

The shadow economy and unemployment in Tunisia: Main recommendations

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Abstract :

The objective of this article is to demonstrate the relationship between the unemployment rate in Tunisia and the development of the informal sector, to subsequently propose recommendations capable of reducing this massive development of the parallel sector. Our study based on the MIMIC model, shows that high unemployment is the main cause of the development of the black economy in Tunisia, moreover the estimate of the size of the black economy shows that this sector is in full expansion to reach 43.59% of GDP in 2017. In addition, the Toda Yama Moto causality test indicates the existence of a one-way causality going from the unemployment rate to the informal economy. From the above, reducing the unemployment rate is the main recommendation addressed to policy makers to fight against the development of the parallel sector in Tunisia. Indeed, the tools of repression are insufficient, or even the opposite effect. Public policies must be modified towards a main objective of reducing the unemployment rate and promoting a transition from the informal sector to the legal sector.

Keywords: shadow economy, MIMIC, Toda Yama Moto causality test, main recommendations.

Introduction

There is a great deal of research on the informal economy, largely on the causes of this phenomenon as well as on the economic, social and budgetary effects or consequences, as well as the literature on the methods of measuring or estimating the informal sector sizes are abundant. Conversely to this vast literature, both theoretical and empirical throughout the world, research on solutions to remedy this expansion is proving to be very limited.

the spectacular development of the parallel economy in post-revolution Tunisia requires emergency measures to try to keep what remains of the economic fabric of the formal sector. Indeed the media as well as the political decision-makers in Tunisia, announce each time that the informal sector reaches 50% of the official GDP. Although these statistics are not precise and in most cases are not based on scientific studies, all economic indicators reflect a massive spread of the black economy: a negative growth rate, a budget deficit of 1.423 billion of dinars at the end of the first five months of 2021, a total debt which reaches 85% of the GDP and an inflation of 5.5% during the same period.

Along with these serious indicators, the measures taken by successive governments after the revolution remain limited and insufficient and the laws are weakly applied and easy to circumvent, for example the limitation of transactions paid in cash to 5,000 dinars turns out to be ineffective.

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This article represents an estimate of the size of the parallel economy in Tunisia using the MIMIC method in a first part, a study of its causal relationship with the unemployment rate in a second part, the rest of this paper will be devoted to propose solutions necessary to reduce the development of the parallel sector.

1.The relationship between the informal economy and unemployment in Tunisia

1.1 Results of the MIMIC model

The coefficients estimated by maximum likelihood are presented in the table below (**Table 2**), these coefficients are directly compared to assess the relative weight of the variables in the explanation of the evolution of the parallel economy in Tunisia. Starting from the MIMIC 6-1-2 model, the variables whose coefficients are not statistically significant are eliminated.

Table 1: Estimated coefficients of the MIMIC model

Variables Modèles	X1	X2	X3	X4	FAC 1	X5	Y2
	Taxes	unemployment rate	self-employment	consumption expenditure	C1 quality of institutions	Inflation	rate of participation in the active population
MIMIC 6-1-2	0.39	0.49	0.05	0.13	0.55	0.11	0.36
MIMIC 5-1-2	0.48	0.51	-----	0.15	0.56	0.12	0.34
MIMIC 4-1-2	0.43	0.51	-----	0.23	0.39	-----	0.30
MIMIC 3-1-2	0.56	0.50	---	---	0.19	----	0.38
The fit indices	Chi-square (p-value)		RMSEA (p-value)		Degree of freedom		
MIMIC 6-1-2	9.34 0.096		0.162 0.12		5		
MIMIC 5-1-2	8.66 0.070		0.188 0.091		4		
MIMIC 4-1-2	3.58 0.31		0.076 0.35		3		
MIMIC 3-1-2	0.52 0.77		0.000 0.79		2		

Source: author's work

Among the criteria for choosing the model, the RMSEA or the approximation mean squared error. According to this criterion, only the last two models (MIMIC 4-1-2 and MIMIC 3-1-2) are accepted, in fact they have RMSEA < 0.08. By combining this criterion with the goodness-of-fit index (GFI) as well as the corrected goodness-of-fit index (IFGI), the MIMIC 4-1-2 model is retained.

The estimate shows that the main causes of the parallel economy in Tunisia, among those included in the model are (in descending order): the unemployment rate, the tax burden, the quality of institutions (noted C1) and expenditure. household consumption.

This model is written:

Measurement equations:

$$\text{GDP} = -1.00 \cdot \eta_t + \mu_t \quad (1)$$

$$\text{PAR AC POP} = 0.30 \cdot \eta_t + \mu_t \quad (2)$$

Structural equation:

$$\eta_t = 0.43 \cdot \text{TAXES} + 0.51 \cdot \text{UNEMPLOYMENT} + 0.23 \cdot \text{CONS EXP} + 0.39 C_{1t} + \varepsilon_t$$

with C_{1t} : represents the quality of institutions in Tunisia, η_t : latent variable which represents the parallel economy.

1.2 Size of the shadow economy

By estimating the coefficients of the MIMIC model, and assuming that the expected value of the error term $\varepsilon = 0$, we will determine only annual indices of the parallel economy and not values. The estimated indices will be the same transformation of independent variables.

To convert these indexes to absolute values of the annual shadow economy as a percentage of GDP, we need an external estimate of the shadow economy in Tunisia for one year during the study period, and then we can use by implementing a calibration procedure. We will use the parallel economy rate in Tunisia for the year 1999 (the study by Schneider (2007) and Schneider et al (2010)), which is equivalent to 38.4% of GDP. This rate is considered as a reference indicator to calibrate the estimate of the annual indices of the parallel economy in Tunisia for the entire study period.

We will follow the procedure of Dell'Anno (2007) in the analysis, according to this procedure we replace the two indices (indices of the evolution of the GDP compared to 1999, and the index of change in the ratio EP / GDP by compared to 1999) in the measurement equation.

$$\frac{GDP_t - GDP_{t-1}}{GDP_{1999}} = \frac{\eta_t - \eta_{t-1}}{GDP_{1999}} \quad (4)$$

In anticipation of structural equation (1) for the study period, we will have a time series of parallel economy indices (latent variable) according to the following equation:

$$\frac{\eta_t}{GDP_{1999}} = 0.43X_{1t} + 0.51X_{2t} + 0.23X_{4t} + 0.39C_{1t} \quad (5)$$

Once we get the indices for all the years in the study, we fix the base year index to get the shadow economy ratio (as a percentage of official GDP) for that year, thereafter we apply the index for each year to obtain a time series of the shadow economy as a percentage of GDP according to the following benchmark equation:

$$\frac{\tilde{\eta}_t}{GDP_{1999}} \frac{\eta^*_{1999}}{GDP_{1999}} \frac{GDP_{1999}}{\tilde{\eta}_{t1999}} \frac{GDP_{1999}}{GDP_t} = \frac{\tilde{\eta}_t}{GDP_t} \quad (6)$$

with : $\frac{\tilde{\eta}_t}{GDP_{1999}}$: is the parallel economy index calculated by the equation (5).

$\frac{\eta^*_{1999}}{GDP_{1999}}$: = 38.4% is the exogenous estimate of the shadow economy.

$\frac{\tilde{\eta}_{t1999}}{GDP_{1999}}$: is the value of the index estimated by the equation (5).

$\frac{GDP_{1999}}{GDP_t}$: is used to convert the index of changes in the shadow economy from the base year to current GDP.

$\frac{\tilde{\eta}_t}{GDP_t}$: is the estimate of the shadow economy as a percentage of official GDP.

Consequently, and by applying the calibration procedure over the entire study period, we will have annual estimates of the parallel economy in Tunisia for the period studied.

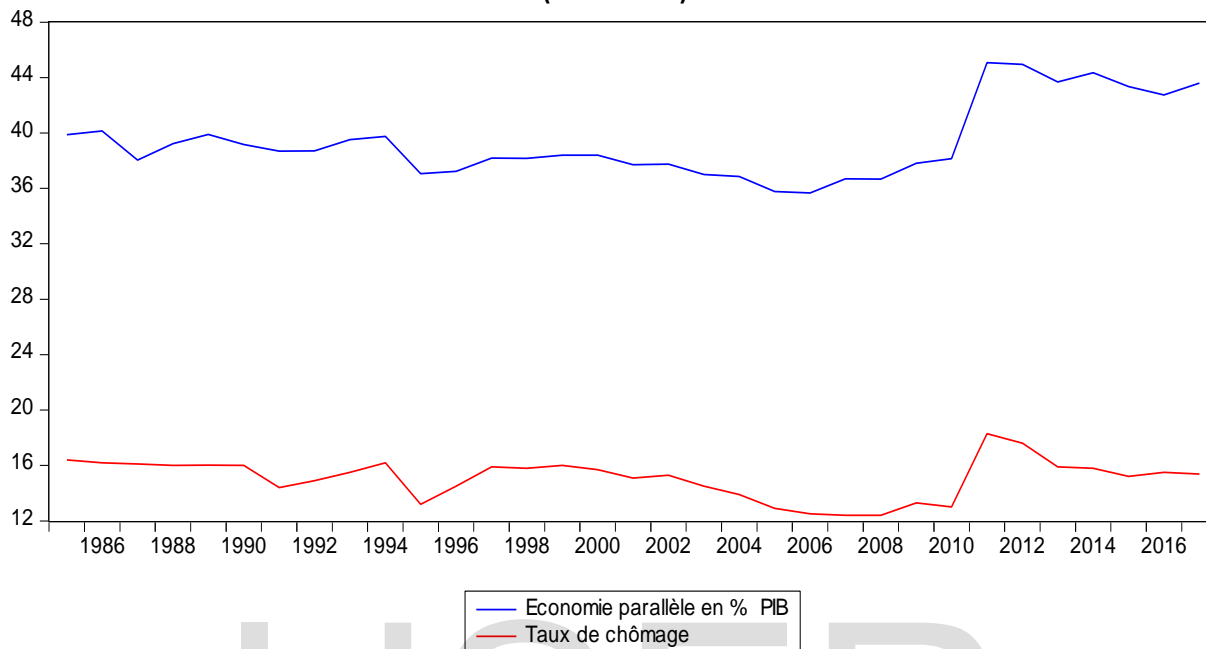
Table 2: Size of the shadow economy in Tunisia

Year	Parallel economy in% of GDP	Unemployment rate
1985	39,865%	16.400 %
1986	40,151%	16.200 %
1987	38,041%	16.100 %
1988	39,233%	16.000 %
1989	39,893%	16.020 %
1990	39,167%	16.000 %
1991	38,691%	14,400 %
1992	38,709%	14,900 %
1993	39,533%	15,500 %
1994	39,739%	16,200 %
1995	37,057%	13,200 %
1996	37,236%	14,500 %
1997	38,183%	15,900 %
1998	38,173%	15,800 %
1999	38,400%	16,000 %
2000	38,388%	15,700 %
2001	37,706%	15,100 %
2002	37,761%	15,300 %
2003	37,012%	14,500 %
2004	36,863%	13,900 %
2005	35,784%	12,900 %
2006	35,683%	12,500 %
2007	36,688%	12,400 %
2008	36,658%	12,400 %
2009	37,810%	13,300 %
2010	38,154%	13,000 %
2011	45,069%	18,300 %
2012	44,947%	17,600 %
2013	43,681%	15,900 %
2014	44,342%	15,800 %
2015	43,336%	15,218 %
2016	42,747%	15,514 %

2017	43,591%	15,379 %
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Source: author's work

Figure 1: Evolution of the size of the shadow economy and the unemployment rate in Tunisia (1985 - 2017)



Source: author's work

According to the results of our study, the average size of the parallel economy in Tunisia for the period 1985-2017 is equal to 39.34% of GDP, this result is very close to the result of the Schneider study in 2010. this study the average size of the parallel economy for the period 1999-2007 is equal to 39.5% of the GDP. Diagram 1, shows that the size of the parallel economy in Tunisia oscillates around the average during the period 1985-2010, with a relative peak of 40.151% in 1986. This peak is due to the political crisis that Tunisia is experiencing around the end of Habib Bourguiba's regime. During this period Tunisia is experiencing a serious economic crisis characterized by a negative growth rate (-1.4%), high inflation, an unemployment rate equal to 16.4% and the highest fiscal pressure during the whole period (22.8%) . The lowest values of the black economy during the whole period of the study are during the years 2005 and 2006, during which the underground economy represents respectively 35.78% and 35.68%. this period is characterized by a relatively low unemployment rate compared to other years 12.5%, likewise the inflation rate was of the order of 2% and also a period characterized by the lowest fiscal pressure with a rate of 18.5%.

Until 2010, the informal economy was seen as a safety valve in the face of the state's inability to boost development and job creation.

Since the revolution and faced with the weakness of the State and its indigence, it has taken spectacular proportions, indeed and with a rate of 45.069% of GDP in 2011 it represents a credible threat to the economic fabric in Tunisia. Its extension constitutes unfair competition for the formal economy, a loss of revenue for the state budget and a threat to the health and safety of populations. This absolute maximum of parallel economy throughout the study period is explained, in addition to the weakness of the state, by difficult economic, political and social conditions. Indeed, in 2011 the majority of economic indicators retrace the

situation. As an example the unemployment rate reached 18.300%, the growth rate fell to -1.9%. Likewise, this scourge was limited to border regions or even reserved for a few barons of the old regime before the revolution, while after 2011 it has largely developed and extended territorially. According to recent studies by the World Bank, the fiscal shortfall for the State, at least 2 billion dinars per year, or 7% of the budget or 2.5% of the GDP. It may be acceptable that the size of the informal economy reached a record in 2011 given the above-explained economic situation, but the problem is that this development of the informal sector continues to grow until today and after 7 years of the revolution to reach 43.591% of GDP in 2017.

1.3 The relationship between the unemployment rate and the shadow economy in Tunisia: The Toda-Yamamoto approach

In this model the unemployment rate has a coefficient of 0.51, indeed the structural equation is written as :

$$\eta_t = 0.43 \cdot \text{TAXES} + 0.51 \cdot \text{UNEMPLOYMENT} + 0.23 \cdot \text{CONS EXP} + 0.39 C_{1t} + \varepsilon_t$$

We study the nature of its relationship with the unemployment rate. To do this, the approach of Toda and Yamamoto is applied. Toda and Yamamoto's causality test (1995) is applied to level VARs when the variables are integrated or cointegrated.

Toda and Yamamoto argue that F-Statistics used to test for classical Granger causation may not be valid when series are integrated or cointegrated. The procedure of Toda and Yamamoto consists of estimating an increased VAR ($K + d \max_{i \in \{1, \dots, p\}} I(1)_i$) where K is the number of optional delays and $d \max_{i \in \{1, \dots, p\}} I(1)_i$ is the order of maximum integration of the variables in the autoregressive vector (VAR) .

This test is carried out in two stages:

- The first step is to determine the number of optional delay K and the maximum order of integration of the variables used, this number is determined by the use of different levels of delay and the choice of the optimal level. This choice is made using standard criteria (LR: sequential modified LR test statistic; FPE: Final Prediction Error; AIC: Akaike information criterion; SC: Schwarz information Criterion ..)

- The second step consists in using the modified Wald procedure to test the causality of the VAR (K) model, the optimal delay number is equal to $(K + d \max_{i \in \{1, \dots, p\}} I(1)_i)$.

In our study we try to test the relationship between the size of the shadow economy (η_t) and the unemployment rate (X_{2t}).

The Toda – Yamamoto causality test is represented as follows:

$$\eta_t = \alpha_0 + \sum_{i=1}^k b_{1i} \eta_{t-i} + \sum_{i=k+1}^{k+d_{\max}} b_{2i} \eta_{t-i} + \sum_{i=1}^k c_{1i} X_{2t-i} + \sum_{i=k+1}^{k+d_{\max}} c_{2i} X_{2t-i} + \varepsilon_{1t}$$

$$X_{2t} = d_0 + \sum_{i=1}^k e_{1i} X_{2t-i} + \sum_{i=k+1}^{k+d_{\max}} e_{2i} X_{2t-i} + \sum_{i=1}^k f_{1i} \eta_{t-i} + \sum_{i=k+1}^{k+d_{\max}} f_{2i} \eta_{t-i} + \varepsilon_{2t}$$

The null hypothesis X_{2t} does not cause η_t is constructed as follows $H_0 : c_{1i} = 0, i=1, \dots, k$.

Similarly the null hypothesis η_t does not cause X_{2t} is constructed as follows $H_0 : f_{1i} = 0, i=1, \dots, k$.

The Wald test is then applied, in the absence of causality, the W statistic asymptotically follows a distribution of χ^2 .

Table 2: Result of the Toda-Yamamoto test

VAR Granger Causality/Block Exogeneity Wald Tests

Date: 02/26/19 Time: 05:55

Sample: 1985 2017

Included observations: 31

Dependent variable: ECONOMIE_PARALLELE_EN____			
Excluded	Chi-sq	df	Prob.
TAUX_DE_CHOMAGE	5.489553	2	0.0643
All	5.489553	2	0.0643
Dependent variable: TAUX_DE_CHOMAGE			
Excluded	Chi-sq	df	Prob.
ECONOMIE_PARALLELE_E N____	0.646454	2	0.7238
All	0.646454	2	0.7238

Source : Autor's work

According to Toda and Yamamoto's causality test presented in Table 2, the null hypothesis : $(H_0) X_{2t}$ does not cause η_t is rejected, while the null hypothesis: η_t does not cause (X_{2t}) is accepted. So concludes the existence of a one-way causal relationship ranging from the unemployment rate (X_{2t}) to the size of the shadow economy in Tunisia (η_t) .

So the high unemployment rate feeds the parallel sector in Tunisia, our study indicates two peaks for both the size of the parallel sector and unemployment during the year 2011, and in general the two variables have the same pace during the entire study period. Indeed, unemployed people will seek a source of income in the informal sector, and therefore this sector is a substitute for the official sector and a means of survival.

2..Main recommendations

The shadow economy is a limited phenomenon in developed countries, but potentially growing continuously to concern economists and policymakers. This phenomenon continues to grow excessively in developing and / or transition countries so that it reaches significant proportions of official GDP.

In Tunisia, our study shows that the parallel economy is of the order of 45% of official GDP, such proportions leave both national and international institutions sounding the alarm. Indeed, and as part of its support policy, the IMF emphasizes the informal sector as the cause of the

difficult economic and financial situation in Tunisia and among these recommendations, the Tunisian authorities should use measures to formalize that sector.

For this reason, we will try in what follows to list the main recommendations that can help political decision-makers in their strategies to fight against the black economy.

2.1 Optimal repression

A first public policy to deal with this phenomenon is to apply heavier penalties to participants in the informal economy. The economic theory of crime (Becker 1968) indicates that the increase in anticipated sentences has the effect of increasing the costs of participation in the economy. informal markets. The increase in anticipated penalties consists either in increasing the penalties applied to convicted persons, or in

Increasing the likelihood of a participant being caught and convicted (more police surveillance, intensive investigations, allocating additional resources to prosecution.) Which forces these stakeholders to better follow the law.

It is generally accepted that allocating additional resources to compliance with the law (Tanzi 2000, p. 174) and / or the application of heavier penalties (Schneider and Enste 2000, p. 83) significantly reduces the economy. parallel. Mixed brigades made up of police officers, customs officers, tax control officers and agents of the national social security fund whose intervention is repetitive and frequent in the affairs of small businesses, on construction sites, in restaurants, in contractual relationships, even between individuals and suppliers, can detect informal activities.

In terms of fiscal control, and as a means of combating the parallel economy, the Tunisian state began with the establishment of legal texts and the creation of a special control unit. Indeed and given that the transactions of the parallel economy are generally in cash, a ceiling for these payments has been established. This ceiling, initially 20,000 TD, was reduced to 5,000 TD. For this reason, all the charges, which are settled in cash, do not give rise to the deduction for VAT and direct taxes. In addition, article 33 of the 2017 Finance Law has put in place the tax police. This body reports to the General Tax Directorate. It will have a judicial character and will work under the direction of the Attorney General of the Republic and of the prosecutors at the courts of appeal, each in their own territorial constituency. Tax police officers will also have the legal status of deputy public prosecutor.

The tax police will be provided with the legal and material means to accomplish their mission. Thus, tax police officers are empowered to investigate criminal tax offenses. They must draw up reports on the offenses under investigation by the public prosecutor and carry out the investigation under the orders of the competent judge. Officers will also be able to collect

information and interview anyone they see fit to interview. These investigations can, in addition to the fight against tax fraud, be a means of discovering undeclared activities.

It should be noted that the effects of these repressive measures remain not only limited, but also incur additional costs for the State which may exceed the advantages sought. It is for this reason that repression must be optimal. Enforcing the law requires additional costs (in terms of personnel, materials etc.) and it would be inefficient to increase the effort beyond the point where the marginal cost exceeds the marginal benefit.

2.2 Modification of public policies

Most governments act with tools of repression to combat the emergence of the black economy. But empirical studies show that this approach is expensive and inefficient. Governments need to change the institutions and regulations that cause this phenomenon.

The causes of the black economy are, according to our study, high unemployment, the burden of deductions (taxes and social contributions), as well as the quality of institutions.

The only solution is therefore to tackle these causes by changing the public policies that are at the root of the problem. Several economists insist on this strategy: "Curing the symptoms obviously did not work, writes Enste (2005, p.123). We must now focus on the causes".

So, to get around this problem, which is harmful to our national development, the main recommendations essentially lie in launching targeted investments with high employment capacity that can promote the transition to the formal sector. These investments must be at the beginning state and installed in the interior regions and where the rate of the informal sector is very high, these investments created an effect of oil by favoring the particular investment. A typical example of this strategy is the highly effective employment program undertaken in South Africa.

Another solution to reducing unemployment is to promote business creation and therefore jobs in the formal economy. Brazil offers an excellent example of rapid formalization, in fact job creation in the formal economy has been three times faster than in the informal economy. This promotion of business creation by young people can be through the provision of financing lines, the reduction of administrative procedures, the reduction of the tax burden and the improvement of training in this area by adapting the education system to changes. enterprises.

Encourage and facilitate the transition of workers and economic units from the informal sector to the official circuit. All people must be encouraged to comply with the rules of formality by granting aid and subsidies and facilitate their access to sources of finance, grant them tax advantages during the years of their integration into the formal sector.

Finally, the creation of free trade zones in free zones turns out to be a necessity.

2.3 The search for an optimal level of the shadow economy

In economics, always seeks an optimal level rather than a maximum or minimum solution, which supposes that one must aim for an optimal level of the parallel economy and not a level of zero. In other words, if the size of the informal economy is less than this level it will be considered beneficial for the national economy since it represents a source of survival which reduces both unemployment and poverty. In this case, the State should not fight against this sector considered as part of the costs necessary to produce these benefits.

Conversely, beyond this threshold, the disadvantages of this sector will be greater than these advantages. So legal repression is mandatory in parallel with economic policy strategies to reduce the size of the black economy.

Conclusion

In this article, The size of the parallel economy measured as a% of official GDP was estimated using the MIMIC model, the results show that it continues to increase especially after the Tunisian revolution of 2011, during which this economy reaches 45.069% of national GDP.

We then studied the nature of the relationship between the unemployment rate and the size of the shadow economy in Tunisia for the period 1985 to 2017, using the approach of Toda and Yamamoto.

Our study showed a positive relationship between the shadow economy and the unemployment rate, so the presence of the shadow economy acts as a buffer as it absorbs part of the unemployed population. Indeed, workers who cannot find an activity in the formal economy will look in the parallel sector and therefore the informal economy has a substitution effect.

Likewise, our empirical results show a one-way causality from the unemployment rate to the size of the shadow economy. This capacity to absorb a large part of the unemployed should in no way hide the major risk of the parallel sector on the Tunisian economy. Indeed, Tunisian policymakers must take into account that it is more important to tackle the causes rather than the consequences in order to eradicate the informal sector. Through our study, unemployment is the main cause of the development of the parallel sector in Tunisia. So, to get around this problem, which is harmful to our national development, the main recommendations essentially lie in launching targeted investments with high employment capacity that can promote the transition to the formal sector. Likewise, we must encourage all people to comply with the rules of formality by granting aid and subsidies and facilitate their access to sources

of financing, grant them tax advantages during the years of their integration into the formal sector and create free zones in border areas.

Another solution that affects the quality of institutions is to improve the nature of the relationship between the public and private sector by simplifying and unifying administrative procedures. For example, the tax administration and the social security administration must establish a unified and simplified system for small taxpayers. Likewise reduce the tax burden by widening the tax base instead of high tax rates

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