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Navigating Informality: The Impact of the Shadow Economy on Growth in Morocco

Naviguer dans l'informalité : l'impact de l'économie souterraine sur la croissance au Maroc

MOUFID Fahd [a]

BOUSSEDRA Faouzi [b]

[a] ,

[a] PhD student , University of Legal, Economic, and Social Sciences -FSJES- in El Jadida - Chouaib Doukkali University, Research Laboratory in Management, Economics and Social Sciences (LARGESS)

[b] Teacher – researcher, University of Legal, Economic, and Social Sciences -FSJES- in El Jadida- Chouaib Doukkali University, Research Laboratory in Management, Economics and Social Sciences (LARGESS)

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Abstract
This article examines the impact of the informal sector on economic growth in Morocco using two complementary econometric approaches: DSGE and MIMIC. Covering the period from 1996 to 2022, the study explores the relationship between the size of the informal sector and GDP per capita to assess how informality influences Morocco's economic performance.
Empirical findings from both models consistently demonstrate that an expansion of the informal sector has a significant negative effect on economic growth. The DSGE approach indicates that a one-unit increase in the relative size of the informal sector results in a 12.51-unit decline in the logarithm of GDP per capita, while the MIMIC approach suggests an even greater reduction of 15.78 units. These estimates underscore the strong elasticity of economic growth to informality, highlighting its substantial role in constraining economic performance.
The analysis confirms that the informal sector represents a major obstacle to Morocco's economic growth, aligning with existing economic theories that emphasize its adverse effects on productivity, access to finance, and tax revenue collection. These findings underscore the urgent need for institutional and fiscal reforms to facilitate the transition from informality to formality, positioning this shift as a crucial driver of sustainable and inclusive economic growth for Morocco's future.

Keywords: Informal sector; economic growth; DSGE; MIMIC; linear regression

Résumé
Cet article examine l'impact du secteur informel sur la croissance économique au Maroc en mobilisant deux approches économétriques complémentaires : DSGE et MIMIC. Couvrant la période 1996-2022, l'étude explore la relation entre la taille du secteur informel et le PIB par habitant, afin d'évaluer l'influence de l'informalité sur les performances économiques du pays.
Les résultats empiriques issus des deux modèles confirment de manière significative l'effet négatif de l'extension du secteur informel sur la croissance économique. L'approche DSGE révèle qu'une augmentation d'une unité de la taille relative du secteur informel induit une baisse de 12,51 unités du logarithme du PIB par habitant, tandis que l'approche MIMIC met en évidence une diminution encore plus marquée de 15,78 unités. Ces coefficients traduisent une forte élasticité de la croissance par rapport à l'ampleur de l'informalité, soulignant ainsi son impact restrictif sur l'économie marocaine.
L'analyse empirique confirme que le secteur informel constitue un frein majeur à la croissance, en ligne avec les théories économiques soulignant ses effets délétères sur la productivité, l'accès au financement et la mobilisation des recettes fiscales. Ces résultats appellent à des réformes institutionnelles et fiscales visant à favoriser la transition vers la formalisation, levier stratégique pour une croissance durable et inclusive, indispensable à l'essor économique du Maroc.

Mots clés : Secteur informel ; croissance économique ; DSGE ; MIMIC ; régression linéaire

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Introduction

The informal economy, often referred to as the underground, parallel, or hidden economy, constitutes a major component of economic activity, particularly in developing countries. It encompasses activities that evade fiscal, administrative, and legal regulations, although its definition varies across different approaches. Some scholars emphasize non-compliance with legal and tax norms (Ihrig & Moe, 2004); others restrict it to unregistered small enterprises (De Soto, 1989), while certain analyses focus on undeclared employment (Chen, 2007).

The role of the informal economy is ambivalent. On the one hand, it serves as a vital source of employment and an economic safety net for populations excluded from the formal labour market, accounting for up to 60% of total employment in some developing countries (Schneider, 2005). On the other hand, its expansion often signals institutional deficiencies, driven by excessive regulation, high tax burdens, limited access to financing, and inefficient governance (Elgin & Oztunali, 2014; Dreher & Schneider, 2010). In economies characterized by weak institutions and high corruption levels, many firms and workers opt to operate outside the legal framework.

Estimating the size of the informal economy is a critical issue for economic policymakers, as it directly affects growth, investment, and the mobilization of fiscal resources. The work of Schneider (2005) provides a detailed assessment of its magnitude across a panel of 110 countries. According to his estimates, the informal sector accounts for an average of 41% of GDP in developing countries, 38% in transition economies, and 17% in OECD countries. Various methods have been developed to measure its scale, ranging from direct household and business surveys (Henley et al., 2009) to indirect approaches such as money demand analysis (Tanzi, 1983) or econometric models like DSGE[1] and MIMIC[2], which incorporate multiple economic determinants (Schneider et al., 2010).

[1] ***DSGE Models (Dynamic Stochastic General Equilibrium)*: These models rely on microeconomic foundations and describe the economy as a system where agents (households, firms, and the government) make optimal decisions under constraints within a dynamic and uncertain framework. Economists widely use them to analyse the effects of economic shocks and macroeconomic policies while incorporating nominal and real rigidities. They are widely used to analyse the effects of economic shocks and macroeconomic policies by incorporating both nominal and real rigidities.**

[2] ***MIMIC Models (Multiple Indicators Multiple Causes):*** These econometric models are designed to estimate unobservable latent variables, such as the informal economy. They are based on the idea that this variable influences multiple observable indicators (e.g., electricity consumption, informal employment) and is affected by various explanatory factors (e.g., tax pressure, regulation).

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Given the challenges it poses, reducing the size of the informal sector requires well-adapted institutional and fiscal reforms. Formalization strategies must be accompanied by improvements in the business climate, enhanced financial inclusion, and an incentive-driven regulatory framework to foster more inclusive and sustainable economic development (Schneider & Klinglmair, 2004; Schneider, 2022).

1. Literature Review and Hypothesis Development

The impact of the informal sector on the formal economy represents a complex and multidimensional subject of study, extensively explored in the economic literature. Numerous empirical and theoretical studies have sought to understand the mechanisms through which informality interacts with growth, fiscal policy, and macroeconomic performance.

In a study on Pakistan, Mughal and Schneider (2020) employ an autoregressive distributed lag (ARDL) bounds testing approach to examine the short- and long-term effects of informality on GDP per capita. Their results reveal a dual impact of the informal sector: in the short term, its expansion leads to economic distortions and inefficiencies, negatively affecting growth. However, in the long term, informality appears to play a compensatory role by providing employment opportunities and absorbing part of the labour force excluded from the formal labour market, thus stimulating growth.

In a broader perspective, Schneider (2005) supports these findings by highlighting a negative relationship between the size of the informal sector and official GDP growth. In developing countries, a 1% increase in the size of the informal economy is associated with a 0.6% decrease in GDP growth. This relationship is even more pronounced in transition and developed economies, where this increase in informality reduces official growth by 0.8% and 1%, respectively. These results underscore the detrimental effects of the underground economy on tax revenue mobilization and productive investment, thereby compromising the sustainability of economic policies.

From a methodological standpoint, Elgin and Erturk (2018) provide an in-depth review of various techniques for estimating the size of the informal sector and the determinants of its expansion. Their work identifies several key factors influencing the extent of informality, including tax pressure, labour market characteristics, trade openness, the level of economic development, and the quality of institutions. They also emphasize that informality generates

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increased macroeconomic volatility, limits the effectiveness of fiscal policies, and exacerbates social and economic inequalities.

On another front, Colombo et al. (2024) focus on the impact of informality on the effectiveness of fiscal policies. Using a local projection method, they show that the larger the informal sector, the smaller the fiscal multiplier, regardless of the level of economic development, the degree of trade and financial openness, or the exchange rate regime. This negative relationship can be explained by the fact that fiscal shocks raise the relative prices of goods and services in the formal sector, thus diverting part of the demand toward the informal economy. This shift in activity undermines the effectiveness of expansionary policies by reducing the transmission of fiscal impulses to the real economy.

In summary, a large informal sector can hinder the effectiveness of fiscal policies, reduce public revenue mobilization, and create unfair competition for businesses operating in the formal sector. These dynamics are likely to negatively affect economic growth by reducing the incentives for capital accumulation, thus limiting long-term development potential. Based on these observations, the following hypothesis is formulated:

• **A reduction in the size of the informal economy leads to an improvement in economic growth in Morocco.**

2. Research Methodology

2.1. Model Presentation

In order to assess the impact of the size of the informal sector on economic growth in Morocco, we estimate two separate multiple linear regression models. Each model examines the effect of the size of the informal sector, measured according to the DSGE and MIMIC approaches, on economic growth.

The general specification of the model is given by the following equation:

$$GDP_t = \alpha + \beta X_t + \varepsilon_t$$

Where:

- GDP_t represents economic growth measured by real GDP per capita;
- X_t refers to the size of the informal sector estimated using one of the two approaches (DSGE and MIMIC);
- ε_t is the error term, assumed to be normally distributed.

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The estimation is carried out using the ordinary least squares (OLS) method, ensuring efficient estimation under the classic assumptions of linearity, absence of autocorrelation, and homoscedasticity.

The model's fit is evaluated using the adjusted R-squared (R^2), which measures the proportion of variance explained by the model. The overall and individual significance of the coefficients are tested using the F-statistic and the t-statistics, respectively. The Akaike Information Criterion (AIC) and the Schwarz Bayesian Information Criterion (BIC) are used to compare different model specifications, and the Durbin-Watson (DW) statistic is employed to detect the presence of autocorrelation in the residuals.

This empirical approach will therefore provide a clearer understanding of the effect of the informal sector on the economic growth dynamics in Morocco.

2.2. Variables analysis

2.2.1. Graphical Analysis

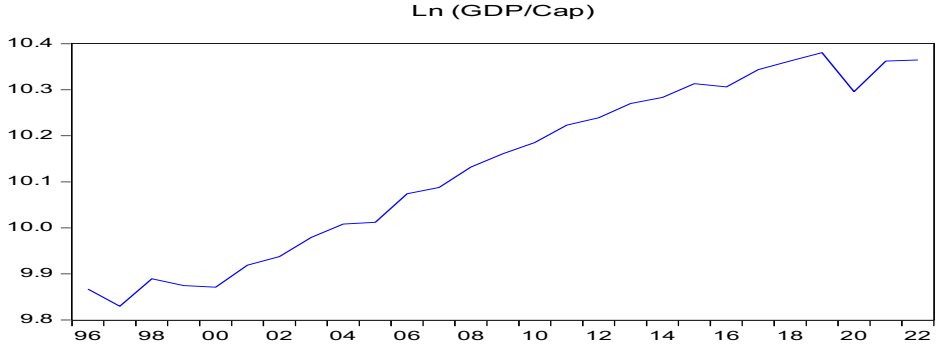
This study examines the impact of informality on Morocco's economic performance by leveraging the DSGE and MIMIC approaches to estimate the share of the informal sector. The analysis covers the period from 1996 to 2022 and relies on the database developed by Elgin et al. (2021), a key reference in economic literature. This source provides consistent and detailed estimates of informality at a global scale, enabling a precise analysis of the relationship between the informal sector and economic growth.

The variables considered in the study are as follows:

- Logarithm of GDP per capita (Ln(GDP/Cap)): An indicator of economic growth.
- Informality rate, estimated using the MIMIC and DSGE approaches.

These variables are graphically represented as follows:

Figure N°1: Evolution of Morocco's GDP



Source : Adapted from (HCP, 2022)

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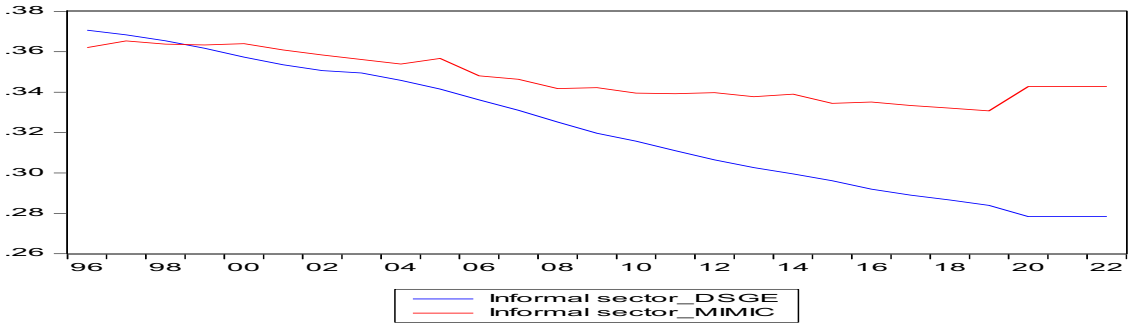
Figure N°2: Evolution of the Informal Sector Size in Morocco



Source : Adapted from Elgin et al. (2021)

Between 1996 and 2022, the evolution of Ln(GDP/Cap) in Morocco follows an upward trend, structured in several phases. The period from 1996 to 2000 is characterized by moderate growth, reflecting the impact of previous structural adjustments. From 2000 to 2008, the economy experiences sustained expansion, driven by increased public investment and a favourable macroeconomic environment. The 2009 financial crisis leads to a temporary slowdown, followed by moderate recovery until 2019. In 2020, the COVID-19 pandemic triggers a sharp contraction, before a recovery begins in 2021–2022, although the momentum appears to weaken towards the end of the period (Boussedra & Moufid, 2022). At the same time, the evolution of the informal sector's size over the same period, estimated using DSGE and MIMIC models, reveals an overall downward trend, though its magnitude varies depending on the approach adopted. The DSGE model suggests a more pronounced decline, with the informality rate dropping from 36% in 1996 to 28% in 2022, while the MIMIC model indicates a more moderate decrease, stabilizing around 34% since the early 2000s.

A period-based analysis highlights an initial rise in informality between 1996 and 2000, likely linked to adjustments under the Structural Adjustment Program (SAP). Between 2000 and 2010, a significant decline is observed, particularly in the DSGE model, reflecting the effects of structural reforms aimed at formalizing the economy, such as improving the business climate and modernizing infrastructure. From 2010 to 2020, the downward trend continues according to the DSGE approach, while the MIMIC model suggests relative stagnation, underscoring persistent difficulties in absorbing informal workers. Finally, the slight increase in informality between 2020 and 2022, as indicated by the MIMIC model, may be attributed to the effects of the health crisis, which prompted a partial shift back to the informal economy.

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The evolution of the informal sector in Morocco reveals a significant reduction in its size, reaching 27.8% according to the DSGE approach and 34% based on the MIMIC approach in the final year of observation. This trend positions Morocco 12th among 48 African countries, behind economies such as Mauritius, South Africa, and Rwanda, but ahead of most nations on the continent where informality remains higher. This ranking reflects the country's continuous progress in economic formalization, although further reforms are necessary to bridge the gap with the best-performing countries.

Table N°1: Ranking of Informal Sector Size in Africa

Pays	**Taux du secteur informel**	**Pays**	**Taux du secteur informel**	**Pays**	**Taux du secteur informel**
Algeria	27,7	Equatorial Guinea	24,8	**Morocco**	**27,8**
Angola	40,4	Eswatini	39,7	Mozambique	25,9
Benin	42,4	Ethiopia	22,7	Namibia	24,7
Botswana	25,7	Gabon	46	Niger	35,7
Burkina Faso	30,9	Gambia	40	Nigeria	54,9
Burundi	36,5	Ghana	35,5	Rwanda	26,6
Cabo Verde	29	Guinea	30,4	Senegal	36,5
Cameroon	28,1	Guinea-Bissau	43,5	Sierra Leone	37,6
Central African Republic	44,8	Kenya	25,9	South Africa	22,7
Chad	36,4	Lesotho	25,1	Sudan	28
Comoros	41,1	Liberia	39,9	Tanzania	40,7
Congo, Dem. Rep.	42,1	Madagascar	35,7	Togo	31,3
Congo, Rep.	38,4	Malawi	39,5	Tunisia	32,7
Cote d'Ivoire	37,7	Mali	31,7	Uganda	32,4
Egypt	29,3	Mauritania	30,5	Zambia	39,6
		Mauritius	19,3	Zimbabwe	60,4

Source : Adapted from Elgin et al. (2021)

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2.2.2. Analyse des caractéristiques statistiques des variables

After examining the evolution of the informal sector in Morocco through the DSGE and MIMIC approaches, a descriptive statistical analysis provides a deeper understanding of its structure and dynamics.

Descriptive statistics outline, for each variable, central tendency measures through the mean and median, dispersion via the standard deviation, and data distribution by examining skewness and kurtosis. Additionally, the Jarque-Bera test is employed to assess the normality of these distributions.

Table N°2: Descriptive Statistics of Variables

	LN_GDP_Cap	LN_FBCF	INFORMAL_SECTOR_DSGE	INFORMAL_SECTOR_MIMIC
Mean	10.13235	12.26199	0.322010	0.347101
Median	10.16096	12.45263	0.319595	0.342745
Maximum	10.38079	12.71334	0.370631	0.365358
Minimum	9.829689	11.47147	0.278353	0.330685
Standard deviation	0.188009	0.408175	0.031255	0.011338
Skewness	-0.205862	-0.591814	0.062384	0.314768
Kurtosis	1.552391	1.842503	1.591177	1.660438
Jarque-Bera	2.548224	3.083371	2.250392	2.464584

Source: Author

The **INFORMAL_SECTOR_DSGE** indicator exhibits a mean of 32.2% and a median of 31.96%, suggesting a symmetric distribution. Its standard deviation of 3.1% indicates moderate variability, influenced by economic reforms and macroeconomic fluctuations. The slightly positive skewness (0.062) points to a mild concentration towards lower values, while kurtosis (1.59); being lower than 3, signals a platykurtic distribution with thinner tails. The Jarque-Bera test (2.25) confirms an approximation to normality, making this indicator a relevant tool for analysing short-term variations in informality.

Conversely, the **INFORMAL_SECTOR_MIMIC** indicator presents a higher mean (34.7%) and a median of 34.27%, also indicating a relatively balanced distribution. Its lower standard deviation (1.1%) reflects greater temporal stability, capturing the structural nature of informality. A skewness of 0.315 reveals a more pronounced asymmetry towards lower values,

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while kurtosis (1.66), although slightly higher than that of the DSGE approach, still indicates relatively thin tails. The Jarque-Bera test (2.46) also validates the normality of the distribution, reinforcing the relevance of this indicator for analysing long-term trends in informality.

These findings highlight distinct dynamics between the two approaches: while the DSGE indicator captures more cyclical fluctuations, the MIMIC indicator reflects greater inertia, mirroring the deep structural determinants of the informal sector.

2.2.3. Analysis of the Correlation Matrix

L'analyse de la matrice de corrélation permet de mettre en lumière les interdépendances entre les dimensions économiques et institutionnelles :

Table N°3 : Correlation Matrix of the Variables

	LN_GDP_Cap	INFORMAL_SECTOR_DSGE	INFORMAL_SECTOR_MIMIC
LN_GDP_Cap	1	-0,987828	-0,951673
INFORMAL_SECTOR_DSGE	-0,987828	1	0,908277
INFORMAL_SECTOR_MIMIC	-0,951673	0,908277	1

Source: Author

The correlations between Ln(GDP/Cap) and the informal sector indicators are consistently negative and strongly significant in absolute value. Specifically, the correlation with **INFORMAL_SECTOR_DSGE** stands at -0.988, while it reaches -0.952 with **INFORMAL_SECTOR_MIMIC**. These results suggest that an expansion in economic activity is generally associated with a contraction in the informal sector. This negative relationship aligns with the conclusions drawn in the economic literature, which emphasizes that the development of the formal sector, driven by an improved business climate and strengthened institutions, contributes to reducing the share of the informal economy (Elgin & Oztunali, 2014).

Furthermore, the two measures of the informal sector derived from the DSGE and MIMIC approaches exhibit a significant positive correlation of 0.908, indicating methodological consistency between these two approaches despite their conceptual differences. This strong association reinforces the robustness of the results regarding the evolution of the informal sector

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in Morocco and validates the complementarity of the estimates derived from the various methods.

3. Results and Discussion

3.1. Impact of the Informal Sector on GDP (DSGE Approach)

The econometric analysis of the relationship between the relative size of the informal sector, estimated using the DSGE approach, and economic growth reveals a statistically significant negative relationship:

Table N°4: EViews Results of the Impact of the Informal Sector Size According to the DSGE Approach

Dependent Variable : LN_GDP_Cap				
Method : Least Squares				
Sample : 1996 2022				
Included observations : 27				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	12.04576	0.060533	198.9943	0.0000
INFORMAL_SECTOR_DSGE	-5.942098	0.187139	-31.75239	0.0000
R-squared	0.975804	Mean dependent variable		10.13235
Adjusted R-squared	0.974836	S.D. dependent variable		0.188009
S.E. of regression	0.029824	Akaike info criterion		-4.115798
Sum squared resid	0.022237	Schwarz criterion		-4.019810
Log likelihood	57.56327	Hannan-Quinn criterion		-4.087255
F-statistic	1008.214	Durbin-Watson statistic		1.373511
Prob. (F-statistic)	0.000000			

Source: Author

The regression model estimated using the Ordinary Least Squares (OLS) method on a sample of 27 observations (1996-2022) is expressed as follows:

$$\mathbf{LN\_GDP\_Cap = 12.04576 - 5.942098*INFORMAL\_SECTOR\_DSGE}$$

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The coefficient associated with *INFORMAL_SECTOR_DSGE*, estimated at -5.942098, is statistically significant at the 1% level. This indicates that a one-unit increase in the relative size of the informal sector leads to a decrease of 5.94 units in the logarithm of GDP per capita. This result supports the findings in the economic literature, which suggests that the size of the informal sector hampers growth by weakening tax revenue mobilization, distorting incentives for productive investment, and generating inefficiencies in resource allocation (Ulyssea, 2020). The model demonstrates a high explanatory power, with an R^2 of 0.9758 and an adjusted R^2 of 0.9748, indicating that 97.5% of the variability in GDP per capita is explained by the size of the informal sector. The overall significance of the model is further confirmed by an F-statistic of 1008.214, attesting to the robustness of the relationship between the two variables.

However, the residual analysis reveals a potential positive autocorrelation, as suggested by the Durbin-Watson statistic (1.3735), which is notably lower than the critical value of 2.

Finally, the Akaike Information Criterion (-4.115798), Schwarz Criterion (-4.019810), and Hannan-Quinn Criterion (HQ) (-4.087255) confirm the quality of the model, suggesting a good balance between fitting accuracy and parametric parsimony.

3.2. Impact of the Informal Sector on GDP (MIMIC Approach)

The regression analysis of the logarithm of GDP per capita in relation to the relative size of the informal sector, measured by the MIMIC approach, reveals a significant negative relationship:

Table N°5: EViews Results of the Impact of the Informal Sector Size According to the MIMIC Approach

Dependent Variable : LN_GDP_Cap				
Method : Least Squares				
Sample : 1996 2022				
Included observations : 27				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	15.60980	0.353706	44.13218	0.0000
INFORMAL_SECTOR_MIMIC	-15.78055	1.018504	-15.49385	0.0000
R-squared	0.905682	Mean dependent variable		10.13235
Adjusted R-squared	0.901909	S.D. dependent variable		0.188009

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S.E. of regression	0.058884	Akaike info criterion	-2.755322
Sum squared resid	0.086682	Schwarz criterion	-2.659334
Log likelihood	39.19684	Hannan-Quinn criterion	-2.726779
F-statistic	240.0594	Durbin-Watson statistic	0.381679
Prob. (F-statistic)	0.000000		

Source: Authors

The model, estimated using the Ordinary Least Squares (OLS) method, is expressed as follows:

LN_GDP_Cap = 15.60980 − 15.78055*INFORMAL_SECTOR_MIMIC

The coefficient associated with the variable *INFORMAL_SECTOR_MIMIC*, estimated at -15.78055, is highly significant at the 1% level, suggesting that a one-unit increase in the relative size of the informal sector, measured using the MIMIC approach, results in a contraction of 15.78 units in the logarithm of GDP per capita. This relationship, more pronounced than the one obtained with the DSGE approach, reflects the considerable impact of informality on economic performance, exacerbating structural distortions and eroding productive bases.

The model demonstrates a strong explanatory power, with an R^2 of 0.9057 and an adjusted R^2 of 0.9019, indicating that over 90% of the variability in GDP per capita is explained by the size of the informal sector. The overall significance is confirmed by an F-statistic of 240.0594, attesting to the robustness of the estimated relationship. However, the Durbin-Watson statistic (0.3817) reveals a positive autocorrelation of the residuals.

Finally, the information criteria confirm the quality of the model while assessing its parsimony. The Akaike criterion (-2.7553), Schwarz criterion (-2.6593), and Hannan-Quinn criterion (-2.7268) suggest a satisfactory compromise between fit and complexity, reinforcing the relevance of the chosen specification.

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Conclusion

The econometric results confirm the hypothesis that the size of the informal sector exerts a significant negative effect on economic growth. The estimation of models using both the DSGE and MIMIC approaches reveals a significant sensitivity of GDP to informality. Specifically, in the DSGE approach, a one-unit increase in the relative size of the informal sector results in a contraction of 12.51 units in the logarithm of GDP. In contrast, the MIMIC approach shows an even more pronounced effect, with a decrease of 15.78 units. These results suggest that the extent of the informal sector is a substantial barrier to economic development, due to the negative externalities it generates.

These conclusions align with the economic literature, which emphasizes that the expansion of the informal sector weakens tax revenue mobilization, restricts access to finance, and reduces productivity in formal enterprises (Djankov et al., 2010; Balasoiu et al., 2023). Furthermore, Schneider (2005) demonstrates that informality limits the effectiveness of public policies and hampers total factor productivity, estimating that a 1% increase in the size of the informal sector reduces GDP growth by 0.6% in developing countries. Similarly, Mughal and Schneider (2020) highlight that while informality may alleviate certain short-term rigidities, it proves detrimental in the long term by compromising infrastructure financing and exacerbating distortions in resource allocation.

The application of these insights to the case of Morocco confirms that the persistence of an extensive informal sector constitutes a major obstacle to investment and growth. Consequently, the gradual formalization of the economy, supported by improvements in the institutional climate and rationalization of the tax system, appears as a strategic lever to stimulate productive investment and reinforce the growth trajectory. However, an effective transition toward a more formal economy requires tailored institutional reforms aimed at improving governance and fostering the gradual integration of informal units into the formal economy, without undermining entrepreneurial initiative.

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