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L'économie non observée au Maroc: estimation et analyse à l'aide de l'approche de la demande de monnaie

The Non-Observed Economy in Morocco: Estimation and Analysis Using the Currency Demand Approach

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Abstract

This study estimates the size of the non-observed economy (NOE) in Morocco and analyzes its evolution over the period 1977 - 2019. We estimate a currency demand function following Tanzi's (1980; 1983) Currency Demand Method. We take into consideration the difference in money velocities between the formal and informal sectors using the Ahumada et al.'s (2006) correction. We also adopt the fully modified least squares (FM-OLS) in order to tackle the series' cointegration and to circumvent the serial autocorrelation issues. In terms of epistemological paradigms, we follow the positivism stance with a hypothetico-deductive approach.

In addition to the conventional variables used in the currency demand approach, we emphasize the effects of other variables that are specific to the Moroccan context and that influence the size of its informal economy. Therefore, we introduce a dummy variable that captures the impact of banking regulations, net remittances, consumer price index, the part of government's final public consumption in the Gross Domestic Product (GDP) and the part of public investment in GDP.

The results of our econometric estimations show that remittances have a negative effect on currency demand. The weight of taxation, reforms, rising living costs, the part of wages in the national revenue, the consumer price index and the parts of public consumption and investment in GDP have a positive impact on the quantity of currency circulating in the economy.

Keywords: Non-observed economy, informal sector, tax burden, fiscal evasion, money velocity currency demand method, fully modified least squares.

Introduction: Context and goal of the study

Developing economies are characterized by a large share of informal activities. The size of the informal economy in these countries was estimated at 35.1% of official GDP in 2006, compared to 33.7% and 16.6% respectively in transition and OECD countries (Schneider & al., 2010). In 2000, the informal sector accounted for 37.7% of GDP in North Africa (United Nations (2008)).

In Morocco, the informal sector contributed to up to 40.8% of employment in 2007. This percentage excludes informal jobs created in the agricultural, public and local government[1].

Economic literature has dedicated an important part to the measurement and analysis of the informal economy's size and evolution. Tanzi (1999) explained that knowing the size of the informal economy makes the understanding of its effects on the formal economy possible[2]. In addition, estimating the size of the informal sector allows tax gap deduction. Kelley (1994) emphasized that taking into account the presence of informal activities would certainly reduce the intended effects of public policies.

This study aims to estimate the size of the NOE in Morocco and to analyze its evolution during the period 1977 - 2019. The period covered in this work is characterized by the implementation of several tax reforms, the adoption of a structural adjustment plan targeting macroeconomic imbalances, loans' regulation, administered interest rates' application followed by their liberalization several years later... etc. It is also characterized by its length, allowing us to construct and run consistent econometric models. Therefore, we estimate a currency demand function using Tanzi's (1980; 1983) approach. We allow for the difference of velocities in the formal and informal sectors in our estimations by relying on the Ahumada

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[1] The report on "the national survey on the informal sector" produced by the High Commissioner Office for Planning (Haut Commissariat au Plan, HCP (2007)), which is the institution in charge of the production of official statistics in Morocco, provides data on the economic characteristics of informal production units (IPUs). The most recent exploitable data was gathered through the 2006-2007 survey. HCP uses the national employment survey as a sampling frame in order to identify production units whose accounts are not in accordance with the accounting organization in force in the country to describe their activities. The survey is limited to non-agricultural activities, but takes into account artisanal and commercial activities carried out by farmers as secondary activities. The sample covers 11,000 IPUs and the survey allows the assessment of added value that is generated by unregistered activities. Three surveys have been carried out to this end (1999-2000, 2006-2007 and 2013-2014). These surveys do not target incomes generated from tax evasion and illegal activities (such as corruption, money laundering, drug trafficking…etc.). The results of the last survey (2013-2014) are still not published (For more details, see HCP's website: www.hcp.ma).

[2] See also Giles (2000).

& al.'s (2006) correction. We also adopt the fully modified ordinary least squares method (FM-OLS) in order to take into consideration, the series' cointegration and solve the issue of serial autocorrelation.

The central hypothesis we test in the present study is that the size of the NOE in Morocco, approached through excess currency that is unjustified by GDP transactions, is impacted not only by the conventional variables of the currency demand equation, but also by context specific factors.

At this point, it should be noted that in the literature, the definitions and delimitations of the informal economy's contours are quite different (non-observed, unregistered...). The authors agree that there is no single definition of the informal economy (see examples: Tanzi(2002), Dell'Anno(2007), Dell'Anno et al.(2007) and Schneider et al.(2010)). In this study, we refer to all undeclared income-generating activities, tax evasion and illegal activities as "NOE" or "informal economy/informal sector" (see Figure (1)).

Figure N°1: Decomposition of the non-observed economy
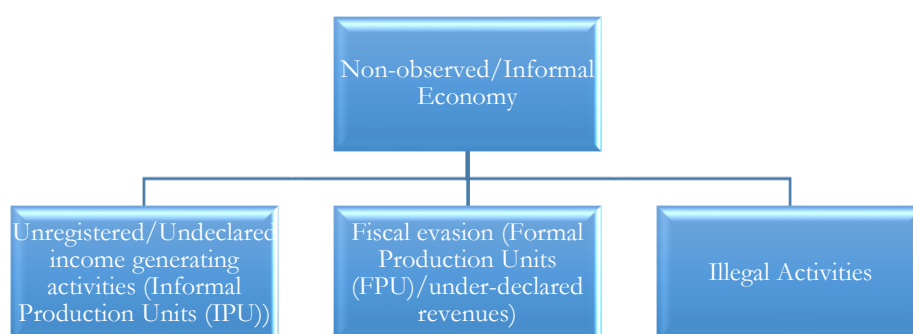
Source: Authors

Many authors sought to measure the size of the informal economy in Morocco by adopting different estimation methods. Schneider (2005) opted for a DYMIMIC model (Dynamic Multiple Indicators Multiple Causes) and evaluated the size of the informal economy for a panel of 110 countries including Morocco. According to the author, the size of the informal sector stood at 36.4% of official GDP in 1999-2000. Schneider et al. (2010) concluded that this percentage was 35.6% on average between 1999 and 2006. Embaye (2007) estimated the size of the informal economy induced by tax evasion for a panel of non-OECD countries. The

share of the Moroccan informal sector averaged then around 12% of GDP during the period from 2000 to 2005[3].

The common feature of these studies is that they consider several countries in their analyses and make their estimations over short periods. This prevents the phenomenon's assessment over time and leads to the production of divergent results, due to their sensitivity to estimation methods and to the choice of analysis periods. In our case, the series used are characterized by their length, which allows us to produce reliable econometric estimates.

The epistemological stance we follow in this study is positivism since we adhere to the view that factual knowledge is gained through independent observation. We adopt, therefore, a hypothetico-deductive approach and use quantifiable observations in order to conduct measurements and statistical analyses.

The rest of the paper is structured as follows. Section 1 focuses on the methodological aspects: We present the currency demand method as well as the variables and their expected theoretical effects. Such effects were highlighted in previous studies that focused on the explanation of the informal economy's size in different empirical contexts. In this paper, we introduce new variables that are specific to the Moroccan context and that are relevant in the explanation of its NOE's size and evolution. Section 2 emphasizes the estimation method, the preliminary statistical treatments on the series and the specifications. Section 3 presents and interprets the econometric results. In the same section, we estimate and comment on the evolution of the NOE's size in Morocco over the entire analysis period. The last section concludes.

1. A currency demand equation for Morocco: methodological aspects

Several methods are used in the literature to evaluate the size of the informal sector in various countries. We distinguish direct methods based on household surveys of monetary or full expenditures (Fortin et al. (2009), Aktuna-Gunes et al. (2014) based on the work of Pissarides and Weber (1989) and Lyssiotou et al. (2004)), indirect methods: the electricity consumption method (Johnson et al. (1997)), labor measurement methods (Contini (1981)), monetary

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[3] The question of the informal economy's size and determinants in many countries and regions interested many researchers. We cite as examples Schneider et al. (2010), Elgin et Oztunali (2012) ou encore Aktuna-Gunes et al. (2014), among others.

methods (Cagan (1958), Gutmann (1977), Feige (1979) and Tanzi (1980; 1983)) and structural models with latent variables (Multiple Indicators Multiple Causes model for example) (Dell'Anno and Solomon (2008), Feld and Schneider (2010), Schneider et al. (2010), Arby et al. (2012), among others.). Each of the previous methods has its advantages and disadvantages that many authors identified, among whom we cite Alderslade et al. (2006) et Georgiou (2007).

In this section, we focus on the currency demand method that we apply to the Moroccan NOE's case. To the best of our knowledge, we believe that this method is the most appropriate to capture the size of the NOE. Indeed, in contrast to the various approaches mentioned above (that do not fully manage to capture all aspects of the informal economy, as is the case of the electricity consumption method, or household surveys, that present the problem of representativeness, etc.), the currency demand method compares the quantity of money in circulation meeting the transaction needs of official GDP to the money supply actually in circulation in the economy. This would make it possible to capture not only unrecorded income-generating activities, but also other aspects of the NOE, namely tax evasion and income generated by illegal activities. Thus, due to its macroeconomic nature and the comprehensiveness of monetary aggregates in terms of capturing the economic sphere's various aspects, the currency demand method allows the integration of classic control variables (those of Tanzi (1980; 1983)), but also others that are specific to the studied countries' contexts. This makes it possible not to over- or underestimate the weight of the informal sector by controlling with variables from the economic sphere.

1.1. The Currency Demand Method

The currency demand method was first developed and applied to the case of the American economy by Cagan (1958). The author wanted to explain the long-term variations in the ratio "quantity of money that would be put into circulation to meet the transaction needs required by official GDP, relative to the money supply actually put into circulation in the economy". The two are supposed to be equal in the absence of informal transactions. Thus, any difference would be attributed to the informal sector. To do this, the author used a simple statistical analysis of historical data. It was only with the work of Gutmann (1977) and especially that of Tanzi (1980; 1983) that the method took on its econometric dimension. Since then, many authors applied the currency demand approach to the informal sector's estimation in many countries. As examples we can cite: Feige (1979), Faal (2003), Anamaria

et al. (2009), Hernandez (2009), Macias and Cazavillan (2009), Magazzino et al. (2011), Pickhardt and Sarda (2011), Arby et al. (2012) among others.

The fundamental assumption behind this approach is that transactions in the informal sector are mainly carried out through cash. Economic agents engaged in informal activities prefer carrying out their transactions in cash in order to reduce the likelihood of being detected by tax authorities. Estimating the amount of money resulting from these transactions would allow us to assess the size of the NOE in Morocco.

Tax burden rate, real GDP per capita, interest rate and the share of wages in national income are the classic variables in Tanzi's currency demand equation (1980; 1983). However, several authors have added variables that are specific to the contexts of the economies they studied.

Examples include: Macias and Cazavillan (2009) whose estimations introduced the share of remittances in GDP, Laflèche (1994) who used the number of ATMs in chartered banks to capture the effect that financial innovations might have on the quantity of money in circulation in the Canadian economy, Embaye (2007) who introduced the inflation rate, and Ardizzi et al. 2011) who took into account the expansion degree of banking activities in the 91 provincial regions in Italy by integrating the number of bank accounts per capita.

In this article, in addition to the conventional currency demand equation variables, we include specific factors that capture the effects of tax reforms, the impact of banking regulations on transactions, the weight of the State in the economy, net transfers and the consumer price index.

The following paragraph presents the characteristics of the variables that we adopt. We also shed light on their expected effects on the quantity of money in circulation in the Moroccan economy, as well as their indirect impact on the size of the NOE.

To the best of our knowledge, we believe that this method is the most appropriate to capture the size of the NOE. Indeed, unlike other methods used in the empirical literature, that do not capture all aspects of the informal economy (i.e. household surveys that present the problem of representativeness…etc.), Tanzi's (1980, 1983) approach compares the quantity of money in circulation meeting the transaction needs of official GDP, to the money supply actually in circulation in the economy. This would make it possible to capture not only unrecorded income-generating activities, but also other aspects of the NOE, namely tax evasion and

income generated by illegal activities. Thus, due to its macroeconomic nature and the comprehensiveness of monetary aggregates in terms of capturing the various aspects of the economic sphere, the currency demand method allows the integration of classic control variables (those of Tanzi (1980, 1983)), as well as those specific to the contexts of the studied countries. This makes it possible not to over- or underestimate the weight of the NOE by controlling with variables related to the economic sphere.

1.2. The Variables

1.2.1. The endogenous variable: M1 deflated by the GDP deflator (M1DEF)

We choose in this study the monetary aggregate M1 (paper currency + scriptural currency) as the endogenous variable that will capture the size of the informal sector. The idea behind this choice is based on the fact that transactions in the NOE are generally carried out in cash or by withdrawal from current bank accounts (scriptural money). We chose this specific aggregate in order to take into account the increased banking of the Moroccan population. Most studies only adopt the quantity of paper money, either deflated or as a share of another monetary aggregate[4]. In the case of our study, such choice would not allow us to consider the progress made in the banking sector in Morocco. Consequently, M1 will permit the inclusion of withdrawals from current accounts[5].

The variable is introduced in our estimations after being deflated by the GDP deflator. The choice of the denominator is justified by criticisms made to Tanzi's approach (1980; 1983): Spiro (1996) explained that M2 contains amounts that reflect the accumulation of long-term wealth. In other words, sight deposits included in M2 contain savings accounts, which are considered long term wealth and are not usually used to settle short-term transactions. Thus, the author infers that it would be inappropriate to use the share of M1 in M2.

M1 steadily increased over the entire period under study (Figure (2)). A slight increase in liquid monetary resources available to economic agents between 1990 and 1999 corresponds to the end of the wave of credit regulation in Morocco, the beginning of deregulation of the

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[4] Such approach was adopted by Tanzi (1980; 1983) or Macias and Cazavillan (2009), for example.

[5] In 1998, 65% of financial assets that were detained by non-financial economic agents were current accounts. This percentage is lower in many other countries with comparable development level (15% in Jordan and 11% Egypt) (HCP, (2005)). It is also worth mentioning that the Moroccan population is progressively accessing banking services, as the rate of use of the banking system was 64% in 2014 (Bank Al-Maghrib (BAM) (2014)) compared to 34% ten years earlier (HCP (2006)).

banking sector and the almost complete liberalization of interest rates. This period also witnessed the introduction of regulations concerning banking transactions beyond certain amounts carried out by companies. The slight decline in M1 in 2000 was offset in 2001 by an 86.4% increase in net foreign assets (OECD (2003)). The aggregate has increased steadily since then.

The M1/GDP ratio (proportion of transactions facilitated by the use of currency in circulation and withdrawals from sight deposits) appears to follow the trend of M1. The ratio declined slightly in the end of 2009 and early 2010, when the effects of the global crisis began to be felt in the Moroccan economy[6].

The behavior of the M1/GDP ratio reflects an increase in the amount of cash and scriptural money in circulation relative to transactions in the economy. This could be explained by three main hypotheses. The first would be related to the increase in public investment effort in several sectors, particularly those of high value-added industries (Industrial Acceleration Plan), which implies significant money creation. The second hypothesis corresponds to the new wave of privatization that has marked the last few years. Indeed, a privatization program has been relaunched during the years 2018 and 2019 and is part of the new strategic plan for the State as a shareholder. And the last, justifies the increase in the quantity of money in circulation by the increase in the size of the NOE, a hypothesis that will be verified by the results of this work.

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[6] In 2009, international trade declined by 11.9% in volume. The world demand addressed to Morocco regressed by 2 digits (-10%). Consequently, Moroccan exports of goods and services regressed by 13.1% in volume.

Figure N°2: Evolution of the monetary aggregate M1 and its share in GDP during the period 1977-2019
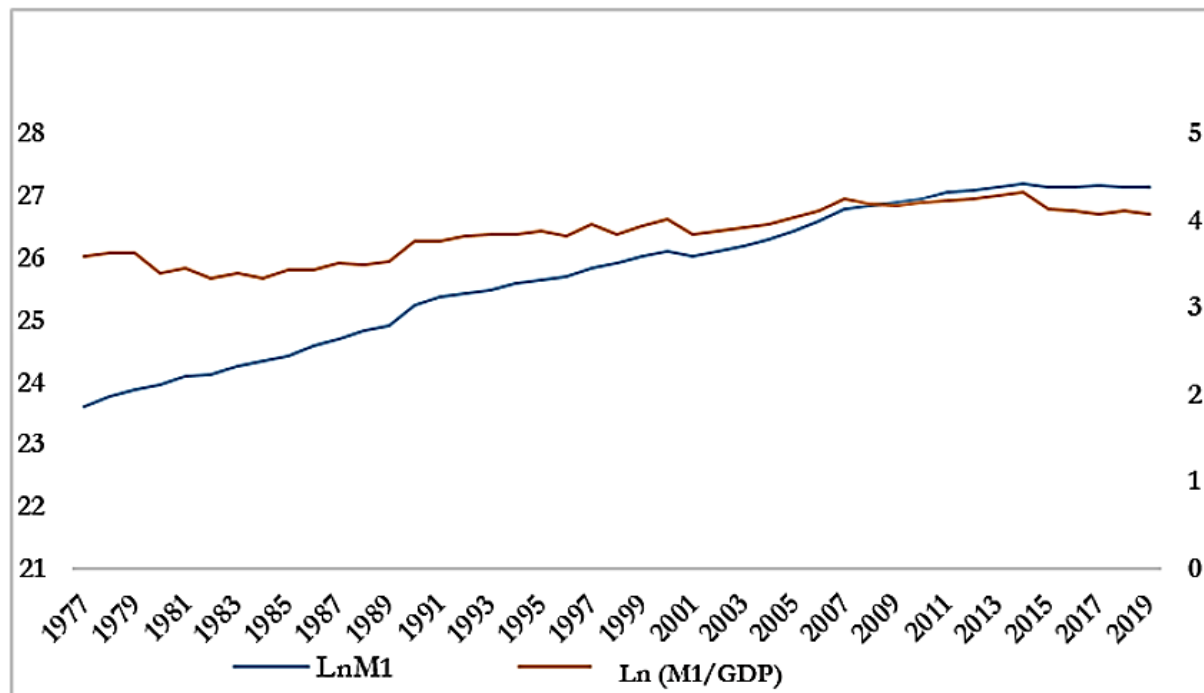
Source: BAM, Calculations and graph: Authors

1.2.2. Currency demand equation's conventional variables

The conventional variables in the currency demand equation, three of which are shown in figure 3, are the tax burden, real GDP per capita, the interest rate, and the share of wages in national income.

> ❖ *The tax burden rate (total taxes and social security contributions as a share of non-agricultural GDP (TAX-BURDEN)* [7]

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[7]We approach tax burden by comparing taxes and social contributions to non-agricultural GDP. We use non-agricultural GDP as a denominator because agricultural added value has fluctuated between 14% and 18% in GDP over the period under analysis. Moreover, it is rather sensitive to climatic fluctuations and, finally, because it has been exonerated from taxation for a long time. The agricultural sector benefited from an exemption scheme from 1984 to 2014 (the date on which its taxation began gradually). We then neutralize its effect when calculating the tax burden rate.

Tax regulations are not necessarily the only cause for economic agents to move towards the informal sector. However, it is likely that a substantial increase in tax burden will lead to an increase in the size of the informal economy[8]. This has been the case in Morocco.

The tax burden rate, an interest variable in the currency demand equation, reflects the increase in the size of the informal economy. Figure 3 shows that, overall, tax burden in Morocco experienced a rather downward trend between 1977 and 1985 before increasing as a result of various measures taken within the framework of the Structural Adjustment Plan with the aim of restoring the country's macroeconomic equilibrium. This phase lasted for about a decade until the second half of the nineties when a first privatizations' wave has started. Later on, two peaks in the tax burden were then observed. The first in 2008 and the second in 2014. This behavior is due to the various reforms that took place during this period, that targeted the rationalization, harmonization, and simplification of the tax system and the reduction of its schedularity as well as the tax base broadening. It should be added that reducing the budget deficit was one of the fiscal policy objectives adopted in 2014 (Ministry of Economy and Finance (2014a)). This objective was in fact achieved following the introduction of new taxes and the increase in the rates of several categories of taxes. The budget deficit has been reduced to less than 4.9% (target set by the 2014 Finance Law).

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[8]The tax reforms undertaken when the Structural Adjustment Plan was adopted in the 1980s and early 1990s consisted in many measures that might have increased tax burden in Morocco. First, it replaced the goods and services tax with the added value tax (VAT) in 1986. Second, it abolished categorical taxes by type of income and replaced them with corporation tax (CIT) in 1988, and general income tax (GIT) in 1990, later renamed "income tax (IR)" (Economic and Social Council (2012)). These reforms led to an increase in the ratio of tax revenues to GDP from 15.6% in 1986 to 22.3% in 1992 (excluding taxation of petroleum products) (Ministry of Economy and Finance (1995)).

AFRICAN SCIENTIFIC JOURNAL
MANAGEMENT AND ECONOMIC DEVELOPMENT

Figure N°3: Evolution of the currency demand equation's conventional variables in the case of the Moroccan Economy (in% and under log)
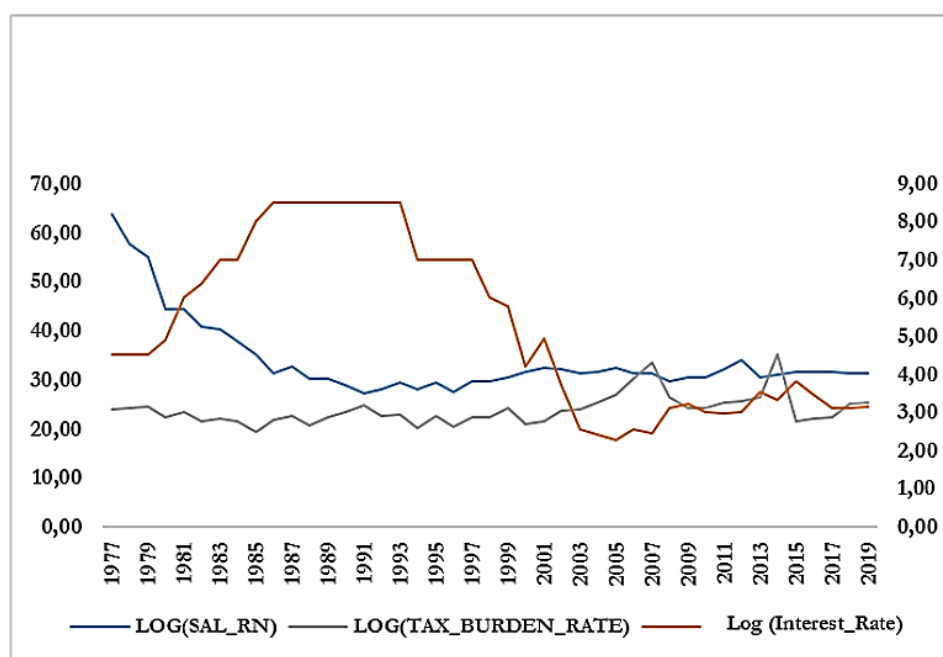
Source: HCP & BAM, Calculations and graph: Authors

Most studies that has focused on the issue of measuring the NOE through various methods highlighted the positive relationship between changes in the size of the informal sector and the importance of the tax burden. Examples include: Bühn and Schneider (2008) in the case of France, Anamaria et al. (2009) in Romania, Macias and Cazavillan (2009) in Mexico, Magazzino et al. (2011) in the Caribbean, Abdih and Medina (2013) in the Caucasus and Central Asia and Haque (2013) in Bangladesh. However, the study by Pickhardt and Sarda (2011) showed that in the case of Germany, the NOE's size depended more on the anticipated profit rates than on the tax rates applied on informal activities.

❖ *Constant GDP per capita (GDP_CAPITA)*

Constant GDP per capita (or real national income (NR) per capita) is another variable of the currency demand equation.

Although GDP per capita increased between 1960 and 2002, reaching USD 1234 in 2002 instead of USD 591 in 1960, this growth is not sufficient compared to the country's potential and that of other countries that were at the same development level as Morocco in 1960. Depending on the results of the agricultural campaigns, Morocco's GDP has experienced

successive performances and counter-performances over this period (HCP (2005)). This dependence continues to this day despite the expansion of the tertiary sector. Its share was 54.9%, compared to 29.6% for the secondary sector and 15.5% for the primary sector (Ministry of Economy and Finance (2015)). The results of the HCP survey on the informal sector carried out in 2007 showed that 57% of IPUs are engaged in trade.

Beyond 2002, GDP growth rates were around 4.5%, while the rate required for countries at the same level of development is 7%. As a result, unemployment, poverty and inequality are on the rise, leading to an increase in the size of the NOE in Morocco.

In empirical literature, the effect of NR per capita (or GDP per capita) varies differently in different contexts. Tanzi (1980; 1983) explains that raising the living standard (measured by the real NR or constant GDP per capita) implies replacing cash money with checks when concluding transactions. As a result, this variable would have a negative effect on the amount of money in circulation. This relationship is highlighted in Ardizzi et al.'s (2011) work.

However, in other contexts, this variable seems to have a positive effect on the quantity of money in circulation. Magazzino et al. (2011) explain that an increase in per capita income would lead to an increase in aggregate demand and would positively influence the liquidity ratio. This result is also shared by Hernandez (2009) and Macias and Cazavillan (2009).

❖ *Share of wages in national revenue (WAGES_NI)*

In empirical literature, the share of wages in national income has a positive effect on the quantity of money in circulation. Tanzi (1980; 1983) explains this relationship by the fact that wages are often paid in cash, unlike other types of income (e.g. interest on investments or dividends). In the case of Morocco, the evolution of aggregate wages in national income has been mainly affected by the trend in wages in the formal private sector. Public officials' salaries have maintained a stable share, ranging between 1.30 percent and 2.90 percent of gross national disposable income over the period 1980-2012, with a fairly significant decline in 1984 (figure 4). The public wages' share decreased because of the payroll regulation that resulted from the structural adjustment plan's provisions, such as wage freeze and limiting the recruitment into the government service (Ministry of the Economy and Finance (1995)).

Figure N°4: Evolution of the shares of private wages, public wages and total wages as a percentage of gross national disposable income over the period 1977-2014
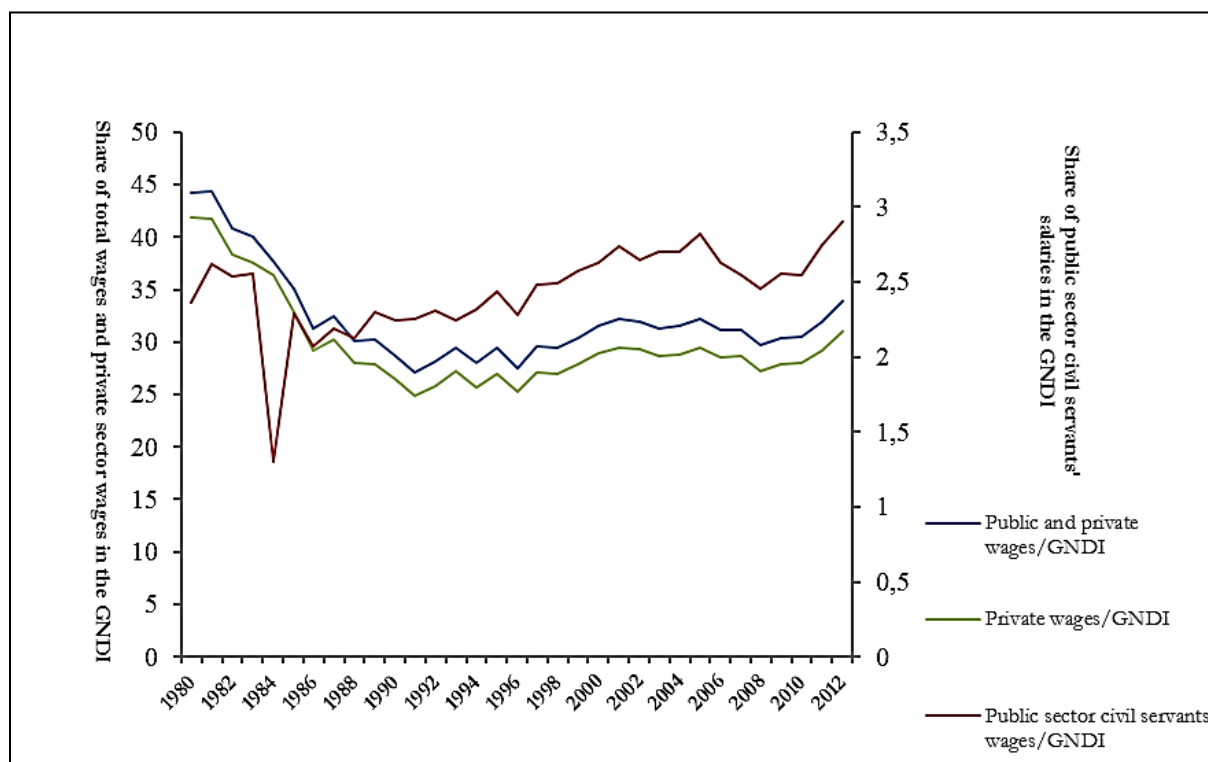
Source: HCP, Calculations and graph: Authors

❖ *Interest rates on long term deposits*

Finally, interest rates on term deposits, one of the classical variables in Tanzi's equations, were introduced to measure the opportunity cost of holding liquid money. In Morocco, interest rates were not liberalized until 1985 in a gradual manner (BAM (2003)).

1.2.3. Specific variables

❖ *Net remittances as a percentage of GDP: (REMITT_GDP-RATIO)*

Foreign currency inflows generated by remittances have always been higher than those coming from foreign direct investment (FDI) throughout the period under review (Figure (5)). Net remittances have maintained a constant share in GDP. Even though they were influenced by economic circumstances in Europe, net remittances varied between 4.5% and 10% of GDP (figure 5). Their decomposition shows that that 71% of those remittances are allocated to household consumption, 20.9% to bank deposits, 7.7% to investment and 0.4% to participation in collective actions (Ministry in Charge of Moroccan Community Living

Abroad's report (2010)). Thus, we believe that the introduction of this factor as an explanatory variable of the quantity of money in circulation in the economy is essential. It should be noted also that the series of remittances we use correspond to observed amounts, while a significant part of remittances actually received by economic agents in Morocco is introduced informally into the country, in order to circumvent regulations or transfer costs on large sums of money. The World Bank (2013) estimated that the average total cost of money transfers by Moroccan residents in France into Morocco was 11.2% in 2012 on the global amount of USD 2.1 billion, and that it would only be 6.8% if the transfers were made from Spain. These results would reflect a gain of USD 92 million that will go directly to Moroccan households or be used for investment. Based on these facts, we believe that remittances would be strongly linked to informality. Macias and Cazavillan (2009) considered the effect of this variable on the currency demand ratio for the Mexican economy. The authors explain that they include this variable since migrants tend to break down their transfers into small amounts or deposit them in several bank accounts to avoid taxation.

Figure N°5: Share of Foreign Direct Investment in GDP (FDI, net inflows) and net remittances as a percentage of GDP, 1977-2014
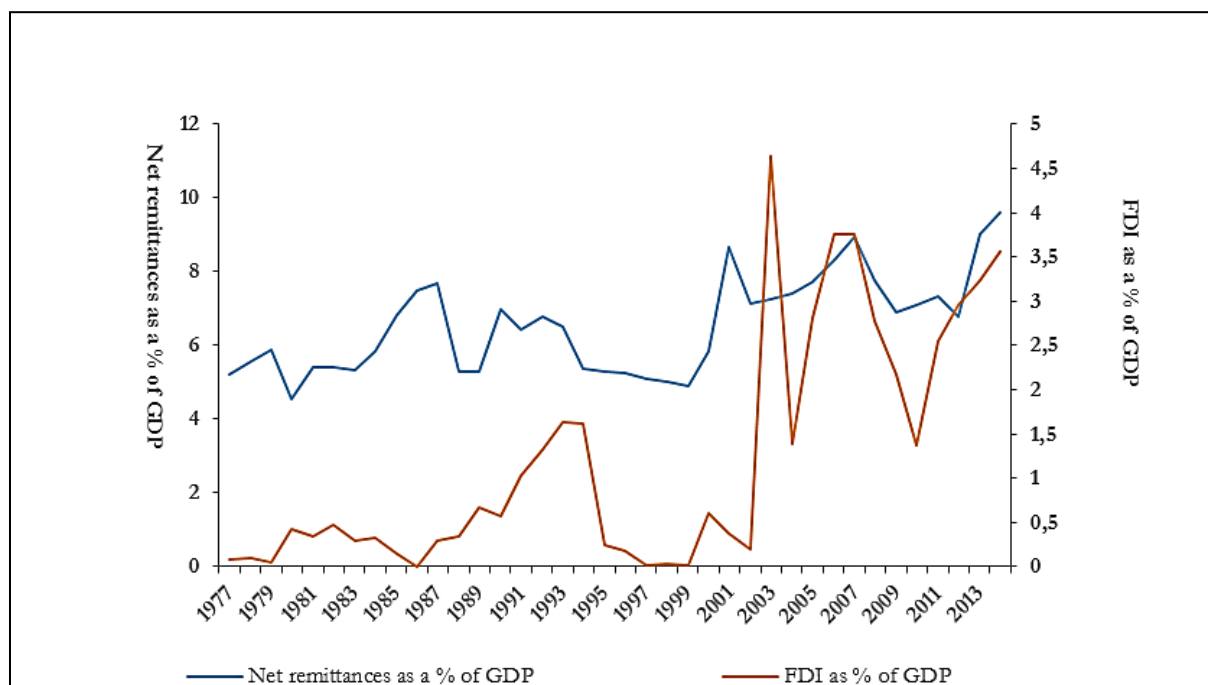
Source: HCP, Calculations and graph: Authors

❖ *The shares of general government final consumption (GGOV_FINALCONSUMP) and public investment expenditures (INVESTEXPEND_RATIO) in GDP*

The shares of government final consumption and public investment in GDP are proxies for the degree of state intervention in the economy. We will test two hypotheses here. The first would be that an intensified State presence in the market would lead to more regulation aimed at reducing the share of the informal sector in the economy. The second hypothesis stipulates that an increase in public investment and government operating expenditures would lead to an increase in aggregate demand in the economy, thus leading to an increase in the quantity of money in circulation.

Figure (6) shows that the share of general government final consumption in GDP fluctuated between 15% and 22% over the entire analysis period. However, public investment showed a downward trend until 1997, before starting to increase again. This decline is mainly due to the restriction of State intervention through the privatizations that took place during the structural adjustment process, in order to give the private sector a more important role in the economy and to attract foreign investors. The subsequent increase is due to the evolution of infrastructure investment (e.g. major highway projects, port facilities…etc.) [9]. In other studies, these factors are mainly introduced as causal variables of the informal economy in the MIMIC model. Authors such as Schneider (2005), Dell'Anno (2003, 2007), Dell'Anno et al. (2007) and Schneider et al. (2010) have emphasized the positive effect of these factors on the size of the informal economy in many individual or panel of countries.

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[9] See the reports produced by the Department of Studies and Financial Forcasts (Ministry of Economy and Finance (1995; 2015).

Figure N°6: Specific variables' evolution in the Moroccan Economy between 1977 and 2019 (ad a % of GDP)
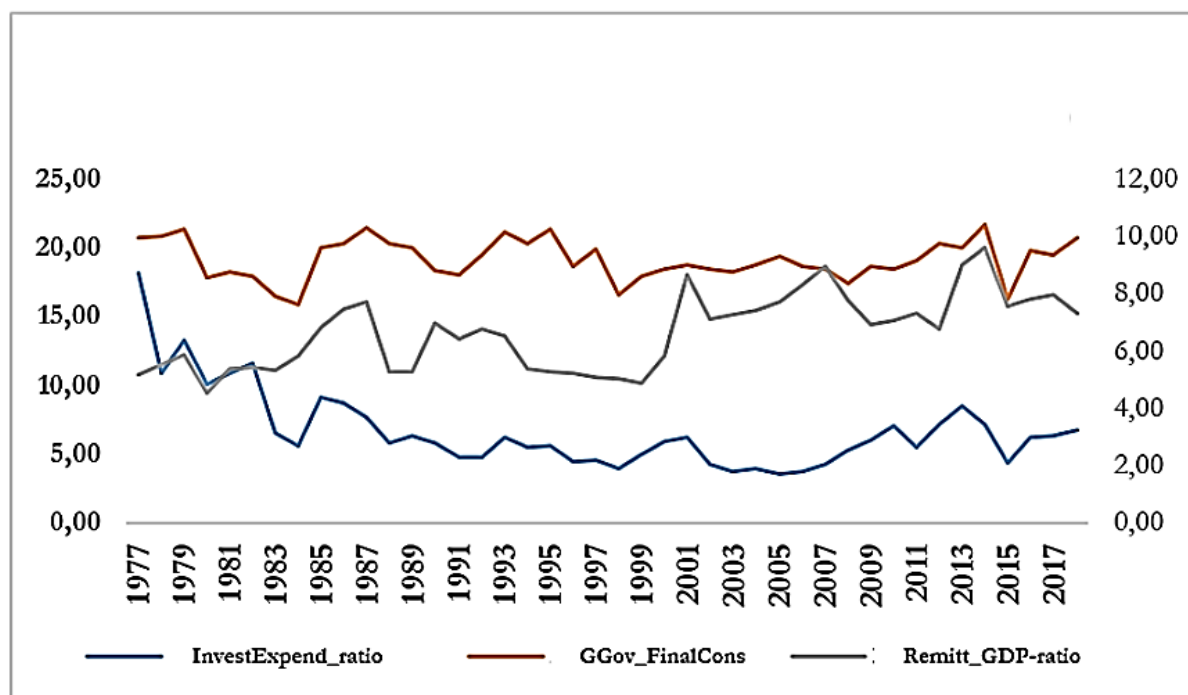
Source: HCP, Calculations and graph: Authors

❖ *The dummy variable: provisions of the 1990, 1996 and 1997 finance laws (DUMMY_FL)*

Developments in the fiscal field have also been combined with changes in regulations on corporate transactions. Among the important regulations that took place, one aimed to gradually encourage companies to pay by check for transactions with amounts greater than or equal to 10,000 MAD (Ministry of Economy and Finance (2013)). These new changes were meant to increase the visibility of companies and the probability of their identification by tax officials. In order to consider these regulations, we introduce a dummy variable (DUMMY_FL) taking into account the effect of the specific provisions of the finance laws of the years 1990, 1996 and 1997.

❖ *Consumer price index (CPI)*

We also use the CPI, following the example of certain studies (Gadea and Serrano-Sanz (2002), Anamaria et al. (2009) ...etc.). We introduce this variable in order to better understand the evolution of consumer prices, which can impact economic agents' decisions (households

in particular) to carry out their transactions in the informal sector if prices increase in the formal sector, in order to maintain the same purchasing power level.

The CPI has varied in a stable manner in Morocco throughout the period under study (BAM (2003)).

It should be noted at this point that the hypotheses tested in this study are based on the results shown by the adopted variables in previous empirical studies mentioned above, as well as these variables behavior all along the period under study in Morocco.

2. Data and estimation method

The series we use come from the statistical yearbooks produced by the HCP as well as the Central Bank of Morocco's published database[10].

We estimate the currency demand equation using a log-linear model estimated by the fully modified least squares method (Fully-Modified OLS, FM-OLS) initiated by Phillips and Hansen (1990).

The choice of this method is justified by the fact that our series are integrated in different orders (I (1) and I (0)). They also have several cointegration relationships at the 5% threshold (appendix 2 and appendix 3) [11]. Therefore, the application of an Error Correction Model (ECM), where the series must be integrated in the same order would be inappropriate (Engle and Granger 1987 and Murray 1994). The introduction of non-stationary series in their differenced form will not allow the assessment of their long-term effects (Bühn and Schneider (2008)).

FM-OLS would therefore allow taking into account the series cointegration as well as the resulting endogeneity bias of the regressors. The method also corrects the residuals' serial correlation. In the presence of unit-roots in the series, FM-OLS provides hyper-consistent

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[10] See appendix (1) for a detailed presentation of data sources.

[11] Conventional Unit-Root tests (Augmented Dickey-Fuller (ADF) and Phillips Perron (PP)) showed that all the series are integrated of order 1, except WAGES_NI, CPI, GGOV_FINALCONSUMP, INVESTEXPEND_RATIO. The latter are level stationary (integrated of order 0) (appendix (2)). The Johansen cointegration test (appendix (3)) confirms the presence of seven cointegration relationships at the 5% threshold (Trace statistic), and four cointegration relationships according to the Eigenvalue statistic at the same threshold.

estimators to the extent that their convergence rate is higher than that of an ordinary least square (OLS) estimators (Phillips (1992; 1995)).

Thus, the specification we retain is as follows:

Ln (M1DEF) = Ln (TAUX_PF) + DUMMY_FL + Ln(GDP_CAPITA) + Ln(WAGES_NI) + Ln(INTEREST_RATE) + Ln(CPI) + Ln(REMITT_GDP-RATIO) + Ln(GGOV_FINALCONSUMP) + Ln(INVESTEXPEND_RATIO) + C

The following section presents and interprets econometric results. The latter are used to estimate the size of the NOE over the entire analysis period.

3. Econometric results and estimation of the NOE in Morocco

3.1. Presentation and interpretation of econometric results

Tableau N°1 : Econometric results

Variables	Coefficients
Ln(Tax_Burden)	6.76 (2.50)*
DUMMY_FL	1.89 (2.99)**
Ln(GDP_CAPITA)	6.04 (2.41)*
Ln(WAGES_NI)	21.04 (3.53)**
Ln(INTEREST_RATE)	4.72 (1.67)[NS]
Ln(CPI)	4.14 (6.48)***
Ln(REMITT_GDP-RATIO)	-3,23 (-1,87)*
Ln(GGOV_FINALCONSUMP)	11,93 (5.29)**
Ln(INVESTEXPEND_RATIO)	7,32 (9.74)***
C	-135.6 (-9.54)***
R²	0.996
Adjusted R²	0.949
Regression S.E.	0.300
Stat. Durbin-Watson	2,88
Mean Dep-Var	26.29
S.D. Dep-Var	1,34
Error Sum Square	0.27
Long Term Variance	0.021
Number of observations	43

* Coefficient is significant at a 10% threshold,

** Coefficient is significant at a 5% threshold,

*** Coefficient is significant at a 1% threshold,

NS Indicates coefficient is insignificant.

Student test statistic is between parentheses.

Source: Authors' calculations using HCP and BAM's data.

The explanatory power of the model is high for this estimation (adjusted R² =0.949). FM-OLS method made it possible to take into account the series' cointegration and corrected the resulting problem of residuals' serial autocorrelation.

As it is the case in almost all the previous studies that focused on estimating the size of the NOE in different contexts, the tax variable, approached by the tax burden rate, has a positive and significant effect on the quantity of money in circulation. The weight of taxation greatly increases the probability of economic agents to carry out their transactions in the informal sector. This result is widely shared in the previously mentioned literature.

Regulations limiting the amount of cash transactions that companies can carry out have a positive effect on the amount of money in circulation. The dummy variable is significant at the 5% threshold. This would reflect companies' preference for informal activities, in order to avoid taxing their profits.

GDP per capita significantly increases the quantity of money in circulation. First, let us recall that GDP growth in Morocco does not allow the stock of unemployed people to be absorbed, nor does it allow coping with the flows of new entrants into the labor market. The increase in poverty and the resulting inequalities will have a positive effect on the size of the NOE. As a result, even if the banking rate is increasing in Morocco, the use of banks as transactions intermediaries is still low. Indeed, many households and businesses are still paid in cash. Thus, an increase in their incomes would lead to an increase in aggregate demand, causing an increase in the amount of currency in circulation in the economy. Although this result is not consistent with Tanzi's (1980; 1983) conclusions for the US economy, it is compatible with the conclusions of studies conducted in developing or emerging countries (Hernandez (2009) and Macias and Cazavillan (2009)).

The share of wages in national income significantly increases the quantity of currency in circulation in the Moroccan economy. It should be recalled that overall formal wages in Morocco are affected by wage evolutions in the formal private sector. Since they are generally paid in cash, they increase the amount of money demanded in the economy. This result is in line with the previously cited studies.

Interest rate on term deposits is not significant. This result, also shared by Gadea and Serrano-Sanz (2002), reflects the fact that interest rates have been administered for a long period in Morocco, making them inadequate to reflect the opportunity cost of holding currency.

The expected significant and positive effect of the CPI is well verified in this estimation. As a synthetic indicator of products prices' evolution, any increase in the CPI would reflect the preference of economic agents to go through the informal sector in order to circumvent any taxation likely to reduce their purchasing power.

Net remittances have a significant effect on the quantity of currency in circulation in the Moroccan economy. The negative sign of the variable seems to contradict the assumptions made above, as well as the results of the research that incorporated it into their currency demand equations (Macias and Cazavillan (2009)).

However, let's recall that in our case, only official remittances are considered. Since these consist largely of bank transfers, it is therefore understandable that an increase in their importance in GDP would have a negative impact on the currency in circulation, since they increase the quantity of money "in banks" (M2 and not M1).

In line with the assumptions made in Section II, the shares of general government investment and final consumption expenditures in GDP have a positive and significant impact on the quantity of currency in circulation in the regression including the overall tax burden variable.

3.2. Estimation of the size of the NOE in Morocco

After estimating the long-run relationship's coefficients between M1DEF and all the explanatory variables, we now proceed to deduce the size of the informal economy's deduction.

M1DEF = 6.76 TAX_BURDEN + 1.89 DUMMY_FL + 6.04 GDP_CAPITA + 21.04 WAGES_NI + 4.72 RATE_INTER + 4.14 CPI -3.23 REMITT_GDP-RATIO + 11.93 GGOV_FINALCONSUMP + 7.32 INVESTEXPEND_RATIO – 135.6   (1)

We follow Tanzi's methodology (1980; 1983) to infer the predicted values of M1DEF, by replacing the values of each series in the equation. These values correspond to the total quantities of cash and paper currencies in circulation in the economy. We call these values $\widetilde{M1}$.

Then, we estimate $\widehat{M1}$ corresponding to the "legal" paper and scriptural money. In other words, it is a question of obtaining the level of M1 corresponding to the state of the economy in which all

economic agents declare their incomes. Tanzi (1980; 1983) calculates this element by using all the coefficients of the selected model, but assuming that the tax burden is equal to its lowest level over the entire analyzed period, to that corresponding to the first year of the selected period or to zero. Therefore the tax burden rate should be introduced in the form (TAX_BURDEN+ 1), so that ln (TAX_BURDEN+1)=0 when TAX_BURDEN=0. Like Tanzi (1980; 1983), we believe that the first approach is the most realistic way to calculate $\widetilde{M1}$. Indeed, it is not possible to conceive an economy where there are absolutely no taxes.

We calculate then the level data by applying the exponential form. We also take into account the impact of prices and cancel out the deflator's effect in order to obtain the estimated values of $\widetilde{M1}$ and $\widehat{M1}$ in nominal terms.

The difference between the nominal values of the two series $\widetilde{M1}$ nom. and $\widehat{M1}$ nom. would in fact represent "illegal currency $\ddot{M}$" resulting from unregistered income-generating activities, tax evasion and illegal activities.

$$\ddot{M} = \widetilde{M1} \, nom. - \widehat{M1} nom \qquad (2)$$

We calculate next the money velocity (υ) for each period by dividing official GDP (GDP form.) by legal currency.

$$\upsilon = \frac{Form.GDP}{\widehat{M1}} \qquad (3)$$

By multiplying the velocity by the illegal currency, we obtain informal GDP (GDP inform.) corresponding to the informal economy.

$$Inform. \, GDP = \upsilon * \ddot{M} \qquad (4)$$

Tanzi (1980; 1983) assumes at this level that money circulates at the same speed in both the formal and informal sectors. However, Ahumada et al. (2006) has shown that this hypothesis is only valid if the elasticity of the quantity of money demanded in the economy relative to GDP equals 1. Since this condition is not met in our case (the GDP coefficient is 6.04), we adopt the correction proposed by Ahumada et al. (2006) to take into account the velocities'inequality in the two sectors.

This correction consists in raising the size of the informal sector obtained by the Tanzi method to

the power 1/β. β represents the elasticity of money demand in relation to GDP.

Figure (7) shows the evolution of the "informal GDP-to- official GDP" ratio calculated based on Tanzi's approach (1980; 1983) and with the application of the Ahumada et al.'s (2006) correction.

Figure N°7: Evolution of the NOE / official GDP ratio over the period 1977-2019 (comparison of Tanzi (1980-1983) & Ahumada et al. (2006) approaches)
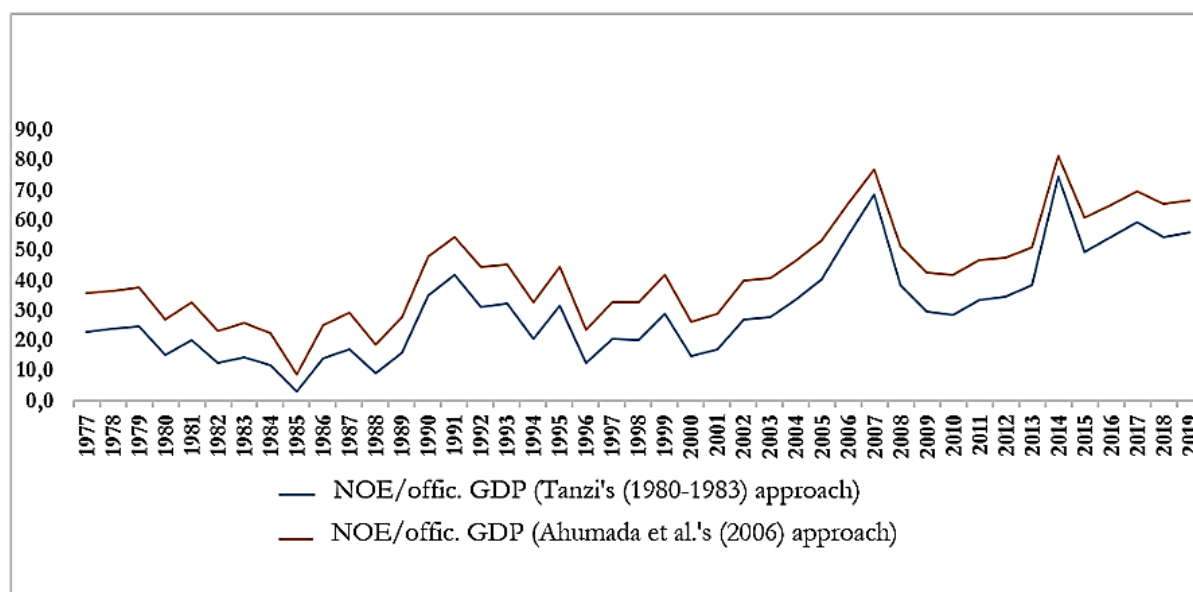
Source: Authors' calculations

We note that despite the variability of the ratio of "informal GDP to official GDP" over the studied period, the latter follows an upward trend. During the last four years of the seventies, informal GDP to official GDP ratio was around 24%. All along the eighties, the ratio dropped to an average of 14%, then picked up to 27.5% during the nineties. During the period 2000-2009, informal GDP to official GDP ratio jumped to 35%. From 2010 to 2019, informal GDP to official GDP surpassed 48% in average. These averages were calculated based on Tanzi's approach. For the same periods under analysis, the ratio averages according to Ahumada's correction were respectively 36.5% (1977-1979), 24% (1980-1989), 40% (1990-1999), 47% (2000-2009) and 59.5% (2010-2019).

In addition to the effect of other variables that may influence currency demand in the Moroccan economy, we believe that the evolution of informal GDP essentially follows that of the tax burden. It is worth noting that well before the adoption of the structural adjustment

plan, Morocco set up a tax system in 1980 with the objective of involving citizens in national solidarity and targeting income in certain categories of taxes[12]. These direct taxes on taxpayers' income operating in the formal sector seem to be among the reasons motivating their decision to operate in the informal sphere. It should be noted, however, that tax burden was at its lowest level during the eighties.

The share of informal GDP in official GDP increased between 1988 and 1991 as a result of tax and banking reforms undertaken as part of the structural adjustment plan previously mentioned in this paper.

The decline in informal GDP between 1996 and 2002 is due to several reasons. The first concerns the total exemption of exporting companies for the part of their income generated by exports during the first five years, and a 50% reduction in the corporate tax rate beyond this period, in order to encourage exports[13]. Then, there was the partial or total suppression of national solidarity participation tax on real estate income or profits generated by corporate or real estate. Finally, regarding patent, an exemption from tax principal was introduced during the first five years for any natural person exercising an activity. All these measures and others[14] had to encourage the formalization of several production units.

Since 2002, the size of the informal economy has grown larger. The exceptional increase in tax revenues in 2008 is due to the good performance of direct and indirect taxes. The widening of the tax base by the suppression of certain allowances, accompanied by a reduction in the corporate tax rate to 30% (37% for financial companies), as well as the elimination of certain VAT exemptions, especially for investment transactions… These decisions led to increases in tax revenues, and consequently in tax burden.

Even with the increase in indirect tax revenues, the tax burden rate fell again between 2009 and 2012, following the decline in direct tax revenues (43% of total tax revenues in 2011

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[12] Prélèvement sur les traitements et les salaires (levy on salaries and wages), impôt sur les bénéfices professionnels (tax on professional profits), taxe urbaine sur les revenus locatifs (urban tax on rental income) and impôt agricole (agricultural tax).

[13] The reduction of the income and corporate tax rates also concerns companies that sell their products to companies that export them after they have been developed. The latter would consequently have gained in added value, which makes them more valuable (Ministry of Economy and Finance (2010)).

[14] Indeed, other tax measures were applied during this period, including the reduction of VAT rates for several categories of taxpayers, the reduction and/or exemption of certain import duties, the renewal of the exemption of the agricultural sector's exemption from corporate and income taxes... etc. (Ministry of Economy and Finance (2010)).

instead of 46% in 2006). This resulted in a decline in the share of informal GDP in official GDP between 2008 and 2012.

In 2013, informal GDP resumed its upward trend and took off to reach an unprecedented level in 2014 (71.20% and 78.73% respectively according to the methods of Tanzi (1980; 1983) and Ahumada et al. (2006)). The year 2014 was characterized by the introduction of new taxes and the increase in the rates of several others. We cite the following as examples: "The increase of the minimum amount to be collected as a minimum contribution under the Corporate Tax and the institution of this minimum for taxpayers subject to the Corporate Tax. The capping of the 55% flat-rate allowance applied to pensions and life annuities, the maintenance of the tax exemption granted to the agricultural sector only for the benefit of the medium and small businesses, the removal of the exemption on income from the rental of new buildings, cancellation of the exemption and application of the 10% rate on catering services provided directly by the company to its employees...etc." [15]. All these decisions to increase existing taxes, or to introduce new tax measures to increase government revenues and reduce the budget deficit, have had a positive impact on increasing the share of informal GDP in official GDP.

A resumption of the upward trend in NOE is observed after 2015 and continues until the end of the analysis period, reflecting an increase in the amount of money in circulation in the economy. This result confirms our hypotheses set out in the methodology section: the increase in public investment effort in several sectors, notably those of added value industry (Industrial Acceleration Plan) and the new wave of privatization that has marked the last few years justifies the increase in the quantity of money in circulation, and therefore the part intended to finance activities in the informal sphere.

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[15] For further details on these measures and others, see Ministry of Economy and Finance (2014b).

Conclusion

As explained by several authors (Kelley (1994), Tanzi (1980; 1999), Dell'Anno et al. (2007)), the existence of a large informal sector in the economy has various effects on the observed macroeconomic variables. In several economies, the failure to take the informal economy into account when calculating unemployment rate, for example, results in its underestimation (several individuals declare themselves unemployed while actually engaged in informal activities and generating income). Inflation rates may also be overestimated, since prices of goods and services are lower in the informal sector (Tanzi (1980)). These variables are considered signals that help policy makers design public policies. If such variables were wrongly calculated because of the ignorance of the informal economy's presence, the designed public policies would be less effective.

Although national surveys on the informal sector allowed the determination of undeclared legal activities' share in the Moroccan added value, they were not able to estimate, from a macroeconomic point of view, the other components of the NOE (income from informal agricultural activities illegal activities as well as FPU's tax evasion).

The goal of this study was to estimate the size of the NOE in Morocco and to shed light on its evolution over a long period of time, allowing us to find consistent results.

The results highlight the effect of taxation on the informal sector's size. The effect of the other variables was clear. Banking regulations discourage companies from conducting their transactions by check, thus avoiding taxation on their profits.

Overall formal wages in the economy are affected by wage evolutions in the formal private sector. Since they are generally paid in cash, they increase the demand for money in the economy.

Government final consumption and public investment as a percentage of GDP reflect the effect of government intervention, as well as the impact that their increase would have on aggregate demand in the economy. The sign of the consumer price index reflected the preference for liquidity in order to maintain high purchasing power. Finally, the signs of the interest rate on term deposits, constant GDP per capita and the share of net remittances in GDP seem counter-intuitive, but are well justified in the context of the Moroccan economy.

From a methodological point of view, this study includes, in addition to the conventional variables of Tanzi's equation (1980; 1983), other variables specific to the Moroccan economy's context. The adoption of the FM-OLS method allowed taking into account the effects of series cointegration and residuals' serial autocorrelation's correction. Thus, we obtained consistent coefficients that consider the long-term relationship between the series. Finally, this work allows the inequality of money velocities' consideration in both the formal and informal sectors by applying the Ahumada et al.'s (2006) correction.

Appendices

Appendix N°1 : Data Sources

Variable/Series	Description et calculation details	Source
M1DEF	Monetary aggregate M1 deflated by GDP deflator (1977-2019).	BAM
TAUX_PF	Tax burden rate calculated based on the sum direct taxes, indirect taxes, registry and stamp duties as well as employer and employee social security contributions, all as part of non-agricultural GDP (1977-2019).	HCP
RATIO_IDTA	Share of direct taxes in non-agricultural GDP (1977-2019).	HCP
RATIO_IMPOTSINDIR	Share of indirect taxes in non-agricultural GDP (1977-2019).	HCP
DUMMY_FL	Dummy variable taking into account the effect of the specific provisions of the finance laws of the years 1990, 1996 and 1997. The values taken by the series are 1 between 1977 and 1989, 3 between 1990 and 1995 and 2 between 1996 and 2019.	Ministry of Economy and Finance
GDP_CAPITA	Nominal GDP deflated by the GDP deflator (1977-2019).	HCP
WAGES_NI	Share of wages in the GNDI (1977-2019).	HCP
INTEREST_RATE	Interest rate on long term deposits (1977-2019).	BAM
CPI	Consumer Price Index (1977-2019).	HCP
REMITT_GDP-RATIO	Share of net remittances in GDP (1977-2019).	HCP
GGOV_FINALCONSUMP	Share of general government final consumption expenditures in GDP (1977-2019).	HCP
INVESTEXPEND_RATIO	Share of public investment in GDP (1977-2019)	HCP

Construction of ratios and calculation of percentages are done by the authors

Appendix N°2: DFA & PP unit-root test results

		M1DEF	TAUX_PF	PIBCST_HAB	WAGES_NI	TAUX_INTER	CPI	REMITT_GDP-RATIO	GGOV_FINALCONSUMP	RATIO_DEPINVEST	RATIO_IDTA	RATIO_IMPOTSINDIR
ADF[a]	Level	3.30	-1.25	0.87	-6.26***	-0.57	-3.16**	-1.91	-4.14***	-4.68***	-0.83	-2.58
	1st difference	-4.21***	-5.38***	-9.69***	-5.61***	-5.21**	-3.53**	-6.36***	-7.43***	-9.52***	-6.21***	-7.59***
PP[a]	Level	-3.29	-1.24	0.57	-8.11***	-0.93	-3.16**	-1.96	-3.33**	-4.77***	-0.64	-2.58
	1st difference	-4.25***	-5.24***	-8.88***	-5.63***	-5.34**	-3.58**	-7.10***	-7.87***	-10.52***	-6.18***	-9.17***
ADF[b]	Level	-0.43	-2.37	-2.41	-4.41***	-2.02	-0.15	-2.96	-3.94**	-4.18**	-3.38*	-3.54**
	1st difference	-5.60***	-5.60***	-9.81***	-7.07***	-5.47**	-4.41***	-6.34***	-7.50***	-9.85***	-6.22***	-7.52***
PP[b]	Level	-0.43	-2.27	-1.50	-12.2***	-2.01	-0.14	-3.07	-3.17	-4.21***	-3.36*	-3.54**
	1st difference	-5.60***	-5.35***	-9.15***	-6.98***	-5.57**	-4.27***	-7.06***	-8.06***	-29.78***	-6.20***	-9.13***
ADF[c]	Level	6.57	0.58	4.83	-2.47**	-0.51	1.44	0.38	-0.08	-2.56**	0.73	0.10
	1st difference	-2.84***	-5.39***	-1.41	-5.31***	-5.27**	-1.05	-6.37***	-7.54***	-9.60***	-6.11***	-7.65***
PP[c]	Level	6.57	0.81	4.61	-2.68***	-0.56	3.57	1.06	0.07	-2.70***	1.09	1.20

1st difference	-2.86***	-5.27***	-6.89***	-5.31***	-5.40**	-1.56	-6.77***	-7.99***	-10.40***	-6.11***	-8.85***

(a) Indicates the test ran with a constant.
(b) Indicates the test ran with a constant and atrend.
(c) Indicates the test ran without a constant or a trend.
***denotes the rejection of the null hypothesis at the 1% threshold.

** denotes the rejection of the null hypothesis at the 5% threshold.

Appendix N°3: Johansen Cointegration test

Null Hypothesis	Alternative Hypothesis		Critical value at the 5% level	Prob**.
Test λ trace		λ trace value		
r=0	r>0	296.5633	159.5297	0.0000
r≤1	r>1	204.7450	125.6154	0.0000
r≤2	r>2	146.2401	95.75366	0.0000
r≤3	r>3	103.7297	69.81889	0.0000
r≤4	r>4	71.23729	47.85613	0.0001
r≤5	r>5	41.08793	29.79707	0.0017
r≤6	r>6	22.85046	15.49471	0.0033
r≤7	r>7	6.549426	3.841466	0.0105
Test λ max		λ max value		
r=0	r=1	91.81830	52.36261	0.0000
r=1	r=2	58.50488	46.23142	0.0016
r=2	r=3	42.51038	40.07757	0.0261

AFRICAN SCIENTIFIC JOURNAL
MANAGEMENT AND ECONOMIC DEVELOPMENT

r=3	r=4	32.49243	33.87687	0.0724
r=4	r=5	30.14935	27.58434	0.0229
r=5	r=6	18.23747	21.13162	0.1212
r=6	r=7	16.30104	14.26460	0.0235
r=7	r=8	6.549426	3.841466	0.0105

**denotes the rejection of the null hypothesis at the 5%.

The probabilities used are those of MacKinnon-Haug-Michelis (1999)

References

Abdih, M. Y., & Medina, L., (2013). "*Measuring the Informal Economy in the Caucasus and Central Asia*". International Monetary Fund, WP 13-137.

Ahumada, H., Alvaredo, F., & Canavese, A. J. (2006). "*The demand for currency approach and the size of the shadow economy: a critical assessment*". Berkeley Program in Law & Economics, Working Paper Series.

Aktuna-Gunes Armagan T., Strazec C., Gardes F. (2014). "*Une évaluation de la taille de l'économie informelle par un système complet de demande estimé sur données monétaires et temporelles*". Revue économique, 4(65), 567-589.

Alderslade, J., Talmadge, J., & Freeman, Y. (2006). "*Measuring the informal economy: One neighborhood at a time*". Washington, DC: Brookings Institution, Metropolitan Policy Program.

AnaMaria, A. A., Ion, D., & Catalin, G. (2009). "*Estimating the Size of the Romanian Shadow Economy Using the Currency Demand Approach*". Analele Universita Din Oradea, 622.

Arby, M. F., Malik, M. J., & Hanif, M. N. (2012). "The size of informal economy in Pakistan". Finance Research, 1(2), pages 11-18.

Ardizzi G. , Petraglia C., Piacenza M. TuratiG. (2011). *"Measuring the Shadow Economy with the Currency Demand Approach: A reinterpretation of the Methodology with an*

Application to Italy". Department of Economics and Public Finance "G. PRATO", Working Paper Series 22.

Bank Al-Maghrib (BAM) (2003) : *« La Modernisation du Cadre Juridique de l'Activité Bancaire au Maroc »*, Présentation du Gouverneur de la BAM à l'occasion du forum international des finances et des affaires tenues à Casablanca du 2 au 5 décembre 2003.

Bank Al-Maghrib (BAM) (2014) : *« Rapport Annuel sur la Supervision Bancaire-Exercice 2014 ».*

Bühn A., Schneider F., (2008*). "MIMIC Models, Cointegration and Error Correction: An Application to the French Shadow Economy".* CESIFO Working Paper N° 2200, Category: Public Finance.

Cagan, P. (1958). "*The demand for currency relative to total money supply".* National Bureau of Economic Research, Occasional Paper 62, 1-37.

Conseil Economique et Social (Economic and Social Council) (2012) : *« Le système fiscal marocain : développement économique et cohésion sociale »*, Auto-Saisine n° 9/2012.

Contini, B. (1981). *"Labour Market Segmentation and the Development of the Parallel Economy: the Italian Experience".* Oxford Economic Papers, New Series, 33(3), 401- 412.

Dell'Anno R. (2003). *"Estimating the shadow economy in Italy: A structural equation approach".* Department of Economics, University of Aarhus, Working Paper 2003-7.

Dell'Anno, R. (2007). "*The shadow economy in Portugal: an analysis with the MIMIC approach".* Journal of Applied Economics, 10(2), 253-277.

Dell'Anno R., Schneider F. (2006). *"Estimating the Underground Economy by Using MIMIC Models: A Response to T. Breusch′s critique".* Department of Economics, Johannes Kepler University of Linz, Working Paper 0607.

Dell'Anno R., Solomon O. H. (2008). *"Shadow Economy and Unemployment Rate in USA: Is there a Structural Relationship? An Empirical Analysis".* Applied Economics, 40(19), 2537-2555.

Dell'Anno, R., Gómez-Antonio, M., & Pardo, A. (2007). *"The shadow economy in three Mediterranean countries: France, Spain and Greece. A MIMIC approach"*. Empirical Economics, 33(1), 51-84.

Elgin, C., & Oztunali, O. (2012). "*Shadow economies around the world: model based estimates"*. Bogazici University Department of Economics, Working Papers 5.

Embaye, A. (2007). "*Underground economy estimates for non-OECD countries using currency demand method, 1984-2005"*. MPRA, Paper No. 20308.

Engle, R., F., & Granger, C., WJ., (1987). *"Co-integration and error correction: representation, estimation, and testing"*. Econometrica: Journal of the Econometric Society, 55(2), 251-276.

Faal, E. (2003). *"Currency demand, the underground economy, and tax evasion: The case of Guyan"*. International Monetary Fund, WP 03:7.

Feige, E., L., (1979). *"How big is the irregular economy?"*. Challenge, 22(5), 5-13.

Feld, L., Schneider, F. (2010). *"Survey on the Shadow Economy and Undeclared Earnings in OECD Countries"*. German Economic Review, 11(2), 109-149.

Fortin, B., Lacroix G., Pinard D. (2009). *"Évaluation de l'économie souterraine au Québec : Une approche micro-économétrique"* Revue économique, 5(60), 1257-1274.

Gadea M. D., Serrano-Sanz J. M. (2002). "*The Hidden Economy in Spain- A monetary Estimation 1964-1998"*. Empirical Economics, 27, 499-527.

Georgiou G. M. (2007): *« Measuring the Size of the Informal Economy: A Critical Review »*, Central Bank of Cyprus.

Giles, D., E., (2000). "*Modelling the hidden economy and the tax-gap in New Zealand*", Advances in Public Economics (pp. 71-90). Physica-Verlag HD.

Gutmann, P., M., (1977). "*The subterranean economy*", Financial Analysts Journal, 33(6), 26-27.

Haque S., T., (2013). "*Underground Economy of Bangladesh: An Econometric Analysis"*. Research Study Series No – FDRS 01/2013.

Haut-Commissariat au Plan (HCP) (2005): *« Les sources de la Croissance Economique au Maroc »*, Rapport Septembre 2005.

Haut-Commissariat au Plan (HCP) (2006) : *« Prospective « Maroc 2030 » : Le Système Financier Marocain »*.

Haut-Commissariat au Plan (HCP) (2007) : *« Enquête nationale sur le secteur informel »*, Direction de la Statistique, Rapport de synthèse.

Haut-Commissariat au Plan (HCP) (2010) : *« Impact de la Crise Mondiale sur l'Economie Marocaine »*.

Hernandez M. A. (2009). *"Estimating the size of the hidden economy in Peru: A currency demand approach"*. Revista de Ciencias Empresariales y Economia, 8, 85-104.

Johnson S., Kaufmann D., SHLEIFER A., (1997). *"The Unofficial Economy in Transition"*, Brookings Papers on Economic Activity, 159-239.

Kelley, B. (1994). "*The Informal Sector and the Macroeconomy: A Computable General Equilibrium Approach for Peru"*. World Development, 22(9), 1393-1411.

Laflèche, T. (1994). "*The demand for currency and the underground economy*". Bank of Canada Review, 1994(Autumn), 39-58.

Lyssiotou P., Pashardes P., StengosT. (2004). "*Estimates of the Black Economy Based on Consumer Demand Approaches*". The Economic Journal, 114(497), 622-640.

Macias J. B., Cazzavillan G., (2009). "*The dynamics of parallel economies. Measuring the informal sector in Mexico*", Research in Economics, 63(3), 189-199.

Magazzino C., Buscemi A. Yallwe A. H., (2011). "*The underground economy in the Caribbean countries"*. International Journal of Economics and Business Modeling, 2(2), 124-132.

Ministère Chargé de la Communauté Marocaine Résidant à l'Etranger (Ministry in Charge of Moroccan Community Living Abroad) (2010), "*Élaboration d'une Stratégie de Renforcement des Politiques, des Mécanismes et des Instruments Relatifs à la Mobilisation de l'Epargne et*

de l'Investissement des MRE au Profit de l'Economie Nationale et les Moyens de Réduction des Coûts de Transfert des Fonds".

Ministère de l'Economie et des Finances (Ministry of Economy and Finance) (1995) : *« Bilan du Programme d'Ajustement Structurel »,* Direction des Etudes et des Prévisions Financières, Document de Travail N°1.

Ministère de l'Economie et des Finances (Ministry of Economy and Finance) (2010) : « *Principales Mesures Fiscales par Année 1990-2010* », Direction des Etudes et des Prévisions Financières.

Ministère de l'Economie et des Finances (Ministry of Economy and Finance) (2013) : « *Principales Mesures Fiscales par Année 2001-2013* », Direction des Etudes et des Prévisions Financières.

Ministère de l'Economie et des Finances (Ministry of Economy and Finance) (2014a) : « *Rapport Economique et Financier 2014 : Défis et opportunités de l'économie marocaine dans un contexte international changeant* », Direction des Etudes et des Prévisions Financières.

Ministère de l'Economie et des Finances (Ministry of Economy and Finance) (2014b) : « Loi de Finance pour l'Année Budgétaire 2014 ».

Ministère de l'Economie et des Finances (Ministry of Economy and Finance) (2015) : *« Tableau de Bord des Indicateurs Macro-économiques* », Direction des Etudes et des Prévisions Financières.

Murray, M., P., (1994). "*A Drunk and Her Dog: An Illustration of Cointegration and Error Correction".* The American Statistical Association: The American Statistician, 48(1), 37-39.

United Nations (2008): *« Rapport Afrique de l'Ouest 2007-2008 »,* 169-178.

OECD (2003) : *« Perspectives Economiques en Afrique ».*

Phillips, P. C. (1992). "*Hyper-consistent Estimation of a Unit Root in a Time Series Regression*", Cowles Foundation for Research in Economics at Yale University, Discussion Paper N°1040.

Phillips, P. C. (1995). "*Fully modified least squares and vector autoregression*", 63(5), Econometrica: Journal of the Econometric Society, 1023-1078.

Phillips, P. C., & Hansen, B. E. (1990). "*Statistical inference in instrumental variables regression with I (1) processe*s". The Review of Economic Studies, 57(1), 99-125.

Pickhardt, M., Sarda, J. (2011). "*The size of the underground economy in Germany: a correction of the record and new evidence from the modified-cash-deposit-ratio approach*". European Journal of Law and Economics, 32(1), 143-163.

Pissarides C. A., Weber G. (1989). "*An Expenditure-Based Estimate of Britain's Black Economy*". Journal of Public Economics 39(1), 17-32.

Schneider, F. (2005). "*Shadow economies around the world: what do we really know?*". European Journal of Political Economy, 21(3), 598-642.

Schneider, F., Buehn, A., & Montenegro, C. E. (2010). "*Shadow Economies all over the World: New Estimates for 162 Countries from 1999 to 2007*". World Bank Policy Research Working Paper Series, WP S5356.

Spiro P. (1996). "*Monetary estimates of the underground economy: A critical evaluation*". The Canadian Journal of Economics, 29(1), S171-S175.

Tanzi, V. (1980). *"The Underground Economy in United States–Estimates and Implications".* Banca Nazionale de Lavoro Quarterly Review, 135, 427-453.

Tanzi, V. (1983). "*The Underground Economy in the United States: Annual Estimates, 1930-80".* Staff Papers-International Monetary Fund, 30(2), 283-305.

Tanzi, V. (1999). *"Uses and Abuses of Estimates of the Underground Economy*". The Economic Journal, 109, F338-F347.

Tanzi, V. (2002). "*The Shadow Economy, Its Causes and Its Consequences*". International Seminar on the Shadow Economy Index in Brazil, Brazilian Institute for Ethics in Competition (ETCO), Rio de Janeiro.

World Bank (2013): « *Migration and Remittance Flows: Recent Trends and Outlook, 2013-2016* », Migration and Development Brief, 21.