The impact of the shadow economy on automatic stabilizers

Ionuț Niculae[1]

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Abstract. Objective: *This paper investigates the impact of the shadow economy on the effectiveness and functioning of automatic stabilizers, a critical component of fiscal policy that mitigates economic cycle fluctuations. The main objective of the research is to assess the extent to which the shadow economy constrains or distorts the ability of budgetary expenditures to respond to macroeconomic shocks. Compared to the traditional literature, which predominantly analyzes the shadow economy through the lens of tax revenue losses, this study contributes a novel perspective by empirically examining its direct impact on the effectiveness of public expenditure as a stabilization mechanism.* ***Method****: To achieve this objective, an empirical analysis based on panel data was conducted, covering all 27 European Union member states over a two-decade period (2003–2022), an interval marked by major economic shocks such as the 2008 financial crisis and the COVID-19 pandemic - periods during which the role of automatic stabilizers was tested to its limits. From a methodological standpoint, Pooled OLS, Random Effects, and Fixed Effects models were comparatively tested, with the Fixed Effects model being selected as optimal based on the Hausman test.* ***Results****: The empirical results demonstrate that macroeconomic variables such as public debt, the output gap, and economic growth significantly influence the execution of government expenditure. Regarding the central objective of the study, the analysis suggests that a large shadow economy distorts the efficiency of automatic stabilizers by constraining fiscal space and reducing the state's capacity to intervene during periods of economic imbalance.*

Keywords: *shadow economy, automatic stabilizers, government expenditure, fiscal policy, panel data.*
JEL Classification: *E62, H26, H61, C23.*

1. Introduction

Fiscal policy is among the most important macroeconomic tools through which governments can intervene to stabilize the economy. Within this framework, automatic stabilizers—such as government expenditure, unemployment benefits, or progressive taxation systems—play a crucial role. By their nature, these instruments respond countercyclically, supporting aggregate demand during economic downturns and tempering economic overheating during expansionary phases, without requiring additional legislative decisions. Their importance has become even more evident over the past two decades, a period marked by profound global shocks, such as the 2008 financial crisis and the COVID-19 pandemic.

Nevertheless, the effectiveness and speed of response of automatic stabilizers depend directly on the robustness of government revenues and the available fiscal space. At this point, a major structural challenge faced by many economies emerges: the shadow economy. A high prevalence of undeclared labor and tax evasion erodes the tax base, depriving the state of essential financial resources. Consequently, at times when the economy most urgently requires capital injections through public spending, governments with a large informal sector face difficult-to-finance deficits and are often forced

[1] PhD Student, Doctoral School of Finance, Bucharest University of Economic Studies, Bucharest, Romania. Email address: niculaeionut18@stud.ase.ro, ORCID ID: 0009-0006-6292-5422.

to implement procyclical measures, such as cutting expenditures or increasing taxes in the midst of a crisis. The expansion of the informal sector distorts the effectiveness of macroeconomic stabilization policies, significantly reducing the capacity of public expenditure to influence aggregate demand and to cushion economic shocks (Bechchani, 2025).

Against this background, the main objective of this paper is to empirically investigate the extent to which the size of the shadow economy distorts or constrains the ability of government spending to function as an automatic stabilizer. Although the existing literature frequently addresses the shadow economy from the perspective of revenue losses, its direct impact on expenditure-based stabilization mechanisms remains an area requiring further investigation, particularly in the context of the heterogeneity among European countries.

To address this research question, the paper proposes a quantitative analysis based on a panel comprising the 27 European Union member states over the period 2003–2022. Using panel econometric models with fixed effects, the study examines the interaction between government expenditure and a set of key macroeconomic variables, including the shadow economy, public debt, the output gap, economic growth, inflation, GDP per capita, and trade openness.

The paper is structured as follows: the next section details the research methodology and the data used, justifying the econometric choices; the second section presents the empirical results and discusses the economic implications of the estimated coefficients; the final section formulates the main conclusions and provides public policy recommendations aimed at strengthening fiscal resilience.

2. Literature review

Although the present topic has not been explicitly addressed in the existing literature, this paper contributes to the academic debate by examining the impact of the shadow economy on automatic stabilizers. In a study conducted for the International Monetary Fund, Debrun and Kapoor analyze automatic stabilizers through the lens of fiscal policy and economic stability. The size of automatic stabilizers is typically approximated by the ratio of general government expenditure to GDP. However, while the size of the public sector may be relevant for automatic stabilization, it can also become detrimental to macroeconomic stability if larger governments tend to generate fiscal shocks of greater magnitude compared to those with a smaller governmental apparatus (Debrun & Kapoor, 2010).

Automatic stabilizers are elements of fiscal policy that operate countercyclically on household income and consumption, cushioning the transmission of economic shocks in the absence of additional discretionary government intervention. More broadly, fiscal stabilizers are legally embedded rules that cause public revenues and expenditures, relative to total income, to fluctuate along with the business cycle (McKay & Reis, 2013). Typical examples of automatic stabilizers include personal income taxes, means-tested social benefits, and unemployment benefits, as these instruments automatically adjust to changes in market income (Coady et al., 2023).

According to estimates by Maravalle and Rawdanowicz (2020) in a study prepared for the OECD, countries with larger and more effective fiscal automatic stabilizers require fewer discretionary changes in public spending and revenues to stabilize the economy in response to a given shock. Automatic fiscal stabilizers are temporary by nature and, in principle, should not affect the structural fiscal position over the course of the economic cycle, provided that the cycle is symmetric. Therefore, automatic stabilizers contribute to ensuring timely, well-targeted, and temporary fiscal responses to economic fluctuations (Maravalle & Rawdanowicz, 2020).

There are multiple approaches to quantifying automatic stabilizers, and the literature has not reached a consensus regarding the most appropriate methodology (in ’t Veld et al., 2012; Mohl et al., 2019). Moreover, procyclical fiscal policy undermines the effective functioning of automatic stabilizers. Consequently, periods of favorable economic growth should be used to build fiscal buffers, in full compliance with the Stability and Growth Pact, particularly in member states with high levels of public debt, in order to allow automatic stabilizers to operate fully during recessions (Mohl et al., 2019).

The findings of the study by Bondzie and Armah indicate that tax increases lead to significant tax evasion and to a reallocation of production factors from the official sector to the shadow economy, thereby causing standard aggregate estimates of fiscal policy effects to lose their effectiveness (Bondzie & Armah, 2022). Although the size of the shadow economy has declined in Europe in recent years, it

remains substantial, particularly in Eastern Europe. In emerging European economies, the main determinants of the size of the shadow economy include the quality of regulation, government effectiveness, and human capital. Successfully combating the shadow economy requires a comprehensive reform package tailored to country-specific factors. The policy mix considered most relevant for emerging European economies includes reducing regulatory and administrative burdens, promoting transparency and improving government efficiency, as well as increasing tax compliance through procedural automation and the promotion of electronic payments (Kelmanson et al., 2019).

3. Research methodology

The research adopts a quantitative approach based on panel data, comprising 27 countries observed over a 20-year period (2003–2022), resulting in a total of 513 observations. The methodological framework consists of applying panel data econometric models, with estimations conducted using the EViews software. The dependent variable analyzed is government expenditure. The main independent variable is the underground economy. The independent control variables are: public debt, the output gap, and economic growth. In order to ensure data stationarity and to avoid spurious regressions, GDP per capita and trade openness were included in first differences.

As estimation methods, three standard panel data approaches were comparatively tested: Pooled OLS (classical regression), Random Effects (estimated using the EGLS method), and Fixed Effects models. To determine the optimal specification between the Fixed Effects and Random Effects models, the Hausman test was applied. The test results, conducted on the stationarized data (Prob. = 0.0000 < 0.05), led to the rejection of the null hypothesis, thereby confirming that the Fixed Effects model is the most appropriate and consistent specification for the analyzed dataset.

Furthermore, the validity of the final model was assessed through an evaluation of its strong explanatory power (adjusted R-squared of approximately 85.0%), the statistical significance of the estimated coefficients (t-tests), and the Durbin–Watson statistic, which was used to diagnose potential autocorrelation in the error terms. Previous empirical analyses based on panel data models support the existence of an interdependent relationship between government expenditure and the shadow economy, demonstrating that high-budget deficits constrain governments' ability to implement optimal fiscal policies (Vo et al., 2023).

4. Data set and results

Data stationarity – unit root tests

To avoid spurious regressions, a crucial preliminary step consisted of testing the stationarity of the data series. As some of the raw macroeconomic variables exhibited non-stationary behavior (i.e., the presence of a unit root), it was necessary to transform them accordingly. Therefore, the series were stationarized by applying first-order differencing, resulting in variables marked with the prefix "D_" (e.g., *D_GDP_PER_CAPITA*, *D_TRADE_OPENNESS*). This procedure ensured the estimation of a robust and valid econometric model based on stationary data.

Stationarity was assessed using the common unit root test proposed by Levin, Lin, and Chu (LLC), applied to the panel data. The distinct feature of this econometric test lies in its assumption of a common unit root, implying that the autoregressive parameter is identical across all cross-sectional units (i.e., all countries included in the panel). The null hypothesis (H_0) of the LLC test states that the analyzed time series contain a common unit root, indicating non-stationary behavior. In contrast, the alternative hypothesis (H_1) asserts that none of the series in the panel contains a unit root, meaning that the data are stationary.

Rejection of the null hypothesis, indicated by probability values lower than the 5% significance threshold ($p < 0.05$), confirms the stationarity of the variables. Consequently, the application of this test mitigates the risk of generating spurious regressions and ensures the consistency of the estimators used in the final econometric model.

Mean, standard deviation, minimum and maximum values

The data analysis shows that the average level of government expenditure in the European Union over the period 2003–2022 amounted to 45.34% of GDP. This relatively high share confirms the strong welfare-oriented role of European states, which allocate substantial resources to social protection, including pensions, education, healthcare, and social assistance. However, the standard deviation of 6.89 percentage points indicates significant cross-country heterogeneity: while some governments pursue more restrained fiscal policies, others intervene heavily in the economy. This dispersion also reflects major crisis episodes during the sample period, when governments were forced to sharply increase spending in order to support households and firms.

On average, European countries allocate nearly half of their economic output (GDP) to public purposes such as pensions, schools, hospitals, and social transfers, underscoring the central role of the public sector in European economies.

From a geographical and structural perspective, values close to the absolute minimum of the shadow economy (6.10% of GDP) are consistently observed in advanced economies of Central and Northern Europe, such as Austria, the Netherlands, and the Nordic countries. These states benefit from high institutional quality, strong trust in public authorities, and near-complete digitalization of economic transactions. At the opposite end of the spectrum, values approaching the alarming maximum observed in the panel (35.30% of GDP) are characteristic of Eastern Europe (notably Bulgaria and Romania) and Southern Europe (particularly Greece). In these regions, a high reliance on cash transactions, the prevalence of hard-to-tax sectors (such as agriculture and seasonal tourism), and low levels of tax morale have perpetuated a chronic dependence on the informal sector.

An exceptionally wide dispersion is observed in the case of public debt, with values in the panel ranging from a minimum of just 3.9% of GDP to an alarming maximum of 209.4% of GDP. This striking gap reflects deep structural vulnerabilities within the euro area: on the one hand, countries characterized by strict fiscal discipline (such as Estonia), and on the other hand, countries that have experienced severe sovereign debt crises, where public debt spiraled out of control (as in the case of Greece).

Table 1. Description of variables, data sources and units of measurement

Variables	Source	Unit of measurement
Government expenditure	EUROSTAT	Expressed as a percentage of gross domestic product (GDP).
Public debt	AMECO	Expressed as a percentage of GDP at current prices.
Trade openness	AMECO	Defined as the ratio between the total volume of external trade (exports plus imports) and the size of the economy, expressed as a percentage of GDP at current prices.
Shadow economy	(Schneider & Asllani, 2022)	Expressed as a percentage of official GDP (Mimic model)
GDP per capita	AMECO	Calculated at current prices and expressed in thousands of euros per inhabitant.
Economic growth	AMECO	Measured as the annual growth rate of GDP, calculated as the percentage change compared to the previous year
Output gap	AMECO	Expressed as a percentage of potential GDP, calculated at constant prices.
Inflation rate	EUROSTAT	Based on the Harmonised Index of Consumer Prices (HICP), expressed as an annual percentage reflecting the average change in the general price level.

Source: own analysis.

The macroeconomic volatility experienced by European economies over the two-decade period is well captured by the extreme values of economic growth rates. The minimum value of −16.04%

reflects the devastating impact of major external shocks, such as the 2008 global financial crisis and the COVID-19 pandemic lockdowns in 2020, while the maximum value of +24.62% corresponds to years of rapid post-crisis recovery driven by strong base effects.

Econometric model specification

To empirically investigate the impact of the shadow economy on the effectiveness of automatic stabilizers, this study employs a panel data econometric approach. Based on the Hausman test results, the Fixed Effects (FE) specification was selected as the most robust and consistent model for capturing country-specific heterogeneity. To ensure data stationarity and avoid spurious regressions, certain variables (trade openness and GDP per capita) were transformed using first-order differencing, denoted by the D_prefix. The formal baseline equation of the estimated model is specified as follows:

$$Government_Expenditure_{it} = \beta_0 + \beta_1 Shadow_Economy_{it} + \beta_2 Public_Debt_{it} + \beta_3 Output_Gap_{it} + \beta_4 Economic_Growth_{it} + \beta_5 D_Trade_Openness_{it} + \beta_6 D_GDP_per_Capita_{it} + \mu_i + \epsilon_{it}$$

i denotes the cross-sectional unit, representing the 27 European Union member states (i= 1,…, 27).

t represents the time period, covering the 2003–2022 interval.

β_0 is the intercept of the model.

$\beta_1 \ldots \beta_6$ represent the long-run elasticities (coefficients) of the explanatory variables.

μ_i captures the unobservable, time-invariant country-specific fixed effects.

ϵ_{it} represents the stochastic error term.

The Dependent Variable:

The dependent variable of the model is Government Expenditure ($Government_Expenditure_{it}$), expressed as a percentage of the official gross domestic product (GDP). In the context of this research, it serves as the primary proxy for measuring the size and activation level of automatic stabilizers, particularly on the expenditure side (e.g., social assistance, unemployment benefits, and state subsidies).

Explanatory Variables and Expected Signs:

The selection of independent variables is grounded in macroeconomic theory and previous empirical literature. The expected signs of the estimated coefficients are defined as follows:

Shadow Economy: expected sign: Positive (+). An expansion of the informal sector is anticipated to artificially inflate public spending. Individuals operating in the shadow economy do not declare their incomes, officially appearing as economically vulnerable, which makes them eligible for non-contributory social benefits. Additionally, a larger shadow economy forces governments to allocate further funds to anti-fraud enforcement structures.

Public Debt: expected sign: Positive (+). Higher levels of public debt structurally increase overall government expenditure due to the rising burden of debt servicing, specifically interest payments and principal repayments.

Output Gap: expected sign: Negative (-). Following the principles of countercyclical fiscal policy, a positive output gap (indicating economic overheating) should prompt fiscally responsible governments to reduce public spending and subsidies to curb inflationary pressures.

Economic Growth: expected sign: Negative (-). During periods of robust economic expansion, government expenditure naturally declines. Rising incomes and falling unemployment automatically reduce the pressure on public budgets by lowering the demand for state social assistance.

Trade Openness (First Difference): expected sign: Positive (+). In accordance with Rodrik's Compensation Hypothesis, more open economies are highly exposed to external macroeconomic shocks. Consequently, governments are expected to maintain larger welfare states and higher public spending to shield their citizens from international volatility.

GDP per Capita (First Difference): expected sign: Negative (-). As the standard of living improves and a society becomes wealthier, the population's reliance on direct financial intervention and state support diminishes, leading to a natural reduction in welfare-related budgetary allocations.

Model diagnostics and robustness checks

Serial Correlation: To check for the presence of first-order serial correlation in the error terms, the Durbin-Watson statistic was analyzed. The test recorded a value of 0.899, indicating the presence of positive first-order serial correlation, a common phenomenon in macroeconomic panel data over long time horizons.

Cross-Sectional Dependence: Given the strong economic and financial integration among the 27 European Union member states, the model was tested for cross-sectional dependence, as macroeconomic shocks in one country are likely to spill over to others. The diagnostic was performed using the Breusch-Pagan LM and Pesaran CD tests. The results yielded a Breusch-Pagan LM statistic of 948.24 ($p = 0.0000$) and a Pesaran CD statistic of 17.16 ($p = 0.0000$). Since the p-values are strictly below the 1% significance level, the null hypothesis of cross-sectional independence is strongly rejected.

Heteroskedasticity: Given the methodological constraints associated with standard heteroskedasticity testing in strictly defined Fixed Effects panel specifications, and considering the inherent structural disparities among the 27 EU member states—which theoretically guarantee non-constant error variances—a formal test was superseded by direct methodological correction.

Robust Estimation Approach:

To simultaneously address the identified first-order serial correlation, cross-sectional dependence, and anticipated heteroskedasticity, thereby guaranteeing the strict validity of the statistical inferences, the final Fixed Effects model was estimated using White cross-section robust standard errors.

Panel Granger causality test for endogeneity check

To formally address potential concerns regarding endogeneity and reverse causality between the shadow economy and government expenditure, a Pairwise Granger Causality test was performed on the panel data, utilizing a lag length of 2. The empirical results demonstrate a strict unidirectional causal relationship. Specifically, the null hypothesis that the shadow economy does not Granger-cause government expenditure is strongly rejected at the 1% significance level ($p < 0.01$). Conversely, the null hypothesis that government expenditure does not Granger-cause the shadow economy is accepted ($p = 0.4185$). These findings empirically validate the structural direction of our baseline model, confirming that fluctuations in the shadow economy directly drive adjustments in automatic stabilizers, without significant reverse feedback mechanisms.

The results are presented in the table below.

Table 2. Unit root test results

Variable	Test Statistic	Prob.
Shadow Economy	-5.53806	0.0000
Public Debt	-2.88081	0.0020
Output Gap	-6.57631	0.0000
Economic Growth	-9.86939	0.0000
D_Trade Openness	-7.40583	0.0000
D_GDP per Capita	-3.63578	0.0001

Source: author computation using EViews.

Correlation matrix

To assess the presence of multicollinearity among the explanatory variables, the Pearson correlation matrix was calculated. The estimated coefficients confirm the absence of severe linear relationships between the regressors, with the highest recorded value being 0.65 (between the dynamics of GDP per capita and economic growth). Since none of the correlation coefficients exceeds the critical

threshold of 0.70 established in the empirical literature, the hypothesis of perfect or severe imperfect multicollinearity is rejected. This ensures robust estimation of standard errors and regression coefficients.

Government expenditure was excluded from the correlation matrix, as it represents the dependent variable. The results are presented below.

Table 3. Correlation matrix

Correlation Probability	Shadow E.	Economic G.	D_Trade O.	D_GDP/Capita	Output G.	Public D.
Shadow Economy	1.000000 -----					
Economic Growth	0.090085 0.0414	1.000000 -----				
D_Trade Openness	-0.005670 0.8981	0.366416 0.0000	1.000000 -----			
D_GDP per Capita	-0.245680 0.0000	0.650681 0.0000	0.327034 0.0000	1.000000 -----		
Output Gap	0.025618 0.5626	0.623431 0.0000	0.081283 0.0658	0.432190 0.0000	1.000000 -----	
Public Debt	-0.128234 0.0036	-0.246560 0.0000	-0.022025 0.6187	-0.170660 0.0001	-0.463786 0.0000	1.000000 -----

Source: author computation using EViews.

It can be observed that the maximum correlation coefficient is 0.650681, which remains below the critical threshold of 0.70. This result indicates the absence of multicollinearity among the explanatory variables included in the model.

The intersection between the shadow economy and GDP per capita reveals a negative correlation of -0.2456, statistically significant at the 1% level (p = 0.0000). This finding suggests that as GDP per capita increases - reflecting a wealthier and more developed society - the size of the shadow economy tends to decrease, as indicated by the negative sign. This result strongly confirms economic theory: poorer countries are typically characterized by higher levels of tax evasion, while wealthier countries, supported by stronger institutions, exhibit lower levels of informal economic activity.

Public debt displays strong and highly significant negative correlations (p = 0.0000) with both the output gap (-0.4637) and economic growth (-0.2465). From an economic perspective, when the economy experiences robust growth (higher growth rates and a positive output gap), public debt tends to decline. This occurs primarily because the denominator (GDP) expands, reducing the debt-to-GDP ratio. Moreover, during periods of economic expansion, governments collect higher tax revenues and rely less on borrowing. Additionally, public perceptions regarding the inefficiency of government expenditure may erode fiscal morale, encouraging economic agents to migrate toward the shadow economy (Torgler, 2005).

Finally, trade openness (first difference) and economic growth exhibit a positive and statistically significant correlation of 0.3664 (p = 0.0000). This result indicates that greater trade openness - reflected in higher levels of imports and exports - is associated with stronger economic growth. Economically isolated states tend to stagnate, whereas countries that actively engage in international trade experience higher levels of economic development.

The estimations indicate a robust effect of the shadow economy on the size of automatic stabilizers, as both the Fixed Effects (FE) and Random Effects (RE) models reveal a statistically significant and positive relationship. Among the three panel data estimation techniques employed (Pooled OLS, Fixed Effects, and Random Effects), the Fixed Effects model proves to be the most robust. In particular, under the FE specification, nearly all explanatory variables pass the most stringent significance threshold, namely the 1% level.

Model estimates

Table 4. Model results

Variables – Stationary	**Pooled OLS (POLS)**	**Fixed Effects (FE)**	**Random Effects (RE)**
Shadow Economy	-0.296910* (0.0000)	0.225605* (0.0015)	0.065448* (0.2669)
Public Debt	0.080690* (0.0000)	0.066039* (0.0000)	0.061575* (0.0000)
Output Gap	0.096899 (0.2461)	-0.199663* (0.0002)	-0.192340* (0.0002)
Economic Growth	-0.392664* (0.0000)	-0.197247* (0.0001)	-0.198516* (0.0001)
D_Trade Openness	0.058525** (0.0334)	0.040949* (0.0063)	0.043143* (0.0040)
D_GDP per Capita	-0.904540* (0.0000)	-0.440267* (0.0001)	-0.489301* (0.0000)
R-squared	0.484856	0.859403	0.422179
C (Constant)	47.75765 (0.0000)	37.54262 (0.0000)	40.96171 (0.0000)
Mean	45.34211	45.34211	7.394264
Std. Dev. (Standard Deviation)	6.893100	6.893100	3.588882

Source: author computation using EViews.
*1% significance level,** 5% significance level,***10% significance level

Following the evaluation of the three panel data estimation methods, the Fixed Effects (FE) model was identified as the most appropriate specification. This choice is supported both by the Hausman test and by the strong explanatory power of the model, as reflected by an R-squared value of 0.8594. Consequently, approximately 85.9% of the variation in government expenditure is explained by the independent variables included in the model. Moreover, the FE model successfully captures country-specific, time-invariant, and unobservable characteristics of each panel unit, thereby providing a more accurate representation of economic reality compared to the Pooled OLS model.

Model selection (Hausman Test)

To statistically determine the most suitable panel data specification, the Hausman test was applied in order to choose between the Fixed Effects (FE) and Random Effects (RE) models. The test was conducted using the stationarized dataset, as required. Methodologically, the Hausman test must always be performed using the Random Effects estimation as the reference model. The null hypothesis assumes that the Random Effects model is efficient and consistent, whereas the alternative hypothesis supports the validity of the Fixed Effects model. The test results report a Chi-square statistic of 34.74 with an associated p-value of 0.0000. Since this probability is strictly below the 1% significance level ($p < 0.01$), the null hypothesis is rejected with a high degree of confidence. Accordingly, the Fixed Effects model is confirmed as the superior econometric approach, best suited to capturing individual country heterogeneity and to interpreting the final results.

Interpretation of the Fixed Effects Model (FE)

Interpreting the results of the Fixed Effects model estimated on stationary data reveals that all explanatory variables are highly statistically significant, meeting the most demanding significance threshold of 1% (p-value < 0.01).

Shadow Economy-the shadow economy exerts a positive and highly significant impact on government expenditure (coefficient = 0.2256, p-value = 0.0015). An expansion of informal economic activity leads to an increase in public spending, which can be explained by the government's need to finance social assistance for individuals without declared income, as well as by the costs associated with

combating tax evasion. A large informal sector reduces the elasticity of fiscal revenues, thereby weakening the role of automatic stabilizers in smoothing economic cycle fluctuations (Tanzi, 1982).

Firstly, individuals engaged in the shadow economy do not report official income and thus appear statistically vulnerable in government records. As a result, they often become eligible for social assistance programs, unemployment benefits, or subsidies, artificially inflating public expenditures. The expansion of the informal sector generates a free-rider behavior, forcing governments to sustain high levels of public spending for services that are non-contributively consumed by tax evaders (Dreher & Schneider, 2010).

Secondly, firms and workers operating in the informal sector consistently use public goods and services—such as transport infrastructure, healthcare systems, and public safety—without contributing proportionally through taxes. This asymmetry forces governments to maintain high levels of public expenditure to ensure the provision of essential services, with revenue shortfalls often financed through public borrowing. A large shadow economy severely constrains fiscal space by eroding the tax base, compelling governments to adopt procyclical policies—such as spending cuts or tax increases—precisely during recessions, thereby neutralizing the effectiveness of automatic stabilizers (Buehn & Schneider, 2012).

Additionally, a substantial informal sector generates significant institutional costs. Governments are compelled to allocate considerable public funds to strengthen anti-fraud enforcement mechanisms, including investments in tax administration digitalization, intensified fiscal controls, and the development of voluntary compliance systems. Overall, a large shadow economy artificially and unjustifiably inflates the size of automatic stabilizers, forcing governments to spend more than would be economically warranted (Schneider & Enste, 2000).

Output Gap -the output gap exhibits a negative and statistically significant impact on government expenditure (coefficient = −0.1990). From a macroeconomic perspective, a positive output gap indicates that the economy is operating above its potential level. During such periods of economic "overheating," fiscally responsible governments implement restrictive fiscal policies, reducing public expenditures -particularly public investment and subsidies - to curb inflationary pressures and avoid crowding out private sector activity. The negative coefficient thus confirms an appropriate countercyclical fiscal behavior among the analyzed countries.

Public debt displays a positive and highly significant relationship with government expenditure at the 1% level (coefficient = 0.0660). An increase in public debt leads to higher public spending, a result that is economically intuitive, reflecting the burden imposed by debt servicing (interest payments and principal repayments) on the government budget. Insufficient revenue collection forces governments to finance deficits through borrowing, the servicing of which severely constrains long-term investment capacity (Elgin & Uras, 2013). Persistent debt accumulation generates structural budget rigidity, limiting fiscal space and potentially reinforcing a vicious cycle of higher taxation, increased informality, and fiscal illusion (Buehn, Dell'Anno & Schneider, 2018). In the analyzed sample, Greece recorded the highest level of public debt, reaching approximately 209.4% of GDP in 2020, while Estonia stood out with the lowest level, at only 3.9% of GDP in 2007.

Economic Growth and Output Gap - both economic growth (coefficient = −0.1972) and the output gap (coefficient = −0.1996) exert a negative and statistically significant effect on government expenditure at the 1% level. These findings confirm the countercyclical nature of fiscal policy: during periods of strong economic expansion, public spending tends to decline, as automatic stabilizers operate through reduced unemployment benefits and lower social assistance needs. Rising incomes and declining unemployment automatically ease pressure on public budgets, resulting in lower government expenditures. Regarding economic dynamics, Ireland experienced the highest annual growth rate, of approximately 24.62 in 2015, whereas Latvia registered the most severe economic contraction, of about -16.04 in 2009, highlighting the significant impact of the global financial crisis on European economies.

Trade Openness (First Difference) - trade openness positively influences government expenditure (coefficient = 0.0409, p-value = 0.0063). This result supports the Compensation Hypothesis, according to which more open economies are exposed to greater external shocks, prompting governments to expand public spending in order to provide social protection. In line with Rodrik's hypothesis, countries with higher trade openness require stronger and more generous automatic stabilizers - a larger welfare state - to shield citizens from uncontrollable external shocks (Rodrik, 1998).

GDP per Capita (First Difference) - GDP per capita exhibits the strongest negative impact in the model (coefficient = -0.4402, p-value = 0.0001). This finding demonstrates that improvements in living standards and per capita economic development significantly reduce the relative need for state intervention. A wealthier population requires less financial support from the government, leading to a natural decline in budgetary expenditures allocated to social assistance and subsidies.

Finally, during the stationarization process, the inflation rate was excluded from the final specification. This adjustment was necessary to comply with the strict assumptions of panel econometric modeling and to ensure the consistency and validity of the final estimators.

Limitations of the study

While this study provides robust empirical evidence regarding the interaction between the shadow economy and automatic stabilizers, several methodological limitations must be acknowledged. First, regarding data constraints, measuring the shadow economy inherently relies on estimates rather than direct observations. The use of MIMIC (Multiple Indicators Multiple Causes) model estimates, while representing the standard in empirical literature, may introduce measurement errors. Second, potential endogeneity and reverse causality remain a challenge. While the model postulates that a large shadow economy inflates government expenditure, the relationship could be bidirectional: high government spending, often financed through distortionary taxation, might incentivize economic agents to migrate to the informal sector. Although the Fixed Effects specification successfully absorbs time-invariant unobserved heterogeneity - mitigating omitted variable bias related to constant institutional or cultural characteristics (e.g., tax morale) - it cannot fully account for dynamic time-varying omitted variables, such as sudden shifts in political cycles or abrupt institutional reforms. Future research could address these constraints by employing dynamic panel estimators (such as System GMM) or Instrumental Variable (IV) approaches to more rigorously isolate the causal mechanisms.

5. Conclusions

This study investigated the interaction between the shadow economy and the effectiveness of automatic stabilizers, using a panel of the 27 European Union member states over the period 2003–2022. Based on the Fixed Effects (FE) econometric model, validated by the Hausman test, the empirical results confirm that the size of the informal sector significantly distorts the macroeconomic stabilization mechanism.

The main finding of the study demonstrates that the shadow economy exerts a positive and highly significant impact on government expenditure (coefficient of 0.2256). This relationship supports the hypothesis that an extensive unobserved economy artificially activates automatic stabilizers. Individuals operating in the informal sector do not declare their incomes and therefore appear officially as economically vulnerable, unjustifiably absorbing public resources through social assistance programs and subsidies. In addition, governments are compelled to allocate further funds to anti-fraud enforcement structures and to maintain public services, while covering revenue shortfalls through public borrowing.

In order to restore the effectiveness of automatic stabilizers and to preserve the fiscal space required for intervention during periods of economic distress, European governments must prioritize policies aimed at combating the shadow economy. Reducing undeclared work and advancing the digitalization of tax administration would generate a dual beneficial effect: expanding the tax base and, according to the results of this model, eliminating unjustified social expenditures that place excessive strain on national budgets.

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