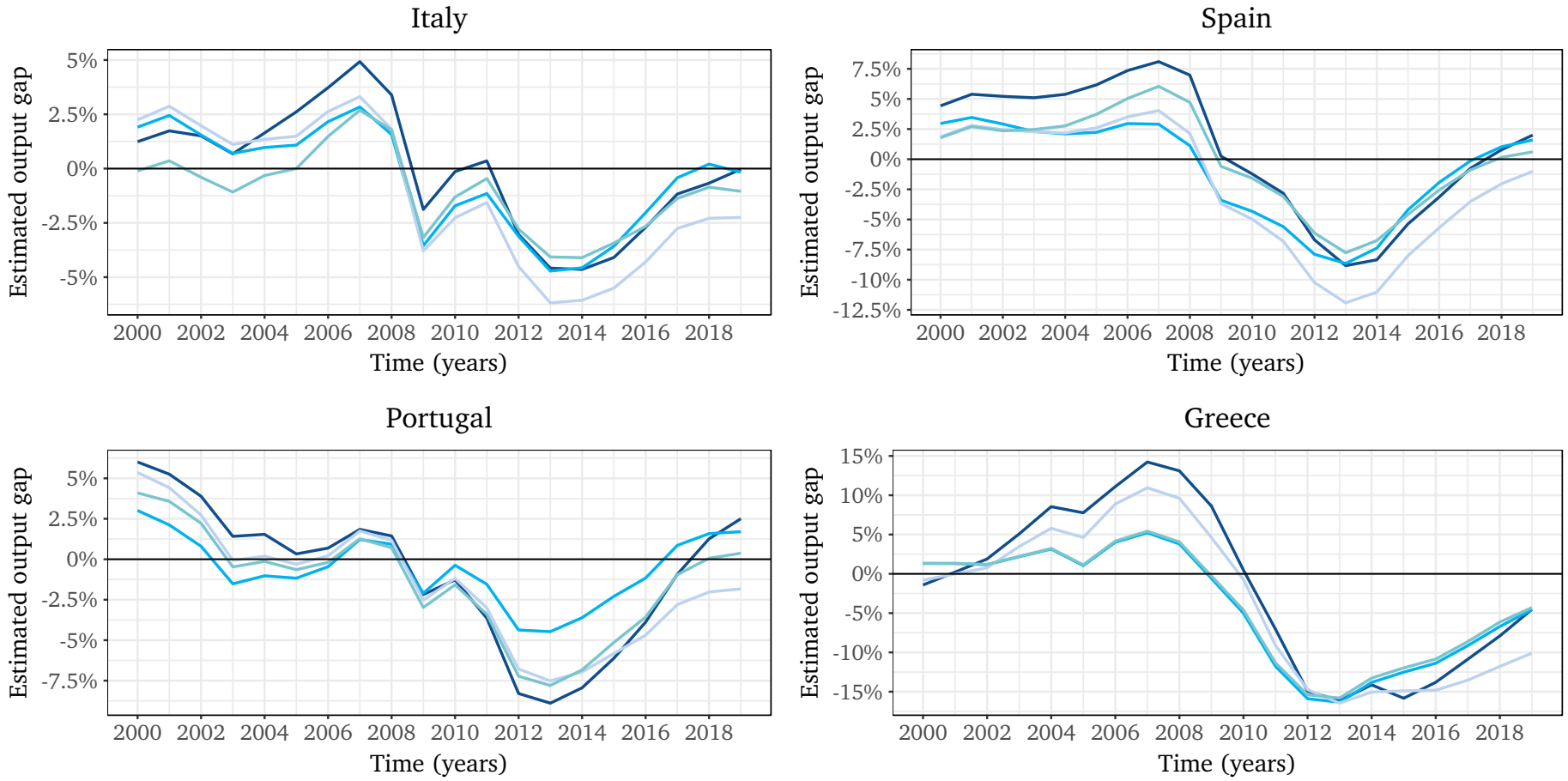
[36] I believe that the trivariate UC model estimates are more consistent and provide a higher degree of comparability.

[37] It refers to the relation of the structural budget balances to the Medium-Term Budgetary Framework implemented in the Stability and Growth Pact.

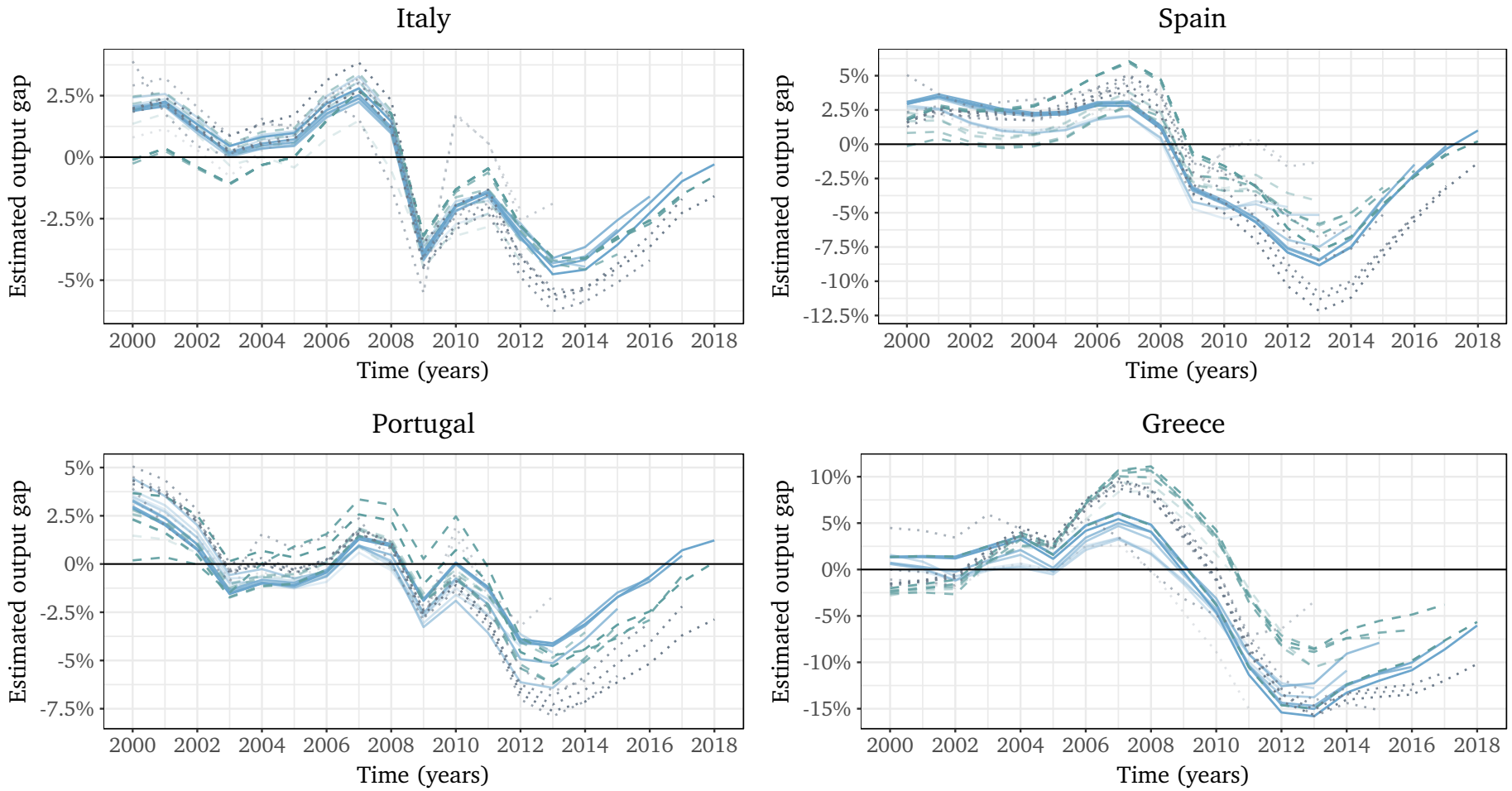
[38] In total, the European Commission output gap estimates assume that eight EU countries were overheating more significantly than Greece (European Commission, 2020a). One may argue that countries like Latvia, which experienced a more pronounced GDP decline in 2009 of -14.2%, were indeed more overheated due to the fact. However, the countries were able to recover in the next years very quickly. For example, Latvia's GDP increased by 6.3% in 2011 as a result of successful economic policies including internal devaluation.

Figure 6.15: Comparison of contemporaneous output gap estimates — EU4, 2000–2019



Source: European Commission (2020a), IMF (2020b), OECD (2020), own calculations and processing.

Figure 6.16: Comparison of historical output gap estimates — EU4, 2000–2018 (late 2011–2018 vintages)

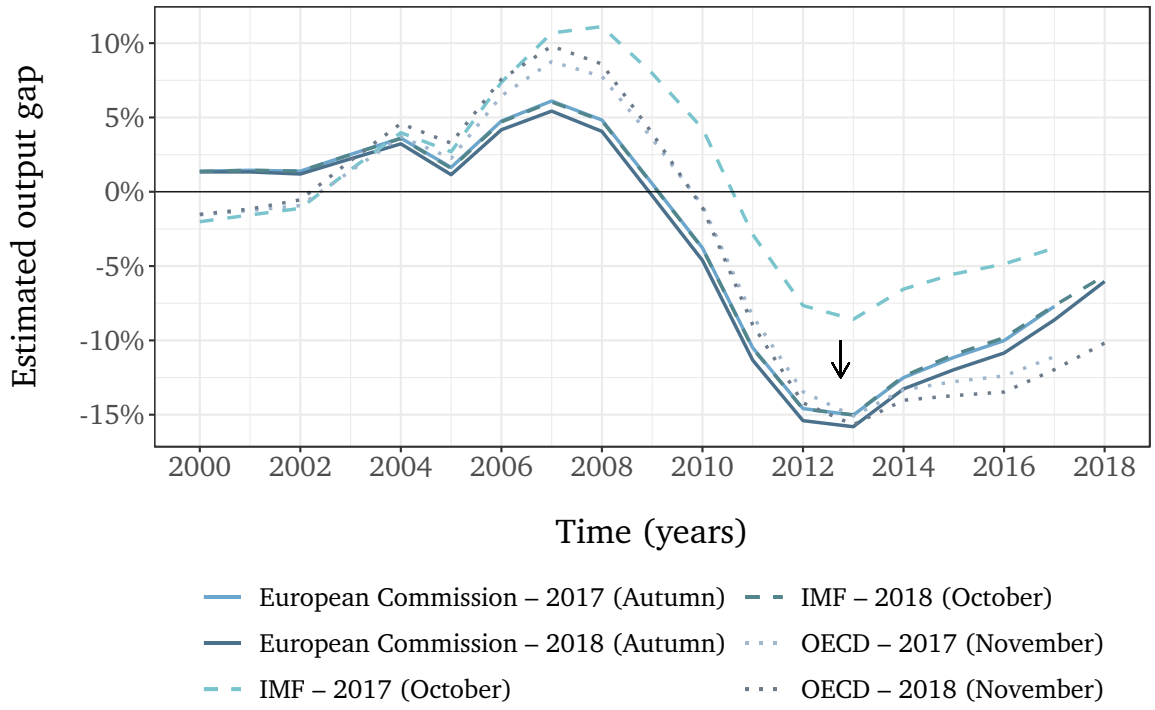


Note: The figure uses data vintages starting from 2011 because the prior estimates are not available in the European Commission's AMECO database.

Source: European Commission (2020a), IMF (2020b), OECD (2020), own processing.

Further evidence of the possible systematic bias of the European Commission's estimates is shown in Figure 6.16. It depicts different estimate vintages of the selected international institutions between 2011–2018. The European Commission's estimates were of a significantly lower magnitude between 2006–2010 for Portugal, Spain, and Greece. Furthermore, it should also be noted that the IMF drastically changed its estimates for Greece in 2018, making them identical to those of the European Commission. In the past, the IMF estimated much larger overheating of the Greek economy, which is in accordance with the presented argumentation. The differences between late 2017 and 2018 vintages are shown in Figure 6.17. The OECD did not significantly change its estimates during the examined period.

Figure 6.17: Comparison of historical output gap estimates — Greece, 2000–2018 (late 2017 and 2018 vintages)



Source: European Commission (2020a), IMF (2020b), OECD (2020), own processing.

The trivariate UC model estimates are following economic fundamentals more closely. The results, depicted in Figure 6.15, show that the estimates are nearly identical to those of the international institutions during the negative output gap episodes. Therefore, it provides some evidence that the estimates in this work do not suffer from systematic bias or higher volatility regarding the episodes of economic overheating prior to the financial crisis. The advantage of the used model is its direct comparability among the

countries, transparency, and flexibility due to the use of stochastic specification search. Moreover, the estimates of the OECD are also of a higher magnitude, which is supporting the presented argumentation.[39] Therefore, I use the trivariate UC model estimates in the subsequent calculations.

6.2.1.3 Fiscal Elasticities

The values of fiscal elasticities are assumptions regarding the size of business cycle effects in the budget balances. I follow the European Commission's methodology and use the aggregated approach[40] which means using the output gap as a single measure of the business cycle, applied to all fiscal items (Mourre, Poissonnier, & Lausegger, 2019). By contrast, disaggregated methodologies identify a specific cyclical pattern for each component of the budget balance (ibid.). In addition, the individual budget items (revenues and expenditures) are subject to further disaggregation. The aggregated approach is less precise when individual fiscal elasticities are unstable because economic cycles may differ across specific revenue and expenditure components. Nevertheless, the disaggregated approach is less transparent.

Furthermore, the estimation methodology may suffer from biases, which could be more pronounced in the disaggregated approach. First, it is working with data which are frequently revised. Second, it incorporates output gap, which is an unobserved variable. Third, it usually does not take into account policy changes or is employing them inconsistently. Finally, the estimations may suffer from endogeneity. The issue is likely significant in the case of the semi-elasticity estimates where GDP is in the denominator.[41] I do not consider the disaggregated approach as a necessarily better alternative. According to Mourre, Poissonnier, and Lausegger (2019), the aggregated method was not performing significantly worse than the disaggregated approach during the financial crisis. A possible reason is that the cyclical pattern of specific granular

[39] I am not convinced that the IMF's estimates are independent of those of the European Commission. In the case of Greece, there is an apparent synchronisation, possibly due to the common lending programmes and monitoring. See Figure 6.15 and 6.17.

[40] Another reason is data limitations.

[41] The IMF (Bornhorst et al., 2011) suggests using instrumental variable approaches or GMM to account for the endogeneity. However, the instruments are in the form of lags of the included variables and are usually weak. Furthermore, the estimated coefficients are probably unstable, and each country would require an individual approach. The same issue applies to time-varying regressions.

components could be unstable in periods of strong recession and thereby difficult to identify based on past behaviour — for instance, regression analysis (Mourre, Poissonnier, & Lausegger, 2019).

The estimation methodology of the fiscal elasticities gradually evolved. However, the main principles still hold. The elasticities are estimated on the basis of the following equation (Bornhorst et al., 2011, p. 7):

$$log\ x = \alpha + \varepsilon_{x,y}\ log(\frac{y}{y^*}) + u\ , \tag{6.13}$$

where:

- x is the budget item for which the output gap elasticity is calculated,
- $\frac{y}{y^*}$ is the output gap measure,
- $\varepsilon_{x,y}$ is the elasticity of X with respect to output gap,
- α is a constant,
- u is an error term.

As it was mentioned in the previous text, the aim is to have comparable estimates of structural budget balances with the European Commission's estimates. Therefore, I use the Commission's latest estimates which are presented in Table 6.4. I am not directly working with estimates of other institutions. Nevertheless, the presented estimates are based on the same methodological principle and are roughly similar to those of the international institutions.

Aggregate revenue elasticity is usually close to one because higher output means higher incomes, higher consumption and higher tax revenues. Budget revenues are pro-cyclical. Therefore, cyclically adjusted revenues are lower in economic expansions and higher in recessions. For countries which rely on direct and progressive tax systems, the elasticity can be slightly larger than one. In contrast, aggregate expenditure elasticity is usually close to zero or being negative. The reason is that without any discretionary changes in fiscal policy, governments end up spending more during recessions. Budget expenditures are usually acyclical or anti-cyclical. Hence, cyclically adjusted expenditures are higher in economic expansions and lower in recessions.

The aggregate revenue elasticities for the EU4 countries are close to the EU27 average, which is depicted in Table 6.4. However, aggregate expenditure elasticities of Spain and Portugal are further away from the average. The reason is a higher share of unemployment related spending in government expenditures in these countries (Price, Dang, & Botev, 2015). In addition, the impact of elasticities on structural budget balances is rather small.[42] The sensitivity analysis of different elasticities and their effects on the estimates is presented in Appendix D.

Table 6.4: Estimates of fiscal elasticities — European Commission (2019)

Country	Aggregate revenue elasticity	Aggregate expenditure elasticity
Italy	1.05	-0.05
Spain	1.02	-0.33
Portugal	0.95	-0.15
Greece	0.93	-0.04
EU4 average	0.99	-0.14
EU27 average	0.98	-0.10

Source: Mourre, Poissonnier, and Lausegger (2019), own calculations and processing.

Finally, it is necessary to mention that different fiscal elasticities for each country imply different "*manoeuvring*" positions of the governments. The changes may result in different volatilities of the structural balance estimates.[43] However, the output gap estimations, which are also contributing to the dynamics, are decisive for the calculations.

6.2.1.4 Factors Beyond Business Cycles

These factors are incorporated into the estimations when the output gap measure does not provide an adequate summary of the state of the economy. The following factors may be considered for the adjustment: asset prices, commodity prices, terms of trade, and output composition effects (Bornhorst et al., 2011). The adjustments may be advisable

[42] Given the plausible numerical boundaries of the elasticities.

[43] The fact may be considered as an "*unfair*" advantage of some countries during certain periods.

when changes in the selected factors are significant — when they notably influence the overall budget balances. First, surges in asset prices, which may include real estate or equity prices, may be connected to a direct increase in the respective government revenues due to the tax collection. Second, budget balances of resource-rich countries can be influenced by price changes of such commodities, which is also reflected in terms of trade. Third, output composition effects estimation follows the mentioned disaggregation procedure, separating budget components in more detail and considering different cyclical patterns of the items (see Bouthevillain et al., 2001).

It should be noted that all the price changes may also impose indirect (dynamic) effects on the budget balances. For example, the relevant channels may include wealth and redistributional changes. Therefore, the selection of these factors is arguable. In addition, international comparisons are becoming problematic. Each country needs individual treatment, and different factors may be considered. This may lead to inconsistent and incomparable estimates of structural budget balances. Finally, the estimation of equilibrium or trend values of the factors is complicated and subjective judgment is needed. The European Commissions does not use this approach either, and this work follows their methodology.[44]

6.2.2 Development of Used Indicators

The final results of the previous calculations are presented and analysed in this section. Figure 6.18 compares the estimates with those of the European Commission. The differences are notable up to 2009 in the case of all the four examined countries. They are strictly driven by the different estimations of output gaps. As a result, the presented estimations suggest that the fiscal performance of the countries was much worse. The only exception is Portugal after 2009, where a better performance was estimated — it meant sharper fiscal consolidation than the European Commission assumes. It should be noted that the European Commission's estimates, which can be found in the AMECO database (2020a), are slightly different due to data revisions. The comparison of the calculations is available in Appendix D.

[44] The IMF also recommends not to use it in international comparisons (see Bornhorst et al., 2011).

Figure 6.19 compares the structural indicators with overall budget balances. The data show that the two measures differ significantly, and two main periods can be identified. Until 2009, the fiscal policy stances or discretionary fiscal policies were much more expansionary than suggested by the overall balances, with the exception of Portugal because of relatively small output gaps. The situation was caused by prohibitive motivations (moral hazard) along with inefficient regulations, and over-optimism which is typical for a period of relatively strong economic growth.[45] After 2009, the data show episodes of significant fiscal consolidation, which was pronounced especially in Greece. In my opinion, it was caused by several factors. First, strong political demand and the initiation of "*rescue programmes*"[46] favoured fiscal austerity. Second, the ECB initiated its quantitative easing programme. Its first round was in effect from 2010 to 2012. It was reinitiated later, for its second and third phase in 2014 and 2019 respectively. The ECB reached zero lower bound with its interest rates, provided vast amounts of liquidity to the banking system, and partly restored confidence in the markets. It is difficult to argue that the intervention was inappropriate during the recession. However, this institution continued with the policy even after the worst effects were mitigated. One of the possible reasons were intense political pressures. It resulted in a continuous and strong incentive for moral hazard or socialisation of risks, which has enabled the EU4 countries to continue with unsustainable policies without significant structural reforms for which the monetary policy is no substitute.[47] Finally, the countries have again experienced economic growth after the worst effects of the crisis have been mitigated. One of the reasons, apart from the effects of myopic macroeconomic policies, was a recovery of external demand. It helped the countries to achieve better fiscal results because of higher government revenues and higher comparative base[48].

Furthermore, the overall budget balances can be decomposed into fiscal policy elements which have direct economic interpretation. I separate the balances are into three items.

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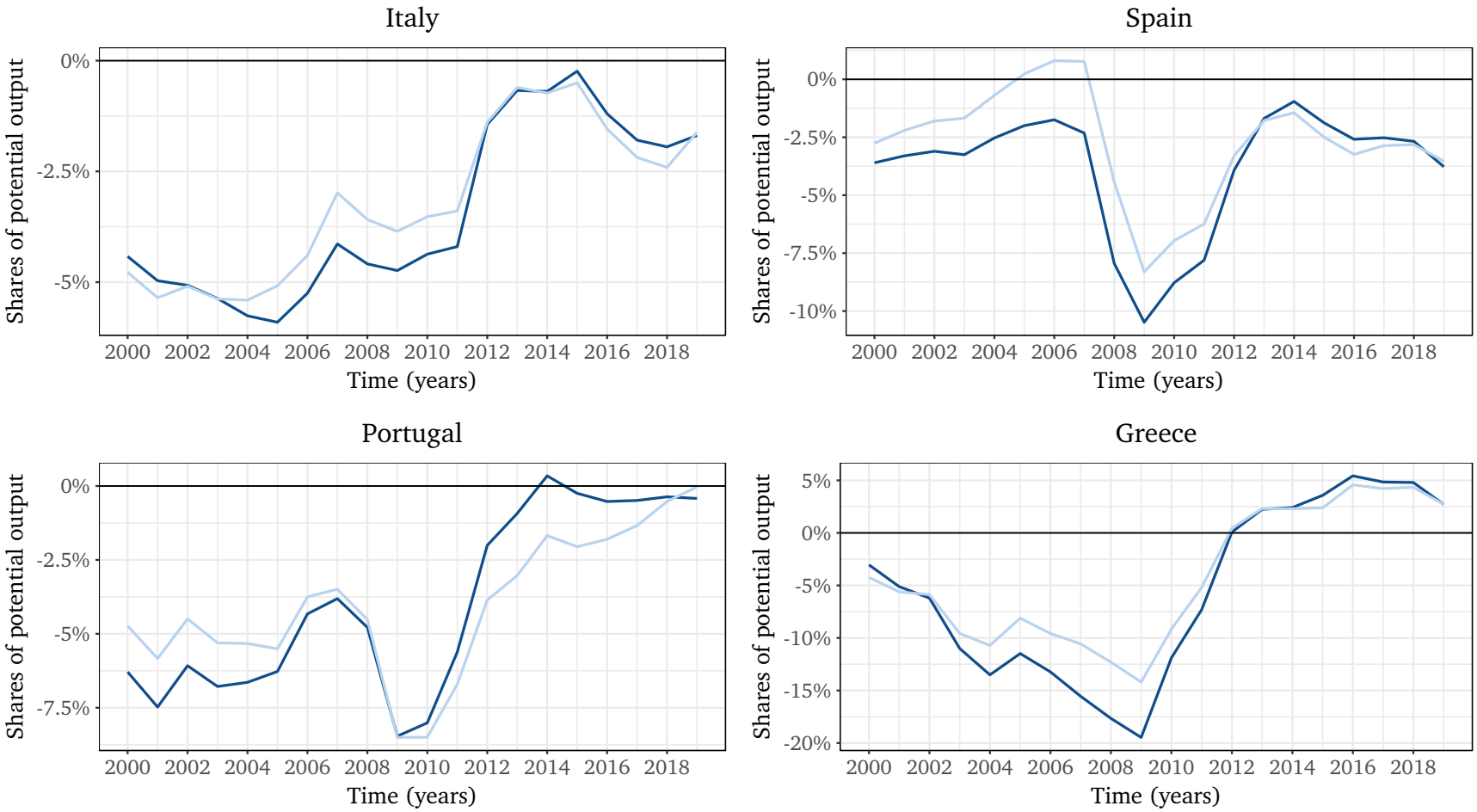
[45] However, note that the EU4 countries were not necessarily doing well in this regard. The whole EU provided external demand and incentives for the examined countries.

[46] I use quotes because these programmes did not serve the rescue purpose. They were designed to mitigate the worst political and economic consequences in the short and medium term for the Euro Area. They did not solve anything. The same argument can be made for the monetary policy decisions.

[47] In the most general sense, I refer to reforms that promote economic growth and efficiency. Arguably, the most significant reform for the countries would be an exit from the Euro Area, which would enable currency depreciation and boost economic recovery through the proper functioning of transmission channels.

[48] The fiscal measures are usually expressed as GDP ratios. When the GDP in the denominator rises, the fraction value becomes lower, therefore, showing better results.

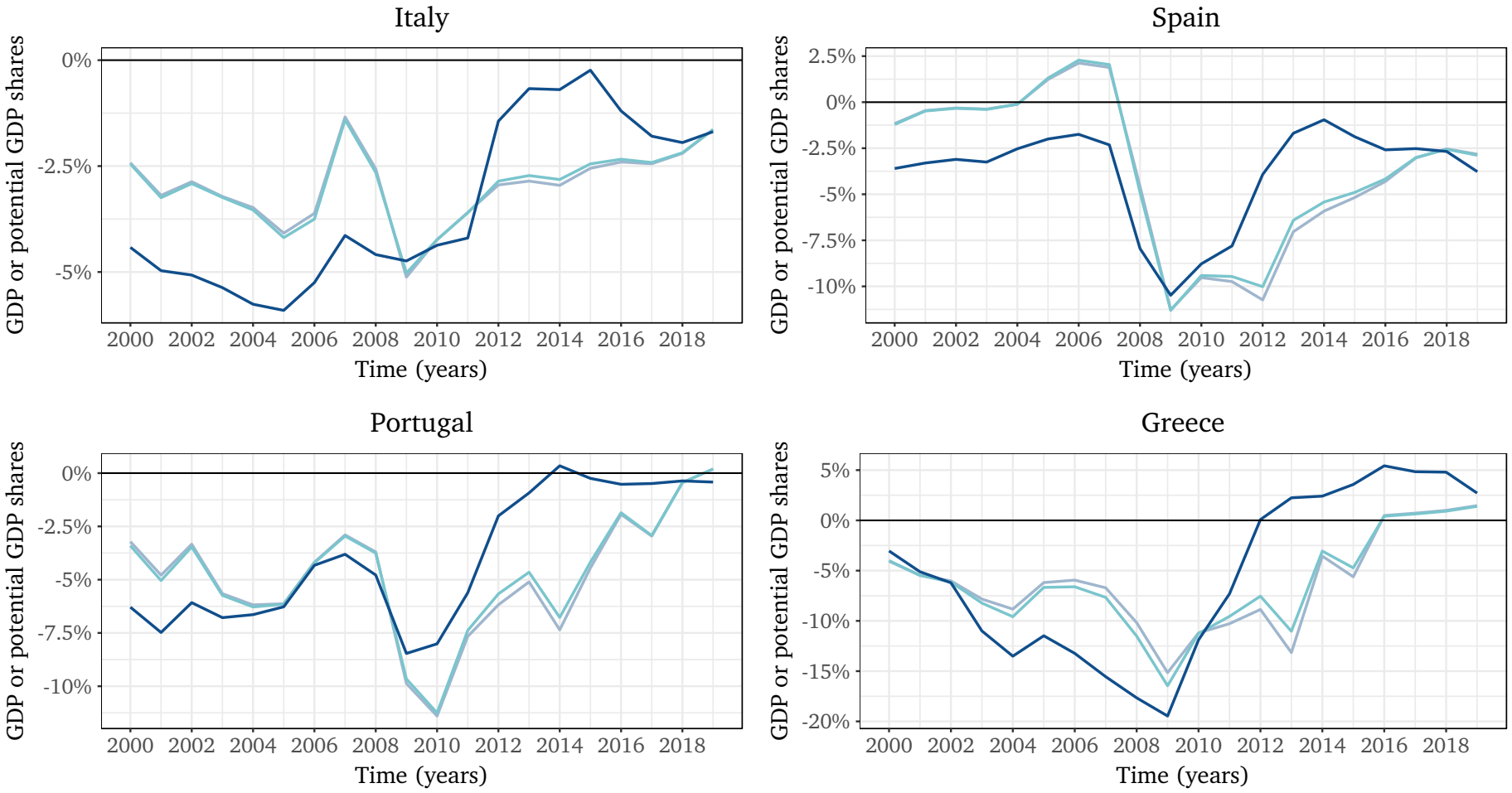
Figure 6.18: Comparison of structural budget balances with the European Commission's estimates — EU4, 2000–2019



Note: The estimates of the European Commission prior to 2010 are implicit values. These are calculations according to the parameters which they use. However, it utilises some estimates of the one-off measures published by the OECD. The European Commission does not publish these estimates in the AMECO database.

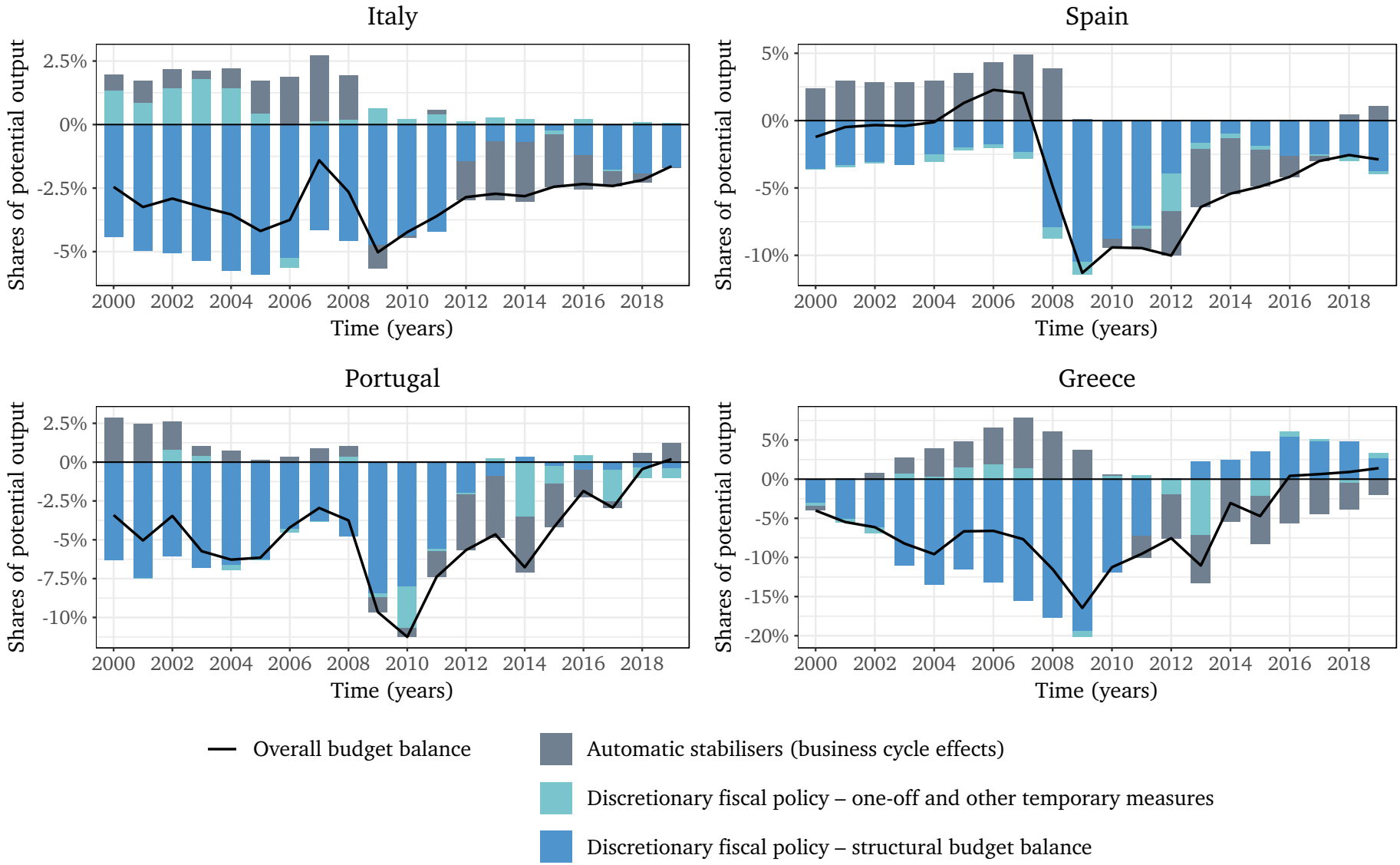
Source: European Commission (2020a) and OECD (2020), own calculations and processing.

Figure 6.19: Comparison between overall budget balances and structural budget balances — EU4, 2000–2019



Source: Eurostat (2020a), own calculations and processing.

Figure 6.20: Decomposition of overall budget balances — EU4, 2000–2019



Source: own calculations and processing.

A discretionary fiscal policy[49] is represented by one-off measures and structural budget balances. Moreover, under the assumption of no other effects, I separate automatic fiscal stabilisers or business cycle effects. The decomposition is depicted in Figure 6.20, and two main conclusions can be made. First, the discretionary fiscal policies were dominant for most of the examined period for all the countries. The expansionary fiscal efforts were so strong that they fully offset the effects of automatic stabilisers. Second, automatic stabilisers became stronger after 2011, with the exception of Spain.

In addition, I need to specify two additional measures for a precise analytical view. The fiscal stance (FS) is defined as the inverse of structural budget balance (BB^{STR}):

$$FS_t = -BB_t^{STR} \quad . \tag{6.14}$$

The positive values mean expansionary fiscal stance, while negative values stand for contractionary fiscal stance. It is often useful to compare this measure to output gap to be able to assess not only the size of a fiscal stimulus but also its relation to the business cycle. Fiscal policy is one of the two key stabilisation macroeconomic policies. Thus, it should aim to be anti-cyclical. Nevertheless, due to various reasons,[50] fiscal policy is often pro-cyclical, which destabilises the particular economy.

The fiscal stances of the EU4 countries are shown in Figure 6.21. The values offer various implications despite their simplicity. First, the countries were running structural budget deficits for most of the examined period, thus, artificially[51] stimulating the economies. The size of the stimulus peaked for all the countries, except Italy,[52]. The highest value was recorded in Greece, and it accounted for nearly 20% of its potential GDP in 2009. The second highest stimulus was made in Spain, reaching approximately 10% of its potential GDP in 2009. These values were extremely high. They even outmatched the size of the GDP gaps in their peaks before the financial crisis of 2008–2009. Although the values were relatively lower in Portugal and Italy, they were still dominant. Hence, I conclude that the fiscal policies caused significant economic instabilities in the countries.

[49] This definition of a discretionary policy has a strictly macroeconomic interpretation as opposed to the microeconomic division regarding discretionary and mandatory measures.

[50] For example, these include deficit bias, moral hazard, or political budget cycles.

[51] I use this adjective because of the well-known inefficiencies and moral hazard of the countries.

[52] Nevertheless, Italy was keeping its fiscal stance considerably expansionary for most of the period before the financial crisis.

Second, I conclude that pro-cyclical fiscal policies have been made before the financial crisis in Italy, Spain, and Portugal. After 2012, the nature of the policies is less clear,[53] it was either acyclical or anti-cyclical. However, I argue that the latter was a result of the continuation of chronic fiscal deficits rather than systematic fiscal consolidation. Furthermore, Greece is a textbook example of pro-cyclical fiscal policies which amplify the existing output gap and destabilise its economy. In my opinion, the character of fiscal policies in Greece, partly due to the design of the "*rescue packages*" is unfortunate. Fiscal rules embedded in the Stability and Growth Pact or in the "*European Fiscal Compact*" cannot solve the issues. Paradoxically, they make the problem even worse as they promote policies, which under certain situations – including this one, promote economic instabilities. They are a result of compromises in the EU policy-making. They are not able to solve the structural problems of the countries, which is also the case for the monetary policy and quantitative easing in particular. It is evident that the primary purpose is political, not economic. More focus should be put on structural reforms promoting competitiveness and efficiency. This issue is explained in the last chapter.

Furthermore, I define the fiscal impulse[54] (FI) as the first differences or absolute changes of the fiscal stance measure (FS):

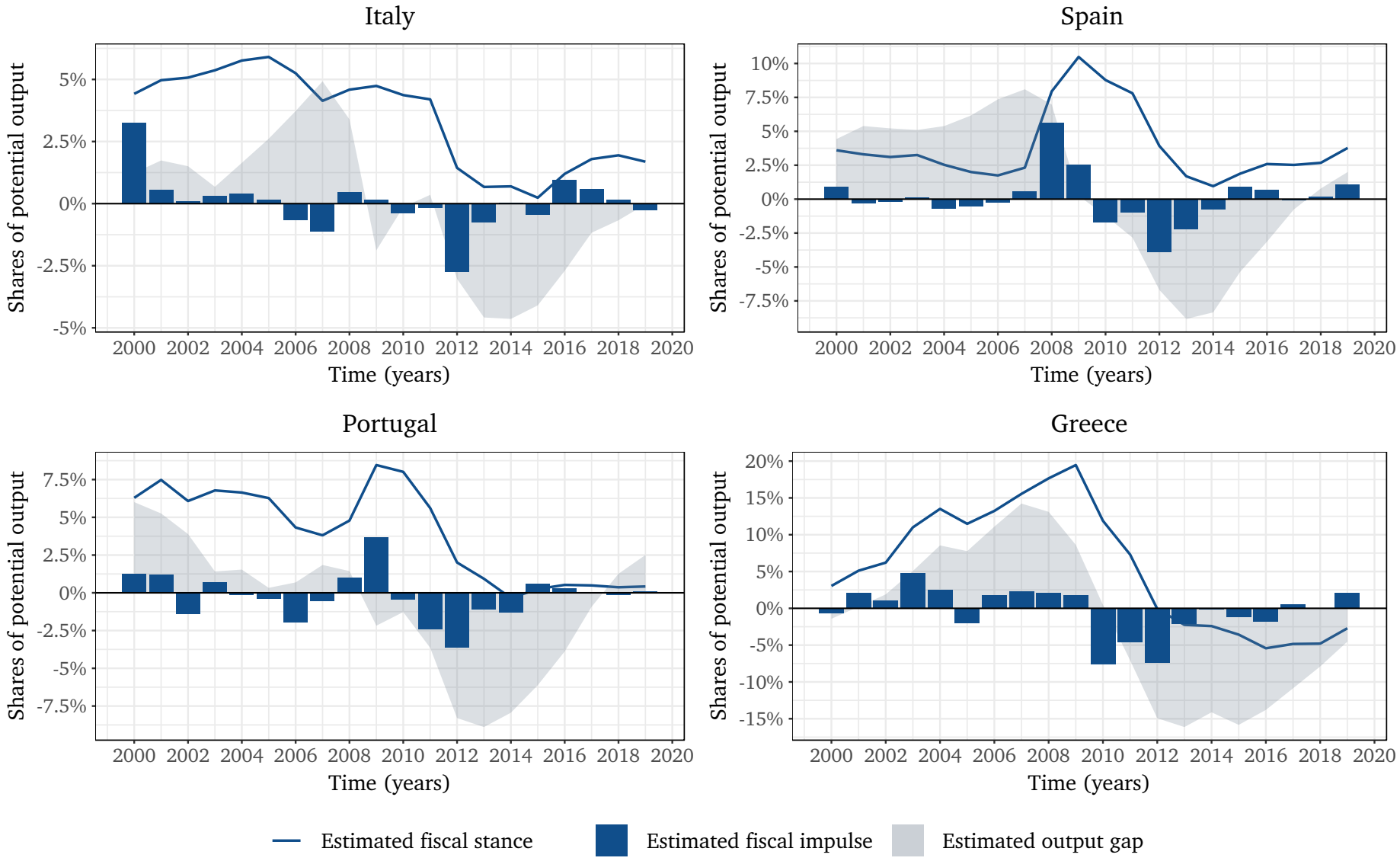
$$FI_t = FS_t - FS_{t-1} \quad . \tag{6.15}$$

The interpretation of the measure is the same as in the case of fiscal stance. However, it captures the changes in fiscal stimulus more visibly. The fiscal impulses of the EU4 countries are also depicted in Figure 6.21. The data show that pro-cyclical nature of fiscal policy in Greece is even more pronounced by using this measure. In addition, the same tendency was in Spain. Finally, I observe a serious expansionary fiscal pressure in Portugal and Spain between 2008–2009. Nevertheless, it was later offset by contractionary efforts because it was not sustainable. One of the lessons is that strong fiscal efforts are inefficient and destabilising the economy later if a crisis is caused or accompanied by serious structural inefficiencies of the countries.

[53] Note that the estimates suffer from some degree of uncertainty.

[54] The measure has been used by the IMF since the 1970s. Refer to Blejer and Cheasty (1993). Alternative measures with a more broad interpretation are various types of fiscal multipliers. This analysis is done in its respective chapter regarding fiscal efficiency.

Figure 6.21: Development of fiscal stances, fiscal impulses, and output gaps — EU4, 2000–2019



Source: own calculations and processing.

6.3 Debt Dynamics and Sustainability

As it was mentioned in the theoretical part, the concept of sustainability can be defined from various standpoints. In the end, a sovereign debt sustainability assessment is an informed judgment on a country's capacity to generate and sustain the primary balances required to stabilise or lower the public debt under a large set of circumstances (Debrun et al., 2018). This section focuses on the most used (traditional) approach to debt sustainability, which is based on the analysis of debt dynamics (snowball effect). In addition, I present deterministic long-term economic projections based on historical averages of relevant variables within two scenarios – total period (2000–2019) and the latest period of positive economic growth (2014–2019). I do not perform a medium-term (stochastic) analysis because it is not corresponding with the aim of this work. The discussion and the proposed solutions are of a long-term nature. Moreover, the values are subject to a high degree of uncertainty regarding the coronavirus outbreak in early 2020. Finally, I decided not to include a significant long-term phenomenon of population ageing for two reasons. First, the projections cover 31 years which is not enough for the phenomenon to fully manifest. Second, it would complicate the analysis by incorporating an additional set of assumptions, and it is associated with a high degree of uncertainty. The assumptions regarding the relevant economic policies and variables are also frequently revised.[55]

6.3.1 Analytical Framework

The debt dynamics analysis is based on the works of the IMF (see Piscetek, 2019). First, it assumes that the government can borrow debt both from abroad and domestically. Hence, the debt is expressed in both domestic (D^d) and foreign currencies (D^f). The nominal effective exchange rate (e),[56] abbreviated as NEER, is defined as the number of domestic currency units per one unit of foreign currency (direct quotation). Therefore,

[55] For example, see the Debt Sustainability Monitor 2019 (European Commission, 2020b).

[56] I use effective exchange rate due to the heterogeneous debt structure. The assumption of homogeneity — debt denominated only in one foreign currency — is not very plausible. The same argument applies to the interest rates regarding heterogeneous debt structure.

an increase in e_{t+1} over e_t represents a depreciation of the domestic currency and vice versa. The assumption is depicted in the following equation:

$$D_{t+1} = D^d_{t+1} + e_{t+1} D^f_{t+1} \,. \tag{6.16}$$

In this case, I assume an open economy and incorporate other flows (stock-flow adjustment and residual term) to achieve a high level of accuracy. Furthermore, the flow budget constraint is defined as follows[57] (for example, refer to IMF, 2013):

$$D_{t+1} = (1+\varepsilon_{t+1})(1+i^f_{t+1})D^f_t + (1+i^d_{t+1})D^d_t - PB_{t+1} + SFA_{t+1} + RES_{t+1} \,, \tag{6.17}$$

where:

- D is the stock of (total) general government debt,
- t is the relevant period,
- D^d is the stock of local currency-denominated debt,
- D^f is the stock of foreign currency-denominated debt,
- ε is the relative change of the NEER, where $1+\varepsilon_{t+1} = \frac{e_{t+1}}{e_t}$,
- i^d is the effective nominal interest rate on D^d,
- i^f is the effective nominal interest rate on D^f,
- PB is the primary balance which is defined as government revenue less non-interest government expenditure,
- SFA are other flows which are not included in the government revenues or expenditures but affect the overall debt level,
- RES is the residual term[58] which contains data inconsistencies.

Next, I express the previous equation in GDP shares, hence, divide it by nominal GDP in local currency in period $t+1$:

$$\frac{D_{t+1}}{Y_{t+1}} = (1+\varepsilon_{t+1})(1+i^f_{t+1})\frac{D^f_t}{Y_{t+1}} + (1+i^d_{t+1})\frac{D^d_t}{Y_{t+1}} - \frac{PB_{t+1}}{Y_{t+1}} + \frac{SFA_{t+1}}{Y_{t+1}} + \frac{RES_{t+1}}{Y_{t+1}} \,. \tag{6.18}$$

[57] A simplified closed-economy version of the flow budget constraint was defined in the first chapter (Section 1.5).

[58] I include this term to ensure that the aggregate calculations are identical to the actual data. The issue of inconsistency is explained in the following text. Therefore, this term should be as small as possible, which was achieved in the calculations.

For simplicity, I replace all the relevant variables, except domestic-currency and foreign-currency debt stocks, with small letters denoting the GDP ratios:

$$d_{t+1} = (1+\varepsilon_{t+1})(1+i^f_{t+1})\frac{D^f_t}{Y_{t+1}} + (1+i^d_{t+1})\frac{D^d_t}{Y_{t+1}} - pb_{t+1} + sfa_{t+1} + res_{t+1} \,. \tag{6.19}$$

Let $Y_{t+1} = (1+g_{t+1})(1+\pi^d_{t+1})Y_t$, where g is the real GDP growth and π is domestic inflation measured by the change of the GDP deflator. This intertemporal definition of nominal GDP can be substituted into the previous expression:

$$d_{t+1} = \frac{(1+\varepsilon_{t+1})(1+i^f_{t+1})D^f_t}{(1+g_{t+1})(1+\pi_{t+1})Y_t} + \frac{(1+i^d_{t+1})D^d_t}{(1+g_{t+1})(1+\pi_{t+1})Y_t} - pb_{t+1} + sfa_{t+1} + res_{t+1} \,. \tag{6.20}$$

I need to deduct d_t from both sides of the previous equation to obtain the change in the debt-to-GDP ratio (debt dynamics):

$$d_{t+1} - d_t = \frac{(1+\varepsilon_{t+1})(1+i^f_{t+1})}{(1+g_{t+1})(1+\pi_{t+1})}d^f_t + \frac{(1+i^d)}{(1+g_{t+1})(1+\pi_{t+1})}d^d_t - pb_{t+1} + sfa_{t+1} + res_{t+1} - d_t \,. \tag{6.21}$$

Furthermore, let $\rho_{t+1} = (1+g_{t+1})(1+\pi_{t+1})$ for simplification:

$$d_{t+1} - d_t = \frac{1}{\rho_{t+1}}\left[(1+\varepsilon_{t+1})(1+i^f_{t+1})d^f_t + (1+i^d_{t+1})d^d_t\right] - pb_{t+1} + sfa_{t+1} + res_{t+1} - d_t \,. \tag{6.22}$$

In the next step, I isolate the contributions from the nominal effective interest rate, nominal effective exchange rate (NEER), and real GDP growth. It takes several adjustments to obtain the following equation:

$$d_{t+1} - d_t = \frac{1}{\rho_{t+1}}\Bigg[\underbrace{d_t(i_{t+1} - \pi_{t+1}(1+g_{t+1}))}_{\substack{\text{Contribution of nom.}\\ \text{effect. interest rate}}} \underbrace{+\varepsilon_{t+1}(1+i^f_{t+1})d^f_t}_{\substack{\text{Contribution}\\ \text{of NEER}}} \underbrace{-d_t g_{t+1}}_{\substack{\text{Contr. of real}\\ \text{GDP growth}}}\Bigg] \underbrace{-pb_{t+1} + sfa_{t+1} + res_{t+1}}_{\substack{\text{Contribution of primary}\\ \text{balance and other factors}}} \,. \tag{6.23}$$

Finally, the previous equation contains some nominal variables. Nevertheless, it is more appropriate to use real variables which have a more precise economic meaning. Therefore, Equation 6.23 can also be expressed in real terms of the effective exchange rate (REER) and the effective interest rate (IMF, 2013):

$$d_{t+1} - d_t = \left(\frac{1}{1+g_{t+1}}\right)\left[\underbrace{d_t\left(r^d_{t+1}\frac{d^d_t}{d_t} + r^f_{t+1}\frac{d^f_t}{d_t}\right)}_{\substack{\text{Contribution of real}\\ \text{effect. interest rate}}} + \underbrace{d^f_t\,\xi_{t+1}(1+r^f_{t+1})}_{\substack{\text{Contribution}\\ \text{of REER}}} \underbrace{-d_t g_{t+1}}_{\substack{\text{Contr. of real}\\ \text{GDP growth}}}\right]$$

$$\underbrace{-pb_{t+1} + sfa_{t+1} + res_{t+1}}_{\substack{\text{Contribution of primary}\\ \text{balance and other factors}}}, \tag{6.24}$$

where the partial real effective interest rates are based on the Fisher equation and the REER is defined as NEER adjusted for price level difference:

$$\begin{aligned}\left(1+i^d_{t+1}\right) &= \left(1+r^d_{t+1}\right)\left(1+\pi^d_{t+1}\right)\\ \left(1+i^d_{t+1}\right) &= \left(1+r^f_{t+1}\right)\left(1+\pi^f_{t+1}\right)\\ 1+\xi_{t+1} &= \frac{e_{t+1}}{e_t}\left(\frac{1+\pi^f_{t+1}}{1+\pi^d_{t+1}}\right).\end{aligned} \tag{6.25}$$

Another important dimension is a gap analysis. A debt-stabilising primary balance (pb^*) needs to be equal to the automatic debt dynamics.[59] However, it is necessary to be careful. As Escolano (2010) states, the term "*debt-stabilising*" is a misnomer because the stabilisation does not imply reaching the target level of the debt. It solely focuses on keeping the debt-to-GDP ratio constant. Furthermore, the calculation does not consider the stock-flow adjustment (*sfa*) and the residual term (*res*) because these "*exogenous*" flows are not relevant in this case. Therefore, I assume that the debt-to-GDP ratio does not change ($d_t = d_{t+1}$) and adjust Equation 6.24:

$$pb^*_{t+1} = \left(\frac{1}{1+g_{t+1}}\right)\left[d_t\left(r^d_{t+1}\frac{d^d_t}{d_t} + r^f_{t+1}\frac{d^f_t}{d_t}\right) + d^f_t\,\xi_{t+1}(1+r^f_{t+1}) - d_t g_{t+1}\right]. \tag{6.26}$$

[59] Some authors also consider tax gap, focusing on government revenue. However, I decided not to use this indicator due to the inappropriateness of tax policy in solving debt problems and economic inefficiencies.

6.3.2 Historical Debt Dynamics

Table 6.5 provides an overview of the used data. There are certain limitations given the open economy assumptions. The data regarding general government debt stock structure in foreign-denominated currencies and the respective effective interest rates are not available. Hence, the calculations assume that the effective interest rates on domestic- and foreign-denominated debt are identical. Furthermore, the euro is taken as the domestic currency.[60]

Table 6.5: Debt dynamics — Used variables

	Indicator	Units		Indicator	Units
1	**General government gross debt**	Total — consolidated, shares of GDP (% values)	5	**Real effective interest rate**	Ratio of interest payments to total debt, real changes based on implicit price deflator (% values)
2	**General government gross debt**	Portion denominated in domestic currency – euro, shares of GDP (% values)	6	**Real effective exchange rate (REER)**	REER of euro against 12 most significant trading partners — Euro area moving compos., (% changes)
3	**General government gross debt**	Portion denominated in foreign currencies – conversions made using a fixed parity, shares of GDP (% values)	7	**General government primary budget balance**	General government net lending/net borrowing excluding interest payments, shares of GDP (% values)
4	**Real GDP growth**	Real changes based on implicit price deflator (% values)	8	**Stock-flow adjustment**	Changes in total debt ratios not captured by budget balances, shares of GDP (% values)

Source: ECB (2020), European Commission (2020a), and Eurostat (2020a), own calculations and processing.

Note that the EU4 countries are participating in a monetary union. Consequently, the distinction between the "*domestic*" and "*foreign*" does not strictly refer to the ownership but the currency denomination aspect. Moreover, the calculations utilise REER changes[61] of the Euro Area for 12 most significant trading partners (EER-12 group),[62] and assume

[60] Greece entered the Euro Area in 2001. Therefore, the calculations for the year 2000 are simplified in this case.

[61] The data are obtained from the ECB Warehouse which is using a different definition of the REER. It is based on an indirect quotation, while the used analytical framework utilises direct quotation. Therefore, I reversed the signs of the original variable to keep it consistent with the concept of direct quotation.

[62] The ECB provides effective exchange rates for a higher number of trade partners. However, I assume that the foreign currency-denominated debt is predominantly held by the most significant trading partners.

the same REER for each of the countries.[63] These inaccuracies, which are insignificant,[64] are captured in the residual term (*res*). Descriptive statistics of used variables are available in Appendix E.

Figure 6.22 shows a historical decomposition of absolute changes in general government gross debt to GDP of the EU4 countries between 2000–2019. First, it is possible to identify the specifics of each of the countries. The automatic debt dynamics (the effects of real effective interest rate, real GDP growth, and REER) was crucial for Italy, Portugal, and Greece. The debt accumulation in Spain was highly determined by primary budget balances which implies that this country has a larger "*manoeuvring*" space or higher potential of discretionary fiscal measures. The effects of REER were negligible due to low amounts of foreign currency-denominated debts in the EU4 countries. In addition, real effective interest rate has been a determining factor of debt dynamics for Italy during the examined period. Furthermore, the GDP growth effect had been decisive for Greece, while Portugal's contributions were fairly diversified.

Second, the data also show time-changing patterns. Real effective interest rates had a relatively strong effect before the financial crisis, which implies that the ECB had a strong argument in reducing the interest rate as a result of its monetary policy decisions. Nevertheless, the policy is arguably not sustainable and beneficial in the long term.[65] Moreover, during the initial impact of the financial crisis (between 2008–2014), the countries were relying on different strategies. Portugal and Spain decided to counter the negative effects of the crisis by stimulating the economies through primary budget balances. This was not the case for Italy and Greece in terms of relative importance. The former country did not need any financial assistance from the EU, while Greece entered a rescue programme (First Economic Adjustment Programme) in 2012 and a large portion of Greek debt was written off which is reflected in the stock-flow adjustment.[66]

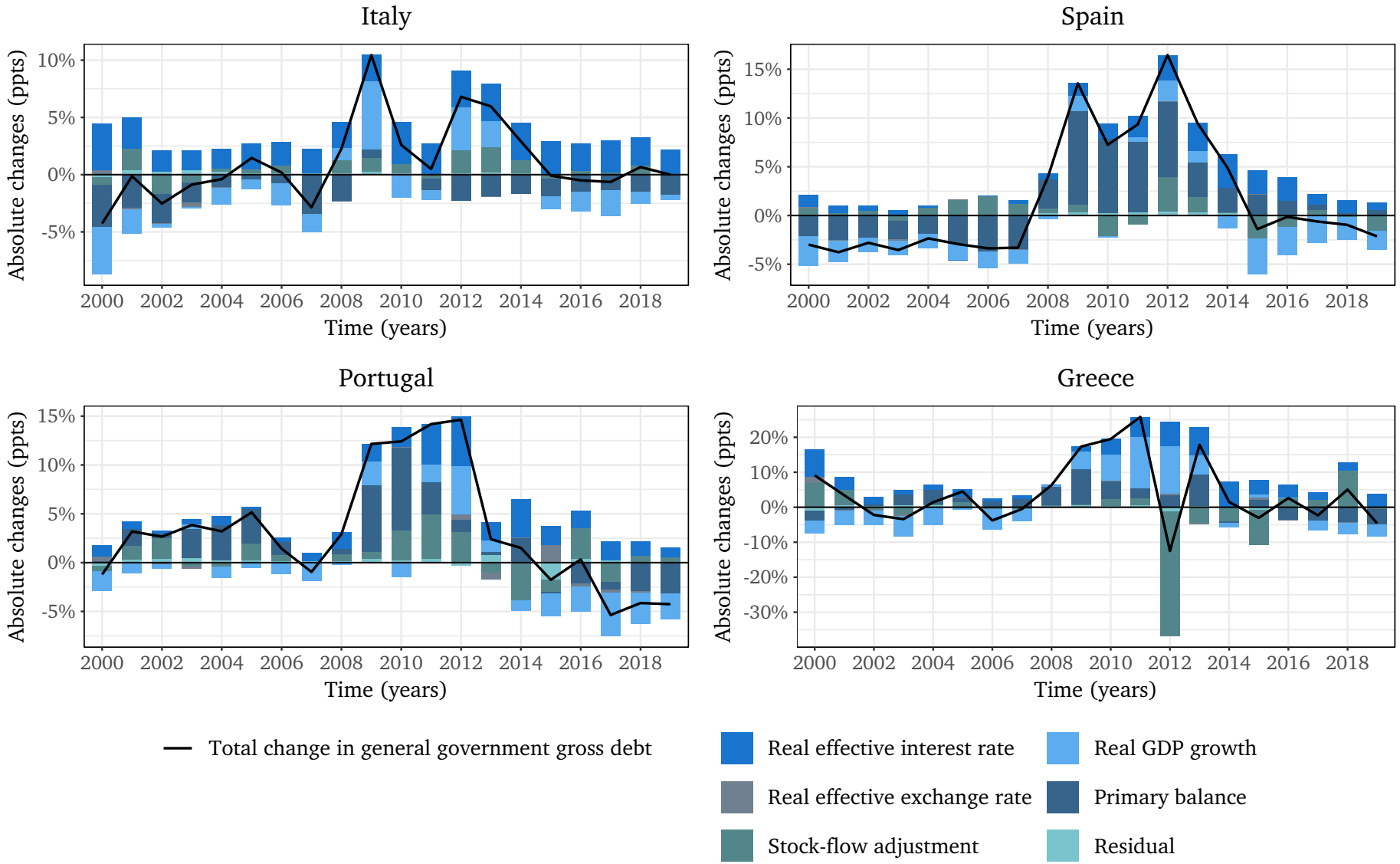
[63] It is necessary to use GDP deflators as price level measures to make the calculations consistent.

[64] Refer to the Figure 6.22 below. The residual term is negligible.

[65] A detailed discussion is provided in the relevant chapters.

[66] Note that the Greek debt relief was much larger than 35.6% of GDP. However, the stock-flow adjustment captures more factors. It was described in Section 6.1.

Figure 6.22: Decomposition of absolute changes in general government gross debt to GDP ratios — EU4, 2000–2019



Source: own calculations and processing.

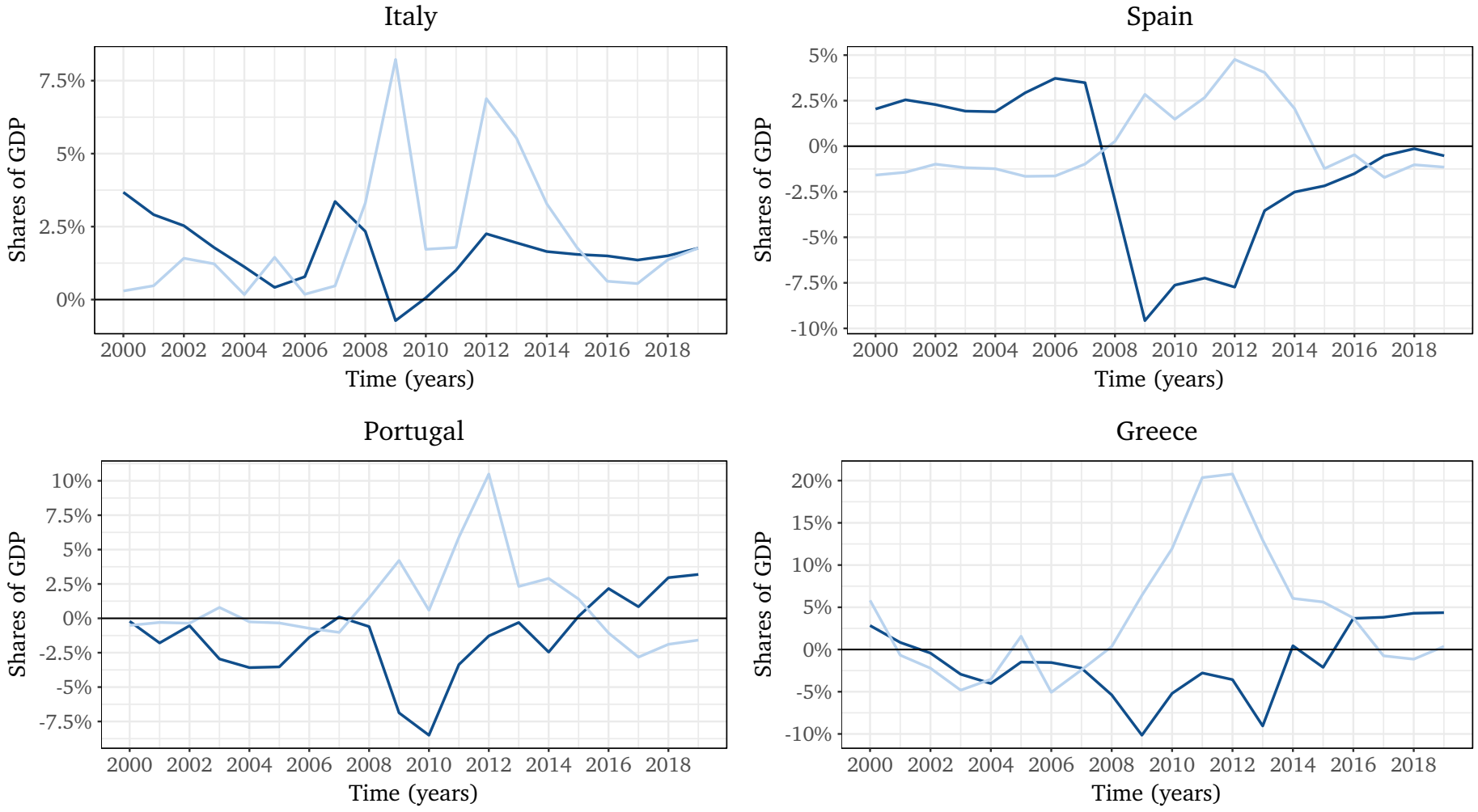
After 2014, the relative indebtedness of the countries had been reduced by positive GDP growth. However, the effect was much weaker in Greece because the country showed comparatively lower growth rate values.[67] Relative contributions, denoting the debt dynamics contributions to debt level ratios, are available in Appendix E.

Figure 6.23 compares debt-stabilising primary balances to the actual primary balances of the EU4 between 2000–2019. Note that the debt levels of the EU4 countries were stable (or even declining in Spain) before the financial crisis, while the actual balances were significantly different from the debt-stabilising balances between 2008–2014. The positive GDP growth after 2014 helped to stabilise the debts. Nevertheless, as it was mentioned, debt-stabilisation is not a sufficient condition in the environment of already high (relative) debt levels which were recorded in the EU4 countries. The debt-stabilising primary balances represent only an effect which was needed to counter the debt dynamics or stop the debt ratios growing. I argue that there is no need to get rid of the debts entirely because the costs would be prohibitive. It would be sufficient for the countries to comply with the Maastricht criterion of 60%. The issue was discussed in the first chapter (Section 1.4.1). Therefore, I also show Figure 6.24, which represents the primary balances needed to bring the relative debt level of each country to 60% of GDP in 50 years. The calculations are based on two scenarios which are presented in the next section.[68] The latter figure offers a more precise interpretation of debt sustainability during the examined period. The primary balances of Italy, Portugal, and Greece were insufficient for most of the period, rendering the debt situations unsustainable. The position of Spain was relatively better.

[67] Refer to the previous chapter (Section 5.1).

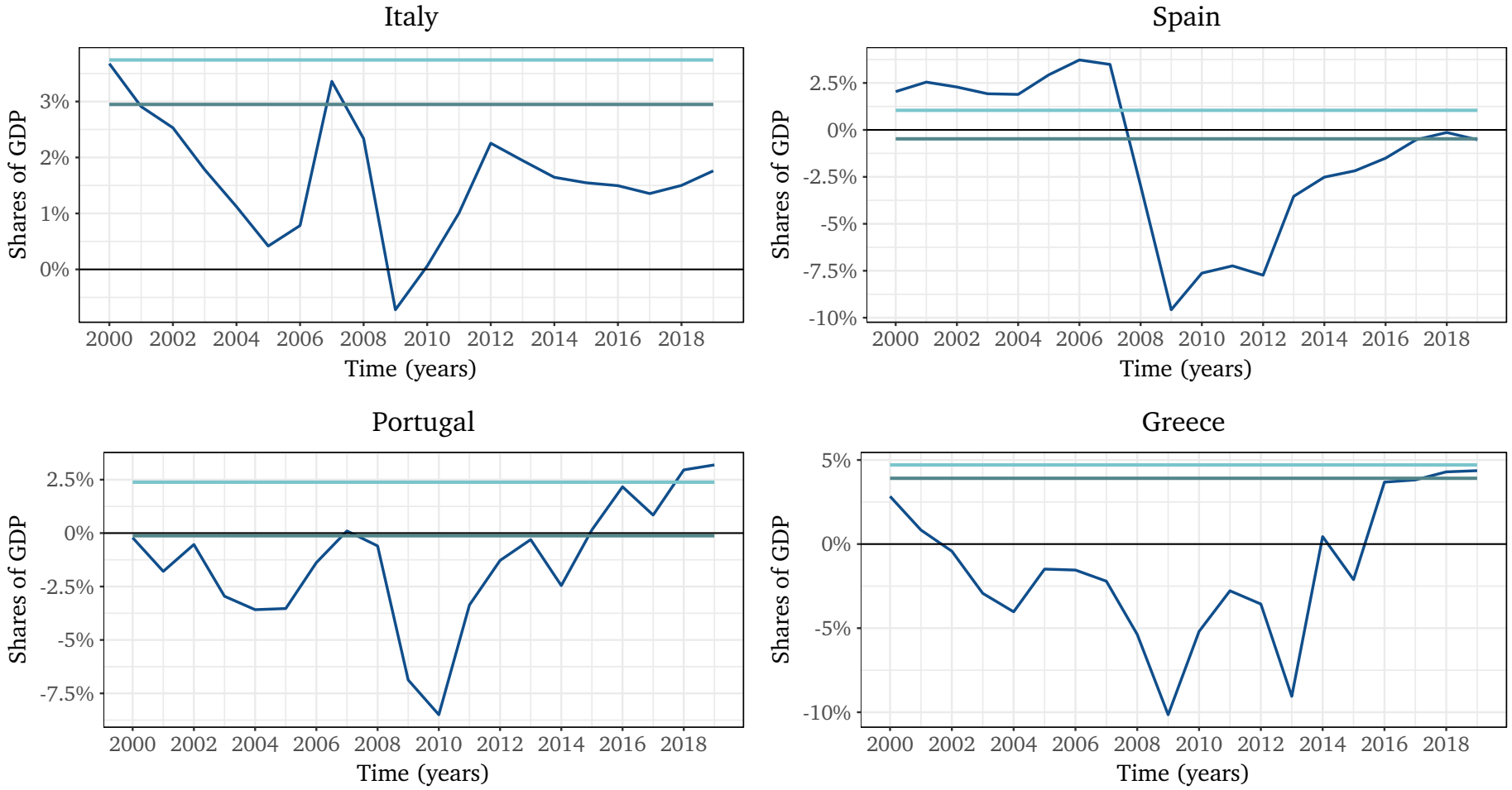
[68] Furthermore, I assume a linear development for simplicity — a stable primary balance to GDP ratio for each year. A non-linear development would need additional assumptions and would make the analysis more complicated and less transparent.

Figure 6.23: Debt-stabilising general government primary budget balances to GDP and actual primary budget balances to GDP (gap analysis) — EU4, 2000–2019



Source: Eurostat (2020a), own calculations and processing.

Figure 6.24: General government primary budget balances to GDP needed to lower general government gross debt ratios to 60% in 50 years starting 2020 and actual primary budget balances (gap analysis) — EU4, 2000–2019



Source: Eurostat (2020a), own calculations and processing.

6.3.3 Long-Term Debt Projections and Sensitivity Analyses

The next part of the analysis is a detailed overview of the debt dynamics of each country. I present 31-year long-term government debt projections, ranging from 2020 to 2050, under two different scenarios of debt dynamics. The first scenario is based on the averages of the relevant variables of the countries between 2000–2019. Therefore, this scenario represents a situation what would the debt to GDP ratio look like if all the relevant variables reached their average values between 2000–2019. In other words, the first scenario is a representative depiction of the period which started approximately when the Euro Area was created. In contrast, the second scenario is based on the averages of the variables between 2014–2019, which can be identified as the post-recession period. The period was, on average, characterised by massive government interventions and expansionary economic policies. Therefore, the second scenario represents a more optimistic outline. The additional value-added of the analysis is a detailed overview of historical debt dynamics (trends) in the given periods.

Nevertheless, it should be noted that small differences exist. The aim was not to precisely replicate the debt dynamics in the given periods. I rather try to answer the question: "*What would be the level of the debt to GDP ratios of the selected countries and the main drivers, if the countries recorded average values of the relevant debt-dynamics variables given the two scenarios?*". To be specific, I use simple arithmetic averages in many cases, as opposed to geometric averages which would capture the dynamics more precisely. For example, I use geometric averages for real GDP growth, but simple averages for effective interest rates. Moreover, the calculations also take into account the stock-flow adjustments and residual values. Furthermore, the section provides a sensitivity analysis and identifies the most critical drivers of the debt dynamics of the EU4 countries under the two scenarios. The analysis ignores the underlying correlations between the variables and possibly endogenous economic policy responses.[69] Moreover, I use constant values or linear development for simplicity and transparency of the analysis.

[69] It represents a trade-off between accuracy (stochastic forecast) and rather static analysis (deterministic forecast based on the concept of partial equilibrium). I believe that the former approach is not useful in this case. It was discussed in Section 6.3.

Finally, it is necessary to mention that the projections do not take into account the coronavirus crisis outbreak in Europe in March 2020, which altered the situation. However, the analysis is a useful depiction of the "*average*" situation of the countries between 2000–2019 and 2014–2019. Note that the aim of the analysis is not to provide accurate forecasts. As it was mentioned, the analysis is of a long-term nature.

6.3.3.1 Scenario 1 — Debt Dynamics of 2000–2019

Table 6.6 provides an overview of the used variables and their average values for the respective period. It is possible to distinguish between two main phases.

Table 6.6: Scenario 1 — Assumed values of used variables

Italy		Spain	
Variable	Assumed value	Variable	Assumed value
Share of debt in national currency	99.18%	Share of debt in national currency	99.14%
Share of debt in foreign currency	0.82%	Share of debt in foreign currency	0.86%
REER change (+deprec./-apprec.)	-0.16%	REER change (+deprec./-apprec.)	-0.16%
Primary balance to GDP	1.64%	Primary balance to GDP	-1.26%
Real GDP growth	0.38%	Real GDP growth	1.82%
Real effective interest rate	2.20%	Real effective interest rate	1.84%
Stock-flow adjustment to GDP	0.45%	Stock-flow adjustment to GDP	0.24%
Residual to GDP	0.14%	Residual to GDP	0.14%

Portugal		Greece	
Variable	Assumed value	Variable	Assumed value
Share of debt in national currency	95.46%	Share of debt in national currency	97.43%
Share of debt in foreign currency	4.54%	Share of debt in foreign currency	2.57%
REER change (+deprec./-apprec.)	-0.16%	REER change (+deprec./-apprec.)	-0.16%
Primary balance to GDP	-1.40%	Primary balance to GDP	-1.53%
Real GDP growth	0.85%	Real GDP growth	0.32%
Real effective interest rate	1.71%	Real effective interest rate	2.52%
Stock-flow adjustment to GDP	0.63%	Stock-flow adjustment to GDP	-1.36%
Residual to GDP	0.13%	Residual to GDP	0.17%

Source: own calculations and processing.

The first part of the period (approximately 2000–2008) was characterised by over-optimism, economic overheating and inadequately expansive economic policies. After 2008, the countries experienced significant economic shocks due to the adverse effects of the financial crisis. Only Italy was able to reach (on average) a positive primary balance to GDP ratio during the given period. However, its real GDP growth was much lower, reinforcing the negative debt dynamics because the real effective interest rate was higher. It was the case of all the countries, except Spain, where the two levels were roughly the same. The implicit debt dynamics of the countries during the given period is shown in Table 6.7. Note that the snowball effect (automatic debt dynamics) was negative for all the countries except Spain.

Table 6.7: Scenario 1 — Implicit debt dynamics — Relative contributions to general government gross debt to GDP ratios

Automatic debt dynamics				
Country	Real eff. interest rate effect (1)	Real GDP growth effect (2)	REER effect (3)	Total effect (1+2+3)
Italy	2.19%	-0.37%	0.00%	1.81%
Spain	1.81%	-1.78%	0.00%	0.03%
Portugal	1.69%	-0.84%	-0.01%	0.84%
Greece	2.51%	-0.31%	0.00%	2.20%

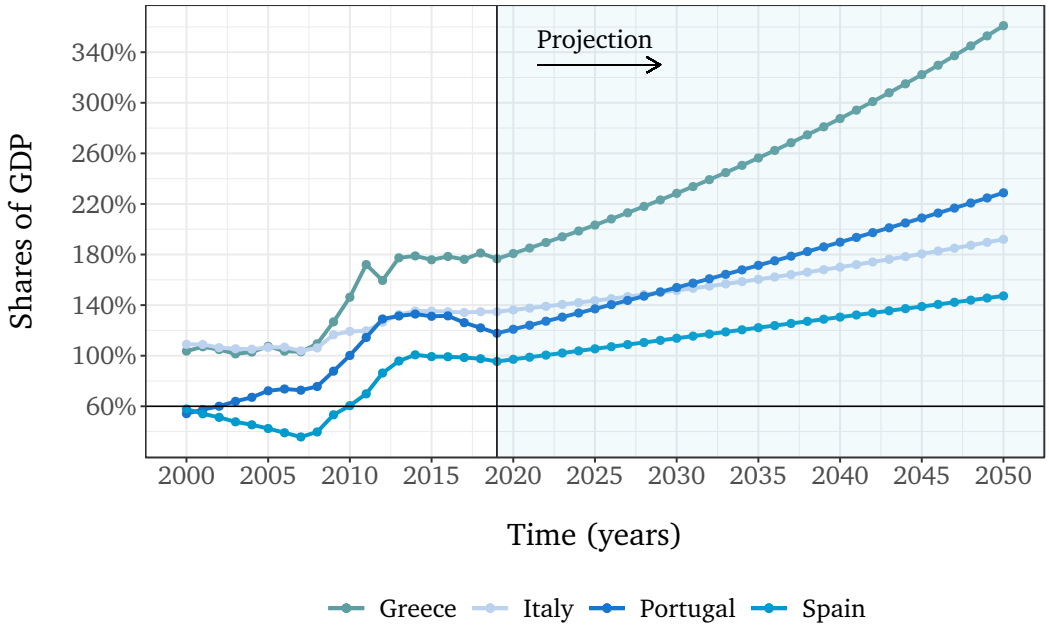
Other factors of debt dynamics				
Country	Average primary balance (4)	Average stock-flow adjustment (5)	Average residual value (6)	Total average debt dynamics (1+2+3+4+5+6)
Italy	-1.02 ppts	0.28 ppts	0.09 ppts	$1.81\% * debt_{t-1}$ - 0.65 ppts
Spain	1.05 ppts	0.20 ppts	0.11 ppts	$0.03\% * debt_{t-1}$ + 1.36 ppts
Portugal	0.84 ppts	0.38 ppts	0.08 ppts	$0.84\% * debt_{t-1}$ + 1.30 ppts
Greece	0.61 ppts	-0.54 ppts	0.07 ppts	$2.20\% * debt_{t-1}$ + 0.14 ppts

Note: Some numbers do not add up due to rounding.
Source: own calculations and processing.

Note that the effect of REER is negligible due to very low amounts of government debts denominated in foreign currencies. Furthermore, Greece and Portugal experienced the most pervasive negative debt dynamics.

Furthermore, these factors are taken into account, and the following text presents debt projections starting from 2020 until 2050. Figure 6.25 shows that if the countries experienced average constant values of the relevant variables in the next 31 years, their debt-to-GDP ratios would grow very quickly. The dynamics are relatively stronger for Greece and Portugal, which is in line with the previous conclusions. The Greek general government gross debt would exceed 340% of its GDP in 2050.

Figure 6.25: Scenario 1 — Development of general government gross debt to GDP ratios



Source: own calculations and processing.

Figure 6.26 depicts reactions of the debt paths to changes in real GDP growth and real effective interest rates under two scenarios for each variable — optimistic and pessimistic variants. I assume constant GDP growth rates of 2.5% to be an optimistic variant as opposed to the growth rates of 0.5% which is an adverse, however, more realistic outcome. Moreover, I show two borderline variants of real effective interest rates. Taking into account the policies of negative interest rates, I show the effects of slightly negative real effective interest rates of -0.5%, which is a favourable scenario regarding the government debt level. At the same time, I present relatively high values

of real effective interest rates reaching 4%. I decided to use a higher value due to a possible rise of a risk premium in the future.[70] Note that the exchange rate effects are not depicted because they are negligible due to low values of foreign-currency (non-euro) denominated debts. The data show that the effect of high interest rates would be detrimental to the countries, especially for Greece, Portugal, and Italy. Surprisingly, even very optimistic values of GDP growth at 2.5% would not be able to bring the debt-to-GDP ratios down noticeably. This is the case of Spain, Portugal, and Greece. In addition, the situation of Spain is arguably the most problematic because GDP growth has a relatively low impact on the overall debt level.

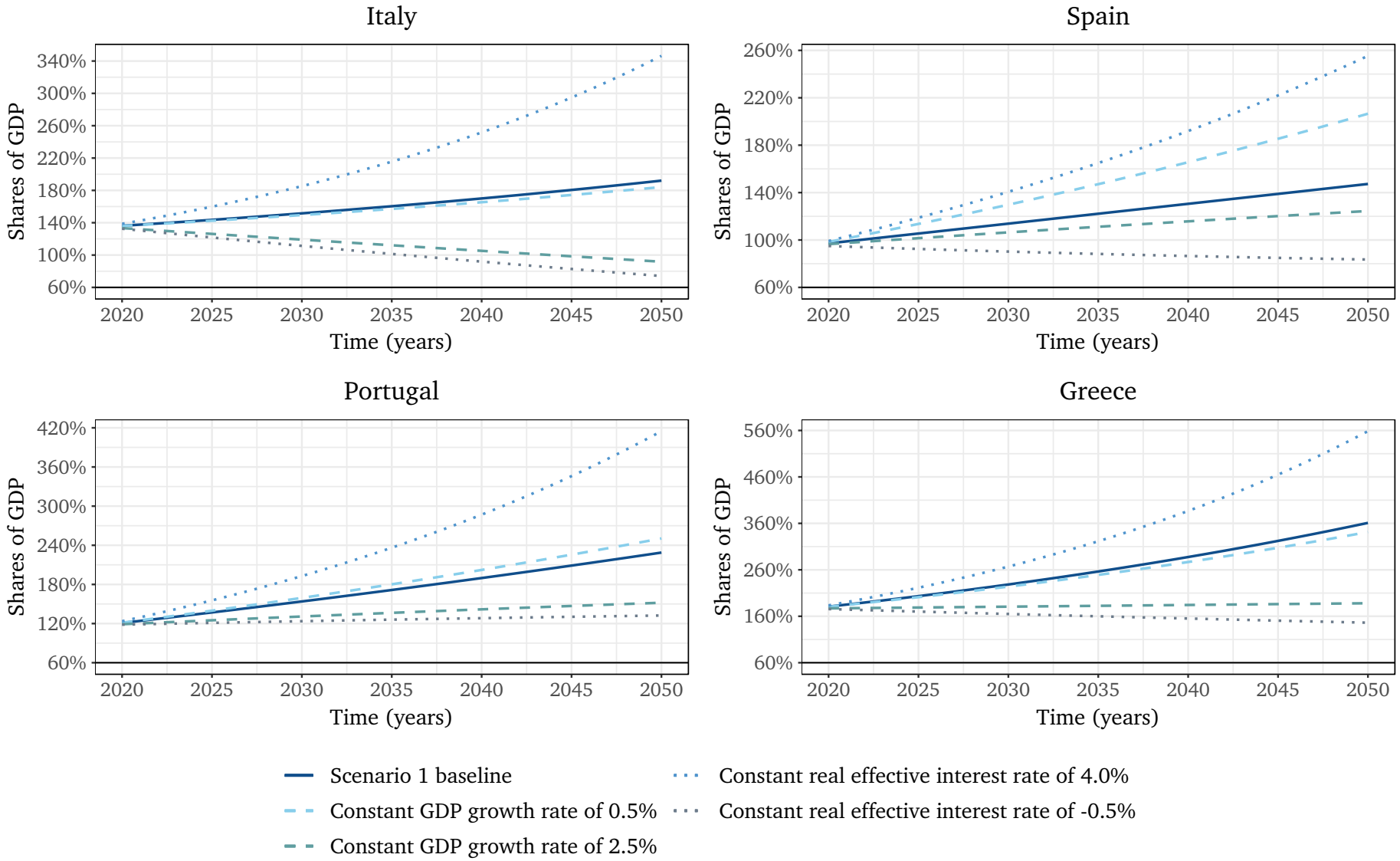
Table 6.8 shows the number of years needed to reach 60% of government debt to GDP ratio (Maastricht criterion level) for different levels of primary balances. Some of the countries are in difficult situations. First, I argue that Greece will probably not be able to keep a balanced budget for the next 50 years; therefore, not reaching the ratio. It would be significantly at odds with its historical behaviour. Second, the situation of Italy is similar, however, slightly better.

Finally, Spain and Portugal are in relatively better positions regarding the sizes of primary balances. The former country would be able to run overall deficits of 1.39% of its GDP and still be able to lower the debt-to-GDP ratio to 60% in 50 years. Portugal would need even lower budget deficits of 1.09% of its GDP on average.

To conclude, I provided evidence that the fiscal positions of the countries would further deteriorate under the assumption that the variables followed their average values in the period of 2000–2019. It cannot be expected that the countries would be able to improve their positions under the given circumstances significantly. Nevertheless, Spain and Portugal have a relatively larger manoeuvring space for improving their situation by adjusting their budget balances.

[70] For example, Greece had already shown substantially high interest rates during the financial crisis.

Figure 6.26: Scenario 1 — Sensitivity analysis — Impact of real GDP growth rates and real effective interest rates



Source: own calculations and processing.

Table 6.8: Scenario 1 — Projected gov. budget balances needed to reach 60% of general government gross debt to GDP ratios

Country	Assumed primary balance	Assumed overall balance	Number of years to reach 60% debt ratio
Italy	2.00%	-2.63%	No convergence
Italy	3.00%	-1.63%	117
Italy	3.74%	-0.89%	50
Spain	1.04%	-1.39%	50
Spain	2.00%	-0.43%	21
Spain	3.00%	0.57%	14
Portugal	2.00%	-1.47%	76
Portugal	2.38%	-1.09%	50
Portugal	3.00%	-0.47%	33
Greece	2.00%	-2.74%	No convergence
Greece	3.00%	-1.74%	No convergence
Greece	4.71%	-0.03%	50

Note: The overall budget balances were calculated from primary balances by using average interest payments during the respective period.
Source: own calculations and processing.

6.3.3.2 Scenario 2 — Debt Dynamics of 2014–2019

I use the same principles of debt projections and analyses on the period of 2014–2019. In my opinion, this scenario represents a more optimistic alternative. The period was characterised by economic revival and significant government interventions based on stimulus packages. Average values of key variables are presented in Table 6.9. In contrast with the first scenario, the REER depreciated on average due to the financial crisis effects. However, the exchange rate effects are, again, negligible due to the small shares of foreign-denominated debt. Moreover, the real GDP growth rates of all the countries improved. Portugal experienced the most notable change in this regard. Furthermore,

Portugal and Greece showed positive primary balances. Therefore, I expect that these two countries will not fall behind, as it was the case in the first scenario.

Table 6.9: Scenario 2 — Assumed values of used variables

Italy		Spain	
Variable	Assumed value	Variable	Assumed value
Share of debt in national currency	99.86%	Share of debt in national currency	99.83%
Share of debt in foreign currency	0.14%	Share of debt in foreign currency	0.17%
REER change (+deprec./-apprec.)	0.90%	REER change (+deprec./-apprec.)	0.90%
Primary balance to GDP	1.55%	Primary balance to GDP	-1.23%
Real GDP growth	0.82%	Real GDP growth	2.58%
Real effective interest rate	1.99%	Real effective interest rate	1.98%
Stock-flow adjustment to GDP	0.31%	Stock-flow adjustment to GDP	-0.79%
Residual to GDP	0.07%	Residual to GDP	0.09%

Portugal		Greece	
Variable	Assumed value	Variable	Assumed value
Share of debt in national currency	93.30%	Share of debt in national currency	97.14%
Share of debt in foreign currency	6.70%	Share of debt in foreign currency	2.86%
REER change (+deprec./-apprec.)	0.90%	REER change (+deprec./-apprec.)	0.90%
Primary balance to GDP	1.14%	Primary balance to GDP	2.41%
Real GDP growth	2.15%	Real GDP growth	0.90%
Real effective interest rate	1.55%	Real effective interest rate	2.15%
Stock-flow adjustment to GDP	-0.48%	Stock-flow adjustment to GDP	0.03%
Residual to GDP	0.15%	Residual to GDP	-0.06%

Source: own calculations and processing.

The implicit debt dynamics is shown in Table 6.10. The data show that Spain and Portugal experienced positive (debt-decreasing) automatic debt dynamic while Italy and Spain showed the opposite. It should be noted that only Portugal would bee able to decrease its debt ratio through both the snowball effect (automatic debt dynamics) and other factors (mainly primary balance and stock-flow adjustment).

Table 6.10: Scenario 2 — Implicit debt dynamics — Relative contributions to general government gross debt to GDP ratios

Automatic debt dynamics				
Country	Real eff. interest rate effect (1)	Real GDP growth effect (2)	REER effect (3)	Total effect (1+2+3)
Italy	1.97%	-0.81%	0.00%	1.16%
Spain	1.93%	-2.52%	0.00%	-0.59%
Portugal	1.52%	-2.10%	0.06%	-0.52%
Greece	2.13%	-0.89%	0.03%	1.27%

Other factors of debt dynamics				
Country	Average primary balance (4)	Average stock-flow adjustment (5)	Average residual value (6)	Total average debt dynamics (1+2+3+4+5+6)
Italy	-1.09 ppts	0.22 ppts	0.05 ppts	$1.16\% * debt_{t-1}$ - 0.82 ppts
Spain	1.29 ppts	-0.83 ppts	0.10 ppts	$-0.59\% * debt_{t-1}$ + 0.56 ppts
Portugal	-1.49 ppts	-0.63 ppts	-0.19 ppts	$-0.52\% * debt_{t-1}$ - 2.31 ppts
Greece	-1.40 ppts	0.01 ppts	-0.03 ppts	$1.27\% * debt_{t-1}$ - 1.42 ppts

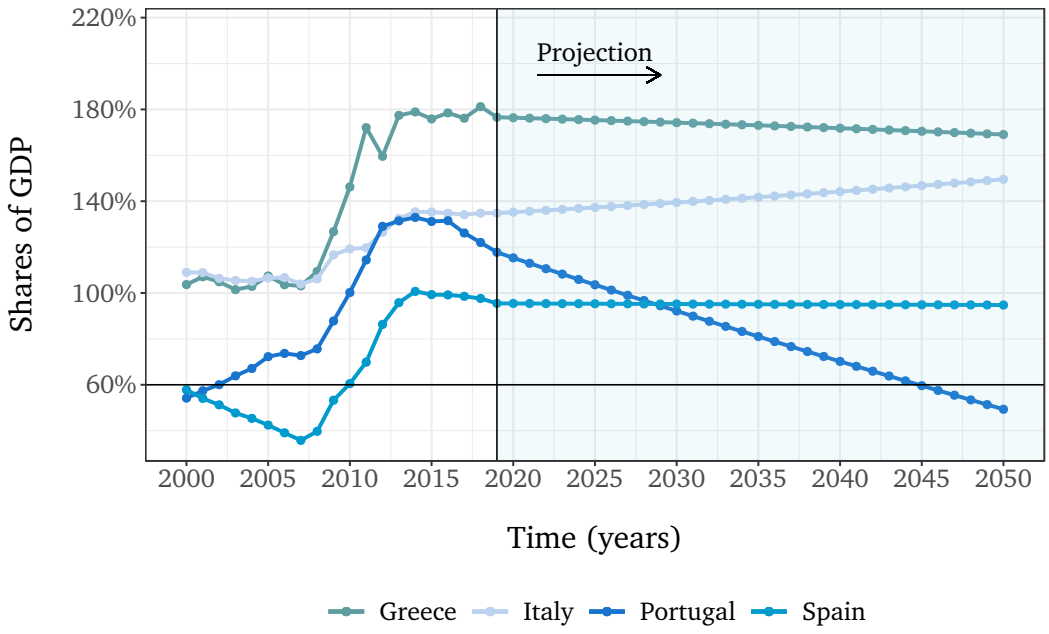
Note: Some numbers do not add up due to rounding.
Source: own calculations and processing.

Figure 6.27 shows that under the second scenario, three of the countries would sustain their debt level. Only Portugal would be able to decrease its debt-to-GDP ratio significantly. The result is better than in the first case. However, as it was mentioned, this scenario represents a more optimistic variant.

Figure 6.28 shows the responses to changes in real GDP growth rates and real effective interest rates. It should be noted that, again, the effects of real exchange rate are not shown because the shares of foreign-denominated debts are negligible. First, the data depict that a spike in real effective interest rate to 4% would be detrimental for the countries, which is similar to the first scenario. Second, the positive effects of real GDP growth are more pronounced in this scenario. Nevertheless, Spain is again in the worst position as the country would not be able to bring the debt ratio down through the GDP

growth effect. In fact, Spain is the most vulnerable country to negative GDP growth shock, after Portugal.

Figure 6.27: Scenario 2 — Development of general government gross debt to GDP ratios

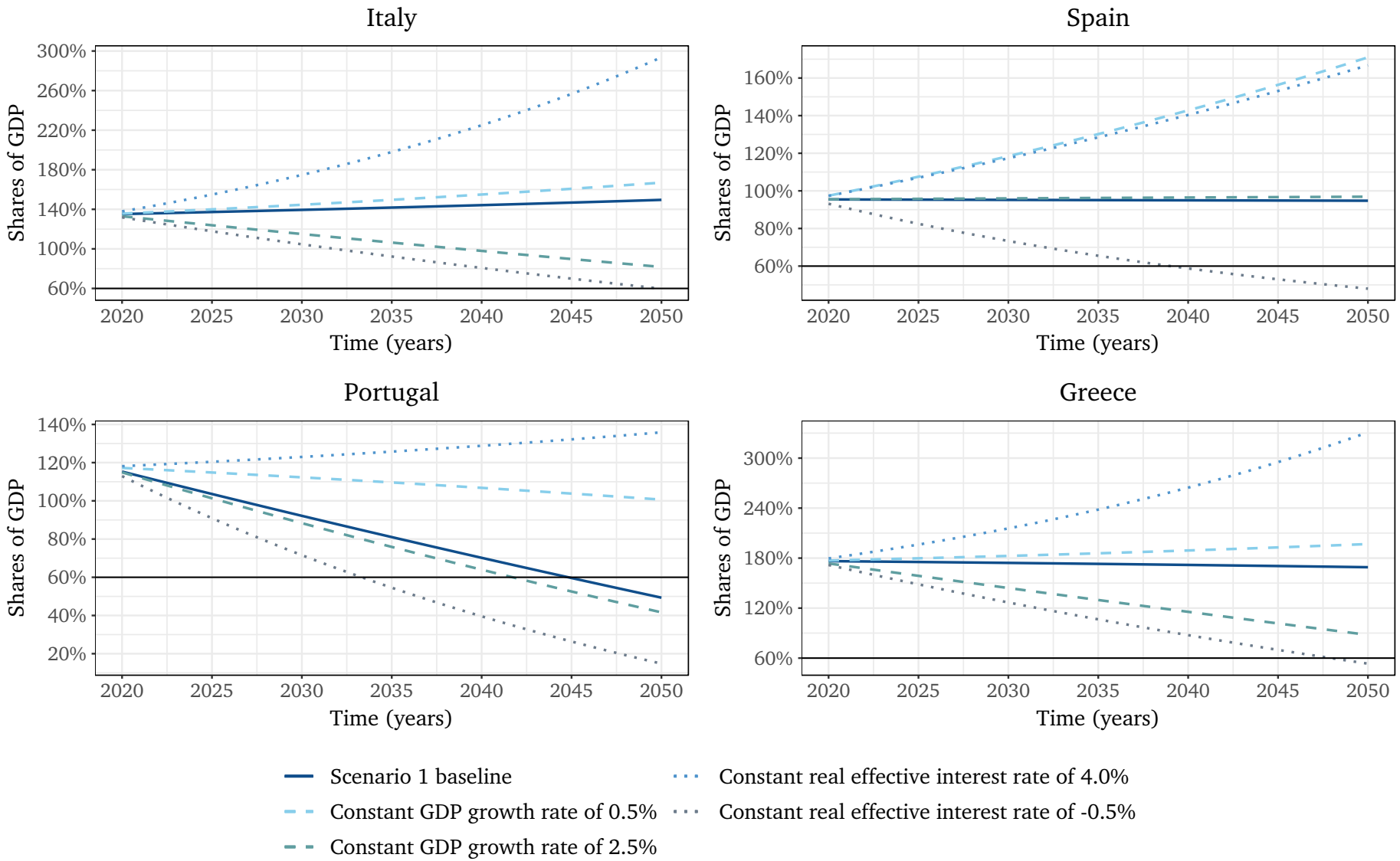


Source: own calculations and processing.

Finally, Table 6.11 depicts different values for overall and primary budget balances for the countries concerning a reduction in the debt ratios to 60% of GDP. The positions of all the countries improved when compared to the first scenario. Italy, Spain, and Portugal would be able to decrease their indebtedness significantly through their budget balances. The countries would even be able to run budget deficits.

Spain and Portugal would decrease their debt ratios to 60% by running overall deficits of 3–4%, making it very likely to be able to lower their debt levels. Italy would be able to do the same by running a deficit of approximately 1% of its GDP. However, Greece would need a budget surplus of approximately 0.5% of its GDP. Given the situation of Greece in 2019, I can securely claim that the debt level of this country is not sustainable.

Figure 6.28: Scenario 2 — Sensitivity analysis — Impact of real GDP growth rates and real effective interest rates



Source: own calculations and processing.

Table 6.11: Scenario 2 — Projected gov. budget balances needed to reach 60% of general government gross debt to GDP ratios

Country	Assumed primary balance	Assumed overall balance	Number of years to reach 60% debt ratio
Italy	2.00%	-1.92%	160
Italy	2.95%	-0.97%	50
Italy	3.00%	-0.92%	49
Spain	-0.48%	-3.21%	50
Spain	2.00%	-0.73%	12
Spain	3.00%	0.27%	9
Portugal	-0.12%	-4.09%	50
Portugal	2.00%	-1.97%	18
Portugal	3.00%	-0.97%	14
Greece	2.00%	-1.33%	No convergence
Greece	3.00%	-0.33%	85
Greece	3.91%	0.58%	50

Note: The overall budget balances were calculated from primary balances by using average interest payments during the respective period.
Source: own calculations and processing.

To conclude, the positions of the countries improved in the second scenario. The debt trajectories were flat, keeping the debt-to-GDP ratios roughly constant, except for Portugal. However, as it was mentioned, this scenario represents an optimistic alternative, and the EU4 countries suffer from systemic fiscal instabilities. In addition, I showed that the situation of Greece regarding its primary and overall budget balances would still not be favourable. Therefore, I claim that the debt levels of the countries are not sustainable because the EU4 countries would not be able to decrease their debt ratios significantly even under the optimistic scenario. Portugal exhibited the most promising signs of sustainability in the second scenario. However, the country experienced extremely good circumstances between 2014–2019.

6.4 Key Findings

The first part of the chapter was the analysis of main fiscal indicators. The EU4 countries showed critical values of both flow and stock fiscal indicators between 2000 and 2019, with only a few exceptions. Moreover, the comparatively larger economies (Italy and Spain) show, on average, a relatively better performance. However, their positions are still alarming. Italy suffers from prohibitively high gross financing needs — high debt service and effective interest rate in particular. The fact puts into perspective the motivations of the ECB and its quantitative easing programmes.[71] Portugal may run into liquidity problems because of a relatively low residual maturity of government debt securities. Finally, Greece is in the worst position.[72] Nevertheless, the country successfully reshaped its debt structure to be more long-term driven; therefore, it is less risky in this regard. It is also necessary to mention that the debt-to-GDP ratio of Greece has significantly changed in 2012 as a result of the largest debt relief in history. The relief amounted approximately to 60% of its GDP. It is captured in the stock-flow adjustment indicator.

The second part of the analysis was the estimation of structural budget balances and its implications in the form of fiscal stance and fiscal effort indicators. First, the estimations are problematic due to the nature of the indicators which cannot be directly observed. In addition, there is no consensus on the appropriate methodology. One-off transactions which are deducted from the overall budget balances consisted mostly of expenditures connected to the financial crisis of 2008–2009.[73] In particular, bank recapitalisation measures were common for Italy, Spain, and Greece. Probably the most problematic and impactful is the estimation of output gaps. In this regard, I presented a large number of model estimates and compared them with the estimates of relevant international institutions. I focused on the estimates of the European Commission because these values are used in the EU's supranational fiscal regulations. In my opinion, the estimates of the European Commission are not consistent when considering all the presented evidence. Own estimates suggest that the structural budget balances were significantly worse

[71] However, the policy is arguably not appropriate for a long term, as it was mentioned in the previous text.

[72] It should be noted that the country has accumulated a significant amount of outstanding liabilities of government-controlled entities which are classified outside the general government sector.

[73] Therefore, making the structural budget balances more positive or less negative.

before 2008 when compared to the European Commission's estimates. The EU4 countries destabilised their economies through prohibitive structural budget deficits, especially Greece and Spain. The highest value was in Greece, and it accounted for nearly 20% of its potential GDP in 2009. The second highest stimulus was made in Spain, reaching approximately 10% of its potential GDP in 2009. These values were extremely high. They even outmatched the size of the GDP gaps in their peaks before the financial crisis. The EU4 countries ran structural deficits for the whole examined period with few exceptions — Greece ran surpluses since 2013 and Portugal was able to run a roughly balanced structural budget balances since 2014. It is possible that the motivations were greater due to the smaller size of their economies when compared to Italy and Spain. Structurally, the discretionary fiscal policies were dominant for most of the examined period for all the countries. The expansionary fiscal efforts were so strong that they fully offset the effects of automatic stabilisers. Moreover, automatic stabilisers became stronger after 2011, except for Spain. The EU4 countries showed rather pro-cyclical fiscal policies before 2008. After the recession, the conclusions are ambiguous and individual for each country. An exception is Greece which can be considered as a textbook example of pro-cyclical fiscal policy in the whole examined period. In my opinion, one of the possible lessons is that strong fiscal efforts are inefficient and destabilising the economy later if a crisis is caused or accompanied by severe structural inefficiencies of the countries. It is evident that the measures taken during the financial crisis were not sufficient, and their primary purpose was, arguably, rather political than economic. I believe that the EU4 countries should focus on structural reforms which would promote competitiveness and efficiency.

The third part was the analysis of debt dynamics, fiscal sustainability, and debt projections. I was able to identify the specifics of each country regarding debt dynamics. The automatic debt dynamics (the effects of real effective interest rate, real GDP growth, and REER) was crucial for Italy, Portugal, and Greece. The debt accumulation in Spain was determined by primary budget balances, which implies that the country has a larger "*manoeuvring*" space or higher potential of discretionary fiscal measures. The effects of REER were negligible due to low amounts of foreign currency-denominated debts in the EU4 countries. In addition, the real effective interest rate has been a determining factor of debt dynamics for Italy during the examined period. Furthermore, the GDP

growth effect had been decisive for Greece, while Portugal's debt contributions were fairly diversified. In terms of time-changing patterns, real effective interest rates had a relatively strong effect before the financial crisis. Moreover, during the initial impact of the financial crisis (2008–2014), the countries were relying on different strategies. Portugal and Spain countered the adverse effects of the crisis by stimulating the economies through primary budget balances. It was not the case for Italy and Greece in terms of relative importance. After 2004, the relative indebtedness of the countries had been reduced by positive GDP growth. However, the effect was much weaker in Greece. The country exhibited comparatively lower growth rate values. The primary budget balances were stabilising or even slightly reducing the debt before 2008. Between 2008–2014, however, the primary balances significantly contributed to the debt increases. I also compared the underlying positions with primary balances needed to bring the relative debt level of each country to 60% of GDP in 50 years. The presented two scenarios suggested that the primary balances of Italy, Portugal, and Greece were insufficient for most of the period, rendering the debt situations unsustainable. The situation in Spain was relatively better.

I demonstrated that the debt situations of the EU countries were not sustainable if the countries would exhibit 2000–2019 average values of the relevant indicators in the next roughly 30 years. The debt-to-GDP ratios would stabilise under the second scenario,[74] which is a more optimistic variant that assumes historical averages of 2014–2019 of the relevant indicators. Therefore, I claim that the debt levels of the countries are not sustainable because the EU4 countries would not be able to decrease their debt ratios significantly even under the optimistic scenario. Portugal exhibited the most promising signs of sustainability in the second scenario. However, the country experienced extremely good circumstances between 2014–2019. Finally, it cannot be expected that the countries reduce their indebtedness to 60% of their GDPs in at least 50 years if a debt restructuring or a major structural reform does not take place.[75]

[74] With the exception of Portugal, which would show a sharp and historically unprecedented decrease in its debt ratio.

[75] I also need to mention the 2020 coronavirus outbreak. It is evident that the EU4 countries are in a dreadful position.

7 Determinants and Efficiency of Fiscal Policies

> *The curious task of economics is to demonstrate to men how little they really know about what they imagine they can design.*
>
> — **Friedrich August von Hayek**
> (Austrian economist, 1899–1992)

The next part of the analysis is to identify and describe the determinants and efficiency of the fiscal policies of the EU4 countries. The determinants should improve the understanding of the countries' fiscal policy-making. However, the text is still missing one critical piece of analysis, which is an efficiency evaluation. In order to fully comprehend the policy effects, I need to to estimate its real effects on GDP. Usually, these types of analyses are problematic due to various issues such as an insufficient number of observations, missing data, inappropriate model specifications, and other factors. Therefore, I focus on addressing all the possible issues and thoroughly explain the used methodology. Nevertheless, it should be mentioned that there is a fair degree of uncertainty concerning the estimates. Hence, the results should be interpreted with caution.

The chapter has two parts. The first part deals with fiscal determinants. It presents estimates of fiscal reaction functions using error correction (EC) models. The second part focuses on the estimation of fiscal multipliers, which are used for the efficiency evaluation of the EU4 fiscal policies. In this regard, advanced Bayesian vector autoregressive (BVAR) models are employed.

7.1 Fiscal Reaction Functions

A fiscal reaction function is a workhorse model approach used to capture fiscal behaviour. It describes the systematic response of primary budget balance to relevant variables in

annual terms[1]. Hence, it is a positive approach which focuses on the empirical description of average patterns in fiscal policy choices (Burger et al., 2011). Primary budget balance is predominantly used as the explained variable due to its direct observability and exclusion of interest payments which would bias the interpretation of the estimates. Furthermore, a wide range of explanatory variables may be used. For instance, the level of government debt, state of the business cycle, or other economic and even political variables. Nevertheless, the fiscal responses are subject to the socio-economic environment — both global and country-specific. Therefore, the fiscal responses are bound to be considerably volatile and country-specific, making the identification of fiscal determinants difficult.

The empirical literature concerning the estimation of the EU fiscal reaction functions is primarily focused on panel data and fiscal sustainability[2]. Nevertheless, the aim of this analysis is to capture country-specific reactions. Hence, the panel data approach, which is averaging the individual effects, is not suitable. According to my knowledge, no comprehensive study, which would individually focus on the EU4 fiscal reactions, has been made. Legrenzi and Milas (2013) estimated state-varying thresholds of fiscal policy reaction functions for the GIPS countries; however, they examined Ireland instead of Italy. Moreover, the authors focused on fiscal sustainability rather than fiscal policy determinants. Possibly, the most relevant study was made by Berti et al. (2016), who estimated individual fiscal reaction functions of selected EU countries for the European Commission. Therefore, the following estimation procedure employs their methodology.

7.1.1 Theoretical Models

The derivation of a fiscal reaction function is based on the debt dynamics equations which were used in the previous chapter (Section 6.3.1). To be specific, it exploits the following long-term relationship:

$$\frac{PB_t}{Y_t} = \alpha + \beta \frac{Debt_{t-1}}{Y_{t-1}} + \varepsilon_t \,, \tag{7.1}$$

[1] The annual data are the most fitting due to the time lags and legislative processes because government budgets are usually planned for one year in advance.

[2] This is done through the inclusion of a debt coefficient which captures the response of primary balance to the overall debt level.

where PB is primary balance, $Debt$ is the overall debt level, Y is total output, and ε is the error term. In other words, the level of primary balance is explained by the overall debt level in the previous period. If the debt-to-GDP ratio increases, the government should respond by improving the primary balance, to counter the increase in the debt ratio. It represents an error-correction mechanism (see Bohn, 1998). It should be noted that an inverse long-term relationship also exists — the reaction of debt level to primary balance. However, in order to make the separate country estimations as transparent and comparable as possible, I use a simple one-way error-correction mechanism. The approach is in contrast to more complicated vector error correction models (VECM) where structural identification would need to be made. Nevertheless, the models utilise lagged debt ratio and relevant lagged explanatory variables to capture fiscal behaviour and avoid endogeneity. The adjustments are in line with the methodology of Berti et al. (2016) regarding the European Commission's estimates.

In the next step, the fiscal reaction equation is adjusted according to the error-correction procedure. Nevertheless, it is estimated in one step using the methodology of Banerjee, Dolado, and Mestre (1998). The fiscal reaction function is specified as follows:

$$\Delta pb_t = \alpha + \rho\left(pb_{t-1} - a\,debt_{t-2}\right) + \beta\Delta debt_{t-1} + \varepsilon_t\,, \tag{7.2}$$

where small letters denote the relevant GDP ratios, and ρ is the error-correction term which should be a statistically significant value between zero and a negative one. Moreover, the error-correction mechanism represents a long-term relationship while the other variables outside the parentheses in Equation 7.2 capture short-term fiscal reactions.

The previous equation serves only as a baseline. I employ an additional model specification for each country regarding the purpose of the analysis. One of the specific aims is to capture different responses of the EU4 countries since the Euro Area accessions and during the financial crisis of 2008–2009. Hence, the relevant fiscal variables are multiplied with the respective dummy variables — the multiplication terms capture the effects.

The model specification for each country are augmented equations in the following form:

$$\Delta pb_t = \alpha + \rho\,(pb_{t-1} - a\,debt_{t-2}) + \beta_1 \Delta debt_{t-1} + \beta_2 X_{t-1} + \beta_3 Z_t + \beta_4 ZX_{t,t-1} + \varepsilon_t\,. \tag{7.3}$$

Note that it includes X_{t-1} which is a vector of other main fiscal variables (controls). These include output gap, change in real interest payments on debt, and primary expenditure gap. The vector Z_t consists of dummy (binary) variables denoting important events — capturing structural breaks in the data. The dummy variables common for each country include World War I, the Great Depression, World War II, Euro Area Accession, and the financial crisis of 2008–2009. Moreover, a model for each country has one unique characteristic which is an inclusion of one dummy variable capturing a country-specific event.[3] The rest is identical for all the examined countries. Finally, a vector $ZX_{t,t-1}$ consists of selected interaction terms of vector X_{t-1} and Z_t, representing changes in fiscal behaviour after the Euro Area accession and during the financial crisis.

7.1.2 Used Data and Further Adjustments

Table 7.1 provides an overview of the used data. The models employ annual data and include dummy variables capturing policy changes at the end of the sample. Hence, the estimation procedure needs a sufficient number of observations, especially before the primary examined period, to obtain representative effects. The main source of data is the Public Finances in Modern History Dataset provided by the IMF (2020a). It consists of public debt and related data between 1800–2011 for many countries. In this case, I decided to use the data for the EU4 countries starting from 1881. In addition, all the values starting from 2000 were updated by using the estimates which were presented in the previous chapters. Hence, I obtained a data sample with a period of 1881–2019. Furthermore, some observations in the middle of the sample were missing.[4] I decided to impute[5] the data by using a Kalman smoother within a state-space representation of automatically selected ARIMA models according to Akaike information criteria. Note

[3] Further details are provided in the following section.

[4] Descriptive statistics and shares of missing values are provided in Appendix F.

[5] In my opinion, the imputation is more fitting than a frequently used interpolation (especially for data regarding primary balances).

that the models include first differences of the explained variable and second lags of one of the explanatory variables. Therefore, three observations needed to be discarded, and the final data sample used for the estimations ranges from 1884 to 2019.

Table 7.1: EC models — Used variables

	Indicator	Units		Indicator	Units
1	**General government gross debt**	Total — consolidated, shares of GDP (% values)	5	**Primary government expenditure gap**	Gap between actual primary expenditure and trend primary expenditure estimated by HP filter, $\lambda = 100$ (% values)
2	**General government primary budget balance**	Overall budget balance excluding interest payments on debt – shares of GDP (% values)	6	**Dummy variables — main historical events**	World War I (1914–1918), Great Depression (1929–1939), World War II (1940–1945) (binary values)
3	**Output gap**	Gap between actual and potential GDP related to potential GDP – estimated by using UC models (% values)	7	**Dummy variables — main recent events**	Euro Area accession (since 1999; 2001 for Greece), financial crisis (FC, 2009–2014) (binary values)
4	**Real interest rate**	Real changes based on consumer price index, US CPI is used as a proxy until 1960s (% values)	8	**Country-specific events**	Italy: Years of Lead (1969–1986), Spain: Transition to democracy (1980–1989), Portugal: 1970s and Carnation Revolution (1970–1979), Greece: Greco-Turkish War (1897–1898) (binary values)

Note: The dates of the events, captured by the dummy variables, were adjusted to the structural changes in the primary balances data (to achieve a better fit).

Source: Eurostat (2020a), IMF (2020a), Shiller (2020), and St. Louis Fed (2020), own calculations and processing.

The output gaps were estimated by using a univariate unobserved components model. The model decomposes the time series into a cyclical and trend component following Grant and Chan (2017). The cyclical component is modelled as a zero-mean stationary AR(2) process, while the non-stationary trend component is considered to follow a second-order Markov process.[6] The univariate model is used because of a lack of additional data. However, as it was mentioned, the dataset starting from 2000 was updated. The values of output gaps are estimated using the trivariate UC model, which

[6] Refer to Grant and Chan (2017) for additional details. The authors entitled the model as the "*UCUR-2M*".

was employed in the previous chapter.[7] The dataset of the IMF (2020a) provides only nominal interest payments to GDP ratio. Changes of real interest payments, which capture economic fundamentals more closely, are calculated on the basis of CPI for each country. However, country-specific data are not available until 1960. Hence, the estimation procedure employs CPI of the USA, provided by Shiller (2020), as a proxy.[8]

7.1.3 Results and Robustness

The variables in the EC models need to fulfil some assumptions. Most prominently, the primary balances and debt ratios should be integrated in the same order. Furthermore, the other variables need to be stationary to obtain unbiased estimates. I utilise three relevant indicators: Augmented Dickey-Fuller test, KPSS test, and Phillips-Perron test. The results are available in Appendix F. All the short-term effect variables are stationary, while the primary balances and debt ratios are rather non-stationary. The latter is in line with the theoretical requirements. However, it should be mentioned that the tests show mixed evidence in some cases. It was also the case of the research made by Berti et al. (2016) for the European Commission. The existence of the long-term relationships between primary balances and relative debt levels is tested by the Engle-Granger cointegration tests.[9] I have verified the validity, as all the tests indicate cointegration between the two variables in the given causal direction. The test results are provided in Appendix F. Finally, the output utilises Newey-West HAC standard errors to allow for heteroskedasticity and autocorrelation of model residuals. The residual values and model predictions are shown in Appendix F.

The results of the first set of models (baseline) are presented in Table 7.2. The EC terms are statistically significant and negative between zero and one. Hence, the error-correction mechanisms are estimated adequately. Spain shows the fastest rate of convergence while Greece the slowest pace. It indicates that debt increases in Greece and the relevant economic instabilities have relatively high inertia, which is not a favourable

[7] I am aware of the potential structural break. Nevertheless, the estimates follow each other rather well. In addition, it makes the estimations consistent with the previous analyses.

[8] It was tested by including it in the models. The relevant coefficient showed statistical significance.

[9] The more general Johansen cointegration test is not appropriate in the case of one-way (single-equation) EC models.

situation. Moreover, only Spain and Greece showed a statistically significant reaction of primary balance change to the lagged debt level within the long-term relationship.

Table 7.2: Estimates of baseline EC models — EU4, 1884–2019

Dependent variable: Δpb				
Independent variables	Italy	Spain	Portugal	Greece
Constant	0.097	−0.037	0.187	−1.539**
	(0.380)	(0.169)	(0.361)	(0.715)
Primary balance (-1) – EC term	−0.167*	−0.249***	−0.220***	−0.153***
	(0.100)	(0.073)	(0.067)	(0.052)
(Gross) Debt to GDP (-2)	0.008	0.010***	0.002	0.025***
	(0.005)	(0.003)	(0.009)	(0.007)
Debt to GDP (-2) * Euro Area	−0.013	−0.006	0.020**	0.023***
	(0.015)	(0.008)	(0.009)	(0.008)
Debt to GDP (-2) * FC	0.051**	0.069***	0.002	−0.041**
	(0.025)	(0.017)	(0.016)	(0.018)
Debt to GDP change (-1)	−0.016*	0.012	−0.024	0.045*
	(0.009)	(0.012)	(0.062)	(0.026)
Output gap (-1)	−0.044	0.007	0.040	0.052**
	(0.055)	(0.010)	(0.027)	(0.021)
Real interest rate change (-1)	−0.099	0.021**	0.041***	−0.017
	(0.071)	(0.009)	(0.010)	(0.030)
Primary expenditure gap (-1)	0.754***	0.325***	0.436***	0.834***
	(0.286)	(0.062)	(0.089)	(0.115)
Euro Area dummy	0.851	0.162	−1.769***	−4.513***
	(1.644)	(0.780)	(0.481)	(0.962)
FC dummy	−6.402**	−5.664***	−1.548	3.169
	(2.957)	(0.784)	(1.793)	(2.270)
World War I dummy	−10.828***	−0.908***	−1.232***	0.504
	(0.598)	(0.127)	(0.298)	(0.407)
Great Depression dummy	−0.250	−0.292	−0.189	−1.527
	(0.664)	(0.187)	(0.223)	(1.448)
World War II dummy	−9.164***	−1.858***	−0.150	−0.796
	(0.425)	(0.400)	(0.125)	(0.576)
Country-specific event dummy	−2.495***	−0.634*	−1.213**	−19.334***
	(0.521)	(0.333)	(0.543)	(0.954)
Number of observations:	136	136	136	136
Adjusted R^2:	0.606	0.337	0.251	0.608
ADF test (basic spec., 1 lag):	−8.234***	−10.786***	−9.575***	−8.062***
Breusch-Godfrey LM test (1 lag):	19.910***	4.616**	5.217**	1.791
Notes:	Newey-West HAC standard errors are in parentheses.			
	* p < 0.1; ** p < 0.05; *** p < 0.01.			

Source: own calculations and processing.

The short-term effects of debt ratio changes are significant only for Italy and Greece. However, Italy shows a negative coefficient which associates higher debt with higher deficits or lower surpluses. It indicates that the country showed high debt inertia, and the debt increases over time were not adequately taken into account. The reaction of primary

balance changes to the output gap (business cycle) was significant only for Greece. The country shows negative values which (on average) indicate that the country pursued anti-cyclical fiscal policy during the examined period. Nevertheless, primary balances do not necessarily reflect government efforts, the GDP data are often revised, and the historical values may be less precise. Therefore, the conclusions should be taken with caution. The reaction to change in real interest payments is significant in the case of Spain and Portugal. The values are positive, linking higher interest payments to lower deficit or higher surplus efforts. Furthermore, the cyclical nature of government expenditure, or the relevant inertia, is captured by primary expenditure gap. The relevant coefficients of all the countries showed high economic and statistical significance. The positive coefficients indicate that higher government expenditure leads to higher savings in the subsequent period (more positive or less negative primary balance). This effect was particularly strong in Greece and Italy.

The interaction terms of lagged debt with the Euro Area accession or the financial crisis occurrence provide another information. The Euro Area accession stimulated the behaviour of smaller economies of Portugal and Greece. The EU4 countries improved their reaction to higher debt by slightly increasing their primary balances. However, the overall dummy variable for the Euro Area accession shows much higher and negative coefficient. According to the estimates, the Euro Area accession motivated the smaller countries to run higher fiscal deficits or lower surpluses. The statistical estimates confirm that the supranational fiscal regulations in the EU were useless in this regard. Furthermore, the reactions to rising debt levels during the financial crisis were different among the EU4 countries. Larger countries (Italy and Spain) showed higher sensitivity to rising debt levels by increasing their primary balances while the effect was insignificant for Portugal and negative for Greece. Arguably, the smaller countries (Portugal and Greece) exploited the socialisation of risk in the Euro Area far more than the other two larger countries. The latter country showed an improvement in its fiscal discipline. It should also be noted that the reaction of primary balance changes of Portugal and Greece to the financial crisis was not strictly negative — it is statistically insignificant. Arguably, the two smaller economies opted or were partly forced to some degree of fiscal austerity. However, it was not the case of Italy and Spain.

Table 7.3 depicts the second set of models which are augmented by the inclusion of additional interaction terms. In other words, fiscal reactions are estimated in response to more variables after the Euro Area accessions and the financial crisis of 2008–2009. All the EC terms are statistically significant and within the appropriate range. Nevertheless, the estimates did not identify the long-term relationship in the case of Italy. It should be noted that all the estimations for Italy were problematic.[10] Arguably, the fiscal behaviour of this country is not very consistent. The long-term convergence paces showed similar results as in the first set of models. However, the cross-country differences are rather small in this case. The second set of models includes additional variables; thus, it was able to capture more effects and distribute them more evenly.[11] The long-term reactions to the lagged debt ratio are similar to the first set of models.

The reaction of primary balance changes to the output gap (business cycle) is the same as in the first case, which showed statistical significance and anti-cyclical fiscal policy reactions in Greece.[12] The effect of real changes of interest payments was found to be statistically significant only for Spain. Furthermore, the countries also show positive and statistically significant coefficients regarding primary expenditure gaps. The effects were, again, the strongest for Greece and Italy. I conclude that the short-term effects remained robust and similar to the first set of model estimates.

The inclusion of more interaction terms offers more insights than the first set of models. First, the Euro Area accession coefficients are slightly different, still negative, but the statistical significance was shown only by Greece and Spain. The observation confirms the hypothesis that the EU fiscal regulations were inefficient in the case of the EU4 countries. Moreover, the financial crisis coefficient confirms the hypothesis that smaller countries opted or were partly forced to follow a more strict fiscal discipline. The opposite conclusion is made when taken into account the estimates of sensitivity to debt ratio changes during the crisis. However, the effect is significantly lower. In my opinion, the interpretation is as follows: the smaller countries were able to exploit the benefits of the socialisation of risks in the Euro Area in terms of fiscal reaction to debt levels.

[10] I was not able to fit a better model which would suit all the EU4 countries.

[11] The interpretation of the results could be that the second set of models fits the data better under the assumption that the long-term convergence is roughly the same among the countries.

[12] Note that the examined period is between 1884 and 2019. Moreover, the estimates show "*average*" reactions. Hence, it is not in conflict with the conclusions presented in the previous chapter.

Table 7.3: Estimates of augmented EC models — EU4, 1884–2019

Dependent variable: Δpb				
Independent variables	**Italy**	**Spain**	**Portugal**	**Greece**
Constant	0.095	0.053	0.274	−1.553**
	(0.688)	(0.143)	(0.362)	(0.624)
Primary balance (-1) – EC term	−0.164	−0.167***	−0.162***	−0.155**
	(0.115)	(0.036)	(0.034)	(0.074)
(Gross) Debt to GDP (-2)	0.008	0.006***	−0.0001	0.025***
	(0.008)	(0.002)	(0.007)	(0.005)
Debt to GDP (-2) * Euro Area	0.010	0.011	0.020	0.077
	((0.026)	(0.019)	(0.016)	(0.046)
Debt to GDP (-2) * FC	0.488***	0.201***	−0.193***	−0.415***
	(0.054)	(0.035)	(0.034)	(0.036)
Debt to GDP change (-1)	−0.015	0.003	−0.058	0.037
	(0.014)	(0.011)	(0.048)	(0.036)
Output gap (-1)	−0.047	0.007	0.039	0.050**
	(0.062)	(0.009)	(0.030)	(0.020)
Real interest rate change (-1)	−0.10	0.023**	0.033	−0.019
	(0.083)	(0.009)	(0.020)	(0.030)
Primary expenditure gap (-1)	0.757**	0.290***	0.385***	0.821***
	(0.316)	(0.060)	(0.077)	(0.154)
Real int. rate change (-1) * Euro Area	0.454*	−1.779	−0.120	−0.216
	(0.271)	(1.244)	(0.238)	(0.491)
Real int. rate change (-1) * FC	0.719	2.694**	−2.086***	1.937**
	(0.819)	(1.233)	(0.295)	(0.931)
Primary exp. gap (-1) * Euro Area	0.166	−0.340	0.222	0.442
	(0.644)	(0.507)	(0.259)	(0.568)
Primary exp. gap (-1) * FC	2.182**	1.675***	1.077***	0.263
	(0.917)	(0.482)	(0.254)	(0.598)
Output gap (-1)* Euro Area	0.282*	−0.486	−0.035	0.165
	(0.149)	(0.436)	(0.115)	(0.125)
Output gap (-1)* FC	1.142***	0.825*	−1.015***	−0.662***
	(0.175)	(0.454)	(0.154)	(0.081)
Euro Area dummy	−1.649	−2.771**	−1.681	−11.167*
	(3.053)	(1.129)	(1.648)	(5.913)
FC dummy	−53.877***	−10.572***	10.443***	50.204***
	(6.109)	(1.867)	(2.848)	(3.956)
World War I dummy	−10.783***	−0.862***	−1.226***	0.470
	(0.785)	(0.137)	(0.238)	(0.713)
Great Depression dummy	−0.225	−0.333**	−0.335	−1.471
	(0.761)	(0.166)	(0.207)	(2.036)
World War II dummy	−9.128***	−1.496***	−0.257*	−0.838
	(0.602)	(0.279)	(0.150)	(0.869)
Country-specific event dummy	−2.501***	−0.392	−1.088*	−19.326***
	(0.819)	(0.255)	0.644)	(1.765)
Number of observations:	136	136	136	136
Adjusted R^2:	0.590	0.483	0.341	0.606
ADF test (basic spec., 1 lag):	−8.207***	−10.605***	−10.203***	−8.007***
Breusch-Godfrey LM test (1 lag):	20.841***	14.452***	9.241***	1.942

Notes: Newey-West HAC standard errors are in parentheses.
* p < 0.1; ** p < 0.05; *** p < 0.01.

Source: own calculations and processing.

Nevertheless, the smaller countries were forced to significantly improve their fiscal discipline as a result of the financial crisis. The larger countries (Spain and Italy) also exploited the benefits of risk-sharing but to a much lesser extent. In the end, they were not forced to opt for fiscal discipline during the financial crisis, which is captured by the relevant negative coefficients. In fact, the larger countries showed the opposite. The fiscal discipline effect was particularly strong for Greece while the opposite effect with similar strength was found for Italy. Nevertheless, Italy was forced to take into account its rising real interest payments on debt as a result of the Euro Area accession.

The behaviour related to changes in real interest payments during the financial crisis is significant for Spain, Portugal, and Greece. Surprisingly, Portugal's coefficient is negative, meaning that the country did respond to the rising interest payments by increasing fiscal surpluses or decreasing deficits. In addition, the cyclicality or inertia in the fiscal policy-making was reinforced in Italy, Spain, and Portugal during the crisis. The effect was the strongest in the case of Italy. Finally, Italy showed positive and significant coefficient of output gap, indicating the country was motivated to run anti-cyclical fiscal policies as a result of the Euro Area accession. The interaction term of the output gap and the financial crisis is significant for all the countries. It shows pro-cyclical tendencies of the larger countries and the opposite for the smaller countries. Finally, it should be noted that Greece showed negative and statistically significant constant in both of the model sets. It may indicate, on average, a poor fiscal discipline of Greece when compared to the other countries. Nevertheless, a constant usually captures many effects in regression estimates and should be interpreted with caution.[13]

As it was mentioned, the results should be taken with caution. The main aim of the analysis was to capture general trends in the fiscal behaviour of the countries. The issue of the volatility in fiscal behaviour is demonstrated by the relatively lower adjusted coefficients of determination.[14] It is the case especially for Portugal and Spain. Nevertheless, the behaviour of Italy is more problematic and rather inconsistent, which was shown by the insignificant EC term in the second set of models. In the end, the estimates offer valuable insights which are aptly summarised in the last section.

[13] Arguably, it should not be interpreted at all in many cases.

[14] However, the estimates are, arguably, still sufficient even from this perspective. See one-step-ahead level predictions in Appendix F.

7.2 Fiscal Multipliers

A crucial aspect of fiscal policy is its efficiency. If a fiscal policy has low efficiency, then even the best-planned policy is useless because it is not able to significantly affect the critical macroeconomic variables. As a result, it further increases economic instabilities by wasting resources. The efficiency is traditionally examined by fiscal multipliers which capture the effects of various fiscal items on main macroeconomic variables. Various fiscal multipliers can be defined depending on the used budgetary items, level of aggregation, lags in fiscal policy effectiveness, and other factors. In this case, the analysis focuses on one of the most widely used multipliers which shows the effect of government expenditure on total output. Formally, the multiplier can be written as follows:

$$FM_{t+n} = \frac{dX_t}{dG_t}, \tag{7.4}$$

where X_t is total output, and G_t is government expenditure. The multiplier shows the change in total output if government expenditure increases by one.

Nevertheless, I need to be more specific in this empirical work. Hence, I define a cumulative multiplier which is used in the subsequent analysis. The cumulative fiscal multiplier is defined in Equation 7.5:

$$FM_{t+n} = \frac{\sum_{p=1}^{n} dX_{t+p}}{\sum_{p=1}^{n} dG_{t+p}}. \tag{7.5}$$

This type of multiplier is, in principle, identical to the previous case. However, it shows the total change in output in response to government expenditure shock after n periods.

The Keynesian approach to government expenditure multipliers assumes that a certain proportion of economic resources is unemployed, and thus that a certain fraction of the population is liquidity constrained or economically myopic (Afonso & Leal, 2019). As a result, fiscal stimulus results in higher employment which creates a higher demand. In this perspective, the relevant multiplier is higher than one. Nevertheless, the size of

government expenditure should vary over the business cycle. It is more efficient during recessions than in expansions (Afonso & Leal, 2019). The Neoclassical perspective assumes that the economy is in equilibrium, and the economic resources are allocated optimally. Hence, an increase in government expenditure crowds out private expenditure, and the relevant fiscal multiplier is between zero and one (Hall, 2009).[15] The standard interpretation is that public expenditure is relatively inefficient when compared to private expenditure if the relevant multiplier is lower than one.

A wide range of research concerning government expenditure multipliers can be found. Most of the papers used structural vector autoregressive (SVAR) models which can be considered as the workhorse model framework.

Fiscal multipliers are likely to change over time. They depend on structural changes in the economy and external conditions in relation to economic openness. According to Batini et al. (2014), DSGE simulations and SVAR models suggest that first-year multipliers generally lie between zero and one in "*normal times*". But the results have been challenged by the more recent literature. In "*abnormal circumstances*", the multipliers can exceed the value of one. In particular, it may occur when the economy is in a severe recession or if the use and / or the transmission of monetary policy are impaired (ibid.).

A number of studies confirm the theoretical insight a fiscal stimulus is less efficient during expansion and more efficient in recession. Thus, the studies show higher values of multipliers in the latter case (see Batini et al., 2014, Warmedinger, Checherita-Westphal, and de Cos, 2015, or Afonso and Leal, 2019). Furthermore, high-debt countries have lower multipliers because the fiscal stimulus is likely to induce adverse credibility and confidence effects on private demand and risk premium (see Senekovič, Kavkler, and Bekő, 2019 or Afonso and Leal, 2019). The research of Ilzetzki, Mendoza, and Végh (2011) shows even negative multipliers for highly indebted countries. The authors claim that the multipliers are relatively higher in industrial countries and economies operating under predetermined exchange rate. At the same time, they are relatively lower in open economies than in closed economies. Kempa and Khan (2015) state that

[15] A shock in government expenditure can increase private investment only if the shock is sufficiently persistent, and taxes are sufficiently non-distortionary (Afonso & Leal, 2019).

expenditure multipliers are lower in the Euro Area when compared to the other EU countries. In addition, the authors conclude that the multipliers are lower after the introduction of the euro, and are higher in the Euro Area periphery than in the EU core countries. Another strand of the empirical research argues that the government spending multiplier is significantly higher when interest rates are at, or near, a zero lower bound (Miyamoto, Nguyen, & Sergeyev, 2018).[16] However, the results are inconclusive. Amendola et al. (2019) show that the results do not hold for the Euro Area.

7.2.1 Theoretical Models

The aim of this chapter is to estimate the effects of government expenditure on total output in the EU4 countries. I need to impose relatively sophisticated methods to obtain values of the fiscal multipliers. Nevertheless, I use a coherent framework for all the examined countries.[17] It should be noted that the presented estimates are based on strong assumptions fit for the specific purpose.[18] Therefore, the results should be interpreted with caution.

The analysis employs a widely-used structural vector autoregressive (SVAR) model framework estimated by Bayesian methods. Hence, I use the BVAR notation. The VAR models are based on the works of the Nobel Memorial Prize in Economic Sciences laureate Christopher A. Sims[19] who proposed the framework as an alternative to the standard econometric models which were used at that time. The framework is popular in empirical macroeconomics because of their relative simplicity and superior performance.[20] The Bayesian econometric techniques significantly differ from the standard frequentist approach. In the Bayesian framework, every parameter of interest is treated as a random variable, characterised by some underlying probability distribution. The distribution

[16] Some authors mention the so-called "*Effective Lower Bound*" (ELB) due to the introduction of negative interest rates. The ELB is defined as the point beyond which further monetary policy in the same direction is counterproductive (Amendola et al., 2019).

[17] It should be mentioned that there is a trade-off between comparability and accuracy of the estimates.

[18] Moreover, estimations can be performed by using various combinations of different approaches. There is no consensus on which approach is the most suitable one. I have examined a very large number of specifications and, in my opinion, the presented framework gives the most plausible results in the context of the "*classical*" monetary VAR model and the used fiscal variables.

[19] For example, see Christiano (2012).

[20] VAR model estimates are commonly used as a benchmark for DSGE models.

needs to be estimated to carry the inference on the models. The traditional (frequentist) approach assumes that the estimated parameters have a "*true*" value which needs to be identified. In other words, the Bayesian approach treats parameters as random variables and the observed data as fixed variables. The traditional approach does the opposite. The Bayesian estimation methods are computationally-demanding and are widely used since the advancements in computer technologies. The methods are famous for their properties. In particular, they are able to solve the problem of over-parametrisation in VAR models by employing a transparent strategy for parameter shrinkage incorporated in various prior beliefs.[21] A detailed description of VAR models, including their estimation and identification methods, is provided by Kilian and Lütkepohl (2017).

The presented BVAR model specifications are based on the seminal work of Blanchard and Perotti (2002), which has been modified by Caldara and Kamps (2008). I use a traditional three-equation monetary VAR model enriched by two fiscal variables of government revenue and expenditure. Nevertheless, the estimations need to be performed in levels[22] to obtain the values of fiscal multipliers. For this purpose, the estimations work with cyclical components of the relevant variables. Therefore, I employ a gap framework which is used to study causal macroeconomic relationships regarding business-cycle developments. It estimates the following model for each country and period:

$$y_t = b_0 + B_1 y_{t-1} + B_2 y_{t-2} + A\varepsilon_t \,, \tag{7.6}$$

where:

$$y_t = \begin{pmatrix} g_t \\ x_t \\ \pi_t \\ r_t \\ i_t \end{pmatrix} \quad A\varepsilon_t = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{pmatrix} \begin{pmatrix} \varepsilon_{g_t} \\ \varepsilon_{x_t} \\ \varepsilon_{\pi_t} \\ \varepsilon_{r_t} \\ \varepsilon_{i_t} \end{pmatrix} . \tag{7.7}$$

The models utilise five macroeconomic variables: government expenditure gap (g_t), output gap (x_t), inflation rate (π_t), government revenue gap (r_t), and nominal interest

[21] VAR models usually contain many parameters, which may cause overfitting and bias the estimates when using the standard frequentist approach. However, note that the choice of a prior and its setting is subjective.

[22] VAR models are most commonly estimated in differences or growth values of the used variables.

rate (i_t). The vector y_t represents all the model equations or specifications for each used variable. Moreover, the vector b_0 represents the constants of all the equations. The specifications assume that the variables have a direct effect lasting two quarters. Therefore, they include two lags (y_{t-1} and y_{t-2}). The number of lags for quarterly data is usually four; however, I was not able to obtain reasonable estimates within this specification.[23] The vector ε_t represents the error components. In addition, the causalities in the structural models are identified by using the most commonly used technique based on contemporary (short-term) restrictions — Cholesky factorisation. In other words, it imposes a particular causal chain and identifies the system recursively. The estimated parameters and restrictions are represented by matrix A.

The restrictions are based on the work of Caldara and Kamps (2008) and, in my opinion, it represents the most feasible variant. It assumes that government expenditure gap is strictly exogenous, meaning that it is not influenced by the other variables. Note that it is ordered first, even before the output gap. According to Ilzetzki, Mendoza, and Végh (2011), it is reasonable to assume that the output gap reacts to changes in government expenditure gap immediately. However, government expenditure usually does not react to a shock from output immediately.[24] The third variable is the inflation rate which is directly influenced by the government expenditure gap and output gap. It would be possible to argue that the ordering of output gap and inflation rate should be switched. Nevertheless, the causality directed from output to inflation is, arguably, significantly stronger than the inverse causal link. The last two variables are government revenue and monetary policy-relevant interest rate. The interest rate is ordered last, meaning that it is considered strictly endogenous, which is a reasonable assumption given the monetary policy determinants. Furthermore, the interest rate does not affect any other variable in the short term, which is in accordance with monetary policy lags.[25]

The Bayesian methods draw from the Bayes' theorem which describes the probability of an event, based on prior knowledge of conditions that might be related to the event (Kilian & Lütkepohl, 2017). Therefore, the estimation methods consider various pri-

[23] Some of the estimates were not stable, and the values of fiscal multipliers were over-stated.

[24] The fact is because of the existence of various fiscal policy and data lags.

[25] It refers to the monetary transmission mechanisms. The pass-through from short-term interest rate to the main macroeconomic variables usually takes some time.

ors which are integrated into the VAR framework. I use one of the most commonly used approaches, developed by Litterman (1986), which is denoted as the Minnesota prior. The estimation procedure considers a normal prior on a set of parameters with fixed and known residual covariance matrix. However, I do not use the original Litterman's restricted diagonal matrix and replace it with a full-VAR matrix estimated by OLS to incorporate more information. Hence, only the vector of parameters is unknown. The Minnesota prior imposes a hypothesis that the variables follow a random walk process. In addition, I estimated and optimised the values of prior hyperparameters within the Bayesian framework by using a grid search introduced by Giannone, Lenza, and Primiceri (2012). The estimated coefficients maximise the value of marginal likelihoods of the models. The procedure finds the corresponding values based on a specified interval of minimum and maximum (plausible) value for each hyperparameter. Therefore, the prior coefficients are not biased by subjective opinion and are set individually for all the estimated models. The estimations were performed by using a MATLAB toolbox developed by Dieppe, Legrand, and van Roye (2016) within the ECB.

7.2.2 Used Data and Other Estimates

An overview of the used variables is provided in Table 7.4.

Table 7.4: BVAR models — Used variables

	Indicator	Units
1	**General government real expenditure per capita — gap**	Difference between actual and trend value Items: payable compensation of employees, taxes, subsidies, interest, property income, social benefits and social transfers in kind, investment grants, and capital transfers (absolute values, 2018 prices — deflated by HICP)
2	**Total general government real revenue per capita — gap**	Difference between actual and trend value (absolute values, 2018 prices — deflated by HICP)
3	**Harmonised index of consumer prices (HICP)**	Year-over-year changes (% values)
4	**Output gap per capita**	Difference between actual and potential GDP (absolute values, 2018 prices — deflated by GDP deflator)
5	**3-month interbank interest rate**	Absolute values (% values)

Source: Eurostat (2020a), St. Louis Fed (2020), own calculations and processing.

The estimations employ quarterly data of the EU4 countries between 2000 and 2019. The values of the gaps were deflated by using HICP with the base year of 2018. Moreover, a seasonal adjustment of the variables was performed by using the standardised X-13-ARIMA procedure. The output gap data draw from the previous estimates based on the trivariate UC model methodology developed by Chan and Grant (2017).[26]

The gaps for government revenue and expenditure were estimated by using a seminal univariate UC model decomposition based on Harvey (1985) and Clark (1987). In this regard, the time series are decomposed into trend and cyclical components:

$$y_t = \tau_t + c_t \,, \tag{7.8}$$

where τ_t is the non-stationary trend component, and c_t is the stationary cyclical component. The cyclical component is modelled as a zero-mean stationary AR(2) process, whereas the trend component τ_t is modelled as a random walk with time-varying drift μ_t which represents average trend growth rate:

$$c_t = \phi_1 c_{t-1} + \phi_1 c_{t-2} + u_t^c \,, \tag{7.9}$$

$$\tau_t = \mu_t + \tau_{t-1} + v_t^\tau \,, \tag{7.10}$$

$$\mu_t = \mu_{t-1} + v_t^\mu \,. \tag{7.11}$$

The gaps are stationary variables by definition. However, all the variables show local non-stationarity in some cases. Moreover, the estimations employ inflation and interest rates in levels.[27] The interest rates exhibit non-stationarity, but both inflation and interest rate are commonly used in VAR models regarding the US data. Arguably, these variables are stationary in a very long term. The Bayesian estimation methods are able to deal with these issues as the parameter estimates are not affected by non-stationarity (see Fanchon and Wendel, 1992). Finally, all the presented BVAR models satisfy the stability condition meaning that no root of the characteristic polynomial (modulus) lies outside the unit circle.

[26] Refer to the previous chapter (Section 6.2.1.3).

[27] I use year-on-year changes in the inflation rate because these values are significantly less volatile. Standard first differences or quarterly changes are highly volatile because they contain a significant amount of high-frequency noise.

The BVAR model estimates are based on 11 000 iterations of the Gibbs sampler with a burn-in period of 1 000 draws. The models produced a large number of estimates,[28] therefore, only the relevant results are shown. As it was mentioned, this section is focused on the effect of government expenditure on output. Descriptive statistics of the used variables, the estimated gaps, and the residual values are provided in Appendix G.

Finally, the fiscal multipliers are calculated on the basis of cumulative impulse-response functions representing the effect of a shock to government expenditure gap on the output gap. The cumulative impulse-response functions are defined as follows:

$$\widehat{FM}_{t+n} = \frac{\sum_{p=1}^{n} d\hat{X}_{t+p}}{\sum_{p=1}^{n} d\hat{G}_{t+p}}, \tag{7.12}$$

where $\hat{X}_{t+p}$ represents the cumulative value of the impulse-response function for output gap in period p after a positive shock to government expenditure gap, and $\hat{G}_{t+p}$ represents the cumulative value of the impulse-response function for the government expenditure gap after the positive shock to this variable. In other words, it is the fiscal multiplier which was defined in Equation 7.5.

7.2.3 Results and Robustness

The models are not able to reflect the structural changes which occurred in the EU4 countries. Therefore, I split each country estimate into three periods: pre-crisis period (2000–2008), financial crisis period (2009–2013), and post-recession period (2014–2019). Moreover, I also present estimates for the total period (2000–2019). The time frames were selected to be consistent with the previous estimates in this work and to reflect the development of real GDP growth rates.[29] In total, I present 16 sets of model estimates. Nevertheless, the estimates for the total period and during the crisis are not reliable due to the instabilities.

[28] For example, they produced 400 impulse-response functions in total (five variables within a five-by-five matrix for four countries during four periods).

[29] The recession did not begin in the same quarter in the case of all the countries. However, the common time frame is used for simplicity and comparability of the estimates in time. In my opinion, the differences are negligible.

Furthermore, the output shows the cumulative impulse-response functions (fiscal multipliers) for up to 20 quarters because I do not assume further impact. The assumption is in accordance with the empirical literature. Nevertheless, I must note that the IRFs are persistent in some cases and do not completely fade out within 20 quarters.[30] Table 7.5 presents the main findings. Moreover, the individual impulse-response functions are shown in Figures 7.1, 7.2, 7.3, and 7.4. The individual impulse-response functions depict the reaction of output gap to unitary shock to the government expenditure gap.

The pre-crisis period was characterised by immensely low multipliers of approximately 0.3, except for Greece which showed a statistically insignificant value of possibly zero. The evidence suggests that each 1 euro of government expenditure was able to generate only 0.3 euros of total output.[31] It means that the fiscal policy efforts were highly inefficient and were wasting resources as a significant crowding-out effect of private investment occurred. In other words, the resources could have been put to better use if they were not redistributed and used by the public sector.[32] Moreover, the effects are country-specific and differ according to the selected period. For instance, Italy showed negative effects of government expenditure after one or two years which ultimately brought its fiscal multiplier down to 0.2793 after five years. Furthermore, Spain showed negative effects up to three years, but the relevant multiplier reached 0.3117 in the fifth year. The persistence of the shocks dissipated during the fifth year in all the examined countries. It is depicted by the individual impulse-response functions.

[30] Refer to the individual impulse-response functions presented below.

[31] Note that I interpret the relationships for the total variables even though the estimates are working with gaps. In my opinion, it is a plausible interpretation in the context of a business cycle.

[32] I do not claim that all the government expenditures are inefficient. The sector may be able to enhance allocation efficiency in many cases, for instance, by long-term investment to infrastructure, digitalisation, or education.

Table 7.5: Country-specific estimates of fiscal multipliers (g shock, x response) — EU4 in different periods of 2000–2019

Italy

Time horizon	Total period (2000–2019)	Pre-crisis period (2000–2008)	Crisis period (2009–2013)	Post-recession period (2014–2019)
IRF – Initial impact, 1Q	0.0456	0.2253	0.4143	0.1204
Cumulative IRF – 1 year (4Q)	0.0956	0.5117	1.3608	0.3287
Cumulative IRF – 2 years (8Q)	0.0061	0.5073	−0.6804	0.7201
Cumulative IRF – 3 years (12Q)	−0.1971	0.3642	−5.2518	1.0496
Cumulative IRF – 5 years (20Q)	**−0.6441**	**0.2793**	**−7.0281**	**1.3986**

Spain

Time horizon	Total period (2000–2019)	Pre-crisis period (2000–2008)	Crisis period (2009–2013)	Post-recession period (2014–2019)
IRF – Initial impact, 1Q	−0.0693	−0.1438	−0.0770	0.0561
Cumulative IRF – 1 year (4Q)	−0.4251	−0.4441	−0.1689	0.1999
Cumulative IRF – 2 years (8Q)	−1.1926	−0.6252	−0.0519	0.3634
Cumulative IRF – 3 years (12Q)	−2.1034	−0.4276	0.0973	0.5005
Cumulative IRF – 5 years (20Q)	**−4.0198**	**0.3117**	**0.1207**	**0.6787**

Portugal

Time horizon	Total period (2000–2019)	Pre-crisis period (2000–2008)	Crisis period (2009–2013)	Post-recession period (2014–2019)
IRF – Initial impact, 1Q	0.0126	0.2281	0.2024	−0.0064
Cumulative IRF – 1 year (4Q)	−0.0007	0.2605	0.7757	0.1579
Cumulative IRF – 2 years (8Q)	−0.0690	0.2994	1.0213	0.5351
Cumulative IRF – 3 years (12Q)	−0.1611	0.3253	0.9415	0.9103
Cumulative IRF – 5 years (20Q)	**−0.3493**	**0.3497**	**0.8244**	**1.4224**

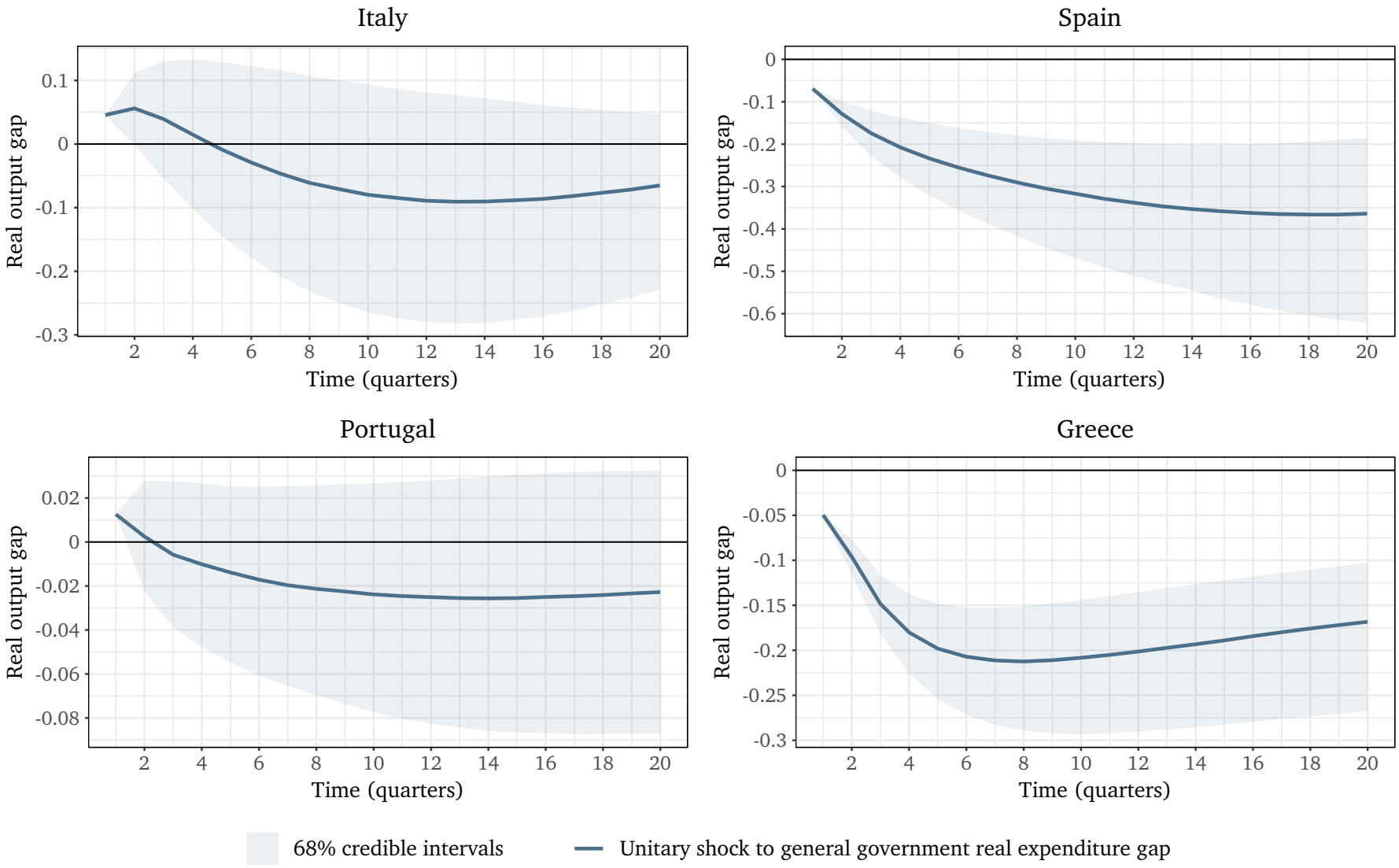
Greece

Time horizon	Total period (2000–2019)	Pre-crisis period (2000–2008)	Crisis period (2009–2013)	Post-recession period (2014–2019)
IRF – Initial impact, 1Q	−0.0495	0.0069	0.1656	0.0329
Cumulative IRF – 1 year (4Q)	−0.2179	0.0117	0.7153	−0.2773
Cumulative IRF – 2 years (8Q)	−0.5508	0.0142	1.2981	−0.3796
Cumulative IRF – 3 years (12Q)	−0.9372	0.0148	1.5637	0.4873
Cumulative IRF – 5 years (20Q)	**−1.7772**	**0.0136**	**1.6333**	**1.2915**

Note: The estimates for the total period and financial crisis period are not reliable due to the structural changes which occurred in these time frames. They are provided for illustrative purposes only.

Source: own calculations and processing.

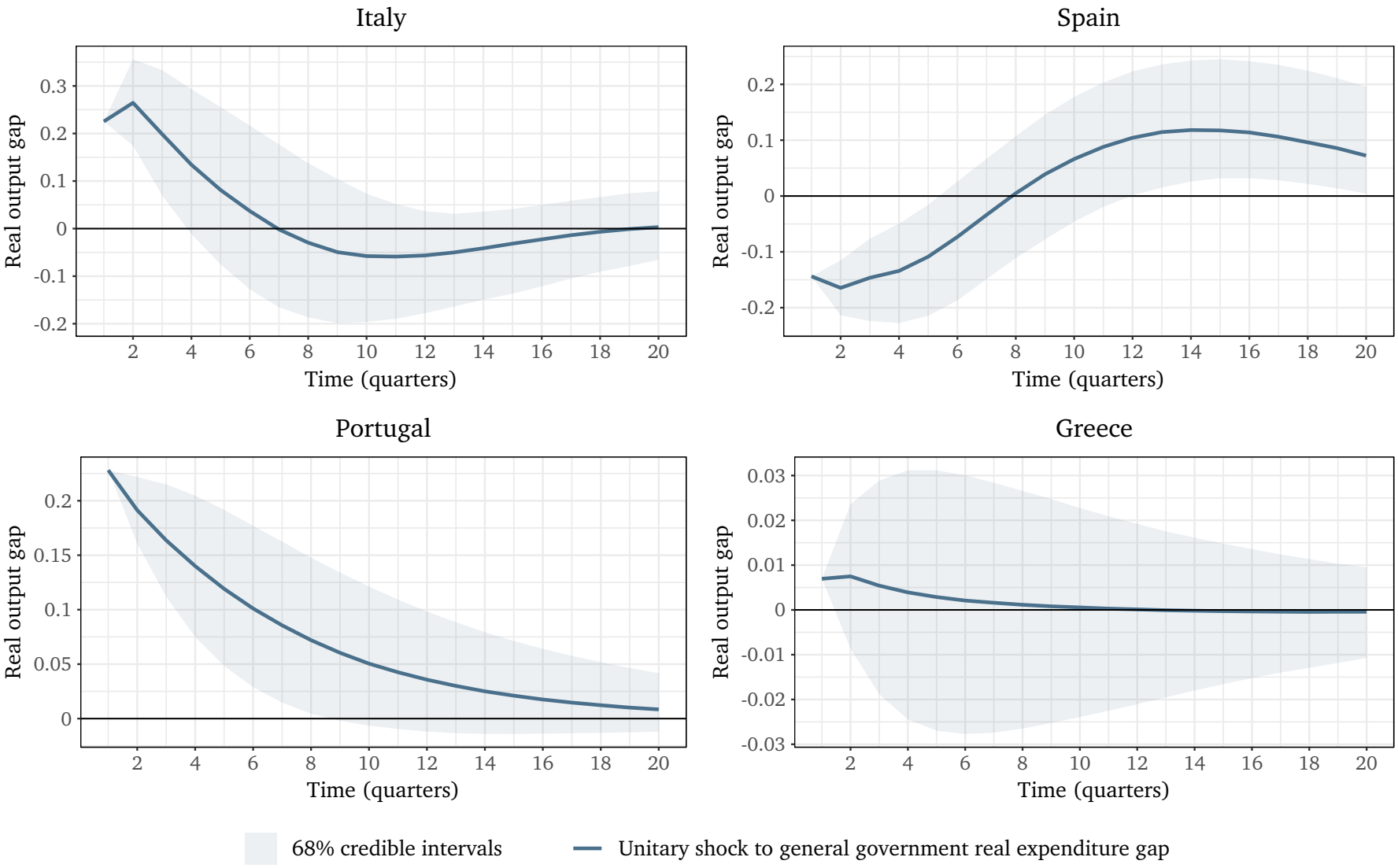
Figure 7.1: Individual impulse-response functions (g shock, x response) — Total period — EU4, 1Q 2000 – 4Q 2019



Note: These estimates are not reliable due to the structural changes which occurred in the selected time frame. They are provided for illustrative purposes only.

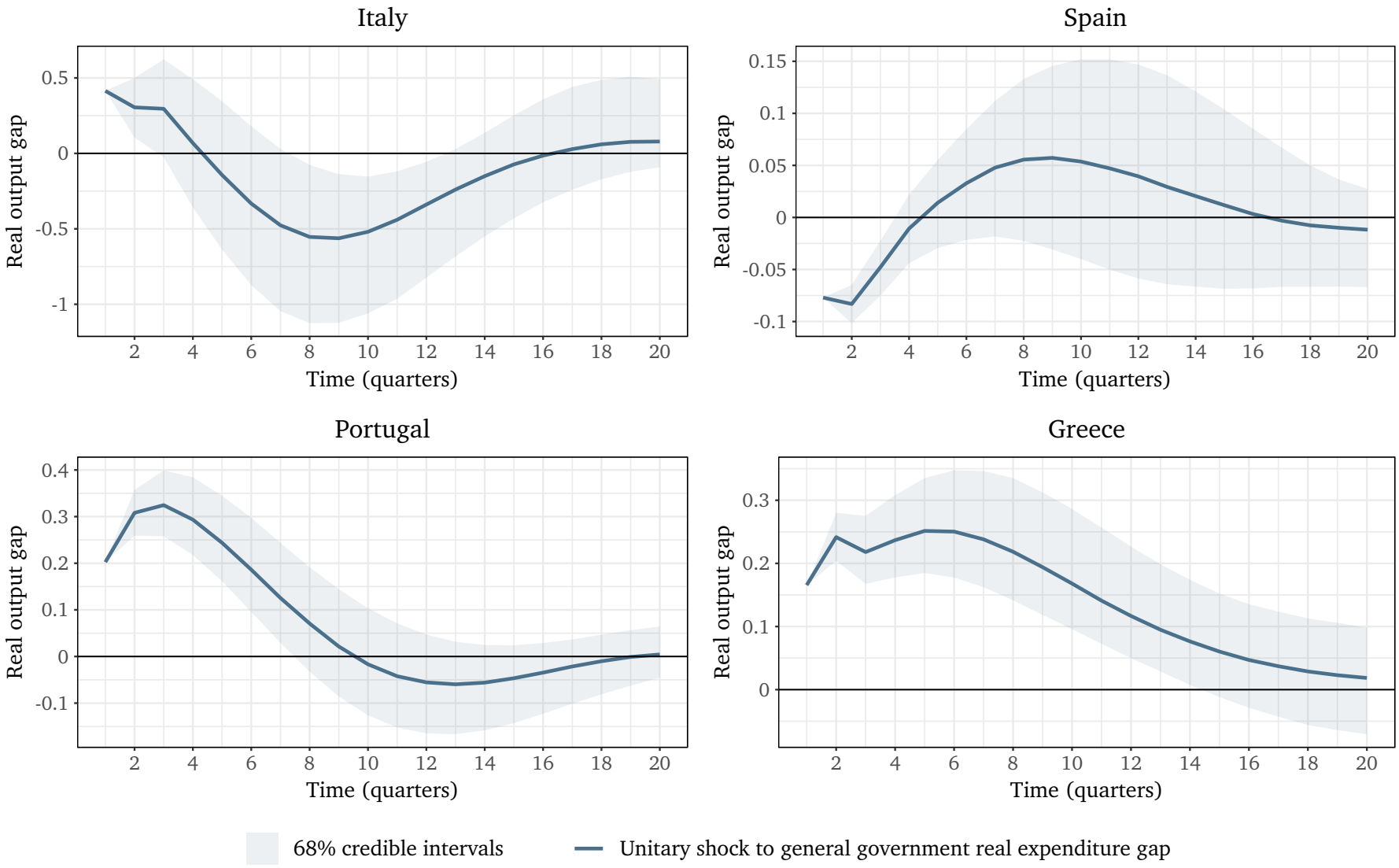
Source: own calculations and processing.

Figure 7.2: Individual impulse-response functions (g shock, x response) — Pre-crisis period — EU4, 1Q 2000 – 4Q 2008



Source: own calculations and processing.

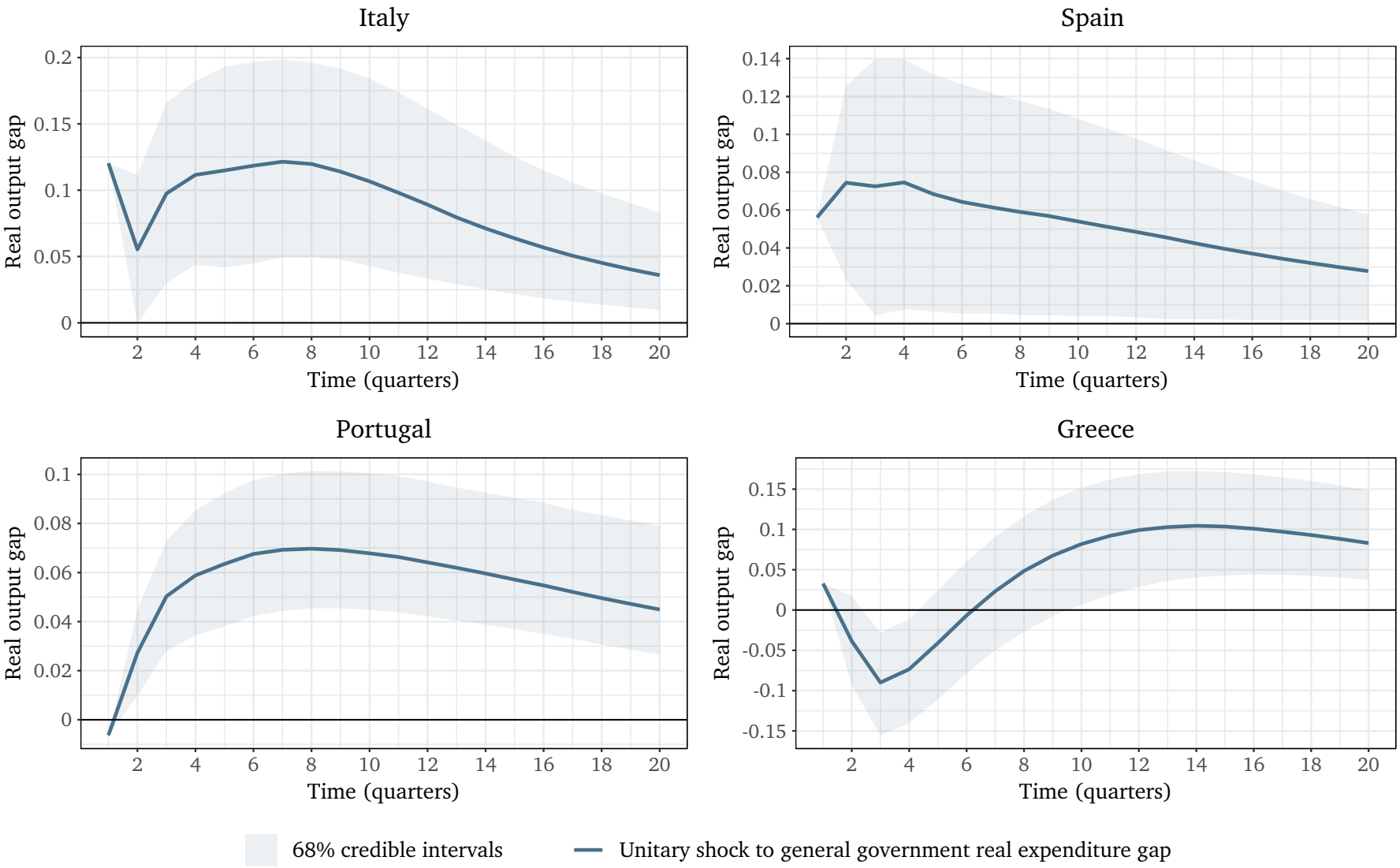
Figure 7.3: Individual impulse-response functions (g shock, x response) — Financial crisis period — EU4, 1Q 2009 – 4Q 2013



Note: These estimates are not reliable due to the structural changes which occurred in the selected time frame. They are provided for illustrative purposes only.

Source: own calculations and processing.

Figure 7.4: Individual impulse-response functions (g shock, x response) — Post-recession period — EU4, 1Q 2014 – 4Q 2019



Source: own calculations and processing.

The estimates suggest that the values of the multipliers in the post-recession period were significantly larger, even higher than one, for all the countries except Spain. In my opinion, the increase in multipliers corresponds with the economic theory. Nevertheless, the development needs to be put into context. The countries had experienced a period of negative output gaps even in the post-recession period.[33] Furthermore, they were arguably less "*overheated*" in the subsequent years when compared to the period before the financial crisis. It is consistent with the previous estimates of the output gaps. Therefore, the values of fiscal multipliers were expected to be higher. The persistence of the shocks was also significantly higher than in the pre-crisis period, which is demonstrated by the individual impulse-response functions. The estimates suggest that the initial shocks to government expenditure do not fully dissipate even after five years. Note that in the case of Spain, the multiplier was lower than one even in the post-recession period, which resulted in significant inefficiencies. Most of the countries were in a position where one euro of government expenditure was able to increase total output by more than one, as suggested by the estimates. Nevertheless, it does not mean that increases in government expenditure would solve the issues of the EU4 countries. In my opinion, it was a temporary phenomenon. It suggests that fiscal austerity without structural reforms is probably not suitable for the EU4 countries.[34]

The analysis primarily focuses on the size of multipliers before and after the financial crisis period. However, the values for the total period and during the crisis are also shown for illustration. The fiscal multipliers for the whole period were negative in the case of all the countries. The result is in accordance with the research of Ilzetzki, Mendoza, and Végh (2011). However, the estimates are biased due to the structural changes which occurred in the examined period. According to economic theory, the multipliers should be higher during the crisis than in the pre-crisis period. It was confirmed in the case of Portugal and Greece. Spain showed a slight decrease, while Italy exhibited an extreme value of minus seven. It was probably caused by the economic instabilities which biased the estimates.

[33] Refer to the fifth chapter (Section 5.1).

[34] Appropriate structural reforms could further improve the allocation efficiency. For instance, they may include structural deregulations or establishing individual currencies which would mean leaving the Euro Area.

The estimates of fiscal multipliers are strongly dependent on the chosen variables, identification and estimation methods, period, and other parameters. Most of the model estimates correctly identified the monetary transmission channels (the negative effect of an interest rate increase to inflation rate and output gap). In addition, the effects of output gaps on government revenues exhibited strong economic and statistical significance. The effects of government revenue to output gaps were statistically insignificant in most of the cases. Furthermore, I present Ljung-Box tests in Appendix G. The tests indicate that almost all of the relevant estimates do not show autocorrelation. It was found for the output gap of Spain in the pre-crisis period, and the output gaps of Greece and Spain in the post-recession period. Autocorrelation may indicate that the models, in these cases, failed to capture some systematic information contained in the data.

It should be mentioned that the presented models do not deal with a fiscal foresight problem, which was identified by Leeper, Walker, and Yang (2012). The fiscal foresight takes into account the fact that discretionary fiscal measures are often known prior to their effectiveness due to the legislative process. Hence, the economic subjects may react to the fiscal policy measures sooner than they are implemented and effective. The fact may bias the estimates. However, the hypothesis is based on the notion of a relatively high degree of rationality and prior knowledge of the possible effects related to the fiscal policy. In my opinion, the assumptions are questionable. Haug, Jedrzejowicz, and Sznajderska (2013) discuss the empirical strategies of dealing with the issue. However, no study was able to solve this problem definitively.

Finally, the model evaluation should be based on the logic of economic theory combined with empirical knowledge. In my opinion, the presented estimates are consistent with both economic theory and the empirical literature, considering the fact that it examined some of the most indebted countries in the world.

7.3 Key Findings

The first part of the chapter dealt with the fiscal behaviour, or fiscal policy determinants, of the selected countries. I estimated two sets of EC models regarding country-specific fiscal reaction functions. The results showed a total inefficiency of the EU's supranational fiscal regulation between 2000 and 2019. A lesser disciplinary effect was found only for Italy, which showed higher effort for anti-cyclical fiscal policy[35] and higher sensitivity to increases in real interest payments as a result of the Euro Area accession. Moreover, Italy exhibited stronger inertia in its fiscal policy-making during the financial crisis of 2008–2009. Nevertheless, the fiscal behaviour of Italy is rather inconsistent and problematic to describe. Furthermore, the effect of the Euro Area accession was strongly detrimental for Greece, while a lesser detrimental effect was found for Portugal and Spain in terms of fiscal discipline. The disciplining factor was the financial crisis shock, but the effects significantly differed among the larger (Italy and Spain) and smaller countries (Portugal and Greece). In my opinion, the interpretation is as follows: the smaller countries were able to exploit the benefits of the socialisation of risks in the Euro Area in terms of their fiscal reactions to rising debt levels. However, the countries were forced to significantly improve their fiscal discipline as a result of the financial crisis. The larger countries also exploited the benefits of risk-sharing but to a lesser extent. Subsequently, they were not forced so strongly to opt for fiscal discipline during the financial crisis. In fact, they did the opposite. The disciplining effect of the financial crisis was particularly strong for Greece, while the opposite effect with similar strength was found for Italy. The estimations also provided some evidence that fiscal instabilities were eliminated relatively slowly in Greece throughout the examined period, while Spain showed the highest rate of convergence.

The second part of the chapter dealt with the estimation of fiscal multipliers to evaluate the efficiency of the EU4 fiscal policies. In particular, I estimated the effects of government expenditure to total output. The estimates suggest that the value of the multipliers in the EU4 countries was significantly lower than one before the financial crisis. In other words, the evidence suggests that each 1 euro of government expenditure was able to

[35] However, note that primary balances were used in this chapter. They do not solely reflect fiscal efforts but capture the overall balances excluding interest payments.

generate only 0.3 euros of total output. However, this was not the case of Greece, which showed a statistically insignificant value — a possibly zero multiplier. The fiscal policies of the EU4 countries were highly inefficient and probably crowded-out some portion of private investment. The persistence of shocks to government expenditure became considerably higher after the recession. Moreover, the fiscal multipliers were also higher, which is consistent with the empirical literature. The values were larger than one for all the countries except Spain. Nevertheless, this fact should not be misinterpreted. In my opinion, it was the result of the desperate situation of the countries. It does not mean that increases in government expenditure would solve the issues. It was rather a temporary phenomenon, but it suggests that a significant fiscal austerity without structural reforms is probably not suitable for these countries. The findings are consistent with the previous analyses. The financial resources could have been put to better use if they were not redistributed and used by the public sector.

Finally, it should be mentioned that each model is a simplification of reality and lacks accuracy in some areas by definition. The presented estimates are no exception. Therefore, I analysed and mentioned the main possible issues connected to the estimates at the end of each section. The estimates presented in this chapter should be treated with caution.

8 Sovereign Debt Resolution Prospects

> *What can be added to the happiness of a man who is in health, out of debt, and has a clear conscience?*
>
> **— Adam Smith**
> (Scottish economist, 1723–1790)

The last chapter puts together the previous text and analyses the possibilities of dealing with the excessive indebtedness of the EU4 countries. Its objective is to provide an overview of suitable options and analyse the position of the EU4 countries. It should be noted that it is primarily examining mid-term and long-term outlooks and resolutions as opposed to short-term perspectives which are often emphasised by the EU officials. Furthermore, it addresses various counter-arguments and identifies false argumentation.

The structure of the chapter follows the main categories of options regarding debt reduction. There are three ways of how to raise additional resources to fund a budget deficit: debt financing (domestic or external debt), money financed deficit (debt monetisation), and sale of assets (Strecha, 2015). These options can also be useful when trying to reduce indebtedness. A debt monetisation can help finance the debt, as well as a sale of assets. Other, more general ways of reducing relative indebtedness include a change in fiscal policy stance (fiscal consolidation – increasing revenues or decreasing expenditures), a sovereign default, or a reliance on GDP growth. Finally, the last section provides a summary and recommendations regarding the most suitable scenario.

8.1 Debt Monetisation in the Euro Area

A monetisation can help reduce indebtedness in two ways. First, if a bail-out takes place, government debt is repaid by other subjects. Second, inflationary pressures reduce the real value of debt stock. However, as it was mentioned in the fifth chapter (Section 5.1),

the EU countries operate in a low-inflationary environment. Nevertheless, the issue is more complicated when it is being carried out in a monetary union. Problems in Europe, which started during the first half of the 1990s, strengthened the drive for the Economic and Monetary Union of the EU (Gros, 2012). Back then, it was argued, for Spain and Italy, that the only way out of the inflation and continuous depreciation is joining the Euro Area. Nevertheless, the Euro crisis leads to the opposite conclusions (ibid.).

According to Gros (Gros, 2012, p. 36): "*It is now argued that financing a high public debt in a monetary union is particularly difficult, or at least unstable because a government that loses the confidence of investors has no other option left than to default*". In addition, a monetary union is usually undergoing some phases, and once the Euro Area's initial phase with its low-interest levels and high growth rates expire, it will become even more challenging to reduce the indebtedness of the countries (Baumgarten & Klodt, 2010). Arguably, the Euro Area is currently experiencing the next phase of low growth. The flaws of the monetary union have already been presented. Sinn (2018) discusses interest rate and exchange rate blockage, comparing the situation to the case of Dutch disease, which is hampering the competitiveness of the EU4 countries. Moreover, the current state of TARGET2 imbalances is another possible indicator of the situation.

Although the current accounts of the EU4 countries currently show less tension,[1] the TARGET2 system still suffers from accumulated imbalances. The imbalances got even higher than their financial crisis peak levels around the year 2012, and they currently amount to double-digit shares of GDP in case of the EU4 countries (Eurostat, 2020a). If the monetary union functioned well, there would be no significant imbalances as the created liquidity would be absorbed by the countries' banking systems more evenly.

It should be added that the membership in the Euro Area implies that ECB needs to make a final decision about debt monetisation, not the individual central banks of the member countries. Lucarelli (2011) claims that national governments need to rely more on financial markets in the formulation of national policies, which is sub-optimal. In other words, the ECB is in a desperate position due to the structural faults of the Euro Area. The current status shows the risk perceptions and fragmentation of the Euro Area did not disappear (see Eurostat, 2020a). Therefore, the risk of additional bail-outs in the

[1] Refer to the fifth chapter (Section 5.1).

Euro Area is still in play (it is very likely to happen to some extent). A bail-out would be a regretful one-shot solution, especially if no significant changes are made. It was observed in the case of Greece to some extent.

While the quantitative easing did not exhibit significant inflationary pressures, for now, it does not mean the future will be the same – a change of externals factors may occur. Inflationary pressures could absorb another portion of the debt; however, it affects the whole economy, it is creating instabilities, uncertainty, and there is no particular reason why debtors should benefit at the expense of creditors[2]. Moreover, some of the effects are hidden. Real estate markets are booming in many countries, and prices or yields of government bonds are also affected. While the latter means easier debt management, it is possibly causing relative losses of subjects which are holding these instruments due to the market distortions.[3] Furthermore, the governments experience no relevant feedback which would arise from their expansionary policies.[4] The current expansionary strategies of many central banks undoubtedly helped in the short-term, most notably during the crisis. However, it is a fatal mistake to continue the trend because it will make the situation worse. Quantitative easing cannot solve the structural issues of low inflation and low GDP growth; it creates new issues. According to Lucarelli (2011, p. 213): "*The imposition of a one size fits all monetary policy by the ECB has only exacerbated asymmetries between the low-inflation and high-inflation countries*". I argue that due to the political motivations, there is a lack of emphasis on real competitive advantages[5] when compared to the past. The current expansionary monetary policy of the ECB is like trying to start a broken engine by kicking it. Therefore, solving the indebtedness using mainly money financing in the Euro Area is not an appropriate solution.

From another perspective, the current situation was caused by political decisions which seem to be trapped in a false ideology or a sunk cost fallacy. The idea of "*buying time*", before some significant changes are made, is not very convincing either as there are no guarantees, and it paradoxically helps with sustaining the current status quo. Baltatescu (2013) argues that even if a fiscal union is set up, there are no reasons to believe that

[2] I feel obliged to comment on this matter. In my opinion, it is morally unjustifiable.

[3] It refers to the concept of opportunity costs.

[4] For instance, the interest rate pass-through is partially blocked. It was discussed in the second chapter (Section 2.3.4).

[5] It refers to those competitive advantages which were created on the basis of market-led economic productivity.

the debt problem of Euro Area will be solved, provided that the socialisation of risks and losses across the region remains possible. The issue was analysed in Chapter 4. A slightly better solution is to decrease the real value of debt by inflationary pressures within a separate domestic currency (which would probably mean that the EU4 countries need to leave the Euro Area), however, as mentioned, the option is inefficient and dangerous when considering its other effects.

8.2 Fiscal Consolidation

8.2.1 Temporary Solutions — Sales of Assets

When a country is pushed into selling its assets, there is probably an opportunistic behaviour of subjects that are willing to buy them. It has nothing to do with an optimal strategy,[6] and it will arguably hurt the economy in most cases. However, a sale of the assets may offer a temporary solution to a government debt reduction. It was already shown in the sixth chapter (Section 6.1.1) that the EU4 countries exhibit a negative general government net financial wealth. Therefore, I analyse general government gross financial assets individually under the assumption that they could be sold.[7] The respective values for the EU4 countries are presented in Table 8.1.

Table 8.1: General government gross financial assets — Shares of GDP — EU4, selected years of 2000–2019

Year	Italy	Spain	Portugal	Greece
2000	23.94%	23.19%	24.20%	28.13%
2005	24.04%	22.53%	24.05%	33.08%
2010	25.04%	28.76%	33.13%	36.96%
2015	28.23%	37.01%	40.69%	39.82%
2019	27.83%	35.99%	35.94%	51.65%

Source: OECD (2020), own processing.

[6] Some exceptions may exist. However, they are likely not very significant.

[7] There is a lack of data on general government non-financial assets. Nevertheless, these assets are usually made mostly of buildings and natural resources. Most of them are arguably not fit to sell under standard circumstances.

The data show that even under the assumption of selling all these assets, none of the countries would be able to reduce its indebtedness ratio below 60% of GDP. Nevertheless, it is almost sure that some assets are of low performance or illiquid, thus could not be easily sold. Moreover, a sale of performing assets would mean, from a long-term perspective, higher debt inertia. Finally, a sale of certain short-term instruments could disrupt the country's budget management.

8.2.2 Long-Term Solutions — Revenues and Expenditures

The depth of a reduction of indebtedness depends on how efficient a fiscal consolidation is. In other words, it depends on which tools are used and how strictly and fast they are implemented. From the theoretical perspective, even a short-term increase in government debt may help to boost growth and subsequently lower the relative indebtedness. The assumption of making credible investments is, however, often not fulfilled.

While the opinions on fiscal consolidation in the relevant literature are mixed, there are no other tools of reducing indebtedness left beside GDP growth and sovereign default. The EU experienced some events of sizeable reductions in the debt ratios. For instance, 50 percentage points in Belgium from 1994 to 2007, and up to more than 69 percentage points in Ireland from 1994 to 2006 (ECB, 2010).

Cafiso and Cellini (2014) claim that fiscal consolidations are inefficient in reducing relative indebtedness. Jeong (2017) reached the same conclusion. On the other hand, it can be theoretically argued that fiscal consolidations can help countries escape from a bad or unsustainable equilibrium (Padoani, Silai, & Noord, 2012). Such programs may boost market confidence and lower risk premia over a more extended period. Fiscal consolidation may initially depress economic growth, but arguably not to the extent where it would push a country into a bad equilibrium or prevent it from escaping from it (ibid.). According to Cottarelli, Gerson, and Senhadji (2014), history shows several episodes of fiscal adjustments that were characterised by medium-term sustainable growth. The growth is needed to ensure that the country is not losing its international competitiveness

while it supports debt reduction further. Historical experience demonstrates that drastic consolidation measures will face massive political resistance and a sharp increase in unemployment (Baumgarten & Klodt, 2010). A gradual adjustment would probably be the most suitable pace of consolidation.

There are two possible ways of balancing a budget – increasing revenues or cutting expenditures. Theoretically, raising taxes (increasing revenues) is problematic as it dampens individual motivations to work, raises costs, and reduces the country's competitiveness. Eventually, it constricts economic growth and lowers potential GDP. Attinasi and Metelli (2016) argue that when fiscal consolidation is based on an increase in government revenues, the initial increase in the debt ratio is more potent and, eventually, the debt ratio reverts to its pre-shock level. It results in the so-called "*self-defeating austerity*". Even critics of fiscal consolidations, Cafiso and Cellini (2014), recommend that such measures should be based on savings because fiscal consolidations that are made by an increase in taxation are more likely to have adverse medium-term effects. According to Eurostat (2020a), Italy and Greece ranked among the top 10 EU countries which have the highest tax wedge. Portugal and Spain are performing relatively better, yet, the differences from EU19 or EU28 are rather small. To conclude, efficient fiscal consolidations should be gradual, credible, and should focus on cutting public expenditures.

8.2.3 Long-Term Solutions — Administrative Measures

Forms of administrative measures – various fiscal rules, seem inefficient from a theoretical perspective when they are used as the primary tool of preventing debt accumulation. Such measures are, in principle, tools of central economic planning. The situation is worse when considering that these rules are also imposed on sovereign countries, that is why these rules are mostly recommendations on a supranational level. It is evident that the main impulses must come from within the economy, not as a purely external factor. Of course, politicians agreed to follow such measures; however, their pledge in the case of the EU was arguably rather populistic.[8] Another piece of evidence may be provided by the general public, as many individuals do not know that such measures

[8] Supranational fiscal regulations in the EU were breached several times in history, even from the EU itself during the financial crisis of 2008–2009.

even exist. It demonstrates that fiscal rules are often completely disconnected from the political process. Hence, their enforceability and motivations to follow them are low. The efficiency of administrative measures highly depends on the individual country and its position in time. Furthermore, when administrative rules are applied, the country is already facing problems in many cases. Therefore, it is highly problematic to empirically measure the effect of imposed fiscal rules (there is a form of endogeneity).

Heinemann, Moessinger, and Yeter (2018) used a meta-regression-analysis which was based on 30 studies published in the last decade. They found positive effects of these rules. Nevertheless, the authors added that their results might be biased due to potential endogeneity issues. In addition, they found a presence of publication bias. It may be beneficial to develop other strategies, such as establishing independent fiscal boards or the role of disciplining incentives from bond markets (ibid.). However, politicians do not comply in many cases because the fiscal boards provide only recommendations which cannot be enforced. In addition, the role of disciplining incentives is deficient, and the improvement is impossible because of the ECB's quantitative easing programmes. The consequences of the expansive monetary policy were already mentioned. In my opinion, the current administrative measures in the EU are rather "*cosmetic*" or populistic. They are not able to make a fundamental difference.

8.3 Structural Reforms Promoting Economic Growth

Reforms which are focusing on the economic structure and promote economic growth are possibly one of the most efficient options. It helps in three ways. First, government budget may be financed by raising revenues due to the expanding economy. Second, if the absolute value of accumulated debt does not change, higher GDP means a lower debt to GDP ratio. Third, harsh austerity measures may eventually lead to social unrests (Sarcinelli, 2012). Positive GDP growth is able to reduce such a possibility significantly.

The current pace of economic growth in the Euro Area is very low. The monetary union is among the slowest growing regions in the world (see IMF, 2020b). Table 8.2 shows

historical averages of real GDP growth of the countries. The most problematic countries were Italy and Greece. Surprisingly, Italy showed slower average economic growth than Greece in the post-recession period. Therefore, there may exist a significant opportunity gap.

Table 8.2: Real GDP growth rates — Geometric averages — EU4, selected periods of 2000–2019

Country	Total period (2000–2019)	Pre-crisis period (2000–2008)	Crisis period (2009–2013)	Post-recession period (2014–2019)
Italy	0.38%	1.18%	−1.57%	0.82%
Spain	1.82%	3.35%	−1.77%	2.58%
Portugal	0.85%	1.39%	−1.64%	2.15%
Greece	0.32%	3.55%	−5.90%	0.90%

Source: Eurostat (2020a), own processing.

Possibly, more precise information is obtained from the decomposition of debt dynamics — the effects of GDP growth are presented in Table 8.3. For the given period, not a single examined country achieved that GDP growth was the main factor of change in indebtedness for at least 40% of the time.[9]

Table 8.3: Number of episodes in 20 years when GDP growth was the dominant factor of debt changes — EU4, 2000–2019

Italy	Spain	Portugal	Greece
3 years	6 years	4 years	7 years

Note: The values are based on the calculations of debt dynamics in the sixth chapter (Section 6.3.1). In particular, Table E.2 presented in Appendix E was used.

Source: own calculations and processing.

A crucial question, when solving debt issues, is how the growth would be created, and whether it is sustainable or not. Do the current monetary and fiscal policies in the Euro Area create such growth? Evidently not, although policymakers often use the argument

[9] Nevertheless, primary balances, which are connected to GDP growth rates to some extent, were often the deciding factor.

of positive effects of economic growth. Sustainable and robust economic development can be created by boosting competitive advantages. First, a change of monetary policy is needed to stop giving governments incentives to accumulate debts by reducing sovereign bond interest rates.[10] Second, it would mean change in the Euro Area's design and structure — exit of some countries or annulment of socialisation of risks and losses in the EU or the Euro Area (as stated by Baltatescu, 2013). The problem is that the EU is trying to deal with many issues while promoting unstable and non-functional political integration. Third, the EU countries need to cut the size of their public sectors; a snowball effect has taken place for decades.[11] Fourth, bureaucracy and tax burden imposed on the private sector should be mitigated. Finally, I recommend making efficient investments in education[12] and research and development. To conclude, a return to market principles is needed in many cases. If there is no major reform, many EU countries should be expecting prolonged years of weak economic growth or stagnation while increasing debt burden at the same time. In such a case, the EU4 countries will be in the worst position.

8.4 Government Default

When a country is not capable of fully repaying its debt, a government default occurs. Moreover, the cases of sovereign defaults should be treated individually, as they may significantly differ. Especially defaults in a monetary union should be scrutinised. The consequences of a sovereign default are quite straightforward. Lender entity loses its resources, while the debtor country (and its citizens) face possible consequences in terms of reputations costs, possible sanctions, or economic, political, and social crises. Nevertheless, the implications of sovereign indebtedness are different from private indebtedness (Borensztein & Panizza, 2008). In the former case, the creditors have arguably weaker position than in the case of private debts. Also, the legal rights of repayments are, in fact, limited because of the sovereignty of the debtor country (ibid.).

[10] The problem is complex. Interest rate reduction may serve as a beneficial factor; however, as it was stated in the second chapter (Section 2.3.4), the current monetary policy in the Euro Area has adverse effects. Hence, policy advocates are frequently using false argumentation.

[11] For example, see the data of OECD (2020).

[12] A proper state of education is able to solve many issues, including those resulting from a political process.

Table 8.4 draws from the history of 200 years in terms of sovereign defaults. Unfortunately, these events are not rare. Greece, Spain, and Portugal experienced many episodes of default. Moreover, Greece spent more than half of the selected period in default, with the longest episode lasting for 33 years (1932–1964). In addition, the countries usually defaulted on the basis of foreign debt. The current situation is no exception; however, the common currency makes the situation less transparent.[13]

Table 8.4: Length of sovereign defaults (for both domestic and external debt) — EU4, 1820–2019

Italy	Spain	Portugal	Greece
7 years	47 years	24 years	120 years

Source: BoC & BoE (2019) and Reinhart (2010), own processing.

The literature offers some historical insights about the costs of sovereign defaults. It agrees that a default event means high costs for the debtor country, although there is some evidence that the long-lasting effects are not always present. Baer, Margot, and Montes-Rojas (2011) analysed the default of Argentina in 2001. They concluded that it was accompanied by a catastrophic economic, political and social crisis which reduced the country's significance and made multilateral institutions to be more sympathetic. Arguably, the EU4 countries are in a similar situation. Borensztein and Panizza (2008) list four types of costs that may result from an international sovereign default: reputational costs, international trade exclusion, costs incurred to the domestic economy through the financial system, and political costs. They found that the costs are generally high (but short-lived), especially political costs.

Gros and Mayer (2011) mention possible problems connected to the "*debt restructuring*" in the case of Greece. It may be too costly, and it is no substitute for the required economic adjustment. The countries in a similar situation may lose access to financial markets. Moreover, debt restructuring will create moral hazard, which could lead to a broader crisis. On the one hand, another series of significant defaults in the Euro Area would mean making it (or the whole EU) even less efficient in economic terms than it currently is and possibly foster or create new structural problems. On the other hand, a

[13] Common currency serves as a "*shield*" against adverse exchange rate fluctuations, but it does not fully mitigate the pressures from non-resident countries which share the currency.

government default is, arguably, needed in extreme cases to set a country on the "*right*" track again (Gros & Mayer, 2011). The authors add that lenders should be punished for lending these countries. Some economists (for example, Skaperdas, 2015) claim that the interests of government officials and the interests of the country are different; therefore, individuals should not be punished. The institute of democracy is not perfect; however, the argument is invalid because there would be a lack of responsibility for elections which would further impede the efficiency of the political process. The default argument seems convincing even though most of these lenders are EU citizens. According to Skaperdas (2015, p. 758): "*If the lender has not been careful in choosing his borrowers, then it is both economically efficient and fair that he loses. From an economic viewpoint, it is clear that the possibility of bankruptcy has been a usual source of improvement, renewal, and vitality in the economies that allow it.*". Nevertheless, a particular cause of de facto bankruptcy in Greece needs to be addressed. From both empirical and theoretical perspective, such a significant event as the government default needs to be executed properly. Half-done policies, especially when facing a severe crisis, are usually not successful. In other words, bailed-out bankruptcy which preserves the current status-quo does not bear the desired effects.

It is evident that a sovereign default should be an option of last resort. The question is whether the Euro Area is in such a desperate situation. Skaperdas (2015) claims that an event of default may not be necessarily as disastrous as it is often presented. Without the euro, it is difficult to imagine how a crisis of such depth would have occurred (ibid.). Furthermore, as it was shown in the previous chapters, if no structural reforms take place, the EU4 countries are caught in a debt trap which could lead to a dangerous spiral of debt increase while experiencing economic stagnation. If the current status quo is being preserved, it seems fit for these countries to default. It would help in shaping voters' demand, thus, helping the political process (the subjects involved would face immediate consequences). Subsequently, it would accelerate reform of the EU's and the Euro Area's structural weaknesses as well as discarding unreasonable policies. In other words, defaults would accelerate the functioning of correction mechanisms (or help with their creation) in the Euro Area and the EU, if there is no political will to do so.

8.5 Key Findings

The chapter identified and analysed four main possibilities of dealing with the debts: debt monetisation, fiscal consolidation, structural reforms, and sovereign default. The debt monetisation as practised by the ECB is not an appropriate solution. Its primary effects are based on a short-term perspective, while its secondary effects are making the situation worse. The effects include the creation of further imbalances in the TARGET2 system, thus raising the probability of another bail-out. Moreover, the socialisation of risks and losses likely strengthens the moral hazard in the EU. Possible inflationary pressures could create other instabilities, and there is no particular reason why debtors should benefit at the expense of creditors. Furthermore, some effects are hidden. Real estate markets of the countries are booming, and both prices and yields of government bonds are affected. The crucial aspect is that governments issuing financial instruments experience no relevant feedback which would arise from their expansionary policies.

The second possibility is a fiscal consolidation which needs to be gradual, credible, and should focus on cutting expenditures rather than increasing revenues by raising tax rates. However, the target is not achievable without structural reforms promoting economic growth provided that the government does not default. In my opinion, there is an opportunity gap regarding higher GDP growth because the Euro Area is among the slowest growing regions in the world. Some authors claim that the reforms should be mainly demand-driven. Nevertheless, I demonstrated that this is not the case considering the previous analyses regarding the Euro Area's instabilities.

Finally, I believe that due to the political motivations, there is a lack of emphasis on real competitive advantages. In many cases, a return to market principles is needed. It is in contrast with the usual short-term reforms focusing on the demand side of the economy. In my opinion, the structural reforms must include a return to country-specific currencies in the EU4 countries due to the systemic instabilities in the Euro Area. When there is an insufficient political will to carry out reforms, a proper and fully-executed sovereign default will accelerate the functioning of correction mechanisms in the EU and the Euro Area. Unfortunately, such action was not executed in the case of Greece, even though the country de facto bankrupted.

Conclusions

The presented work focused on the analysis of fiscal policies of Italy, Spain, Portugal, and Greece between 2000–2019. In addition, it provided an overview of possible debt resolution options and proposed relevant economic policy measures. It confirmed both of the main research hypotheses. According to the presented analyses, the general government debts of the EU4 countries are unsustainable in a medium- and long-term horizon. Furthermore, the current institutional design of the Euro Area is not suitable for the EU4 countries due to the existence of systemic flaws regarding the monetary union. The work explored various fiscal perspectives, described key debt mechanisms, identified numerous implications, and connected the fiscal positions of the EU4 countries with other factors, namely with the structural flaws of the Euro Area and the common monetary policy of the ECB.

I believe that the presented work showed an elaborate analysis of fiscal policies of the EU4 countries and the related implications, which resulted in a considerably high added-value of the text. In particular, the work offered theoretical insights including the interaction between fiscal policies of the EU4 countries and the common monetary policy of the ECB, systemic flaws of the Euro Area, sovereign debt channels in the Euro Area, and the analysis of doubtful effects of a potential establishment of a fiscal union. The empirical part of the dissertation focused on the analysis of the fiscal policies and the possible debt resolution prospects from various perspectives. It demonstrated the interconnections of the EU4 countries using a cluster analysis. Then, the work presented the analysis of all the main fiscal indicators, including their comparison with the standard fiscal benchmarks used by relevant international institutions. It showed estimates of structural budget balances, including the estimates of output gaps and the comparison with the estimates of the European Commission. Hence, it derived the related fiscal

stances and fiscal efforts measures. In addition, I used augmented equations of debt dynamics for an open economy which also incorporated the stock-flow adjustment measures, thus, achieving high accuracy. The work thoroughly analysed the historical debt dynamics and incorporated the fiscal situations into long-term projections within two scenarios. Furthermore, it presented econometric estimates of the determinants and efficiency of the examined fiscal policies. In other words, I estimated country-specific fiscal reaction functions within the EC model framework and showed estimates of fiscal multipliers regarding government expenditure effects on total output using a BVAR model framework. Finally, the relevant chapter discussed the relevant debt resolution prospects in accordance with the previous analyses. The literature consists of many studies and books regarding the topic of this work. However, I was not able to find a similar study which would analyse the topic in the presented level of detail while offering a coherent text and connecting all the relevant analyses.

The answers to the main research questions were provided in eight chapters. The work presented evidence that the EU4 countries suffer from a constant debt accumulation in the Euro Area. In particular, I identified five main systemic flaws of the Euro Area. These are overly ambitious integration ideology, the country composition of the Euro Area, socialisation of risks and moral hazard, dependence of the ECB, and snowball effects combined with systemic inertia. The Euro Area suffers from overly ambitious integration ideology which is based on normative judgments rather than positive economic analysis. The ideology which is deeply rooted in the political mainstream of Germany and France, and promotes policies which are sub-optimal for the EU4 countries. Moreover, the EU4 economies are not functioning properly within the common currency system. Inflexible or even relatively fixed exchange rate combined with the common monetary policy created a policy mix which promoted economic instabilities and motivated the EU4 countries to run unsustainable policies. The exchange rate channel is partly blocked as the common currency cannot properly depreciate and reflect the country's position. It leads to lower GDP through the income channel, which may also be accompanied by higher debt pressures, internal devaluations, and capital outflows. In addition, economic recovery mechanisms are also working inefficiently. The combination of the previous two factors promotes widespread socialisation of risks and moral hazard. One of the main ideas is that the interest rate mechanism has also been blocked and was not able to

promote fiscal discipline. This factor, combined with the short-term-oriented political processes, was able to preserve the sub-optimal status quo. Once individuals get used to a certain living standard, it is not politically feasible to deprive them of it. When such living standard is not covered by the country's productivity, it leads to high government deficits and further deterioration of the macroeconomic fundamentals. As a result, the countries gradually lose their national sovereignty and are increasingly dependent on centralised policy-making in the EU.

The common monetary policy of the ECB and its effects on the fiscal positions of the countries is complex and should be mentioned separately. Expansive monetary policy of the ECB leads to a temporary relaxation of fiscal conditions of the EU4 countries in the short term. However, it has significant adverse economic effects in the medium and long term. These include various market distortions such as bubbles in asset markets, prohibitive motivations, low fiscal discipline, and other factors. Paradoxically, the policy combined with the EU's mainstream political agenda led to unproductive investments, waste of resources and the dependence of the EU4 countries on more fiscal stimuli. Moreover, the common monetary policy of the ECB exacerbates the economic and structural inefficiencies in the Euro Area. In my opinion, the current monetary policy of the ECB is a result of compromises within a heterogeneous group of countries. I argued that the ECB is a fundamentally dependent central bank because the current Euro Area system needs constant interventions. The fact is connected with the systemic flaws of the Euro Area.

The work presented eight sovereign debt channels in the Euro Area, and these are institutional characteristics of the Euro Area, nature of democracy and political cycles, information asymmetries, Keynesian stabilisation efforts, reputation and expectations, strict preferences, current economic conditions, and future prospects. The mechanisms fostered the indebtedness of the EU4 countries both directly and indirectly. The Euro Area does not form the optimum currency area, which is producing economic instabilities by itself. The policymakers needed to promote unsustainable economic policies and introduce many compromise decisions within the institution to keep the common currency. This effect was further amplified by the political process, which is short-term oriented. Furthermore, many politicians completely ignore the relevant structural problems of the

Euro Area. They focused on Keynesian stabilisation-oriented reforms which are not credible. In other words, they misinterpreted the occurring and did not take the structural flaws into account. This lead to a degradation of reputation and future expectations regarding the EU4 countries. Nevertheless, the unsustainable fiscal policies of the EU4 countries cannot be attributed to external factors only. It could have been a result of strict preferences. A simple explanation is that individuals are willing to be better off in the short term at the expense of long-run problems because their life is finite, and they have a strong short-time preference. It may be the case of Greece, which received significant external help during the financial crisis of 2008–2009. The current economic conditions of the EU4 countries are poor. The fact may contribute to a negative debt spiral. Furthermore, the EU4 countries will suffer from population ageing in the future. At the same time, there is a competition between the "*old Western democracies*" and the rising superpowers such as China which may put additional debt pressures. Finally, the EU4 countries were hit by the coronavirus crisis in early 2020. I concluded that the examined countries are at the core of the economic instabilities in the Euro Area. If the monetary union is not reformed, I do not see a way for these countries to prosper. It will likely result in a further reduction of the living standards. However, it may affect the whole EU.

Moreover, the work presented a positive economic analysis of a possible establishment of a fiscal union within the Euro Area. Fiscal union is often mentioned as one of the possible solutions to the systemic instabilities of the Euro Area. Nevertheless, I identified 14 assumptions, which would need to be met, and concluded that there is not a single assumption which would not be seriously challenged. In fact, many of them would not be fulfilled. Also, a fiscal union within the Euro Area would probably not be sustainable because a constant shift of resources from the Northern to the EU4 countries would be needed. In my opinion, the current Euro Area should focus on competitive advantages, long-term policies and a transparent system design which would not require serious government interventions.

The first chapter of the empirical part of the work showed that the EU4 countries form a relatively stable group (cluster) within the EU and the Euro Area. Therefore, the countries should be concurrently analysed. Nevertheless, some differences within the

group are notable. The most crucial distinction is the size of the economies. Smaller countries (Greece and Portugal) showed slightly different macroeconomic behaviour than the larger countries (Italy and Spain). The examined countries exhibited critical values of both flow and stock fiscal indicators between 2000–2019, with only a few exceptions. Moreover, the larger economies show, on average, a relatively better performance. However, their positions are still alarming.

The policy of the ECB is understandable considering the fact that equilibrium interest rates in the EU4 countries would make their situations immediately unsustainable, especially in Italy. I estimated structural budget balances for the EU4 countries and showed a historical decomposition of the overall debt balances. Moreover, I argued that the European Commission's output gap estimates, which are necessary for the estimation of the structural balances, are not consistent with the economic fundamentals of the countries before the financial crisis of 2008–2009. The estimates suggested that the structural budget balances were significantly worse before 2008 when compared with the European Commission's estimates. The EU4 countries destabilised their economies through prohibitive structural budget deficits. The values of the deficits were extremely high in Greece and Spain. They even outmatched the size of the GDP gaps in their peaks before the financial crisis. Moreover, the analysis of debt dynamics indicated that automatic debt dynamics was crucial for Italy, Portugal, and Greece. The debt accumulation in Spain was highly determined by primary budget balances which implies that this country has a larger "*manoeuvring*" space or higher potential of discretionary fiscal measures. In addition, the euro exchange rate fluctuations are not a problem per se due to negligible shares of debts denominated in foreign currencies in the EU4 countries.

The work analysed the determinants of the EU4 fiscal policies since 1884 to provide a sufficient benchmark for the occurring during 2000–2019. In my opinion, the estimates showed a total inefficiency of the supranational fiscal regulation within the EU and the Euro Area. A lesser disciplinary effect was found only for Italy, which showed higher effort for anti-cyclical fiscal policy and higher sensitivity to increases in real interest payments as a result of the Euro Area accession. The effect of the Euro Area accession was strongly detrimental for Greece, while a lesser detrimental effect was found for

Portugal and Spain in terms of fiscal discipline. The disciplining factor was the financial crisis of 2008–2009, but the effects significantly differed among the larger (Italy and Spain) and smaller countries (Portugal and Greece). In my opinion, the smaller countries were able to exploit the benefits of the socialisation of risk in the Euro Area in terms of their fiscal reactions to rising debt levels. Nevertheless, they were forced to significantly improve their fiscal discipline as a result of the financial crisis. The larger countries also exploited the benefits of risk-sharing but to a lesser extent. Subsequently, they were not forced so strongly to opt for fiscal discipline during the financial crisis. In fact, they did the opposite.

Furthermore, the work presented estimates of the effects of government expenditure to total output in the EU4 countries. The evidence suggested that the value of the multipliers in the EU4 countries was significantly lower than one before the financial crisis. In particular, 1 euro of government expenditure was able to generate only 0.3 euros of total output. However, this was not the case of Greece which showed a possibly zero multiplier. The fiscal policies of the EU4 countries were highly inefficient and probably crowded-out some portion of private investment. The multipliers became considerably higher after the recession, reaching values higher than 1 for all the countries except Spain. Nevertheless, this fact should not be misinterpreted. In my opinion, it was the result of the desperate situation of the countries. It does not mean that structural increases in government expenditure would solve the issues. It was rather a temporary phenomenon, but it suggests that a significant fiscal austerity without structural reforms is probably not suitable for these countries.

After 2014, the relative indebtedness of the countries had been reduced by a positive GDP growth. Nevertheless, I believe that the fiscal situation of the EU4 countries is unsustainable. Two scenarios of long-term debt projections were presented, and I concluded that even under the optimistic scenario, the countries would not be able to decrease their debt ratios significantly. Portugal exhibited the most promising signs of sustainability. However, the country experienced extremely good circumstances between 2014–2019. The calculations demonstrated that it could not be expected that the countries to reduce their indebtedness to 60% of their GDPs in at least 50 years if a debt restructuring or a major structural reform does not take place.

The last chapter identified and analysed four main possibilities of dealing with the debts: debt monetization, fiscal consolidation, structural reforms, and sovereign default. The debt monetisation as practised by the ECB is not an appropriate solution. Its primary effects are based on a short-term perspective, while its secondary effects are making the situation worse. For example, the effects include higher pressures to the socialisation of risks and moral hazard, and inflationary pressures which are often hidden within price bubbles in various asset markets. The crucial aspect is that governments issuing financial instruments experience no relevant feedback which would arise from their expansionary policies. In my opinion, the most appropriate solution to the debt crisis is a fiscal consolidation combined with structural reforms which should promote long-term economic growth. Unfortunately, I believe that the structural reforms must include a return to country-specific currencies in the EU4 countries due to the systemic instabilities in the Euro Area. It should be noted that sole fiscal consolidation is not sufficient. All in all, a return to market principles is needed in many cases. It is in contrast with the usual short-term reforms focusing on the demand side of the economy. Nevertheless, if this option would not be politically feasible, a sovereign default would accelerate the functioning of correction mechanisms in the EU and the Euro Area.

Finally, the research could be complemented by other analyses which could utilise alternative methodologies and different input data. For instance, the position of the countries in the EU could be identified using time series cluster analysis supported by Bayesian estimation methods. The fiscal reaction functions could be used to assess debt sustainability, or the fiscal multipliers could be estimated by using other identification methods. The subsequent studies should utilise the evidence presented in this work. In particular, the insights should be related to the current situation of the EU4 countries which has been altered by the coronavirus crisis in early 2020.

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List of Abbreviations

AR component	Autoregressive component
BVAR model	Bayesian vector autoregressive model
CPI	Consumer price index
EC	European Commission
EC model	Error correction model
ECB	European Central Bank
EDP	Excessive Deficit Procedure
ELB	Effective Lower Bound
ESA	European System of National and Regional Accounts
EU	European Union
EU4	Examined countries: Italy, Spain, Portugal, and Greece
EU19, EMU	Euro Area, European Economic and Monetary Union
EU27	All the 27 countries of the European Union (as of 2020)
EUR	Euro
FC	Financial crisis of 2008–2009
GDP	Gross domestic product
GMM	Generalised method of moments
GNI	Gross national income
HAC errors	Heteroskedasticity- and autocorrelation-consistent errors
HICP	Harmonised index consumer prices
HP filter	Hodrick-Prescott filter

IMF	International Monetary Fund
IRF	Impulse-response function
MIP	Macroeconomic Imbalance Procedure
N/A	Not available
NAIRU	Non-accelerating inflation rate of unemployment
NEER	Nominal effective exchange rate
OCA	Optimum currency area
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary least squares
PPP	Purchasing power parity (or parities)
PPS	Purchasing power standard (or standards)
PPT(S)	Percentage point(s)
REER	Real effective exchange rate
SNA	System of National Accounts
UC model	Unobserved components model
USA	United States of America
VAR model	Vector autoregressive model
YoY growth	Year-on-year growth
ZLB	Zero Lower Bound

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Appendices

Hierarchical Cluster Analysis

A

Table A.1: Descriptive statistics of used variables — EU27, 2000–2019

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
GDP per capita – 2018 constant PPS	539	26 758	12 329	7 112	18 841	33 030	79 724
Government final consumption expenditure to GDP	540	19.719	2.848	11.900	18.000	21.025	27.900
Household and NPISH final consumption expenditure to GDP	540	55.261	8.348	29.300	49.800	61.650	71.100
Gross capital formation to GDP	540	23.057	4.521	10.200	20.400	25.225	46.000
Exports of goods and services to GDP	540	60.514	35.518	18.500	37.200	74.300	221.200
Total GDP – real changes	539	2.527	3.477	−14.800	1.100	4.200	25.200
Government final consumption expenditure – real changes	539	1.747	2.849	−12.400	0.500	3.200	14.400
Household and NPISH final consumption expenditure – real changes	539	2.373	3.546	−17.400	0.900	3.800	19.600
Gross capital formation – real changes	539	3.252	11.978	−54.600	−1.750	8.000	74.100
Exports of goods and s. – real changes	539	5.563	7.044	−20.300	2.400	8.800	39.200
Aggregate productivity – hours	537	2.006	2.785	−8.600	0.400	3.300	19.900
R&D expenditure to GDP	503	1.447	0.887	0.230	0.715	2.050	3.900
Labour force participation rate	537	70.659	5.346	57.600	66.900	74.500	82.900
Old-age dependency ratio	539	24.967	4.370	15.600	21.800	27.900	35.700
Compound tax quota	516	36.505	5.991	23.000	31.775	41.325	49.900
General unemployment rate	537	8.778	4.414	2.000	5.800	10.600	27.500
Youth unemployment rate	537	20.052	9.817	4.600	12.600	24.500	58.300
GDP deflator – changes	539	2.729	3.684	−9.730	1.117	3.420	43.181
Price level index	540	88.282	26.791	33.100	65.400	111.725	141.800
General government gross debt to GDP	540	57.745	33.918	3.766	36.044	74.227	184.851
General gov. budget balance to GDP	540	−2.231	3.407	−32.030	−3.882	−0.073	6.736
Long-term interest rate	516	3.921	2.407	−0.250	2.253	5.080	22.500
General government revenue to GDP	540	41.891	6.545	25.292	37.345	46.666	56.362
General gov. expenditure to GDP	540	44.122	6.714	25.294	39.431	48.998	65.052
REER - changes	540	0.575	3.469	−14.538	−1.316	1.970	17.652
Current account balance (BPM6)	540	−0.811	5.673	−23.904	−4.436	2.696	12.603
Real unit labour costs	537	0.527	0.054	0.340	0.490	0.562	0.764
Intra-EU27 trade	540	63.426	9.945	35.699	56.760	71.717	84.333
Import intensity of exports	540	132.918	92.480	53.809	94.809	138.482	868.503

Source: Eurostat (2020a), own calculations and processing.

Table A.2: Indices used for determining the optimal number of clusters

	Index	Author(s)
1	**KL index**	Krzanowski, W. J., & Lai, Y. T. (1988). A Criterion for Determining the Number of Groups in a Data Set Using Sum-of-Squares Clustering. *Biometrics*, 44(1), 23–34.
2	**CH index**	Calinski, T., & Harabasz, J. (1974). Dendrite Method for Cluster Analysis. *Communications in Statistics – Theory and Methods*, 3(1), 1–127.
3	**Hartigan index**	Hartigan, J. A. (1975). *Clustering Algorithms*. John Wiley & Sons, New York.
4	**C index**	Hubert, L. J., & Levin, J. R. (1976). A General Statistical Framework for Assessing Categorical Clustering in Free Recall. *Psychological Bulletin*, 83(6), 1072–1080.
5	**DB index**	Davies, D. L., & Bouldin, D. W. (1979). A Cluster Separation Measure. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 1(2), 224–227.
6	**Silhouette index**	Rousseeuw, P. (1987). Silhouettes: A Graphical Aid to the Interpretation and Validation of Cluster Analysis. *Journal of Computational and Applied Mathematics*, 20, 53–65.
7	**Duda index**	Duda, R. O., & Hart, P. E. (1973). *Pattern Classification and Scene Analysis*. John Wiley & Sons, New York.
8	**PseudoT2 index**	Duda, R. O., & Hart, P. E. (1973). *Pattern Classification and Scene Analysis*. John Wiley & Sons, New York.
9	**Ratkowsky index**	Ratkowsky, D. A., & Lance, G. N. (1978). A Criterion for Determining the Number of Groups in a Classification. *Australian Computer Journal*, 10(3), 115–117.
10	**Ball index**	Ball G. H., & Hall, D. J. (1965). *ISODATA: A Novel Method of Data Analysis and Pattern Classification*. Stanford Research Institute, Menlo Park.
11	**PtBiserial index**	Milligan, G. W. (1980). An Examination of the Effect of Six Types of Error Perturbation on Fifteen Clustering Algorithms. *Psychometrika*, 45(3), 325–342.
12	**Gap index**	Tibshirani, R., Walther, G., & Hastie, T. (2001). Estimating the Number of Clusters in a Data Set Via the Gap Statistic. *Journal of the Royal Statistical Society B*, 63(2), 411–423.
13	**McClain index**	McClain, J. O., & Rao, V. R. (1975). CLUSTISZ: A Program to Test for The Quality of Clustering of a Set of Objects. *Journal of Marketing Research*, 12(4), 456–460.
14	**Gamma index**	Baker, F. B., & Hubert, L. J. (1975). Measuring the Power of Hierarchical Cluster Analysis. *Journal of the American Statistical Association*, 70(349), 31–38.
15	**GPlus index**	Rohlf, F.J. (1974). Methods of Comparing Classifications. *Annual Review of Ecology and Systematics*, 5, 101–113.
16	**Tau index**	Rohlf, F.J. (1974). Methods of Comparing Classifications. *Annual Review of Ecology and Systematics*, 5, 101–113.
17	**Dunn index**	Dunn, J. (1974). Well Separated Clusters and Optimal Fuzzy Partitions. *Journal Cybernetics*, 4(1), 95–104.
18	**SD index**	Halkidi, M., Vazirgiannis, M., & Batistakis, I. (2000). *Quality Scheme Assessment in the Clustering Process*. Proceedings of PKDD 2000, 265–276. Freiburg, Germany: Springer.
19	**SDbw index**	Halkidi, M., & Vazirgiannis, M. (2001). *Clustering Validity Assessment: Finding the Optimal Partitioning of a Data Set*. ICDM'01 Proceedings, 187–194. San Jose, USA: IEEE.

Note: The literature is not included in References because it would be redundant.

Source: Charrad et al. (2014), own processing.

Table A.3: Tests of the optimal number of clusters — EU27 (2-10 clusters)

EU27 (2000–2019)

	Index	Value	Result		Index	Value	Result
1	KL	1.3022	4	11	PtBiserial	0.4817	5
2	CH	3.4749	2	12	Gap	-0.9832	2
3	Hartigan	0.6361	4	13	McClain	0.9861	2
4	Cindex	0.3446	10	14	Gamma	0.8051	10
5	DB	1.2718	10	15	GPlus	2.8348	10
6	Silhouette	0.1551	10	16	Tau	43.8348	5
7	Duda	0.7594	2	17	Dunn	0.6524	8
8	PseudoT2	3.4849	2	18	SDindex	3.9705	10
9	Ratkowsky	0.2740	4	19	SDbw	0.4401	10
10	Ball	2.8688	3		Result		- 2-4 -

EU27 (2000–2009)

	Index	Value	Result		Index	Value	Result
1	KL	1.4701	5	11	PtBiserial	0.5093	7
2	CH	4.4552	2	12	Gap	-1.0410	2
3	Hartigan	0.8138	5	13	McClain	0.3941	2
4	Cindex	0.4492	3	14	Gamma	0.8485	10
5	DB	1.1742	10	15	GPlus	2.2650	10
6	Silhouette	0.1964	10	16	Tau	46.8319	5
7	Duda	0.8599	2	17	Dunn	0.6687	8
8	PseudoT2	3.2597	2	18	SDindex	3.0318	10
9	Ratkowsky	0.2799	4	19	SDbw	0.4089	10
10	Ball	4.9542	3		Result		- 2-4 -

EU27 (2010–2016)

	Index	Value	Result		Index	Value	Result
1	KL	1.4747	2	11	PtBiserial	0.4887	6
2	CH	5.1228	2	12	Gap	-1.0050	2
3	Hartigan	0.5579	7	13	McClain	0.8404	2
4	Cindex	0.3691	8	14	Gamma	0.8647	10
5	DB	1.0796	10	15	GPlus	2.1852	10
6	Silhouette	0.2660	10	16	Tau	39.4017	4
7	Duda	0.8240	2	17	Dunn	0.5892	10
8	PseudoT2	3.2044	2	18	SDindex	2.5233	10
9	Ratkowsky	0.2700	6	19	SDbw	0.2994	10
10	Ball	5.3695	3		Result		- 6-10 -

EU27 (2017–2019)

	Index	Value	Result		Index	Value	Result
1	KL	1.5434	4	11	PtBiserial	0.6985	3
2	CH	5.1534	2	12	Gap	-1.1817	2
3	Hartigan	1.0771	4	13	McClain	0.3546	2
4	Cindex	0.4525	10	14	Gamma	0.8568	10
5	DB	1.1756	10	15	GPlus	2.0826	10
6	Silhouette	0.2078	2	16	Tau	72.5755	3
7	Duda	0.8378	2	17	Dunn	0.6840	3
8	PseudoT2	3.8733	2	18	SDindex	2.3588	10
9	Ratkowsky	0.2686	5	19	SDbw	0.4946	10
10	Ball	7.3394	3		Result		- 2-4 -

Note: The results are based on a subjective opinion; the tests provide only recommendations.
Source: own calculations and processing.

Table A.4: Tests of the optimal number of clusters — EU19 (2-10 clusters)

EU19 (2000–2019)

	Index	Value	Result		Index	Value	Result
1	KL	1.4839	5	11	PtBiserial	0.6063	2
2	CH	3.0491	5	12	Gap	-1.1133	2
3	Hartigan	0.7633	5	13	McClain	0.1940	2
4	Cindex	0.2775	6	14	Gamma	0.9263	10
5	DB	0.9005	10	15	GPlus	0.4737	10
6	Silhouette	0.3336	10	16	Tau	24.4795	3
7	Duda	0.8383	2	17	Dunn	0.8419	10
8	PseudoT2	2.8925	2	18	SDindex	2.8250	10
9	Ratkowsky	0.3012	5	19	SDbw	0.2689	10
10	Ball	2.1696	3		Result		- 2-5 -

EU19 (2000–2009)

	Index	Value	Result		Index	Value	Result
1	KL	1.3581	3	11	PtBiserial	0.5673	7
2	CH	4.1503	3	12	Gap	-1.0648	2
3	Hartigan	0.8105	3	13	McClain	0.6991	2
4	Cindex	0.4667	4	14	Gamma	0.9306	7
5	DB	0.8526	10	15	GPlus	0.4444	10
6	Silhouette	0.3662	10	16	Tau	24.3626	5
7	Duda	0.9615	2	17	Dunn	0.7732	7
8	PseudoT2	0.4399	2	18	SDindex	2.5274	7
9	Ratkowsky	0.3131	4	19	SDbw	0.2065	10
10	Ball	3.6862	3		Result		- 2-7 -

EU19 (2010–2016)

	Index	Value	Result		Index	Value	Result
1	KL	1.6160	3	11	PtBiserial	0.5654	4
2	CH	4.2620	3	12	Gap	-1.1085	2
3	Hartigan	1.3635	3	13	McClain	0.4612	2
4	Cindex	0.4586	2	14	Gamma	0.9254	10
5	DB	0.8362	10	15	GPlus	0.4795	10
6	Silhouette	0.3840	10	16	Tau	25.2164	4
7	Duda	0.7796	2	17	Dunn	0.8230	10
8	PseudoT2	3.6746	2	18	SDindex	2.0303	10
9	Ratkowsky	0.3122	4	19	SDbw	0.1881	10
10	Ball	3.9738	3		Result		- 2-4 -

EU19 (2017–2019)

	Index	Value	Result		Index	Value	Result
1	KL	1.3408	4	11	PtBiserial	0.6950	3
2	CH	3.7812	2	12	Gap	-1.2333	2
3	Hartigan	0.6200	4	13	McClain	0.4358	2
4	Cindex	0.4663	8	14	Gamma	0.9154	10
5	DB	0.8048	10	15	GPlus	0.5789	10
6	Silhouette	0.3634	10	16	Tau	35.4269	3
7	Duda	0.8004	2	17	Dunn	0.7490	3
8	PseudoT2	3.2421	2	18	SDindex	1.7581	10
9	Ratkowsky	0.2992	4	19	SDbw	0.2411	10
10	Ball	5.3066	3		Result		- 2-4 -

Note: The results are based on a subjective opinion; the tests provide only recommendations.
Source: own calculations and processing.

Table A.5: Tests of the optimal number of clusters — EU4 (1-3 clusters)

EU4 (2000–2019)

	Index	Value	Result		Index	Value	Result
1	KL	1.8831	2	11	PtBiserial	0.5481	2
2	CH	2.0345	2	12	Gap	-0.9449	1
3	Hartigan	N/A	-	13	McClain	1.6392	2
4	Cindex	0	3	14	Gamma	1	2
5	DB	0.4444	3	15	GPlus	0	2
6	Silhouette	0.5735	3	16	Tau	1.3333	2
7	Duda	3.544	2	17	Dunn	1.0085	3
8	PseudoT2	0	2	18	SDindex	2.3084	3
9	Ratkowsky	0.4672	3	19	SDbw	0.2380	3
10	Ball	1.0836	2		Result		- 2 -

EU4 (2000–2009)

	Index	Value	Result		Index	Value	Result
1	KL	1.4507	2	11	PtBiserial	0.8806	2
2	CH	1.6201	2	12	Gap	-0.9303	1
3	Hartigan	N/A	-	13	McClain	0.8414	2
4	Cindex	0.8982	2	14	Gamma	1	2
5	DB	0.5192	3	15	GPlus	0	2
6	Silhouette	0.5133	3	16	Tau	1.5000	2
7	Duda	1.5768	1	17	Dunn	1.1239	2
8	PseudoT2	-0.7316	1	18	SDindex	1.9573	3
9	Ratkowsky	0.4713	3	19	SDbw	0.2342	3
10	Ball	1.8202	2		Result		- 2 -

EU4 (2010–2016)

	Index	Value	Result		Index	Value	Result
1	KL	1.3355	3	11	PtBiserial	0.6647	3
2	CH	1.5658	3	12	Gap	-0.9409	1
3	Hartigan	N/A	-	13	McClain	1.8055	2
4	Cindex	0	3	14	Gamma	1	3
5	DB	0.4623	3	15	GPlus	0	3
6	Silhouette	0.5652	3	16	Tau	1	2
7	Duda	5.9033	2	17	Dunn	1.0646	3
8	PseudoT2	0	2	18	SDindex	1.9221	3
9	Ratkowsky	0.4885	3	19	SDbw	0.2186	3
10	Ball	1.3260	2		Result		- 3 -

EU4 (2017–2019)

	Index	Value	Result		Index	Value	Result
1	KL	1.8094	3	11	PtBiserial	0.8490	3
2	CH	2.1422	3	12	Gap	-0.9339	1
3	Hartigan	N/A	-	13	McClain	1.7129	2
4	Cindex	0	3	14	Gamma	1	3
5	DB	0.3948	3	15	GPlus	0	3
6	Silhouette	0.6222	3	16	Tau	0.8333	3
7	Duda	6.9982	2	17	Dunn	1.3097	3
8	PseudoT2	0	2	18	SDindex	1.5323	3
9	Ratkowsky	0.4882	3	19	SDbw	0.1239	3
10	Ball	1.6797	2		Result		- 3 -

Note: The results are based on a subjective opinion; the tests provide only recommendations.
Source: own calculations and processing.

B

Structural Balances — One-Off Measures

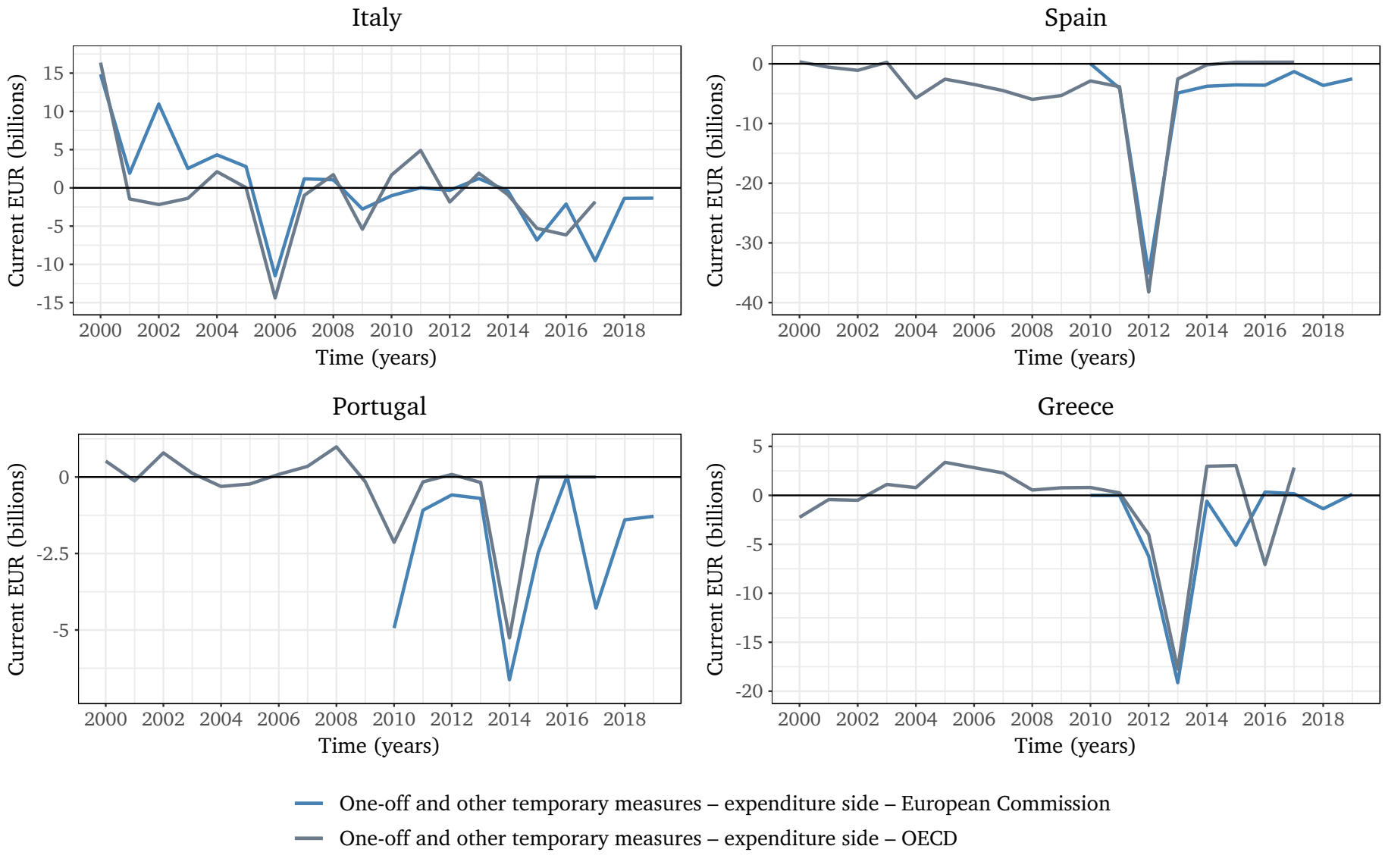
Table B.1: Descriptive statistics of used variables — EU4, 2000–2019

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Italy – Total one-offs (EC, 2019)	20	6.614	8.120	−5.536	1.977	10.473	25.069
Spain – Total one-offs (EC, 2019)	10	−5.249	9.201	−31.038	−3.729	−1.370	0.063
Portugal – Total one-offs (EC, 2019)	10	−1.940	2.476	−6.645	−3.539	−0.151	0.807
Greece – Total one-offs (EC, 2019)	10	−2.021	5.186	−15.341	−3.584	1.131	1.286
Italy – Total one-offs (OECD, 2019)	20	−0.358	7.116	−18.822	−4.013	2.397	14.582
Spain – Total one-offs (OECD, 2019)	20	−4.311	8.459	−36.999	−5.423	0.0004	1.716
Portugal – Total one-offs (OECD, 2019)	20	−0.483	1.924	−5.271	−0.423	0.186	2.665
Greece – Total one-offs (OECD, 2019)	20	0.102	4.423	−15.340	0.000	1.824	5.159
Italy – Total one-offs (OECD, 2015)	18	−0.699	7.646	−18.822	−4.825	2.969	14.582
Spain – Total one-offs (OECD, 2015)	18	−4.932	9.658	−40.749	−6.272	0.417	1.716
Portugal – Total one-offs (OECD, 2015)	18	−0.216	1.417	−5.271	−0.262	0.234	1.507
Greece – Total one-offs (OECD, 2015)	18	−0.235	4.508	−15.742	−0.998	2.864	3.826
Italy – Expenditure one-offs (EC, 2019)	20	0.180	5.926	−11.497	−1.558	2.062	14.845
Italy – Revenue one-offs (EC, 2019)	20	6.434	5.451	1.121	2.985	8.252	22.534
Spain – Expenditure one-offs (EC, 2019)	10	−6.245	10.229	−35.068	−4.029	−2.785	0.000
Spain – Revenue one-offs (EC, 2019)	10	0.996	1.577	0.000	0.000	1.270	4.030
Portugal – Exp. one-offs (EC, 2019)	10	−2.334	2.209	−6.627	−3.830	−0.796	0.034
Portugal – Rev. one-offs (EC, 2019)	10	0.394	0.408	−0.018	0.063	0.694	1.150
Greece – Expendit. one-offs (EC, 2019)	10	−3.180	6.073	−19.132	−4.170	0.086	0.338
Greece – Revenue one-offs (EC, 2019)	10	1.159	1.028	0.314	0.528	1.171	3.791
Italy – Exp. one-offs (OECD, 2015)	18	−0.725	6.020	−14.395	−2.100	1.719	16.373
Italy – Rev. one-offs (OECD, 2015)	18	0.026	4.654	−4.642	−2.440	0.999	14.007
Spain – Exp. one-offs (OECD, 2015)	18	−4.191	8.782	−38.220	−4.329	0.145	0.328
Spain – Rev. one-offs (OECD, 2015)	18	−0.741	2.051	−4.814	−2.023	0.429	1.885
Portugal – Exp. one-offs (OECD, 2015)	18	−0.312	1.387	−5.257	−0.174	0.114	0.985
Portugal – Rev. one-offs (OECD, 2015)	18	0.096	0.462	−0.469	−0.229	0.299	1.423
Greece – Exp. one-offs (OECD, 2015)	18	−0.576	5.056	−17.744	−0.488	2.693	3.373
Greece – Rev. one-offs (OECD, 2015)	18	0.341	1.216	−2.276	−0.231	0.879	3.387

Note: The observations are expressed in absolute values - current EUR, billions.

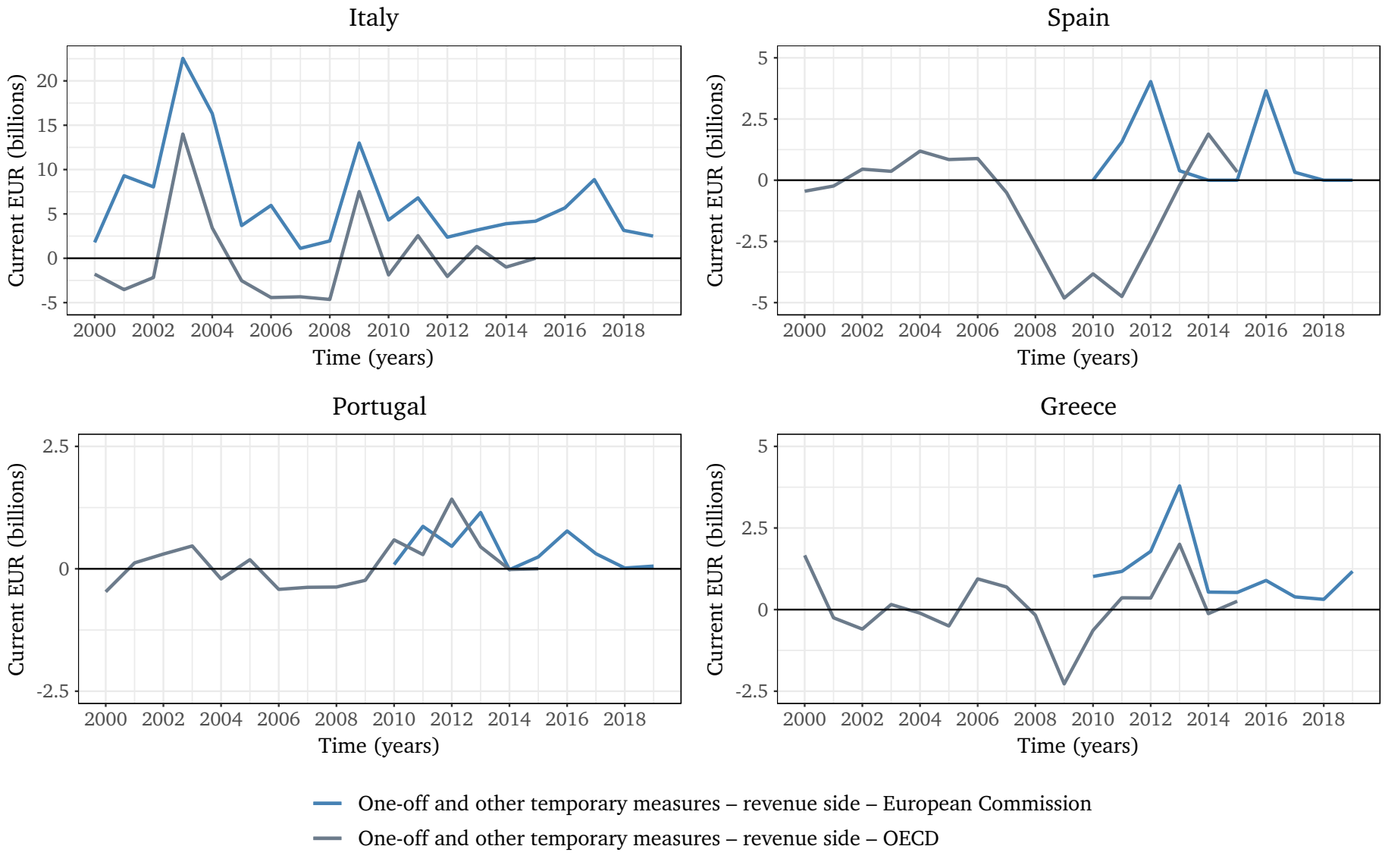
Source: European Commission (2020a), OECD (2020), own calculations and processing.

Figure B.1: Size of one-off and other temporary measures, expenditure side — European Commission vs OECD — EU4, 2000–2019



Source: European Commission (2020a), OECD (2020), and Eurostat (2020a), own calculations and processing.

Figure B.2: Size of one-off and other temporary measures, revenue side — European Commission vs OECD — EU4, 2000–2019



Source: European Commission (2020a), OECD (2020), and Eurostat (2020a), own calculations and processing.

C

Structural Balances — Output Gaps

Table C.1: Descriptive statistics of used variables — EU4, 1Q 1960 – 4Q 2019

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Italy – GDP (2018 constant prices)	240	325 117	109 149	111 166	234 039	430 813	465 401
Spain – GDP (2018 constant prices)	240	174 122	78 656	42 796	117 023	258 862	308 341
Portugal – GDP (2018 constant prices)	240	32 179	14 028	8 412	20 286	46 595	52 614
Greece – GDP (2018 constant prices)	240	36 013	13 331	9 789	27 646	45 344	61 220
Italy – General unemployment rate	148	9.475	1.665	5.933	8.225	11.017	12.733
Spain – General unemployment rate	135	16.789	4.856	7.967	12.200	20.333	26.200
Portugal – General unemployment rate	148	8.612	2.947	4.800	6.358	9.800	17.300
Greece – General unemployment rate	120	13.655	6.286	6.879	9.649	18.228	27.747
Italy – CPI (% changes)	239	1.398	1.375	−0.428	0.484	1.715	6.382
Spain – CPI (% changes)	239	1.557	1.447	−0.687	0.579	2.241	7.673
Portugal – CPI (% changes)	239	1.948	2.265	−5.429	0.464	3.032	15.372
Greece – CPI (% changes)	239	1.943	2.037	−1.569	0.487	3.351	12.533

Source: St. Louis Fed (2020), OECD (2020), own calculations and processing.

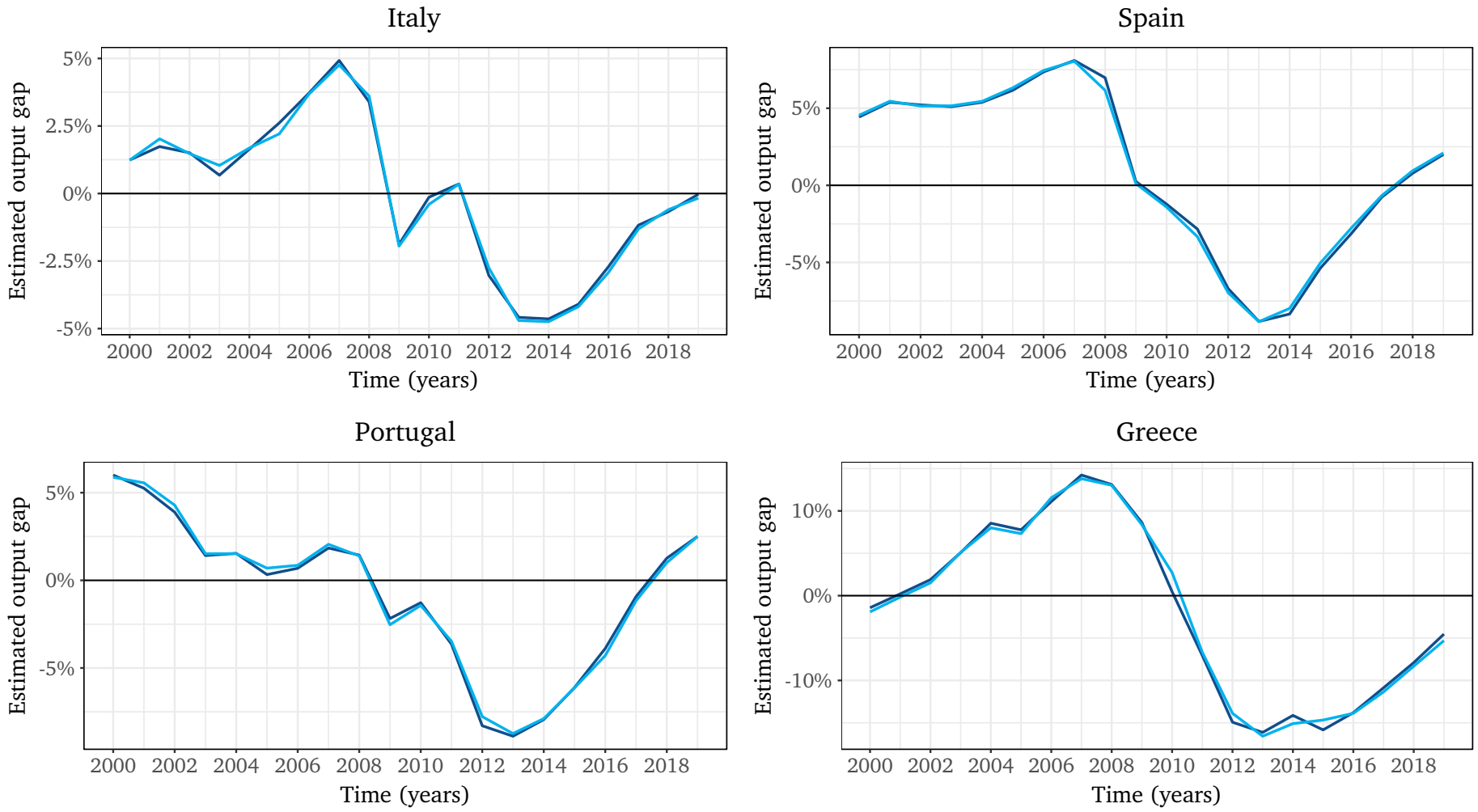
Table C.2: Methods used for estimations of output gaps

	Method	Author(s)	Index	Author(s)
1	**Hodrick-Prescott filter (lambda = 1600)**	Hodrick, R. J., & Prescott, E. C. (1997). Postwar U.S. Business Cycles: An Empirical Investigation. *Journal of Money, Credit and Banking*, 29(1), 1–16.	**Hamilton's alt. to the HP filter (h = 8, p = 4)**	Hamilton, J. D. (2018). Why You Should Never Use the Hodrick-Prescott Filter. *Review of Economics and Statistics*, 100(5), 831–843.
2	**Baxter-King filter (pl = 6, pu = 32)**	Baxter, M., & King, R. G. (1999). Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series. *Review of Economics and Statistics*, 81(4), 575–593.	**Wavelet filter (3 levels)**	Percival, D. B., & Walden, A. T. (2008). *Wavelet Methods for Time Series Analysis*. Cambridge: Cambridge Univ. Press.
3	**Christiano-Fitzgerald filter (pl = 6, pu = 32)**	Christiano, L. J., & Fitzgerald, T. J. (2003). The Band Pass Filter. *International Economic Review*, 44(2), 435–465.	**Univariate UC (UCUR-2M model)**	Grant, A. L., & Chan, J. C. C. (2017). Reconciling Output Gaps: Unobserved Components Model and Hodrick–Prescott Filter. *Journal of Economic Dynamics and Control*, 75, 114–121.
4	**Beveridge-Nelson decomposition (l = 8)**	Beveridge, S., & Nelson, C. R. (1981). A New Approach to Decomposition of Economic Time Series Into Permanent and Transitory Components With Particular Attention to Measurement of the Business Cycle. *Journal of Monetary Economics*, 7(2), 151–174.	**Augmented HP filter – UC**	Grant, A. L., & Chan, J. C. C. (2017). Reconciling Output Gaps: Unobserved Components Model and Hodrick–Prescott Filter. *Journal of Economic Dynamics and Control*, 75, 114–121.
5	**BN filter (automatically determined delta and full sample mean demeaning method)**	Kamber, G., Morley, J., & Wong, B. (2018). Intuitive and Reliable Estimates of the Output Gap from a Beveridge-Nelson Filter. *The Review of Economics and Statistics*, 100(3), 550–566.	**Bivariate UC (unemployment, various breaks)**	Grant, A. L., & Chan, J. C. C. (2017). A Bayesian Model Comparison for Trend-Cycle Decompositions of Output. *Journal of Money, Credit and Banking*, 49(2–3), 525–552.
6	**Empirical mode decomposition (no boundary)**	Kožić, I., & Sever, I. (2014). Measuring Business Cycles: Empirical Mode Decomposition of Economic Time Series. *Economics Letters*, 123(3), 287–290.	**Trivariate UC (main model)**	Grant, A. L., & Chan, J. C. C. (2017). *Measuring the Output Gap Using Stochastic Model Specification Search*. CAMA Working Paper 2/2017.

Note: The literature is not included in References because it would be redundant. However, the two exceptions are the univariate and the trivariate UC model. They are directly used in the presented analyses.

Source: own processing.

Figure C.1: Quarterly to annual data conversions — Q3 values vs annual averages — EU4, 1Q 1960 – 4Q 2019



Source: own calculations and processing.

Structural Balances — Main Indicators

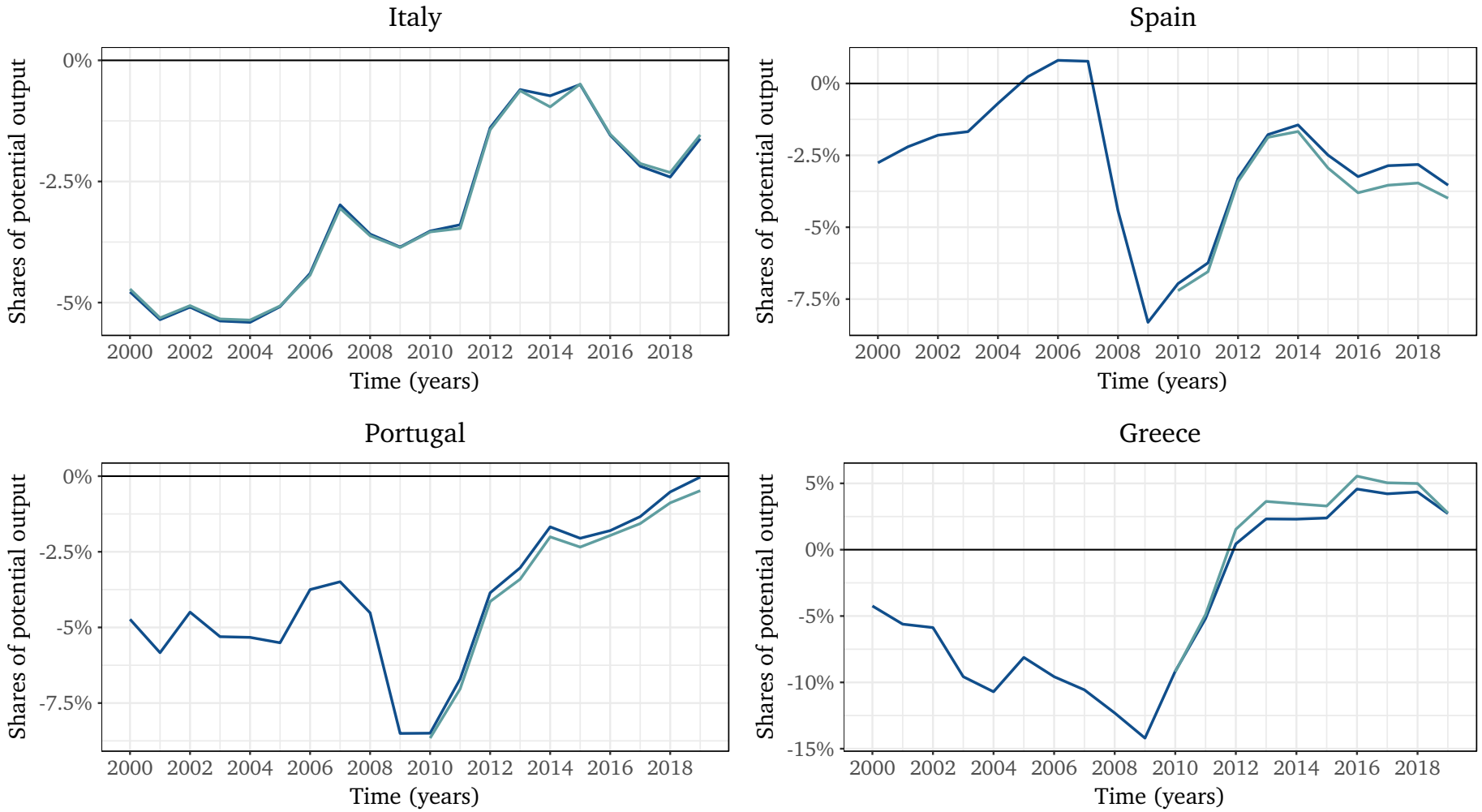
D

Table D.1: Descriptive statistics of used variables — EU4, 2000–2019

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Italy – Overall balance to pot. GDP	20	−2.984	0.891	−5.025	−3.553	−2.440	−1.406
Italy – Struct. bal. to pot. GDP (EC)	20	−3.191	1.723	−5.407	−4.855	−1.599	−0.499
Italy – Structural balance to pot. GDP	20	−3.422	1.945	−5.906	−4.995	−1.626	−0.237
Italy – Auto. stabilisers to pot. GDP	20	−0.029	1.408	−2.328	−1.028	0.797	2.583
Italy – One-offs to potential GDP	20	0.467	0.601	−0.370	0.116	0.696	1.810
Italy – Fiscal stance	20	3.422	1.945	0.237	1.626	4.995	5.906
Italy – Fiscal impulse	20	0.026	1.099	−2.760	−0.392	0.407	3.248
Italy – Output gap	20	−0.056	2.789	−4.642	−2.087	1.666	4.924
Spain – Overall balance to pot. GDP	20	−3.567	4.133	−11.304	−5.670	−0.379	2.280
Spain – Struct. bal. to pot. GDP (EC)	20	−2.736	2.385	−8.307	−3.359	−1.618	0.804
Spain – Structural balance to pot. GDP	20	−3.843	2.671	−10.483	−3.811	−2.239	−0.955
Spain – Auto. stabilisers to pot. GDP	20	0.683	2.900	−4.324	−1.467	2.952	4.860
Spain – One-offs to potential GDP	20	−0.407	0.626	−2.809	−0.428	−0.089	0.080
Spain – Fiscal stance	20	3.843	2.671	0.955	2.239	3.811	10.483
Spain – Fiscal impulse	20	0.055	1.882	−3.881	−0.723	0.765	5.626
Spain – Output gap	20	0.998	5.445	−8.830	−2.909	5.385	8.097
Portugal – Overall balance to pot. GDP	20	−4.780	2.777	−11.253	−6.183	−3.295	0.195
Portugal – Struct. bal. to pot. GDP (EC)	20	−4.049	2.386	−8.504	−5.374	−1.990	−0.032
Portugal – Struct. balance to pot. GDP	20	−3.959	3.058	−8.462	−6.378	−0.516	0.343
Portugal – Auto. stabilisers to pot. GDP	20	−0.350	1.991	−3.962	−1.674	0.748	2.839
Portugal – One-offs to potential GDP	20	−0.470	1.095	−3.535	−0.617	0.092	0.795
Portugal – Fiscal stance	20	3.959	3.058	−0.343	0.516	6.378	8.462
Portugal – Fiscal impulse	20	−0.232	1.542	−3.608	−1.127	0.619	3.680
Portugal – Output gap	20	−0.849	4.393	−8.891	−3.702	1.616	6.008
Greece – Overall balance to pot. GDP	20	−6.306	4.754	−16.454	−9.561	−3.768	1.398
Greece – Struct. bal. to pot. GDP (EC)	20	−4.091	6.366	−14.199	−9.572	2.335	4.572
Greece – Structural balance to pot. GDP	20	−5.468	8.337	−19.465	−12.225	2.488	5.428
Greece – Auto. stabilisers to pot. GDP	20	−0.573	4.266	−6.155	−4.719	3.331	6.427
Greece – One-offs to potential GDP	20	−0.265	1.917	−7.122	−0.567	0.615	1.922
Greece – Fiscal stance	20	5.468	8.337	−5.428	−2.488	12.225	19.465
Greece – Fiscal impulse	20	−0.322	3.249	−7.576	−1.899	2.075	4.794
Greece – Output gap	20	−1.779	10.383	−16.131	−11.604	7.963	14.231

European Commission (2020a) and Eurostat (2020a), own calculations and processing.

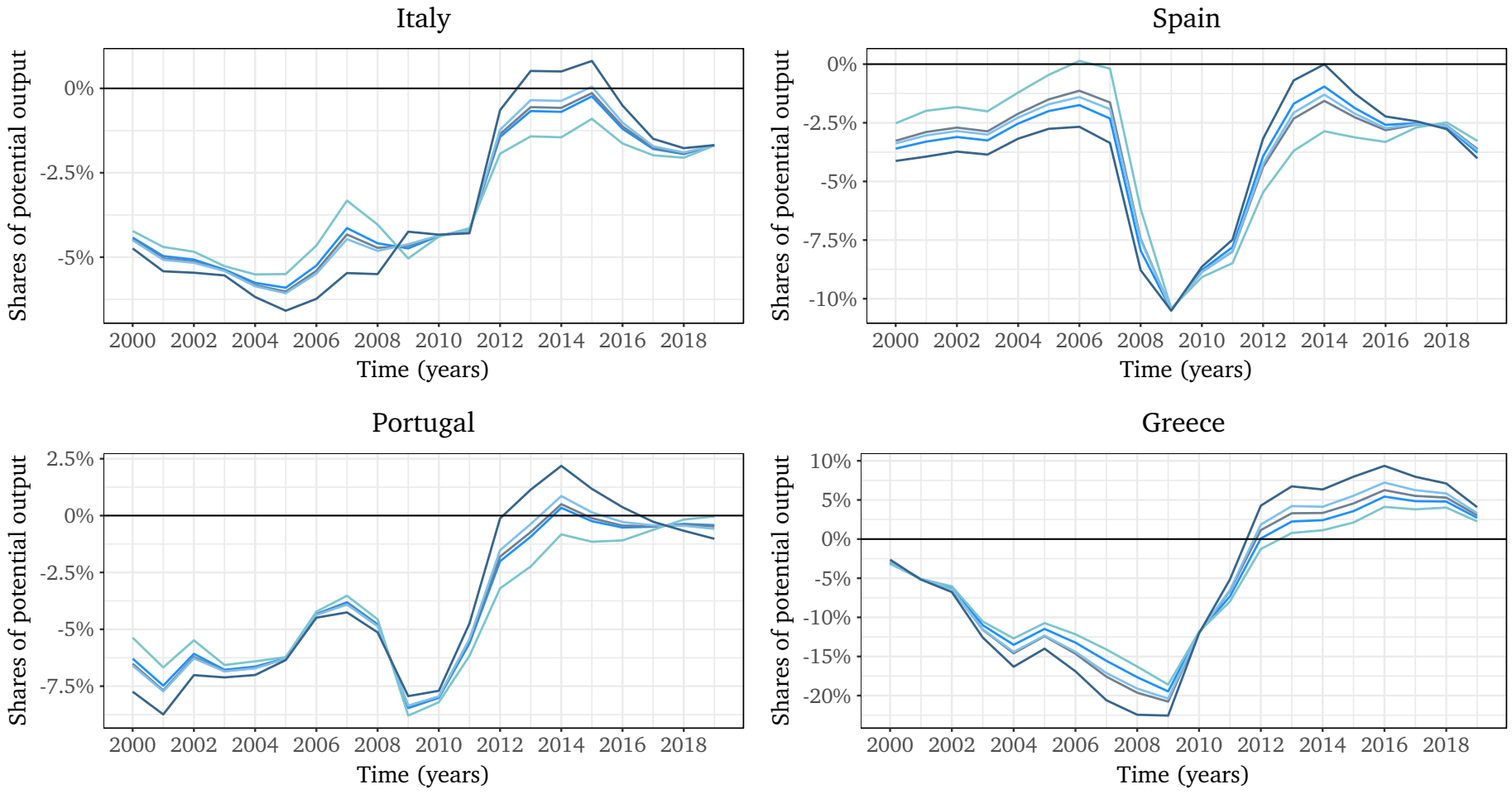
Figure D.1: Comparison between European Commission's actual estimates and the presented calculations — EU4, 2000–2019



Note: The differences are due to revisions of input data.

Source: European Commission (2020a), own calculations and processing.

Figure D.2: Sensitivity analysis — different fiscal elasticities and their effects (trivariate UC model estimates) — EU4, 2000–2019



Source: own calculations and processing.

Debt Dynamics and Sustainability

E

Table E.1: Descriptive statistics of used variables — EU4, 1999–2019

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Italy – Gen. govern. gross debt in nat. curr. to GDP	21	117.801	13.461	103.261	105.333	133.967	135.172
Spain – Gross govern. debt in national currency to GDP	21	67.586	24.539	35.536	46.850	95.448	100.435
Portugal – Gen. govern. gross debt in nat. curr. to GDP	21	89.033	26.610	51.128	66.856	115.740	121.414
Greece – Gen. govern. gross debt in nat. curr. to GDP	21	133.291	34.730	80.126	101.989	170.075	177.187
Italy – Gen. govern. gross debt in foreign curr. to GDP	21	1.016	1.263	0.117	0.172	1.841	3.693
Spain – Gen. govern. gross debt in for. curr. to GDP	21	0.532	0.480	0.107	0.229	0.600	1.607
Portugal – Gen. govern. gross debt in for. curr. to GDP	21	5.096	5.853	0.151	0.800	8.947	18.612
Greece – Gen. govern. gross debt in for. curr. to GDP	21	4.199	3.370	0.530	1.379	5.631	14.430
Italy – Total gen. government gross debt to GDP	21	118.817	12.693	103.892	106.558	134.145	135.369
Spain – Total gen. government gross debt to GDP	21	68.118	24.344	35.765	47.712	95.782	100.700
Portugal – Total gen. government gross debt to GDP	21	94.130	30.563	54.194	67.100	126.143	132.940
Greece – Total gen. government gross debt to GDP	21	137.490	35.194	94.556	103.666	176.167	181.212
Real effective exchange rate (against EER-12)	21	0.163	5.625	−10.846	−2.352	3.487	12.505
Italy – Real effective interest rate	21	2.267	0.615	1.590	1.828	2.496	3.728
Spain – Real effective interest rate	21	1.876	1.189	−0.090	0.935	2.934	3.584
Portugal – Real effective interest rate	21	1.683	1.060	0.289	1.092	2.280	4.214
Greece – Real effective interest rate	21	2.531	1.845	0.083	1.311	3.530	8.500
Italy – Real GDP growth	21	0.452	1.944	−5.300	0.100	1.600	3.800
Spain – Real GDP growth	21	1.971	2.457	−3.800	0.900	3.700	5.200
Portugal – Real GDP growth	21	1.014	2.129	−4.100	0.300	2.200	3.900
Greece – Real GDP growth	21	0.533	4.240	−9.100	−0.400	3.900	5.800
Italy – Primary budget balance to GDP	21	1.781	1.227	−0.721	1.121	2.336	4.627
Spain – Primary budget balance to GDP	21	−1.099	4.089	−9.576	−2.972	2.161	3.724
Portugal – Primary budget balance to GDP	21	−1.338	2.874	−8.498	−2.956	0.101	3.190
Greece – Primary budget balance to GDP	21	−1.371	4.115	−10.148	−3.565	1.807	4.364
Italy – Stock-flow adjustment to GDP	21	0.473	0.972	−1.676	−0.082	1.148	2.197
Spain – Stock-flow adjustment to GDP	21	0.296	1.416	−2.328	−0.546	1.192	3.508
Portugal – Stock-flow adjustment to GDP	21	0.624	1.940	−3.900	−0.388	1.687	4.525
Greece – Stock-flow adjustment to GDP	21	−1.210	8.890	−35.616	−0.863	2.092	10.324
Italy – Residual to GDP (2000.2019)	20	0.138	0.137	−0.251	0.089	0.197	0.391
Spain – Residual to GDP (2000.2019)	20	0.138	0.152	−0.105	0.037	0.241	0.452
Portugal – Residual to GDP (2000.2019)	20	0.133	0.505	−1.728	0.110	0.387	0.820
Greece – Residual to GDP (2000.2019)	20	0.167	0.547	−1.240	0.098	0.515	0.698

Source: ECB (2020), European Commission (2020a), and Eurostat (2020a), own calculations and processing.

Table E.2: Decomposition of relative contributions to changes in gross government debt to GDP ratios — EU4, 2000–2019

Real effective interest rate	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Italy	3.73%	2.48%	1.76%	1.60%	1.62%	2.13%	1.94%	2.00%	2.14%	1.96%	3.07%	2.18%	2.51%	2.43%	2.42%	2.10%	1.76%	2.09%	1.80%	1.60%
Spain	2.16%	1.43%	0.96%	0.92%	0.50%	-0.09%	0.10%	1.09%	1.51%	2.39%	2.58%	3.13%	2.99%	2.96%	3.36%	2.45%	2.45%	1.10%	1.33%	0.80%
Portugal	2.03%	1.37%	0.42%	0.76%	1.35%	0.27%	0.56%	1.08%	2.26%	2.04%	1.96%	3.63%	3.90%	1.41%	2.91%	1.47%	1.36%	1.50%	1.18%	0.85%
Greece	7.46%	3.35%	1.94%	1.26%	1.43%	2.03%	0.71%	0.91%	0.08%	1.18%	3.10%	3.30%	4.35%	4.48%	4.05%	2.35%	1.97%	1.15%	1.25%	2.06%

Real GDP growth	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Italy	-3.80%	-1.96%	-0.31%	-0.10%	-1.39%	-0.78%	-1.77%	-1.52%	0.99%	5.10%	-1.64%	-0.69%	2.93%	1.75%	0.00%	-0.79%	-1.29%	-1.68%	-0.79%	-0.30%
Spain	-5.20%	-4.02%	-2.77%	-3.13%	-3.16%	-3.81%	-4.28%	-3.80%	-0.80%	2.95%	-0.18%	0.70%	2.50%	1.28%	-1.31%	-3.71%	-2.92%	-2.84%	-2.37%	-2.00%
Portugal	-3.74%	-1.76%	-0.76%	0.85%	-1.68%	-0.74%	-1.54%	-2.47%	-0.29%	2.76%	-1.46%	1.51%	3.79%	0.89%	-0.78%	-1.79%	-1.96%	-3.53%	-2.62%	-2.23%
Greece	-3.42%	-3.81%	-3.83%	-5.67%	-4.79%	-0.57%	-5.59%	-3.21%	0.28%	3.88%	5.04%	8.51%	8.49%	2.97%	-0.69%	0.41%	0.20%	-1.50%	-1.81%	-1.91%

Real effective exchange rate	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Italy	0.34%	-0.08%	-0.12%	-0.34%	-0.07%	0.01%	-0.01%	-0.03%	-0.01%	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%
Spain	0.29%	-0.07%	-0.11%	-0.27%	-0.06%	0.01%	0.00%	-0.04%	-0.04%	0.00%	0.05%	0.01%	0.03%	-0.02%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%
Portugal	0.76%	-0.13%	-0.26%	-0.37%	-0.04%	0.00%	0.00%	-0.01%	-0.01%	0.00%	0.09%	0.01%	0.45%	-0.54%	0.06%	1.39%	-0.22%	-0.21%	-0.11%	0.04%
Greece	1.58%	-0.17%	-0.22%	-0.34%	-0.06%	0.01%	0.00%	-0.04%	-0.05%	0.00%	0.03%	0.02%	0.18%	-0.16%	0.02%	0.44%	-0.07%	-0.08%	-0.07%	0.05%

Primary balance	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Italy	-3.37%	-2.67%	-2.38%	-1.69%	-1.07%	-0.39%	-0.73%	-3.23%	-2.20%	0.62%	-0.05%	-0.84%	-1.78%	-1.47%	-1.22%	-1.14%	-1.11%	-1.01%	-1.11%	-1.31%
Spain	-3.53%	-4.71%	-4.46%	-4.03%	-4.17%	-6.91%	-9.53%	-9.75%	7.48%	17.98%	12.6%	10.36%	8.96%	3.69%	2.5%	2.19%	1.52%	0.53%	0.14%	0.55%
Portugal	0.40%	3.12%	0.89%	4.63%	5.34%	4.89%	1.87%	-0.14%	0.79%	7.83%	8.48%	2.94%	0.99%	0.23%	1.85%	-0.12%	-1.65%	-0.67%	-2.42%	-2.71%
Greece	-2.74%	-0.78%	0.40%	2.89%	3.92%	1.39%	1.49%	2.14%	4.91%	8.01%	3.55%	1.61%	2.23%	5.10%	-0.25%	1.20%	-2.06%	-2.17%	-2.37%	-2.47%

Stock-flow adjustment	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Italy	-0.58%	1.75%	-1.58%	-0.66%	0.30%	0.26%	0.58%	-0.08%	1.08%	1.08%	0.69%	-0.33%	1.63%	1.66%	0.85%	-0.26%	0.24%	0.06%	0.53%	-0.02%
Spain	1.28%	0.30%	0.75%	-1.14%	1.58%	3.81%	5.10%	3.33%	1.19%	1.46%	-3.48%	-1.31%	4.06%	1.60%	0.10%	-2.34%	-1.22%	0.47%	-0.19%	-1.66%
Portugal	-1.16%	2.33%	3.43%	-0.56%	-0.58%	2.34%	0.81%	0.03%	0.90%	0.79%	3.06%	3.96%	2.44%	-0.80%	-2.93%	-0.98%	2.40%	-1.56%	0.47%	0.45%
Greece	6.85%	3.95%	-0.82%	-2.15%	0.34%	1.10%	-0.53%	-0.59%	0.09%	0.10%	1.27%	1.23%	-22.32%	-2.61%	-2.26%	-5.73%	1.31%	1.19%	5.70%	-0.28%

Residual value	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Italy	-0.23%	0.36%	0.25%	0.37%	0.23%	0.14%	0.15%	0.12%	0.13%	0.21%	0.10%	0.09%	0.09%	0.14%	0.09%	0.02%	0.04%	0.06%	0.07%	0.01%
Spain	-0.18%	0.09%	0.17%	0.24%	0.14%	0.07%	0.00%	-0.07%	0.60%	0.66%	0.41%	0.48%	0.52%	0.38%	0.24%	-0.02%	0.04%	0.12%	0.12%	0.07%
Portugal	-0.53%	0.63%	0.71%	0.73%	0.39%	0.37%	0.24%	0.21%	0.20%	0.44%	0.26%	0.35%	-0.23%	0.62%	0.04%	-1.32%	0.30%	0.22%	0.11%	-0.01%
Greece	-0.94%	0.65%	0.42%	0.66%	0.55%	0.26%	0.27%	0.30%	0.46%	0.50%	0.34%	0.33%	-0.78%	0.26%	-0.04%	-0.41%	0.13%	0.09%	0.09%	-0.06%

Source: own calculations and processing.

Fiscal Reaction — EC Models

F

Table F.1: Descriptive statistics of used variables — EU4, 1881–2019

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Italy – General government primary balance to GDP	139	−1.326	6.928	−34.045	−3.049	2.625	6.550
Spain – General government primary balance to GDP	139	0.676	2.611	−9.576	−0.494	2.381	6.370
Portugal – Gen. government primary balance to GDP	139	−0.484	2.613	−9.114	−1.445	1.318	3.466
Greece – Gen. government primary balance to GDP	139	−1.166	5.045	−29.921	−3.645	2.918	7.293
Italy – Gross gen. gov. debt to GDP	139	87.759	34.550	24.214	58.953	115.069	159.720
Spain – Gross gen. gov. debt to GDP	139	59.210	30.131	8.212	38.888	75.529	143.671
Portugal – Gross gen. gov. debt to GDP	139	49.274	27.620	13.504	24.344	59.764	132.940
Greece – Gross gen. gov. debt to GDP	139	83.726	56.881	10.435	29.113	108.405	223.496
Italy – Output gap	139	0.273	8.725	−55.545	−3.166	4.493	24.004
Spain – Output gap	139	−1.173	8.410	−23.170	−5.321	4.269	17.685
Portugal – Output gap	139	−0.273	5.498	−14.740	−4.205	3.471	14.783
Greece – Output gap	139	−1.132	15.196	−68.665	−7.194	8.585	33.213
Italy – Consumer price index (changes)	139	3.667	6.192	−13.253	0.740	5.255	21.060
Spain – Consumer price index (changes)	139	3.946	6.331	−13.253	0.705	6.555	24.540
Portugal – Consumer price index (changes)	139	4.701	7.686	−13.253	0.619	7.718	31.020
Greece – Consumer price index (changes)	139	4.667	7.643	−13.253	0.385	7.939	26.560
Italy – Real interest rate on debt (changes)	138	−2.623	6.109	−19.493	−4.215	0.218	14.157
Spain – Real interest rate on debt (changes)	138	−2.896	6.321	−23.221	−5.550	0.471	15.125
Portugal – Real interest rate on debt (changes)	138	−3.642	7.530	−29.113	−6.726	0.262	14.114
Greece – Real interest rate on debt (changes)	138	−3.617	7.437	−25.132	−7.080	0.598	13.629
Italy – Primary expenditure gap	139	0.000	3.574	−9.266	−1.177	0.508	14.664
Spain – Primary expenditure gap	139	0.000	1.789	−5.317	−0.959	0.591	7.330
Portugal – Primary expenditure gap	139	−0.000	1.528	−5.250	−0.681	0.498	8.661
Greece – Primary expenditure gap	139	−0.000	3.778	−6.770	−1.817	0.702	29.435

Note: The data used in the models start in 1884. Some observations had to be dropped due to the inclusion of first differences and lags of variables.

Source: Eurostat (2020a), St. Louis Fed (2020), IMF (2020a), and Shiller (2020), own calculations and processing.

Table F.2: Shares of missing observations before data imputations

Variable	Italy	Spain	Portugal	Greece
Real GDP growth	0 / 139 (0.0%)	0 / 139 (0.0%)	0 / 139 (0.0%)	0 / 139 (0.0%)
Total gross government debt to GDP	0 / 139 (0.0%)	4 / 139 (2.9%)	0 / 139 (0.0%)	24 / 139 (17.3%)
Primary balance to GDP	0 / 139 (0.0%)	4 / 139 (2.9%)	5 / 139 (3.6%)	23 / 139 (16.5%)
Debt interest payments to GDP	0 / 139 (0.0%)	4 / 139 (2.9%)	5 / 139 (3.6%)	23 / 139 (16.5%)
Primary government expenditure to GDP	0 / 139 (0.0%)	4 / 139 (2.9%)	5 / 139 (3.6%)	23 / 139 (16.5%)
Consumer price index (annual average rate of change)	10 / 139 (7.2%)	10 / 139 (7.2%)	10 / 139 (7.2%)	10 / 139 (7.2%)

Source: own calculations and processing.

Table F.3: Engle-Granger cointegration tests

$Model: pb_t = debt_{t-1} + 1$		
Country	**EG test statistic**	**Result**
Italy	-5.667^{***}	Cointegration
Spain	-4.264^{***}	Cointegration
Portugal	-4.379^{***}	Cointegration
Greece	-4.076^{***}	Cointegration

Note: * p < 0.1; ** p < 0.05; *** p < 0.01.

Source: own calculations and processing.

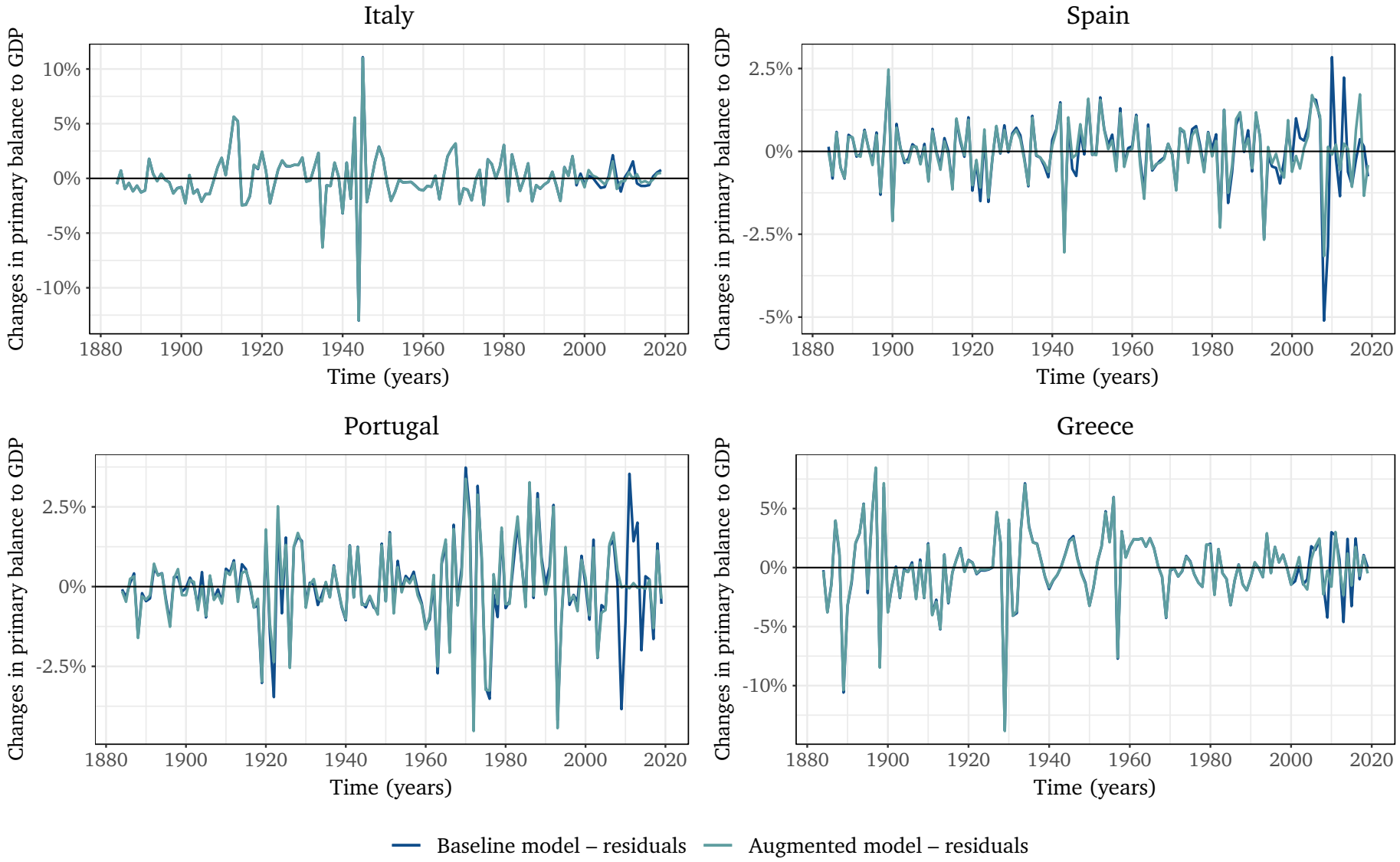
Table F.4: (Non-)Stationarity tests (with drift, automatic lag selection)

Variable	ADF test	KPSS test	PP test	Result
Primary balance to GDP – Italy	−3.418**	0.153	−19.020**	Stationarity
Primary balance to GDP – Spain	−3.314**	0.695**	−16.286**	Mixed evidence
Primary balance to GDP – Portugal	−3.875***	0.286*	−29.234***	Mixed evidence
Primary balance to GDP – Greece	−5.770***	0.200	−83.162***	Stationarity
Gross gov. debt to GDP – Italy	−1.8317	0.236	−4.628	Mixed evidence
Gross gov. debt to GDP – Spain	−1.803	0.477**	−11.777*	Mixed evidence
Gross gov. debt to GDP – Portugal	0.127	0.277	−0.373	Mixed evidence
Gross gov. debt to GDP – Greece	−0.695	0.249	−5.092	Mixed evidence
Output gap – Italy	−4.844***	0.098	−21.981***	Stationarity
Output gap – Spain	−3.296**	0.121	−16.452**	Stationarity
Output gap – Portugal	−3.455**	0.121	−35.539***	Stationarity
Output gap – Greece	−5.442***	0.094	−37.775***	Stationarity
Real interest rate a. a. changes – Italy	−4.815***	0.244	−83.774***	Stationarity
Real interest rate a. a. changes – Spain	−4.450***	0.264	−78.215***	Stationarity
Real interest rate a. a. changes – Portugal	−3.755***	0.272	−58.469***	Stationarity
Real interest rate a. a. changes – Greece	−3.922***	0.306	−58.377***	Stationarity
Primary expenditure gap – Italy	−7.432***	0.043	−36.023***	Stationarity
Primary expenditure gap – Spain	−6.479***	0.043	−85.665***	Stationarity
Primary expenditure gap – Portugal	−7.779***	0.053	−28.371***	Stationarity
Primary expenditure gap – Greece	−8.878***	0.048	−76.272***	Stationarity

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

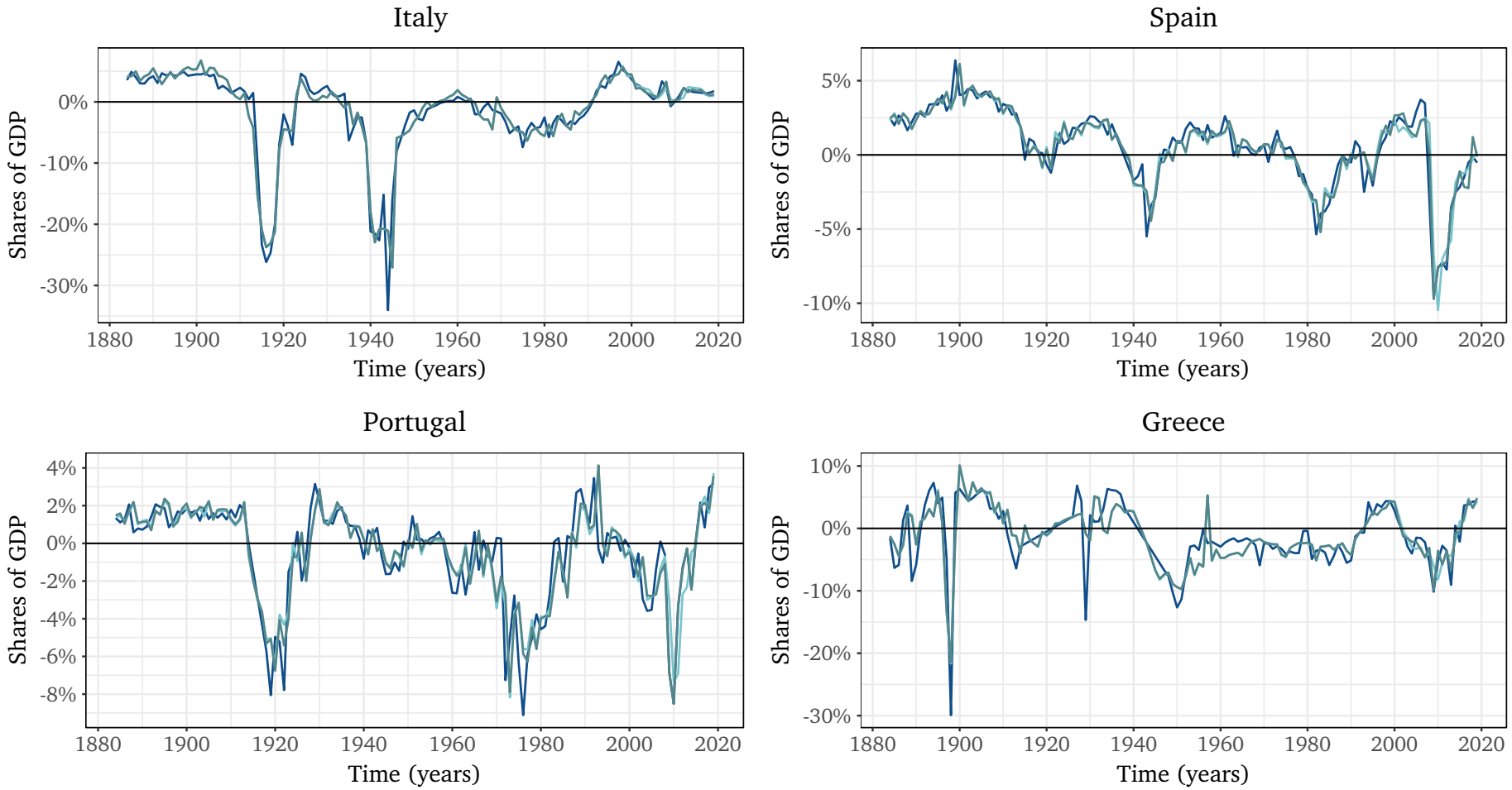
Source: own calculations and processing.

Figure F.1: Residuals of EC model estimates (first differences of primary balance to GDP ratios) — EU4, 1884–2019



Source: own calculations and processing.

Figure F.2: Predictions of primary balances to GDP ratios in levels (EC model estimates, one step ahead) — EU4, 1884–2019



Source: own calculations and processing.

G

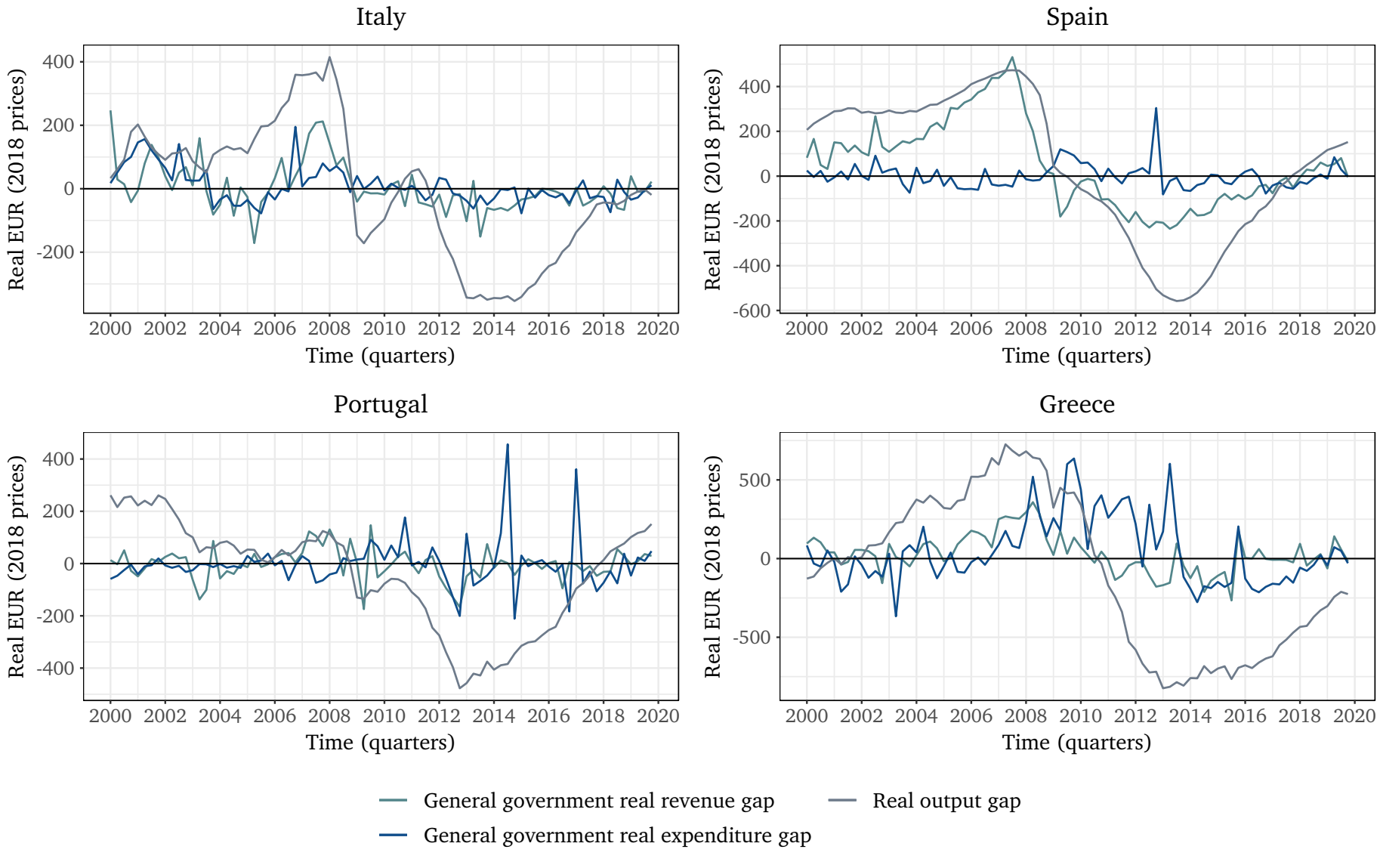
Fiscal Multipliers — BVAR Models

Table G.1: Descriptive statistics of used variables — EU4, 1Q 2000 – 4Q 2019

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Italy – Real output gap p.c.	80	−4.171	208.119	−353.903	−153.154	128.143	414.907
Spain – Real output gap p.c.	80	47.182	316.787	−557.815	−178.850	295.200	472.875
Portugal – Real output gap p.c.	80	−44.064	203.319	−477.143	−176.599	86.058	261.283
Greece – Real output gap p.c.	80	−88.832	490.666	−824.006	−590.214	358.005	726.137
Italy – Real gov. total rev. gap p.c.	80	4.402	75.884	−171.261	−42.487	33.818	246.940
Spain – Real gov. total rev. gap p.c.	80	49.543	191.205	−235.160	−103.146	157.994	531.540
Portugal – Real gov. total rev. gap p.c.	80	−2.413	59.338	−174.351	−30.591	28.258	146.617
Greece – Real gov. total rev. gap p.c.	80	31.444	121.369	−266.127	−29.382	95.997	358.440
Italy – Real gov. exp. gap p.c.	80	8.620	54.460	−77.566	−27.405	30.120	195.123
Spain – Real gov. exp. gap p.c.	80	0.498	55.058	−81.664	−34.815	25.507	304.105
Portugal – Real gov. exp. gap p.c.	80	−2.348	90.092	−211.064	−36.240	16.116	456.305
Greece – Real gov. exp. gap p.c.	80	46.141	213.085	−366.781	−115.942	172.674	635.943
Italy – HICP (% changes, YoY)	80	1.798	1.089	−0.290	0.964	2.550	4.085
Spain – HICP (% changes, YoY)	80	2.111	1.556	−1.073	1.049	3.260	4.951
Portugal – HICP (% changes, YoY)	80	1.910	1.480	−1.487	0.739	3.023	4.780
Greece – HICP (% changes, YoY)	80	2.013	1.920	−2.149	0.607	3.453	5.611
Italy – 3M interbank rate (%)	80	1.687	1.769	−0.403	0.073	3.255	5.024
Spain – 3M interbank rate (%)	80	1.687	1.769	−0.403	0.073	3.255	5.024
Portugal – 3M interbank rate (%)	80	1.687	1.769	−0.403	0.073	3.255	5.024
Greece – 3M interbank rate (%)	80	1.861	2.171	−0.403	0.073	3.255	8.914

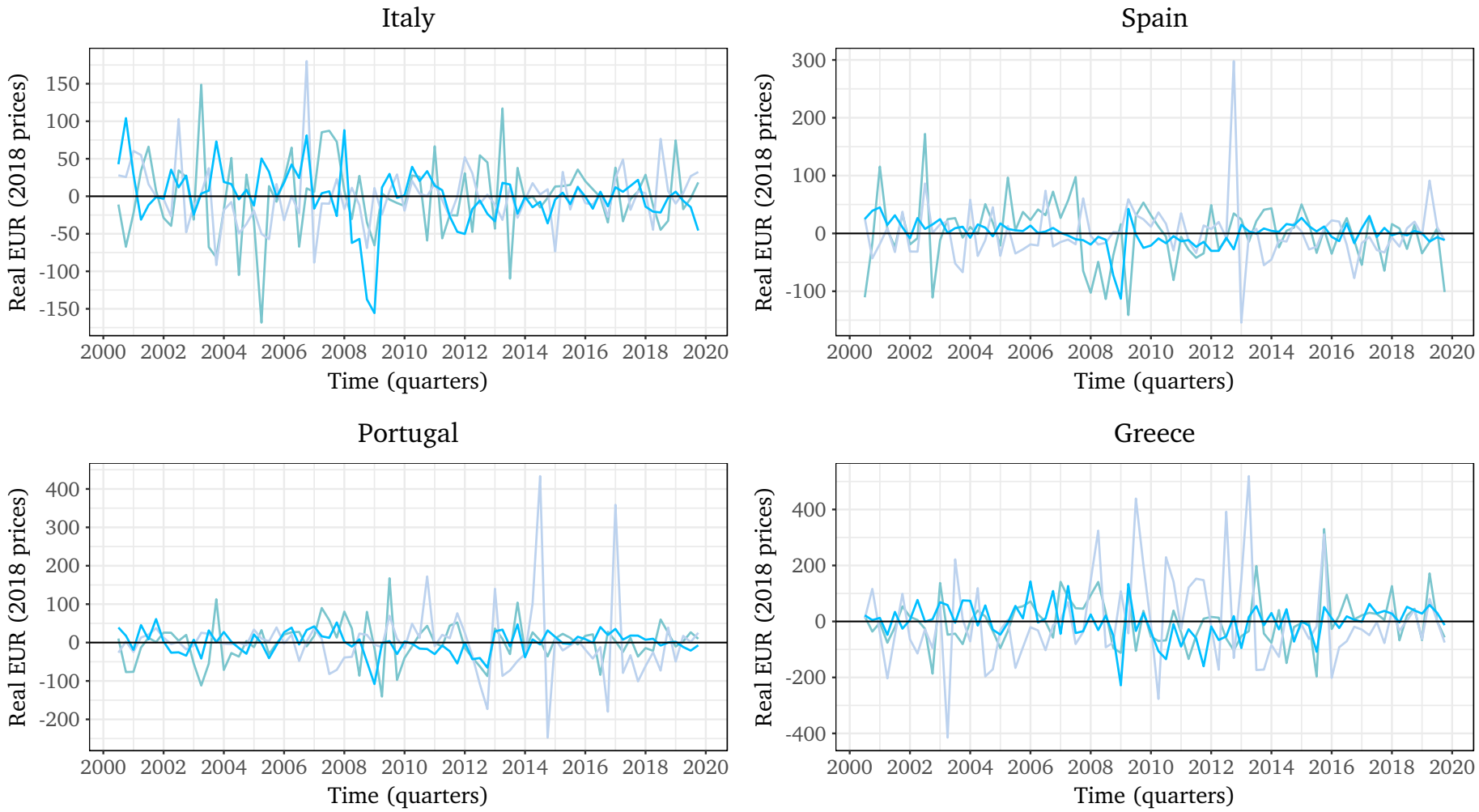
Source: Eurostat (2020a), St. Louis Fed (2020), own calculations and processing.

Figure G.1: Used variables — Estimated gaps (per capita values) — EU4, 1Q 2000 – 4Q 2019



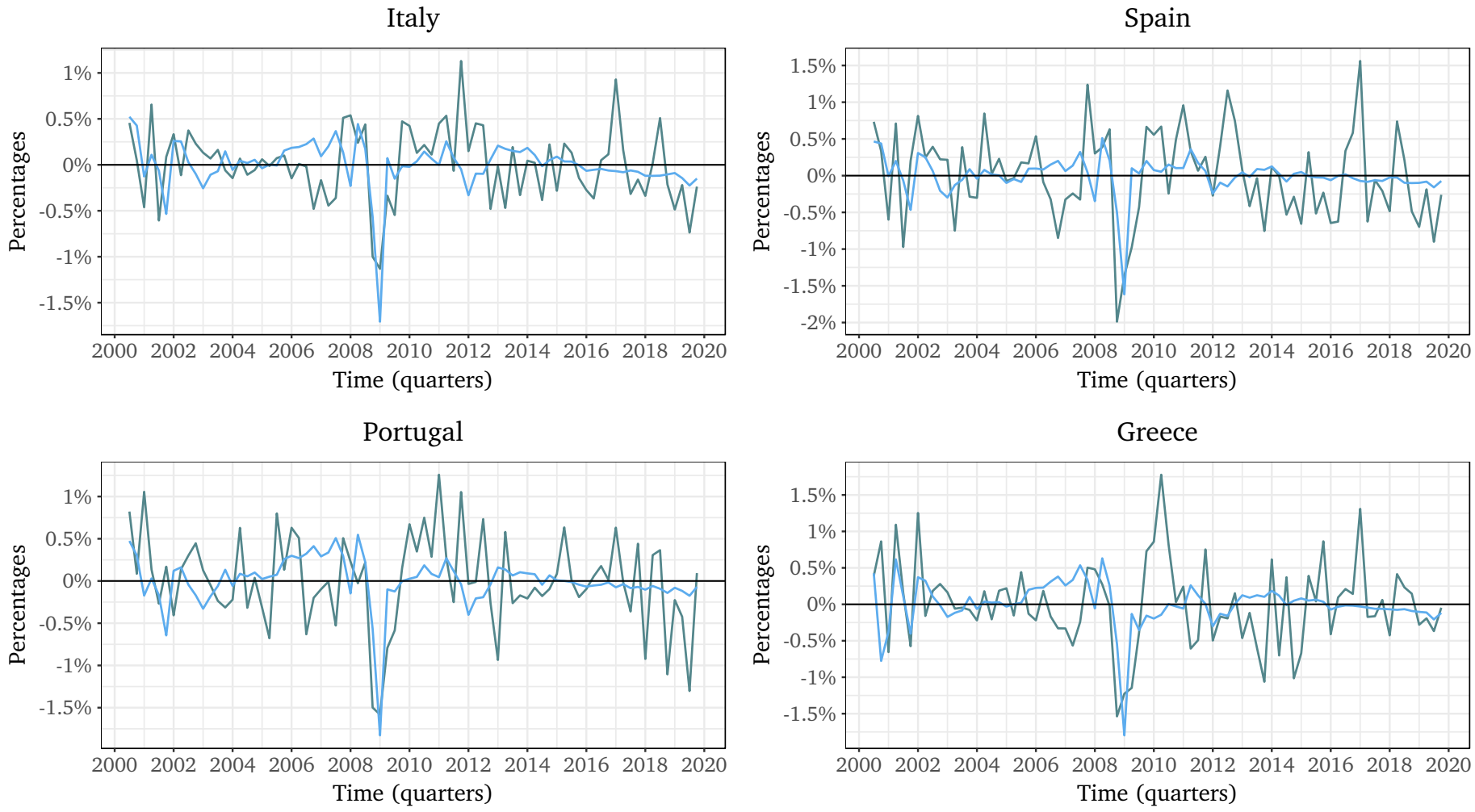
Source: own calculations and processing.

Figure G.2: Model residuals — Total period (I) — EU4, 1Q 2000 – 4Q 2019



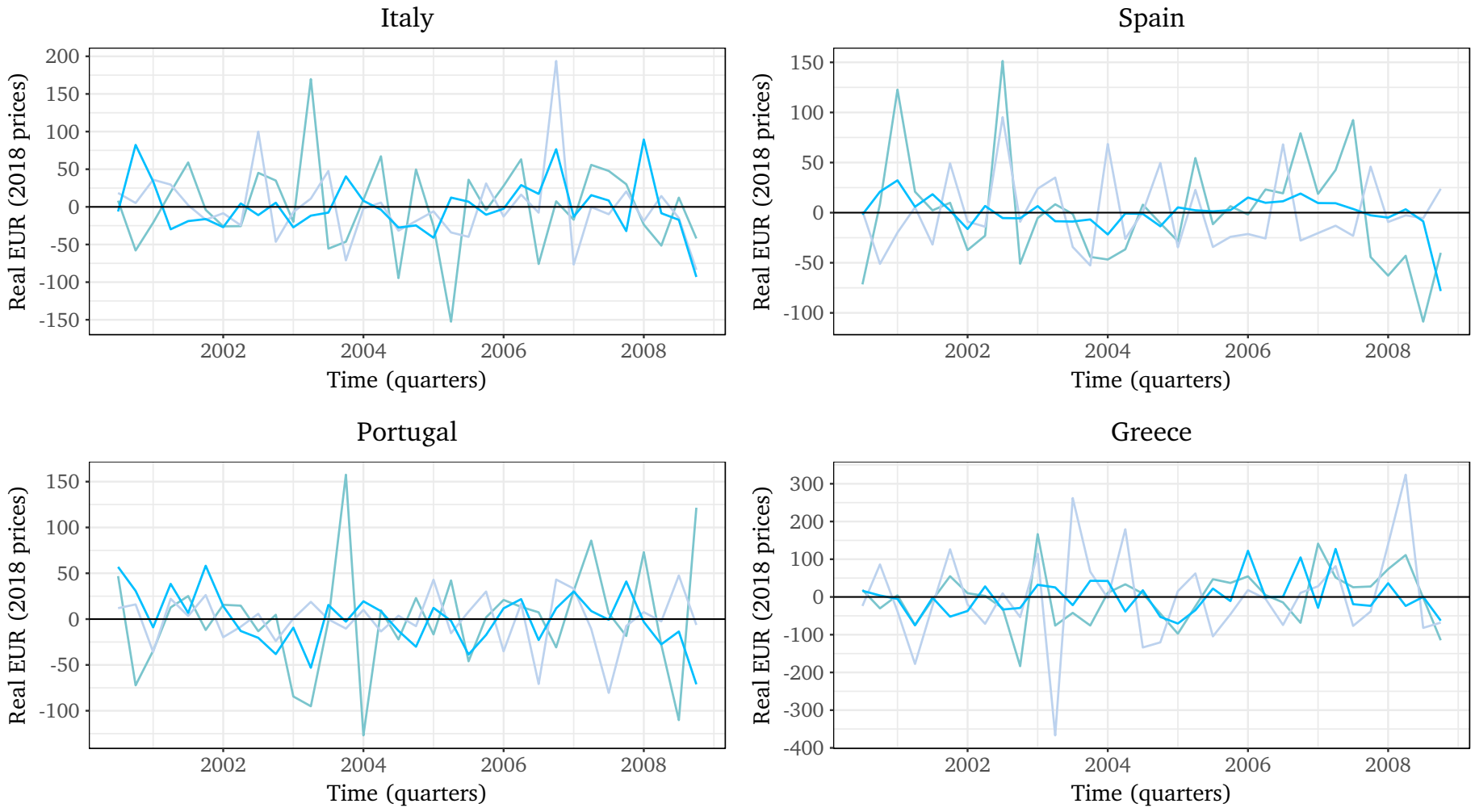
Source: own calculations and processing.

Figure G.3: Model residuals — Total period (II) — EU4, 1Q 2000 – 4Q 2019



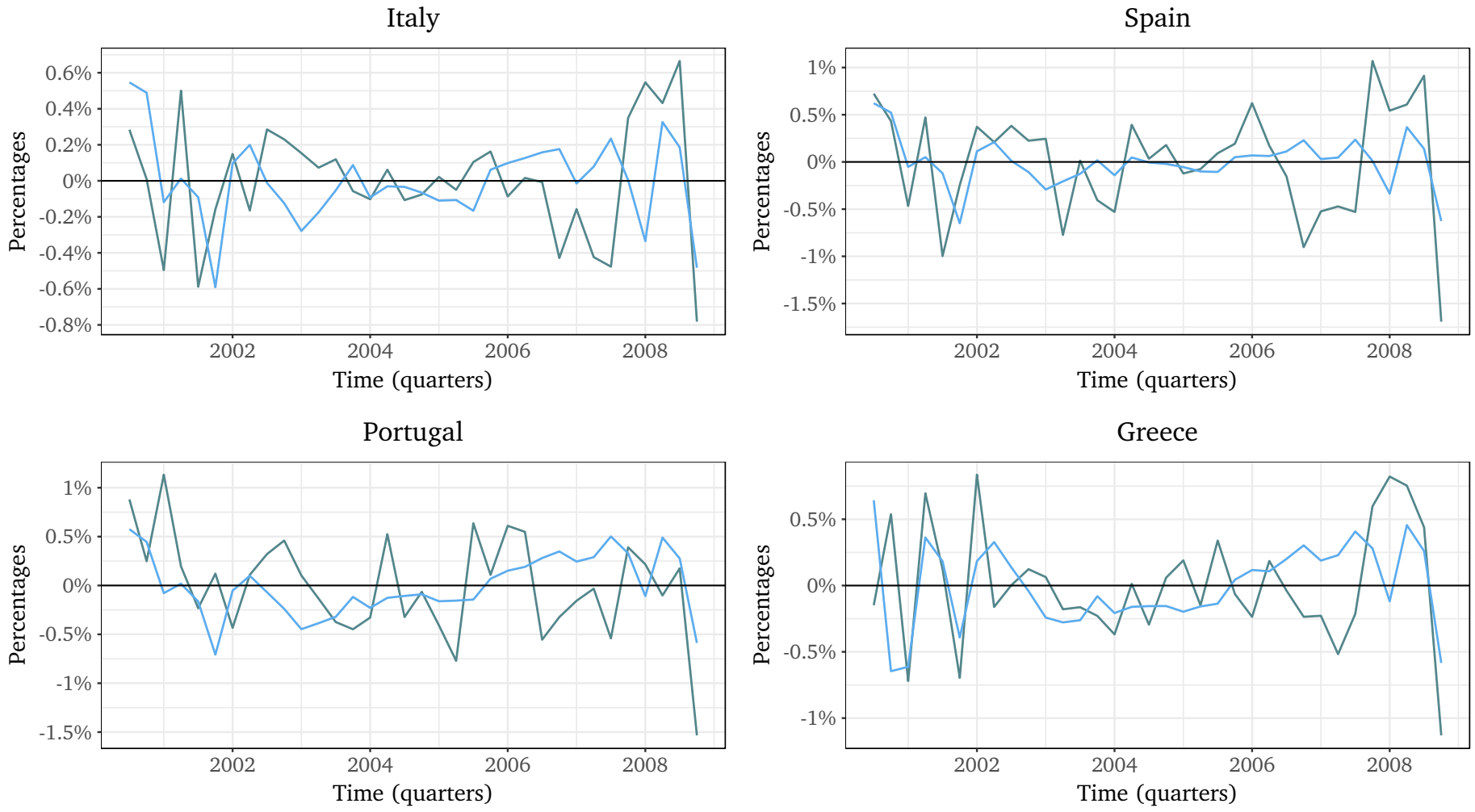
Source: own calculations and processing.

Figure G.4: Model residuals — Pre-crisis period (I) — EU4, 1Q 2000 – 4Q 2008



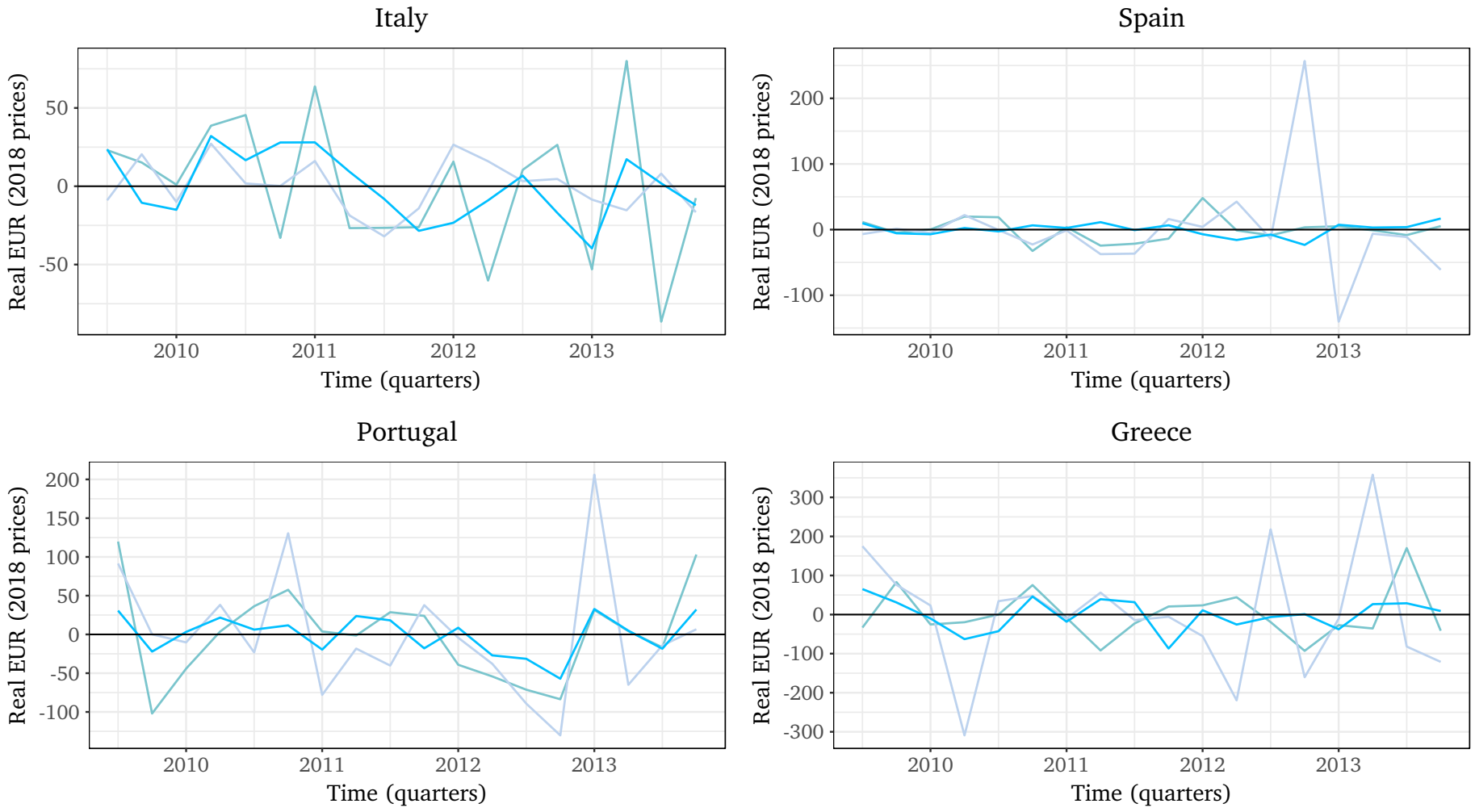
Source: own calculations and processing.

Figure G.5: Model residuals — Pre-crisis period (II) — EU4, 1Q 2000 – 4Q 2008



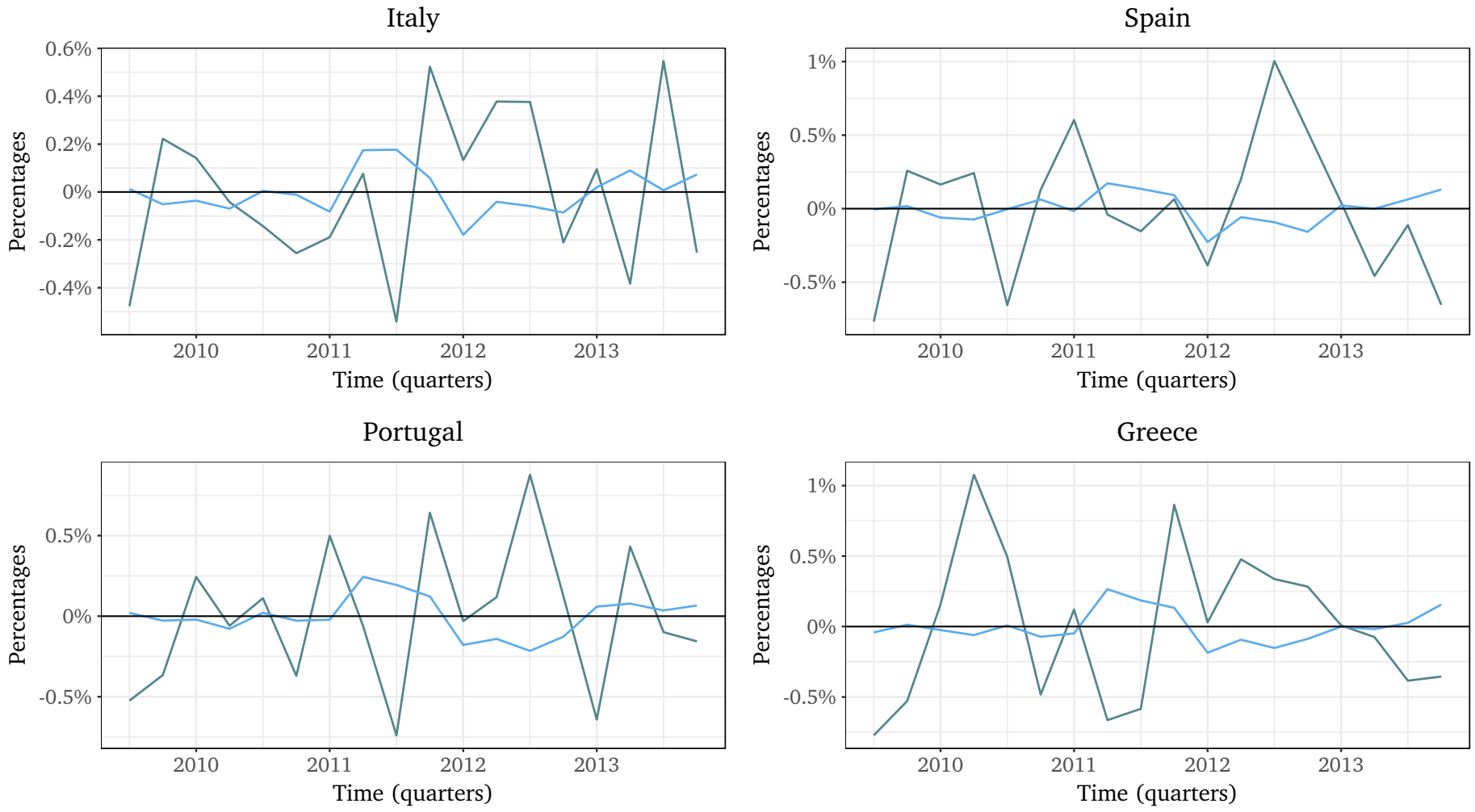
Source: own calculations and processing.

Figure G.6: Model residuals — Financial crisis period (I) — EU4, 1Q 2009 – 4Q 2013



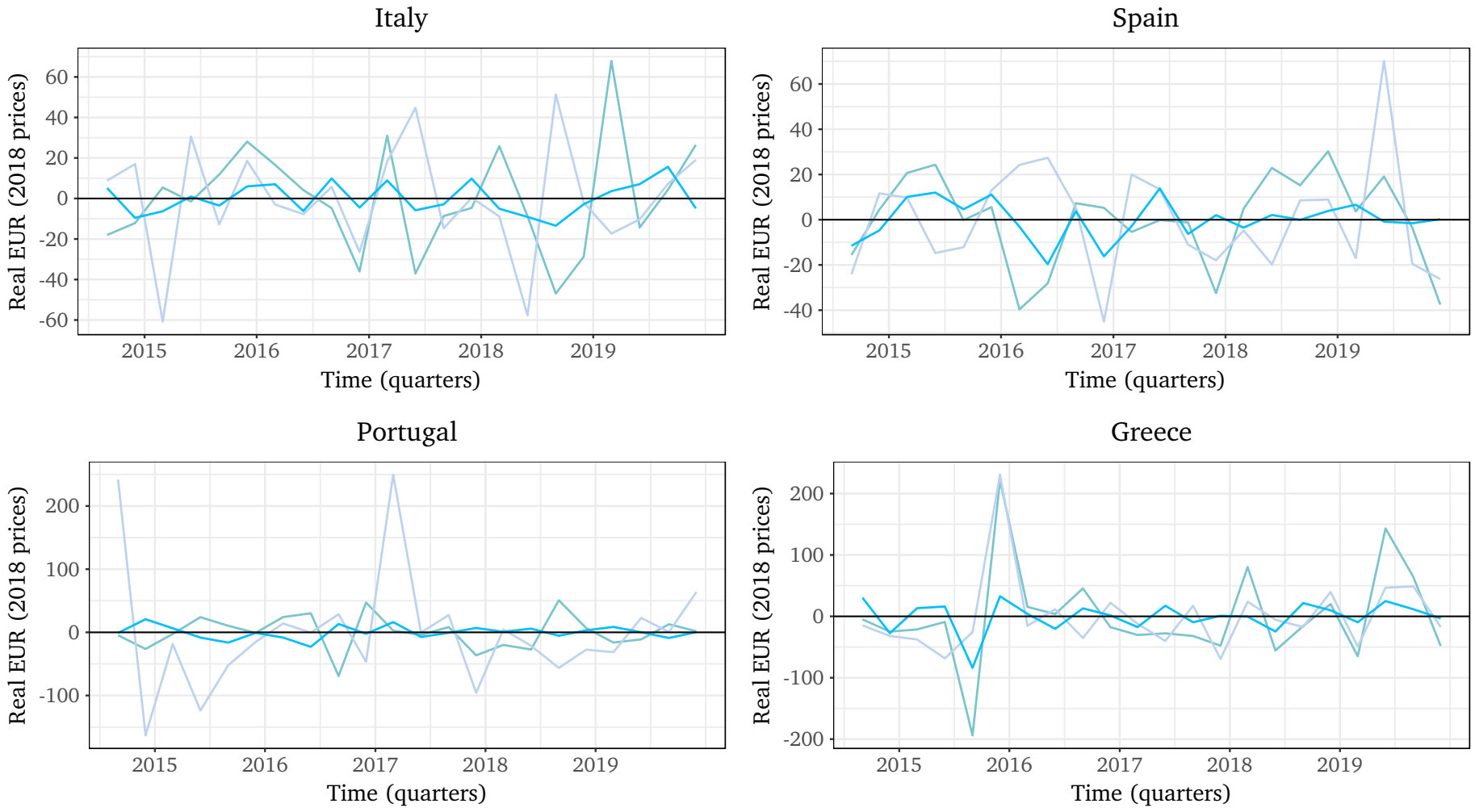
Source: own calculations and processing.

Figure G.7: Model residuals — Financial crisis period (II) — EU4, 1Q 2009 – 4Q 2013



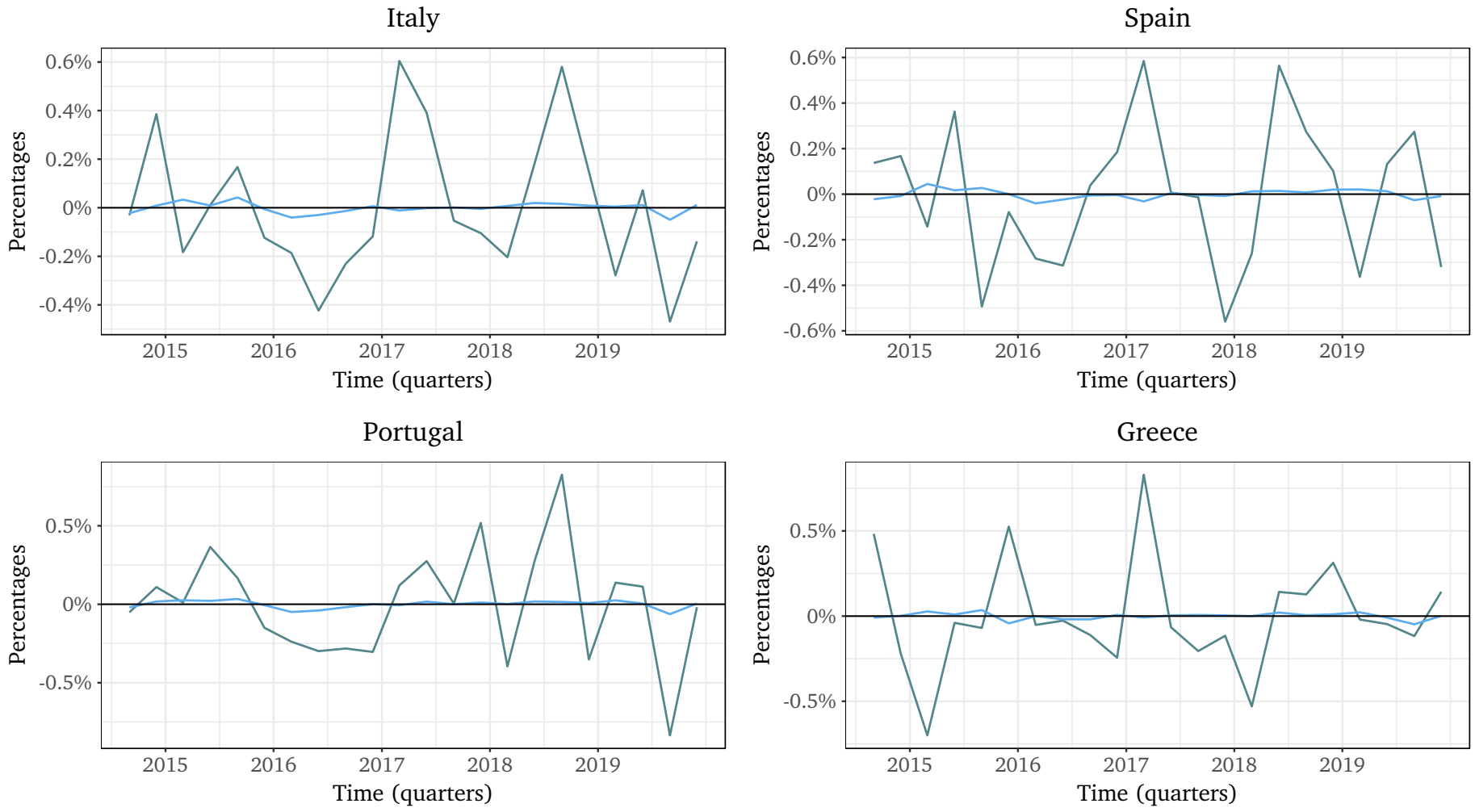
Source: own calculations and processing.

Figure G.8: Model residuals — Post-recession period (I) — EU4, 1Q 2014 – 4Q 2019



Source: own calculations and processing.

Figure G.9: Model residuals — Post-recession period (II) — EU4, 1Q 2014 – 4Q 2019



Source: own calculations and processing.

Table G.2: Autocorrelation tests of residuals of selected variables (BVAR model estimates) — EU4, 1Q 2000 — 4Q 2008

Pre-crisis period		
Variable	**Ljung-Box test (4 lags)**	**Result**
Real output gap – Italy	2.2789	No autocorrelation
Real output gap – Spain	4.1438	No autocorrelation
Real output gap – Portugal	2.2847	No autocorrelation
Real output gap – Greece	7.4670	No autocorrelation
Real gov. expenditure gap – Italy	5.7106	No autocorrelation
Real gov. expenditure gap – Spain	13.7360***	Autocorrelation
Real gov. expenditure gap – Portugal	4.2304	No autocorrelation
Real gov. expenditure gap – Greece	3.5352	No autocorrelation
Real gov. total revenue gap – Italy	4.0698	No autocorrelation
Real gov. total revenue gap – Spain	2.2615	No autocorrelation
Real gov. total revenue gap – Portugal	5.3823	No autocorrelation
Real gov. total revenue gap – Greece	1.5585	No autocorrelation

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Source: own calculations and processing.

Table G.3: Autocorrelation tests of residuals of selected variables (BVAR model estimates) — EU4, 1Q 2014 — 4Q 2019

Post-recession period		
Variable	**Ljung-Box test (4 lags)**	**Result**
Real output gap – Italy	4.0530	No autocorrelation
Real output gap – Spain	8.6755*	Autocorrelation
Real output gap – Portugal	0.4897	No autocorrelation
Real output gap – Greece	19.9160***	Autocorrelation
Real gov. expenditure gap – Italy	5.4369	No autocorrelation
Real gov. expenditure gap – Spain	3.0825	No autocorrelation
Real gov. expenditure gap – Portugal	3.9105	No autocorrelation
Real gov. expenditure gap – Greece	1.4747	No autocorrelation
Real gov. total revenue gap – Italy	1.9248	No autocorrelation
Real gov. total revenue gap – Spain	7.0295	No autocorrelation
Real gov. total revenue gap – Portugal	2.6386	No autocorrelation
Real gov. total revenue gap – Greece	5.3128	No autocorrelation

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Source: own calculations and processing.