

DETERMINANTS OF THE SHADOW ECONOMY IN SELECTED SOUTHERN EUROPEAN (EU) COUNTRIES: A MIMIC MODEL APPROACH

Baylarov R.

Master in International Business

WSB University, Krakow Poland

Karimova U.

PhD in Mathematics

Azerbaijan Technical University, Baku, Azerbaijan

Abdullayev K.

Doctor of Sciences in Economics, D.Sc. (Economics),

Institute of Economics of the Ministry of Science and Education of the Azerbaijan Republic, Baku, Azerbaijan

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Abstract

This study empirically evaluates the determinants of the shadow economy in selected Southern European Union countries over the 2013–2023 period using the MIMIC (Multiple Indicators Multiple Causes) model. Since the shadow economy is considered a latent economic phenomenon that cannot be directly observed, identifying its structural determinants is important for both the academic literature and economic policymaking. The study sample includes Cyprus, Croatia, Greece, Italy, Malta, Spain, Portugal, and Slovenia. In the model, unemployment and population growth are used as causal variables, while self-employment is employed as the indicator variable.

The empirical findings indicate that unemployment has a positive and statistically significant relationship with the shadow economy, suggesting that constraints in the formal labor market may encourage a shift toward informal economic activity. In contrast, population growth demonstrates a negative and statistically significant effect, implying that more favorable demographic dynamics may be associated with greater formal economic activity. Comparative cross-country results reveal substantial heterogeneity within the region; while Greece and Italy exhibit higher latent shadow economy index values, Cyprus and Malta display relatively lower levels.

The findings suggest that reducing the shadow economy should not be approached solely through fiscal control measures, but rather through an integrated policy framework that also incorporates labor market reforms and broader structural economic policies.

Keywords: Shadow economy, MIMIC model, Informal economic activity, Southern European Union, Economic determinants

Introduction

The shadow economy remains one of the most persistent and conceptually contested phenomena in contemporary economic analysis. Although the literature provides a range of definitions, the prevailing consensus describes the shadow economy as economic activity that generates value while remaining partially or wholly unrecorded in official national accounts; such activities typically occur outside the scope of taxation, labor market regulation, and institutional oversight [21]. The enduring nature of this phenomenon presents significant challenges for both economic analysis and policymaking [14]. On the one hand, particularly during periods of limited opportunities in the formal labor market, informal economic activity may serve as an essential mechanism for household survival and income generation. On the other hand, persistent informality undermines tax collection, distorts market competition, diminishes the effectiveness of regulatory institutions, and complicates macroeconomic governance. From this perspective, the shadow economy should be understood not merely as a set of activities absent from official statistical records, but as a structural economic challenge with far-reaching implications for fiscal sustainability, labor market efficiency, and institutional trustworthiness.

The scale and characteristics of the shadow economy are unevenly distributed across regions. While the

advanced economies of Northern Europe have generally maintained stronger institutional control over informal economic activity, Southern European countries have exhibited more persistent informal economic structures. The literature has proposed several structural explanations for this divergence, including high unemployment, fragmented labor markets, bureaucratic inefficiency, rigid regulatory frameworks, and cross-country differences in tax compliance culture. The sovereign debt crisis that unfolded after 2008 further exacerbated these structural vulnerabilities. In particular, in economies such as Greece, Italy, Spain, and Portugal, fiscal consolidation pressures coincided with deteriorating labor market conditions and declining household purchasing power. Although some degree of macroeconomic recovery was observed in subsequent years, the labor market instability and institutional distrust that emerged during the crisis persisted to a meaningful extent.

Southern Europe constitutes a particularly compelling case for analytical inquiry, as the region simultaneously reflects economic integration and pronounced structural heterogeneity. Although these countries share membership in the European Union, common regulatory frameworks, and broad mechanisms of macroeconomic coordination, they differ significantly in terms of labor market performance, demo-

graphic dynamics, economic structure, and administrative capacity. For example, Greece has long been identified in both empirical scholarship and policy discourse as an economy characterized by a comparatively large shadow sector. By contrast, smaller economies such as Malta and Cyprus warrant separate analytical consideration owing to their service-oriented economic structures and distinct regulatory environments. This internal heterogeneity underscores the limitations of treating the region as a homogeneous category; a comparative cross-country empirical analysis is therefore essential for identifying and understanding the determinants of the shadow economy.

The existing academic literature has generated important insights into the determinants of informal economic activity. Traditional explanatory frameworks emphasize tax burden, regulatory costs, unemployment, and institutional weakness as the principal drivers of shadow economic activity [22]. More recent scholarship has broadened this perspective to incorporate factors such as governance quality, demographic pressures, labor market dualism, and processes of economic transformation [14]. Nevertheless, important gaps remain in the literature. A substantial proportion of existing studies relies on large cross-country samples which, while yielding broadly generalizable findings, often do so at the expense of regional specificity. Conversely, some studies focus narrowly on single-country cases, thereby limiting the scope for comparative interpretation. Although Southern European countries are frequently represented in broader OECD and European datasets, comparative studies specifically centered on this region and employing latent variable modeling frameworks remain relatively scarce.

From a methodological perspective, measuring the shadow economy has long posed a substantial challenge, given that the phenomenon is inherently not directly observable. Direct measurement approaches, such as surveys and tax audits, are frequently constrained by data concealment, incomplete reporting, and limited cross-country comparability. Consequently, indirect estimation methods have become more widely adopted in the academic literature. Among these, the Multiple Indicators Multiple Causes (MIMIC) model is one of the most widely employed approaches for conceptualizing and estimating the shadow economy as a latent construct [20]. By modeling the unobserved shadow economy through observable economic indicators and structural determinants, this approach offers a theoretically grounded response to the measurement problem while providing a robust framework for comparative empirical analysis.

This study employs the MIMIC methodology to examine the determinants of the shadow economy in selected Southern European member states of the European Union over the period 2013–2023. The sample includes Croatia, Cyprus, Greece, Italy, Malta, Portugal, Slovenia, and Spain. This period is analytically significant for several reasons, as it encompasses the post-sovereign debt crisis adjustment phase, the subsequent economic recovery, and the economic disruptions associated with the COVID-19 pandemic. It therefore provides a valuable context for observing the behavior of

the shadow economy under varying structural economic conditions. In the empirical specification, unemployment and population growth are included as causal variables, while self-employment serves as the observable indicator of the latent shadow economy.

This study makes three principal contributions to the literature. First, it addresses the gap between highly aggregated international analyses and single-country studies by providing a comparative regional assessment centered on Southern Europe. Second, it extends the empirical application of latent variable modeling within a European regional context characterized by significant economic and institutional heterogeneity. Third, by linking labor market and demographic structural variables to the level of the shadow economy, it offers empirical evidence relevant to policy debates concerning economic formalization, labor market resilience, and fiscal governance [1].

Literature review. Conceptual background of the shadow economy

The shadow economy remains one of the most extensively debated and conceptually complex constructs in economic theory. This complexity stems not only from the widespread prevalence of the phenomenon across economic systems, but also from the absence of a universally accepted conceptual boundary across competing theoretical frameworks. While some scholars define the shadow economy narrowly as economic activity concealed from tax authorities, others adopt a broader interpretation encompassing activities conducted outside labor market regulations, social protection systems, and administrative oversight. From this perspective, the shadow economy should not be understood merely as an issue of tax evasion; rather, it constitutes a structural phenomenon closely linked to economic formalization, institutional trust, and state governance capacity [3].

One of the most widely cited conceptual frameworks was proposed by Schneider and Enste (2000), who define the shadow economy as all legal production and service activities that generate economic value yet remain unrecorded in the official statistical system [5]. Although this framework has been widely adopted in empirical research, some scholars have argued that its conceptual boundaries may be excessively broad. For example, grouping informal labor activity, unregistered small enterprises, family-based informal production, and partially concealed income-generating activities within a single analytical category may generate theoretical ambiguity in certain contexts. Nevertheless, within the empirical economics literature, the shadow economy is generally treated as a pragmatic construct referring to income-generating activities occurring outside the formal regulatory framework [4].

The theoretical literature on the emergence of the shadow economy has developed primarily along two major explanatory perspectives. The first is grounded in rational choice economics and argues that individuals shift from the formal to the informal sector as tax burdens, regulatory costs, and administrative barriers increase. Under this view, informal economic activity represents a rational response by economic actors to the

costs and constraints imposed by the formal institutional environment [22]. The second adopts an institutional perspective, emphasizing that informal economic activity is shaped not only by economic incentives, but also by trust in public institutions, governance quality, and patterns of normative compliance. Within this framework, the shadow economy is interpreted not merely as a market response, but also as a manifestation of institutional weakness.

Labor market theory likewise provides an important explanatory framework for understanding the shadow economy. Rising unemployment, the expansion of precarious employment, and limited access to formal employment opportunities may push individuals toward informal economic activity. Particularly during periods of economic crisis, the shadow economy may function as an adaptive adjustment mechanism. From this perspective, the informal sector is not simply a by-product of tax evasion, but may also represent a broader socioeconomic response to labor market failures. This interpretation is particularly relevant in the Southern European context, where persistently high unemployment, youth labor market exclusion, and structural labor market instability have long constituted defining economic challenges.

Although the relationship between demographic variables and the shadow economy has received comparatively limited attention, scholarly interest in this dimension has grown in recent years. Population growth, migration, demographic aging, and changes in the composition of the working-age population may influence the balance between formal and informal economic activity. In some contexts, a growing and dynamic population may strengthen economic formalization through labor market expansion and rising consumer demand. Conversely, an aging and contracting population may alter the structure of economic activity and reinforce particular forms of informal employment. Although the literature has not yet reached a clear consensus on these dynamics, demographic factors are increasingly recognized as secondary but meaningful determinants of the shadow economy.

Empirical evidence from previous studies

Empirical research has produced extensive, albeit not entirely uniform, evidence regarding the size and determinants of the shadow economy. Early studies primarily emphasized the role of tax burden and state regulation in shaping informal economic activity. In his analysis of the United States, demonstrated that higher tax burdens and fiscal pressures were associated with the expansion of informal economic activity. Subsequent research extended this analytical framework to the international level [22].

Cross-country studies by Schneider et al. found that the shadow economy is systematically associated with institutional weakness, elevated tax burdens, and labor market instability [20]. Their findings suggest that even in advanced economies, the shadow economy does not disappear entirely; rather, its scale and structural composition evolve. The comprehensive international analysis conducted by Medina and Schneider broadly reinforces these conclusions, demonstrating that informal economic activity is systematically linked

to structural economic characteristics and governance quality [14].

Labor market determinants have consistently emerged as particularly important explanatory variables. High unemployment rates have been associated with the expansion of informal economic activity across numerous empirical studies. This relationship appears especially pronounced during periods of economic crisis and structural transformation, when individuals excluded from formal employment may increasingly rely on informal income-generating activities. However, some scholars have noted that this relationship is not necessarily linear, arguing that the effect may be attenuated in economies characterized by stronger social protection systems.

Empirical studies in the European context likewise provide important insights. Herwartz et al. identified significant regional disparities in the shadow economy across Europe, indicating that institutional quality and economic structure generate substantial variation even within national economies [8]. Using a MIMIC framework for Germany, Buehn demonstrated that informal economic activity is closely associated with regional economic determinants [2]. These findings further strengthened the methodological credibility of latent variable approaches in shadow economy research.

Although empirical studies specifically addressing Southern Europe do exist, they have predominantly adopted single-country analytical perspectives. Greece and Italy, in particular, are frequently identified in the literature as economies characterized by comparatively high levels of informal economic activity. Commonly cited explanations include persistent tax non-compliance, weak enforcement mechanisms, elevated self-employment rates, and fragmented economic structures. In the cases of Spain and Portugal, scholarly discussion has focused on the effects of post-crisis labor market reforms on informal economic activity. Nevertheless, comparative studies evaluating the region's major economies within a unified methodological framework remain relatively scarce.

From a methodological perspective, the MIMIC approach remains one of the dominant empirical tools in the shadow economy literature. Given the inherent challenges of direct measurement, latent variable models are widely regarded as practical and theoretically coherent alternatives. However, this methodology is not without criticism. Some researchers have emphasized that model estimates are sensitive to the choice of indicators and determinants. Nevertheless, for comparative regional analysis and the evaluation of structural determinants, the MIMIC approach continues to represent one of the most effective empirical frameworks available.

Research gap and contribution

Although the existing literature has established a substantial body of knowledge concerning the determinants of the shadow economy, several important gaps remain. The first relates to regional specificity. While large-scale international studies provide valuable generalizable insights, they may not adequately capture structural heterogeneity within specific regions. This limitation is particularly pronounced in regions such as

Southern Europe, where countries operate within a broadly shared institutional framework while exhibiting considerable economic heterogeneity.

The second gap concerns the absence of a sufficiently developed comparative regional research design. A substantial proportion of existing studies either focus on single-country cases or treat Southern Europe as a minor subgroup within broader European datasets. As a result, the systematic analysis of intra-regional variation remains limited [23].

The third gap relates to determinant selection. Although unemployment and fiscal variables have been extensively examined, the relationship between demographic dynamics and the shadow economy remains comparatively underexplored. In particular, the connection between population growth and economic formalization has yet to receive sufficient empirical clarification.

This study seeks to address these gaps directly. By providing a comparative MIMIC analysis of selected Southern European member states of the European Union, it develops a more regionally focused empirical framework for examining shadow economy dynamics.

At the same time, by evaluating the effects of labor market and demographic determinants on the latent shadow economy construct, the study contributes to both methodological advancement and policy-oriented debate [24].

Data and methodology. Data description and sample selection

This study employs a balanced panel dataset to empirically examine the determinants of the shadow economy in selected Southern European member states of the European Union. The sample comprises Croatia, Cyprus, Greece, Italy, Malta, Portugal, Slovenia, and Spain. The selection of these countries was deliberate and informed by considerations of regional relevance, economic comparability, and data availability. Although all are members of the European Union and therefore operate within broadly shared institutional and regulatory frameworks, they exhibit substantial variation in labor market performance, economic structure, demographic dynamics, and levels of economic formalization. These differences provide an appropriate analytical setting for comparative regional investigation.

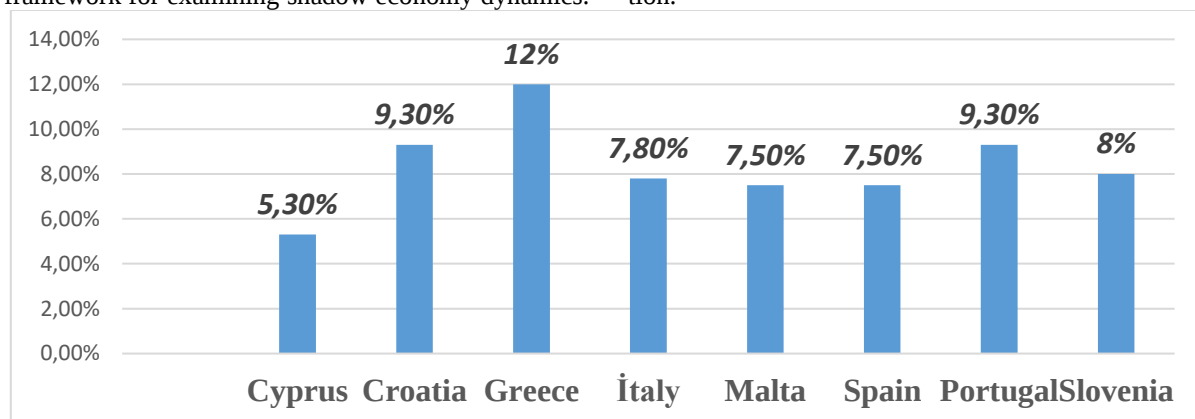


Figure 1. Shadow Economy Size (% of GDP) in in selected Southern European) countries (2023)

Analyses show that in recent years the share of the shadow economy in GDP has been increasing in some European countries. For example, in Greece this figure was 12%, in Croatia and Portugal 9.3%, and in Slovenia 8%. Although serious measures have been taken in this area at the state level, the problems have not yet been eliminated (Figure 1).

Source: <https://www.ey.com/content/dam/ey-unified-site/ey-com/en-gl/insights/tax/documents/ey-gl-shadow-economy-report-02-2025.pdf>

The study covers the period 2013–2023. The selection of this time frame is justified on both methodological and economic grounds. First, it captures the post-adjustment phase following the European sovereign debt crisis that emerged after 2008, thereby enabling the observation of structural economic changes, particularly within Southern European economies. Second, the period encompasses the economic disruptions associated with the COVID-19 pandemic and their effects on labor markets and broader economic activity. Accordingly, the selected temporal framework allows for the examination of shadow economy dynamics under varying macroeconomic conditions, spanning both

the post-crisis recovery phase and a subsequent period of renewed economic uncertainty.

The data were collected from internationally recognized open-access macroeconomic sources. Variable-specific information was obtained primarily from the World Bank and related international statistical databases. Only publicly available and standardized macroeconomic indicators suitable for cross-country comparison were included in the analysis. As the study does not involve human participants, personal data, or experimental data collection procedures, ethical approval was not required.

The balanced panel structure enhances the comparability of empirical findings while ensuring methodological consistency across observations. In total, the dataset comprises 88 observations derived from 8 countries over an 11-year period.

Variable definitions

Given that the shadow economy is inherently a latent economic construct that cannot be directly observed, its empirical estimation must rely on indirect indicators and structural determinants. In this study, consistent with the theoretical logic of the MIMIC framework, both causal variables and an observable indicator variable were specified.

The unemployment rate was included as one of the principal causal determinants. Unemployment represents a key macroeconomic indicator reflecting weakened opportunities in the formal labor market and constraints on legitimate income generation. The existing literature has extensively documented the potential for elevated unemployment to push individuals toward informal economic activity. Particularly in economic systems characterized by limited formal employment opportunities, the informal sector may function as an alternative income-generating mechanism. Accordingly, unemployment is expected to exert a positive effect on the size of the shadow economy.

Population growth was included as the second causal determinant in order to assess the potential relationship between demographic dynamics and economic formalization. Population growth may be associated with labor market expansion, increased consumer demand, and higher aggregate economic activity. At the same time, rapid demographic shifts may, under certain conditions, facilitate the expansion of informal labor markets. Given that the empirical literature has not reached a clear consensus regarding this relationship, the inclusion of this variable was considered analytically justified.

Self-employment was employed as the observable indicator of the latent shadow economy construct. Although self-employment does not inherently imply informal economic activity, it is widely used in the empirical literature as a proxy indicator for the shadow economy, particularly in economies where informal and micro-scale economic activity is more prevalent. Previous studies suggest that elevated levels of self-employment may, in certain contexts, be associated with greater informal economic intensity. For this reason, self-employment was incorporated into the model as the observed indicator variable.

The MIMIC model specification

The inherently unobservable nature of the shadow economy makes its empirical measurement methodologically challenging. Consequently, latent variable models—particularly the Multiple Indicators Multiple Causes (MIMIC) approach—have emerged as one of the most widely applied methodological frameworks in this field. The MIMIC model constitutes a specific form of structural equation modeling that enables the indirect estimation of unobservable constructs through observable variables.

In this study, the shadow economy is modeled as a latent construct using the following structural specification:

Shadow Economy = $f(\text{Unemployment, Population Growth})$

The measurement (indicator) equation is specified as follows:

Self-employment = $f(\text{Shadow Economy})$

Within this framework, the latent shadow economy is conceptualized as an unobservable construct influenced by observable economic determinants while being indirectly measured through the self-employment indicator. The general mathematical specification of the structural model is presented as follows:

$$\eta = \gamma x + \zeta$$

where:

- η denotes the latent shadow economy,
- x represents the vector of causal variables,
- γ denotes the structural coefficients,
- ζ represents the structural disturbance term.

The measurement model is specified as:

$$y = \lambda \eta + \varepsilon$$

where:

- y denotes the observed indicator variable,
- λ represents the factor loading,
- ε denotes the measurement error term.

This framework transforms the inherent challenge of the shadow economy's direct unobservability into a theoretically grounded and empirically tractable analytical model.

Estimation procedure

The empirical analysis was conducted using the R statistical computing environment. Structural equation modeling and MIMIC estimation were implemented using the lavaan package. Prior to model estimation, the structural suitability of the dataset was assessed, and the variables were subjected to preliminary examination through descriptive statistics and correlation analysis.

The model was estimated using the Maximum Likelihood (ML) estimation method. This approach is widely employed in structural equation modeling and is generally regarded as appropriate due to its statistical efficiency in parameter estimation. Model fit was assessed using multiple goodness-of-fit indices, including the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR).

To facilitate comparative analysis of the latent shadow economy index across countries and over time, standardized latent scores were computed. These scores were used for relative comparisons within the regional sample; they do not represent monetary values, but rather indicate the relative intensity of the latent construct. Higher positive values indicate comparatively greater shadow economy intensity, whereas lower or negative values reflect relatively lower levels within the sample.

This procedure enables a systematic interpretation of the findings both in terms of structural determinants and from a comparative cross-country perspective.

Empirical findings. Descriptive statistics

Table 1.

Descriptive statistics of the study variables						
Variable	N	Mean	Std. Dev.	Median	Minimum	Maximum
Unemployment Rate (%)	88	11.11	6.03	9.78	3.47	27.69
Self-employment Rate (%)	88	18.56	6.28	16.30	10.78	37.13
Population Growth (%)	88	0.35	1.14	0.09	-1.61	4.05

Note: Calculated by the author based on World Bank and Eurostat data for selected Southern European EU countries (2013–2023).

Table 1 presents the descriptive statistics, providing an initial overview of the macroeconomic characteristics of the selected Southern European Union countries over the period 2013–2023. The results reveal substantial variation across the sample, reflecting the pronounced structural heterogeneity of the region.

The unemployment rate averaged 11.11%, with a relatively high standard deviation of 6.03, indicating marked differences in labor market conditions across the selected countries. This variation likely reflects the uneven post-crisis recovery trajectories observed across Southern Europe, particularly between economies historically characterized by persistently high unemployment and those exhibiting comparatively more stable labor market performance.

Self-employment averaged 18.56%, suggesting that a significant proportion of economic activity is

concentrated in self-managed or less formally structured employment arrangements. The wide observed range, spanning from 10.78% to 37.13%, further underscores substantial structural differences in labor market composition.

Population growth remained positive on average (0.35%), although some countries experienced demographic contraction while others recorded expansion. This variation reflects differing migration dynamics, demographic aging patterns, and labor mobility trends across the region.

Overall, the descriptive findings confirm considerable heterogeneity among the selected economies, thereby reinforcing the appropriateness of applying comparative latent variable modeling to examine the determinants of the shadow economy.

Correlation analysis

Table 2.

Variable	Correlation matrix of study variables		
	Unemployment	Self-employment	Population Growth
Unemployment	1.000	0.628	-0.443
Self-employment	0.628	1.000	-0.467
Population Growth	-0.443	-0.467	1.000

Note: Author's calculations based on the compiled dataset (2013–2023).

The correlation results presented in Table 2 reveal statistically meaningful associations among the variables. A positive, moderately strong correlation ($r = 0.628$) was observed between unemployment and self-employment, suggesting that as conditions in the formal labor market weaken, individuals may increasingly resort to informal or independent income-generating activities. This finding is broadly consistent with established theoretical perspectives on the shadow economy.

Negative correlations were likewise identified between population growth and both unemployment ($r =$

-0.443) and self-employment ($r = -0.467$), suggesting that more favorable demographic dynamics may be associated with a greater concentration of economic activity within the formal sector. However, given that correlation analysis does not establish causal relationships, a more rigorous examination of these associations should be conducted using the results of the structural model.

MIMIC estimation

Table 3.

Variable	MIMIC model estimation results			
	Standardized Coefficient	Std. Error	z-value	p-value
Unemployment	0.525	0.089	5.891	0.000
Population Growth	-0.234	0.089	-2.629	0.009

The MIMIC model results presented in Table 3 identify unemployment as a significant determinant of the shadow economy in the selected Southern European countries. The standardized coefficient for unemployment is positive and statistically significant ($\beta = 0.525$, $p < 0.001$), suggesting that diminishing opportunities in the formal labor market may compel individuals to turn to informal economic activities as alternative sources of income.

By contrast, population growth exerts a negative and statistically significant effect ($\beta = -0.234$, $p = 0.009$). This finding suggests that more dynamic demo-

graphic conditions may, in certain contexts, be associated with a higher degree of economic formalization. One plausible explanation is that population growth may foster labor market expansion, increased domestic demand, and a greater concentration of economic activity within the formal sector.

The model demonstrates moderate explanatory power ($R^2 = 0.439$), indicating that approximately 43.9% of the variation in the shadow economy is explained by the determinants included in the model. Although the model fit indices appear robust, they should be interpreted with caution given the model's just-identified specification.

Table 4.

Model fit statistics	
Indicator	Value
CFI	1.000
TLI	1.000
RMSEA	0.000
SRMR	0.000
R ² (Shadow Economy)	0.439
Observations	88

Note: Estimated using maximum likelihood MIMIC modeling. Self-employment was used as the observed indicator of the latent shadow economy construct. Author's calculations.

The MIMIC estimation results presented in Table 3 indicate that both unemployment and population growth exert statistically significant effects on the latent shadow economy across the selected Southern European countries.

Unemployment exhibits a positive and statistically significant association with the shadow economy ($\beta = 0.525$, $p < 0.001$), suggesting that deteriorating labor market conditions contribute to the expansion of informal economic activity. This finding is theoretically consistent with the established shadow economy literature, which posits that individuals excluded from formal employment often turn to unregistered or informal sectors as alternative sources of income generation.

By contrast, population growth demonstrates a negative and statistically significant effect ($\beta = -0.234$, $p = 0.009$), implying that more favorable demographic

dynamics are associated with lower levels of shadow economic activity. One plausible interpretation is that population expansion may coincide with stronger labor market absorption, increased domestic demand, and higher degrees of economic formalization.

The explanatory power of the model is moderate, with approximately 43.9% of the variation in the latent shadow economy construct explained by the included determinants ($R^2 = 0.439$). Although conventional model fit indices indicate perfect fit, this result should be interpreted with caution, given that the model is just-identified (degrees of freedom = 0), meaning that fit statistics are mechanically optimized by the model specification rather than independently validating model adequacy.

Overall, the findings suggest that labor market fragility remains a central driver of informal economic activity in Southern Europe, whereas favorable demographic trends may contribute to greater economic formalization.

Country-level shadow economy index results

Table 5.

Country-level shadow economy index estimates (2013–2023)								
Year	Croatia	Cyprus	Greece	Italy	Malta	Portugal	Slovenia	Spain
2013	-0.126	-0.160	2.956	0.997	-0.605	0.330	0.014	-0.172
2014	-0.202	-0.107	2.794	0.974	-0.624	-0.015	0.202	-0.099
2015	-0.185	-0.579	2.633	0.926	-0.633	-0.222	-0.100	-0.185
2016	-0.180	-0.682	2.464	0.810	-0.701	-0.371	-0.151	-0.341
2017	-0.274	-0.856	2.189	0.765	-0.681	-0.414	-0.237	-0.348
2018	-0.335	-1.118	2.043	0.691	-0.713	-0.512	-0.252	-0.442
2019	-0.446	-1.134	2.024	0.595	-0.685	-0.517	-0.443	-0.505
2020	-0.543	-1.203	1.999	0.586	-0.702	-0.518	-0.413	-0.465
2021	-0.576	-1.224	1.966	0.536	-0.712	-0.556	-0.595	-0.466
2022	-0.696	-1.218	1.876	0.456	-0.692	-0.537	-0.648	-0.508
2023	-0.797	-1.239	1.973	0.435	-0.713	-0.585	-0.678	-0.593

Note: Higher positive values indicate relatively greater estimated shadow economy intensity, whereas lower negative values indicate comparatively lower shadow economy levels within the sample. Author's calculations based on MIMIC latent variable estimation.

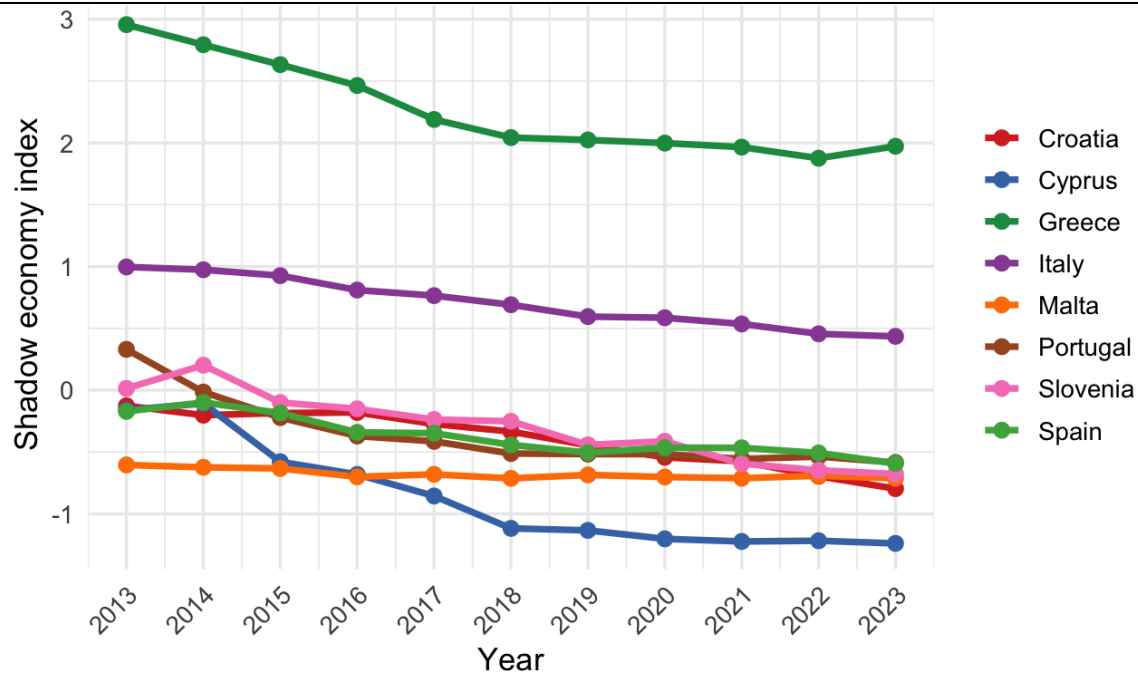


Figure 2. Country-level dynamics of the estimated shadow economy index in selected Southern European EU countries (2013–2023)

Source: Author's calculations based on MIMIC model estimation using compiled macroeconomic data for selected Southern European EU countries (2013–2023).

Note: The shadow economy index represents a standardized latent construct estimated through the MIMIC model, where self-employment serves as the observable indicator of informal economic activity. Higher positive values indicate relatively greater shadow economy intensity, whereas lower (more negative) values indicate comparatively lower levels within the sample [25,6] (Figure 2).

The country-level latent index results clearly demonstrate that the shadow economy does not exhibit a homogeneous pattern across the Southern European region. Greece consistently emerges as the country with the highest shadow economy index throughout the study period. This finding may be attributed to the country's prolonged fiscal challenges, persistently high unemployment, and the weakening of formal economic activity in the post-crisis period [16].

Italy likewise exhibits a relatively high level of shadow economy intensity, as reflected in its positive index values, although these remain lower than those observed for Greece. By contrast, countries such as Cyprus, Malta, Croatia, and Spain display comparatively

lower latent index values, suggesting that the shadow economy is shaped by heterogeneous structural and institutional conditions across the region [17].

From a temporal perspective, the shadow economy index appears to exhibit a declining trend in many countries. This pattern may reflect the strengthening of formal economic institutions, improved labor market stability, and broader economic adjustment processes in recent years. Nevertheless, the observed cross-country variation suggests that a uniform regional policy approach may be insufficient, underscoring the importance of accounting for country-specific economic conditions [18].

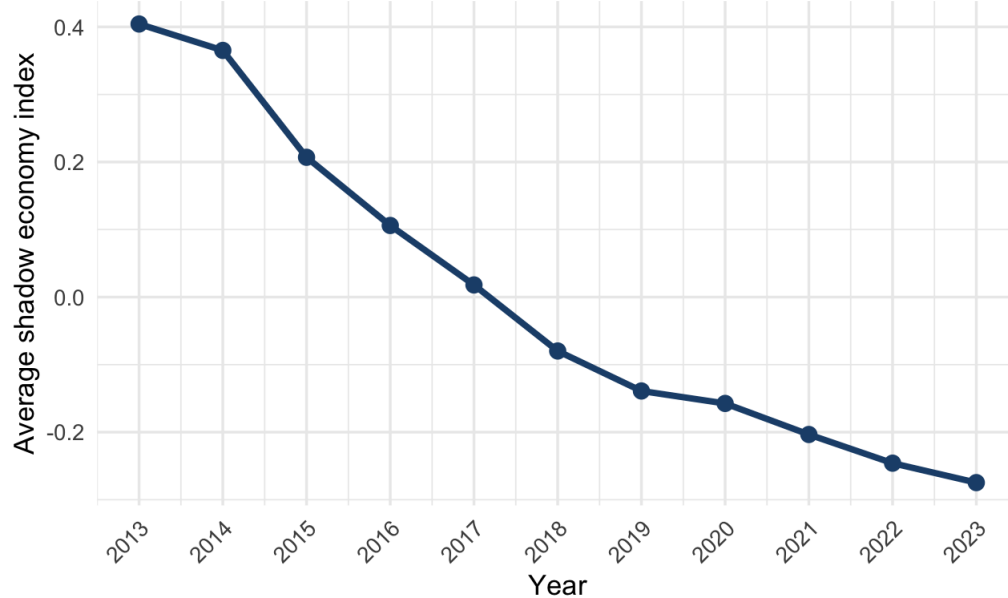


Figure 3. Regional trend of the estimated shadow economy index in selected Southern European EU countries (2013–2023)

Source: Author's calculations based on compiled macroeconomic data (2013–2023).

Note: The figure presents the annual average shadow economy index across the selected Southern European countries derived from the MIMIC latent variable estimation [15,9].

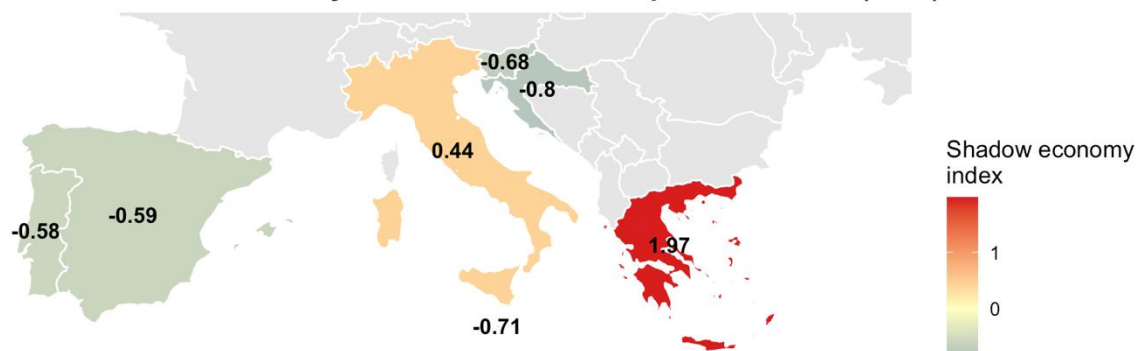


Figure 4. Geographic distribution of the estimated shadow economy index across selected Southern European EU countries in 2023

Source: Author's calculations based on MIMIC model estimation using compiled macroeconomic data (2013–2023).

Note: The figure presents country-level estimates of the latent shadow economy index derived from the MIMIC model for 2023. Higher positive values indicate relatively greater shadow economy intensity, whereas lower negative values indicate comparatively lower levels within the study sample.

Discussion

Interpretation of determinant effects

The empirical findings of this study indicate that unemployment constitutes a significant and positive determinant of the shadow economy across the selected Southern European member states of the European Union. This result is broadly consistent with the existing theoretical and empirical literature, suggesting that informal economic activity may emerge as an adaptive response to labor market constraints. Reduced employment opportunities within the formal sector may compel individuals to seek alternative, less regulated forms of income generation. This dynamic appears particularly pronounced in regions such as Southern Europe, where labor market fragility has persisted as a long-standing structural challenge.

This relationship should be understood not merely as a statistical association, but as a reflection of deeper

structural economic mechanisms. In economies characterized by persistently high unemployment, informal activity often becomes less a matter of voluntary choice and more a necessity-driven form of economic adjustment. High barriers to entry into formal employment, employment instability, and sustained youth unemployment may further intensify this process. In particular, the prolonged unemployment pressures observed in economies such as Greece and Spain during the post-crisis period lend further support to this interpretation [7].

The results also indicate that population growth is negatively and statistically significantly associated with the shadow economy. At first glance, this finding may appear counterintuitive, as more rapid population growth could, in some contexts, generate labor market pressures that encourage informal activity. However, within the context of the selected region, an alternative

interpretation appears more persuasive. More favorable demographic dynamics may be associated with labor market expansion, stronger domestic demand, and a greater capacity for economic activity to be absorbed within the formal sector. In this sense, population growth may function less as a driver of informal expansion and more as a proxy for broader economic dynamism [19].

The region's demographic structure should also be considered when interpreting this relationship. Many Southern European economies face population aging, low fertility rates, and long-term demographic decline. In this context, higher—or less negative—population growth may signal comparatively healthier structural economic conditions. Accordingly, the negative relationship identified here may be interpreted not merely as a direct demographic effect, but also as a broader indicator of economic resilience.

Nevertheless, these findings should be interpreted with caution. Within the MIMIC framework, the estimation of latent constructs is inherently dependent on the selection of indicators and structural determinants. Consequently, while the results reveal meaningful structural tendencies, they should not be interpreted as deterministic causal relationships. Even so, the findings suggest that labor market conditions and demographic structure play a substantial role in shaping the shadow economy within the Southern European context [10].

Cross-country comparative discussion

The cross-country comparison clearly demonstrates that the shadow economy is not a homogeneous phenomenon across the region. Based on the estimated latent index values, Greece appears to exhibit the highest level of shadow economy intensity, distinguishing itself markedly from the other countries in the sample. This finding is consistent with both the region's economic history and the existing literature. Greece has long been associated with persistent tax compliance challenges, elevated unemployment, post-crisis structural pressures, and comparatively weak enforcement mechanisms. In particular, the economic disruptions following the 2008 crisis may have imposed substantial constraints on formal economic activity, thereby reinforcing informal adaptation mechanisms.

Italy also exhibits relatively high shadow economy intensity, as reflected in its positive latent index estimates, although the magnitude remains substantially lower than that observed for Greece. This difference may be explained by the persistence of informal economic activity, particularly within small business sectors and in the context of regional economic dualism, despite Italy's larger and more diversified economic structure. North-south economic disparities, the prevalence of family-owned small enterprises, and administrative complexity are likely contributing factors.

Spain and Portugal display comparatively lower latent index values. These findings introduce greater nuance into the broader regional narrative surrounding the shadow economy, given that both countries also experienced significant post-crisis economic pressures. However, labor market reforms, macroeconomic recovery, and the institutional strengthening of the formal

sector over the past decade may have contributed to the relative containment of informal economic activity.

Croatia and Slovenia are characterized by comparatively lower latent intensity levels. Despite its background as a transition economy, Slovenia appears to benefit from a relatively stronger institutional framework and a more stable labor market. In Croatia, post-European Union accession formalization processes may likewise have contributed to lower levels of informal activity. In both cases, the findings underscore the importance of institutional variation within Southern Europe [11].

Malta and Cyprus exhibit the lowest latent index estimates. This pattern may be linked to the structural characteristics of their economies. In smaller, service-oriented, and administratively more manageable economic systems, formal regulatory mechanisms may be implemented more effectively. Nevertheless, these findings should be interpreted with caution, as latent variable model estimates may be more sensitive in small-economy contexts [12].

Overall, the observed cross-country differences indicate that European Union membership and a shared macro-institutional framework do not produce full homogeneity in shadow economy intensity. National economic structures, historical institutional legacies, and labor market dynamics continue to play a decisive role in shaping informal economic outcomes [13].

Policy implications

These findings carry several important policy implications. First, policy strategies aimed at reducing the shadow economy should not rely exclusively on monitoring and punitive enforcement mechanisms. If unemployment constitutes one of the principal determinants of informal economic activity, then efforts to address the shadow economy cannot be meaningfully separated from labor market policy. Expanding formal employment opportunities—particularly through the creation of sustainable jobs for young people and workers in precarious labor market segments—may represent a more effective long-term strategy.

Second, the simplification of tax and administrative systems appears critical for advancing economic formalization. High compliance costs for small and micro enterprises may incentivize a shift toward informal economic activity. In this context, digital tax administration, streamlined registration procedures, and incentive mechanisms that encourage formal business participation may play a particularly important role.

The demographic findings are likewise noteworthy from a policy perspective. If more favorable demographic dynamics are associated with lower levels of shadow economic activity, then strengthening the long-term sustainability of labor markets and preserving human capital may be regarded as indirect but strategically relevant components of formalization policy.

At the same time, the results suggest that a uniform regional policy approach may not be optimal. While institutional compliance challenges and structural labor market weaknesses may represent more pressing priorities in countries such as Greece and Italy, economies such as Malta and Cyprus may require dif-

ferent regulatory policy emphases. From this perspective, country-specific policy design appears more appropriate and potentially more effective.

Conclusion

This study empirically examined the determinants of the shadow economy in selected Southern European member states of the European Union over the period 2013–2023 using the Multiple Indicators Multiple Causes (MIMIC) framework. Given the inherently latent and directly unobservable nature of the shadow economy, unemployment and population growth were incorporated as causal determinants, while self-employment served as the observable indicator variable. This analytical framework enabled a comparative evaluation of the structural determinants of the shadow economy across the region.

The findings indicate that unemployment is positively and statistically significantly associated with the shadow economy. This result suggests that constraints within the formal labor market may encourage movement into informal economic activity and is broadly consistent with established theoretical and empirical perspectives. By contrast, the negative and statistically significant effect of population growth requires a more nuanced interpretation. Within the selected regional context, this finding may indicate that more dynamic demographic conditions are associated with greater economic formalization and stronger macroeconomic resilience.

The cross-country comparison revealed substantial heterogeneity within the region. Greece, and to a lesser extent Italy, exhibited comparatively higher latent shadow economy intensity, whereas Cyprus, Malta, Slovenia, and several other economies displayed relatively lower levels. These findings suggest that even within a shared European Union institutional framework, national economic structures, labor market characteristics, and historical institutional trajectories continue to play a significant role in shaping shadow economy outcomes.

This study contributes to the academic literature in several important respects. First, by providing a comparative empirical analysis focused specifically on Southern Europe, it helps bridge the gap between broad international studies and single-country approaches. Second, it extends the application of latent variable modeling within regional economic analysis. Third, by evaluating the relationship between labor market and demographic determinants and the shadow economy within a structural empirical framework, it offers policy-relevant evidence for broader economic governance discussions.

Nevertheless, several limitations should be acknowledged. First, the MIMIC framework is inherently sensitive to the selection of indicators and structural determinants, meaning that alternative model specifications may yield different results. Although self-employment is a widely accepted proxy indicator for the shadow economy in the literature, it does not provide a definitive distinction between formal and informal economic activity. In addition, the latent index estimates are intended for relative comparison rather

than direct monetary measurement of the shadow economy. The restriction of the sample to selected Southern European European Union countries also limits the broader generalizability of the findings.

Future research may extend this analytical agenda further. The inclusion of broader variable sets, alternative indicators, institutional quality measures, and fiscal determinants may generate deeper empirical insights. Comparative analyses involving other European regions could further enhance understanding of regional heterogeneity. The application of panel structural equation models or alternative latent variable estimation approaches may likewise offer methodological advantages.

Overall, this study demonstrates that the shadow economy should be understood not merely as a fiscal or administrative issue, but as a complex economic phenomenon closely linked to labor market structures, demographic dynamics, and institutional resilience. Accordingly, efforts aimed at reducing the shadow economy should extend beyond enforcement mechanisms and be integrated with broader structural economic policy interventions.

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