#### PHD. THESIS

# UNIVERSITY OF SALAMANCA FACULTY OF ECONOMICS AND BUSINESS DEPARTMENT OF ECONOMICS AND ECONOMICS HISTORY



# THE EUROZONE PUBLIC FINANCE AND ITS EFFECTS ON THE ECONOMIC GROWTH AMID THE COVID-19 PANDEMIC

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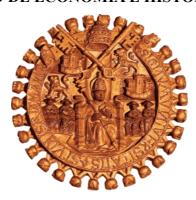
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# LAS FINANZAS PÚBLICAS DE LA EUROZONA Y SUS EFECTOS SOBRE EL CRECIMIENTO ECONÓMICO EN MEDIO DE LA PANDEMIA DEL COVID-19

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# UNIVERSITY OF SALAMANCA FACULTY OF ECONOMICS AND BUSINESS DEPARTMENT OF ECONOMICS AND ECONOMICS HISTORY

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To the honorable memory of my mother Israela Avalos Galvez, who as a professor forged my spirit of improvement, the love of study and research, since I was a child.

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#### Summary

This Ph.D. Thesis investigates about one of the most controversial issues of the Economic and Monetary Union of the European Union (EMU) public finance, searching the determinants of the current high national Public Debts accumulated since the Euro currency inception, that exceeded more than doubled the established in the Maastricht Treaty (1992). Analyzing especially the moral hazard behavior of private investors as one of the main causes that exacerbated the demand of government debt securities (issued sovereign bonds) by private banks, in the context of financial sector asymmetric information; especially, during the period of Sovereign Debt Crisis (2008-2012). Furthermore, it analyses the possible interactions of the public finance of national governments with the monetary policy developed independently and centralized by the European Central Bank (established on June, 1998). Finally, the effects of these economic policy issues on the global and percapita economic growth rates, proxy indicators of the economic wellbeing, are also studied.

In this way, for better assessment of these public financial issues, the thesis splits logically in three chapters: (i) "Determinants of the Public Debt in the Eurozone and its Sustainability Amid the Covid-19 Pandemic", (ii) "The Eurozone Moral Hazard: From the Sovereign Debt Crisis to the Covid-19 Pandemic", and (iii) "Economic Policy and Growth in the Eurozone: Lessons for the post Covid-19 takes off".

The three chapters assesses dynamical and econometrically through System Generalized Method of Moments (SGMM), implemented to control for any potential endogeneity problems caused by the panel data structure. The data used comes from different sources such as the European Central Bank, Bank for

International Settlements, World Bank (World Development and Worldwide Governance Indicators), European Commission, International Labor Organization, World Health Organization, Transparency International Agency, CountryRisk.io, among others.

In the first chapter, the thesis considers four econometric regressions. Two estimated by the System GMM and the other two by instrumentalized GMM-Cluster regressions with the aim to get the factors that explain the determinants of the public debt-GDP ratios evolution. The results support a significant positive impact of the bond interest rate, unemployment rate, life expectancy at birth, voice and accountability, dummy of the sovereign debt crisis period, which explain the high public debt levels in EMU countries. Unexpectedly, an improving on corruption control and corruption perception index (a higher/better ranking) also seem to impact positively on the public debt ratios increase. On the other hand, the government effectiveness indicator, the primary balance surplus of the public sector and the economic growth affected negatively this studied public finance ratio (Debt).

It is proved the public debt dynamic behavior, because its first lag was considered as explanatory variable, as well as other lagged variables as the public sector primary result. Furthermore, when different Worldwide Governance Indicators are tested, not all their coefficients resulted being significant, as firstly were expected, with the exception of the "government effectiveness", which seem to reduce the public debt ratio. What shocking is the positive and significant impact of the high expectancy at birth. The study also includes other explanatory variables as unemployment rates and the permanent (structural) changes caused by the past Sovereign Debt Crisis (2008-2018), which resulted being positive and significant. The latter effect reflects that the past crisis has affected permanently the high public debt ratio, the fact that must be taken into account when facing the current Covid-

#### 19 pandemic crisis.

After assessing the explicit factor of the huge public debts, the second chapter of the thesis is focused on one of the main factors that clearly explains the high indebtedness of the national governments and their 'massive' policies of issuing sovereign debt securities (public bonds) in international markets, which are demanded by private banks. This is the possible moral hazard behavior of some private investors (banks) who can take some advantages by over demanding risky sovereign bonds. In this way, the chapter analyzes the reaction of these private investors (banks) in response to the sovereign risk score and/or the premium risk. These indicators represent the possible default of the national governments over the private holders of public debt (bond holders). Therefore, this research emphasized the relevance of both riskiness indicators to explain the high indebtedness of EMU governments in the last two decades.

Variables such as economic growth, the index of nominal residential property and the interest rate, are found to have a positive impact on the demand of government debt securities (sovereign bonds). The results are compatible with the economic theory, showing a boosting interaction between the economic growth, the real state sector and the interest rates; both last indicators showed a complementary rentability for private investors. On the other hand, when it is tested separately the impact of the sovereign risk score, for each GIIPS (Greece, Ireland, Italy, Portugal and Spain) countries, its impact has affected negative only for Greece, because of its dramatic situation since before sovereign debt crisis episode. It is also fair to point out that the stock of public debt has affected negatively and significantly the emission of new government debt securities (bonds).

The third chapter of this thesis assesses the factors that can explain the global and percapita economic growth rates in this Economic and Monetary Union; especially,

those linked with the public sector finance such as the Government Consumption Expenditure, Deficit Budget of the Public Sector and the Public Debt, which resulted having a negative and significant impact. Of course, the classical structural factors such as gross capital formation, human capital and commercial openness have impacted positively. Similarly, the nominal residential property price index is a driver of the economic growth rates (both in global and percapita terms), because European citizens used to invest on residential properties to maintain their life status for their old ages. Additionally, its relationship is positive with the global economic growth to such an extent that both parallelly were increasing, until bursting the real state bubble.

Furthermore, this chapter studies the effects of GDP gap impact on the Deficit tendency for all EMU countries, after splitting the tendency and the cycle of the public sector Deficit and the Gross Domestic Product variables using the Hodrick-Prescott filter. The resulted coefficient sign of the GDP-cycle is negative and significant in average for all EMU countries, which means that when the GDP is above its tendency, the public sector Deficit is adjusted discretionary, adopting anticyclical fiscal policy; not only during the Sovereign Debt Crisis period (2008-2012), but also in the normal periods (NSDC). However, when separating EMU countries between GIIPS, Frugal (including Germany and France) and the other countries it is found that the first group (GIIPS) are using anticyclical fiscal policies, but the effect for the other countries (Frugal) is not clear.

Finally, each chapter of the thesis develops some public and economic policies conclusions to obtain lessons and recommendations, with the aim to manage optimal the public finance to get sustainable development of the Eurozone economy and recovery in the post-Covid19 pandemic, that affected dramatically the real and financial sectors, and thus putting again the European Monetary Union to the test.

#### Resumen

Esta Tesis Doctoral investiga sobre uno de los temas de finanzas públicas de la Unión Económica y Monetaria de la Unión Europea (UEM) más controvertidos, los determinantes de las actuales elevadas Deudas Públicas nacionales acumuladas desde la implementación del Euro, superando en más del doble de lo establecido en el Tratado de Maastricht (1992). Analiza especialmente el posible comportamiento del *riesgo moral* de los inversores privados como una de las principales causas que exacerbaron la demanda de títulos de deuda pública (bonos emitidos por los gobiernos) por parte de la banca privada, en el contexto de información asimétrica del sector financiero; especialmente, durante el período de la crisis de la deuda soberana (2008-2012). Además, analiza las posibles interacciones de las finanzas públicas de los gobiernos nacionales con la política monetaria desarrollada de forma independiente y centralizada por el Banco Central Europeo (establecido en junio, 1998). Finalmente, también se estudian los efectos de estas cuestiones de política económica sobre las tasas de crecimiento económico -global y per cápita-, consideradas como indicadores proxy del bienestar económico.

De esta forma, para una mejor valoración de los aspectos de finanzas públicas de la Eurozona la tesis se divide lógicamente en tres capítulos: (i) "Determinantes de la deuda pública en la zona del Euro y su sostenibilidad en medio de la pandemia Covid-19", (ii) "El Riesgo Moral en la zona del Euro: Desde la crisis de la deuda soberana a la pandemia del Covid-19" y (iii) "Política económica y crecimiento en la zona del Euro: Lecciones para el despegue posterior al Covid-19".

Los tres capítulos evalúan dinámica y econométricamente a través del Método de Sistemas Generalizado de Momentos (SGMM), implementado para controlar cualquier problema potencial de endogeneidad causado por la estructura de datos de panel. Los datos utilizados provienen de diferentes fuentes como el Banco

Central Europeo, Banco de Pagos Internacionales, Banco Mundial (Indicadores de Desarrollo y Gobernanza Mundial), Comisión Europea, Organización Internacional del Trabajo, la Organización Mundial de la Salud, Agencia Internacional de Transparencia y CountryRisk.io, entre otras.

En el primer capítulo, la tesis considera cuatro regresiones econométricas. Dos estimadas por el Método de Sistemas Generalizado de Momentos (SGMM) y dos por las regresiones instrumentalizadas GMM-Clúster, con el objetivo de obtener los factores que explican los determinantes de la evolución de los elevados ratios de Deuda Pública-PIB. Los resultados respaldan un impacto positivo significativo de la tasa de interés de los bonos, la tasa de desempleo, la esperanza de vida al nacer, la capacidad de voto y rendición de cuentas, una variable dummy (ficticia) desde el período de crisis de la deuda soberana (2008-2018), que explican los altos niveles de deuda pública en la UEM. Inesperadamente, una mejora en los índices de control de la corrupción y de la percepción de la corrupción, una mejor o más alta clasificación, también parecen tener un impacto positivo en los ratios de deuda pública en aumento. Por otro lado, el índice de efectividad del gobierno, superávit del saldo primario del sector público y crecimiento económico afectaron negativamente a esta razón de finanzas públicas estudiada (Deuda Pública).

Se comprueba el comportamiento dinámico de la deuda pública, siendo significativos tanto su primer retardo como el retardo del resultado primario del sector público. Además, cuando se prueban diferentes indicadores de gobernanza, no todos sus coeficientes resultaron ser significativos como se esperaba en un primer momento, con la excepción de la efectividad del gobierno, que reduce el ratio de deuda pública-PIB. Lo que es sorprendente es el impacto positivo y significativo de la alta esperanza de vida al nacer en las deudas públicas de los países de la UEM-EU. El estudio también incluye otras variables explicativas como

las tasas de desempleo, los cambios permanentes (estructurales) provocados por la Crisis de la Deuda Soberana (2008-2018), que resultaron ser positivos y significativos. Este último efecto refleja que la pasada crisis ha afectado de forma permanente al elevado ratio de la deuda pública, que hay que tener en cuenta ante la actual crisis del Covid-19.

Tras analizar las causas explícitas de la elevada deuda pública, el segundo capítulo de la tesis se centra en uno de los factores relevantes que también explican el alto endeudamiento de los gobiernos nacionales y sus políticas 'masivas' de emisión de títulos de deuda soberana (bonos públicos) en los mercados internacionales, que son demandados por la banca privada. Este es el comportamiento del *riesgo moral* de algunos inversores privados (bancos), que pueden aprovechar algunas ventajas al adquirir deuda pública riesgosa. De esta forma, el capítulo analiza la reacción de estos inversores privados (bancos) ante la calificación del riesgo soberano y/o la prima de riesgo. Estos indicadores representan el posible incumplimiento de los gobiernos nacionales sobre los tenedores privados de deuda pública (bonos soberanos). Por ello, esta investigación enfatiza la relevancia de ambos indicadores de riesgo para explicar el alto endeudamiento de los gobiernos de la UEM en las últimas dos décadas.

Variables económicas como el crecimiento económico, el índice del precio nominal de las propiedades residenciales y la tasa de interés tienen un impacto positivo en la demanda de títulos de deuda pública. Los resultados son compatibles con la teoría económica, mostrando una interacción dinamizadora entre el crecimiento económico, el sector inmobiliario y las tasas de interés; ambos últimos indicadores mostraron una rentabilidad complementaria para los inversionistas privados. Por otro lado, cuando se prueba por separado el impacto del score de riesgo soberano, para cada país del llamado grupo GIIPS (Grecia, Irlanda, Italia, Portugal y España),

su impacto ha sido negativo solo para Grecia, debido a su dramática situación desde antes del episodio de crisis de la deuda soberana. También es preciso señalar que los stocks de deudas pública acumulados han afectado negativa y significativamente la emisión de nuevos títulos de deuda pública (bonos soberanos).

El tercer capítulo de esta tesis evalúa los factores que pueden explicar las tasas de crecimiento económico global y per cápita en la Unión Económica y Monetaria; especialmente, los vinculados con las finanzas del sector público, tales como el Gasto en Consumo del Gobierno, Déficit del Sector Público y Deuda Pública, que resultaron tener un impacto negativo y significativo. Por supuesto, los factores estructurales clásicos como la inversión en formación bruta de capital, el capital humano y la apertura comercial han tenido un impacto positivo. De manera similar, el índice de precios nominal de las propiedades residenciales es un motor de las tasas de crecimiento económico (tanto en términos globales como per cápita), porque los ciudadanos europeos suelen invertir en propiedades residenciales para asegurarse futuros ingresos que les permitan mantener sus status de vida en la vejez. Adicionalmente, su relación es positiva con el crecimiento económico global a tal punto que ambos fueron aumentando paralelamente hasta estallar la burbuja inmobiliaria.

Además, este capítulo estudia el efecto del impacto del ciclo económico o brecha del Producto Bruto Interno (PIB), en la tendencia del Déficit Público para todos los países de la UEM, después de separar la tendencia y el ciclo de las variables Déficit del sector público y Producto Interior Bruto utilizando el filtro de Hodrick-Prescott. El signo del coeficiente resultante del ciclo del PIB es negativo y significativo en promedio para todos los países de la UEM, lo que significa que cuando el PIB está por encima de su tendencia, el sector público ajusta el Déficit discrecionalmente, adoptando una política fiscal anticíclica; no solo durante el período de Crisis de la

Deuda Soberana (2008-2012), sino también en los períodos normales (NSDC). Sin embargo, al separar los países de la UEM entre GIIPS, Frugal (incluidos Alemania y Francia) y los demás países, se encuentra que el primer grupo (GIIPS) está utilizando políticas fiscales anticíclicas, pero el efecto de los países Frugal, no es tan claro.

Finalmente, cada capítulo de la tesis desarrolla algunas conclusiones de políticas públicas y económicas para obtener lecciones y recomendaciones, con el objetivo de gestionar de manera óptima las finanzas públicas para lograr el desarrollo sostenible de la economía de la zona del Euro y la recuperación en la post pandemia del Covid19, que afectó dramáticamente al sector real y financiero, poniendo así nuevamente a prueba la Unión Económica y Monetaria.

### **List of Tables:**

Chapter 1	
Table 1.1. Variables and Data Sources	24
Table 1.2. Average and Standard Deviation of the Public Debt-to-GDP ratio	26
Table 1.3. European Public Debt Amid the Covid-19 Pandemic	
Table 1.4. Expected Relationship Regarding the Public debt Ratio	43
Table 1.5. Estimations for the Logarithm of Public debt Ratio	49
Table 1.6. Short-Run and Long-Run Elasticities Regarding the Public debt	57
Table Appendix 1.A: Public Debt Ratio - Coefficient of Variation	70
Chapter 2	
Table 2.1. Variables and Data Sources	
Table 2.2. Expected Relationship between Government Debt Securities dema	nd and
its Determinants	
Table 2.3. Demand of the Government Debt Securities	
Table 2.4. Demand of the Government Debt Securities	100
Table 2.5. Demand of the Government Debt Securities	102
Chapter 3	
Table 3.1. Variables and Data Sources	129
Table 3.2. Expected impacts of the determinants on Economic Growth	134
Table 3.3. Determinants on Eurozone Economic Growth	141
Table 3.4. The Effect of the GDP-Cycle on the Public Deficit Tendency	147
Table Appendix 3.A: Determinants on real per capita GDP growth rates	163
Table Appendix 3.B: Matrix of Correlations	
Table Appendix 3.C: Panel Unit Root Test of Levin-Lin-Chu (Adjusted t*)	



# **List of Figures:**

Chapter 1	
Figure 1.1: Public debt ratio in the High Indebted Euro Countries (HIDC)	27
Figure 1.2: Spanish and Italian public debt ratio (adjusted by quadratic tendenc	y) 29
Figure 1.3: Primary balance of public sector (lag) and public debt ratio	31
Figure 1.4: Real economic growth and public debt ratio	33
Figure 1.5: Real interest rate and public debt ratio	34
Figure 1.6: Current account surplus and public debt ratio	35
Figure 1.7: Life expectancy at birth and public debt ratio	37
Figure 1.8: Unemployment Rate and the Public debt Ratio	38
Chapter 2 Fig. 2.1: Government Debt Securities Demand in International Markets (US\$ NFig. 2.2: Bond Interest Rate 10-Years	
Fig. 2.3: Gross Domestic Product (US\$ MN)	86
Fig. 2.4: Index of Nominal Residential Property Prices	
Fig. 2.5: Sovereign Risk Score	89
Chapter 3	
Figure 3.1: Difference of Logarithms of Gross Domestic Product	
Figure 3.A: Logarithm-Difference of GDP per capita (Constant 2010 US\$)	



### **Contents**

Acknowledgements	iz
Summary	x
Resumen	xv
List of Tables	xx
List of Figures	
Introduction	1
Chapter I: Determinants of the Public Debt in the Eurozone and its Sustainab Covid-19 Pandemic	ility Amid the
	1.0
1.1. Introduction	
1.2. Materials and Data	
1.2.1. Literature Review	
1.2.2. Economic, Social and Institutional Data	
1.2.3. Public (Government) Debt	
1.2.4. Economic and Finance Variables	
1.2.5. Socioeconomic variables	
1.2.6. Governance and Institutional Indicators	
1.2.7. Instrumental variables	
1.3. Empirical analysis	
1.3.1. Theoretic Model and Estimation Methodology	
1.3.2. Econometric results	
1.3.3. Economic and finance explanatory variables	
1.3.4. Socioeconomic variables	
1.3.5. Institutional Quality Indicators	
1.3.6. Sovereign debt crisis (2009–2012)	
1.3.7. Elasticities and possible collinearity	
1.4. Discussion amid the Covid-19 pandemic	
1.5. Conclusions	
1.6. References	
Appendix 1.A	70
Chapter II: The Eurozone Moral Hazard: From the Sovereign Debt Crisis to Pandemic	the Covid-19
2.1. Introduction	
2.2. Literature review	
2.3. Financial and Economic Data	72
2.4. Econometric assessment.	89

2.4.1. Theoretic Model and Estimation Method	90
2.4.2. The demand for Government bonds in the Eurozone	94
2.4.3. Country specific effects of Sovereign Debt Crisis and Sovereign Risk Scor	e 97
2.4.4. Robustness checking, multicollinearity and endogeneity	
2.5. A Discussion on the Government Bonds Demand Amid the Covid-19 Pandem	
2.6. Main concluding remarks and public policy recommendations	
2.7. References	
Chapter III: Economic policy and growth in the Eurozone: Lessons for the post-Co	ovid19
takes off	
3.1. Introduction	116
3.2. Monetary and fiscal policies for economic growth: A literature review	
3.2.1. Main economic policies in the 20th. Century	119
3.2.2. Last economic policies in the 21st. Century	122
3.3. Methodology, theoretic model and data	
3.3.1. Dynamic econometric analysis	
3.3.2. Description of economic data, indicators proxies and sources	
3.3.3. Endogeneity, Multicollinearity, Unit Root Test and Cointegration issues	135
3.4. Empirical results	
3.4.1. Determinants of economic growth	137
3.4.2. Monetary and fiscal policies on economic growth	144
3.4.3. Policy implications for the post Covid-19.	151
3.5. Conclusions	154
3.6. References	157
Appendix 3.A	163
Appendix 3.B	166
Appendix 3.C	167
Final conclusions	169
Conclusiones finales	175

#### Introduction

Undoubtedly, the adoption of the Economic and Monetary Union of the European Union (EMU) in 1999, had raised different issues for economy policymakers, academic researchers and journalists to discuss in the worldwide; especially, for those incredulous of the Maastricht Treaty (1992), Stability and Growth Pact (1997) and Euro currency (1999) in twelve countries about their sustainability in the long run. Especially, when all the members are keeping up their own fiscal rules, financial public regulations and separated sovereign debt markets. There were different doubts caused by the high heterogeneity of their productive structures, domestic market regulations and rigidities of the members in the old continent; even though, their apparently successful results in the first years of Euro currency inception, until the housing bubble burst (2008).

These discussions about their unsustainability increased amid the Sovereign Debt Crisis (2008-2012), after bursting the real state bubble in different countries; following the American Lehman Brothers Bank collapsed, in the third quarter of 2007. To such an extent that GREXIT was very namely by the economy profession, but only was discussed, not a reality; otherwise, it had been even worse the financial situation. Maybe, that situation would have meant the end of the EMU experiments. However, after a long run negotiation process with the European Union Commission, the current BREXIT has been yet recently a reality (2021). Because of the fact that this country is not part of the EMU, they never adopted the Euro currency; therefore, its recently exited has not been detrimentally affected the financial sector of the EMU nowadays.

In this way, the central aim of this doctoral thesis assessment is the analysis of the evolution of the financial public sector in the Economic and Monetary Union since the Euro currency inception (1999), the main determinants of their highest public

debt ratios (%GDP), since an integrated point of view, including the possible moral hazard behavior of private investors (banks) to over demand government debt securities (bonds) issued by each national governments separately, since a formal and quantitative views. This is after testing the positive impacts of the sovereign risk score and/or the premium risk as explanatory variables of the sovereign bonds demand, amid the past sovereign debt crisis (2008-2012), under third generation models because of liquidity problems, accumulated high sovereign debts; but not exactly under speculative attacked models developed previously by Krugman (1999).

Previous explanations about moral hazard sources are in the own monetary union, when De Grauwe and Ji (2019) pointed out that government bonds markets in the Eurozone are unstable just because national governments issue sovereign debt in Euro currency, not their private currencies, what makes impossible any kind of monetization. The national governments cannot plenty assure private bond holders that they will fulfil with their maturities. This leads to a situation in which government bond markets in a monetary union can be hit by self-fulfilling crisis, pressing the bond yields, making difficult to rollover their debt and falling in default. Let us not forget that Economic and Monetary Union countries, such as Greece (187.4%), Italy (149.4%), Portugal (126.1%), Belgium (115.3%), France (114.1%), Cyprus (113.2%) and Spain (110.1%) are some of the highest indebted national governments in the world as a percentage of their GDP<sup>1</sup>. Similarly, national governments have taken for granted reaching the Public Sector Deficit of 3% of the GDP, also fixed in the Maastricht Treaty (1992). Which in turn affects the European wellbeing in the long run.

<sup>&</sup>lt;sup>1</sup> After Japanese economy with the highest Public Debt in the world (240% of the GDP).

This topic is relevant nowadays that the Eurozone has been hit again by the Covid-19 pandemic since the onset of 2020, that obligated European countries to adopt drastic healthy measured such as quarantine, social immobilizations, stopping transportation system, closing business, etc.; with the aim to dealt with the increasing millions of contagions and thousand deaths. But as all policy measures in economics, these have high public cost increasing the public deficit of the Eurozone countries, and the stock of accumulated public debts. Exacerbating their unstable sovereign bond markets, because each member issued their own sovereign bonds, backed only by their own public guarantees, without any common endorsement of the EMU members.

Among the main contributions of this doctoral research are: (i) The development of a unified approach to the determinants of the high public debt in the Eurozone, which includes not only economic factors of the governments' budget constraint, but also their behavior, institutional and governance indicators; (ii) The problem of moral hazard and its effects on the fiscal deficit and public debt sustainability issues are addressed; (iii) A panel data approach is developed trying to control by country effects, but also to analyze their different situations in the face of the deficit; (iv) It partially includes an analysis of the discretionary fiscal policy of governments and also of monetary policy from the European Central Bank; especially, in the past period of the sovereign debt crisis; (v) Approaching econometrically the public finance and fiscal determinants of the economic growth, and (vi) Develops different conclusions and recommendations to deal better with the current crisis derived from the Covid-19 pandemic.

In this way, the thesis has been splitting into three chapters, that are assessing the public finance and the economic growth issues used the panel data econometric technique under the System Generalized Method of Moments (SGMM), in order to

solve the expected endogeneity problems inherent to economic dynamic panel data sets, providing valid instruments for estimations based on the lagged values of the exogenous and predetermined variables of the econometric model (Blundell and Bond, 1998). The thesis avoided used explicitly results under Fixed Effects (FE) and Random Effects (RE) estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS), respectively, because both are inconsistent under endogeneity problems contained in the panel data analysis.

Therefore, the first chapter of the thesis develops a unified approach to the determinants of the highest public debt levels in the Eurozone, their main drivers; even though, the Maastricht Treaty fixed them up to 60%. Currently, there are different financial, social and institutional factors that can help to support these highest indicators. Among them the bonds interest rates, the highest life expectancy at birth in an aged European society, high unemployment rates, democracy activities (voice and accountability) and the last Sovereign Debt Crisis (2008-2012), that affected permanently (structural changes). On the other hand, some factors have affected significantly the reduction of the government debt stock, such as the Gross Domestic Product rate increasing, and the surplus primary result of public sector. These factors are chosen also based on the intertemporal budget restriction of the government, following previous studies such as Bajo, Díaz and Esteve (2006, 2008, 2009 and 2010).

This integral analysis also considers institutional factors as worldwide governance indicators (government effectiveness and the control of corruption) and corruption perception index, from the World Bank and International Transparency, respectively, to explain the enormous public debt accumulation. In general, after considering different governance indicators, it is founding that improving the quality of public finances (QPF) and government effectiveness has emerged also as a significant

economic growth driver to be considered for European policy makers in an environment of more closely integrated markets and greater global competition (Barrios and Schaechte, 2008). Unexpectedly, improving on control of corruption and corruption perception indexes have been a positive and significant effect on the public debt ratios in the SGMM, coincidentally with other researchers (e.g. Tarek and Ahmed, 2017).

Let us remember that unlike the current Covid-19 crisis effects, the past financial crisis followed the governments intervention to recovery broken private banks, after mortgage banking crises, the real sector bubble burst, which in turn led to a permanent increase in their public debts. Other of the main factors that can help to mitigate the high public debt increases in the EMU is the government effectiveness, that reflects the good formulation and implementation qualities of public policies and civil services. Furthermore, the positive primary results or surplus of the public sector (without including interest payments), have a negative and significant impact, contributing to reduce this high public debt-to-GDP ratio.

After this previous assessment, apart from the econometric factors that explain the drivers of the high public debts, the next chapter of the Ph.D. Thesis has profoundly the analysis and study about how moral hazard, as a result of asymmetric information between national governments and private banks, has been influenced in the increasing of the public debt in the European and Monetary Union; especially, in the GIIPS countries. Therefore, it focuses on one of the causes of high public debt in the Eurozone as the moral hazard issue; especially, when national governments have been issuing bonds in order to get fresh money from the private sector as banks, to finance their activities and discretional fiscal policies. This could be a current salient issue in the recently European Union mutualization costs of Covid-19 pandemic, being the most receptors Italy and Spain. In this way, the

second chapter of the thesis tested how Sovereign Risk Score (CountryRisk.io) and the Premium Risk, regarding the haven bond interest rate (Germany), have impacted positively the demand of the international bond emissions by national governments, to such an extent that is not matter for private banks if both risk indicators are increasing.

Because both indicators can represent the risk of unpaid public debts, a quantitative measure of government ability to honor their financial liabilities, e.g. when foreign debt obligations are required. Unexpectedly, the econometric assessment detected in average that if both risk indicators increase, the demand of government debt securities (bonds) issued in hands of private banks are also increasing. However, we can see how the Sovereign Risk Score for Greece was not significant to explain their demand, because its precarious and detrimental public financial situation before the Euro currency introduction. When its tested the risk premium to check robustness of the government debt securities demand (bonds), its coefficient in average for GIIPS countries has been found again positive and significant; especially, for Ireland and Spain. This asymmetric and heterogeneous behavior is showing the needs to study Eurozone countries separately.

Furthermore, as secondary aim this Ph.D. Thesis analyses any possible anticyclical fiscal policy adoption of national governments, splitting EMU countries between subgroups: GIIPS, Frugal and Others. The possible interactions between their own national fiscal and the autonomous monetary policies, adopted independently by each national government and the European Central Bank, respectively. As well as, their final effects on the economic growth rates, global and percapita. Understanding these rates such as indicators of the wellbeing, even though the high heterogeneity between economic members of this European Economic and Monetary Union (EMU).

Therefore, after assessing the public finance issues in the first two chapters of the thesis, the third chapter analyses the different public finance factors that have impacted negatively the economic growth rates in the last two decades, including government final consumption expenditure, public sector deficit and public debts stock. We can see clearly how these public finance indicators (as %GDP) affected negatively the European wellbeing. On the other hand, there are some factors that affected positively the economic growth (Barro, 2003), such as the gross capital formation, human capital, economic openness and the nominal residential property index (Bank for International Settlements, 2020). Being accepted as a broad indicator of wealthfare the Gross Domestic Product percapita, the appendix of this chapter presents the impacts of these financial and economic variables.

At the same time, this last chapter studies the reaction of possible discretionary anticyclical fiscal policies of national governments, including the Sovereign Debt Crisis period (2008-2012), that might have an interaction with monetary policy such as quantitative easing (QE). The duration effects of temporary increases of the monetary base depends on the bonds maturities, which must be kept short to avoid excessive liquidity (Marmefelt, 2020). Indeed, there is a high interaction that most researchers have been taken for granted. Because of high heterogeneity in social and economically terms, this analysis splits the Eurozone in GIIPS, Frugal and other countries, with the aim to difference the impact of business cycle. On econometric grounds, it is clear that always the first group has been implementing anticyclical discretionary fiscal policies, including the "not Sovereign Debt Crisis" period (NSDC).

For instance, the European Union has been responding to the Covid-19 crisis coincidentally with expansionary fiscal policy, considering a recovery fund under Next Generation EU (NGEU), which focuses on the green and digital transitions.

At the same time, the monetary policy includes unconventional measures, in particular asset purchases under the pandemic emergency purchase programme and targeted longer-term refinancing operations to support bank lending to businesses and households, but consistently with the independent European Central Bank, taken for granted National Government's fiscal policies (Marmefelt, 2020). However, both economic policies are not enough for recovery, we need not only Fiscal Union, in terms of regulations and rules, but also more homogeneous public policies and market regulations in different scopes as labor, minimum salary, pension and retirement ages, taxes contributions, digitalization, green and environmental maintenance, among others.

Last but not least, in this Ph.D. Thesis the concept of Fiscal Union is related with more homogeneous and credible fiscal and public finance rules, regulations and policy measures, with more coordination among members, and common financial instruments, not exactly as the independent and autonomous European Central Bank entity<sup>2</sup>. For instance, in line with De Grauwe and Ji (2019), it could be recommendable to create the Eurobond market based on mutualized and joint public liabilities of the government participants, leading to conform a common and unique sovereign bonds market, which in turn can help to eliminate the inherent instability and reduce the Sovereign Risk Score of the European Monetary Union members, helping to mitigate any moral hazard behavior.

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<sup>&</sup>lt;sup>2</sup> This concept is used in this sense in the next chapters.

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## Chapter I

# Determinants of the Public Debt in the Eurozone and its Sustainability Amid the Covid-19 Pandemic

**Abstract**: Different economic studies have been concentrated on specific and/or isolated factors to explain public debt evolution. In this chapter, the thesis has developed an integrated viewpoint based on financial, social and governance or institutional factors. Under our dynamic econometric assessment for the last two decades (i.e., since the Euro currency inception), economic growth, interest rate, life expectancy at birth, unemployment, government effectiveness and the last sovereign debt crisis have resulted as being the major determinants of its evolution. They help to assess public debt sustainability continuously with the aim to discuss technical recommendations to maintain it at an even rate, to allow sustainable economic growth and better life standards, in the context of life expectancy increasing and stable governance and institutional conditions. Undoubtedly, the Covid-19 pandemic leads more damaged Eurozone countries with negative real economic growth and high unemployment rates, increased dramatically their current public debts, to such an extent that they could fall into unsustainable paths. Therefore, substantial reforms in European pension and unemployment insurance systems are necessary conditions to ensure public debt sustainability in the post Covid-19 pandemic.

**Keywords:** Sustainability; public debt; Covid-19 pandemic; governance-institution indicators; Eurozone.

### 1.1. Introduction

Currently, public debt issues have become again a major academic, policy-maker and journalist topic of discussion in the Eurozone, which has suffered three major crashes since its conformation in the last two decades: Subprime mortgage and Sovereign debt crises; and recently the Covid-19 pandemic. Undoubtedly, this current health crisis has generated a brutal stumbling block in the large recovery from the past sovereign debt crisis (2008–2012). The Eurozone economies did not finish recovering from it, but they have to face again high public budget deficits in 2020 and unprecedented growth in public debts derived from the pandemic, two—three months of quarantine, social immobilization, closing borders, reduction of international commerce and touristic activities, generating huge unemployment rates. Indeed, the main aim of this chapter is to identify the determinant factors of the huge public debt, in order to assess to what extent these factors can influence their sustainability amid the Covid-19 pandemic.

Different developing countries have been receiving financial support and resources from the World Bank and the International Monetary Fund; furthermore, the G20 group of most developed economies have decided not to charge the poorest countries, but it is a little impossible to get these kinds of facilities for European Union. However, in the middle of different policy proposals, meetings and discussions, the European Union had approved the establishment of a fund of €100 billion, which was required by the Spanish government and others with the aim to support especially the cost of firing workers and unemployment insurance, as the ERTE by starting the quarantine. The ERTE (Expediente de Regulación Temporal de Empleo) is a Spanish temporary unemployment subsidy for temporary unemployed workers because of the economic activity stoppages caused by the Covid-19.

The most recently damaged economies—Spain, Italy and France—by the pandemic have seen highly increased their public debts in the first year of the Covid-19 health crisis (2020). Spanish public debt, having reached 99% of the GDP in 2019, increased € 35.4 billion in the first quarter, meeting €27.6 miles per capita. Italy reached a public deficit of 10.4%, and its public debt ratio was around 156% of the GDP. France, after having public debt ratios below 100% since adoption of the Euro, surpassed above 101%, in the first quarter of 2020. These statistics are associated with the dramatic GDP contraction for 2020, with −12.8% for Spain and Italy, and −12.5% for France. These rates are above the average for Eurozone projections (IMF, 2020).

In this way, since starting negotiations to get financial support, Spain and Italy were proposed the mutualization of their new public debts emissions to deal with the high pandemic costs. Additionally, the European Central Bank proposed the creation of a reconstruction fund to buy public debt (sovereign bonds) from troubled countries derived from pandemic, but conditionality on accepting public policy implementations to guarantee the economic growth. However, initially North European countries and the so-called Frugal (Holland, Austria, Denmark and Sweden) were opposed to these proposals, they proposed supporting only with soft credits. It is also fair to point out that the fiscal deficit for the first quarter of 2020 is not only in European countries, but also in different countries<sup>3</sup>.

Therefore, the central research question of this chapter focuses on the main factors that have determined the public debt evolution of the Eurozone countries, after the Euro currency introduction (1999), in the last twenty years. This topic becomes

<sup>&</sup>lt;sup>3</sup> For instance, the United States of America had expected to reach a federal budget deficit of US\$ 3.7 trillion by the end of 2020. Japan's public debt ratio was supposed to reach about 240% of the GDP between 2020–2021.

more relevant because of the fact that there is not a fiscal union yet, neither homogeneous social policy regulations, such as an employment and pension system. The second research question concerns the assessment that would allow us to declare whether public indebtedness has been adequately sustainable managed, according to the evolution of different economic-financial, social and institutional quality factors. This second issue is only preliminary addressed based on the obtained relations and the new economic and social indicators amid the Covid-19 pandemic.

Among the first group of determinants the thesis considers the economic growth, interest rate, primary balance of the public sector (government tax collection reducing the spending), etc. In the case of social factors, it is considering the unemployment rates and the expected life at birth of the population, its aging and growth rates, the public health situation for preventing and coping with possible pandemics. The institutional and governance indicators included Voice and Accountability, Government Effectiveness, Corruption Perception and/or Control Corruption, Political Stability, Regulatory Quality, as well as Rule of Law.

Fiscal sustainability is a crucial topic nowadays amid the Covid-19 pandemic, with international financial analysts, investors and investment grading institutions focusing on this issue to assess the capacity of a government to comply or not with its debt and liability commitments—amortization of the principal and payment of interest—to its creditors, which in turn impacts on the sovereign risk score and the cost of public debt for governments. Indeed, among the relevant institutional factors are corruption-related indexes, which have been obtained from Worldwide Governance Indicators (World Bank) and Transparency International, a non-governmental organization (NGO).

This chapter implicitly and explicitly sheds lights on the financial sustainability of Economic and Monetary Union, in accordance with these financial, socioeconomic and institutional quality factors that explain their evolution. But how can we explain sustainability of public debt? This question does not have a straightforward answer. For instance, Bajo-Rubio et al. (2010) used the intertemporal budget constraint (IBC) method to test the sustainability of the Spanish public debt for a long-term perspective, one hundred and half years (1850-2000), finding different (multiple) structural changes in the cointegrated regression models. Furthermore, the current manager director of the International Monetary Fund (2020) in reference to Argentina said, it had serious problems because its public debt was unsustainable, in a context that this Latin-American country postpones the restructuration of its public debt. Therefore, we can continue with more technical specifications about public debt sustainability in the third section of this chapter (empirical analysis).

In this way, this research thesis approached sustainability of the Public Debt by understanding its determinants and estimating a joint model that aims to anticipate the expected impact of the Covid-19 crisis, given the relation in the past for the Eurozone. This would represent a clear warning for policy makers to be serious in containing public debt expansion in the long run. Consequently, after receiving currently enormous rescue packages because of the pandemic, in the next years responsible governments should adopt budget constraints and public policies in order to mitigate the current expansion of public debts, in accordance with our sustainability assessment.

For instance, we are concerned especially with the High Indebted Euro Countries (HIDC) with public debt to GDP ratio above 100%, such as Italy and Spain. Countries that benefit from the mutualized reconstruction fund of €750,000 million, passed by the Europe Commission by the end of May 2020, which includes

structural reform commitments. Corresponding to €500 billion as cash transferences and €250 billion as soft borrowings: Italy, Spain, France and Germany were benefiting with €172,745, €140,446, €38,772, and €28,806 million, respectively. Additionally, the amount of the Pandemic Emergency Purchase Program of the European Central Bank increased to €600 billion by June and €500 billion by December 2020; it was prolonged up to May, 2022.

It is also fair to point out that the Council of the European Union's recovery efforts at the level of the Presidents (July, 2020) has also approved a mutual fund of €750,000 million to deal with the adverse socioeconomic effects of the Covid-19 pandemic—€ 390,000 million for direct support, the rest for loans. The aim of this Fund is to prevent the health of citizens and stoppages of the economy. This happened after a very wide-ranging package was presented at the end of May, 2020 which combined the future Multiannual Financial Framework (MFF) and a specific recovery effort under Next Generation European Union (NGEU). This support includes a plan of reforms that countries must adopt.

In the next section of this chapter, it has reviewed some concepts and ideas about how public debt has been accumulated, what factors have determined it in the last centuries, and its possible sustainability in the Eurozone. This section also describes the evolution of some financial, socioeconomic and institutional variables used for our econometric assessment, which possibly have been determining the public debt, as well as its sustainability, based on the public budget restriction of the governments. Section 3 will focus on the econometric panel data dynamic assessment, through different models and estimation techniques that accounted for the effects, as well as possible endogeneity and multicollinearity problems. The following section 4, based on our econometric results will be concentrated on the adverse effects discussion amid the Covid-19 pandemic in EU public finance. The

last section 5 of this chapter, to sum up some conclusions and recommendations to improve the sustainability management of the Euro public debt, especially in the HIDC, in their increasing current context of pandemic.

#### 1.2. Materials and Data

#### 1.2.1. Literature Review

Indeed, different theoretic and empirical factors can explain the current high level of the public debt reached by most of Eurozone countries in the last decades; especially, for countries with above 100% of their own Gross Domestic Product (GDP). For instance, in the case of Spain, it could be the Sovereign Debt Crisis (2008-2012), after taking borrowed €100 billion from the Troika (European Union, European Central Bank and International Monetary Fund), in the fourth quarter of 2012. Similarly, this pre-pandemic sovereign debt crisis, contributed Greece, Ireland and Portugal to huge increasing their public debts after being rescued between 2010-2011 by the so-called Troika.

Amid this past public finance dark episode, the public debt sustainability has been one of the topics of concentration in the Economics profession. In this way, different authors such as Bajo-Rubio, Díaz-Roldán and Esteve (2010) used econometric techniques to test sustainability of some EMU governments, based on government expenditures and revenues derived from the intertemporal budget constraint (IBC). Their research covers a spam of one hundred-fifty (150) years for Spanish Public Budgets, finding different episodes of deficits, up to the fiscal reforms of 1970s, that allowed increasing revenues. They proved the sustainability of the public budget deficit in the long run period of assessment.

Meanwhile, the 2020 public debt increasing were caused by a Malthus (1,798) prediction, triggered by the Covid-19 pandemic, with thousands of deaths, which forced more damaged countries increased their public spending on health and prevention systems, to correct current weak aspects of the systems; as well as financing unemployment insurance to assure subsistence for unemployed workers. In "An Essay on the Principle of Population", more than two centuries ago, Malthus said that the population increased at geometric rate, and subsistence for men only at arithmetic rate. The increase of the human species would evidently be much greater than any increase that has been hitherto known. Consequently, the poorest people must live worse and reduce to severe distress. The number of laborers also being above the proportion of the work in the market, the price of labor must tend toward a decrease, while the price of provisions would at the same time tend to rise. Laborers must work harder to earn the same as he did before.

In this vein, more than two centuries later, Eatock (2015) maintains that one in four European citizens currently depends on their pension income, and younger citizens will one day also benefit from pensions. Consequently, the pension system is one of the biggest public expenditure items; in a context of lower birth rates and increasing longevity (expectancy of life at birth), it has come under increasing pressure. Overall European Union spending on public pensions as a percentage of the GDP is now expected to be similar in 2060 to today's level, despite demographic ageing. The population in European Union is ageing due to a combination of increasing longevity and low birth rates. People aged over 65 are becoming a much more significant group, whilst the 15–64 age group is shrinking.

In accordance with these asseverations, the current General Director of the World Health Organization, Ghebreyesus (2020) said (press conference on May, 2020) that people have improved their standards of living, they nowadays have longer and

healthier lives, but economic progress is slow to achieve the Sustainable Development Goals. Global life expectancy has increased by 5.5 years, from 66.5 to 72 years, recently. Spain ranks third in the world, with a life expectancy of 83 years, only behind Japan and Switzerland with 84.2 and 83.3 years, respectively. However, this life expectancy improvement will now be threatened by the Covid-19 pandemic. Consequently, there is a need for all countries to invest to strengthen health systems, against current pandemic outbreaks and future diseases.

Maybe Malthus implicitly said that people will live more years nowadays, but also their personal incomes will be scarce to finance their longevity, because of the fact that in modern society it is expected that people finance their own means of life. Therefore, the natural question is who would pay for these issues as expectancy of life increases, if the personal subsistence resources are poor? Friedman (1975) reintroduced the old phrase "there's no such thing as a free lunch" as the title of his book of essays on public policy. This phrase means that our society cannot get improvements without costs, for each alternative chosen to solve any social problem, there is a best option with an opportunity/alternative cost.

In this way, Cossia (2017), concluded that several countries within the Economic and Monetary Union (EMU) have elevated their public debt from 2001, although there is heterogeneous evolution in their public debts, due to different factors: demographic, economic, fiscal or structural. These factors cause asymmetric effects of the economic policies on public debt and growth, concluding that these socioeconomic issues of high public debt in Europe need to be solved with an economic policy of debt dissolution. This means redesigning the socioeconomic environment to eliminate the basic conditions that cause these problems considering the specificities of each countries, thus enabling European society and the involved institutions to do better in the future than the best they can do today. The author

concludes that there is a high heterogeneity between countries within and outside the Economic and Monetary Union due to different socioeconomic factors.

Furthermore, the heterogeneity has been also in health expenditure in accordance with "Health and Glance: Europe 2018" (OCDE and EU, 2018), after the sovereign debt crisis, some countries have recovered, other maybe more than improved their health public investment in the last decade. Across the EU as a whole, health spending per capita increased by around 1.9% each year in real terms between 2013 and 2017, compared with an annual growth rate of only 0.6%, between 2009 and 2013. During this crisis, ten EU countries saw health expenditure retracted in real terms, only Bulgaria and Romania continuing to grow above 5% annually. In the subsequent four years there has been a large-scale turnaround, but two EU countries were growing, despite economic growth having remained slow in some countries. Therefore, health systems need to be more efficient in accordance with demographic (ageing) changes using new digital technology.

In accordance with demographic ageing, the sustainability problems of the pension system in some European countries have been expected for a long time, but in the last years they have been sharpened. For instance, the deficit in Spain increased to reach €16,6 billion in 2019. In accordance with the Allianz Pension Report (2020), this country has begun since this cumbersome point to reach a sustainable pension system to keep up with the conditions of retired workers being the same to active employee's life conditions. In accordance with the report, Spain placed 67 out of 70 in sustainability conditions, with a compelling structural deficit. The public social spending on third aged people, above 11% of GDP, led Spanish public finance to have serious sustainability problems.

Consequently, in order to European governments continue approving to invest on healthcare and pension systems, it should be very important for policymakers to assess the sustainability of public debt. A simple starting point for our sustainability assessment risks relates to the evolution of the (explicit) government debt-to-GDP ratio; as high and rising debt ratios already hint at potential sustainability problems in the government budget constraint, we chose as a central variable the Public debt-to-GDP ratio. This is because high and rising government debt ratios indicate potential sustainability problems (Lojsch et al., 2011).

For other authors, the assessment of public debt sustainability arguably intends to simply answer the question about its correct measure, when the public debt in a country is becoming so big that it would not be fully serviced, tracking its evolution over time (Wyplosz, 2005). Whenever the interest rate exceeds the economy's growth rate, the debt accumulation process is intrinsically unstable, which is precisely why sustainability is an important macroeconomic issue. Two difficulties follow: First, relatively small changes in the real interest and growth rates can tilt the debt path from stability to instability. Second, when the real interest and economic growth rates are close, small shocks can have dramatically powerful effects on the public debt path.

For other authors, the sustainable fiscal policy must respect the present value borrowing constraint under the economic environment, with the intertemporal budget constraint being a necessary condition for sustainability (Collignon, 2012). If debt must not explode over time, policy makers have to respond to the changing conditions in their tax base (economic growth) and to the cost of finance (interest rate) with suitable policies. The author concluded that European public debt is sustainable in this respect. A government can be solvent in the sense that it can raise sufficient revenue in the future to pay the service of public debt.

In accordance with D'Erasmo et al. (2015), different strategies of policies can be equivalent to restore fiscal solvency, however, they can have different effects on

welfare, macro aggregates and production. This is particularly the case for taxes on capital in the United States and labor taxes in Europe. Furthermore, the fact that both are financially integrated economies implies that the revenue-generating capacity of taxation on capital income is adversely affected by international externalities. A structural change in fiscal accounts has been found since the 2008 international financial crisis.

In this vein, Kudla (2018), in his dynamic panel data econometric methodology considers that the set of explanatory variables of the public debt are: a) variables that affect the directly distinguished factors of spending, the ratio of interest payable, subsides, general government expenditures to the GDP; b) social conditions of the economy, such as the unemployment rate, ratio of social security expenditure to total government expenditure and population growth; c) the attractiveness of the economy to foreigners partners, net foreign direct investment (FDI) inflow, the stock of FDI in the economy, the openness factor–(*Export + import*)/*GDP*.

Aldama et al. (2019), estimated and compared different specifications of fiscal rules for the United States of American Public debt, with the aim to test its sustainability in the long run using annual data. On the one hand, with Standard Model-Based Sustainability (MBS) analysis they concluded that estimates of constant-parameter fiscal rules showed no evidence of sustainability, maybe due to instability of government behavior over time. However, the estimated Markov-switching fiscal policy rule identifies two regimes. There is a strong significant positive response of primary surplus to lagged public debt in regime 2 which we label sustainable, whereas the response of primary surplus to lagged public debt is insignificant but positive in regime 1, which we label unsustainable. They show that the United States of America (USA) government stabilizes its debt only during some periods.

A relatively short-lived but tight fiscal contraction can be sufficient to ensure long-run USA debt sustainability. Finally, the main outcome of the paper is that fiscal policy in the USA has been globally sustainable since 1940.

Many economists have viewed the public deficit as harmful to the USA's and world economies, predicted by the life-cycle theory (Barro, 1998). Its effects include high real interest rate, low saving, low rate of economic growth, large current account deficit, poor performance of the economy, etc. A budget deficit leads to increased aggregate demand, obligated interest rate to increase for restoring equilibrium, but making crowding out the investment; reducing the stock of capital in the long run for future generations. Similar reasoning applies to pay-as-you-go social security programs. In an open economy, a country's budget deficit or social security programs would have negligible effects on the real interest rate on the international capital markets.

Furthermore, there are some institutional and governance variables that can also help explain the evolution of public debt in the Eurozone in our period of assessment, for instance, corruption and shadow economy. In this way, Cooray et al. (2017), tested how the increasing of corruption and larger shadow economy directly affected the public debt—both are reinforced complementarity to their negative influence. However, under dynamic panel data analysis, Lee (2018) has found robust evidence that increasing public debt in the Organization for Economic Co-operation and Development countries has not been attributable to social expenditure. Indeed, because public debt levels influence long-term economic growth, Liu and Lyu (2020) suggested that policy makers should control its scale.

Last but not least, in the current context of the Covid-19 pandemic adverse effects, the European Central Bank (2020) stated that the pandemic is set to weaken fiscal positions, as automatic stabilizers and discretionary measures translate into high

deficits. Consequently, public debt ratios are going to follow an unsustainable path in already High Indebted Euro Countries (HIDC) if there is a more severe and prolonged economic contraction than envisaged, combined with higher sovereign funding costs and the materialization of contingent liabilities.

### 1.2.2. Economic, Social and Institutional Data

We have classified the variables under analysis in three subgroups: the studied dependent public debt, the explanatory and instrumental variables. Table 1.1 gathers the main variables involved in our study and their data sources.

**Table 1.1** Variables and Data Sources.

Variable Name	Definition	Source	
HIDC	High Indebted Euro Countries Eurozone countries which have reached a public debt ratio of 100% more than once	European Central Bank	
Debt	Ratio of public debt stock with the gross domestic product in percentage	European Central Bank	
Growth	Annual percentage growth rate of GDP at market prices based on constant local currency	World Bank	
Rate	Long-term interest rate for convergence purposes, debt security issued, 10-year maturity, denominated in Euro	European Central Bank	
Balance	Current account of balance of payments, ratio to GDP	World Bank	
PSResult	Net lending/net borrowing excluding interest payable (primary deficit or surplus), ratio to GDP	European Central Bank	
Unemployment	Unemployment, total (% of total labor force)	International Labour Organization	
Life	Life expectancy at birth, total (years)	World Bank	
WGI	Worldwide Governance Indicators: six aggregate indicators, summarizing the views on the governance quality	World Bank	
Democracy	Voice and accountability	World Bank	
Government	Government effectiveness	World Bank	
Control	Control of corruption index	World Bank	
Corruption	Corruption Perception Index	Transparency International Agency	
SDC(2008-2018)	Structural change caused by the sovereign debt crisis	Own study	

HICP	Harmonized index of consumer prices	European Central Bank
PEPP	Pandemic emergency purchase program	European Central Bank
ERTES	Expediente de Regulación Temporal de Empleo: Temporary Employment Regulation File	Spanish legislation
Eurostat	European statistics	European
Eurostat		Commission
COVID-19	Coronavirus disease	World Health
		Organization

#### 1.2.3. Public (Government) Debt

By introducing the Euro currency in 1999, the twelve countries—Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, the Netherlands, Portugal and Spain—, were making efforts to reduce their public debt ratio, as the Maastricht Treaty had fixed it up to 60%, and the Public Budget Primary Balance Deficit set a roof of 3% to the GDP. In the first five years (2000–2004) only Belgium, Greece and Italy had surpassed the 100% bound. However, by finishing the decade of the 2010s, the public debt ratio of Cyprus and Portugal had crossed this bound, whilst Ireland reached 107.5% between 2010–2014.

For our study, we have named them as the High Indebted Euro Countries (HIDC); in particular, when the public debt ratio had reached more than 100% for at least two years in our period of assessment, because they are living on more than their own means in the short period of several years. Spain has marginally been out of this group before the Covid-19 pandemic. Meanwhile, the ratios of Austria, France, Finland, Germany, Spain, Slovenia, Malta and Netherlands were just above the 60% reference value in the last two decades, before Covid-19 pandemic. The public debt of Estonia, Luxembourg, Slovakia, Lithuania and Latvia reached less than 60% of the GDP, faithfully complying with the Maastricht Treaty.

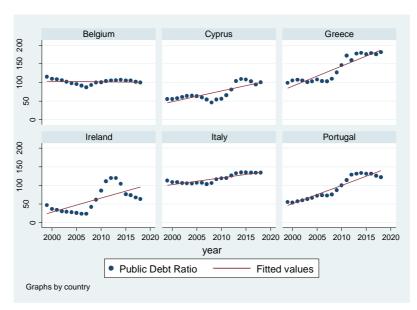
Furthermore, in accordance with the Table 1.2, the coefficient of variation (Standard Deviation/Geometric Average) shows us that the behavior of this public finance indicator has been very different, in several subperiods. Indeed, it has been increasing in the context of the sovereign debt crisis. For estimated coefficient of variation, you can see the appendix 1.A of this chapter.

**Table 1.2.** Average and Standard Deviation of the Public Debt-to-GDP ratio.

	Geometric Average			Standard Deviation						
Country:	1995-1	2000-2	2005-2	2010-2	2015-2	1995-1	2000-2	2005-2	2010-2	2015-2
	999	004	009	014	019	999	004	009	014	019
Austria	66.091	66.122	69.728	82.470	77.895	2.332	0.648	5.756	1.036	6.048
Belgium	123.679	104.315	93.372	104.185	102.063	6.630	5.058	4.746	2.535	2.892
Cyprus	52.906	60.333	54.982	80.566	100.040	3.129	3.940	6.698	23.078	5.599
Estonia	6.903	5.238	4.841	8.417	9.231	0.809	0.374	1.306	2.110	0.774
Finland	50.504	41.776	37.046	52.750	61.396	5.062	1.165	3.854	5.406	1.966
France	59.841	61.492	69.354	90.329	97.597	2.190	3.410	7.694	3.947	1.138
Germany	58.218	60.942	67.244	79.507	65.486	2.063	3.002	3.421	2.567	5.092
Greece	91.623	103.970	109.732	166.367	177.656	2.853	2.127	9.694	13.799	2.229
Ireland	50.907	31.662	32.959	107.450	67.802	8.128	3.349	16.422	14.042	7.337
Italy	116.507	106.961	107.903	126.475	134.764	2.784	1.867	4.948	7.308	0.405
Latvia	11.667	13.534	14.772	43.150	38.272	1.977	1.001	11.681	3.004	1.706
Lithuani	15.603	21.436	18.140	38.497	38.181	4.183	1.976	5.337	1.762	3.346
a Luxembo	13.003	21.430	10.140	30.497	36.161	4.103	1.970	3.337	1.702	3.340
urg	9.139	7.581	10.626	21.450	21.481	0.730	0.205	4.160	1.914	0.936
Malta	45.584	65.981	65.338	67.386	50.206	10.873	4.432	3.356	2.504	6.321
Netherla nds	66.065	50.098	49.603	64.438	56.573	6.018	1.233	5.918	3.858	6.595
Portugal	58.963	60.350	76.213	120.916	125.603	3.653	5.119	6.493	14.051	5.934
Slovakia	32.239	46.211	32.168	48.556	50.512	9.135	4.236	3.188	6.230	1.749
Slovenia	21.573	26.597	25.976	55.683	74.156	2.074	0.538	5.001	17.199	6.511
Spain	62.839	51.048	41.653	81.148	98.008	1.917	4.952	6.703	17.069	1.577

Source: European Central Bank.

As we can see in Table 1.2, most of the HIDC had been also in the group of the GIIPS countries (Greece, Italy, Ireland, Portugal and Spain), which dramatically suffered from the sovereign debt crisis after the subprime mortgage crisis struck between 2007–2008. Consequently, Greece, Ireland, Italy and Portugal showed rates above 100% for several years; marginally we can also include Spain because after the sovereign debt crisis its public debt also reached 100% of the GDP once again. This leads us to the need to analyze the possible existence or not of a structural change (break point), precisely since the sovereign debt crisis (2008–2012). In Figure 1.1, we can see the evolution of the public debt ratio in these countries, which in most cases exhibits an increasing tendency.



**Figure 1.1.** Public debt ratio in the High Indebted Euro Countries (HIDC). Source: European Central Bank

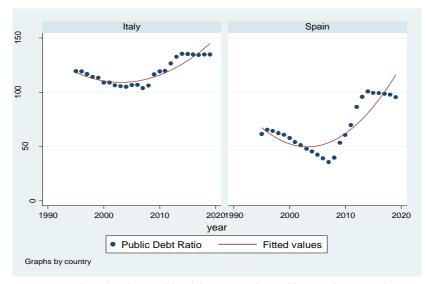
Indeed, the cases of Spain and Italy are paid special attention because of the fact that they have resulted been the most damaged Eurozone countries in the aftermath of the Covid-19 pandemic. Both governments have increased their public expenditures to finance the cost of the health crisis, as well as making ambitious

plans of recovery for more damaged industrial sectors such as the automobile industry and tourism, among others. They have supported costly quarantines for two—three months, between March and May of 2020. Let us remember that in Spain, since the Euro inception in January, 1999, the public debt ratio was just 60%, however, later, the subprime mortgage crisis of 2007 caused it to reach 35.7%. After that, the indebtedness was triggered by various factors, including the bank rescuing granted in 2012 worth € 100,000 million, which represents a sudden public debt increases of 10% of the GDP. By the end of 2012, the gross public debt was at 86.3% of the GDP, which clearly had been more than double of the pre-crisis level. The quadratic fit shows an exponential growing tendency (see Figure 1.2).

Due to high corruption, reduction of tax collection (revenues) and increasing of social spending, the Italian public debt ratio path has been higher than other countries. Unlike the Spanish case, Italy has shown a ratio above 100% since the 1990s. After the introduction of the Euro, the government made efforts to reach the commitments of the Maastricht Treaty and the ratio decreases reached 103.9% in 2007. However, after the sovereign debt crisis (2008–2012), the public debt ratio reached 132.5%, and later 134.8%, in 2019. The accurate quadratic (exponential) fitted tendency is also clear for Italy (see Figure 1.1).

Unfortunately, there were different opinions about Italian public finance evolution; for some authors during the nine-year period preceding the financial crisis of 2008, Italy stood out as the worst offender of the Maastricht Treaty, sustaining budget deficits in excess of 3% of GDP for six years straight (Henningsen, 2012). This has been the result of a vicious cycle between lack of growth and low productivity labor, social inequality and more of the poorest people with limited tax collection, increasing the public debt and increasing high sovereign risk score for the unpaid,

which in turn increases the interest rate and the cost of public debt. Finally, Italy has never implemented an austerity policy to mitigate this increase.



**Figure 1.2.** Spanish and Italian public debt ratio (adjusted by quadratic tendency). Source: European Central Bank

Between 2008 and 2014, the Italian public debt ratio increased by more than 28 percent points, while the Spanish ratio increased by about 60 percent points, both regarding their current GDP. Nowadays, after the Covid-19 pandemic, with the new financing operations and generous loans of the European Central Bank and the purchase of corporation debts, it is expected that the public debt of both countries has increased much higher than the increases before due to sovereign debt crisis. In accordance with International Monetary Fund projections, Italy, Portugal, France and Spain will reach public debt ratios between 150% and 115%, above the average of the Eurozone (see Table 1.3).

Indeed, there are different factors that can explain the evolution and increase of public debt in the last two decades in the Eurozone before the Covid-19, as finance and economic variables, such as the primary balance of the public sector, before

interest payment, the real economic growth and the interest rates. Other kinds of socioeconomic variables are *expectancy of life at birth* and *unemployment rate*. Another group of institutional factors related to good governance are democracy, policy stability, good regulation, government effectiveness, corruption indexes, and so on. In accordance with the previous assessment of public debt, it is important to introduce a dummy variable in order to test any possible structural changes since the sovereign debt crisis (2008–2012).

Table 1.3. European Public Debt Amid the Covid-19 Pandemic.

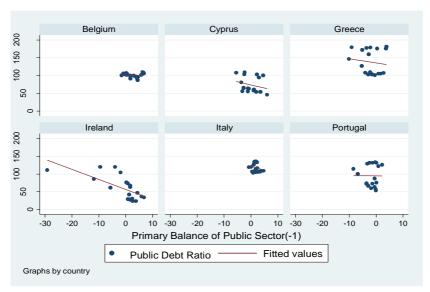
Country	2019	2020*	2021*
Italy	134.8	155.5	150.4
Portugal	117.6	135	128.5
Francia	98.5	115.4	116.4
Spain	95.5	113.4	114.6
Germany	59.8	68.7	65.6
Euro-zone	84.1	97.4	95.6

Source: International Monetary Fund; (\*) Projections.

However, there are other cumbersome explanatory factors associated with the financing of the public deficit; especially, in this monetary union, where explicitly it has been prohibited any monetization of the public debt. For instance, the high instability of the sovereign bond markets, because each governments are financing their public debts by issuing government debt securities in foreign currency, being almost impossible to guarantee bondholders fulfilment repayment (De Grauwe & Ji, 2019). This instability in the sovereign bond market is the outcome of the systemic problem in the Eurozone (De Grauwe, 2011), that can exacerbate the sovereign risk score or risk premium, which in turn increases the interest rate that the governments must to pay to the bondholders; exacerbating also moral hazard behavior of investors which is profoundly studied in the next chapter of this Ph.D. Thesis.

#### 1.2.4. Economic and Finance Variables

Even though HIDC countries are reported as having the highest public debt ratio since the 1990s, only Greece, Ireland and Slovenia have shown ratios of negative primary balance of public sector (deficits) smaller than -10; regarding GDP for some years, there have even been some outliers, such as Ireland with -30% in 2010. Meanwhile, Portugal, Cyprus and Spain have shown in some years, ratios between -5% and -9%. In this last group we can also include Finland, Slovakia, Latvia and Lithuania that kept up with ratios less than 60% in the same time period. It seems that there is not a strict negative relationship between public debt ratio with the lag of the primary balance in the HIDC; as we can see in the Figure 1.3. However, public debt is the result of consecutives negative primary balance (deficits) accumulations, as well as the interest payable for the accumulated public debt.



**Figure 1.3.** Primary balance of public sector (lag) and public debt ratio. Source: European Central Bank and World Bank.

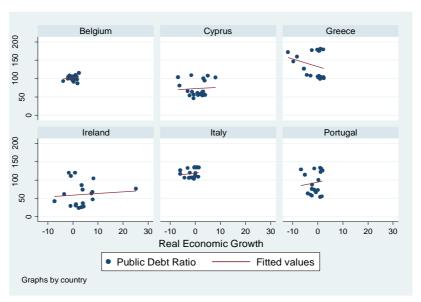
This public primary balance (*PSResult*) has been defined as the net public income, current income (taxes) after reducing the current public spending, without including

interest payment of the Public Debt (stock of sovereign bonds). There is a negative relationships between the first lag of the primary result of public sector (PSResult(-1)) and the public debt ratio  $(Debt_t)$  as illustrated in Figure 1.3. In accordance with the fitted value of the graph, there is not a homogeneous relationship in our so-called HIDC. While Greece, Ireland and Cyprus showed a negative relationship, other situations are not clear, such as Belgium and Italy, maybe because both countries had high public debts before the introduction of the Euro currency. Furthermore, Portugal also does not present any clear tendency.

Indeed, there are other factors that can explain the dynamics or evolution of the public debt ratio, as the real economic growth rate. From the annual percentage growth rate of GDP at market prices, based on constant local currency of U.S. Dollars for 2010 (World Bank, 2020), we have subtracted the annual inflation rate to get the real rate of change of economic growth. Usually, the real growth rate of the GDP has been stationary, at around 0%, however, we have some outliers such as Greece with less than 10% and Ireland with more than 20%.

Usually, it is expected that an increase of the real gross domestic product reduces the public debt ratio. Figure 1.4 depicts these relationships for the HIDC. It seems that only for the case of Greece we can see a negative relationship. For Belgium, it is not clear. Paradoxically, for Ireland, Italy, Cyprus and Portugal the relationship is positive; consequently, the positive real economic growth increases the studied ratio. These latter findings could be revealing the presence of some unsustainability signs; however, in the next section, we present a more robust econometric analysis of these relationships. Additionally, in the context of the Covid-19 pandemic, the effect of the expected negative economic growth rate will contribute to increasing the ratio. For the first quarter of 2020, the GDP growth rate of the Eurozone has

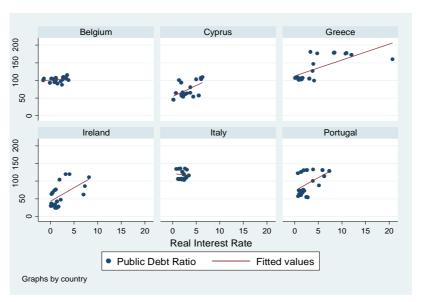
contracted by 3.6% in real terms; later, it has shrunk in the second quarter by more than 12%.



**Figure 1.4.** Real economic growth and public debt ratio. Source: European Central Bank and World Bank

In accordance with Escolano (2010), there is an important impact of the inflation rate on the public debt ratio, which should be negative because inflation can affect the real value of public debt. Consequently, we have considered implicitly as an explanatory variable the annual percentage change of the consumer price index. In accordance with Eurostat (European Commission) this is the Harmonized Index of Consumer Prices, which covers monetary expenditure on final consumption by residential and non-residential households in the economic territory of the Euro area. This inflation measure has remained relatively stable with a maximum of 10% in some countries. In accordance with our previous analysis, there is a negative impact of this variable on the public debt ratio.

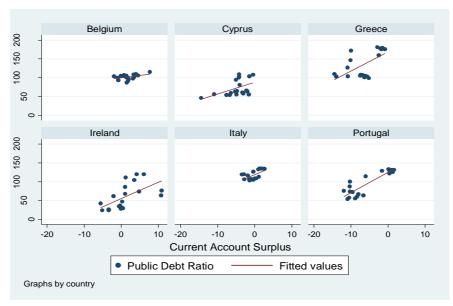
Furthermore, the inflation rate can increase the nominal interest rate, which will fully offset the erosion of the public debt due to inflation, since the latter reduces its real value (Escolano, 2010). In Figure 1.5, we can see the evolution of the real interest rate of the bonds for HIDC, which should have a positive and significant impact on the public debt ratio, because of the fact that increases the public debt service. It is noteworthy that in this figure we have used the long-term interest rate defined as being debt security issued, with 10-year maturity, denominated in Euro. The increasing relationship between the real interest rate and the public debt ratio is clear, except for Italy and Belgium.



**Figure 1.5.** Real interest rate and public debt ratio. Source: European Central Bank

Finally, Figure 1.6 shows that the current account balance of payment (Balance) maintains a positive relationship with the public debt ratio-GDP, i.e. a surplus in the Balance increases the public debt. It should be noted that some countries present outliers that can affect the econometric results; for instance, Cyprus and Greece

presented deficits around -14.5%. In accordance with international economics theory, an excessive domestic private spending in foreign goods and services may generate a deficit in this balance, which in turn can be financed with public deficit or sufficient excess of domestic saving (S) relative to national investment (I). However, as getting a domestic saving investment surplus could be cumbersome, public debt increases. The relationships for Belgium and Italy are not clear.



**Figure 1.6.** Current account surplus and public debt ratio. Source: World Bank

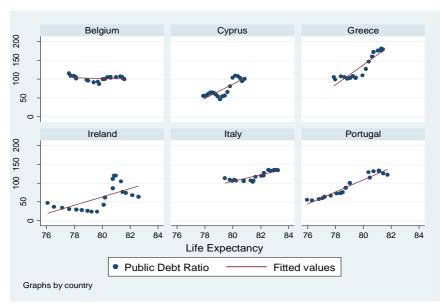
#### 1.2.5. Socioeconomic variables

Different authors have pointed out that the origins of the crises in the Eurozone are demographic, not only economic and/or institutional, demonstrating that Greece, Spain, Italy and Portugal have below-replacement birth rates, with particularly low rates in the Spanish and Portuguese cases; coincidentally, these countries also have some of the highest sovereign debts in Europe, with expensive pension regimens. Under current trends, a simultaneously ageing and shrinking population will lead

to a drop in tax revenue as workers retire and an increase in public expenditure as they draw pensions and resort increasingly, as the aged do, to public healthcare (Hansen and Gordon, 2014). Undoubtedly, this crisis has also been bolstered by the increase of life expectancy at birth.

In this way, another social variable that we should take into account to assess the accumulated public debt ratio is the life expectancy at birth (in total years). See Figure 1.7. This indicates the number of years that a newborn infant would live if prevailing patterns of mortality at the time of their birth were to stay the same throughout their life (World Bank Database, 2020). All these Euro countries have been increasing their life expectancy, reaching more than 80 years in the last decade, except Slovakia, Estonia, Latvia and Lithuania which are below 80 years; consequently, it is expected that governments spend more on public and social policies, pensions and health, in order to improve their life conditions, especially in the so-called welfare societies.

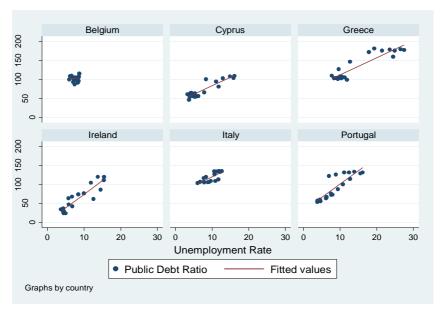
This behavior is also noted for Spain with a life expectancy at birth of more than 83 years, which coincidentally nowadays have become very damaged due to the Covid-19 pandemic, with the government being obligated to adopt different very costly measures for the public treasury. Furthermore, the North of Italy maintains a higher life expectancy of near 83. Other Euro countries with the highest index are Ireland, France, Malta and Luxembourg, with 82.6, 82.5, 82.3 and 80.1 years, respectively, in 2018. From Figure 1.7, it is also clear that an increase of life expectancy in Cyprus, Greece, Ireland, Italy and Portugal also increases the public debt. For Belgium, this evidence is not clear.



**Figure 1.7.** Life expectancy at birth and public debt ratio. Source: World Bank and United Nations

Another important socioeconomic variable that we should take into account to assess the evolution of the public debt ratio is the unemployment rate, because unemployed workers receive unemployment benefits in Euro countries (such as ERTES in Spain), among other social benefits. The social protection benefits are transfers, in cash or in kind, made to relieve households and individuals of the burden of one or more social risks or needs (Eurostat, 2020). Our unemployment rate data is derived from the European Union Labour Force Survey and supplementary national sources (Eurostat), based on the International Labor Organization definition (ILO, 2020). Coincidentally, HIDC have reached the highest unemployment rates; especially in the sovereign debt crisis period, with rates for Greece reaching above 20%, which in turn feeds back into social public spending.

Regarding the relationship between public debt and unemployment ratios, it is supposed that an increase in this rate increases also the public debt ratio (see Figure 8), due to the cost of unemployment insurance. The fitted line between both have a positive sign, corroborating this hypothesis. This evidence is more salient in Cyprus, Greece, Ireland, Italy and Portugal governments, whilst the Belgium case is undetermined.



**Figure 1.8.** Unemployment Rate and the Public debt Ratio. Source: European Central Bank

#### 1.2.6. Governance and Institutional Indicators

In order to comply with our aim, it is very important to assess how governance and institutional aspects can affect the action and manner of governing a state, which in turn affects their public debt evolution in the European Monetary Union; especially because there is not a Fiscal Union. These institutional aspects affect most of the countries; Southern European countries suffered from an institutional bias against structural market reforms. It is also fair to point out that for some authors the Euro

crisis has been also institutional, which has been proven to be woefully inadequate in heading off or in coping with the crisis, as well as the institutions having been too weak to create consensus to implement the right Euro reforms (Hansen and Gordon, 2014).

In this way, we have identified the Worldwide Governance Indicators (2020), which reflect the enforcement of institutions through which authority is exercised. These include six process indicators by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that governs economic and social interactions among them (World Bank). These six indicators are Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Control of Corruption and the Rule of Law. Finally, we will also test the Corruption Perception Index from International Transparency, a non-governmental organization (2020). In what follows, we define and explore the expected relationship of these variables with the public debt ratio.

Voice and Accountability. The two are very close; this indicator is related to democratic aspects, reflects the perceptions of the extent to which a country's citizens are able to participate in selecting autonomously their governments, as well as freedom of expression, freedom of association, and a free media, which in turn allow citizens to supervise the government behavior. It denotes a specific variety of power or capacity to engage someone in reason-giving to justify their behavior and/or the capacity to impose a penalty for poor performance (Goetz and Jenkins, 2002). Democracy is also refusing publicly corruption; it seems to represent a negative relationship between public debt ratio and the Voice and Accountability indicator. However, the cost of these related activities can affect positively the

public debt; indeed, these democratic activities and multiple social demands of citizens can force governments to increase their public debt.

Political Stability. In accordance with the worldwide definition, this indicator measures perceptions about the likelihood of political instability and politically motivated violence such as terrorism. Because Euro countries have not faced these kinds of problems, it is expected this indicator would not be significant. However, in other regions of the world the indicator has had a negative and significant impact, which in turn reflects on how political instability leads countries to increase the public debt ratio. On the contrary, a better perception of it reduces the public debt ratio (Tarek and Ahmed, 2013). Alternatively, we might say that there is political stability to the extent that members of society restrict themselves to the behavior patterns that fall within the limits imposed by political role expectations (Ake, 1975). We expected a negative relationship between public debt ratio and the Political Stability indicator.

Government Effectiveness. It reflects perceptions of the quality of public services and civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (WGI). In turn, this government effectiveness indicator is determined with different factors related with characteristics of public administration, organizational and political environment, economic development and income level (Garcia-Sanchez, et al., 2013). Better ranking in governance implies better quality of public services and public policy formulation, sound public finance and controlled fiscal deficit, which in turn could help to reduce the public debt ratio; therefore, we expect a negative relationship between both variables. However, for Middle East and North Africa (MENA) countries the coefficient of this indicator has been positive and significant (Tarek

and Ahmed, 2013). It is supposed that there would be negative relationship between public debt ratio and Government Effectiveness.

Regulatory Quality. It reflects perceptions of government abilities to formulate and implement sound policies and regulations that permit and promote private sector development, including new investment for domestic and international investors. In some studies, good regulatory quality has influenced negatively public debt (Tarek and Ahmed, 2013). The expected relationship between public debt and regulatory quality is negative. However, because of the fact that these activities can have some costs for the States, maybe this indicator can have some positive impact on the public debt ratio.

Control of Corruption. This indicator reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (WGI). It is supposed that better control of corruption can help to reduce the public debt ratio, because good perception can result in for getting rid of any bad projects and/or unnecessary government expenses, improving the perception results in reducing the ratio. However, these activities can also have costly public policies, regulations, supervision and controls; consequently, this induces an increasing of the ratio. In accordance with our previous analysis, there is evidence for a negative impact of Control of Corruption on the public debt ratio for most of the countries, with some exceptions (Ireland and Belgium).

Rule of Law. Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence (WGI). The rule of law is a concept that describes the supreme authority of the law over governmental action and individual behavior. It

corresponds to a situation where both the government and individuals are bounded by the law and comply with it. It is the antithesis of tyrannical or arbitrary rule (Valcke, 2012). In this way, it is expected that better Rule of Law can lead to good public finance; however, it has costs for governments compliance. It is supposed that good Rule of Law has a negative impact on the public debt ratio; however, for some specific countries the relationship is positive; it is not clear in other cases.

Corruption Perception Index. Last but not least, we are considering this indicator built by Transparency International (2020), which aggregates data from a number of different sources and provides perception by businesspeople and country experts of the level of corruption in the public sector. This index goes from 1 to 100. 100 being the best (no perception of corruption). So, the highest Corruption Perception Index shows countries with less or maybe almost inexistent corruption. For instance, Finland and the Netherlands have been ranked better in the Eurozone. In the cases of the so-called HIDC, Spain, Ireland and Portugal have showed better indexes; on the other hand, Italy and Greece showed the worst, with indexes below 60 for the period of analysis.

It is supposed that a low corruption perception index can increase the public debt cost, because this can increase the sovereign risk score, which in turn increases the interest rate. Additionally, low index perception could show the wrong use of public funds on unprofitable social projects, or maybe bailing out some private business and banks with political support. Last but not least, a low index could be due to a poor tax revenue collection, as in Ireland, Italy and Greece in the first decade 2000s. It is expected that there would be a negative relationship between public debt ratio and the Corruption Perception Index, i.e., better corruption perception by improving transparency the less public debt ratio; however, the elasticity is different for each country.

After this qualitative ex ante assessment, we expected some relationship among these possible explanatory variables and the public debt ratio, shown in Table 1.4. Some of them have a positive relationship and others negative. The former is because it can help to increase the public debt ratio, such as the interest rate, life expectancy at birth, or unemployment, and the other group has a negative impact such as economic growth, government effectiveness, because an increase can help to reduce the public finance studied ratio.

Table 1.4. Expected Relationship Regarding the Public Debt Ratio.

Explanatory variable	Expected sign/relationship		
Primary Result of Public Sector	Negative		
Real Economic Growth	Negative		
Consumer Price Index	Negative		
Interest rate	Positive		
Current Account Balance	Negative		
Life Expectancy at Birth	Positive		
Unemployment rate	Positive		
Voice and Accountability	Positive		
Political Stability	Negative		
Government Effectiveness	Negative		
Regulatory Quality	Negative		
Control of Corruption	Negative		
Rule of Law	Negative		
Corruption Perception	Negative		

Source: Own elaboration

#### 1.2.7. Instrumental variables

Finally, in accordance with our econometric method, we include as instrumental variables the revenues and the public spending on healthcare and the military. Public health spending estimates the current health expenditures, including healthcare goods and services consumed during each year. This indicator does not include capital health expenditures such as buildings, machinery, information

technologies and stocks of vaccines for emergency or outbreaks. The military expenditures data, from the Stockholm Military International Peace Institute (SIPRI) is derived from the North Atlantic Organization (NATO). It includes current and capital expenditures on the armed and peacekeeping forces; defense ministries, defense projects agencies; paramilitary forces, if these are judged to be trained and equipped for military operations; and military space activities, including military and civil personnel, retirement pensions and social services for military personnel; operation and maintenance; procurement; military research and development. It also considers military aid.

## 1.3. Empirical analysis

#### 1.3.1. Theoretic Model and Estimation Methodology

In accordance with Escolano (2010), there is a dynamic relation between primary balance ( $p_t$ ) and public debt ( $d_t$ ), because the main recursive equation governing the dynamics of the debt ratio is

$$d_t = (1 + \lambda_t)d_{t-1} - p_t \tag{1}$$

where  $\lambda_t = \frac{r_t - g_t}{1 + g_t}$ , with  $r_t$  and  $g_t$  being real interest and the GDP growth rate in period t, respectively.

Other authors as Aldama and Creel (2019) used the following fiscal rule

$$p_t = a + \gamma d_{t-1} + a_x x_t + a_g s_t + u_t, \tag{2}$$

to assess the sustainability of the USA Public debt, where  $p_t$  is the primary surplusratio-GDP,  $d_{t-1}$  is the public debt ratio by the end-of-last period,  $x_t$  is the output gap and  $s_t$  is the cyclical real public spending. This simple linear fiscal policy rule generally displays auto-correlation; therefore, it estimates a model with first-order autoregressive residuals:  $u_t = (1 - \rho L)^{-1} \varepsilon_t$ , with  $\varepsilon_t$  representing white noise. Furthermore, Chalk and Hemming (2000), following the same theoretic structure, established this static budget constraint to study the sustainability of the public debt:

$$d_{t+1} = (1+r_t)d_t + p_t (3)$$

where  $d_t$  is the Government Debt Securities (Bonds) in the beginning t,  $p_t$  the Primary Balance (Fiscal Deficit, excluding the interest payment) and  $(1+r_t)$  the discounted factor between the present (t) and the future (t+1).

Sustainability implies that sum of future primary surplus ( $p_t$ <0) values exceeds the present value of future primary deficit ( $p_t$ ). This must be in a sufficient value that covers the difference between initial debt stock ( $d_t$ ) plus the present value of the terminal ( $T\rightarrow\infty$ ) debt stock ( $d_{t+T+1}$ ), in the infinity period. It must also hold the following intertemporal budget constraint:

$$d_{t} = -\sum_{j=0}^{\infty} R(t, t+j)^{-1} d_{t+j} + \lim_{T \to \infty} R(t, t+T)^{-1} d_{t+T+1}, \tag{4}$$

where R represents the factor of discounts between t and t+j; as well as t and t+T.

Because sustainability implies no Ponzi game (governments must not have accumulated any debts by the end), it must be maintained that

$$\lim_{T \to \infty} R(t, t+T)^{-1} d_{t+T+1} \le 0.$$
 (5)

Consequently, a sustainable fiscal policy should comply the follow dynamic structure for the public debt:

$$d_t = -\sum_{j=0}^{\infty} R(t, t+j)^{-1} d_{t+j}$$
 (6)

For this purpose, the thesis studied the evolution of the logarithm of public debt ratio (*LDebt*) in terms of a (stationary) first order autoregressive process (AR(1)) that depends on the primary balance of public sector (*PSResult*) and other variables: the economic real growth rate (*Growth*), the log run interest rates (*Rate*) and the

current account surplus (*Balance*) as main economic determinants. In addition, the Ph.D. Thesis includes other socioeconomic and institutional factors, such as the life expectancy at birth (*Life*), the unemployment rate (*Unemployment*), and four governance indicators: Voice and Accountability (*Democracy*), Government Effectiveness (*Government*), Corruption Perception Index (*Corruption*) and Control of Corruption (*Control*).

The election of these explanatory variables is based on the intertemporal government budget constraints (IBC). The problem of public debt finance from the intertemporal government debt has been comprehensively studied also by Bajo, Díaz and Esteve (2006, 2008, 2009 and 2010) and many other references therein. In this line, the main economic factors that explain the public debt evolution considered in this chapter are expressed in the follow dynamic economic relationship:

$$LDebt_{it} = \beta_0 + \beta_1 LDebt_{it-1} + \beta_2 Growth_{it} + \beta_3 Rate_{it} + \beta_4 Balance_{it} + \beta_5 PSResult_{it-1}$$

$$+ \beta_6 Life_{it} + \beta_7 Unemployment_{it} + \beta_8 Democracy_{it} + \beta_9 Government_{it}$$

$$+ \beta_{10} Corruption_{it} + \beta_{11} Control_{it} + \alpha_i + \varepsilon_{it},$$

$$(7)$$

where  $\alpha_i$  captures the idiosyncratic effects for every High Indebted Euro Country.

The main objective of this chapter is to provide a panel data model that allows to explain the main determinants of the public debt in the Eurozone, since their conformation, including the last sovereign debt crisis. Panel data models were derived for optimally exploiting the cross-section and time-series structure of the data, as well as controlling for unobserved heterogeneity. These issues are intrinsic in our study, where not all governments take actions in the same way, even though they share the same observable characteristics; therefore, we should contemplate unobservable latent effects, specific characteristics for each country and general constant at the time of assessment. Under possible correlations between latent

effects and explanatory variables, the ordinary least squares (OLS) method reports inconsistent estimators. Moreover, both fixed and random effects regressions produce biased estimations when the model presents dynamic relations. These are the endogeneity problems inherent to panel data, namely, unobserved heterogeneity, simultaneity or dynamic endogeneity, see Ullah et al. (2018), for a comprehensive description on the methods to deal with all these endogeneity sources. Particularly, the generalized method of moments (GMM) allows dealing with all these problems by removing endogeneity with first-differencing of the model and using lagged values of the variables as valid instruments. This procedure also presents some limitations since it produces first-order autocorrelation that should be taken into account and presents potential losses of observations in incomplete panels. This latter problem is solved with two-step GMM (i.e., forward orthogonal deviations), which is implemented in System GMM estimation.

In this way, the models in Equation (7) are estimated with a panel-composed data from the Eurozone nineteen (19) countries, spanning over the period between 1999 and 2018. This data panel satisfies the assumptions derived by Roodman (2009) to implement GMM estimation: regressors that are endogenously determined, dynamic relationships, idiosyncratic disturbances uncorrelated across countries, potential regressors not strictly exogenous, panels with a long cross section. In order to achieve consistent estimations, we applied four variants of the general method of moments (GMM): Two types of System GMM and two stages least squares (2SLS) with clusters. System GMM eliminates the potential sources of omitted variables bias, controlling for the endogeneity problem by considering the lagged level variables as instruments of the variables in the difference equation (Arellano and Bover, 1990); (Blundell and Bond, 1998). Cluster analysis attempts to determine the natural groupings (or clusters) of observations by countries and fits linear

models where one or more of the regressors are endogenously determined with GMM to correct the heterogeneity problems of residuals. Furthermore, the 2SLS estimation accounts for potential endogeneity problems from Primary Balance of Public Sector (*PSResult*), using total current revenues, health and military expenditures as instrumental variables.

#### 1.3.2. Econometric results

Table 1.5 displays the best model specifications after testing many other alternatives with different explanatory variables. The models consider all nineteen (19) Euro countries, and different explanatory variables as *control of corruption*, which resulted significantly in the first and third regressions. On the contrary, when we included *corruption perception* as explanatory variables in the second and fourth regressions, it did not result as significant to explaining the behavior of the dependent variable  $LDeb_t$ . All of them are also controlled by the particular impact of the sovereign debt crisis with a dummy  $(SDC_p)$ , that scores 1 in the period 2008–2018 and zero in the rest of the sample.

The System GMM estimations present the typical autocorrelation pattern in the first difference estimation autocorrelation AR(1) and absence of second order autocorrelation AR(2). Furthermore, Sargan and Hansen tests support the validity of the instruments of the procedure. It is also worth noting that *p*-values in Table 1.5 correspond to 'robust' estimations for standard errors, i.e., consistent with heteroskedasticity and autocorrelation corrections. The results from System GMM 1 and Instrumentalized GMM-Cluster 1 regressions seem to be robust with the estimation method. In particular, the coefficients are significant, they maintained their sign, and some of them are very similar, including the Control of Corruption (*Control*), which reflects the consistency of our estimations.

**Table 1.5.** Estimations for the Logarithm of Public debt Ratio ( $LDeb_{it}$ ).

Explanatory	System	System	Instrument.	Instrument.	
Factors	GMM 1	IM 1 GMM 2 GMM-Clust		er 1 GMM-Cluster 2	
Intercept	-0.7825	-0.6527	-0.6632	-0.6791	
(p-value)	(0.073)	(0.102)	(0.024)	(0.032)	
LDebt(-1)	0.9098	0.9265	0.9175	0.9301	
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	
Growth	-0.0078	-0.0079	-0.0072	-0.0075	
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	
LRate	0.0196	0.0210	0.0243	0.0225	
(p-value)	(0.014)	(0.021)	(0.003)	(0.006)	
Balance	0.0013	0.0011	0.0012	0.0011	
(p-value)	(0.070)	(0.132)	(0.083)	(0.073)	
PSResult(-1)	-0.0028	-0.0030	-0.0030	-0.0050	
(p-value)	(0.000)	(0.000)	(0.016)	(0.003)	
LUnemployment	0.0369	0.0309	0.0302	0.0142	
(p-value)	(0.032)	(0.045)	(0.013)	(0.418)	
Llife	0.4827	0.3952	0.4125	0.4161	
(p-value)	(0.045)	(0.071)	(0.014)	(0.021)	
dLDemocracy	0.3384	0.3066	0.3939	0.4051	
(p-value)	(0.017)	(0.033)	(0.024)	(0.040)	
Government	-0.0012	-0.0003	-0.0010	-0.0004	
(p-value)	(0.009)	(0.308)	(0.002)	(0.164)	
Control	0.0009		0.0008	-,-	
(p-value)	(0.014)	-,-	(0.000)		
Corruption		0.0002		0.0002	
(p-value)		(0.344)	-,-	(0.169)	
SDC(2008-2018)	0.0268	0.0243	0.0268	0.0221	
(p-value)	(0.002)	(0.002)	(0.000)	(0.001)	
ArellBond AR(1)	-2.49	-2.40	-,-	-,-	
(p-value)	(0.013)	(0.016)			
ArellBond AR(2)	1.19	1.27			
(p-value)	0.233	(0.205)			
Sargan	276.80	277.35			
(p-value)	(0.189)	(0.161)		-,-	
Hansen	1.53	1.22			
(p-value)	(1.000)	(1.000)		-,-	

The table includes panel data regressions estimated by System GMM (columns 1 and 2) and Instrumentalized Cluster (columns 3 and 4). *LDebt(-1)*: First lag of the logarithm of public debt-GDP ratio; *Growth*: real economic growth rate; *LRate*: logarithm of nominal interest rate of bonds with maturity at 10 years; *Balance*: current account of balance of payments-GDP ratio; *PSResult(-1)*: First lag of primary result of public sector budget-GDP ratio; *LUnemployment*: logarithm of the unemployment rate; *LLife*: logarithm of the life

expectancy at birth; *dLDemocracy*: logarithm-difference of the Voice and Accountability indicator; *Government*: Government Effectiveness indicator; *Control*: Control of Corruption indicator; *Corruption*: Corruption Perception Index; *SDC*: Dummy variable for all Euro countries scoring 1 during and after the sovereign debt crisis (2009-2018) and 0 otherwise. *p*-values for statistics robust to heteroscedasticity in parentheses.

#### 1.3.3. Economic and finance explanatory variables

As we expected, the lag of the dependent variable, LDebt(-1), has a positive and significant effect on the dependent variable LDebt, which has proven the dynamic nature of public debt accumulation. The lagged public debt also influences on the current level. In this process the Primary Balance of Public Sector (PSResult), has a determinant role in the public debt. Particularly, we found significant evidence of a strictly negative feedback effect of the lagged primary fiscal balance (PSResult(-1)) on the public debt. Therefore, a positive result (surplus) decreases the ratio; and viceversa a negative lag of primary balance results (deficit) increases the logarithm of the accumulated public debt ratio; in both cases as a percentage of the GDP. This is because the public debt is linked to the results of the public sector; similarly, the external debt is linked to the evolution of the primary current account balance (Wyplosz, 2005).

It is also fair to point out that we use as an explanatory variable the lag of the primary result of public sector (PSResult(-1)) in order to avoid the endogeneity problem between contemporaneous values of this variable and the public debt (LDebt), because of limitations of outside instruments. Furthermore, this natural instrument contains information on the current value of the variable as there is, frequently, a delay between the decision made by individuals and its actual realization (Pindado et al., 2014). Even though there is not a homogeneous relationship between the  $PSResult_t$  and the public debt ratio for each country (for some it is positive, for others negative, or it is not clear, see Figure 1.3), in

accordance with our econometric estimations, on average the relationship is negative, as we expected (see Table 1.4). Consequently, a positive point percent increasing in the *PSResult(-1)* leads to a reduction of the public debt ratio by about 0.28–0.30%, keeping the other explanatory variables. The *PSResult* represents the policy fiscal of each country, the difference between tax collection and public current spending. It does not include the interest payable.

While the real economic growth rate has a significant and negative impact, a positive economic growth rate reduces the public debt ratio. Furthermore, the GDP is the denominator of this ratio. Therefore, a one percent point of economic growth increases, allowing to reduce about 0.78–0.72% the public debt ratio. On the other hand, the logarithm of the bond (nominal) interest rate has a positive and significant impact; therefore, an increase of the bond cost for the government by one percent point increases also the studied ratio by about 0.020–0.024%, keeping the other explanatory variables. In this way, policy makers should have to respond to the changing conditions in their tax base (economic growth) and the cost of finance or interest rate (Collignon, 2012); especially, nowadays, as it is very low after huge quantitative easing adopted by the European Central Bank to buy public debt (and corporation debt) during the Covid-19 pandemic.

However, the nominal interest rate of the bonds (*LRate*) is sensitive; when we have introduced the Sovereign Risk Score as an explicit explanatory variable, the significance of the nominal interest rate is notably reduced. This could be because the interest rate implicitly incorporated the Sovereign Risk Score; when it increases, so does the interest rate. Therefore, by keeping it out we have eliminated collinearity. It is also fair to point out that in the analysis we have proved to control by the real interest rate, without inflation, which is also positive but not significant according to the results, to explain the evolution of the public debt ratio.

Regarding the international finance variables, the coefficient of the Current Account (Balance of Payment) as a percentage of the GDP (*Balance*), the impact on the studied ratio is positive and significant. This indicator provides us with information about goods, services and other primary transactions, excluding the financial transactions of each Euro country resident regarding the rest of the world. Therefore, in accordance with this econometric result, a point increases in the *Balance* also increases the public debt ratio by 0.12–0.13 percent, keeping the other explanatory variables; consequently, a surplus of the *Balance* would lead Euro countries to increase their public debt ratio. It could be interpreted/inferred that a current account surplus (*Balance*>0), i.e., the accumulation of Eurozone resident investments abroad, is also indirectly financed with public debt.

#### 1.3.4. Socioeconomic variables

Unemployment rate and Life expectancy at birth. The logarithm of unemployment rate (*LUnemployment*) and the logarithm of the life expectancy at birth (*Llife*) have positive and significant effects on this public debt ratio, keeping the other explanatory variables constant. Undoubtedly, unemployment insurance is another cost that Euro governments are faced with and has also been used as a macroeconomic political instrument to boost the economy. One-point increases of unemployment, also increases the studied ratio by 0.037, retaining the other explanatory variables. Naturally, both imply public spending that affects negatively the stock of capital and the real economy growth in the long run, in accordance with Barro (1998).

Different discussions around unemployment insurance schemes have said in some countries they are more generous and/or more effective than others, and recommended that they should be built in a homogeneous way in the European

Economic and Monetary Union. Furthermore, the divergence in unemployment rates experienced in the aftermath of the Great Depression (1929) reinforces the idea of a common stabilization mechanism. In this way, implicit unemployment insurance has also been considered as an ideal solution for an anti-cyclical expenditure mechanism (Beblavý, 2017).

As far as the coefficient of Expectancy Life at Birth is concerned, the effect is positive and significant, which means that an increase of life expectancy in one year also increases the studied fiscal ratio by about 0.48 (half point, approximated). There are different possible explanations: this leads governments to increase their public pensions and prevention systems funds in order to finance the future long life of European citizens, as well as the public health system prevention to take care old people (as residences for the elderly). For instance, Spain and Italy are inhabited by people with the highest longevity in the world, after Japan; recently, Spain passed the law of Minimum Vital Income.

#### 1.3.5. Institutional Quality Indicators

The six Worldwide Governance Indicators tested in our econometric models have different impacts on the public debt ratio. Only three of them appeared to be significant: Voice and Accountability (Democracy), Government Effectiveness (Government) and Control of Corruption (Control). The first two resulted as the expected effect (relationship). The first logarithm-difference of Voice and Accountability (dLDemocracy) is significant and positive, showing that an exchange rate increase of the Voice and Accountability indicator has a positive impact on the studied ratio, because of the fact that these democratic related activities allowed citizens to get public finance support for necessary social and productive projects to be developed by the government, which in turn puts pressure

on the public debt ratio. Additionally, this result can be interpreted as an improvement of institutions in assuming responsibilities and accepting consequences for their decisions, forcing Euro states to increase their public debt because of their cost.

On the other hand, the relationship between the Government Effectiveness (*Government*) indicator and public debt ratio is negative and significant. This means that better public services perception, good public planning and public policy formulation quality improvements lead to better public finance, which in turns contributes to reducing the public debt ratio, as we expected. A one-point increase of the Government Effectiveness indicator (*Government*) causes a reduction of about 0.12 point of the studied public debt ratio in the Eurozone, when keeping the other explanatory variables.

The Control of Corruption (*Control*) from the WGI requires special attention. Its coefficient is positive and significant (first column), as well as in our instrumentalized GMM cluster model (third column). Consequently, an increase in this indicator, due to improvements in control of corruption mechanisms, also increases the public debt ratio, which seems to be paradoxical. These findings show that improvements of control of corruption have influenced positively the ratio. On the other hand, when we tested the Corruption Perception Index (*Corruption*) built by the Transparency International non-governmental organization, its coefficient was not significant to explaining the evolution of the public debt ratio logarithm in the GMM-2 model (second column) and also in the case of GMM Cluster-2 model (fourth column).

Undoubtedly, it seems irrelevant to consider both variables *Control* and *Corruption* at the same time because they are highly correlated. Indeed, the second index included implicitly the Government Effectiveness. These possible nonlinear

relationships were also assessed in our econometric estimations by including multiplicative effects between some institutional indicators, such as Government Effectiveness × Control of Corruption, as well as the Government Effectiveness × Corruption Perception; however, both new variables failed to produce any significant coefficient (or impact on the Public Debt), both in level and in logarithm.

These results can be caused by this indicator, which could measure also the ratio of "public debt financing capacity"; that is, the less corrupt a country is perceived to be because of improving controls against it, the more it can finance itself through debt (maybe the cost of financing is lowering). For this reason, countries that are perceived as not being very corrupt can resort to this resource more by increasing their public debt ratio. Furthermore, this could mean that public activities to improve the perception about corruption have important costs to such an extent that it increases the public debt ratio. On the other hand, when the index is reduced, as the perception of corruption worsens, the ratio reduces in parallel.

The results are also similar to research findings for other regions. For instance, for the Middle East and North of Africa (MENA), the impact of this WGI have also been positive and significant. The estimated long-run effects of Tarek and Ahmed (2013) suggested that one-unit point increases in the Control of Corruption indicator leads to an increase of approximately 0.006% in the public debt ratio. For these authors, this can support "the romantic view of corruption", whereby a smaller corruption control indicator could improve businesses and boost economy growth when institutions and bureaucracy are ineffective; consequently, public debt ratio would also decrease. On the contrary, higher control of corruption can reduce GDP and increase public debt ratio.

In other studies, such as Kim et al. (2017), the interaction between public debt and corruption is a statistically significant variable to explain economic growth, which

reinforced the hypothesis that the marginal effects of public debt on economic growth are a function of corruption. Even if the threshold differentiating the sign of the marginal effect is dependent upon the models selected, the authors concluded that in the case of a highly transparent (low corruption) country, public debt enhances economic growth and vice versa. The authors concluded that the institutional quality of better corruption perception can play a very important role in determining the effects of public debt policies. Finally, in our Euro panel data analysis, the other three World Governance Indicators (Political Stability, Regulatory Quality and the Rule of Law) were not significant to explain the evolution of the public debt ratio since the inception of the Euro.

#### 1.3.6. Sovereign debt crisis (2008–2012)

Last but not least, for our research aim it is very important to test the effect of the sovereign debt crisis (2008–2012) on the evolution of the public debt ratio. Therefore, when we tested the dummy of transitory changes (SDC<sub>t</sub>) caused by it; this has been proven to be statistically not significant. However, when we tested the dummy of structural changes (SDC<sub>p</sub>), permanent changes, where SDC = 1 for observations 2008–2018, otherwise 0 (for observation 1999–2008), this has resulted been significant and positive. This approach is equivalent to a Chow test for the model intercept. The dummy variable approach has distinct advantages, as it does not only tell if the two subperiods are different but also may pinpoint the source(s) of the difference—whether it is due to the intercept or the slope or both (Gujarati, 2008).

#### 1.3.7. Elasticities and possible collinearity

To sum up, in accordance with our econometric results, because of the fact that in average the real economic growth (Growth>0) and the lagged positive fiscal

balance (*PSResult*(-1)>0) led to reducing the logarithm of the public debt ratio in Euro countries, the sum of their impacts should be greater than the aggregated impacts of the nominal interest rate (*LRate*), logarithm life expectancy at birth (*LLife*) and the logarithm of unemployment rate (*LUnemployment*), ceteris paribus, in order to get a sustainable public debt ratio in the long run. Furthermore, it is important to recall that the final effect also depends on specific country effects, since the social reality, labor markets, structural economy and productivity for each Euro country can be very different from others. However, this unobserved heterogeneity has been controlled by the panel data approach. In the Table 1.6, we have summarized the public debt-GDP ratio elasticities regarding the different explanatory factors.

Table 1.6. Short-Run and Long-Run Elasticities Regarding the Public debt.

Tim	Grow				Unemploym					SD
e	th	e	ce	-1)	ent	e	cy	ent	ol	C
Sr	-0.78	0.0 2	0.13	-0.28	0.04	0.4 8	0.0034	-0.12	0.09	2.68
Lr	-8.65	0.2 2	1.44	-3.10	0.44	5.3 5	0.0377	-1.33	0.998	29.7 1

Sr: Short run.; Lr: Long run.

Finally, we assessed any possible multicollinearity between the explanatory variables, especially among the institutional indicators, by estimating the correlations matrix of them. It seems that only there is possible collinearity between "Government Effectiveness" and "Control of Corruption", as well as among "Government Effectiveness" and "Corruption Perception". It could be because the better effectiveness of the government leads also to reducing corruption by controlling it, increasing the indicator of control of corruption value (or maybe the corruption perception index). Vice versa, a higher control of the corruption indicator leads to improving the perception of the quality of public and civil services and the quality of policy formulation and implementation. However, in order to

illustrate better the explanatory factors' behavior, we have decided to maintain both on the right-hand side of our estimated models.

#### 1.4. Discussion amid the Covid-19 pandemic

The Covid-19 pandemic health crisis is definitely changing the way of making public finance and other public policies in the Eurozone, not only to track their finance and institutional factors, but also the social security and healthcare systems. It is well known how the expectancy of life at birth has been increasing in the Eurozone countries in the last decade, which in turn affects social expenditure, such as healthcare, retirement pensions and nursing homes. Indeed, the public health spending on innovation, research and development (R&D) to prevent any future illness and pandemics will determine also the path of public finance. Additionally, it is a necessary condition to improve salary and labor conditions for healthcare staff at different levels. Therefore, it is important to assess the current determinants of the public debt to have more elements of judgment for a major sustainability assessment of public debt amid the Covid-19 pandemic.

In accordance with our econometric assessment, a point increase in the real economic growth rate reduces by more than half point the public debt ratio. In this way, the Eurozone economic growth is projected to evolve for 2020, 2021 and 2022 by -8.7%, 5.2%, and 3.3%, respectively. It implies that the Eurozone will increase its public debt ratio by about 6% on average for 2020. However, the contraction of economy activities for some countries will be higher than the average because of detrimental impact of the Covid-19 pandemic, their weak public health systems, such as Spain and Italy, regarding core European Union health systems (Germany). Additionally, the results depend on any possible outbreaks of Covid-19 infections, as we should see after the end of the quarantine, the earlier implementation of a

vaccine, the country's capacity of recovery based on healthcare implementation measures and other exogenous factors. It is also fair to point out that Eurozone economy activities have been showing some important recoveries since July, 2020, some weeks after finishing quarantine and social immobilizations adopted since March, 2020.

Our econometric results have also confirmed the positive relationship between interest rate and public debt ratio; a one-point increase of interest rate increases also the public debt ratio by about 0.21–0.20%. In the current context of low interest rates, this financial variable will not be the major determinant of the ratio increasing; however, we should pay especial attention in these current conditions to allow getting enormous indebtedness with very low interest rate. In the future, this situation can be reversed and increase the service cost of the public debt causing a stumble in Euro countries; especially, in the context of the board of the European Central Bank having increased the monetary stimulus (quantitative easing) and the volume of Pandemic Emergency Purchase Program (PEPP).

Let us remember, firstly, that the European Central Bank passed a PEPP for  $\[mathebox{\ensuremath{$\in$}}750$  billion (in the middle of March, 2020), to buy private and public sector debt securities up to the end of the year 2020. After that, it increased by  $\[mathebox{\ensuremath{$\in$}}600$  billion (starting June, 2020) and has been extended up to June, 2021. In accordance with the European Central Bank, it has bought debt of  $\[mathebox{\ensuremath{$\in$}}33,058$  million.  $\[mathebox{\ensuremath{$\in$}}28,248$  is associated with the PEPP. By the end of the first half of 2020, it has used  $\[mathebox{\ensuremath{$\in$}}15,508$  million, from the total  $\[mathebox{\ensuremath{$\in$}}1.35$  billion approved. Buying with the rest of the programs has reached  $\[mathebox{\ensuremath{$\in$}}4,810$  million:  $\[mathebox{\ensuremath{$\in$}}2,883$  million public debt and  $\[mathebox{\ensuremath{$\in$}}1,927$  million in business debt. The European Central Bank also bought corporation bonds from 10 new businesses in the first half of 2020.

Our empirical model shows that a point increase in unemployment rate also increases the public debt ratio between 0.10% and 0.12%. Therefore, after 2–3 months of obligated quarantines and generalized reduction of mobility, the unemployment rate has increased by about 10%, which has also supported an increase in the public debt ratio, especially in the most damaged countries (Spain, Italy and France). Public spending on unemployment benefits is also expected to increase, e.g. ERTES and the minimum income implemented by Spanish government in March and June, 2020, respectively, to mitigate the adverse effects and family income reduction caused by the pandemic.

Furthermore, later, the Spanish Minister of Labor announced the revision of ERTES legislation to improve it, in favor of weak and unemployed workers. Consequently, Spain will be the new HIDC in accordance with our operational definition, with public debt ratio of over 100% for the forthcoming years. Spanish public debt has increased by around €22,500 million in March, 2020, reaching 98% of the GDP; later it surpassed the 100%, by the end of the first half-year 2020. It is projected to reach about 115% of the GDP, by the end of the year 2020.

In the case of Italy, after the public debt ratio reached 134.8% in 2019, the second highest in the European Union, it has soared around 158.9% after the current pandemic, in the first half of 2020, and it will hit almost 160% by the end of 2020. This will be the highest rate since World War II. It is expected to decrease slightly for 2021, if the Covid-19 pandemic will not see another outbreak. These estimations also have originated because of the predicted shrinking of the economy of about 10–12% for 2020, regarding the last year. The European Union has made these predictions, highlighting the longer-term impact of coronavirus lockdown measures on the Eurozone states worst hit by the epidemic.

In the case of France, the second biggest Eurozone country, its economy will be shrunk severely due to Covid-19. Up to May 2020, less than a third of its working capacity was being used. In the first quarter of 2020, its economy contracted by nearly 5.8%, from the previous three months. It is projected that the GDP will shrink by 10–12% for 2020, which in turn will lead abruptly to an increase in its public debt ratio, reaching 115% of GDP by the end of 2020, after finishing at 98% the previous year (2019). The French government has estimated a package cost of €100 billion because of Covid-19.

Unfortunately, the contraction of the Spanish economy for the second quarter of 2020 reached 18.5%. France's contraction in the same period was 13.8%, the Italian contraction was 12.4%; and in the case of Germany, 10.1%. Lesser economies such as Portugal shrank by 16.5% in the same period. On average, the Eurozone economy is expected to shrink by more than 12% in the second quarter of 2020. Up to the first half of 2020, the Spanish economy shrank by about 22.1%, as the most damaged Euro country. These results led to the poor recovery of employment in the Eurozone in accordance with official statistics of July, 2020. This reduction of hiring new workers has also been caused by the digitalization of economy activities, such as e-commerce, e-government, remote jobs, online applications, etc. Up to June, 2020 the Euro area's seasonal unemployment rate reached 7.8%.

Regarding the life expectancy at birth, the short-run flexibility obtained is positive as we expected (see Table 1.6), about half-percent point, which in turn, with one more year of life expectancy, contributes to increasing the ratio up to a fourth-point percent in the Eurozone. A high public debt ratio can also result from poor institutional and governance indicators. For instance, the flexibility of the public debt ratio regarding government effectiveness has been -0.12; consequently, an improvement of this indicator by one point can help to slightly reduce the public

debt ratio. Therefore, it could be recommendable to make different arrangements in the public sector to improve the effectiveness of the government.

As we expected, in our model, the relationship of public debt ratio with the lagged primary balance result of public sector (PSResult(-1)) is negative, which means that a deficit will also increase the studied ratio. In this vein, different financial support (subsidies) has been introduced to help keep alive some industries, such as touristic and automobile industries, adopted by the Spanish government and other European countries, with the aim to help recover these industries, which is going to increase the primary deficit to such an extent that in accordance with European Central Bank it would affect the public debt ratio up to 115-120%. Depending on economy recovery and also some outbreaks of Covid-19 that force some cities to return to confinement.

However, in the current pandemic and with its adverse effects, some Euro economies have been registering a deflation of the consumer prices index, due to the fact that international oil prices have reduced. This has been caused by quarantines of more than two months in different European and industrialized countries, and consequently by their industrial contraction. Furthermore, because of maximum reduction of people's mobility and transportation dictated by medical and scientific specialists, different kinds of vehicles (for earth, air and maritime transportation) did not consume any oil. This can help to increase the public debt ratio, in accordance with the expected relationship between the consumer price index and the public debt ratio (Table 1.4).

Finally, one of the last measures adopted in the Special European Council, 17–21 July 2020 (European Commission, 2020), passed a Covid-19 pandemic recovery package and the budget for 2021–2027 for the 27 European countries, including the Eurozone. This is after the Commission presented, at the end of May, 2020, a very

wide-ranging package combining the future Multiannual Financial Framework (MFF) and a specific recovery effort under Next Generation EU (NGEU). Undoubtedly, this could be a clear signal to move toward the necessary "fiscal union". Furthermore, the compromised green, digital and social public policies should be adopted in order to receive financial support, including the 19 Eurozone countries. The fund will help to finance the green and digital transition in European Union, computing, artificial intelligence and cybersecurity. The future public finance articles and working papers should also be concentrated on its sustainability after the Covid-19 pandemic.

#### 1.5. Conclusions

To assess the evolution of the Eurozone public debts, we have identified three groups of explanatory variables: financial, social and institutional (governance). The overall impacts seem to be in accordance with what was expected, and also according to economic theories. However, different variables tested, were not significant. We have interpreted this coherent modeling as evidence showing that, apparently, on average the public debt ratios have been sustainable before starting the Covid-19 pandemic, we have found the expected relationships.

However, it is recommended to assess sustainability amid Covid-19 pandemic context that leads to an abrupt increase in the public debt ratios of Euro countries; especially, Spain, Italy and France, the most damaged countries, in accordance with different projections (by the European Central Bank and International Monetary Fund). They were the most affected early on, with the first and second waves, adopting drastic policies such as strict quarantines, stopping their touristic activities by closing international borders, drastically reduced of mobility, industrial activities and transportation services.

It is very important to reform pension systems, not only by implementing more homogeneous, but also more sustainable ones in accordance with the increasing of life expectancy at birth and market mechanisms. The positive and significant relationship between this indicator and the public debt ratio is clear, in different econometric models. After establishing a personal capitalized pension account (individually funded), some countries decided to privatize their pension system, such as some Latin American countries have done. Others have fixed a minimum government-backed pension for retired workers to promote the private participation of pension funds management. Furthermore, governance or institutional factors are also relevant in explaining the evolution of the public debt ratio.

High public debt ratio makes Euro governments very vulnerable to exogenous adverse shocks. These shocks include future drops in terms of trade, increases in the international interest rate, new pandemics, outbreaks of the current Covid-19 pandemic, etc., and may even cause a public debt financial crisis again. We know that international markets are susceptible to government over-indebtedness because of the Eurozone sovereign debt crisis in the 2000s, experiences of the Southeast Asian financial crisis in the 1990s and the Latin American debt crisis of the 1980s, which suffered compelling GDP contractions of two digits.

In the context of a new (re-negotiated) Maastricht Treaty, it is important to re-think the setting of new quantitative and qualitative public finance parameters to be achieved, within the public debt risk management for the next years, otherwise it would be unsustainability increased, to such an extent that future European generations would be condemned to pay, restricting future economic development. European citizens cannot be paying high debt services, it is time to really embark on a responsible policy of renegotiation, restructuring and debt forgiveness, taking

into account the region's poor macroeconomic situation amid the Covid-19 pandemic, at least in the short and medium terms.

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## Appendix 1.A

Table 1.A: Public Debt Ratio - Coefficient of Variation

Countries:	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019
Austria	3.529%	0.980%	8.255%	1.256%	7.765%
Belgium	5.361%	4.849%	5.082%	2.434%	2.834%
Cyprus	5.915%	6.531%	12.182%	28.645%	5.597%
Estonia	11.714%	7.137%	26.971%	25.063%	8.388%
Finland	10.023%	2.790%	10.405%	10.249%	3.202%
France	3.659%	5.546%	11.093%	4.369%	1.166%
Germany	3.543%	4.925%	5.088%	3.228%	7.776%
Greece	3.114%	2.045%	8.834%	8.294%	1.254%
Ireland	15.967%	10.578%	49.824%	13.068%	10.821%
Italy	2.390%	1.745%	4.585%	5.778%	0.301%
Latvia	16.949%	7.395%	79.071%	6.963%	4.457%
Lithuania	26.806%	9.218%	29.422%	4.578%	8.763%
Luxembourg	7.987%	2.701%	39.144%	8.922%	4.356%
Malta	23.852%	6.717%	5.137%	3.716%	12.590%
Netherlands	9.110%	2.460%	11.931%	5.988%	11.657%
Portugal	6.195%	8.482%	8.519%	11.620%	4.724%
Slovakia	28.335%	9.167%	9.912%	12.830%	3.462%
Slovenia	9.616%	2.023%	19.254%	30.888%	8.781%
Spain	3.050%	9.700%	16.092%	21.035%	1.609%

Source: European Central Bank. Own elaboration.

### **Chapter II**

# The Eurozone Moral Hazard: From the Sovereign Debt to the Covid-19 Pandemic Crises

**Abstract:** This chapter of the Ph.D. Thesis investigates on the determinants of the international demand for Government Debt Securities (Bonds) issued by GIIPS countries since the Euro inception, including the sovereign debt crisis period (2008-2012). The study focuses on testing the emerge of moral hazard, as a result of the positive impact of the *sovereign risk score* and the *risk premium* on demand, as another factor of high public debt ratio. The analysis pretends to illustrate the situation that Eurozone is facing amid Covid-19 pandemic, serving as a warning for policy implementation, taking into account long-term effects of public debt and monetary policy. Salient examples are the peripheric Italian and Spanish economies, supported with mutualized funds from the European Commission to finance public policies to deal with the adverse effects of the pandemic, exacerbating investor's moral hazard behavior.

**Keywords:** Government Debt Securities, Sovereign Bonds, Moral Hazard, Sovereign Risk Score, Sovereign Debt Crisis, Covid-19 Pandemic, Eurozone.

#### 2.1. Introduction

In the onset of 2020, the Eurozone was shocked by the Covid-19 pandemic, generating a new financial crisis. However, this is an old issue as the 1929 stock market crash, ten years after beginning the 1918 'Spanish flu', that killed about half hundred million people around the world, in three years. Later financial crises have reappeared, e.g. Energy Crises (1970s), Latin American Debt Crisis (1980s), Mexican, Argentina, Southeast Asian, Russian and Brazilian financial crises (1990s), Dotcom and Subprime Mortgage Crises in the United States of America and European Sovereign Debt Crisis (2000s).

Abundant papers based on macroeconomic fundamental disturbances to explain their origins appeared (First generation models of financial crises); however, few attempted to introduce moral hazard theory (Third generation models of financial crises) to explain them and provide sustainable solutions. Moral hazard behavior arises as a direct reaction of investors to incentives leading to decisions that increase risk exposures, putting financial/economic system on jeopardy. This behavior resulted from asymmetric information presented normally in financial market interactions, imperfectly informed markets with one side better informed than the other, are markets with asymmetric information.

Although a vast literature in this field arising from the seminal work of 2001 Nobel Prize laureate researchers in Economics, e.g. Akerlof (1970), Spence (1973) and Stiglitz (1975), that extends the economic information theory to applied topics in financing, banking and insurance services; however, further research is demanded to assess the origins of financial crises. This issue is an important development for applying in financial theory and international economics research areas, where the reaction of the agents to incentives lead to increasing market risk of loss. Also, we can understand *moral hazard* based on the *externalization of risk costs* that are

assumed by innocent bystanders (Mack, 2011)<sup>4</sup>.

Since the introduction of the Economic and Monetary Union of the European Union each government member is issuing their own sovereign bonds in a foreign currency, this generates fragility of the government bonds market. Because (i) governments cannot guarantee to fulfillment their bondholders; and (ii) they do not have liquidity to pay off the bond at maturity. Both make more probable to develop moral hazard because high instability that press sovereign risk score and/or the risk premium. In this way, amid sovereign debt crisis, the European Central Bank has discovered that its function is not only to preserve prices stability, but also the last resource lender in the Eurozone, which in turn exacerbate moral hazard (De Grauwe, 2011).

Indeed, exogenous factors can also boost financial crises attached with moral hazard. Therefore, after Eurozone had been recovering from the last sovereign debt crisis, dramatically has been shocked by the Covid-19 pandemic. In this way, the main objectives of this chapter sheds lights on how the new financial crisis can be managed under moral hazard theory, rather than traditional weak economic fundamentals. The effects of the "unobservable" moral hazard can be assessed indirectly by the demand investors behavior to deal with the sovereign risk score or risk premium indicators. After having assessed the performance of the sovereign debt crisis, we would like to get policy recommendations; especially, for GIIPS (Greece, Ireland, Italy, Portugal and Spain) economies with the aim to strengthen Eurozone amid the Covid-19 pandemic.

In this context, the European Central Bank approved a Pandemic Emergency Purchase Program (PEPP) for € 1,35 bn in 2020, for buying government debt securities (bonds), with the aim to deal with the Euro market fragmentation risk,

<sup>&</sup>lt;sup>4</sup> Hillman (1992) pointed out that limited liabilities, similar to externalize risk cost, is very inefficient.

relaxing monetary position to increase liquidity. Furthermore, the European Commission approved measures for the mutualization of new public debt emissions to finance the recovery plans and unemployment insurance (e.g. ERTES in Spain). This collateralization can have moral hazard adverse effects, to such an extent that the European Central Bank has been buying unprecedent huge of government bonds during 2020. Consequently, this chapter focuses on analysing this demand, testing the emergence of risk averse effects of this relationship since Euro inception.

The sovereign debt crisis<sup>5</sup> effects were different for each country, as a result of their own sovereign bond market, productive and labour markets structures, GDP's participation, public finance discipline, transparency, accountability and investor's behavior; even though they are linked by geographical proximity, rich historical facts and the same currency. After the direct bailouts of the European Central Bank in the government bond markets, the government debt securities (bonds) issuing continued, the private investor's behavior might have strategically changed to take advantages buying these bonds with excess profitability, not matter the collateralized and/or externalized risks. Therefore, under the presence of moral hazard, the *risk indicator* can help to explain not only the default risk, but also the government bonds demand to get unfair/advantage benefits.

In this chapter, the *sovereign risk score* is a crucial variable to explain the moral hazard demand. This *score* calibrated by CountryRisk.io<sup>6</sup> is a quantitative measure of the government ability and willingness to honour its foreign currency debt obligations. Alternatively, the *risk premium*, spread of the bond interest rate regarding Germany, represents the credit repayments difference capability. Indeed,

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<sup>&</sup>lt;sup>5</sup> This includes also the subprime crises since the latter had its origin in the expansionary fiscal policies implemented by the Eurozone to recover from the adverse effects of the former.

<sup>&</sup>lt;sup>6</sup> https://www.countryrisk.io

private investor's behavior should take into account both indicators to decide bonds demand. In the financial literature the sovereign stress is commonly measured in terms of a particular government bond yield spread against a safe benchmark bond (e.g. Germany).

Furthermore, these indicators are interpreted as a measure of the excess default risk premium embedded in the risky government bond price (Singh et al., 2019). It is expected that less risk premium represents better expected repayment. Higher perceived risk implies higher long terms domestic interest rate, as well as unsustainable future public debt. In this way, the spread could be adequate to quantify the stress of sovereign bond market risk. These authors use the 'derivatives contingent claim models' in order to estimate the sovereign risk, becoming a major approach of the intertemporal equilibrium under uncertainty.

The next section of this chapter reviews different financial crises and moral hazard related research papers. The third, describes the data used to explain the demand for government bonds in the international markets. After that, the following section of this chapter focuses on assessing through panel data econometric model to what extent moral hazard is driving it. According to the evidence, in the fourth section we discussed what should we learn for policy implementation to deal with new government debt issues amid pandemic. The last section summarized main conclusions and recommendations to manage the sharply increased of the sovereign debt triggered by the Covid-19 pandemic.

#### 2.2. Literature review

Different authors explained financial crises based on broken macroeconomics fundamentals –e.g. Radelet et al. (1997), Esquivel et al. (2003), Briceño (2003)–, they argue that most financial crises were characterized by similar features:

persistent fiscal deficits and high public debt, current account deficit, foreign exchange reserves and domestic saving reductions, etc. These episodes in developing markets such Argentina, Brazil, Russia, South-East Asia, Mexico and Chile were attached with overvaluation currencies, under fixed exchange rates. After registering capital inflows stoppage, exports and GDP contractions, huge unemployment rates, decided devaluating their currencies to gain international competitiveness, generating financial crises.

However, Akerlof and Romer (1994) understand that *moral hazard* financial crises arose because of the fact that banks are able to borrowing funds based on implicit and explicit public guarantees of bank liabilities (externalization of risk cost). For both authors if banks are undercapitalized or under-regulated, they may use these funds in overly risky or even criminal ventures. They argued that the "economic of looting," in which banks use their state backing to purloin deposit, is more common than generally perceived and played a large role in the USA savings and loan crises.

In this line of research Krugman (1999) argued that some financial crisis in emerging markets can be explained based on the "third generation" models of currency crisis, due to the origins of the problem are in the banking system, where moral hazard driven lending could have provided a sort of hidden subsidy to investment, collapsing when visible losses leads government to withdraw their implicit guarantees. However, he is questioning whether the psychological of the speculators can be captured in a formal model, acknowledge that sudden crisis in the balance of payments maybe no so hard to model after all. Furthermore, Krugman (1998) maintains that the 1997 Asian Financial Crisis is a reflection of excessive gambling, indeed stealing by banks that gained access to domestic and

<sup>&</sup>lt;sup>7</sup> For better understanding of third generation models of financial crisis, we can review Krugman (1979), Obstfeld (1986), and Corsetti et al. (1999).

foreign deposits by virtue of state guarantees on these deposits<sup>8</sup>.

Later, Basu (2009) based on the financial crisis (2007-09) builds a rational expectation microeconomic model about why the local crisis escalated into a general freeze in credit flows. The author includes a risk of default, there is the probability p that the entire loan will be repaid (1-p: the loan will not be repaid; where 0 ), it depends on different factors, as banking regulation and supervision of the government that hopefully can make <math>p increasing.

Furthermore, according to Roubini "no attempt at understanding the financial crisis of 2008-09 can be made without considering the intellectual canvas against which it proceeded, one that long championed the innate virtues of markets efficiency, financial innovation and financial market opening, literally as ends in themselves"; therefore, he predicted in advance the U.S.A. mortgage crisis based on past financial crises.

In this way, there are non-traditional approaches to assess financial crises sources as the moral hazard caused by asymmetric information between agents and the principal, focusing on their long-term effects. In this framework it can be cited also Noy (2006), Allen and Carletti (2008), Muhanzu (2011), Bratis, Laopodis and Kouretas (2015), Briceño (2016), Gaballo and Zettlin-Jones (2016), Gullberg (2017), Del Brio, Castillo, Mora-Valencia, Perote (2017 and 2018), De Grauwe (2011, 2014 and 2019), among others.

Noy (2006) explained how IMF's rescues created moral hazard, testing if bailouts

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<sup>&</sup>lt;sup>8</sup> Radelt and Sachs (1998). The Onset of the Asian Financial Crisis. (Cited in)

<sup>&</sup>lt;sup>9</sup> Delimatsis, P. (2009). Financial Services Trade after Crisis (cited in). An additional review of Roubini's point of view has been commented by Stephen Mihn in her "The New York Times" column: <a href="http://www.nytimes.com/2008/08/17/magazine/17pessimist-t.html?pagewanted=all">http://www.nytimes.com/2008/08/17/magazine/17pessimist-t.html?pagewanted=all</a>

changed international investor's perception of default risk on international borrowing; however, he did not find conclusive evidence for 1994 Mexican crisis. The author focused on creditors' moral hazard effects, if they are bailed out, the risk premium changed. In this way, an implied bond insurance can lead a change in the composition of investment away from uninsured investment to insured flows as sovereign bonds. This implies that IMF bailouts lead to sub-optimal equilibrium: a dead-weight-loss and redistribution of resources away from domestic or foreign taxpayers (who pay for the loan and subsidy), toward the bailed out international creditors. The author found moral hazard evidences for some financial crisis (Russian, 1998).

Other papers have taken for granted the real state bubble to explain financial crises. However, one of the main causes of the USA bubble was the monetary policy losing, easy access to money, subprime mortgage, weak regulatory structure, high leverage in banking sector; increasing the real estate prices (bubble) that after collapsing triggered the Subprime Crisis. This occurred not only in the Lehman Brothers crash (2008), but also in most European countries such as Spain and Ireland (Allen et al., 2008). These authors introduced the idea of moral hazard when said that "was caused by greedy people of Wall Street". They assessed who had taken excessive risk, private or public sectors? Concluding that Federal Reserve also had created the real state bubble. Finally, they illustrated the riskiness of quantitative easing (QE).

For Muhanzu (2011), investor's moral hazard problem has been presented in the Greek financial crisis before the IMF bailout. He focused on ten-years government bond spreads of Eurozone's countries before and after the Greek bailout (May, 2010), investigating changes in the level of bond spread after the bailout and the sensitivity of spreads in response to fundamentals, concluding that IMF induced

investor's moral hazard by implicit insulating investors. Indirect moral hazard is studied in the bond and equity markets analysing the government bonds spread regarding Germany, and its links with fundamentals. The results rejected the existence of moral hazard investor behavior after the bailout (hypothesis), because this problem seemed to exist before the bailout.

Sovereign debt crisis was caused by different factors as the boom and bust in housing market, associated with the credit cycle, seemed the main drivers of the USA, Ireland, United Kingdom and Spain crises (2007-2008). Household mortgages were at the peak 65% of the GDP and loans to real estate developers and construction firms accounted for another 45% of the GDP. Therefore, the size of the loans' pool related directly with real estate activities amounted more than 100% of GDP. Moreover, household debt in Spain (mortgages and consumer credits) was 91% of GDP in 2010, just below 106% and 95%, in UK and USA, respectively, but substantially higher than France and Germany, with 69% and 64%, respectively (Akin et al., 2014).

Bratis et al. (2015) focused on the asymmetric information role in the advanced Eurozone countries during Sovereign Debt Crisis, to capture bond spread as a systemic risk measure as well as moral hazard proxy –'indirect index'– at macroeconomic level, in the context of international lending. The authors found evidences in favor of creditor moral hazard hypothesis as a result of the collateralization and/or solidarity of the member states and the financial rescue programs of Greece, Ireland and Portugal with the IMF. They concluded that the impacts of creditor moral hazard are different and depend on country-specific characteristics and the probability to be rescued.

Other papers provided empirical evidence and theoretical knowledge about how the

Eurozone debt crisis was triggered, after collapsing the USA financial system (2008). This literature is based on moral hazard theory, because it relates to implicit and explicit risk costs externalization of financial institutions (banks), Briceño (2016). This author assessed related financial statistics of GIIPS, as the ratio Short Term External Debt/Foreign Exchange Reserve (moral hazard index), fiscal and external unbalances, comparatively with core Euro countries; concluding the presence of moral hazard. The Euro induced the interest rate reduction and easily capital access to finance unprofitable and risky businesses, as the real estate sector, without appropriate regulation, ending up in vicious circles between weak financial system and implicit government guarantees, weak banking systems bailing out, fiscal imbalances, huge public deficits and debts.

Gaballo et al. (2016)<sup>10</sup>, formalized the relationship between moral hazard, sovereign debt and bailouts, showed how maintaining sovereign debt by banks led failure in successful bailouts. This seems a vicious cycle: acquiring sovereign bonds, allowing bank's bailouts financed by new debt issue, impacting negatively the credit risk of sovereigns and reducing the value of bank's assets. In the model, sovereign temptation to intervene in domestic markets, following adverse shocks to rescue, reduce the ex-ante efficiency of the financial sector. Likewise, Gullberg (2017) investigates euro (€) impacts on the fiscal balance and the long-term interest rate using dynamic panel data with Ordinary Least Squares (OLS) bias correction (LSDVC) for 20 European countries (1980-2015). The author showed that primary balances and long-term interest rates of these economies are mainly explained by

 $<sup>^{10}</sup>$  From the European Stability Mechanism created in march of 2011, to replace European Financial Stability Facility, with the aim to keep up with the Eurozone stability.

macro-economic variables, rather than €. However, data did not seem to provide support for moral hazard.

Other contribution studies the transmission channels of the crises among developed and emerging markets through different sources of risk (Del Brio et al., 2017), concluding that European markets are net receivers, and the North American and Asian countries are net transmitters of the high-order moment risk (i.e extreme negative). On the other hand, North America seems being unaffected from other market shocks. Finally, financial markets are linked through the three high moments of the distribution; especially, through skewness and kurtosis.

Castillo et al. (2018), analyse moral hazard at micro level, measuring its impact on the credit risk in the Colombian Small and Medium Enterprises collateralized loans, concluding that this problem is inherent to the lender and borrower financial operations due to asymmetric information. They introduced moral hazard to study financial ratios: liquidity, profitability, leverage, solvency and turnover variables. In a recent paper the same authors (2020), built a moral hazard index for credit risk of SME based on these variables, finding that moral hazard has effects on the SME failure with collateral obligations, because of low efforts and underinvestment, proposed the inclusion of moral hazard effects for predicting financial distress.

In this way, during the sovereign debt crisis the ECB pursued a variety of strategies to inject funds into financial system, e.g. buying assets backed securities. Although this is a positive stimulus, the magnitude is very small because the Euro market for asset backed securities is smaller than the USA. The ECB also offered to lend funds with four-years maturities to commercial banks at low interest rate to provide funds for banks to lend to commercial borrowers. The uptake of these funds by the

commercial banks has been very small because of banks' concerns about their capital ratios and the borrowers seeking bank credit low quality (Feldstein, 2015).

Undoubtedly, all these attempts to boost regional economy by injecting liquidity, induced moral hazard in a monetary union, where each Euro country is issuing sovereign debt securities (bonds), apparently as in a foreign currency, because governments cannot guarantee that the bondholders will always be paid out at maturity, increasing sovereign risk (risk premium); pressing a high instability of the Eurozone sovereign bond market (De Grauwe and Ji, 2019). Indeed, after the inception of the Euro currency, governments changed the nature of their sovereign debt, forcing these countries into default and making Eurozone fragile and vulnerable to change market sentiments, self-fulfilling multiple bad equilibria arise, competitiveness divergences and governance issues (De Grauwe, 2014).

This systemic problem of the monetary union has several ingredients that made sovereigns become vulnerable, forced them into default with punishingly high interest rates, chronically high budget deficits, low growth and domestic banking crisis (De Grauwe, 2011). Furthermore, like with all insurance mechanisms there is a risk of moral hazard by providing lender of last resort insurance, the European Central Bank gives an incentive to governments to issue too much debt.

### 2.3. Financial and Economic Data

For the analysis we have built a panel data that lumps together twelve initial Eurozone economies: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal and Spain. Due to sovereigns are more likely to default foreigner's holdings debt securities than domestic (Guembel et al., 2009); it has been considered the government debt securities (bonds) issued for

instruments serving as debt evidence, covered by the financial assets and liabilities (financial instruments) category "debt securities" (IMF Handbook on Security Statistics, 2008). The Handbook considers the issuer's and holder's sides. A "fromwhom-to-whom" approach is presented, reflecting the links between issuance and holdings. Our data have been collected from the Bank for International Settlements (BIS), European Central Bank, European Commission (Eurostat) and World Bank (Table 2.1).

Table 2.1. Variables and Data Sources.

Variable Name	Definition	Source	
GDS	Government Debt Security (Bonds)	Bank for International Settlements	
GDP	Gross Domestic Product	World Bank	
Rate	Long-term interest rate for convergence purposes, debt security issued, 10-year maturity, denominated in Euro	European Central Bank	
Risk	Sovereign Risk Score	CountryRisk.io	
Spread	Risk Premium	European Central Bank	
IPROP	Index of Nominal Residential Property Prices	Bank of International Settlements	
Balance	Current account of balance of payments, ratio to GDP	World Bank	
Debt	Public Debt ratio to GDP	European Central Bank	
SDC(2008-2012)	Dummy variable for transitional changes caused by the Sovereign Debt Crisis	Own study	
HICP	Harmonized index of consumer prices	European Central Bank	
PEPP	Pandemic emergency purchase program	European Central Bank	
Eurostat	European statistics	European Commission	
COVID-19	Coronavirus disease	World Health Organization	

Moral hazard can be concentrated indistinctly on domestic or international

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 $<sup>^{11}</sup>$  <u>https://stats.bis.org/statx/srs/table/c1</u>.The accumulated (outstanding) domestic government debt securities participation goes from 60% to 100% of the total government debt securities.

markets<sup>12</sup>; however, some authors pointed out that the 'home country debt bias" of domestic banks towards the sovereign debt. It is difficult for governments to go against their local or national holders, being more likely to declare default with foreigner's debt holders (Gallo et al., 2016)<sup>13</sup>. In this way, this study considers the general government <sup>14</sup> debt securities issued for international markets. Fig. 2.1 depicts the series evolution for GIIPS countries. International investors would be expected to have objections considering Basel III, established with the aim to strengthen regulation and supervision to improve bank's risk management<sup>15</sup>, as a response of the last sovereign debt crisis.

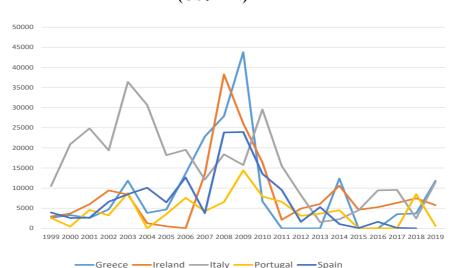


Fig. 2.1: Government Debt Securities Demanded by International Markets (US\$ MN)

<sup>&</sup>lt;sup>12</sup> Debt securities comprise financial assets, negotiable and traded on secondary markets; don't grant the holders any ownership rights in the issuing entity. Money market papers and private placements are included in debt securities statistics. They are compiled for Bank of International Settlements from data submitted by central banks (BIS, 2020).

<sup>&</sup>lt;sup>13</sup> E.g. Argentina declared the IMF's unpaid (beginning, 2020).

<sup>&</sup>lt;sup>14</sup> It includes four subsectors: Central, State and local government, as well as social security funds.

<sup>&</sup>lt;sup>15</sup> Basel III regulation intended to strengthen bank capital requirements, increasing bank liquidity and decreasing bank leverage.

One of the explanatory variables is the interest rate of the bonds (10-years)<sup>16</sup> for the government financing through debt securities (bonds), because represents the rentability for the international investors. In accordance with Fig. 2.2, it is clear how the Euro introduction led not only to reduce bond interest rates, but also to convergence toward low levels; consequently, the difference or spread among them almost disappeared. This is the euphoria dominated period in financial markets leading consumers, banks, firms, and investors to be blind for risk (De Grauwe and Ji, 2019); however, when the sovereign debt crisis started, in the aftermath of subprime mortgage crisis (2008-2009), the interest rates suffered big divergences due to the sharp rise in risk premia experienced and the sovereign risk score. The most notably was Greek that exponentially increased, not only regarding the core countries (Germany), but also against Italy, Ireland, Portugal and Spain rates.



Fig. 2.2: Bond interest rate 10-years maturity

<sup>&</sup>lt;sup>16</sup> Long-term interest rate for government bonds denominated in Euro for Eurozone, and national currencies for member that have not adopted the Euro at the time of publication. This indicator is released monthly on the ECB website on the 8th working days of the month (Eurostat, 2020).

Because of economic activities and wealth generation determines the durable good demand, the other explanatory variable is the Gross Domestic Product (GDP), which is concentrated in Italian and Spanish economies, that participated with more than four-fifths of the total GIIPS-GDP. Undoubtedly, the Eurozone showed good performance after the Euro introduction, as a result of the intra-commerce increasing, low interest and inflation rates, which eliminated uncertainty pushed up investment, employment and economic growth. This variable is showed as logarithm-difference (see Fig. 2.3).

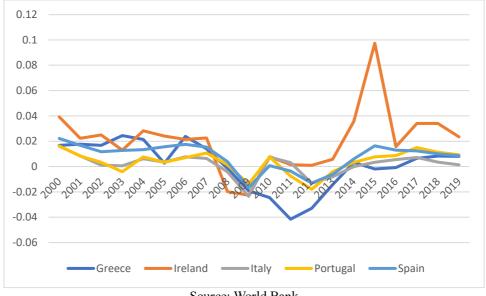


Fig. 2.3: Gross Domestic Product Log-Diff. (US\$ MN, 2010)

Source: World Bank

Another factor that can explain the demand of government bonds is the rentability of a related sector as the real state, which can be measured by the evolution of the index prices of property residential, which can lead investors to change their investment, from the long run government bonds market, toward the real estate sector; especially, in the real sector boom period until crashing the bubble. There are different indexes to assess the yield of this sector, in the United Kingdom the index  $\binom{\textit{Yearly rent}}{\textit{Housing prices}} * 100\%$  explains the return. However, this thesis uses the index of nominal residential property prices, published by the BIS (see Fig. 2.4). It is assumed that the housing price index is a proxy of the return investment on this sector. Also, the analysis considers their logarithm-difference as explanatory variable.

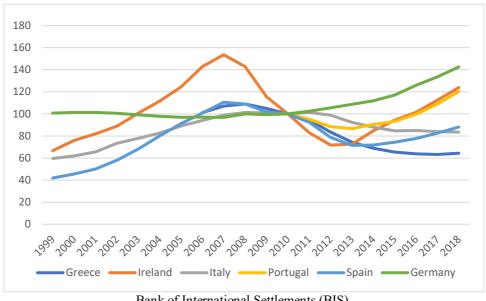


Fig. 2.4: Index of Nominal Residential Property Prices

Bank of International Settlements (BIS).

Because of the fact that government bonds demand is not determined only by the interest rate, or another related assess profitability indicator, but also by the risk of unpaid, where the uncertainty payment of the public debt feeds or increases the risk, we tested the sovereign risk score as another explanatory variable. The score has b

een calibrated by CountryRisk.io<sup>17</sup> on a 5-years horizon, it is the typical focus of a sovereign credit rating to assess the ability and willingness to repay government b onds. Most of the input data for this score is only available on annual basis. It is co mposed by Current Account Balance, Government Debt, Consumer Price Index, a nd other macroeconomic variables (Obenhuber, 2020).

Fig. 2.5 illustrates the evolution of this score for GIIPS countries in the period under analysis, which also includes expectations on political and behavioral issues related to default. Although there is not a consensus about its definition, the variable is definitely linked to the possibility of the government debt repayment breach by the governments and associated, to a lower extent, with the possibility of obligations b reach by the public and private sectors of a country (Fuenzalina et al., 2005). It is noteworthy that Bratis et al. (2015) assessed the existence of moral hazard based on the interest bond spread, as a systemic risk measure of moral hazard, other measures considered, e.g. the general shares price index and the ratio current account balance-to-GDP.

It must be also fair to point out that in the period under analysis GIIPS countries sharing the same monetary policy, making even more vulnerable to external shocks and more dependent on their fiscal policy. The analysis includes the Sovereign Debt Crisis that particularly affected negatively peripheral countries and constrained the capacity of creditors to resolve bank's moral hazard. After Greek crisis, this spread out Ireland, Italy, Portugal and Spain in 2010. Consequently, the dummy took one to control for the qualitative aspects of the crisis, including the establishment of the European Financial Stabilization Facility (May, 2010) and the European Stability Mechanism (October, 2012) contributing to create moral hazard.

 $<sup>^{17}</sup>$  The Sovereign Risk Score data is available from the CountryRisk.io webpage:  $\underline{www.countryrisk.io}$ 

70
60
40
30
20
10

\$\int\_{0}^{\infty} \frac{6}{6} \fra

Fig. 2.5: Sovereign Risk Score

Source: CountryRisk.io

As a summary, Table 2.2 gathers the expected effects of main explanatory variables on Government Debt Securities.

Table 2.2: Expected Relationship between Government Debt Securities demand and its Determinants

Explanatory variable	Expected sign/relationship		
Interest Rate of Bonds	Positive		
Gross Domestic Product	Positive		
Nominal Residential Property Prices	Negative		
Sovereign Risk Score	Negative		
Premium Risk	Negative		
Public Debt ratio to GDP	Negative		
Sovereign Debt Crisis (Dummy)	Negative		

Source: Own elaboration

### 2.4. Econometric assessment

This chapter provides econometric estimations of the government debt securities (bonds) demanded by international investors with the aim to provide financial

resources to the government (x). Investors might have incurred in moral hazard behavior, observed indirectly if they do not take into account the *Sovereign Risk Score*, or maybe if its coefficient turns to be positive and significant in the period of study. Indeed, we can use also the alternative *Risk Premium* indicator to test robustness of our *dynamic panel data* regressions.

### 2.4.1. Theoretic Model and Estimation Method

The emergence of moral hazard related with the government debt securities demand can be explained from the asymmetric information model developed by Holmstrom (1979). We assumed that the *agent* (a bank or international investor) chooses his 'efforts' to manage risk, a(Risk), e.g. the bank efforts to deal with financial crises. This action is taken on the basis of the same information as the *principal* (government), known before the state of the nature ( $\theta$ ) is revealed. The principal observes the outcome x (e.g. financial resources from international investors) of such decision and receives a part of it r(x)=x-s(x), where s(x) is the share of outcome that goes to the agent. Given that  $H(\cdot)$  is the agent's utility function, defined on both s(x) and a(Risk);  $G(\cdot)$  is the Principal's utility function dependent on r(x); and  $W(\cdot)$  a social welfare function, which depends on the utility of the principal and the agent, as well as the risk management efforts; then the constrained Pareto optimal 'sharing rule' s(x) is generated by the follow optimization program:

$$Max W\{G(r(x)), H(s(x), a(Risk))\}$$
(1)

Or alternatively,

$$Max E\{G(x-s(x))\}$$
 (2)

$$s.t. E\{H(s(x), a(Risk))\} \ge H \tag{3}$$

$$a(Risk) \in argmax \ E\{H(s(x), a(Risk)')\},$$
 (4)

where the constraint (3) guarantees that bank gets a minimum expected utility H

attained via the international financial markets. The *argmax* denotes the arguments that maximize the objective function, it reflects the restriction that the principal can observe x but not a(Risk). If he also could observe a, an appropriate amount of bond can be sold to the bank to guarantee that it selects a proper effort a(Risk) even when s(x) is chosen to solve the restriction 1, ignoring the 3.

After the sharing rule is fixed, bank will learn something new about the difficult of its tasks or the environment in which it is to be performed. Let risk be the signal about  $\theta$  which the agent observes prior to choosing a, so that this choice becomes a function a(risk), as before we suppress  $\theta$  and write f(x,y,risk,a) for the joint density function, where y represents additional information observed by both parties. The best sharing rules s(x,y) can be determined to solve the program:

$$Max \int G(x - s(x, y)) f(x, y | Risk, a(Risk)) p(Risk) dx dy dRisk$$
 (5)

s.t. 
$$\int U(s(x,y))f(x,y|z,a(Risk))p(Risk)dxdydRisk - \int V(a(Risk))p(Risk)dRisk \ge \overline{H},$$
(6)

$$a(Risk) \in argmax \int U(s(x,y))f(x,y|Risk,a(Risk))dxdy - V(a(Risk)), \forall Risk.$$
 (7)

Here f(x,y/Risk,a) is the conditional density function of x and y, given risk and the effort a, and p(Risk) is the marginal density of Risk. Letting u(Risk)p(Risk) be the multiplier function for the second equation and  $\lambda$  the multiplier for the first restriction, point-wise gives the characterization:

$$\frac{G'(x-s(x,y))}{U'(s(x,y))} = \lambda + \frac{\int \mu(Risk).fa(x,y|Risk,a(Risk))p(Risk)dRisk}{\int f(x,y|Risk,a(Risk))p(Risk)dRisk}$$
(8)

In the context of the Principal–Agent relationship, banks provide the input a(Risk) in order not to overestimate risk positions, since it cannot be observed by the principal directly; the results relate to a specific kind of agent's actions. Therefore, the Principal does not know a social contract to be satisfied by the agent, because

of asymmetric information. Banks seek reaching only their own benefits (selfishness) without considering the Principal's function; therefore, there is a clear disagreement causing the probability distribution function modification of the outcome x, identified in the wealth function of the program (5).

The Eq. (9) below, resulted from the government and investors behavior who maximize their restricted social welfare function. Unlike the principal, we assume that the investor's demand for government bonds should take into account the risk assigned to the debt issuer, measured as a Sovereign Risk Score (*Risk*), as well as different factors in international markets, such as variables related to the long run interest rates, economic growth, alternative investment markets, the amount of debt obligations of the issuer or the default/bailout episodes occurred in the past. Therefore, we consider the following explanatory variables: Interest Rate of Bond with maturity at 10-years (*Rate*), Gross Domestic Product (*GDP*), Residential Property Prices Index (*IPROP*), the stock of Government Debt (*Debt*). As the government bond demand and stock is a dynamic process, we consider the following equation:

$$dLBONDS_{it} = \beta_0 + dLBONDS_{it-1} + \beta_1 LRate_{it} + \beta_2 dLGDP_{it} + \beta_3 IPROP_{it} + \beta_4 dLRisk_{it} + \beta_5 dLDebt_{it-1} + \beta_6 SDC_{it} + \beta_7 Rescue_{it} + \alpha_i + \varepsilon_{it}$$
(9)

For stationarity purposes, some of the explanatory variables can be considered in variation rates ( $\%\Delta$ ) defined as logarithm-difference (hereafter *dLBOND*, *dLGDP*, *dLIPROP*, *dLDebt* and *dLRisk*). Furthermore, two dummies are included in the regressions with the aim to capture the effects of sovereign debt crisis episode (*SDC*)

and the impact of financial rescue programs undertaken by the Troika<sup>18</sup>, formed by the European Union, European Central Bank and International Monetary Fund (*Rescuei*). The former dummy scoring one for the period 2008-2012, for all country, and the latter scoring one for the bailout periods only in cases of Greece (2010-2012), Ireland (2010-2013), Portugal (2011-2014) and Spain (2012-2014), zero otherwise. All variables described in previous section and measured for i and t representing the country and period indexes, respectively;  $\alpha_i$  is a latent variable capturing idiosyncratic country effects; and  $\varepsilon_{it}$  represents the error terms.

It was expected a positive relationship with the GDP and interest rate, negative with residential properties index, sovereign risk score and the effects of the crisis, and positive relationship with the *Rescue*. Last but not least, the relationship with the government debt stock will be positive. Indeed, the government debt securities demand modeling requires the consideration of a dynamic structure, since the dynamics and the cumulated government debt have an impact on future bonds emissions. There are also many reasons to incorporate a dynamic structure driven by psychological, technological and institutional aspects. For instance, investors do not change their habits as an immediate response to interest rate, economic growth, risk score, alternative investment yields, government or international regulations, and other aspects. For this reason, we introduce the lagged of the dependent variable as other explanatory variable to evaluate the dynamic behavior of international investors. We consider the simplest AR(1) structure, after being tested it was parsimonious enough to account for the time dependence of the Government Debt.

<sup>&</sup>lt;sup>18</sup> These programs were consistent on financial support subjected to structural reforms in different areas such as budgetary policy, macro-economic framework, structural reforms as labor, pensions, or banking reforms, and ensure that specified requirements are being met.

As random and fixed effects, dynamic panel models cannot be consistently estimated by Ordinary Least Square or Generalized Least Squares (see e.g. Pindado and Requejo, 2014) because endogeneity, we use the System Generalized Method of Moment (SGMM), controlling for endogeneity and providing valid instruments for estimation based on the lagged values of the exogenous and predetermined variables of the model. The so-called 'difference GMM' was developed by Arellano and Bond (1991) and Arellano and Bover (1995) and later modified by the 'System GMM' provided by Blundell and Bond (1998). Furthermore, it provides short and long run coefficients or elasticities (impacts on bond demand), identifying possible endogenous or exogenous explanatory variables.

### 2.4.2. The demand for Government bonds in the Eurozone

Table 2.3 presents the dynamic estimations for government debt securities (bonds) demanded by international markets, the p-values for the statistics consider 'robust' standard errors, consistent with heteroskedasticity and autocorrelation corrections. The coefficient of the dynamic autoregressive structure is negative and significant reveling the dynamic feedback on the decreasing accumulation of government bonds. The lagged demand of government debt securities (BONDS(-1)), affected negatively its current demand in international markets; both expressed in logarithm-differences (i.e. variation rates).

The private investment rentability of government debt securities (*Rate*), proxied by the 10-years-maturity bond interest rate, and the impact of the economic activity or economic growth, represented by the *GDP* log-diff., are positive and significant, as predicted by the economic theory. The residential property prices index (*IPROP*), also has a significant and positive impact on government bonds demand, which captures the fact that international investors complementary can invest in the real

estate sector; especially, Ireland and Spain, before the housing bubble until burst in 2008 (Allen and Carletti, 2009).

The *Risk* coefficient is positive and significant, which seems counterintuitive since it was expected that the demand of government bonds reduces when this score increases. This result supports our hypothesis of investor's moral hazard behavior. If investors underestimate risk or consider that markets overestimate risk premia, taken into account the bond collateralization of the ECB, they increased demand with the higher risk score. This is an indirect way of testing moral hazard behavior, which is an unobservable variable. Once again, the latter effect does not mean that investors are *risk lovers* but the fact that they present a significant moral hazard pattern.

The coefficient of the lagged government debt-to-GDP, in log difference (dLDebt<sub>1</sub>), is negative and significant, which means that the influence of the accumulated public debt stock to determine the demand of government debt securities (bonds) is negative; as we expected in the Table 2.2. The higher change rate of public debt stock, affected negatively the change rate of government bonds issued (and demanded) for international markets. It is also fair to point out that the regressions considered the first lag of this variable (dLDebt(-1)), with the aim to resolve any possible endogeneity problem between contemporaneous values of this explanatory variable and the government bonds emission.

The dummy for the sovereign debt crisis period (2008-12) to test any transitional change hasn't any statistics significance, but its coefficient is negative, showing some adverse impact on government bond demand. Undoubtedly, governments were forced to adjust their public finance and restructure their financing instruments under Maastricht Treaty, which established ceilings for public deficits and debts.

Table 2.3. Demand of the Government Debt Securities (dLBOND<sub>it</sub>)

Table 2.5. Demand of the Government Debt Securities (albond <sub>it</sub> )					
	SGMM	SGMM	SGMM		
	MODEL 1	MODEL 2	MODEL 3		
Intercept	-0.4491	-0.4685	-0.4174		
(p-valor)	(0.009)	(0.007)	(0.006)		
dLBOND(-1)	-0.2908	-0.2920	-0.3040		
(p-valor)	(0.000)	(0.000)	(0.000)		
LRate	0.1243	0.1410	0.1129		
(p-valor)	(0.090)	(0.080)	(0.084)		
dLGDP	1.1524	1.0921	1.1341		
(p-valor)	(0.053)	(0.072)	(0.056)		
IPROP	0.0037	0.0038	0.0034		
(p-value)	(0.022)	(0.018)	(0.016)		
dLRisk(-1)	0.9690	0.9652	0.9698		
(p-value)	(0.007)	(0.007)	(0.007)		
dLDebt(-1)	-1.3758	-1.3667	-1.8839		
(p-value)	(0.055)	(0.061)	(0.085)		
SDC(2008-12), Greece	-,-	-0.1025	-,-		
(p-value)		(0.059)			
SDC(2008-12), Ireland	-,-	-,-	0.2553		
(p-value)			(0.030)		
Num. Obs.	192	192	192		
Num. Groups	12	12	12		
Arellano-Bond AR(1)	-1.91	-1.91	-1.93		
(p-value)	(0.056)	(0.056)	(0.054)		
Arellano-Bond AR(2)	-1.34	-1.41	-1.35		
(p-value)	(0.181)	(0.159)	(0.176)		
Sargan	158.65	158.70	157.49		
(p-value)	(0.603)	(0.581)	(0.607)		
Hansen	5.87	6.13	4.23		
(p-value)	(1.000)	(1.000)	(1.000)		

The table includes panel data regressions estimated by System GMM (Models 1, 2 and 3). dLBON D(-1): First Lag of the logarithm-difference of Government Bonds issued/demanded in Internation al Markets; Rate: Interest Rate of Bond with maturity at 10-years; dLGDP: Logarithm-difference of the Gross Domestic Product; IPROP: Index of Nominal Residential Property Price; dLRisk: Logarithm-difference of Sovereign Risk Score; SDC: Dummy variable scoring 1 during the period of Sovereign Debt Crisis (2008-2012) (for the specified country) and 0 otherwise.

Furthermore, in the past, excessive sovereign indebtedness helped to generate the expectation of local currency depreciation against the stronger currencies. Finally, in this section it was tested a dummy for rescuing programs (*Rescue*<sub>i</sub>) due to

financial bailouts undertaken by Greece (2010-2012), Ireland (2010-2013) and Portugal (2011-2014), and later by Spain (2012-2014), capturing not only the benefits of smoothing *risk premia*, but also a significant moral hazard component; however, it wasn't statistic significant. Maybe because of the fact that their effects were vanished to recovery of sovereign debt emissions demand in the Eurozone in average by the international investors. Similarly, their individual country effects were not significant in each case.

The model diagnosis does not detect problems, and the instruments employed seem to be valid, according to the statistics shown in Table 2.3. As expected, the System GMM estimations exhibit a slight negative first order autocorrelation, but absence of second order autocorrelation, according to Arellano-Bond AR(1) and AR(2) statistics, respectively. The Sargan and Hansen statistics also seem to confirm the validity of the employed instruments: Primary Result of Public Sector and the Current Account Balance (BoP).

## 2.4.3. Country specific effects of Sovereign Debt Crisis and Sovereign Risk Score

The overall sovereign debt crisis impact on bonds demand for the twelve first Eurozone governments, measured through a specific dummy variable (SDC<sub>2008-2012</sub>), is negative but not significant; therefore, it was dropped from the Model 1 (Table 2.3). In this way, for investigating potential differences on the international investor's behavior, we estimated System GMM regressions controlling for country specific effects. Initially, we argued that this effect might be different between GIIPS countries, since they are heterogeneous and investors decision might be different. For this reason, interacting variables between SDC and a country specific for Greece, Ireland, Italy, Spain and Portugal were built (i.e. the impact of the crisis in every country); and tested as explanatory variable, being significant only for

Greece and Ireland in Models 2 and 3, respectively (Table 2.3). However, resulted signs or impacts were different in both countries, negative and positive, respectively. The other results (coefficients and p-values) found in Model 1 are almost replicated.

In the case of Greece, the coefficient is negative at 94% of confidence, which means that the SDC made international investors reluctant to Greek government bonds. Maybe because investors lose confidence on relaxed fiscal policy, reacting negatively to the critical and detrimental economic situation. For instance, Standard & Poors Agency downgraded Greece to BB+, the lowest credit rating in the Eurozone (Muhanzu, 2011), by that time Greece had high level of unemployment, political and economic corruption were compelling, the highest tax evasion and low global competitiveness compared to its EMU-partners.

The Irish economy, so-called "Celtic Tiger" because of its rapid economic growth (1990s), also resulted being one of the most affected countries when stroke the sovereign debt crisis, reaching the highest public deficit in 2011, more than 30% of GDP. Even though the government efforts to get rid of fiscal unbalances, public deficit increased due to transfers for unemployment and business closures; additionally, the property-related taxes plummeted. However, the dummy of SDC<sub>Ireland</sub> was positive and significant, showing that the demand of government bonds in international markets remaining, maybe because Irish economy received public stimulus in order to bolster domestic investment and consumption (Gurdgiev et al., 2011). Indeed, this positive and significant impact could be seen as a consequence of moral hazard.

Regarding Italy, the biggest GIIPS economy in terms of GDP, the history was similar to Greece. With a complex political situation, the government debt higher than 100% of the GDP and compelling tax evasion, the Standard & Poors Agency downgraded sovereign debt and private investors lost confidence (Henningsen,

2012). The Italian economy shrunk more than 6% during the SDC period. After being pointed out Mario Monti as the First Minister, concerns about fiscal discipline returned by the end of 2011.

The fact that international investors still demanding Spanish government bonds, despite increasing default risk, was not necessarily due to moral hazard (the country dummy was not significant). In fact, the risk premium had probably overreacted, taking into account that their conditions were not severe, e.g. debt levels were not so high and the government encouraged to reduce fiscal deficit. Consequently, international investors still demanded Spanish bonds, that pay 6-7% for assuming a default risk that never fulfilled expectations, their debt neither defaulted nor was bailed out. However, financial system had to be rescued in the second quarter of 2012, since it was not done during the subprime crisis as other economies 20.

In the case of Portugal, the country effect dummy was not significant. After financial crisis had struck Greece, it spread Portugal and Ireland, to such an extent that financial bailout programs were launched starting 2011. Portugal registered high GDP slowdown, unemployment and fiscal deficits rates up to two digits, reduction of saving rate and exports, lack of accountability and transparency of political governance, among others. These factors also downgrading Portuguese sovereign debt, government started bailing out some private banks in the last quarter of 2008. By starting 2011, Portugal was rescued by the ECB, IMF and EC by € 78 billion (Souza and Duarte, 2011).

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<sup>&</sup>lt;sup>19</sup> Although the famous Mario Draghi's forward guidance message in the summer 2012 "The ECB is ready to do whatever it takes to preserve the Euro. And believe me, it will be enough" might also contribute to the non-default of the Spanish economy.

<sup>&</sup>lt;sup>20</sup> Caja Castilla-La Mancha, a small Spanish bank, had the largest liquidity problem and its direction was finally taken over by the Bank of Spain in March 2009 (Elteto, 2011).

Additionally, we have considered as explanatory variable the interacting effects of the sovereign risk score (Risk) and the dummy for each GIIPS countries (Risk<sub>it</sub>×giips), with the aim to compare if its effects are similar (positive and significant) in each case, separately. It resulted being positive and significant in the four cases, except for Greece. Surely, because the country Risk of Greece does not be sufficient to explain its chaotic situation at that time (Table 2.4). Coincidently, the dummy for the sovereign debt crisis showed in Table 2.3, also was not significant. Consequently, we have confirmed the positive impact of this variable (Risk) to explain the international demand of government bonds for Ireland, Italy, Portugal and Spain. However, in all cases the stock of the public debt (*Debt*) was not significant; therefore, it was dropped from the regressions.

Table 2.4. Demand of the Government Debt Securities (dLBONDit)

	SGMM	SGMM	SGMM	SGMM
	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Intercept	-0,4144	-0.4455	-0.4498	-0.4304
(p-valor)	(0.018)	(0.020)	(0.018)	(0.025)
dLBOND(-1)	-0.3016	-0.2927	-0.2942	-0.2865
(p-valor)	(0.000)	(0.000)	(0.000)	(0.000)
LRate	0.1006	0.1141	0.1178	0.1064
(p-valor)	(0.107)	(0.085)	(0.072)	(0.107)
dLGDP	1.389	1.3712	1.6394	1.4749
(p-valor)	(0.002)	(0.002)	(0.002)	(0.003)
IPROP	0.0033	0.0035	0.0035	0.0034
(p-value)	(0.048)	(0.050)	(0.045)	(0.061)
dLRisk(-1),Ireland	0.9421	-,-	-,-	-,-
(p-value)	(0.000)			
dLRisk(-1),Italy		0.2953	-,-	-,-
(p-value)		(0.000)		
dLRisk(-1),Portugal		-,-	1.1179	
(p-value)			(0.000)	
dLRisk(-1),Spain		-,-	-,-	1.6975
(p-value)				(0.000)
Num. Obs.	194	194	194	194
Num. Groups	12	12	12	12
Arellano-Bond AR(1)	-1.88	-1.92	-1.92	-1.93

(p-value)	(0.059)	(0.055)	(0.055)	(0.474)
Arellano-Bond AR(2)	-1.51	-1.31	-1.31	-1.14
(p-value)	(0.132)	(0.190)	(0.192)	(1.000)
Sargan	163.93	166.72	166.57	165.50
(p-value)	(0.509)	(0.448)	(0.451)	(0.474)
Hansen	7.44	7.51	6.88	7.20
(p-value)	(1.000)	(1.000)	(1.000)	(1.000)

The table includes panel data regressions estimated by System GMM (Models 1-4). dLBOND(-1): First Lag of the logarithm-difference of Government Bonds issued/demanded in the International M arkets; Rate: Interest Rate of Bond with maturity at 10-years; dLGDP: Logarithm-difference of the Gross Domestic Product; IPROP: Index of Nominal Residential Property Price; dLRisk: Logarithm-difference of Sovereign Risk Score.

### 2.4.4. Robustness checking, multicollinearity and endogeneity

In order to test the robustness of our previous econometric results, now we have controlled by the spread of the bond interest rates of each country regarding to the German bond interest rate. This spread is called *Risk Premium*, a proxy variable of the *Sovereign Risk Score*, resulted being positive and significant for some countries (Table 2.5). Note that the logarithm of interest rate (*LRate*) was dropped in these new regressions, in order to avoid natural multicollinearity induced by the high correlation of both variable (above 75%). Similarly, to Model 1 of Table 2.3, the overall impact of the dummy of sovereign debt crisis (SDC) on bonds demand for the initial twelve Eurozone governments was not significant but negative; consequently, it was also dropped. Surely, there was not necessary to introduce it, simply because the spread of interest rates absorbs its effects.

It is also fair to point out that was necessary to consider the first logarithm-difference of the residential property prices index (dLIPROP<sub>t</sub>), near the percent change rate, not its level as in the previous regressions. Furthermore, we dropped the log-difference of the government debt (dLDebt<sub>t</sub>) because it was not significant. The *risk premium* measures the health of the economy including the stock of public debt influence; therefore, the higher debt, the higher spread; being unnecessary to

include it explicitly. Surely, this can help to avoid any potential endogeneity problem between government debt emissions (new bonds) and the stock of public debt (stock of bonds).

The effect of the specific explanatory variable *risk premium* for GIIPS countries (*Spread<sub>GIIPS</sub>*) was positive and marginally significant in Model 1 of Table 2.5. After that, we analyze the country specific *Spread* effect separately for each country, which resulted being significant with the expected sign only for Ireland and Spain; but not significant for Greece and Portugal. The first two cases are explained by the acceptable performance of both economies at that time. On contrary, the cases of Greece and Portugal. The case of Italy was cumbersome, the coefficient was significant and negative, because its fiscal problems and corruption registered since before the crisis; similarly, Greece.

Table 2.5. Demand of Government Debt Securities (dLBOND<sub>it</sub>)

					<u>,                                    </u>
	SGMM	SGMM	SGMM	SGMM	SGMM
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5
Intercept	-0.1215	-0.1199	-0.1071	-0.1094	-0.0938
(p-valor)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)
dLBOND(-1)	-0.3177	-0.3268	-0.3253	-0.3282	-0.3216
(p-valor)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
dLGDP	1.5520	1.3642	1.3400	1.455	1.3947
(p-valor)	(0.004)	(0.006)	(0.007)	(0.003)	(0.003)
dLIPROP	2.3734	2.5510	2.1199	1.9819	1.2555
(p-value)	(0.062)	(0.152)	(0.097)	(0.100)	(0.153)
dLSpread(-1)	0.2607				-,-
(p-value)	(0.109)				
dLSpread(-1),GIIPS		0.3100			
(p-value)		(0.313)			
dLSpread(-1),Ireland			0.4270		-,-
(p-value)			(0.003)		
dLSpread(-1),Spain				0.6220	
(p-value)				(0.000)	
dLSpread(-1), Italy					-0.7127
(p-value)					(0.000)
Num. Obs.	163	163	163	163	163

Num. Groups	11	11	11	11	11
Arellano-Bond AR(1)	-2.49	-2.46	-2.42	-2.47	-2.43
(p-value)	(0.013)	(0.014)	(0.016)	(0.013)	(0.015)
Arellano-Bond AR(2)	-1.13	-1.14	-1.15	-0.96	-1.08
(p-value)	(0.258)	(0.256)	(0.252)	(0.339)	(0.279)
Sargan	131.38	133.60	133.90	134.09	133.88
(p-value)	(0.728)	(0.680)	(0.674)	(0.669)	(0.696)
Hansen	6.83	7.83	6.25	7.19	8.59
(p-value)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)

The table includes panel data regressions estimated by System GMM (Models 1-5). dLBOND(-1): First Lag of the logarithm-difference of Government Bonds issued/demanded in International Mar kets; dLGDP: Logarithm-difference of the Gross Domestic Product; dLIPROP: Logarithm-difference of Nominal Residential Property Price Index; dLSpread: Logarithm-difference of the Bond Inter est Rate Spread with maturity at 10-years. dLSpread<sub>GIIPS</sub>, considers Greece, Ireland, Italy, Portugal and Spain. dLSpread<sub>Ireland</sub>, only Ireland. dLSpread<sub>Spain</sub>, only Spain. dLSpread<sub>Italy</sub>, only Italy.

Last but not least, the model diagnosis in Tables 2.3 and 2.4 does not detect serious problems. The instruments employed for the System GMM estimations seem to be valid, according to the statistics displayed in Table 2.5. As expected, the SGMM regressions exhibit a slight negative first order autocorrelation, but absence of second order autocorrelation; according to the Arellano-Bond AR(1) and AR(2) statistics. The Sargan and Hansen statistics also seem to confirm the validity of the employed instruments: Primary Deficit of Public Sector, Current Account Balance and Standard Deviation of Interest Rate.

# 2.5. Discussion of the Government Bonds Demand Amid the Covid-19 Pandemic

Around twelve years later after activating the sovereign debt crisis, without finishing to full-plenty recovery, Eurozone was hitting again by the Covid-19 pandemic, since the first quarter of 2020. Especially, Italy, Spain and France, three of the biggest economies, after Germany. It seems being the major financial catastrophic crash since the World War II, not only in the financial, securities, bonds

and stock markets, but also in the real sector. Slowdown the international commerce, touristic activities and Gross Domestic Product, causing high unemployment, millions of infected people and miles deaths, attached with costly social public policies, resurrecting the sovereign debt crisis (Briceño and Perote, 2020).

Undoubtedly, the current health crisis is very different from what the Eurozone lived in the first decade 2000s, after Euro inception that reduced interest rate, bolstered the profitability of construction sector, busting mortgage credits, generating housing bubble (the IPROP peak). After the bubble collapsing, it started the subprime mortgage crisis (2007-2008), to such an extent that governments had to bail out the banking sector. For instance, Ireland after a decade of almost uninterrupted surpluses, the general government deficit soared to 7.5% and 12.9% in 2008 and 2009, respectively, and 32% of GDP in 2010 (Gurdgiev et al., 2011).

After controlling our econometric model for the sovereign debt crisis that slowed down the Greek bonds demand, as a consequence of its public finance and political concerns –high public debt, lack of transparency, raise of populism, etc. In the last years, these issues have been worsened by the Brexit affecting financial sector; especially, Italy, jeopardizing the economic recovery and exacerbating the inequality. Currently, the Spanish situation is different with political problems, the economy had started to recovery from sovereign debt crisis; consequently, in the quarter 2020-I declined 5.2%, whilst in the same quarter of 2009 only 2.5%. In the quarter 2020-II, it plunged 17.5%.

In this context, having supported social demands to mitigate adverse effects of the pandemic, the ECB approved a Pandemic Emergency Purchase Program (PEPP), a financial aid package for € 750 billion (March, 2020), to buy government and

corporation bonds. Later the PEPP increased up to € 1,35 billion. Furthermore, the ECB has been relaxing the monetary policy, keeping the interest rate up to cero. The financial aid is also aimed at Small and Medium Enterprises, export companies and unemployment insurance. After passing the PEPP to support governments and big corporations to provide liquidity, investors can take advantage and contribute to bolster the adverse effects of the financial crisis. The Program is making commercial papers more sufficient credit quality eligible for purchase under Corporate Sector Purchase Program (CSPP) and the expansion of the Additional Credit Claims (ACC) to include claims related to the financing of the corporate sector. The issues lead government debts to sharply increase again. Between 2010 and 2019, Italian and French government debts have raised almost a third since 2008, reaching 134.83% and 98.39% of the GDP, respectively in 2019. The same story for Spanish debt, more than doubled since 2008, soared 97.6% in 2019, making governments weakest to deal with new public debt emissions.

These measures generate an unprecedented fiscal bomb, deeply public debt (bond market) unsustainability, awakening moral hazard. Similarly, the mutualization of the new government expenditures to recovery from the health crisis ('reconstruction bonds'). Only under the current monetary union, without fiscal rules and regulation unification, the tools to deal with the adverse effects of the pandemic are scarce, inequalities among countries increase. A salient example is the per capita health expenditure, which evolution illustrates how the gap between north (Germany) and south (Italy and Spain) is increasing. Similarly, the corresponding French gap has doubled after the sovereign debt crisis; being necessary to increase the expenditure on public health.

To better assessing the adverse impacts of this new financial crisis and the measures

to finance them, we have estimated a demand function for government bonds in international markets, concluding that the previous sovereign debt crisis affected their demand negatively in some countries. The results said that the GDP and sovereign risk score positively and significantly have influenced the demanded amount. Consequently, after the contraction of the GDP because of the pandemic, it is expected that the demand of government bonds will be reduced. Furthermore, it is supposed to raise the sovereign risk (or risk premium) for the most affected countries.

In accordance with the ECB and IMF the GDP reduction for Italy and Spain were projected in 10% and 9% for 2020. This means that, *ceteris paribus*, the reduction of government bonds demand could drop more than 10 and 9 percent this year, respectively. In the current context with economic contraction, interest rates will continue in low levels, constrained by the Zero Lower Bound (ZLB) imposed by the ECB. The evolution of the Residential Property Prices is expected to be stable in the short run, having a low impact on government bonds demand. The economic recovery in the upcoming months is slowly, due to the uncertain of the Covid-19 epidemiology and the vaccine massification. In this situation, governments should consider alternative ways of financing and expect a sharp increase in risk premia.<sup>21</sup>

Undoubtedly, these possible results can be attached with moral hazard behavior of investors. Consequently, governments should take into account the possible over demand of new bonds emission, as a consequence of higher sovereign risk score (or risk premium), particularly as the ECB aid packages be effectively released. However, it could be difficult for Italy and Spain get fresh financial funds from

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<sup>&</sup>lt;sup>21</sup>It is not considering the demand shift from domestic private investors to the demand coming from the aid packages from the ECB.

international investors to finance the health crisis. The ECB is buying government bonds, used € 565,641 million up to September 2020 (42%), which will be in force until June 2021, it can also stimulate moral hazard. Likewise, the ECB undertook to reinvest the maturities of the assets acquired under this program until the end of 2022.

Definitely, the illness effects could also be the source of financial crisis as the 1918 influenza which caused one of the major devastations, not only with fifty million deaths, but also with huge economic contraction in the world (Barro, 2020). Particularly, this pandemic caused a GDP and consumption shrank, about 6 and 8 percent, respectively. The Covid-19 pandemic is causing unprecedented plunges of the stock markets and a forecasted contraction of the real economic activity of the 4 percent, twice the decline after the subprime crisis (2007-2008). This economic activity reduction and its unemployment effects are still to be determined but, as a matter of fact, they justify substantial public expenditure to attempt to limit the damage.

Finally, it is also fair to point out that these financial measures have been adopted not only in Eurozone, but also around the world. For instance, the USA Federal Reserve initially announced a package of US\$ 1,000 billion to buy government bonds (US\$ 500 million), mortgage securities (US\$ 200 million) and businesses and municipalities (US\$ 300 million), in march of 2020. Later, the USA President, worried about the health crisis, approved the quarantine and an aid package for US\$ 2 billion.

### 2.6. Main concluding remarks and public policy recommendations

It is noteworthy how the tendency of the government debt, the stock of government

liabilities or debt securities, has changed since 2008, experiencing a sharp increase after Lehman Brothers' collapse. Nowadays, amid the Covid-19 the government debt is dramatically increased again, e.g. according to the International Monetary Fund, Spanish and Italian public debts will be surpassed 115% and 150% of the GDP by finishing 2020, respectively. Undoubtedly, the differences might rely on the government attitude towards fiscal deficit and the long-term sustainable public debt policies.

The *Sovereign Risk Score* and the *Risk Premium* have been proved to be significant and robust variables to help explain the demand for government debt securities (bonds); its coefficient is significant and positive, showing its directed impact. This behavior helps to explain the over demand during the sovereign debt crisis, supporting the presence of moral hazard, induced by the collateralized public debt.

Definitely, these results might be considered to predict Covid-19 pandemic effects, particularly Italy and Spain, most of the damaged, at the same time receptors of European Commission financial supports. The pandemic impact is being so huge, this time the story is different, the Eurozone might be put under jeopardy. On the other hand, the ECB intervention can help reestablishing the government bond markets to get fresh funds from international markets, exacerbating moral hazard, that will menace the long terms Euro sustainability. Unlike the past, both economies managed to elude being rescued during sovereign debt crisis, among other reasons, they were considered 'too big to fail'.

In the current expansionary unconventional monetary policy, it is necessary to adopt especial regulation for the real estate and mortgage credits markets, to avoid a new bubble that might attract investors in a log-term scenario of excess liquidity, low interest rates and lack of alternative profitable vehicles for investment. It is also

remarkable that the Italian and Spanish economies are very dependent on touristic and construction sectors. If the former is highly damaged from Covid-19, these countries will need to expand the latter, boosting the IPRO peak.

Because of the fact that Euro currency adoption was collectively decided, helped to manage debt securities emissions, with the aim to reach Maastricht Treaty ceiling for government deficits and debts, these experiences should be reviewed constantly by the ECB to manage risk against moral hazard. Especially, after the mutualization of the pandemic cost, buying government debt securities (bonds). As a matter of fact, this demand will be conditioning the sustainability of the Euro area in the future.

In order to reduce moral hazard, governments should come up with the possibility to explicitly and legally limit the direct and discretionary interventions of the ECB, in order to rescue or bailout broken commercial financial institutions (private and non-systemic banks). After the explicit legal prohibition for broken financial private institutions to get public financing bailouts, the possibility of private financial institution's moral hazard behavior will be reduced, improving the sustainability of the Eurozone Financial System.

Also, it is important that the ECB spread out the benefits and advantages of Euro currency and its sustainability amid the Covid-19 pandemic. The Euro's credibility as a potential competitor to the USA Dollar should be reinforced but, for this purpose, the image of having common objectives between its members should be recovered. Otherwise, developing countries will stop keeping Euros as store of value and safe haven. The inequalities raised during the crises, the Brexit, and the 'excessive' openness to new state members do not contribute to improve the Euro's credibility. As a matter of fact, Covid-19 pandemic is putting Euro's sustainability

to the test.

On the other hand, GDP participation of every state in the Eurozone is very heterogeneous, as well as their productive structures and labor market regulations. In the same way their institutions, public and fiscal policies are diverse, notwithstanding the geographical proximity and historical ties. Indeed, these countries since 1999 are sharing the same currency and monetary policy, but not fiscal policy. This might be unsustainable in the long-term since it exacerbates the differences among economies. Consequently, they should also converge towards a Fiscal Policy Union to cope with future financial and exogenous shocks, based on more homogenous fiscal and financial public rules and regulations.

As a final remark, it is clear that the Eurozone was not sufficiently prepared in advance to deal with exogenous shocks as the Covid-19 pandemic. In this way, under the current necessity to finance its costs and the aggressive fiscal policy to reactivate economy, policymakers should consider the impact of the factors on the demand for bonds analyzed in this chapter and, particularly, the adverse effects of moral hazard, generated in the natural unsustainability of the government bond markets under this Economic and Monetary Union.

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# **Chapter III**

Economic policy and growth in the Eurozone: Lessons for the post-

Covid19 take off

Abstract: This chapter analysis the main drivers of the Eurozone economic growth (1999-2019), estimating dynamic panel data models to explain the global and percapita growth rates and the undertaken fiscal and monetary policies. This research finds that the Government Consumption Expenditure, Primary Deficit and Government Debt have affected negatively the economic growth. However, Gross Capital Formation, Human Capital, Commercial Openness and Residential Property Prices are positive determinants of the economic growth. Furthermore, this research finds that peripheral countries have adopted clear anticyclical fiscal policy; especially, during the Sovereign Debt Crisis (2008-2012), although this policy orientation is not clear for the so-called Frugal countries. Finally, the applicability of these economic policies to get Eurozone takes off in the post Covid-19 is also discussed.

**Keywords:** Economic Growth; Business Cycle, Eurozone; Dynamic Panel Data, Covid19 pandemic.

#### 3.1. Introduction

Undoubtedly, the Eurozone fiscal deficits have reached unprecedented levels in 2020 due to Covid-19 pandemic, with Public Debt-to-GDP ratios more than doubling the ruled by the Maastricht Treaty. E.g. Greece (187.4%), Italy (149.4%), Portugal (126.1%), Belgium (115.3%), France (114.1%), Cyprus (113.2%) and Spain (110.1%). Therefore, despite the crisis remains, more active fiscal policies could not be advisable with the aim to boost this regional economic growth and create new employments to reestablish the social welfare.

Furthermore, monetary policies adopted by the European Central Bank (ECB) as the quantitative easing (QE) also have been very active, increasing about 37% the Pandemic Emergency Purchase Program (PEPP) in December 2020 (reaching € 1.85 trillion), maintaining the interest rate at zero lower bound (ZLB). This 'liquidity trap' with huge credits offer makes conventional monetary policy inefficient and calls for unconventional policies devoted to buying public and private debt to lower risk premia. Fortunately, in a crisis scenario these policies have not yet affected inflation rates, but the recovery based on an unlimited liquidity and credit may put the stability under a serious menace of jeopardy.

Of course, this chapter of the thesis does not pretend to provide the answer to this puzzle. However, it considers very important that the appropriate future decisions on fiscal and monetary policies will need to look back the impact of past economic policies. Therefore, its first aim is the analysis to what extent monetary and fiscal policies helped to explain the evolution of the economic growth Eurozone, with the purpose of contributing to the economic recovery discussions. The second aim allows us to know how the last sovereign debt crisis (2008-2012) negatively affected transitory and/or permanently the per capita GDP, a worldly accepted concept of economic wealthfare, after mortgage loans nonperforming crisis starting,

similarly nowadays, national governments spend a lot of money to deal with adverse effects of the pandemic.

In the last century, governments in developed and developing economies were practicing different strategies, sophisticated monetary and financial policies to dealt with different financial crises, since the Wall Street Crash (1929-1933) that boosted Great Depression in the past century, up to the Covid-19 Pandemic (2020). Not only monetary quantitative easing (QE) and referential interest rates reduction were used to attempt alive their global currency and recover economies, but also fiscal and public policies in order to relief detrimental social situations as recession, unemployment, poverty, illness, deaths, etc.

Similarly, the past century financial crises, recently financial crises have been originating new ways of making nonconventional financial and monetary policies, to such an extent that starting Covid-19 pandemic they were intensively used again by the European Central Bank, USA Federal Reserve, Japanese Bank and others Central Banks. For instance, followed the 1929 Financial Crisis and the World War-II, when appeared the new Financial and Monetary International Systems, based on the regional development banks; as well as the USA Dollar as the reference international currency, after the Bretton Woods Agreements (1944).

Consequently, the natural research question of this chapter copes with the best economic policies that policymakers should be taking into account in order to engine economies in the post-Covid-19 pandemic, to help get the Eurozone economy takes off considering their heterogeneity between members: GIIPS, Frugal and Other countries. Three main contributions develop this chapter. Firstly, analyzes under dynamic panel data econometric technique, the public financial and nonfinancial determinants of the global and percapita economic growth. Secondly, the possible anticyclical monetary and fiscal policies over this process; especially,

during the sovereign debt crisis period (2008-2012). Thirdly, the adverse impacts of the last mortgage and sovereign debt crises on the global and percapita economic growth rates since 2008 and the anticyclical discretionary fiscal policy to mitigate them.

Indeed, after the American stock market crashed 1929, different causes have been responsible of financial crises, e.g. the 1970s crises caused by price oil shocks (supply side), that affected the economic decisions of consumers and enterprises. The 1980s Sovereign Debt Crisis of Latin America, after the USA interest rate increased and natural disasters. The Asian Financial Crisis originated in risky overinvestment of some Korean chaebol enterprises in the 1990s in specific industries and wrong financial policies adoption recommended by International Monetary Fund. The Russian Crisis after its restructuration and reconversion into open free market economy. Over indebtedness of some Euro countries to finance their real state sector investment and nonperforming mortgage credits caused the 2008 Sovereign Debt Crises; following the USA subprime mortgage crisis. Finally, the recently, supply shock of Covid-19 pandemic that leads governments spend a lot of money in order to mitigate adverse effects and promote economic recovery. However, some exposed causes are arguably and demanded a deeper timing analysis, which is not the aim of this chapter.

In this line, in accordance with the organization of this chapter, the next section reviews literature regarding how policy makers have dealt with different financial crises and attempt to achieve economic recovery since the last century. The third section revises data, methodology and basic models to be empirically tested, with the aim to get gauged the impact of different economic growth factors. The fourth section presents the econometric dynamic results on the economic growth drivers, including the orientation of fiscal and monetary policies undertaken during the last

two decades in the Eurozone. The last section summarizes the main conclusions, discussing the possible policy to be adopted in the current Covid-19 pandemic to boost economic growth and employment.

### 3.2. Monetary and fiscal policies for economic growth: A literature review

For a better comprehension this section has been subdivided in two subsections. Firstly, we attempt to search on economic policies developed in the past 20th. century. The second section is focused on economic policies developed in the last 21st. century; in both cases with the aim to recovery the economic growth rates, after different financial crisis.

### 3.2.1. Main economic policies in the Past 20th. Century

Keynesian macroeconomic policy maybe was the most predominant in the past century, after the Wall Street Crashing of 1929, with the aim to boost economic demand side and reactivate economic growth and employment in developed economies (Commendatore et al., 2002). With the same purposes, financial systems also adopted different structural reforms, e.g. the separation of stock market related activities from investment banks, to get more transparency and strengthen specialized regulations. Definitely, after successive financial crises, economies adopted different financial, monetary and exchange rate measures to cope with them.

Indeed, different past policies based on the trade-off inflation and unemployment, after 1929 Crash and before the two 1970s oil crises, are not possible to be adopted anymore, neither monetary policy based on monetary aggregates, nor monetary policy based on fixed exchange rates. In this context, different research academic economy directions followed up with the aim to assess macroeconomic problems since the 1980s: Rational Expectations, New Classical and New Keynesian Macroeconomics (Mankiw, 1990). However, these experiences and lessons had

been insufficient to avoid following financial crises. Additionally, some of them were caused by strong exogenous factors such as the oil price shock, natural disasters, international wars, terrorism, social conflicts, and the recently pandemic.

In accordance with Bernanke (1983) different factors triggered the 1929 financial crisis: the failure of financial institutions, defaults and bankruptcies, contractions of correlated macroeconomic activities, which in turn reduced the quality of financial activities, primarily credit intermediation. Germany, Austria, Hungary, among others, resulted being the most damaged with banking crises; also, Great Britain suffered from an overvalued Pound and huge unemployment rate in 1920s decade. At this time, the international finance was very different compared to nowadays; for instance, international exchange reserves included gold and foreign currency, basically were composed by US Dollar and UK Pound. The loss threat of collateral reduces the unprofitable projects. Other countries had debt crisis without banking crisis. In this way, the expectation of collapsing financial crisis in 1931 became self-fulfillment, reached the low point in the bank holiday at March, 1933. Only with the New Deal's rehabilitation of the financial sector (1933-1935) the economy started taking off.

Undoubtedly, the following energy crises triggered by the oil price rises (by the OPEP), that began in the fall of 1973, caused a dramatic increasing in the USA inflation rate up two digits, being necessary to take contractionary monetary policies in order to cut it. Therefore, after being pointed out Paul Volcker at the Reserve Federal head (the FED) by the end of 1970s, the tighten monetary policies caused a quickly inflation reduction in the early 1980s, by increasing the monetary referential interest rate, increased the real interest rate.

For Goodfriend and King (2005) the observed upward volatility and subsequent stubborn elevation of long-term interest rates during the disinflation were the key indicators of that imperfect credibility. In accordance with transcripts of the Federal Open Market Committee (FOMC) released to the public later, the authors found that Volcker and other FOMC members regarded the long-term interest rates as indicative of inflation expectations and credibility of their disinflationary policy.

Likewise, the early 1970s oil price crises led to industrialized economies implemented different economic measures to dealt with the stagflation, as well as with the aim to recovery their industrial sectors and reestablished their economic growth. For instance, Japan, Italy and Germany implemented aggressive monetary policy measures also to deflate their economies after the 1973 oil crisis. However, this crisis was also caused by wrong monetary policies, attached with poor economy performance (Mohan, 2015). For Cukierman (2013) the great inflation of the seventies was followed by Volcker's stabilization program, and the consolidation of the Central Banks independence. The great moderation spurred inflation targeting, Taylor's rule and the New-Keynesian framework, along with a relative neglect for financial stability issues, underlined the importance of the central bank's lender of last resort function, using unconventional policy instruments.

The 1980s Financial Crisis in Latin American followed the highest FED interest rate increased since the ending of 1970s, attached with reductions of their Terms of Reference, basically caused by the decision of the Organization of the Petroleum Exporting Countries (OPEC) to rise the international oil price. In this context with detrimental contraction of the economy, high deficits of the Current Accounts (BOP) and unemployment rates, the devaluation of local currencies resulted in domestic bank bankruptcy; some governments rescued private banks; especially, Chile. As a consequence, different financial policies were implemented, including inconsistent monetary and foreign exchange rate policies. Governments adopted different strategies (monetary anchor) with the aim to control inflation, mobile currency band

to manage exchange rate, with high interest rate to attract foreign capitals; on the other hand, they implemented controls of foreign capitals, the reserve requirement rates were inversely proportional to the length of stay of the foreign capitals in this country (Edwards, 1998).

Later, in order to test consistency of fiscal policies under the Maastricht Treaty and Stability and Growth Pact in the European Union, Gali and Perotti (2003) investigated the public finance rule accomplishment for the discretionary budget deficit over the period 1980-2002, using Economic and Monetary Union of European Union (EMU EU) and control groups (non-EMU EU and other non-EU OECD countries). They did not find much support for this view, finding that discretionary fiscal policy in EMU countries has become more countercyclical, following what appears to be a trend affecting other industrialized countries as well. Also, they hope the evolution of fiscal policy impacted the autonomous monetary policy lost; therefore, emergence of the common monetary policy, with a clear mandate to focus on price stability, leaves the objective of stabilization of national business cycles exclusively in the hands of national fiscal authorities. Consequently, the process of monetary integration was associated with more strongly countercyclical fiscal policies in EMU countries, the authors evaluate the validity of the above hypotheses tested empirical fiscal policy rules for some of them, over the period 1980-2002.

#### 3.2.2. Last economic policies in the 21st. Century

In the aftermath of the Asian Financial Crisis, Xue and Taylor (2018) highlighted the importance of non-monetary financial factors implemented with the aim to boost recovery. They found that the actions played an important role regarding the speed and depth of nation's recoveries; the lessons of the Great Depression were taken to heart. The econometric results showed the importance of a healthy banking

system, bank profitability and the interaction term between money supply and bank health ratio are significant for GDP growth recovery after Asian Financial Crisis. Furthermore, credit supply has a significant impact.

Other authors have found that trade and domestic markets size are robust determinants of economic growth in the past period, when trade openness is measured as the US Dollar value of imports and exports relative to GDP in PPP US\$ ("real openness"). When trade openness is measured as the US Dollar value of imports and exports relative to GDP in exchange rate US\$ ("nominal openness"), however, trade and the size of domestic markets are often non-robust determinants of growth. The author argued that real openness is the most appropriate measure of trade, and their empirical results should be seen as evidence in favor of the extent-of-the-market hypothesis (Ciccone and Alcalá, 2011). Similarly, there are other factors that have influenced positively the economic growth; for instance King and Levine (1993) concluded a positive impact of financial development on the economic growth, after examining about a cross-section 80 countries for the period 1960-89, they found that various measures of financial development are positively and strongly associated with both current and future rates of economic growth.

In addition, Teixeira and Queirós (2016) through econometric dynamic panel data analysis have noted that countries where structural change contributes to increasing the share of knowledge-intensive activities that require high skills (e.g., Financial Intermediation, Computers or Research and Development and Education) tend, on average, to grow faster. In this way, investment variables have considered as one of the core explanatory factors, the productive specialization including a relationship with human capital, measured by the average educational attainment of adults; they found that human capital significantly and positively impacts on the countries' economic growth but the effect of human capital via specialization in high-tech and

knowledge-intensive activities is negative. Finally, the lack of industrial structures able to properly integrate highly educated individuals into the productive system leads countries to experience disappointing economic returns, investment on human capital by itself is not sufficient to assure economic growth.

It is also fair to point out that, the European Central Bank (ECB) has been introducing different innovations and unconventional policies in accordance with financial and economic evolution and the Eurozone necessities. In advance, the Maastricht Treaty did not prevent the European Financial Stability Facility (EFSF), European Financial Stability Mechanism (EFSM), European Stability Mechanism (ESM) and other mechanisms in order to provide funding for the Eurozone (Smits, 2015). The ECB introduced a Securities Market Program to buy sovereign bonds and debt instruments issued by private entities. Similarly, what nowadays the ECB has been performing amid the Covid-19 pandemic. Also, it was announced the Covered Bonds Purchasing Programme (CBPP) with the aim of "(a) promoting the ongoing decline in money market term rates; (b) easing funding conditions for credit institutions and enterprises; (c) encouraging credit institutions to maintain and expand their lending to clients; and (d) improving market liquidity in important segments of the private debt securities market". However, following the global financial crisis (2008-2012), the evolution of per capita real GDP euro area suffered a much deeper and protracted slump than the United States; being an important reason of this difference that both fiscal and monetary policies have been more restrictive in the euro area, despite the similar nature of the initial macroeconomic shock. A comparison of fiscal and monetary policies and their economic outcomes in the euro area and the United States suggests that both fiscal and monetary policies in the euro area have been overly tight (Orphanides, 2017).

During the 2000s Global Financial Crises the risks of inflation in USA and Europe,

appeared negligible at first blush and, judging by survey results, inflationary expectations were well anchored; demonstrated that highly expansionary monetary policies did not necessarily raise inflation, due to huge increasing in the demand for liquidity and safe assets by banking system and other financial institutions over the crisis. Complementary, following the crisis, more countries, e.g. Japan, Switzerland, Brazil and Israel, periodically intervened in the foreign exchange markets (FOREX) to moderate excessive appreciations caused by inflows of foreign exchange (Cukierman, 2013). The author concluded that the transmission of monetary policy expansion into the real sector and inflation is weaker during financial crisis. The excessive increasing of monetary emission by the FED in the 2008 USA Financial Crisis, alive the Keynesian phrase of liquidity trap that setting up the policy fiscal in the main attention to boost economy activity. Also, this was observed after Japanese financial bubble bursting in 1991, amid its depression that reduced the interest rate. In July 1995, the short-term nominal interest rate (the monthly average of the Uncollateralized Overnight Call Rate) fell to 0.95% as well as in march 1999 reached 0.4%. Later, the inflation rate reached 1.38% in 2008 (Ugarte et al., 2017). In the USA context of low interest rate obligated by the FED increased nonconventional OE since Nov. 2008. The authors recommended also fiscal and structural reforms with the aim to driving sustainability economic growth. However, other studies also highlighted the inefficiency to conduct effective countercyclical monetary policy to engine economic growth at zero bound on nominal interest rates, when inflation is low. In this context Coenen, Orphanides and Wieland (2003) simulate in a stochastic model how the asymmetry of policy ineffectiveness increased the variability of output significatively.

Recently, by using a probit order model, Cour-thimann and Jung (2020) for 20 years Euro data (1999-2018), have estimated an empirical reaction function for the ECB

monetary policy to capture the discrete nature of the changes in policy rates, asymmetries and nonlinearities. They demonstrated the importance of the international interest rate linkages (capturing global cycle), ECB reacted to the Federal Fund rate. The econometric results matched with the policy maker's responses during the period of analysis, including financial crisis episode. The authors concluded that the ECB press conference provides essential information about risk stability and economic growth. Furthermore, in some economic studies, monetary policy has been introduced as explanatory variable in a theoretical neoclassical economic growth model, expanding from two-assets to a three-assets, bond market plays the role of a third asset (Moosavi Mohseni and Cao, 2020). They highlighted the independence of the bond market. In the long run, low and stable inflation should be the primary goal for the monetary policymaker, acknowledge that the fiscal intervention can perturb the long run economic growth, because reduces effectiveness of the monetary policy. Even though, currently there can be any nexus between both policies as a natural response to the Covid-19 pandemic, the ECB has injected liquidity into euro area economies through the Pandemic Emergency Purchasing Program (PEPP) and Targeted Longer-Term Refinancing Operations (TLTROs) in order to stabilize them, while focusing on its price stability target. The European Council has added a complementary common fiscal response implementing the Next Generation EU (NGEU), which focuses on the structural change of EU economies to make green and digital transformations (Marmefelt, 2020).

Following ECB adoption of monetary quantitative easing (QE), has arisen studies in order to assess its impacts on inflation and monetary stability. For instance, Ferdinandusse and Freier (2020) model simulates how central bank asset purchases have been effective in lowering yields in Euro area. The effects can be potentially

stronger in Eurozone peripheral countries than in core countries, at the time of the program announcement, by modelling the indirect transmission channel of the Central Bank QE purchasing program. In their model, the effects depend on search friction in the markets. Also, their model suggests that the asset purchases effects are expected to be larger in economies with more preferred habitat investors, as core Euro markets (German and French sovereign bonds), than for Italian and Spanish ones (peripheral markets). Last but not least, this QE measure has effects on financial friction, yields and liquidity in Euro area countries with a relatively high and low Preferred Habitat Index (PHI). Undoubtedly, there are special characteristics in the Eurozone regarding other financial markets, as institutional investment increasing on the real state sector since 2012, it has more than quadrupled in absolute terms and as a share of total housing investment. These investors leverage buy-to-rent housing investment (Muñoz, 2020). One central conclusion of his paper is that all these investment activities seem to have nonnegligible macroeconomic effects, amplify procyclicality impact the borrowing's capacity of these investors and represent potential avenues for strengthening macroprudential policies for non-banks.

## 3.3. Methodology, theoretic model and data

### 3.3.1. Dynamic econometric analysis

This chapter models the GDP growth rate in Eurozone countries with a dynamic panel data structure accounting for the impact of the lagged values of this variable and a wide set of economic, financial and institutional explanatory variables, as well as controlling for unobserved heterogeneity. This latter feature comes from the idiosyncratic specific factors that affect differently to every country and need to be controlled for (Pindado and Requejo, 2014). In order to solve potential endogeneity problems, the models were estimated by the System GMM (SGMM), which, unlike

Difference GMM, does not exclude the fixed effects. There are reasons to include the dynamics on the dependent, explanatory, or both type of variables in the model specification, e.g. psychological, business costumes, technological, fixed asset/infrastructure and institutional aspects as labor contracts. Economic agents, families and domestic investors do not change their habits and expectations immediately in response to the changes of variables such as the interest rates, per capita GDP, or maybe Sovereign Risk Score, because they are constrained to fixed contracts and rules that do not allow them to react quickly to unexpected shocks or policies. Furthermore, the dependence is not instantaneous, it could be lasted for a long time, slowing, or step by step.

The GMM for panel data estimation was developed in Stata by Arellano and Bond (1991) and Arellano and Bover (1995). The difference GMM model basically removes the idiosyncratic factors by differencing the initial model and propose lagged variables as instruments for the difference equation. Subsequently, the System GMM model was proposed by Blundell and Bond (1998) to eliminate potential sources of omitted variable bias in estimation and thus reducing the endogeneity problems. It is also noteworthy that the considered dependent variable is the continuously compounded or exponential growth rate of GDP, computed as the difference of the logarithms of GDP. As commented in previous section, to achieve stationarity variables this transformation is also applied to other explicatory variables such as Gross Capital Formation or Human capital. Finally, after differentiating nonstationary variables all econometric models (1-5) are cointegrated and the panels exhibit a stable long run relationship (see Table 3.3).

Based on the economic growth cross-country catch-up relationship developed by Barro and Sala-i-Martin (2003), we attempt to estimate the following economic growth equation to explain the dLGDP, logarithm-difference (i.e. percentage

variation rate) of either the nominal GDP or real per capita GDP (the latter regressions are moved to the Appendix 3.A):

$$Y_{i,t} = \alpha_0 + \alpha_1 Y_{i,t-1} + \beta' X_{it} + \gamma' Z_{it} + \mu_i + \varepsilon_{i,t}$$
 (1)

where  $Y_{i,t}$  represents either (nominal Economic Growth rate)  $dLGDP_{i,t}$  or (real Economic Growth rate)  $dLGDP_{per\ capita\ i,t}$ ,

$$X'_{it} = (dLGKF_{i,t} \ dLHK_{i,t} \ dLOPEN_{i,t} \ Gini_{i,t})$$

and

$$\boldsymbol{Z_{it}'} = \left( \ \textit{LGFCE}_{i,t} \ \ \textit{LCPI}_{i,t} \ \ \textit{LNRPP}_{i,t} \ \ \textit{ECB-Rate}_{i,t} \ \ \textit{LGD}_{i,t} \ \ \textit{Deficit}_{i,t-1} \ \ \textit{SDC}_{i,t} \ \ \textit{Chow}_{i,t} \ \right)$$

are two vectors containing the fixed and variable variables considered in the regressions ( $\beta$  and  $\gamma$  being their respective vectors of parameters),  $\alpha_0$  and  $\alpha_1$  are the intercept and dynamic coefficients,  $\mu_i$  represents the unobservable country-specific effect, and  $\mathcal{E}_{i,t}$  is the error term satisfying the usual assumptions on panel data models. The notation of the variables follows the acronyms in Table 3.1 and a previous 'L' and 'dL' has been added to the variables expressed in logarithms or differences of logarithms, equivalent to the percent change, respectively.

Table 3.1 summarizes all the aforementioned variables and their data sources and

Variable Name	Definition	Source	
GDP	Gross Domestic Product (Current Euro)	European Central Bank	
GDPper	Percapita Gross Domestic Product (Constant 2010)	World Bank-WDI	
GKF	Gross Capital Formation (%GDP)	European Central Bank	
НК	Human Capital: School Enrollment, Secondary (% net)	World Bank-WDI	
OPEN	Export + Imports of Goods and Services-ratio-GDP	World Bank-WDI	
GFCE	General Government Final Consumption Expenditure (%GDP)	World Bank-WDI	

Table 3.1. Variables and Data Sources.

GD	Government or Public Debt (%GDP)	Bank for International Settlements	
Deficit	Negative Primary Result of Public Sector (%GDP)	World Bank-WDI	
POP	Population	European Central Bank	
Gini	Gini coeficient from 0 upto 100	World Bank-WGI	
СРІ	Index of Consumer Prices	Bank for International Settlements	
NRPP	Index of Nominal Residential Property Prices	Bank for International Settlements	
ECB-Rate	Central Bank Interest Rate	European Central Bank	
SDC	Sovereign Debt Crisis (Dummy: 1 in 2008-2012 and 0 otherwise)	Own elaboration	
Chow	Post SDC (Dummy: 1 in 2008-2019 and 0 otherwise)	Own elaboration	
FDI	Foreign Direct Investment, net inflows (% of GDP)	World Bank-WDI	
Rule	Rule of Law	World Bank-WGI	
Stability	The Political Stability and Absence of Violence/Terrorism	World Bank-WGI	

WGI: Worldwide Governance Indicators. WDI: World Development Indicators.

### 3.3.2. Description of economic data, indicators proxies and sources

The empirical analysis in the next section considers as dependent variable the logarithm-difference of Gross Domestic Product (GDP) at market (current) prices, neither seasonally adjusted nor calendar adjusted data in accordance with the ECB definition (2020). The GDP is the sum of the gross value added by all resident producers in the economy, plus any product taxes and minus any subsidies, not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Also, in the subsection of policy analysis we use the GDP 2010 constant prices (WDI, 2020) to separate in trend and cyclical components, with the aim to assess the impact of monetary impact and possible anticyclical fiscal policies evolution in the Eurozone during the Sovereign Debt Crisis. Furthermore, our analysis also uses per capita GDP (constant 2010 US\$), consider the midyear

population; therefore, its logarithm-difference (dL) represents approximately the real change rate (although the results for this variable are moved to the Appendix 3.A of this paper). The data available for this analysis covers the two first decades of 2000s for the Eurozone. The following Figure 3.1, depicts the GDP (logarithm-difference) evolution of the twelve first Euro countries.

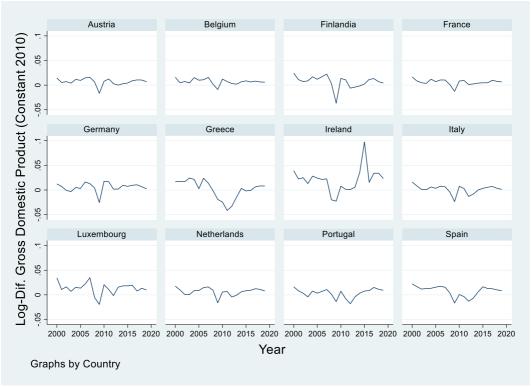


Figure 3.1: Difference of Logarithms of Gross Domestic Product

Source: World Development Indicators – World Bank

One of the factors that can help to boost the economic activities and the GDP is the Gross Capital Formation (GKF), that represents the outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. We hope finding a positive impact on economic growth, because Gross Capital Formation increases the productivity capacity, the demand of credits to impulse and finance new

businesses and household activities boosting the real income.

For testing the impact of the Human Capital factor on the economic growth, we consider the net children enrollment rate/ratio of official school age who are enrolled in school to the population of the corresponding official school age. This is because the fact that secondary education completes the provision of basic education that began at the primary level (5-6 years of life), and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers (WDI, 2020). Similarly, other empirical studies use this indicator as explanatory variable. For instance, Loayza and Soto (2006), Barro (1991), etc.

The Economic Openness (X+M)/GDP) degree should also be a driver of economic growth, since the increasing of globalization favors international commercial/business relations development and leads to increases in both exports and imports. This indicator has been tested for other authors who found a robust variable to explain the economic growth (Vamvakidis, 2002). In our assessment, this indicator is represented by the international trade of goods and services, Exports plus Imports, as a percentage of the GDP: (X+M)/GDP.

On the other hand, we have expected a negative impact of the government expenditures on the economic activities, represented by the General Government Final Consumption Expenditure (%GDP) (GFCE), on the Economic Growth rate, because it includes all government current expenditures for purchases of goods and services (including compensation of employees) that can affect negatively the private activities as crowding out, due to pressing interest rate market. Furthermore, high GFCE can increase the fiscal deficit (Primary Result of Public Sector) and Government debt (GD), in this way we consider both as negative potential explanatory factors of economic growth. Indeed, high levels of public debt, as we

observe nowadays in the Eurozone countries, can create conditions for higher Sovereign Risk Score (Risk) (linked to the default risk premia) and financial instability, damaging private investment and GKF as a result of the higher financial access costs (Briceño and Perote, 2020). In this way, we consider also that this explanatory variable has a negative impact on the Eurozone economic growth rates.

Another relevant factor to explain economic growth is population (POP), defined as people who are living in a reference area (Euro country), not transformed data, neither seasonally adjusted nor calendar adjusted data (ECB, 2020). This variable may also be considered as a proxy of the size of the country. Indeed, the quantitative population in EU countries are very different. From half-million people in Malta up to more than eighty million in Germany, which in turn affects the development in each one. Similarly, the income distribution of this population measured by Gini index, which gauged the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individuals or households. Geometrically spoken, the Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality (WDI, 2020).

Undoubtedly, the Consumption Price Index (CPI) needs to be considered when explaining economic growth since consumption and investment decisions are making in real terms. Furthermore, its increasing rate (inflation) generates uncertainty and for investors, reduces the real value of cash flows and impacts income distribution. It also creates distortions in relative prices, e.g. affecting net

exports and tax collection. Therefore, given that our dependent variable is the nominal GDP growth, we need to control our regressions by the CPI. This index has 2010 as its base year (with reference value 100). On the other hand, we consider that the Index of Nominal Residential Property Prices (NRPP) increase has an opposite impact on Europeans wealth. The acquisition of a real property is a profitable investment for households, since it constitutes a 'safe' saving and a potential source of future rents. Furthermore, the real estate prices measure the activity of the construction sector and thus is a relevant variable to explain economic growth.

Table 3.2 the expected impacts of explanatory variables on economic growth.

Table 3.2. Expected impacts of the determinants on Economic Growth

Explanatory variable	Expected sign/relationship
Gross Capital Formation	Positive
Human Capital	Positive
Economic Openess	Positive
Nominal Residential Property Prices	Positive
General Government Final Consumption Expenditure	Negative
Government Debt	Negative
Primary Defict of Public Sector	Negative
Total Population	Negative
Gini coeficient	Negative
Consumption Price Index	Negative
Referential Interest Rate of European Central Bank	Negative

Source: Own elaboration.

In order to test how monetary and financial policy from the European Central Bank (ECB) have influenced in the economic growth, we will test as explanatory variable the Referential Interest Rate of the ECB (ECB-Rate) and the domestic credits to the private sector. The greater this last ratio, the higher the intensity of financial service that might be expected from any liquidity aggregate or at any level of velocity inverse. For King and Levine (1993) this ratio can be seen as an economic

refinement of the M3 (cited by Von Furstenberg and Fratianni, 1996). M3 money supply technical definition includes M2 plus large time deposits in banks, institutional money market funds, short-term repurchase agreements (repo), and larger liquid assets.

# 3.3.3. Endogeneity, Multicollinearity, Unit Root Test and Cointegration issues

Undoubtedly, panel data models have endogeneity problems because of measurement errors, missing data, omitted variables, simultaneity or inverse causality between dependent and explanatory variables, etc. In this last case, some of the explanatory variables have effects on the dependent variable (Log-difference of the GDP), at the same time the dependent variable has contemporaneous or past effects on the explanatory variables: Government debt, public deficit, monetary aggregates, among other. Consequently, in order to avoid endogeneity the model specifications consider the first lag of these explanatory variables, e.g. GD(-1) or Deficit(-1), and thus model specification involves either exogenous or predetermined variables. This type of specification was also used to gauge the impact of the GDP-Cycle on the Deficit trend to assess the possible anticyclical fiscal policy. Furthermore, it is using the Generalized Method of Moments (GMM) to estimate our econometric models, strengthen the correction of possible endogeneity problems, particularly those induced by dynamic specifications.

To test in advance potential multicollinearity problems among the explanatory variables, we checked that correlation matrix does not show evidence of high sample correlation between the explanatory variables. Most of them are less than 0.50; e.g. the "Commercial Openness" and "Government Debt", exhibiting a sample correlation of -0.4081, or "Gross Capital Formation" and "Human Capital" with a sample correlation of 0.0019. Except the correlations of some variables

"Population" and "Commercial Openness", with the highest correlation index of -0.7764, or the correlation between "Government Debt" and "Gross Capital Formation" with a value of -0.5152 (see the Appendix 3.B). Therefore, we decided to maintain all these relevant variables in our regressions on the determinants of the Gross Domestic Product (global and per capita) and the impact of the GDP-Cycle on the Fiscal Deficit Trend.

Following our statistical analysis, we have applied the Fisher-type Unit Root Test based on the Dickey-Fuller Augmented statistic to find out whether or not the variables contain unit roots in the panels; therefore, we test the null hypothesis "all panels contain unit roots", against the alternative hypothesis "at least one panel is stationary". It is important to ensure that the economic series are stationary to perform econometric regressions. In the presence of unit roots, the variance grows without limits, causing problems in the consistency and in the asymptotic normality of estimators, generating spurious regression. As most of our economic variables the panels have unit roots, such as the Public Debt, Government Consumption Expenditure, Gross Domestic Product (global and percapita), Domestic Credit to Private Sector, among others. In this case, we use their first log-difference transformation to make them stationary in order to perform our econometric regressions (see the Appendix 3.C).

Furthermore, cointegration analysis was performed through the Kao panel data test for all regressions. This statistic tests the null hypothesis of 'no cointegration' (of panels), against the alternative hypothesis that 'all panels are cointegrated'. As we can see in the next sections, the null hypothesis was rejected at the 1% significance level for all the regressions, which implies that panels are cointegrated, there is a stable long-term equilibrium relationship of all panels. Therefore, the estimations and inferences based on the models presented in the next subsections are valid. Each

Table of regressions (Table 3.3 and 3.4) reported the Modified Dickey Fuller for each regression.

# 3.4. Empirical results

### 3.4.1. Determinants of economic growth

Table 3.3 and Table 3.4 present the econometric assessment of the models and how the explanatory variables impact on Eurozone nominal growth rate (dLGDP) and real per capita growth rate (as results are quite similar, the latter was moved to the Appendix 3.A). After comparing the static FE and RE models in accordance to the Hausman test, the hypothesis that both models provide equivalent (and consistent) estimates is rejected and thus fixed effects model is preferred. However, Table 3.3 considers only the dynamic estimations including the first lag of the dependent variable (dLGDP(-1)) as an additional regressor. The coefficient of this variable captures the short run elasticity, which is positive and significant. This means that there is a significant dynamic process in the Eurozone economic activity, as conjectured in previous section. Consequently, for the purpose of consistency, the models implement SGMM estimation.

For this purpose, 'Political Stability', 'Foreign Direct Investment' and 'Rule of Law' were as instrumental variables, because these have been proven to be exogenous regarding our economic growth models. These variables are determined by interactions with external economic factors, as international investors and/or economic agent's decisions, having impact on the economic growth (Aisen & Veiga, 2013). According to Sargan and Hansen overidentifying restrictions tests the chosen instruments were valid, as well as the moment restrictions employed. These tests for model diagnosis are displayed in the last rows of Table 3.3. Furthermore, the Arellano and Bond (A-B) test for serial autocorrelation of the model errors in first

differences reveals the typical negative and significant AR(1) coefficient but insignificant AR(2) coefficient. All of this points to the validity of the inference based on the regression estimates, whose standard errors are robust in the presence of heteroscedasticity.

In what follows we explain the main effects found in the regression coefficients. The growth rate of Gross Capital Formation (dLGKF) is positive and significant, which means that economies with a high level of investment tend to grow faster than others. Different authors (Teixeira and Queirós, 2016; Boamah et al., 2019), also verified that investment/physical capital formation plays an important role in economic growth, both for the more developed, Western countries and the more heterogeneous sample with Eastern European emergent economies. This factor is also associated with the financial development of Eurozone in the last decades, related with both the investment rate and the relative efficiency on the capital use before the Euro introduction (King and Levine, 1993). The positive and significant impact in our model means that during the two decades, before pandemic, more investment in fixed assets and net changes in the level of inventories have contributed to dynamizing the economic activities and wealthfare.

The coefficient of the proxy for Human Capital (dLHK) was also identified as one of the most relevant factors to explain economic growth, playing an important role in the technological progress (its coefficient is positive and significant). Especially, in our dynamic regressions, after introducing a dummy variable for transitional and permanent changes due to Sovereign Debt Crisis. The positive elasticity-impact varies between 0,22 and 0,33. Which means for each one-point percent increase in secondary school children enrollment the economic growth rate also rises about a quarter-point of percentage. This variable represents the basic education that contribute to create the foundations for lifelong learning and human development,

similar results were obtained for other researchers worldwide (see e.g., Barro, 1991 and 2003). Based on dynamic panel data estimation some authors have also found that human capital and countries' productivity and specialization are crucial factors for economic growth (Teixeira and Queirós, 2016).

As expected, the economic openness indicator (OPEN) has a positive and significant effect on the economic growth for EU countries. Indeed, the Euro currency removed the volatility of the exchange rates and the exchanging currencies cost between countries, being one of the core benefits of the Eurozone that has been emphasized since its inception. It facilitates trade (goods and services) and investment among the countries of the EMU and hence increases income growth within the region, by reducing transaction costs of cross-border businesses. The Eurozone also allowed a more integrated financial market. with more opportunities for businesses to increase international markets and intracommerce, resulting in a stronger presence for the Eurozone in the global economy and positively influencing the regional economic growth. For instance, the commercial transit of merchandise between China and the Eurozone has increased sharply, especially, through the Russian railway network in the last years. Consequently, and consistently with previous research, economic growth increases with favorable movements in the terms of trade and increasing international openness (Barro, 2003). Other authors have argued that more international commerce makes a country learning, increasing productivity and economic growth, which is known as the 'learning by exporting' hypothesis (Chirinos, 2006).

The Government Final Consumption Expenditure (GFCE) seem to have influenced negatively the global and average economic growth rates in our period of assessment, since the cash government payments for goods and services helped to grow the public deficit (Deficit) and reach high government debts (GD). Most of

these goods and services produced by public sector (e.g. Health, recreational and sporting services, cultural services, education and social protection) are not market priced because they are produced by the governments, thus prices are based on their production costs, i.e. salaries, intermediate consumption and depreciation. Let us not forget that the production of these goods and services are related with payments used for the fixed capital formation. Consequently, the size of these public activities can generate a trade-off with the private sector activities. The negative and significant sign also is similar with other authors that consider this variable as the government size (Kim et al., 2017) Coincidentally, between 2005 and 2012, 25 out of the 29 Organization for Economic Cooperation and Development (OECD) governments increased their individual consumption as percentage of GDP. The Netherlands showed the largest increase in their share: from 13.4% of GDP in 2005 to 17.5% of GDP in 2012. In contrast, Portugal and Hungary showed the largest decrease in government's individual consumption share relative to GDP (OECDE, 2014).

The Model 4 reported in Table 3.3, also reports a clear negative and significant impact of the Log-difference of Government Debt (dLGD) on our economic growth rate. The last Sovereign Debt Crisis affected negatively the public finance in the Eurozone because of public rescuing operations for broken private banks, leading accumulated high public debt ratios. The high accumulated public debt stock in the Eurozone has a negative impact not only on the global, but also on the per capita GDP growth (see the Appendix 3.A). Undoubtedly, these public financial indicators can press the sovereign risk score, which in turn would impact on the borrowing costs for corporations and family consumer credits, making private investment crowding out. Coincidentally, among the twenty highest indebtedness countries in the world, there are Greece, Italy, Portugal, Spain, France, Cyprus and Belgium.

Finally, after testing the Primary Deficit of the Public Sector (*Deficit*), defined as the income of the government less expenditures, without including public debt interest – i.e. a positive (negative) sign means primary surplus (deficit). The lag of this variable has been proved in Model 5 (Table 3.3) to have a negative and significant impact on the economic growth rate.

Table 3.3. Determinants on Eurozone Economic Growth

	SGMM MO DEL 1	SGMM M ODEL 2	SGMM M ODEL 3	SGMM MODEL 4	SGMM M ODEL 5
INTERCEPT	0,3914	0,3053	0,2799	0,1727	0,2632
(p-valor)	(0,000)	(0,000)	(0,001)	(0,000)	(0,006)
dLGDP(-1)	0,2881	0,2650	0,2845	0,2976	0,4770
(p-valor)	(0,007)	(0,011)	(0,008)	(0,001)	(0,000)
dLGKF	0,2432	0,2275	0,2365	0,1629	0,3006
(p-value)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
dLHK	0,3134	0,2951	0,2978	0,2285	
(p-value)	(0,049)	(0,100)	(0,070)	(0,108)	-,-
dLOPEN	0,1003	0,1086	0,1002	0,1000	0,1024
(p-value)	(0,023)	(0,015)	(0,028)	(0,004)	(0,035)
<i>LGFCE</i>	-0,0765	-0,0726	-0,0749		
(p-value)	(0,000)	(0,000)	(0,000)	-,-	-,-
dLGD				-0,1670	
(p-value)				(0,000)	
DEFICIT(-1)					-0,0007
(p-value)					(0,000)
Gini	-0,0011	-0,0010	-0,0010		-0,0005
(p-valor)	(0,010)	(0,014)	(0,011)		(0,121)
LCPI	-0,1823	-0,1416	-0,1250	-0,1258	-0,1714
(p-valor)	(0,000)	(0,000)	(0,026)	(0,000)	(0,003)
LNRPP	0,0592	0,0588	0,0582	0,0460	0,0522
(p-valor)	(0,000)	(0,000)	(0,000)	(0,000)	(0,008)
ECB-Rate	-0,0015		-0,0017		
(p-valor)	(0,153)		(0,113)		

$SDC_{2008-12}$		-0,0058			-0,0064
(p-value)		(0,000)			(0,001)
Chow2008-19			-0,0061		
(p-value)			(0,001)		
Num. Obs.	241	241	241	269	123
No. Groups	19	19	19	19	18
MDF-Cointeg.	-4.7512	-5.3584	-4.7512	-7.6681	-12.3945
(p-value)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
A- $B$ $AR(1)$	-2,21	-2,16	-2,15	-1,79	-2,31
(p-value)	(0,027)	(0,030)	(0.032)	(0,073)	(0,021)
A- $B$ $AR(2)$	-1,25	-1,46	-1,23	0,97	-1,78
(p-value)	(0,211)	(0,143)	(0,218)	(0,334)	(0,075)
Sargan	258,84	266,58	262,35	270,40	144,09
(p-value)	(0,101)	(0,054)	(0,070)	(0,332)	(0,301)
Hansen	2,63	5,83	4,69	13,88	5,35
(p-value)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)

This Table includes lineal regression dynamic models estimated by System GMM (SGMM). *dLGD P(-1)*: First lag of the logarithmic difference (log dif.) of the Gross Domestic Product. *dLGKF*: Log dif. of the Gross Capital Formation. *dLKH*: Log dif. of Human Capital. *dLOPEN*: Log dif. of Econ omic Openness Coefficient. *LGFCE*: Logarithm of the Government Final Consumption Expenditur e. *dLGD*: Log dif. of Government (Public) Debt. *DEFICIT(-1)*: First lag of the Government Primar y Deficit. *Gini*: Coefficient of Gini. *LCPI*: Logarithm of the Consumption Price Index. *LNRPP*: Logarithm of the Nominal Residential Property Prices Index. *ECB-Rate*: Central Bank Referential Int erest Rate. *SDC*<sub>2008-12</sub>: Dummy scoring 1 in the sovereign debt crisis period 2008-2019. *Chow*<sub>2008-19</sub>: Dummy scoring 1 in the period 2008-2019. *MDF-Cointeg*.: Modified Dickey-Fuller Test for Coin tegration. *A-B AR(1)* and *A-B AR(2)*: Arellano-Bond Test for Autocorrelation at First and Second O rders, respectively. *Sargan* and *Hansen*: Tests of overidentification restrictions.

Similarly, the impact of Gini coefficient (Gini) is negative and significant on the economic growth rate, on both global GDP and per capita GDP analysis. Therefore, this coefficient has been proved to be a robust indicator to explain our models. However, Eurozone countries have the smallest Gini coefficients in the world, after considering taxes payment and government transfers. This means that this world area exhibits it a quite homogeneous income distribution; however, its impact is negative. It must be also pointed out that in our econometric analysis we have

considered also as one of the explanatory variables the average mid-year population, for explaining the per capita GDP evolution (see the Appendix 3.A), finding a negative and significant effect, because of the fact that per capita income is a decreasing function of population. Therefore, our results confirm the negative relationship between population growth and economic growth (Teixeira & Queirós, 2016).

The logarithm of the Consumption Price Index (LCPI) also has a negative and significant impact on the economic growth. Inflation negatively affected the real income of people reducing economic real activities and the per capita income. Furthermore, discourage the possibility to get financial instruments that allow keeping personal real income. However, unfortunately, we cannot say that disinflationary process (reduction of LCPI) increases the per capita income, because disinflationary process could be resulted from a detrimental economic contraction and high unemployment, like the last year starting pandemic shocked. In the case of the logarithm Nominal Price of Property Index (LNPPI), this resulted being significant and positive to explain the global and per capita economic growth. The real state sector has been one of the major factors that boost the labor market before bursting the housing bubble (2008). Furthermore, for much families this is not only a real housing investment to live, but also can represent an extra income for most old age people, being currently the central income for much elderly citizens. There are different indicators to assess the yield of this real sector e.g. the yearly rent regarding the housing price, but this research uses only the logarithm of this index, published by the Bank of International Settlements, as a proxy of this return investment.

Finally, the coefficient of the Sovereign Debt Crisis (SDC) dummy built to control for its adverse effects on the economic growth is negative and significant. This variable scores one (1) for all countries, only for the period: 2008-2012; otherwise, zero (0). Coincidentally, from the middle of 2008 to the 2012, the proportion of the total liabilities of Non-Financial Corporations (NFC) accounted for Monetary Financial Institutions (MFI) loans diminished in the twelve initial Euro area countries, most strongly in Ireland (ECB, 2013). During this period asset prices reduced their market value, households and business were unable to pay their debts and credit and financial operations crunched, affected detrimentally the real sector; especially, for Greece, Ireland, Italy, Portugal and Spain (GIIPS). Last but not least, when we tested the Chow break point for the structural change of the economic growth, since 2008 to 2019, for all nineteen panels, this has been also negative and significant. This means that the Sovereign Debt Crisis has also affected negatively the economic growth permanently, because of different mechanisms as its structural effects on unemployment, generating a vicious cycle with credit debtors in most countries.

# 3.4.2. Monetary and fiscal policies on economic growth

Two cornerstones of the economic growth, and particularly for financial crisis recovery, have been the monetary and fiscal policies undertaken by the ECB and the National Governments, respectively. In this way, this section analyzes these policies to detect their potential anticyclical behaviors and any possible coordination of both institutions when using their policy instruments. Firstly, it was tested the impact of the ECB intervention by using its referential interest rate, which, under the inflation targeting scheme, and among other monetary instruments, it is the main short-term instrument that influence on the interbank interest rates (Euribor). This variable affects to the economy because allowed the expectation formation of economic agents (investors and households) and influences in the

market long-term interest rates structure. However, our results support that the referential interest rate has impacted negatively the economic growth rate, in both global (see Table 3.3) and per capita economic growth analyses (see the Appendix A), although this effect is more significant in the latter regressions. This means that ECB interventions (probably guided by some type of Taylor rule) have a clear stabilizing target, e.g. reducing referential interest rate in recessions and increasing it in expansions.

Furthermore, we have tested the impact of two financial/monetary variables that broadly represented the financial sector development, particularly the effects of Domestic Credit to Private Sector (%GDP) and Domestic Credit provided by Financial Sector (%GDP), to know their possible influence on the global and per capita GDP growth rates. The findings strengthened the weak relationship between them and the global and per capita GDP growth rates in the last decades; maybe as a result of financial crisis and excessive use of QE mechanism. To avoid the effects of potential endogeneity problems between these variables and the GDP, we also have considered their first lags as explanatory variable in the System GMM Models; the effects resulted being not significant. There are not clear effects of these financial indicators on the good performance of economic growth. However, the right causality could be in the other way around, from GDP per capita towards financial system development as in previous studies (King & Levine, 1993). This can be also the source of endogeneity problems in our regressions that we tackle by estimating System GMM dynamic panel data.

In the same way, it is important to analyze what type of fiscal policy National Governments have been carrying out, as a potential driver of economic growth. Following Gali and Perotti (2003), we analyze whether fiscal policy has been procyclical or countercyclical in our period of study (1999-2019). For this purpose,

after estimating the trend and cycle of the Public Sector Deficit and the Gross Domestic Product by using the filter of Hodrick and Prescott (1997), we regressed the Primary Public Deficit Trend (Deficit-trend) on the production-gap or GDPcycle and the lagged logarithm-difference of the Public Debt (dLGD(-1)), as well as other control variables including the above mentioned ECB interest rate. Therefore, if the GDP cycle parameter resulted being negative and statistically significant, this means that when economy is in growth phases (i.e. the current GDP is above its trend), the fiscal deficit trend tends to reduce due to discretional policies; not necessarily due to the impact of automatic stabilizers (that are supposed to impact directly the Deficit-cycle). On the other hand, if the impact of the GDPcycle resulted being positive and statistically significant, it would mean that National Governments remain increasing their public expenditure even when the economy is doing well, above its trend GDP. Similarly, a negative sign for the ratio must be interpreted as pointing to a deliberate countercyclical fiscal stance, whereas the size of the ratio captures the strength of that response, relative to the size of the output gap decline. Therefore, we gauge the follow fiscal rule:

$$tDeficit_{i,t} = \theta_0 + \theta_1 E_{t-1} [LGDP_{i,t} - tLGDP_{i,t}] + \theta_2 LGD_{i,t-1} + \theta_3 tDeficit_{i,t-1} + \theta_4 Lrate_{i,t} + \theta_7 LPOP_{i,t} + \mu_i + \varepsilon_{i,t}$$
 (2)

where *Deficit* accounts for the Primary Deficit of Public Sector and the rest of the notation follows the acronyms in Table 3.1 but adding 'L' for logarithm and 't' for the Hodrick-Prescott trend of the variable.  $\theta_j$  (j=1,...,7) are the parameters of the model,  $\mu_i$  represents the unobservable country-specific effect, and  $\mathcal{E}_{i,t}$  is the error term satisfying the usual assumptions on panel data models.

Table 3.4 displays the results of some regressions on the dependent variable, the current tendency of the public sector Deficit (*tDeficit*) of the type of that in equation (2). This variable is explained in terms of a dynamic model that includes as

explanatory variables its own first lag, the lagged expected cycle of GDP (production gap: *LGDP-tLGDP*) and logarithm-difference of Public Debt (*dLGD(-1)*). Furthermore, it includes the logarithm of ECB interest reference rate (*LRate*) and Logarithm-difference of the Population (*dLPOP*) to account for potential interaction with monetary policy and size effects, respectively. As in the previous regressions, the statistics for model diagnosis show that the model is cointegrated (thus results are not spurious) and the SGMM estimation is based on valid instruments (according to Hansen test). However, the second order autocorrelation of the differenced model seems not to be vanished (maybe requiring a more complex dynamic structure).

Table 3.4: The Effect of the GDP-Cycle on the Public Deficit

Tendency

	SGMM MO	SGMM MO	SGMM MO	SGMM MO
	DEL1	DEL2	DEL3	DEL4
INTERCEPT	-0,1826	-0,1779	-0,1853	-0,1713
(p-value)	(0,006)	(0,007)	(0,002)	(0,023)
TendDeficit(-1)	0,8546	0,8552	0,8664	0,8761
(p-value)	(0,000)	(0,000)	(0,000)	(0,000)
CycleLGDP(-1)	-31,2469			
(p-value)	(0,000)			
CycleLGDP <sub>NSDC</sub> (-1)		-45,3599		
(p-value)		(0,000)		
CycleLGDP <sub>SDC</sub> (-1)		-20,1702		
(p-value)		(0,000)		
CycleLGDP <sub>giips</sub> (-1)			-71,3036	
(p-value)			(0,001)	
CycleLGDP <sub>frugal</sub> (-1)			-3,9374	
(p-value)			(0,611)	
CycleLGDP <sub>other</sub> (-1)			-24,0050	
(p-value)			(0,000)	

SDC*CycleLGDP <sub>giips</sub>				-47,5552
(-1)				· ·
(p-value)	-,-			(0,012)
SDC*CycleLGDP <sub>frug</sub>				0 2002
al(-1)			-,-	-0,2883
(p-value)				(0,966)
SDC*CycleLGDPothe				2 2421
r(-1)	-,-			-3,2421
(p-value)				(0,590)
dLGD(-1)	-5,0631	-4,9736	-4,3005	-3,1539
(p-value)	(0,011)	(0,006)	(0,003)	(0,054)
ECB-LRate	-0,2108	-0,1860	-0,1968	-0,2541
(p-valor)	(0,000)	(0,000)	(0,000)	(0,000)
dLPOP	-72,2932	-76,0352	-66,0080	-83,8408
(p-value)	(0,003)	(0,00)	(0,002)	(0,001)
Number of obs.	161	161	161	161
Number of groups	17	17	17	17
MDF-Cointg.	-4.0047	-3.7274	-4.5054	-3.0407
(p-value)	(0,000)	(0,000)	(0,000)	(0,001)
A- $B$ $AR(1)$	1,47	1,44	1,64	2,30
(p-value)	(0,141)	(0,151)	(0,100)	(0,021)
A- $B$ $AR(2)$	-1,83	-1,56	-1,45	0,01
(p-value)	(0,067)	(0,120)	(0,147)	(0,995)
Sargan	582,65	585,14	476,12	682,79
(p-value)	(0,000)	(0,000)	(0,000)	(0,000)
Hansen	7,45	8,70	6,34	5,15
(p-value)	(1,000)	(1,000)	(1,000)	(1,000)

This Table includes four Dynamic Regression Models estimated by System GMM (SGMM). Defin itions: CycleLGDP(-1): First lag of the Gross Domestic Product Cycle in Logarithm for all Eurozo ne. CycleLGDPgiips(-1): First lag of the Gross Domestic Product Cycle in Logarithm for GIIPS co untries. CycleLGDPfiugal(-1): First lag of the Gross Domestic Product Cycle in Logarithm for Fru gal countries (including Germany and France). CycleLGDPother(-1): First lag of the Gross Domestic Product Cycle in Logarithm for other countries. dLGD: Logarithm-Difference of Government (Public) Debt. LCPI: Logarithm of the Consumption Price Index. LNRPP: Logarithm of the Nomin al Residential Property Prices Index. ECB-LRate: logarithm of ECB Referential Interest Rate. MD F-Cointeg: Modified Dickey-Fuller Test for Cointegration. A-B AR(1) and A-B AR(2): Arellano-B ond Test for Autocorrelation at First and Second Orders, respectively. Sargan and Hansen: Test of o ver-identification restrictions.

Model 1 supports the fact that Eurozone National Governments have been using anticyclical fiscal policy since their inception, which could be the optimal policy to minimize economic cycles in the presence of demand shocks. In other words, when there is economic recession (expansion), the deficit increases (decreases), not only at the expense of automatic stabilizers, but also because of the government's discretionary fiscal policy. This means that National Governments intentionally influenced public revenues and/or expenditures, attempting to stabilizing their primary Deficits, Government Debt level and their long-term sustainability. This is consistent with the Gali and Perotti (2003) analysis for the period (1992-2002), for most of the European countries; however, these authors found that the biggest Eurozone countries (Germany and France) tend to present a positive parameter (i.e. a procyclical fiscal policy) in this period.

The Model 2 tested the impact of the yearly GDP-cycle on the Deficit-trend for the normal periods of Non-Sovereign Debt Crisis (NSDC) and the impact of the yearly GDP-cycle on the Deficit-trend for the periods of Sovereign Debt Crisis (SDC), confirming the anticyclical fiscal policies for both periods (negative and significant impact of the GDP cycle). For disentangle the puzzle of Germany and France fiscal policy orientation in Model 3 we estimated separately the GDP-cycle impacts of GIIPS (Greece, Ireland, Italy, Portugal and Spain), Frugal (Austria, The Netherland and Finland, including Germany and France), and the other countries (Belgium, Cyprus, Estonia, Lithuania, Luxembourg, Latvia, Malta, Slovakia and Slovenia) on the Deficit-tendency. In the three cases when the GDP-cycle is positive, the Deficit-trend seems to reduce, although for the Frugal countries this effect is not significant. These results can show that Frugal countries do not follow a clear pro- or counter-cyclical fiscal policy; maybe they are neither expansive in crises, nor restrictive in expansions. Such a behavior might also be linked to the smoother pressure that risk

premia put on their Public debt amounts, unlike the GIIPS countries.

Model 4 pretend to refine the previous result by testing the reaction of National Governments only during the period of Sovereign Debt Crisis (2008-2012). For this reason, we have estimated three interacting variables by multiplying the dummy for this period (SDC) and the LGDP-Cycle lag. This is done for the three subgroups of countries: SDC\*CycleLGDP<sub>giips</sub>(-1), SDC\*CycleLGDP<sub>frugal</sub>(-1), and SDC\*CycleLGDP<sub>Other</sub>(-1). Even though, the three parameters of the LGDP-Cycle resulted being negative, only for GIIPS countries is statistically significant, which can confirm that GIIPS countries clearly were making anticyclical fiscal policy during the Sovereign Debt Crisis. However, the estimated parameters for Frugal and the Other group of countries are not statistically significant. All results strengthen our view of Euro countries are very heterogenous, not only in economic growth rates, but also in fiscal policy adoption.

Finally, it is worth to note that the parameter of the logarithm ECB interest rate (*LRate*) in all regressions of Table 3.4, resulted being negative and significant, pointing to a coincidence of the sign with fiscal policies (both tend to be expansionary or contractive). This result does not necessarily mean an intentional coordination between the ECB and National Governments. In fact, the ECB is one of the most independent institutions, but it is clear that in much of the sample (including financial crisis), both institutional policies should have gone hand in hand, for reaching the obvious common goal of making anticyclical policy. Developments during the Covid-19 crisis involve strongly complementary monetary and fiscal policy, and not the outcome of an emergent monetary-fiscal nexus; the ECB maintains its independence using unconventional monetary policy to reach price stability (Marmefelt, 2020). On the other hand, it would be logical to

think that the decreases in the BCE interest rate, have facilitated the discretionary and/or intentionally increased of public deficits, by paying less interest for the stock of Government Debt (GD<sub>t-1</sub>). It does seem a new and interesting result in our economic research, because the mechanism of the referential interest rate affects the market interest rate structure, including government debt securities and bond markets.

### 3.4.3. Policy implications for Economic Growth in the post Covid-19

Even more adverse than the Sovereign Debt Crisis, the Covid-19 pandemic has negatively shocked the real and financial sectors, with unprecedented economic contraction, huge unemployment and human capital deterioration, illness and dead people, impacting on the life standards, etc. After some months of quarantine, full multimodal transport immobility and economic activities stopping, to dealt with coronavirus contagions; the GDP has detrimentally contracted about 9% in 2020. Undoubtedly, these crises affected negatively the public finance, increasing the public sector deficits and the stock of debts, which in turns reduce economic growth in accordance with our econometric results. However, unlikely the nowadays Covid-19 pandemic, the past Sovereign Debt Crisis was caused by the vicious cycle between high public debts, due to recovery broken banks; at the same time the high accumulation of government debt securities (bonds) keeping by European private banks that feedback this vicious cycle creating the moral hazard. Furthermore, the public deficits and the total final magnitude of the Covid-19 pandemic adverse effects depends of the vaccine effectiveness, its fast massification and possible outbreaks.

Currently, without any previous coordination, governments have finished over indebtedness directly with the European Central Bank, which approved a Pandemic Emergency Purchase Program (€ 1.85 billion), with the aim to perform asset-buying

public and corporation securities debts, in order to enhance the liquidity, buying not only public debt securities (bonds), but also corporate bonds up to March, 2022. Therefore, the nowadays high public deficits, increasing of the big public debts and the current financial crises are consequences of the Covid-19 pandemic.

In accordance with our econometric results, it is still important keep on investing in fixed capital, basic education and promoting more international commerce in order to mitigate the falling of the GDP rates. Indeed, these public investments can mitigate the divergence on income distribution among citizens, supporting possible reduction of Gini coefficient, which in turn mitigate the GDP reduction. Furthermore, starting Covid-19 pandemic, governments have made countercyclical fiscal policies by supporting specific industries to keep up environmental, digitalization and innovation policies, increasing the public pension system benefits, incorporating a minimum income for the poorest, finance sanitary/health public policies and Innovation, Research and Development on Health (R&DH), etc. Furthermore, the ECB has adopted different nonconventional measures in a context of zero lower bound of interest rates where conventional monetary policies are ineffective, as in the 2008 Sovereign Debt Crisis to stimulate economy, e.g. the Pandemic Emergency Purchase Program, without causing inflation and/or Euro depreciation.

Therefore, after Eurozone economic contraction and detrimentally increased of unemployment rate due to pandemic, reached up to 8.5% in October 2020, the development of the financial sector has been affecting negatively. However, for some countries the negative impacts are even more detrimental. For instance, Spanish, Italian and French 2020 GDPs felt more than 10% in 2020. In the case of unemployment rates, Spain and Greece have reached the highest rates. 16.2% and 16.8%, respectively, because their highest touristic activities participations in the

GDP. Even though, they are making countercyclical fiscal policies, they have been very weak to recovery from the pandemic.

Hopefully, the inflation for 2021 will recover attached with employment and economic activities, reactivation, reduction of uncertainty because of voluntary massive vaccines adoptions; especially, in the second half-year. Therefore, these facts give ECB more breathing space for continuing acting to get their aims. However, in accordance with our econometric results high inflation rates in the Eurozone can slow the economic growth, not only in nominal, but also in real terms. The deflation observed in the last year was attached with economic contraction and unemployment. Without doubts, this health financial crisis is making ECB to rethink their aims, as possible long run inflation target, that allows in the next years getting higher inflations than its historic rates. By the end of 2020, Spain, issued government debt securities (bonds) with 10-years negative interest rates.

Even though the ECB laxing measures adopted before the Covid-19 pandemic, since the Sovereign Debt Crisis that had later effects, this Central Bank has been over intervened since the 2020-II quarter, starting the pandemic. It implemented not only the Pandemic Emergency Purchase Program, but also credit standards flexibility to buy much riskier assets (public and private corporation securities debts), granting cheap credit programs for liquidity enterprises, cutting up the interest rates (LBZ), among others. These similar interventions have been continuously projected unless in the short and medium terms, but less insensitivity than in last year. Indeed, all these measures also helped avoid the 2008 illiquidity crisis.

Our econometric analysis also supported the fact that National Governments have adopted anticyclical fiscal policy. When the Gross Domestic Product is above its tendency, the primary deficit decrease, not only as result of the automatic stabilizers but also as a consequence of tighten discretionary fiscal policy (governments are rationally saving in expansion periods). After making separately assessment for each group of Eurozone (GIIPS and Frugal) or for subperiods of growth and the Sovereign Debt Crisis, to see what is the impact of the cyclical component of GDP; we confirm the previous results of anticyclical fiscal policy for the GIIPS countries. Therefore, according to Table 3.4, most of fiscal policies have been countercyclical in the period of analysis. If this is the case, when we get out of the Covid-19 crisis, the result also will have to be treated with a restrictive fiscal policy, we must be attentive to see what happens in the next years also with fiscal policy to make it sustainable in the long term.

Currently, the appearing of new Covid-19 vaccines has shed light on the future economic recovery, which, in the short and medium terms, it will be solely in the hands of their positive effects and very fast massification. However, even in the ideal situation of the Covid-19 exogenous shock erasing, this would not necessarily reestablish the economic growth path, unless the 'disequilibria' of fiscal and monetary policies were generally accepted or solved. This is particularly complex in the Eurozone, where there are salient differences among countries and, once more, the post Covid-19 crises will definitely put the Euro area under the test. As a matter of fact, the decision and policy making would require structural measures but also revising the admissible or sustainable public debt ratios and liquidity (Marmefelt, 2020).

#### 3.5. Conclusions

This chapter investigates on the economic drivers and policies impacting in the Eurozone economic growth with dynamic panel data econometric technique, splitting it into three groups: Peripheral (GIIPS: Greece, Ireland, Italy, Portugal and Spain), Frugal (Austria, The Netherland and Finland, including Germany and

France) and other (Belgium, Cyprus, Estonia, Lithuania, Luxembourg, Latvia, Malta, Slovakia and Slovenia). By assessing the impact GDP-cycle (production gap) on the public sector deficit tendency we study the role of fiscal policy and interaction with monetary policy. The models show the effects of Gross Capital Formation, Human Capital, Commercial Openness, Residential Property Prices (e.g., Barro, 2003 and 1991, Vamvakidis, 2002) and the Anti-cyclical Fiscal Policy for maintaining the global economic growth. On the other hand, Government Consumption Expenditure, Public Debt and Primary Deficit have affected negatively. The findings must be taken into account in order to boost economic growth in the post-Covid-19; especially, the anticyclical monetary and fiscal policies.

The heterogeneity between Eurozone members since its inception is sharply deepening not only in the real sector, but also in the financial and capital markets, affecting negatively the financial regional integration and development. Also on their own National Governments public finance (Briceño and Perote, 2020). The Covid-19 crisis risks leading to a further widening of economic divergences in the European Union, the pandemic is also an asymmetric shock, the impacts and profoundly differences across Member States, reflecting their severity and stringency of related containment measures, different exposures due e.g. to the size of the tourism sector and the space for discretionary fiscal policy responses (European Commission, 2020). Therefore, the recuperation required homogeneous regulations, not only in the pension systems and retirement ages to mitigate the cost of pension system, but also on labor markets contracts, environmental maintenance, digitalization, information and telecommunication services, etc.

Different from the past Sovereign Debt Crisis, after subprime mortgage crisis, where the vicious circle between high government debts and rescued private banks

supported by political influenced leading to these institutions finishing with high public debt securities; nowadays, the European Central Bank is ending up maintaining the high public debt securities of their members countries; government and corporate bond buying have been passed up to the first quarter of 2022. Gaballo and Zetlin-Jones (2016) explored this feedback mechanism in a model of financial intermediation, banks are subject to managerial moral hazard and ex ante optimality requires lenders to commit to ex post inefficient bank liquidations showed that an increase in banks' holdings of domestic sovereign debt decreases the ability of domestic sovereigns to successfully enact bailouts.

The solely implementation of the vaccine against coronavirus since December of 2020 and its slow massification in the first quarter of 2021, to attempt containing the propagation of contagion, do not ensure the economic recovery confidently. The Covid-19 pandemic has left the euro area economy quite weak. It is essential that both fiscal and monetary policies remain mobilized to achieve a sustainable recovery in the next years. The ECB have to tread a fine line between its price stability mandate and the need to avoid disrupting debt markets (Wyplosz, 2020). Furthermore, social and productive infrastructures, digital technologies, environment, innovation, healthy and sanitary investment will be markedly performed in the next years. e.g. the implementation of the digital Euro currency should be a reality in the next years for cash transfers and payments, supporting productivity increases.

During the Eurozone existence, the national governments have been following fiscal anticyclical policy, particularly during the Sovereign Debt Crisis, affecting the tendency of public sector Deficits; especially, in the GIIPS after separating from the so-called Frugal countries. In this way, national governments should help to strengthen the ECB aims, by keeping on making countercyclical discretional fiscal

policy to reach economy takes off. Nevertheless, a fiscal policy having a long-term perspective has emerged, the Multiannual Financial Framework (2021-2027), the long-term EU budget and the Next Generation EU, as well as the green and digital transitions are key elements acknowledged by the ECB (Marmefelt, 2020). Both temporary and long-term instruments should be balanced to boost a sustainable recovery.

There are also limitations and paths for future research. It is important to move into a most elaborated proxy indicator to represent the economic well-being in a heterogeneous society. We need to explore different and specific financial, monetary and fiscal policy measures such as QE programs, interest rates cuts, credit into private and productive sectors promotion, buying public and corporation debt securities (bonds), lack and relaxation regulations, etc., adopted with the aim to get recovery domestic economies after financial crisis episodes to develop in the post-Covid-19 age. It is important to separate the analysis between peripheral and not peripheral countries because of heterogeneity, the economic drivers and factors to explain economic growth and the economic policies to support economic growth can be different for each group (Parker and Tsarouhas, 2018). Finally, we need more evidence about possible coordination between National Governments and the European Central Bank, under Quantitative Easing, government bonds eventually mature and their paid back.

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### **Appendix 3.A:**

This appendix contains the results of the econometric regressions on the real per c apita GDP growth rate determinants, measured in difference of logarithms, (Table A.1) and a figure with the evolution of this variable in different countries of the Eu rozone during the period 1999-2019.

Table 3.A: Determinants on real per capita GDP growth rates

	OLS (FIX	GLS (RAND	SYSTEM	SYSTEM	SYSTEM	SYSTEM
	ED) EFF	OM) EFECT	GMM MO	GMM MOD	GMM MO	GMM MOD
	ECTS	S	DEL 3	EL 4	DEL 5	EL 6
INTERCEPT	0,4374	0,3410	0,2744	0,2158	0,1149	0,1248
(p-valor)	(0,000)	(0,000)	(0,000)	(0,000)	(0,017)	(0,011)
dLGDPper(-1)			0,2664	0,2404	0,2577	0,2375
(p-valor)			(0,002)	(0,006)	(0,003)	(0,000)
dLGKF	0,1541	0,1818	0,1710	0,1551	0,1634	0,1069
(p-value)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
dLHK	0,2795	0,3316	0,3194	0,2189	0,2537	0,2303
(p-value)	(0,057)	(0,029)	(0,032)	(0,153)	(0,111)	(0,122)
dLOPEN	0,1094	0,0928	0,1288	0,1421	0,1253	0,1383
(p-value)	(0,000)	(0,001)	(0,000)	(0,000)	(0,000)	(0,000)
<i>LGFCE</i>	-0,2129	-0,1043	-0,0521	-0,0468	-0,0513	
(p-value)	(0,000)	(0,000)	(0,002)	(0,006)	0,002	
dLGD						-0,1117
(p-value)						(0,000)
dLPOP			-0,5757	-0,6129	-0,6651	-0,5859
(p-value)			(0,002)	(0,003)	(0,002)	(0,001)
Gini	-0,007	-0,0007	-0,0007	-0,0007	-0,0007	-0,0003
(p-valor)	(0,261)	(0,020)	(0,019)	(0,017)	(0,020)	(0,267)
LCPI	-0,0931	-0,1137	-0,1184	-0,0929	-0,0342	-0,0811
(p-valor)	(0,012)	(0,002)	(0,000)	(0,000)	(0,225)	(0,003)
LNRPP	0,0271	0,0265	0,0299	0,0308	0,0278	0,0277
(p-valor)	(0,024)	(0,014)	(0,000)	(0,000)	(0,000)	(0,000)
ECB-Rate	-0,0019	-0,0017	-0,0026	-0,0017	-0,0029	-0,0016
(p-valor)	(0,035)	(0,059)	(0,001)	(0,018)	(0,001)	(0,078)

$SDC_{2008-12}$	-,-			-0,0062		-0,0019
(p-value)	-,-			(0,000)		(0,101)
Chow <sub>2008-19</sub>	-,-				-0,0087	-,-
(p-value)	-,-				(0,001)	
Number of obs.	227	227	220	308	289	220
Number of group s	19	19	19	19	19	19
Hausman test	28,79					
(p-value)	(0,000)					
MDF-Cointeg.	2,4040		-4.9792	-5.4789	-5.2156	-5.2933
(p-value)	(0,008)		(0,000)	(0,000)	(0,000)	(0,000)
A- $B$ $AR(1)$	-,-		-2,86	-2,61	-2,80	-2,63
(p-value)	-,-		(0,004)	(0,009)	(0,005)	(0,009)
A- $B$ $AR(2)$	-,-		-1,21	-0,94	-0,74	-0,34
(p-value)	-,-		(0,227)	(0,348)	(0,461)	(0,735)
Sargan	-,-		225,23	231,94	229,78	251,95
(p-value)	-,-		(0,210)	(0,122)	(0,143)	(0,020)
Hansen	-,-		8,99	8,88	3,43	3,44
(p-value)	-,-		(1,000)	(1,000)	(1,000)	(1,000)

This Table includes lineal regression models estimated by OLS (FE: Fixed Effects), GLS (RE: Ran dom Effects) and Dynamic Models estimated by System GMM (Models 3-5). dLGDPper(-1): Loga rithm-Difference of the Percapita Gross Domestic Product. dLGKF: Logarithm-Difference of the G ross Capital Formation. dLKH: Logarithm-Difference of Human Capital. dLOPEN: Logarithm-Difference of Economic Openness Coefficient. LGFCE: Logarithm of the Government Final Consump tion Expenditure. dLGD: Logarithm-Difference of Government (Public) Debt. Gini: Coefficient of Gini. LCPI: Logarithm of the Consumption Price Index. LNRPP: Logarithm of the Nominal Resid ential Property Prices Index. ECB-Rate: Central Bank Referential Interest Rate.  $SDC_{2008-12}$ : Dumm y scoring 1 in the sovereign debt crisis period 2008-2019.  $Chow_{2008-19}$ : Dummy scoring 1 in the peri od 2008-2019. MDF-Cointeg: Modified Dickey-Fuller Test for Cointegration. A-B AR(1) and A-B AR(2): Arellano-Bond Test for Autocorrelation at First and Second Orders, respectively. Sargan and Hansen: Tests of overidentification restrictions.

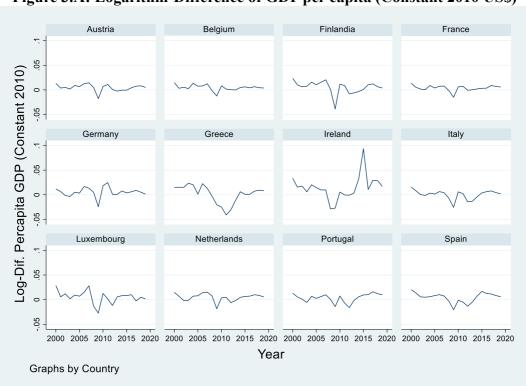


Figure 3.A: Logarithm-Difference of GDP per capita (Constant 2010 US\$)

Source: World Development Indicators-World Bank

## Appendix 3.B:

**Table 3.B: Matrix of Correlations** 

	LGDP1	LGKF	LHK	LCPI	LNRPP	LOPE N	LPOP	Gini	LGD	Primary
LGDP10	1.000									
<b>LGKF</b>	-0.0534	1.0000								
LHK	0.0348	0.0019	1.0000							
<b>LCPI</b>	-0.1087	-0.3270	-0.0137	1.0000						
LNRPP	-0.2392	0.3610	-0.0781	0.4785	1.0000					
<b>LOPEN</b>	-0.6771	0.0698	-0.2825	0.2373	0.2792	1.0000				
<b>LPOP</b>	0.9590	-0.0484	0.1039	-0.1297	-0.2355	-0.7764	1.0000			
Gini	0.0592	-0.2628	0.2315	0.0038	0.0240	-0.2970	0.1378	1.0000		
<i>LGD</i>	0.5012	-0.5152	0.0993	0.1591	-0.4482	-0.4081	0.4904	0.0427	1.0000	
Primary	0.0259	0.2223	-0.0358	-0.2109	-0.1060	0.0767	-0.0383	-0.1025	-0.1133	1.0000

Primary: Primary Result of Public Sector (%GDP) L: Logarithm

# **Appendix 3.C:**

Table 3.C: Panel Unit Root Test of Levin-Lin-Chu (Adjusted t\*)

W.: 11 (4 )	<b>C</b> 4 4	Constant+	First Log-	
Variable name (Logarithm)	Constant	Trend	Difference	
Gross Domestic Product (Current Euro)	-1.3083	-3.8157	-6.5387	
(p-value)	(0.0954)	(0.0001)	(0.0000)	
Gross Dom. Product (Const. 2010 US\$)	-0.9386	-2.5785	-7.1488	
(p-value)	(0.1740)	(0.0050)	(0.0000)	
Percap. Gross Dom. Prod (Const. 2010)	-1.8550	-2.5272	-7.2714	
(p-value)	(0.0318)	(0.0057)	(0.000)	
Gross Capital Formation	-3.6386	-3.7015	-10.6752	
(p-value)	(0.0001)	(0.0001)	(0.0000)	
Commercial Openess	-1.5033	-5.0711	-7.7573	
(p-value)	(0.0664)	(0.0000)	(0.0000)	
Govern Final Consump Expendit (%GDP)	-4.1021	-3.7943	-9.8236	
(p-value)	(0.000)	(0.0001)	(0.0000)	
Public Debt ratio to GDP	-2.2177	-0.3381	-4.6358	
(p-value)	(0.0133)	(0.3676)	(0.0000)	
Primary Resulf of Pubic Sector	-6.1286	-5.9069		
(p-value)	(0.0000)	(0,000)		
Population	-6.0491	-4.2983	-3.1603	
(p-value)	(0.0000)	(0.0000)	(0.0008)	
Index of Consumer Prices	-6.3416	-3.3316	-6.9996	
(p-value)	(0.0000)	(0.0004)	(0.0000)	
Political Stability and Absence of Violence	-4.9088	-5.3592	-13.2727	
(p-value)	(0.0000)	(0.0000)	(0.0000)	
Rule of Law	-5.6029	-5.0687	-10.2436	
(p-value)	(0.0000)	(0.0000)	(0.000)	

### **Final conclusions**

The European Monetary Union of the European Union (EMU) has been a successfully political project that was running since the Maastricht Treaty (1992), that has integrated in the last years more countries and helped to maintain the political stability in the European Union, which in turn has indirectly supported the social and economic development. However, the salient differences among the countries and the same monetary policy, but not fiscal policies have also created certain drawbacks that put the stability in the area under jeopardy. In particular, the high public deficits and debt achieved for some of its members as a consequence of the past sovereign debt crisis (2008-2012) and the current Covid-19 pandemic has revealed certain instabilities that may menace the future of the Eurozone.

As a matter of fact, there is a high heterogeneity among EMU countries in terms of economic size, population, history and culture traditions, sectorial economic activities, regulations, among others. In this context, not only it is necessary to conform the Fiscal Union, based on homogeneous fiscal rules and regulations, to resolve the current financial problems, but also it is important to adopt some new and homogeneous sectorial regulations and public policies, such as labor market, unemployment insurance, age of retirements and pension systems, digitalization or environmental issues. This recommends splitting the Eurozone at least into three subgroups –GIIPS, Frugal and Other countries— to better analysis the behavior and impact of public finance policy on the Eurozone.

This thesis has focused on studying the most relevant factors that can explain the high public debt ratios (% GDP) in the Eurozone. Not only financial and economic, but also social, governance and institutional factors. As a matter of fact, variables such as the high life expectancy at birth, pension and care public systems for old

people, unemployment rates, government effectiveness, control of corruption, corruption perception index and the past sovereign debt crisis have resulted being the major determinants of public debt evolution in the Eurozone. Indeed, the Longterm interest bond rate, highly influenced by monetary policy of the ECB, also has a positive and significant impact.

Within the social factors a representative variable is the high life expectancy at birth in the "old" continent, that positively impacts on the high public debts and calls for considering pension system reforms amid the Covid-19 pandemic crisis, which should be concentrated in fairness concerns, but also in sustainable issues pointing to the increasing of the retirement age and the monthly worker contributions. Indeed, it is necessary to consider the participation of the private enterprises in their administration e.g. to create especial sustainable funds in Public Private Associations (PPA), capitalizable personal accounts; the adoption of voluntary personal retirement plans should be disappeared, for a strictly mandatory one; among other measures to reduce the current direct cost for the governments.

The quality of institutions is found as a key factor for explaining public finance and economic growth. For instance, within the Worldwide Governance Indicators (WGI), the impact of Government Effectiveness on the public debt ratio is negative and significant, because better public services perception, good public planning and public policy formulation quality improvements lead to better public finance, which in turns contributes to reducing the public debt ratio. On the other hand, Voice and Accountability indicator have impacted positively the public debt ratio, this indicator representing the policy activities under democracy regimes. Although usually taken for granted in EMU countries, it seems that variables such as citizens participation in selecting their governments, freedom of expression and association or free media are still highly correlated to public debt levels.

Similar to other authors, the sovereign debt crisis, high public debts and the unsustainability of the Eurozone are based on their own structure and government debt securities (bonds) markets. The national governments are issuing public debt (bonds) to finance their deficits in a foreign currency, because they do not have the option to manage monetary policy; this situation does not allow them any kind of monetization. Therefore, private financial markets (investors) can change their behavior with the aim to increase *sovereign risk score* and/or *risk premium*, which in turn increasing the interest rate that the governments should pay to their bondholders.

In this way, this thesis research attempts to document and formalize moral hazard behavior in the public financial sector, as the government debt securities (bonds) market. Researchers seem to underestimate the impact of moral hazard issues to explain the demand of bonds, particularly in periods of higher risk premia and instability. However, national governments might over issue risky bonds in order to finance the recovery of broken private banks in a vicious cycle; but only they have better information about their possible default. This research covers this gap in the literature by formally and quantitatively reporting that the *sovereign risk score* and the *premium risk*, are robust variables to explain the demand of public debt securities (bonds) by private sector (banks).

There was a possible over demand of government debt securities (sovereign bonds) in the increasing risky period of the Sovereign Debt Crisis (2008-2012). The effects of both risk related indicators can help to explain how the unobservable moral hazard behavior affecting the market efficiency of the sovereign bonds market. In this way, the sovereign risk *score* and risk *premium* variables have been proven to be robust to explain positively the demand of sovereign bonds, in different econometric regressions. Indeed, these findings after controlling the regressions for

endogeneity problems with System Generalized Method of Moments (SGMM), robust standard errors, and introducing dummies and lagged variables, etc.

Furthermore, the reaction of international investors to demand government debt securities (bonds) during Sovereign Debt Crisis were different for each country; especially, between GIIPS (Greece, Ireland, Italy, Portugal and Spain). After accounting for country heterogeneity, the *sovereign risk score* still being positive and significant variables for determining the demand of GIIPS national government bonds; except for Greece because its compelling fiscal problems. Similarly, the *risk premium* seems to exert a positive impact on the demand for public bonds during the sovereign debt crisis in Ireland and Spain; but its effect does not significant for Greece, neither Portugal.

Regarding the main drivers of economic growth in the EMU, the following three public finance indicators (%GDP), are found to be particularly significant: Government final consumption expenditure (GFC), public sector deficit (Deficit) and public debt ratio (Debt). All of them affecting negatively the economic growth rates, in global and percapita terms. Furthermore, there is also a clear interaction and positive impact of real factors, such as the investment in the physical and human capitals, economic openness, and the economic policies on the economic growth. The econometric assessment finds that these factors are determinants of the economic growth, in global and percapita terms.

After filtering through the Hodrick-Prescott technique to separate cycle and tendency of the public sector deficit and the gross domestic product variables, the impact of the GDP-cycle on the public sector deficit tendency was estimated to elucidate the character pro- counter-cyclical of the discretionary fiscal policy (i.e. after removing the effect of automatic stabilizers in the business cycle). Results point to a clear counter-cyclical fiscal policy in GIIPS countries, although this effect

seems not that clear in the most 'frugal' countries. Additionally, it seems that there is an interaction between fiscal and monetary policies, since the fiscal expansions (contractions) are usually coincident with reductions (increases) in the ECB referential interest rate, both stimulating (hindering) economic growth.

Even though GDP growth is one of the most acceptable indicators of wealthfare, in the future it is important to move into a most elaborated proxy indicator to represent better the economic well-being for European citizens; especially, in a very heterogeneous society as EMU. Furthermore, we need some further research to explore different and specific new financial, monetary and fiscal policy measures such as QE programs, interest rates cuts, credit into private and productive sectors promotion, buying public and corporation debt securities (bonds), lack and relaxation regulations, commercial openness, etc., adopted with the aim to get recovery domestic economies after different financial crisis episodes, to develop new recommendations in the post-Covid-19 age.

Because the high heterogeneity in the EMU, for future research it is important to separate the analysis between European countries: Peripheral and not peripheral, Central and Eastern, GIIPS and Frugal, etc. The factors or determinants to explain economic growth can be very different in each group of countries; similarly, the economic and public policies to support it. Or maybe in order to analyze the causes and consequences of the Eurozone financial crisis after pandemic. In the past, some member states were hard-hit by the 'sovereign debt crisis' and associated 'credit crunch', particularly some peripheric and Baltic states, which highly and rapidly increasing their levels of mortgage debts that led to significant economic crises and recessions.

Finally, we need more research evidence about possible coordination between National Governments and the European Central Bank. Under excessive Quantitative Easing, government debt securities (sovereign bonds) eventually mature and have to be paid back according to public bond maturity. For instance, the duration of the temporary increase in the monetary base with QE depends on what maturities the public bonds have. Undoubtedly, there is a high implicit interaction between fiscal and monetary policies in the EMU that currently most researchers had been taken for granted, future research also should be concentrated on it.

### **Conclusiones finales**

La Unión Económica y Monetaria de la Unión Europea (UEM) ha sido un proyecto político exitoso que se ha venido ejecutando desde la firma del Tratado de Maastricht (1992). Ha integrado en los últimos años a más países y ha contribuido a mantener la estabilidad política en la Unión Europea, lo que a su vez ha apoyado indirectamente el desarrollo socioeconómico. Sin embargo, las diferencias resaltantes entre los países y las políticas públicas y fiscales también han creado ciertos inconvenientes que ponen en peligro la estabilidad de la zona del Euro. En particular, los elevados déficits y endeudamientos públicos alcanzados por algunos de sus miembros, como consecuencia de la pasada crisis de deuda soberana (2008-2012) y la actual pandemia del Covid-19, han revelado ciertas inestabilidades que pueden amenazar el futuro de la Eurozona.

De hecho, existe una alta heterogeneidad entre los países de la UEM en términos de tamaño económico (PIB), población, tradiciones históricas y culturales, actividades económicas sectoriales, regulaciones, entre otros. En este contexto, no solo es necesario conformar la Unión Fiscal, con regulaciones y reglas físcales homogéneas, para resolver los problemas financieros actuales, sino que también es importante adoptar normativas sectoriales y políticas públicas nuevas y homogéneas, tales como regulación del mercado laboral, seguros de desempleo, edades de jubilación y sistemas de pensiones, digitalización o asuntos medioambientales. Esto recomienda dividir la Eurozona al menos en tres subgrupos -GIIPS, Frugal y Otros- para analizar mejor el comportamiento e impacto de las políticas públicas financieras.

Los factores más relevantes que pueden explicar los elevados ratios de deuda pública (%PIB) de la Eurozona, no solo son financieros y económicos, sino también sociales, de gobernanza e institucionales. Variables como la alta esperanza de vida

al nacer, los sistemas públicos de pensiones y de cuidados para las personas mayores, las tasas de desempleo, la efectividad del gobierno, el control de la corrupción, el índice de percepción de la corrupción y la crisis de la deuda soberana pasada, han resultado ser determinantes importantes de la evolución de la deuda pública. Asimismo, el tipo de interés de los bonos de largo plazo, muy influenciado por la política monetaria del Banco Central Europeo, también tiene un impacto positivo y significativo.

Dado que una variable explicativa relevante que impacta en las elevadas deudas públicas es la alta esperanza de vida al nacer en el "viejo" continente, convoca a considerarse respetables reformas en el sistema de pensiones, en medio de la pandemia del Covid-19, las cuales deben concentrarse no solo en aspectos de equidad, sino también en temas de sostenibilidad que apunten al aumento de la edad de jubilación y cotizaciones de los trabajadores. De hecho, es necesario considerar la participación de las empresas privadas en su administración. Por ejemplo. crear fondos especiales sostenibles en Asociaciones Público Privadas, cuentas personales capitalizables; debería desaparecer la adopción de planes de jubilación voluntarios, por uno estrictamente obligatorio; entre otras medidas que permitan reducir el costo directo actual para los gobiernos.

La calidad de las instituciones se encuentra como un factor clave para explicar las finanzas públicas y el crecimiento económico. Por ejemplo, dentro de los Indicadores Mundiales de Gobernanza (WGI), el impacto de la "Efectividad del Gobierno" en la deuda pública es negativo y significativo, porque una mejor percepción de los servicios públicos, una buena planificación pública y mejoras en la calidad de la formulación de políticas públicas conducen a mejores finanzas públicas, que a su vez contribuyen a reducir la ratio de deuda pública-PIB. Por otro lado, el indicador de "capacidad de elección política y rendición de cuentas" ha

impactado positivamente el índice de deuda pública, este indicador representa las actividades políticas bajo regímenes democráticos. Aunque generalmente se da por sentado en los países de la UEM la importancia de las actividades democráticas, parece que la participación de los ciudadanos en la elección de sus gobiernos, libertad de expresión y asociación o libertad de comunicación están muy correlacionadas con los elevados niveles de deuda pública.

Al igual que para otros autores, la crisis de la deuda soberana, el elevado endeudamiento público e insostenibilidad de la zona del Euro, se basan en su propia estructura y en sus propios mercados de títulos de deuda pública (bonos soberanos). Al parecer, los gobiernos nacionales están emitiendo bonos soberanos para financiar sus déficits sin la posibilidad de administrar la política monetaria; esta situación no les permite ningún tipo de monetización de sus deudas. Por tanto, los mercados financieros privados (inversores) pueden cambiar sus comportamientos con el objetivo de incrementar el nivel de riesgo soberano y/o la prima de riesgo, lo que a su vez incrementa la tasa de interés que los gobiernos deben pagar a sus inversores.

habían documentado ni cuantificado Investigaciones anteriores no comportamiento de riesgo moral en el sector financiero público, como el mercado de títulos de deuda pública (bonos). Otros parecen subestimar el impacto de los problemas de riesgo moral para explicar la demanda de bonos públicos, particularmente en períodos de alta inestabilidad y primas de riesgo elevadas. Sin embargo, los gobiernos nacionales pudieron haber emitido bonos riesgosos para financiar la recuperación de bancos privados quebrados en un círculo vicioso; pero solo ellos tienen mejor información sobre su posible incumplimiento (default). Esta investigación cubre esta brecha en la literatura económica informando formal y cuantitativamente como el nivel de riesgo soberano y la prima de riesgo resultan

ser variables robustas para explicar la demanda de títulos de deuda pública (bonos) por parte del sector privado (bancos).

Ha existido una sobredemanda de títulos de deuda pública (bonos soberanos) en el período más riesgoso de la crisis de la deuda. Los efectos de ambos indicadores de medición del riesgo ayudan a explicar cómo el comportamiento de riesgo moral no observable afecta la eficiencia del mercado de bonos públicos. De esta forma, el *nivel de riesgo soberano* y la *prima de riesgo* han demostrado ser robustos para explicar positivamente la demanda de títulos de deuda pública (bonos soberanos), en diferentes regresiones econométricas. De hecho, estos hallazgos han sido después de controlar las regresiones por problemas de endogeneidad con el Método Generalizado de Momentos 'de Sistema' (SGMM), errores estándar robustos, introduciendo variables dummies, interactivas y explicativas rezagadas, etc.

La reacción de los inversores internacionales para adquirir títulos de deuda pública (bonos) durante la crisis de la deuda soberana fue diferente para cada país; especialmente, entre los GIIPS: Grecia, Irlanda, Italia, Portugal y España. Después de tener en cuenta su heterogeneidad, el *nivel de riesgo soberano* sigue siendo una variable que explica positiva y significativamente la demanda de bonos soberanos de dichos países; excepto para Grecia debido a sus apremiantes problemas fiscales históricos. Asimismo, la *prima de riesgo* resultó tener un impacto positivo y significativo sobre la demanda de bonos públicos irlandés y español; pero no es significativo para los bonos griegos, ni portugueses.

En cuanto a los principales determinantes del crecimiento económico, el Gasto público en consumo final (GFC), Déficit del sector público (Déficit) y Deuda pública (Deuda), como coeficientes de GDP, incidieron negativamente en las tasas de crecimiento económico, en términos globales y per cápita. Además, existe un claro impacto positivo de factores reales, como la inversión en capital físico y

humano, apertura económica y políticas económicas sobre el crecimiento económico; de acuerdo con la evaluación econométrica son determinantes de las tasas de crecimiento económico, en términos globales y per cápita.

Después de aplicar el filtro de Hodrick-Prescott, para separar el ciclo y la tendencia del déficit del sector público (Déficit) y el producto interno bruto (PIB), se estimó el impacto del ciclo del PIB sobre la tendencia del Déficit para dilucidar el carácter pro-contra-cíclico de la política fiscal discrecional, después de eliminar el efecto de los estabilizadores automáticos del ciclo económico. Los resultados apuntan a una clara política fiscal anticíclica en los países GIIPS; este efecto no parece tan claro en los denominados "Frugales". Además, parece que existe una interacción entre las políticas fiscal y monetaria, ya que las expansiones (contracciones) fiscales suelen coincidir con reducciones (aumentos) en la tasa de interés referencial del BCE, ambas estimulando (dificultando) el crecimiento económico.

Aunque el crecimiento del Producto Interno Bruto percapita es uno de los indicadores de riqueza más aceptables, en el futuro es importante pasar a un indicador de medición más elaborado para representar mejor el bienestar económico de los ciudadanos europeos; especialmente, en una sociedad muy heterogénea como la UEM. Además, necesitamos más investigación para explorar nuevas medidas de política financiera, monetaria y fiscal, diferentes y específicas, como impactan los programas de QE, recortes de tasas de interés, promoción del crédito a los sectores privado y productivo, compra de títulos de deuda pública y corporativa (bonos), flexibilidad y/o relajación de regulaciones, apertura comercial, etc., adoptadas con el objetivo de lograr la recuperación de las economías domésticas luego de los diferentes episodios de crisis financieras, para desarrollar nuevas recomendaciones de política económica en la era post-Covid-19.

Debido a la alta heterogeneidad entre los integrantes de la UEM, para futuras

investigaciones es importante seguir separando el análisis entre países periféricos y no periféricos, centrales y orientales, GIIPS y Frugal, etc. Los determinantes o factores que explican el crecimiento económico pueden ser diferentes en cada grupo; de igual manera, las políticas económicas y públicas para apoyarlo. O tal vez para analizar las causas y consecuencias de las crisis financieras después de la pandemia. En el pasado, algunos estados miembros se vieron muy afectados por la "crisis de la deuda soberana" y la "contracción crediticia" asociada en particular a economías periféricas y bálticas, que aumentaron de forma acelerada los niveles de deudas hipotecarias, provocaron crisis económicas y recesiones.

Finalmente, necesitamos más evidencias e investigaciones sobre la posible coordinación entre las políticas fiscales y monetarias, de los gobiernos nacionales y el Banco Central Europeo, respectivamente. En medio de una flexibilización cuantitativa excesiva los valores de deuda pública (bonos soberanos) finalmente vencen y deben reembolsarse de acuerdo a su maduración. De esta forma, la duración del aumento temporal de la base monetaria con los estímulos monetarios (QE), depende de los vencimientos que tengan los bonos públicos. Sin duda, existe una alta e implícita interacción entre las políticas fiscales y monetarias que en la actualidad muchos investigadores económicos no le han dado la debida importancia, las investigaciones futuras deberían tratarlo.