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Summary

**FISCAL SUSTAINABILITY AND ECONOMIC
GROWTH.
THEORETICAL AND EMPIRICAL EVIDENCE
AT EUROPEAN LEVEL**

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Keywords: *fiscal policy, procyclical fiscal policy, countercyclical fiscal policy, acyclical fiscal policy, fiscal instruments, fiscal rules, government expenditures, government revenues, fiscal policy theory, Keynesian theory, meta-regression analysis, econometric models, autoregressive distributed lag model, vector error correction model, vector autoregressive model, impulse-response function, beta convergence, fiscal multipliers, rates of convergence to equilibrium, long-run elasticity, stochastic shock, fiscal sustainability, predictability model, Stepwise analysis, Cluster analysis , canonical discriminant analysis, fiscal sustainability indices.*



MOTIVATION AND IMPORTANCE OF THE RESEARCH TOPIC

The motivation for choosing the research topic is related to ensuring long-run fiscal sustainability in the Member States of the European Union, as well as the need to use those instruments that can be applied to implement a fiscal policy consistent with its objectives. Particular attention was paid to government expenditures, as identifying their effects on the economy were an ongoing difficulty, sparking much debate and controversy, as opposed to government revenues, which are a frequently used fiscal policy instrument, in the sense of increasing or decreasing them. In the empirical literature there was a special interest in these fiscal-budgetary instruments, being still considered a topical issue due to the research gaps that still exist and that require an astringent intervention.

The aim of this research is to interconnect the theoretical and empirical elements, to integrate them into existing fiscal circumstances to provide viable solutions, to estimate the coordinates of a fiscal policy to ensure long-run sustainability by capturing a complete transnational environment, due to the inclusion of the 28 member states of the European Union. The main reason why only these states were included in the study is represented by the fiscal policy regarding the maintenance economic equilibrium of a country through two fundamental treaties. The first act under consideration is the Maastricht Treaty, which provides for a share of less than 3% of the current or planned deficit in gross domestic product at market prices, as well as a share of less than 60% of government debt in gross domestic product at market prices. The Treaty on Stability, Coordination and Governance in Economic and Monetary Union is the second act which imposes a new set of fiscal rules on Member States. These treaties, as well as the rules imposed by them, were the benchmarks in the development of analyses that contributed to achieving the ultimate goal of the research.

Fiscal policy should be applied in order to restore economic equilibrium and reorient towards sustainable development. Its applicability has multiple implications on socio-economic life. Achieving fiscal sustainability in the Member States of the European Union has become an extremely important goal as a result of the effects of the latest global crisis, questioning the usefulness of government expenditures as a fiscal stimulus in the economic recovery.

Consequently, it is imperative to study the theories underlying fiscal policies, the literature, the empirical results obtained from the analysis of the Member States of the European Union and the applied fiscal policies, as these could validate the sustainability of the European economic environment. The capture of these elements makes it possible to draw conclusions to demonstrate the position of fiscal policy in relation to government

expenditures, the convergence to equilibrium of the Member States and the type of optimal fiscal policy in going through the process of removing an economic shock. Also, the clear delimitation of the concept of fiscal sustainability, correlated with the propagated effects on the level of economic development and the analysis of the role of fiscal policy in optimizing economic welfare can be important elements for both theorists and practitioners in the field.

I. The current state of scientific research

In all macroeconomic policies, fiscal policy is based on theories developed in the context of economic recovery. These tried to demonstrate the causes and effects of an economic collapse, adjusted to the reference periods. According to classical economic theory, in the absence of fiscal policies to limit public expenditures, their growth inevitably leads to the degradation of the economy of a state, affecting future generations due to irresponsible behaviour inclined to consumption, giving rise to the fight against the tax burden. The annihilation of these effects is possible through an awareness of the fact that the increase in public expenditures causes a time lag, so current expenditures will impose costs for the future. In reply, Keynesian economic theory starts from the hypothesis that an increase in public expenditures to cover the deficit, followed by the issuance of currency will have the effect of economic recovery, without leading to inflation. Their incidence on gross domestic product is higher than in the case of taxes, because it affects first the income and only then the level of production. Future generations will not be affected, as the state will replace public expenditures with private expenditures, thus making it possible to anticipate tax increases. The new Keynesian theory is based on the Keynesian doctrine, although it signals a series of deficient elements of it. The hypotheses of the new Keynesian theory are similar to those of the new classical economy because these try to maximize the efficiency of public expenditures decisions, having rational anticipations. Moreover, studies realised by various authors captured the effects of fiscal policy in different Member States of the European Union, but no explicit delimitation was created between the effects it produces in emerging countries compared to developed countries taking into account the implications of using government expenditures as an instrument for economic balancing. The research is based on the assumption that government expenditures play a strategic role in implementing fiscal policy and ensuring long-run fiscal sustainability.

II. Research objectives

The research was limited to establishing a general objective aimed at identifying how fiscal instruments can be used to implement a fiscal policy consistent with its objectives, as well as developing a model for assessing and forecasting fiscal sustainability in the Member States of the European Union. The elaboration of specific objectives took place after the purpose was established, having a direct impact on the research methodology. Subsumed to

the general objective, *Table 1* summarises the five specific objectives to achieve the research purpose. Each objective was assigned a set of actions to guarantee its fulfilment.

Objective 1 aims at the theoretical analysis of the research niche and corresponds to the first chapter of this paper. Actions such as identifying fiscal policy theories, conducting a comparative analysis of concepts related to the use of government expenditures as an instrument of fiscal policy, but also determining economic theories that are the foundations for the implementation of current fiscal policies contributed to achieving the first objective.

Objective 2 requires the investigation of the research niche based on a meta-analysis and corresponds to the second chapter of this paper. Defining the criteria for including studies in the analysis, viewing 2,643 empirical studies in the field of fiscal policy enforcement and estimating fiscal multipliers are a series of actions that were taken. Moreover, an inclusion in the coding procedure of the study characteristics, together with a series of imposed analyses led to the determination of the specificity of the econometric models that influence the values of the fiscal multipliers and implicitly, to the achievement of the second objective.

Objective 3 contributes to the projection of a complete transnational environment by achieving a synthesis of legislative elements of a fiscal-economic nature, specific to the European Union, as well as by developing multiple analyses in order to identify the heterogeneity of fiscal policy.

Objective 4 aims to formulate a reasoned opinion related to the acceptance or rejection of the Keynesian theory according to which in developed countries, fiscal multipliers tend to have higher values, imposing both a theoretical and an empirical approach. This objective is of paramount importance in drawing conclusions, as it aims to analyse and develop a summary of the statistics following the processing of data for the 28 Member States of the European Union. The degree of novelty was completed both by determining the influence of short-run and long-run fiscal policy instruments on economic growth, as well as by determining a new type of fiscal multiplier to observe the maximum contraction of gross domestic product in the presence of shocks produced by various macroeconomic indicators.

Objective 5 is distinguished from the first four objectives by its purely empirical nature, as the aim was to develop a model for predicting long-run fiscal sustainability. Thus, the pre-establishment of the creditworthiness of the fiscal policies application, the selection of the most relevant fiscal, macroeconomic and social indicators, the development of the mathematical model together with the testing of its predictability capacity represent actions that were carried out in order to achieve the last objective. In addition to mentioned aspects, obtaining indices of fiscal sustainability is another independent process that also exposes the practical applicability of this research.

Table 1: Specific research objectives

Research objectives	Actions taken for reaching the objectives
<p>Theoretical substantiation of the study 1</p>	<p>Identifying fiscal policy theories; Comparative analysis of concepts related to the use of government expenditures as an instrument of fiscal policy; Determining the economic theories that represent the foundations for the application of current fiscal policies.</p>
<p>Empirical substantiation of the study 2</p>	<p>Defining the meta-regression analysis method; Elaboration of a procedure for including empirical studies in the meta-regression analysis; Elaboration of a procedure for coding and quantifying the characteristics of studies in metric forms; The use of descriptive statistics to identify the basic characteristics of the identified studies; Applying the ordinary least squares regression in order to obtain the results of the first meta-analysis of the fiscal multipliers related to the European Union space.</p>
<p>Establishing the heterogeneity of fiscal policy in the Member States of the European Union 3</p>	<p>Identifying the variety and objectives of fiscal policy; Revision of the fiscal-economic procedures of the European Union; Analysing the position of fiscal policy in the Member States of the European Union in relation to government expenditures.</p>
<p>Determining the position of fiscal policy at European level 4</p>	<p>Comparative analysis of long-run fiscal elasticity; Comparative analysis of short-run coefficients and rates of convergence to equilibrium; Estimation of the impulse-response function; Capturing the dynamics of fiscal multipliers; Determining a new type of fiscal multiplier.</p>
<p>Development of a model for predictability of fiscal sustainability 5</p>	<p>Pre-establishing the creditworthiness of the fiscal policies application; Selection of the most relevant fiscal, macroeconomic and social indicators; Development of the mathematical model for predicting fiscal sustainability; Testing the predictability of the model; Fiscal sustainability forecasting through new indices estimated based on the model.</p>

Source: Author's processing



CHAPTER 1. CONCEPTS AND THEORIES REGARDING FISCAL POLICIES UNDER THE INFLUENCE OF GOVERNMENT EXPENDITURES

Economic theories are considered desideratum in identifying the main issues for ensuring fiscal sustainability. These are pillars in shaping fiscal policies and in defining the main types of economies. This chapter focuses on the theoretical elements in order to carry out an in-depth analysis of the economic theories that were imposed in determining the instruments for implementing fiscal policies, focusing in particular on the implications of government expenditures. Thus, the aim was to systematize the concepts and theories that represent the foundation of the application of current fiscal policies, in order to identify existing limitations and new research directions. The importance of using such a research method is given by the need to identify the current state regarding the horizon of information provided by this niche.

The first aspect considered is related to the capture of economic theories to identify assumptions about the usefulness of government expenditures in implementing fiscal policy. The second aspect is related to a complex comparative analysis of the incidences of fiscal policy theory, government expenditures theory, classical economic theory, Keynesian theory, new Keynesian theory, new classical economic theory and real business cycle theory. These concepts and theories represented the pillars in the formation of fiscal policies and in defining the main types of economies, contributing to the creation of a solid scientific basis to interpret and explain existing economic phenomena related to the applicability of fiscal policy in a transnational European environment. Going through the theoretical aspects related to fiscal policy and government spending has facilitated the indexation of the notions needed to understand the issues related to this research niche.

Following the review of economic theories, it can be stated that all aim at the optimal use of government expenditures to maximize economic and social welfare. Wagner's law remained a point of reference in the development of subsequent theories, models and hypotheses, as the increase in investment expenditure will stimulate the increase in production and, implicitly, the increase in gross domestic product. Such a fiscal action must be imposed by the government and not by public authorities in a particular jurisdiction or region as argued in the Leviathan hypothesis. Thus, it will be avoided the risk of fiscal inequality and uneven economic development. The government is not considered an important decision-maker by all economic theories, and its presence in the implementation of fiscal policies is considered inappropriate, negatively influencing the development capacity of states.

According to classical economic theory, in the absence of fiscal policies to limit public expenditures, their growth inevitably leads to the degradation of the economy of a state, affecting future generations due to irresponsible behaviour inclined to consumption, giving rise to the fight against the tax burden. The annihilation of these effects is possible through an awareness of the fact that the increase in public expenditures causes a time lag, so current expenditures will impose costs for the future. Keynesian theory has positive and realistic valences only in the short-run economic recovery. This starts from the hypothesis that an increase in public expenditures to cover the deficit, followed by the issuance of currency will have the effect of economic recovery, without leading to inflation. Their incidence on gross domestic product is higher than in the case of taxes, because it affects first the income and only then the level of production. Future generations will not be affected, as the state will replace public expenditures with private expenditures, thus making it possible to anticipate tax increases. The new Keynesian theory is based on the Keynesian doctrine, although it signals a series of deficient elements of it. The hypotheses of the new Keynesian theory are similar to those of the new classical economy because these try to maximize the efficiency of public expenditures decisions, having rational anticipations. The results revealed that economic theories will remain only a foundation in the application of fiscal policies, and the most important aspect in terms of identifying economic reality is given by an in-depth study.



CHAPTER 2. FISCAL MULTIPLIERS. A META-ANALYSIS OF EMPIRICAL LITERATURE

The way fiscal rules influence fiscal policy has become a matter of interest in national and international research, especially in the post-crisis period. Based on epistemological assumptions that focused on economic recovery and, implicitly, sustainable development, a wide range of approaches was revealed in empirical research.

In this sense, the chapter dedicated to the literature review was replaced with a meta-regression analysis that involves the investigation of “empirical analyses that try to integrate and explain the literature about a certain important specific parameter”¹. As the present research also provided a solid foundation for the empirical literature specific to the analysis of fiscal multipliers in the Member States of the European Union, a simple review of the studies would not have allowed the extraction of relevant information. Studies which estimate the impact of government expenditures on economic growth in the 28 Member States of the European Union are the area of interest in this process. The purpose of the meta-analysis was to quantify their qualitative characteristics in nominal values, more precisely, to convert the information into metric forms that would allow a quantitative comparison.

Considering important databases such as *Web of Science* and *Google Scholar*, a total number of 2.643 studies were considered relevant for starting an in-depth study of the literature. The studies were selected based on a series of criteria and only 33 of them were included in the meta-regression analysis. As the size of the fiscal multiplier becomes the most important aspect of this analysis, this was assigned a series of characteristics included in six samples that refer to the econometric model on which it was estimated, research methodology, level of development of the countries that are the subject of this analysis, the method of calculating these multipliers, as well as the particularities related to the time series. These data become important for obtaining results that finalize the limit from which the literature has not yet managed to bring satisfactory contributions.

One of the main objectives of this chapter was to present new strategies for searching the relevant empirical literature, based on the main scientific databases. Determining search limits is beneficial in ensuring satisfactory information consistency. The inclusion criteria defined in this study contributed to the robustness of the analysis, being a reference element for further meta-analyses in terms of capturing the dynamics of fiscal multipliers. Determining the relevance of each inclusion criterion has become a particularly important

¹ Stanley, Tom D., Jarrell, Stephen B., 2005. Meta-regression analysis: a quantitative method of literature surveys. *Journal of economic surveys*, vol. 19, no. 3, p. 301

action, as, based on it, the validation or deletion of the studies was done with a low degree of error and influence on the final results.

The results of the analysis reveal that the type of econometric models tends to greatly affect the value of multipliers. The inclusion of control variables revealed that the DSGE and MK models report the largest fiscal multipliers and at the opposite pole are the TSVAR and TVAR models. Overall, the fiscal multipliers estimated on the basis of VAR-derived models have lower values than the fiscal multipliers estimated on the basis of stochastic models, as well as other Keynesian models. The additional characteristics related to the level of development of the states that were the subject of the studies best discriminate the fiscal multipliers. Regardless of the reference specification, analyses performed at the level of developed countries tend to report higher fiscal multipliers, while analyses performed at the level of emerging states report lower multipliers in value. These results were also obtained by using descriptive statistics as a necessary tool in extracting basic quantitative information. Moreover, fiscal multipliers are also dependent on the calculation method. Cumulative multipliers are higher than peak multipliers, and integral multipliers have the lowest values. In this meta-regression analysis, attention was also focused on the time horizon on which the multipliers were estimated. The results assimilated to the meta-analysis performed by Gechert and Will (2012) indicate the existence of a causality although the value of the coefficients is insignificant, close to zero, stating that a wider measurement horizon will result in obtaining multipliers with higher value². In contrast, the time horizon coefficients obtained in this meta-regression indicate the lack of influence on the multipliers. A peculiarity is found in the case of the properties of time series, these being dependent on the econometric model. Thus, the SF coefficients related to the VAR-derived models indicate significantly lower values of fiscal multipliers when the last year used in the analysis is related to a period closer to the present and in the case of SF coefficients related to DSGE and MK models the results indicate otherwise. The control of the variable related to the length of the time series is insignificant, so that the variation of the fiscal multipliers cannot be explained by this characteristic. Within the time series properties group, only the variable SF tends to influence the values of the fiscal multipliers, while the LUNG coefficients remain insignificant, regardless of the reference specification.

In conclusion, the values of fiscal multipliers are strongly influenced both by the econometric modelling process and by other characteristics that could be quantified based on a statistical process of categorical data creation. The results obtained can be a starting point in the analysis and application of fiscal policy when fiscal multipliers are taken into account by decision makers. Thus, considering the influences of these characteristics on multipliers will be able to improve the application of fiscal policies, as well as certain resolutions related to their impact on the economy.

The growing interest in determining the intensity with which a state responds to fiscal policy, as well as in estimating fiscal multipliers, became visible only after the economic situation in the European Union eased due to the economic crisis that began in 2007 in the

² Gechert, Sebastian., Will, Henner., 2012. Fiscal multipliers: A meta regression analysis. *IMK working paper*, no. 97, p. 27

United States of America. Since then, the concern in identifying the gross domestic product response to an economic shock has become more and more pronounced. However, the number of meta-analyses summarizing information on the dynamics of fiscal multipliers is very limited, and the number of those covering only the European Union is non-existent. In this context, the research carried out in this chapter contributes significantly to the completion of the literature in the field.



CHAPTER 3. CONSIDERATIONS ON THE HETEROGENICITY OF FISCAL POLICIES AND THE IMPLICATIONS OF GOVERNMENT EXPENDITURES

One of the European Union's desiderates is to ensure a fiscal policy that strengthens the common objectives and responsibilities of the Member States. The current mix of fiscal policies in the European Union is characterized by inconsistency due to economic heterogeneity. This specificity is also attributed to legislative, fiscal and macroeconomic factors, having important implications also geopolitical and social factors.

There is little debate in the literature on the general features of fiscal policies in the Member States of the European Union. The complexity of this analysis is given by the particularities of emerging and developed states, as well as by the common legislative framework. Defining the main features of fiscal policies applied in the 28 Member States of the European Union contributed to create an overview of the impact of government expenditures.

In order to identify the cyclicity of fiscal policy in the 28 Member States of the European Union, with a particular focus on the impact of government expenditures on the business cycle, a correlation analysis was carried out taking into account the pre-crisis and post-crisis period. Determining the correlation between the cyclical components of real government expenditures and real gross domestic product helped to recognize the fiscal policy launched by each Member State.

The Member States of the European Union are characterized by a positive correlation between government expenditures and gross domestic product, which defines the existence of a procyclical fiscal policy. However, the procyclical nature is better highlighted in emerging countries, as the correlation coefficients resulting from the analysis are higher than in developed countries. The existing procyclical trend of fiscal policies in all Member States is manifested as a result of the common legislative framework governing fiscal-budgetary issues and imposing a certain economic behaviour that prevents the imbalance generated by unpredictable and imminent fiscal shocks. Thus, the treaties of accession to the European Union, the Maastricht Treaty, and the Stability and Growth Pact are a set of factors that determine the current fiscal and economic trend through the application of foreign policies that lay the foundations for economic and monetary union.

Also related to the legislative aspects, within the interstate evaluation regarding the types of fiscal rules implemented at European level, the existence of a connection between the years of accession of each state and the year of implementation of the fiscal rules was identified. These fiscal rules refer to the establishment of ceilings on maintaining the budgetary balance and limiting the public debt, foreshadowing also the assurance of fiscal-

budgetary discipline. The results reveal the efficiency of the implementation of the national fiscal rules that were influenced by the level of economic development and implicitly by the political factors. However, empirical studies aimed at analysing and drawing a conclusion on this topic have questioned whether fiscal rules restrict the application of fiscal policy and whether there is an explicit agreement between them. Fiscal rules can be a cause to prevent the manifestation of fiscal policy.

Objectively, fiscal policy should manifest itself as a general framework of the economy on the basis of which to develop fiscal rules that act in the direction of the sustainable development of the business environment and implicitly, of the socio-economic life. When economic instability sets in, being the main responsible for affecting socio-economic life, it is necessary for state intervention to counterbalance the dysfunctions that arose by implementing recovery policies. All these factors contribute to the improvement of the social and economic environment, having an impact on both the individual and the entities in a state.

CHAPTER 4. EUROPEAN FISCAL POLICY COORDINATES

4.1. Conceptual and methodological framework

Fiscal policy aroused particular interest regarding the effects it exercises on the macroeconomic level. In the literature, there are approaches to the impact of fiscal policies on the economy. Its application by the government can have both positive and negative effects on the individuals of a society and on the business environment. Thus, having as foundation the method of analysis proposed by Perotti (2004)³, based on the work written by Blanchard and Perotti (1999), in which they demonstrated that "constantly positive shocks of government expenditures have a positive effect on production and positive tax shocks have a negative effect"⁴, the research carried out aimed at the effects that fiscal policy instruments produce on economic growth.

In this context, fiscal policy is disaggregated, in particular, into the components of government expenditures and revenues to determine their implication for economic growth, represented by real gross domestic product. Barro and Sala-i-Martin (1992) contribute to a more explicit delimitation of them⁵, classifying the variables of fiscal policy in terms of expenditure as productive (public investment and private investment) and unproductive (final consumption expenditures and social transfers), as well as fiscal policy variables in terms of revenues as distortionary (income tax) and non-distortionary (taxes on production and imports).

This chapter aimed to provide a detailed assessment of the effects of fiscal policy on economic growth, based on the economic literature and the recovery policies applied. In order to assess the role of government expenditures, the study highlighted the fiscal behaviour of Member States in the context of a shock. Thus, the clear delimitation of the concept of fiscal sustainability, correlated with the effects in terms of economic growth and the analysis of the role of fiscal policy in optimizing economic welfare can be important elements for both theorists and practitioners in the field.

³ Perotti, Roberto., 2004. Estimating the effects of fiscal policy in OECD countries, IGIER – Bocconi University, no. 276, Italia

⁴ Blanchard, Oliver., Perotti, Roberto., 1999. An empirical characterization of the dynamic effects of changes in government spending and taxes on output, National Bureau of Economic Research, *NBER Working Paper Series*, no. 7269, p. 3

⁵ Barro, Robert J., Sala-i-Martin, Xavier., 1992. Public Finance in Models of Economic Growth. *Review of Economic Studies*, vol. 59, no. 4, pp. 645-661

4.2. Short-run and long-run analysis of fiscal policy

In order to achieve objective 4 on assessing the applicability of fiscal policy in the Member States of the European Union and determining the characteristics of a complete transnational framework, this chapter aimed to determine long-run elasticity by estimating the β coefficients of econometric models to provide information on gross domestic product variation in the future when fiscal policy instruments are confined to a previous 1% increase. Such an interstate analysis highlights particularities related to the instruments that can be used to ensure fiscal sustainability, as well as the ability of Member States to be stimulated by them. From the first analyses performed, it was possible to observe a different fiscal behaviour of the emerging states compared to that of the developed states. In the long-run, unproductive expenditures, represented by final consumption expenditures, leads to an increase in gross domestic product of up to 1,24% in emerging countries, and in developed countries it results in a contraction of gross domestic product of up to 2,32 %. It is confirmed that such expenditures bring more satisfaction to low-income individuals, as some personal expenditures will be replaced by facilities provided by the government, thus eliminating the constraints of the individual budget. The situation is different in terms of social transfers estimates, as such an instrument indicates a similar fiscal behaviour of emerging countries to that of developed countries. A previous 1% increase in such unproductive expenditures determines both growth and economic contraction. With the exception of Malta, whose coefficient of -16,6481 indicates deviant behaviour due to the socio-economic situation, social transfers lead to a stronger decrease in gross domestic product in emerging countries than in developed countries. However, higher positive coefficients were found in developed countries. This type of instrument requires a particular analysis as its position as a stimulating or altering factor is uncertain. Although from a social point of view, in the empirical literature, social transfers are seen as a means of eliminating poverty and ensuring the well-being of the individual, from a fiscal and economic point of view these can lead to long-run imbalances.

The coefficients of productive expenditures contributed to the completion of the informational framework. If at the level of developed countries, public and private investment produce both positive and negative effects on gross domestic product, at the level of emerging states these impose a distinct variation in the structure of gross domestic product. Thus, private investment is one of the most useful instrument in ensuring economic growth and, implicitly, long-run fiscal sustainability in emerging countries. The implementation of fiscal practices to stimulate them should be one of the main objectives of governments. On the other hand, public investment produces demobilizing effects on gross domestic product in emerging countries. Although in the long-run the coefficient indicates a maximum contraction of only 0,15%, the use of these types of expenditures as instruments for guiding fiscal policy must be taken into account with certain limitations. There is a possibility that a previous 1% increase in public investment will derive to an expansion of the economy only if they are taken into account alongside other fiscal policy instruments.

A final process in analysing the effects of long-run fiscal policies was also related to the segmented analysis of government revenues. Emerging countries also continue to be extremely responsive to the influence of non-distortionary and distortionary revenues. Thus, if

in the case of developed countries revenues from taxes on production and imports produce both positive and negative effects on gross domestic product, at the level of emerging countries, as expected, such revenues can ensure long-run fiscal sustainability. The situation is different in the case of distortionary revenues represented by revenues collected to the budget from income tax. Developed countries are receptive to these types of revenues, leading to economic growth. On the other hand, a negative response to the use of such a fiscal stimulus was observed in all emerging countries. One of the factors contributing to the economic contraction by increasing by 1% the revenue collected to the budget from income tax is directly related to the mandatory levies that affect to a greater extent the lower individual incomes specific to emerging countries. These aspects contribute to a constraint on the individual budget, followed by a decrease in private consumption and then an irreparable decrease in gross domestic product.

The estimation of short-run coefficients targeted the second direction of research and reconfirmed, in most cases, the results obtained in the long-run analysis. An exception is encountered at the level of emerging countries, as the positive short-run effect of public investment is volatile, the same situation being encountered at the level of developed countries under the influence of private investment. One of the objectives of this chapter was to identify the rates of convergence to equilibrium of the European Union Member States under the influence of the same fiscal instruments. The results of the study provide empirical evidence on the period required to achieve long-run equilibrium. The error correction estimate indicates the existence of short-run relationships between the variables involved in the analysis. The ECM(-1) coefficients of developed countries tend to have slightly higher values compared to those of emerging countries. These aspects demonstrate that a developed country can achieve long-run equilibrium faster, requiring an average of three quarters and in the case of emerging countries four quarters. In conclusion, the level of development tends to influence the fiscal behaviour of the European Union Member States.

4.3. Dynamics of fiscal multipliers

The impulse-response functions resulting from the use of the analysis were divided to compare the fiscal multipliers of emerging countries with the fiscal multipliers of developed countries. For a better representation and extraction of conclusive results it was necessary to create informational groups in order to synthesize a large database.

The average values of the fiscal multipliers estimated in *Table 2* provided a defining picture of the fiscal and economic behaviour of the European Union Member States, taking also into account their level of development. Thus, at the level of emerging countries, the averages of the multipliers of productive expenditures are positive, compared to the average of non-distortionary revenues, which are negative. The situation is different in the case of unproductive expenditures and distortionary income. The average of final consumption expenditure multipliers, respectively the average of social transfers multipliers are negative and lower than the average of income tax multiplier which is positive. In this context, it can be said that emerging countries are more receptive to the shock of productive expenditures

than to the shock of non-distortionary revenues. The application of a procyclical fiscal policy in emerging countries, determined by the increase in the level of taxation in the context of a recession, will only produce demobilizing effects on the economy. However, attention must also be paid to unproductive expenditures in such periods of imbalance, as the contraction of gross domestic product will be stronger when expenditures are predominantly administrative and social. The income tax multiplier indicates a positive effect on economic growth. However, this result must be interpreted with certain limitations, as the increase in revenues to the general consolidated budget from income tax may also have adverse effects on economic growth. This statement is explained by the intensification of the tax burden and the decrease of the liquidity of the population, which will have visible effects by diminishing the consumption, generating at the same time a contraction of the gross domestic product.

Developed countries behave slightly differently compared to emerging countries. From the category of productive expenditures, the shock of public investment produce, on average, negative effects on economic growth. In contrast, the shock of private investment and taxes on production and imports leads to a stimulation of economic growth. On the other hand, by comparing the shocks of unproductive expenditures with the shocks of distortionary revenues, the existence of the same fiscal behaviour is observed as in the case of emerging countries.

Table 2: The average of fiscal multipliers

Countries	CCF	IPRIV	IPUB	IV	TPI	TS
Emerging	-0,2081	0,1405	0,0342	0,1082	-0,0416	-0,0940
Developed	-0,0773	0,0402	-0,1454	0,0101	0,0878	-0,1240

Source: Author's processing in Excel spreadsheet based on data extracted from EViews statistical software

The need to identify the shocks that have the strongest negative impact on economic growth required the determination of a new type of fiscal multiplier, as in the empirical literature have been defined, so far, only impact multipliers, multipliers at a horizon n , peak multipliers and cumulative multipliers. Thus, the new fiscal multiplier will be further called the distortionary fiscal multiplier because it will indicate the maximum contraction of the gross domestic product in the presence of shocks generated by different macroeconomic indicators, receiving the following form:

$$k = \min_n \frac{\Delta Y(t+n)}{\Delta \delta(t)} \quad (1)$$

where k represents the value of the distortionary fiscal multiplier, Y is the gross domestic product, δ substitutes a certain macroeconomic indicator, t represents the time interval taking into consideration, Δ indicates the changes produced at the level of Y and δ , and \min_n represents the lowest value which a fiscal multiplier can obtain at a horizon n .

Based on the new calculation model, *Table 3* contains the distortionary fiscal multipliers related to expenditures and revenues. At the level of emerging countries, non-distortionary revenues affect economic growth to a greater extent than productive expenditures. The same effect is also found in the case of distortionary revenues and unproductive expenditures. The shock of income tax is more intense than the shock of final consumption expenditures and

social transfers. On the contrary, the contraction of gross domestic product in developed countries is stronger in the presence of expenditures shocks, regardless of their nature.

Table 3: Distortionary fiscal multipliers

Countries	CCF	IPRIV	IPUB	IV	TPI	TS
Emerging	-1,4871	-1,3521	-1,0001	-2,1691	-1,5399	-1,4584
Developed	-1,1098	-1,1783	-2,4785	-0,6058	-0,8522	-1,9151

Source: Author's processing in Excel spreadsheet based on data extracted from EViews statistical software

According to the Cholesky identification scheme, the gross domestic product is contemporaneously affected by the changes in exogenous variables. From the obtained results it could be observed that both the shock of productive and non-productive expenditures, as well as the shock of non-distortionary and distortionary revenues have an asymmetric impact on the endogenous variable.

Revenues shocks lead to a stronger contraction in gross domestic product in emerging countries than expenditures shocks. In the context of a recession, it is necessary to apply a countercyclical policy, by increasing expenditures, especially those related to public and private investment. These will contribute to maintaining the equilibrium due to the direct impact on production and, implicitly, on the gross domestic product. At the level of developed countries, the shocks of expenditures determine the contraction of the economy. This requires a procyclical fiscal policy in the case of a recession, as government revenues are seen as a stronger stimulus for gross domestic product.

Government expenditures plays a strategic role in implementing fiscal policy and ensuring long-run fiscal sustainability regardless of the level of economic development. On the contrary, only at the level of emerging countries, revenues will lead to a slight contraction in gross domestic product rather than an increase.

However, the size of the fiscal multipliers obtained based on the impulse-response function related to VECM models does not differ depending on the level of development of a country. The Keynesian theory, according to which the fiscal multipliers afferent to the developed countries have values higher and close to 1, cannot be validated. Beta convergence is one of the arguments behind this statement. As long as the growth rate of gross domestic product is higher in emerging countries, it is understood that economic development is more pronounced at their level. Moreover, in developed countries it is much more difficult to stimulate the growth of gross domestic product. A fiscal stimulus can more easily send impulses to an emerging economy due to instability, existing a real possibility that the size of fiscal multipliers to be equal or even greater than in developed economies.



CHAPTER 5. THE PREDICTABILITY MODEL OF FISCAL SUSTAINABILITY

The intensification of instability due to the economic crisis marks a new beginning related to the interest shown in the importance of implementing a fiscal policy that ensures medium and long term sustainability. Although there are treaties in the European Union Member States that impose fiscal rules in order to maintain the economic equilibrium, these cannot provide premises on the possibility of the existence of an optimal framework for protection and development. In this context, the assessment and forecasting of fiscal sustainability become fundamental elements as part of the fiscal theory. Its relevance in the field is provided by the fiscal behaviour that can be influenced by the level of economic development, thus requiring the knowledge of the extent to which a coherent fiscal policy is applied.

In this chapter, a new model for assessing fiscal sustainability was proposed by applying a research methodology unique to those currently existing in the empirical literature, bringing as a factor of novelty the forecasting for a period of up to four years. The purpose of developing the new model is to eliminate the limitations related to the lack of understanding of the characteristics of a complete transnational environment. All 28 Member States of the European Union were included in the analysis and for these were collected independently 22 fiscal, macroeconomic and social indicators from 2000 quarter I - 2019 quarter IV, which could be considered relevant in determining fiscal sustainability. These indicators were not randomly selected, the studies included in the meta-analysis section constituting the theoretical reasoning of this process.

The proposed model focused on aggregating the objectives of fiscal policy and expressing them in the form of a mathematical equation indicating the state of equilibrium and also the express delimitation between a sustainable fiscal policy and an unsustainable fiscal policy.

Both the Member States and the indicators proposed for inclusion in the analysis underwent a thorough selection based on theoretical and statistical aspects.

In the research conducted, a mathematical model was obtained in the form of a linear regression to predict fiscal sustainability in the European Union. Six variables containing the largest amount of information were identified.

Establishing confidence intervals following the identification of a predictability model was an indispensable step in completing this process. Their determination was performed with high precision, due to the applied procedure. The confidence interval between 0,092 and 3,474, called the *instability interval*, characterizes a volatile fiscal state, as the applied fiscal policy is not congruent with the targeted objectives, there is an increased risk of an economic

imbalance. Those countries that achieved a *SF* result of less than 0,092 are considered unsustainable, and the confidence interval was considered an *imbalance interval*. On the other hand, the countries in which a coherent fiscal policy is applied were identified, positioned in the *sustainability interval*, where the *SF* value obtained is higher than 3,474.

The main objective considered following the use of such a technique is to identify the predictability of the proposed function of assessing fiscal sustainability. The accuracy of the model with one year *a priori* indicated an average forecast percentage of 93,77%. The repetition of this analysis for the second year indicated a percentage of correctness of 88,51%, for the third year of 80,37%, and for the fourth year of 77,11%. Individually, the type II error for the last year under analysis is 30,80%, which indicates that the minimum predictability limit by four years *a priori* of fiscal sustainability is 69,20%.

Thus, the estimation and forecasting of fiscal sustainability in the 28 Member States of the European Union were carried out by determining some estimated indices based on the proposed predictability model. These allow the transposition of fiscal sustainability in metric form, having as main purpose the evaluation of the way in which the applied fiscal policy can lead to the three states: sustainability, instability or imbalance. Although the indices may show a slight variation over time, fiscal sustainability maintains its general state. Due to the fiscal volatility and economic dynamics present in some countries, the application of a fiscal policy that ensures long-rung sustainability becomes a difficult process. A permanent analysis is recommended in order to obtain information with a high accuracy related to the direction in which the decision makers have to act through the different fiscal instruments of economic equilibration.

PERSONAL CONTRIBUTIONS

The specific objectives set were achieved and the evaluation of the relevance, consistency, internal coherence and the degree of novelty of the results obtained brought robustness to the final goal. This doctoral thesis also aimed at identifying the fiscal behaviour that can be influenced by the level of economic development. By **capitalizing on the research results**, it can be stated that the determination of the types of fiscal policies applied in the European Union Member States, the capture of legislative elements, along with the identification of instruments that contribute to obtaining long-run fiscal sustainability have contributed to achieving a high degree of novelty. Moreover, the elaboration of a mathematical model for estimating and predicting fiscal sustainability brought fullness to this thesis. This study serves a wide range of users, from decision makers to practitioners in the field, as it will allow the determination of fiscal sustainability and the use of only those instruments through fiscal policy that will facilitate the achievement of this long-run state.

These objectives also brought value through their heterogeneous character as they allowed the division of the **original contributions** of the doctoral thesis in three ways: theoretical, methodological and empirical as represented in *Figure 1*. Structured in the form of a pyramid, this figure tolerates the complete visualization of the research staging starting from the broad context specific to the contributions of a theoretical nature, to the narrow context specific to the contributions of an empirical nature.

An aspect to consider is related to the **limitations of this research**. The specificity of national legislation may be an element that diminishes the degree of coherence of results. Permanent changes in this direction may affect the implementation of fiscal policies and will make the analyses required constantly updated. Another aspect with a limiting character is represented by the revision of the specialized literature which, by omission, can distort the horizon of novelty. Although this doctoral thesis was based on viewing 2,643 empirical studies, only two large databases were consulted. Identifying a larger number of relevant articles by consulting larger databases could have presented new perspectives and offered new approaches to the gaps in this research niche. Moreover, non-economic aspects (eg. pandemic crises, wars, natural disasters) could influence the likelihood of predicting the fiscal sustainability model.

In this respect, the establishment of **new research directions** and the proposal of **further developments** could eliminate or fade away some of the specific limitations of this study. Extending the meta-analysis by consulting larger databases and including a larger number of studies could be a further development of this research and help identify new perspectives for analysis in this niche. Another proposal for possible further developments is related to improving the predictability of the model for assessing fiscal sustainability, as well as methodological elements. This research can be the foundation for establishing new research directions. In this context, the development of a complex macroeconomic model to identify an optimal fiscal policy that can ensure both long-run fiscal sustainability, individual well-being and environmental protection could be a relevant contribution to the existing scientific framework.

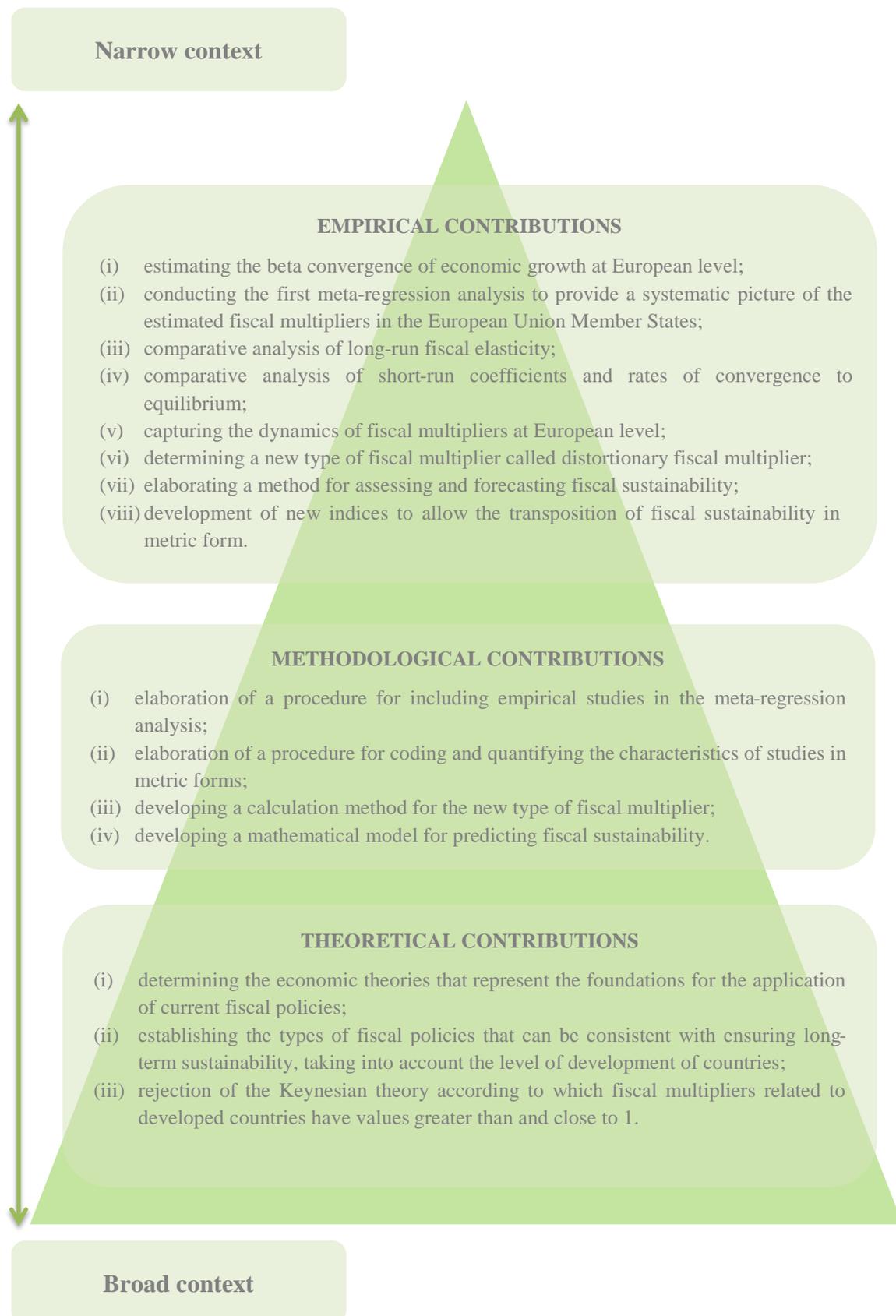


Figure 1: Research contribution

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