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SHADOW ECONOMY OF MACEDONIA

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Abstract

Measurement and assessment of the shadow economy is an area of research which is always challenging and surrounded with debate and ambiguity. In this research we use the indirect method used by Kaufman and Kaliberda like the Electricity Consumption Method (ECM) as well as the Multiple Indicators Multiple Causes (MIMIC) approach which is structural modeling using the shadow economy as a latent variable considering several causes and indicators of the SE. The ECM results of SE estimates are discussed within the framework of the possible causes of the SE like: tax and social contributions, social transfers paid by the Government of Macedonia (GoM), regulatory intensity, corruption level, global economic crisis. We also give raw estimates of the shadow employment rate. Next, we discuss the structure of the shadow economy by industries in accordance with the ECM method and we once again discuss the informal economy estimates of CEA done in 2009. The estimates of the SE by the State statistical office in Macedonia are also presented. We finish with the MIMIC estimates and give comparative illustration of all known to us estimates of SE in Macedonia so far.

Keywords: Shadow economy, structural modeling of economy, stationarity of time series, Engle-Granger two step approach, co-integration approach, Augmented Dickey-Fuller statistical test, Philips-Peron statistical test.

Introduction

Measurement and assessment of the shadow economy is an area of research which is always challenging and surrounded with debate and ambiguity. The fact that the shadow economy (SE) by definition captures the activities which are "hidden" and on purpose unexposed to the authorities makes the data directly unavailable.

The shadow economy activities are a fact of life and everyone (more or less) has been in direct contact with shadow economy activities. Most of the countries make attempts in establishing effective shadow economy control mechanisms such as: various policies, system of punishments, incentives for economic growth, awareness rising, tax system reforms, social security system reforms, etc.

The effectiveness of the measures taken against the shadow economy activities are highly dependent on the effective gathering of relevant statistical data on the magnitude of the SE, the frequency of the non-observed economy activities, the sectors where these occur and similar. However, the individuals engaged in the SE activity do not want to be exposed and thus, the collection of accurate data on the magnitude and the size of the SE is difficult to be collected.

All of the attempts for estimation and calculation of the magnitude of the shadow economy within the over-all official economy are a challenge and an attempt to estimate the "unknown". There are many variations and controversies starting from the definition of the term "shadow economy" up to the most adequate method for estimation of the size of the SE and its growth rate.

In the next chapters we define the shadow economy and discuss the causes and consequences of the shadow economy. Further we discuss the methods for measuring the size of the SE. In this research we use the indirect method used by Kaufman and Kaliberda like the Electricity Consumption Method (ECM) as well as the Multiple Indicators Multiple Causes (MIMIC) approach which is structural modeling using the shadow economy as a latent variable considering several causes and indicators of the SE. The ECM results of SE estimates are discussed within the framework of the possible causes of the SE like: tax and social contributions, social transfers paid by the Government of Macedonia (GoM), regulatory intensity, corruption level, global economic crisis. We also give raw estimates of the shadow employment rate. Next, we discuss the structure of the shadow economy by industries in accordance with the ECM method and we once again discuss the informal economy estimates of CEA done in 2009. The estimates of the SE by the State statistical office in Macedonia are also presented. We finish with the MIMIC estimates and give comparative illustration of all known to us estimates of SE in Macedonia so far.

Definition of shadow economy

Prior the attempt to measure the size of the shadow economy in Macedonia, it is necessary to define what shadow economy is. Despite the numerous researches done in the area of shadow economy there is no single definition of what shadow economy is.

According to the OECD handbook for "Measuring the Non-Observed Economy"[1] (2002) *"the groups of activities most likely to be non-observed are those that are underground, illegal, informal sector, or undertaken by households for their own final use"* together with the deficiencies of data collection *"are collectively said to comprise the non-observed economy (NOE)".* According to the same source, the non-observed economy is occurring due to seven reasons, categorized into three main areas: (i) underground production, (ii) informal production and (iii) illegal production. The *underground* production is an area where the activities are not recorded due to economic reasons such as tax avoidance, avoidance of social contributions, wages, work hours etc., and statistical reasons for not recording activity due to lack of responsiveness, not updated data and difficulty of the statistical system to capture the changes especially in small sized production activities. The *informal* production refers to data missing due to lack of registration which is usually not legally required such as craftsmanship, farmers, home workers, etc. The *illegal* production refers to activities involving production, sales and distribution of products/services which are legally prohibited.

Others (Startienė and Trimonis 2010)[2] define the non-observed economy as "*the secondary market with trade deals that would be possible in official economy but were taxed or would not be possible at all because of law*".

The shadow economy usually considers the T4, T5 and T6 which is solely the economic part of the non-observed economy (see Figure 1).

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1) http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/documents/OECD_non-observed_economy_2002.pdf

2) http://www.businessjournalz.org/articlepdf/BMR_1205.pdf

Figure 1 ISTAT framework for NOE
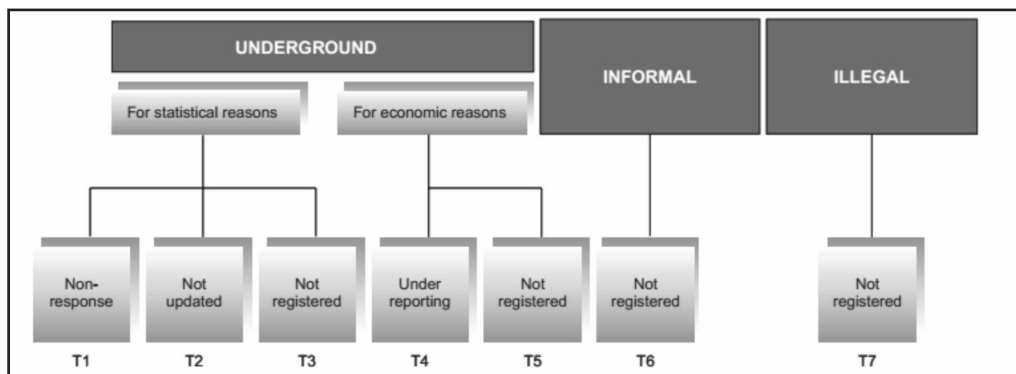
Source: OECD (2002)

Since in the literature there is an overabundance of names suggestive of different situations of this category of economy called unofficial, shadow, black, grey, hidden, unobserved and irregular economy (Alderslade, Talmage and Freeman, 2006) informal, parallel, illegal, subterraneous, etc. this paper would employ shadow economy (SE) as a standard term.[3]

Cause and consequence of shadow economy

Size, causes and consequences of the shadow economy (SE) are different in each country. The causes of the shadow economy are an unexhausted topic for many authors. According to Tanzi (2002) there are four major causes of shadow economy: (1) taxes; (2) regulations; (3) prohibitions; and (4) corruption.

The inexistence of taxes will mean no shadow economy activities which are avoiding taxes. However, in a developed world with developed tax systems and heavy taxes it is expected that the activities for avoidance of tax payment and the shadow activities are increasing.

As the tax rates and the tax levels increase the efforts of the tax payers to avoid tax payment is increasing as well through increased engagement in unreported and nonofficial activities. Schneider's study (2006) demonstrates that the rising burden of taxation (direct and indirect) is the major contributor providing the strongest incentive for the increase of shadow economy. Most often the avoided taxes which are connected with shadow activities are the income taxes, VAT, excise, social security, foreign trade, etc. The level of the tax avoidance and the increase of shadow economy due to tax avoidance are affected by the efficiency of the tax administration and the cost of compliance with tax policies.

The **regulation** level is also proportional with the increase of the shadow economy activities. The countries with a high regulation level are expected to create incentives and pressure for the companies to engage in shadow economy activities. As the businesses face expensive demand from the government bureaucracy or suffer in this hostile environment (Friedman, Johnson, Kaufman and Zoido-Lobatón, 2000) the motivation for shadow economy activities is increasing.

The level of **prohibition** of certain activities in various countries is different, thus the inclusion of these activities in the shadow economy is quite controversial. The **corruption** level is another controversial aspect of whether it should be considered as part of the shadow economy, as it can ultimately potentially distort the market prices.

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3) ibid

Other authors (Marinov, 2008) argue that, besides the tax and regulation issues, the shadow economy is influenced by other socio-economic factors such as: market tradition disappointment of government; limited and low quality of public sector services; corrupted, slow, and closed legislative system; deficiency of administrative capacity and competence of the governments; low tax morality.[4]

According to Chye (2011) all of the causes can be structured in several factors that contribute to SE: (1) Government through low bureaucracy efficiency, low trust level and transparency, unsatisfactory quality of public sector service, and corruption level; (2) Regulation through intensity, slow and closed legislative system, equality under the law and labor market regulation; (3) Taxation through high tax burden and social insurance contribution and tax morale; (4) Economy through recession, unemployment, high public debt and inadequate and slow economy growths; (5) Social ethos through the break in market tradition and culture, public attitude, bribery, urbanization and growth in self-employment.

According to a research on flat taxation effects in Macedonia (CEA, 2008) main reasons for tax evasion of the companies which are directly affecting the shadow economy include excessive tax burden, poor quality of the public services, weak capacity of the Public Revenue Office, politically privileged companies and high labor costs.

The shadow economy within an economy can have significant negative effects including inequality and unfairness of the economic system, as there are individuals who procure the same goods cheaper by not paying taxes and other who pay more expensive goods with taxes included. The same is concerning the sellers of the goods who are either paying (operating in official economy) or not paying taxes (operating in SE). The ultimate negative effect of a serious sized SE can be a competition distortion.

Another consequence of a significant shadow economy is the need for increased taxes for the government to provide the public services. Since only the official economy actors are meeting their obligations and yet both groups (participants within the official and unofficial economy) are using the services, the government may be forced to raise the taxes which have a negative effect on the official economy players through imposing even higher taxes. The reduced public revenues on the other hand mean reduced ability or quality of provision of public goods and service which ultimately will lead more economic actors into the shadow economy.

The existence of shadow economy logically means that the statistical measurement of the main economic indicators which are the basis of creation of the economic policy are distorted which leads to inadequate economic policies. Such policies of harsh taxation and regulatory regimes appear to drive economic agents from the official sector into the unregulated shadow economy (Loyanza, 1998).[5]

Disincentive for foreign investment is another negative consequence of the shadow economy. As the foreign investments are often more regulated, the products of the foreign investments can potentially be uncompetitive in comparison with the domestic competitors who are operating in the shadow economy.

On the other hand, the shadow economy is tolerated for certain reasons. Since the shadow economy is a cash economy it affects the liquidity and as a result, it encourages economic activities and employs people. This is especially a case when the economies are in a transition period since in a period with high unemployment it engages people and solves politically sensitive issues.

Methods for measuring the size of shadow economy

As mentioned before the shadow economy by its nature is "impossible" to be measured with certainty, however there are numerous methods developed for estimating the size of the shadow economy. Commonly, the

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4) It refers to the willingness of individual to pay the right tax at the right time (Maurin, Sookram and Watson, 2003) A declining tax morality tends to increase the size of shadow economy (Torgler, Schneider and Schalteggar, 2009).

5) http://166.111.106.206/bxj/courses/intensive-english-3/sup/Shadow%20Economy.pdf

methods are classified in three groups (i) *Direct methods* which are based on direct data collected through surveys, observations and interviews with economic operators (ii) *Indirect methods* which are endeavoring into determining the extent of the shadow economy by measuring "indicators" of macroeconomic data such as the cash-deposit ratio approach, physical input, etc., and (iii) *Model approach* based on the statistical theory of latent variables, which considers several causes and several indicators of the shadow economy.[6]

The *direct method* approach is not commonly used because its outcome and reliability highly depends on the willingness of the interviewees to reveal truthful answers, as well as the structure and form of the questionnaire. Thus, there are serious difficulties with estimating the actual size of the shadow economy with this approach.

The *indirect method* is estimating the size of the shadow economy based on measuring the differences between national expenditures and revenues, an assessment of the labor market analyzing the differences among the officially registered employment, the unemployment rate and the number of people who are actually employed within the economy.[7] The indirect method with currency demand approach[8] is used in the estimation of the shadow economy in OECD countries (Schneider, Johnson, and Kaufman, 1998). Another indirect method used by Kaufman and Kaliberda is the electricity consumption method[9] which will be the focus of this paper as well as the multiple indicators multiple causes (MIMIC) approach which is *structural modeling* using the shadow economy as a latent variable considering several causes and indicators of the SE.

The objective of the analysis in this paper is to make an attempt to estimate the portion of the shadow economy and its structure. The analysis will also make an attempt to identify the incentives for development and the effect on the economic growth and the competitiveness of the economy. In this research the shadow economy is measured both by the energy consumption method (ECM) and the multiple indicators multiple causes (MIMIC) model.

Electricity Consumption Method: An attempt to estimate the shadow economy in Macedonia

The basic justification of the Electricity Consumption method (ECM) for measuring the size of the shadow economy, is that the electricity consumption in a country is proportional to total economic activity of the country and the changes in electricity consumption which do not correspond to changes in the total activity of the country signifies a proportional change in the size of the shadow economy within the total economic activity.

The electricity consumption is regarded as the single best physical indicator of overall (both official and unofficial) economic activity moving in sync with GDP with elasticity close to one. This means, that the growth of total electricity consumption is an indicator for growth of overall (official and unofficial) GDP.

The expected results are indicators of changes in the shadow economy over the time period analyzed, however without an absolute size of the shadow economy. In order to determine an absolute size of the shadow economy there is a need for a base estimate of the size of the shadow economy in a base year. This estimate is random and depends on other research i.e. attempts for estimation of SE.

This method is used by Kaufmann and Kaliberda (1996) where with replacement (base) measurement an estimate of unofficial GDP can be derived. This is a simple method and appealing however, it is also criticized as: (i) not all shadow economy activities require a considerable amount of electricity and other energy sources can be used (gas, oil, coal, etc.) thus only a part of the shadow economy will be captured. (ii) the technical progress resulted with higher production and electricity efficiency compared to the past concerning both the official and the unofficial/shadow activity usage.[10]

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6) ftp://ftp.econ.au.dk/afn/wp/03/wp03_07.pdf

7) See Friedrich Schneider and Dominic Este, "Shadow Economies Around the World- Size, Causes, and Consequences, Max-Planck-Institute for Research into Economic Systems, 1999.

8) The currency demand approach has been used by Cagan (1958) and further developed by Vito Tanzi (1980-1983).

9) See: Kaufman and Kaliberda, The Underground Economy in Poland.

10) http://ftp.iza.org/dp2315.pdf

In the following text attempt will be made for implementation of the Kaufmann and Kaliberda electricity consumption to be used for estimation of the size of shadow economy in R. Macedonia in the period between 2000 and 2010.

Formula used

$$S_t = S_{t-1}\left(1 + \frac{1}{\mu}gE_t - gY_t\right) = S_0 \prod_{i=1} * \left(1 + \frac{1}{\mu}gE_i - gY_i\right)$$

Where:

St is the shadow economy in year t

So is the output in the shadow economy in base year

gEi is the annual growth rate of electricity power consumption

gYi is the annual growth rate of GDP

μ is the output elasticity of electricity consumption

The size of the shadow economy is derived as a difference between estimates for overall and official economic activities. In order to estimate the shadow economy the data for real GDP and the electricity consumption is collected. The base year for this estimation is 2000. The baseline year proxy for SE as percentage of GDP are former empirical estimate of Schneider[11] estimating the SE in Macedonia in 2000 of 34,1% of the GDP.

In accordance with other research so far the elasticity of GDP and electricity consumption is taken as 1.

Using the Kaufmann and Kaliberda electricity consumption method for Macedonia in the period between 2000 and 2010, the output indicates that the shadow economy trend in the last decade in Macedonia is decreasing.

Table 1 Estimation of the SE using ECM*

|		Estimation of SE using the total electricity consumption method										
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GDP	in milion MKD	236.389	233.841	243.970	258.369	272.461	295.052	320.058	364.989	411.728	410.734	424.762
EC	GWh	5.207	5.018	4.973	5.698	5.764	6.227	6.440	6.747	6.897	6.392	6.782
SE%	% of GDP	34,10%	33,23%	31,49%	34,22%	32,75%	32,67%	31,02%	28,14%	25,16%	23,38%	24,01%
St	SE	80.609	77.701	76.833	88.423	89.241	96.399	99.275	102.719	103.609	96.049	101.986
TA	estimated total actitity (GDP+SE)	316.998	311.542	320.803	346.792	361.702	391.451	419.333	467.708	515.337	506.783	526.748

Source: Authors own calculations, raw data from SSO

*Starting from 2007 the largest electricity consumers in Macedonia, started to purchase the electricity on a "free" market, with market prices which are not regulated. In this study, these are not excluded from the total electricity consumption due to (1) consistency reasons - in order to have consistent approach in calculating the SE Index for the observed period (2) more importantly due to the fact that from the data we had on dispose the consumption of the largest electricity consumers could've not be extracted from the total electricity consumption and the GDP data.

The table above presents the inputs used for calculation of the SE in Macedonia for the period between the years 2000 and 2010. As mentioned, the SE estimate through the electricity consumption method relies on an already calculated value of SE in a base year which in our case is year 2000 with a SE estimated at 34,10% of GDP. Although the relative share of the shadow economy within the total economic activity are strongly dependent on the shadow economy in the base year and can be misleading, regardless of the initial base value estimate the dynamic trend of SE in GDP is not affected.

11) ibid

The general trend for the observed period shows that the SE in Macedonia as a percentage of the GDP is declining, from 34,10% in 2000 to 24,01% in 2010. Starting from 2000 until 2010 the SE is declining slowly, by one to two pp per annum in the first half and then in the second half of the period decreases with higher rate to almost three pp per annum. The 2003 SE estimates is an exception when it is increasing from 31,49% in 2002 to 34,22% in 2003. During the year (2002-2003) the annual growth rate of the EC is 14,9% which is much greater than the annual growth rate of the GDP for the same period (5,9%). According to the Kaufmann/Kaliberda method this is an indicator that the total economic activity (including the industry and the households) are using more electricity to produce goods and services that are not captured by the recorded official GDP.

**Chart 1. Shadow economy Growth Trends vs. GDP and EC**
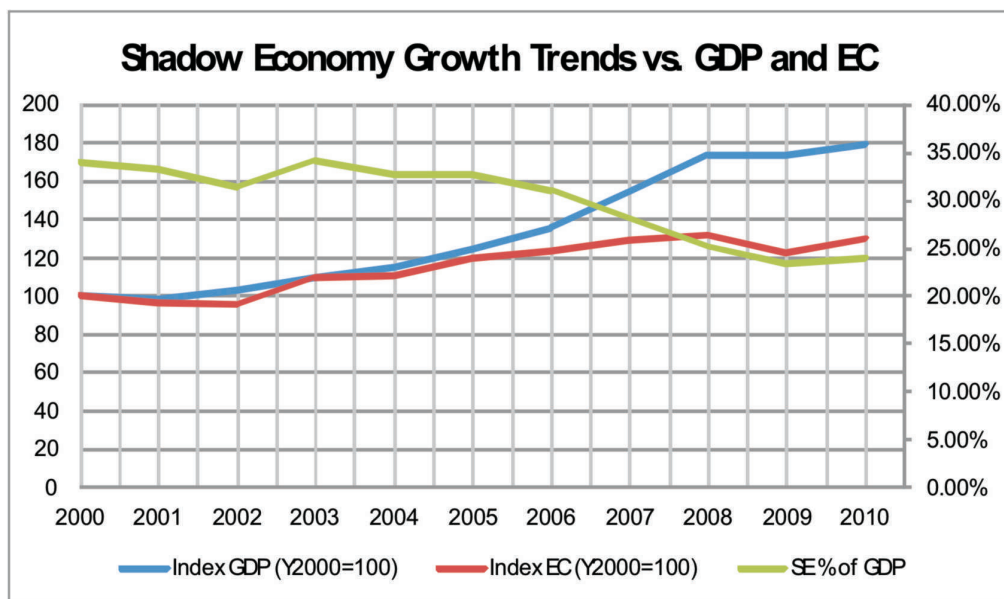
The chart presents the GDP and the EC growth through index versus the estimated/calculated SE as a percentage of GDP. From the chart we can see that the GDP has grown to 180 index points in 2010 while the growth of the EC is not as significant, growing to the 130 index points. Using the electricity consumption method for establishing the SE, we can conclude that in the observed period, higher degree of the produced goods and services with the given amount of consumed electricity energy are recorded in the official GDP, and thus declining the SE.

Table 2 Annual SE growth rate

|	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
annual SE growth rate	-2,6%	-5,2%	8,7%	-4,3%	-0,3%	-5,1%	-9,3%	-10,6%	-7,1%	2,7%

As an illustration, even if the base year estimation of the SE (proxy) is altered, the annual growth rate of SE does not alter showing the trend of growth and decline of the SE which can easily be seen from the chart below which considers three arbitrary options as proxy values for 2000 SE: 20%, 34,1% and 40%.

Chart 2 SE trough ECM with arbitrary base year values
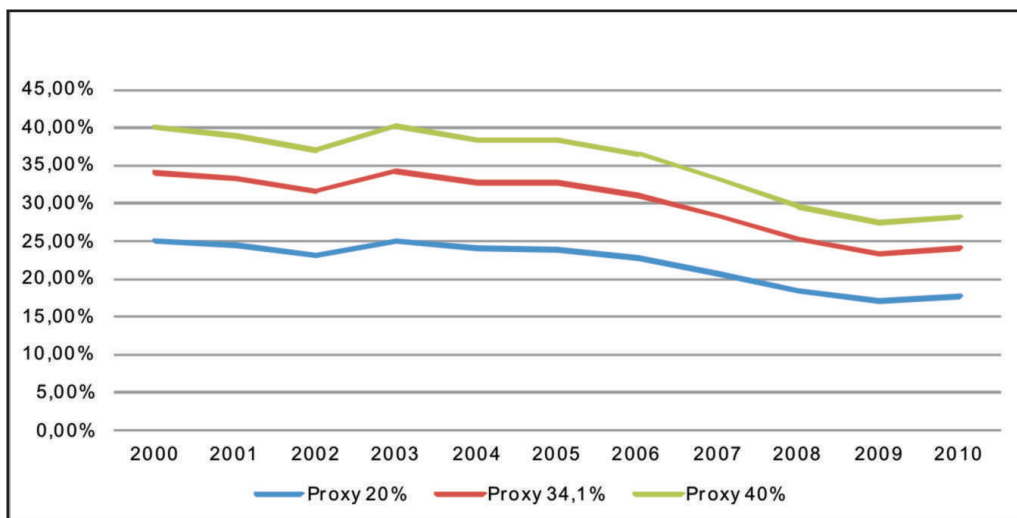
Possible causes of the SE to explain the Electricity Consumption Method's results

The following text attempts to explain the SE trend in Macedonia through discussion about the potential causes of the SE given the Tanzi (2002) taxonomy.

Tax and social contribution burdens to the business sector - The most significant downwards change in the SE movement in the observed period is in 2006/2007. In 2006 the Government of Macedonia (GoM) implemented a new model of taxation, as the previously used progressive taxation model was replaced with the flat taxation model. The progressive rates for profit tax, the personal income tax and withholding tax were replaced with one 10% tax rate, common for all taxes. At the same time, with the introduction of the flat taxation model, the tax base has increased thus making the tax evasion more difficult and creating incentives for the SE economic activities to move in the official economy.

Chart 3 Tax & Social Contribution Burden
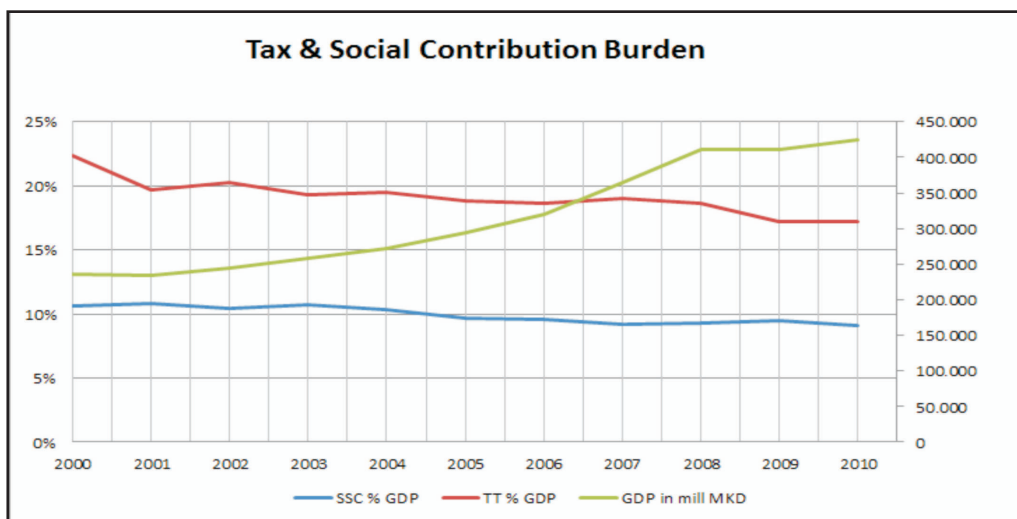
Resulting from the flat taxation model and the wider tax base, the tax revenue from 55.681 million MKD in 2005 increased to 59.575 million MKD in the 2006. In the upcoming years the growth of the tax revenue in the state budged is more rapid. Total taxes expressed as a percentage of the official GDP shows a stable increasing trend until 2009 when the GoM was forced to make adjustments to the profit tax law in order to reduce the influence of the global economy crisis. With the 2009 changes the companies are tax exempt if the profit is reinvested and profit is not distributed to the owners. This has resulted in decrease of the total taxes in the state budget; however the enforcement of the measure has been strictly implemented by the relevant institutions creating positive influence on decreasing the overall SE. In 2009, the GoM reduced the total payroll contributions from 44,9% to 33%, and changed the concept of the net salary which was used until the end of 2008, to a concept of gross salary. With this change, the possibility for tax evasion has been reduced trough new forms of control of the salary payment, and reduction of the payroll contributions and benefits. The initial 2009 plan announced within three years reduction of the payroll benefits to 22% (from the gross salary), which has been postponed indefinitely due to the global economy crises.

The effects of these measures on the SE are evidently positive, providing higher transparency and control to the Public Revenue Office. With higher control of the total number of the employed persons and decreased payroll benefits a significant number of unregistered workers gained stimulus to migrate to the official economy, thus reducing the number of workers previously contributing to the SE.

Table 3 Total Taxes and Social contribution in the period 2000-2010

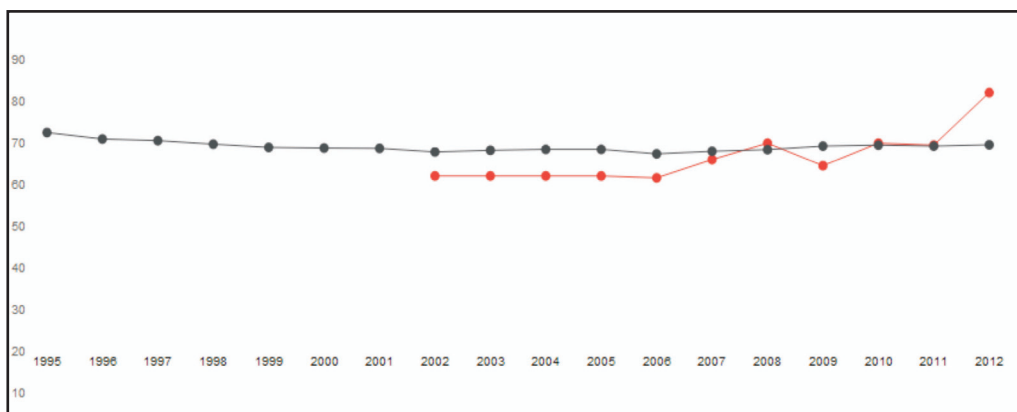| year/unit	Social transfers paid by GoM mill. MKD	SSC as % GDP	Total Taxes mill. MKD	TT as % GDP
2000	25.091	11%	52.906	22%
2001	25.363	11%	45.943	20%
2002	25.494	10%	49.447	20%
2003	27.781	11%	49.805	19%
2004	28.072	10%	53.184	20%
2005	28.595	10%	55.681	19%
2006	30.766	10%	59.575	19%
2007	33.457	9%	69.514	19%
2008	38.249	9%	76.559	19%
2009	38.837	9%	70.754	17%
2010	38.687	9%	72.938	17%

Social transfers by the GoM – The increasing of social transfers paid by the business and paid by the government have an opposite effect on the SE. When social contributions paid by the business are increasing, the SE is increasing, and when the social transfers paid by the Government are increasing the SE is increasing as well.

In Macedonia although there have been significant structural reforms in the financial sector and the trade regime, the track record in enterprise reform was weak. As most of the socially owned enterprises have been sold to insiders rather than to strategic investors some of the results are poor company performance and no job creation thus, many of the unemployed participate in the SE employment due to lack of job creation. The number of registered unemployed actually working is registered as such to take advantage of social, health, and unemployment insurance benefits which overestimates the overall unemployment rate.

In the period observed, the total social transfers paid by the GoM as a percentage of GDP, are decreasing (see table 3). In 2000 the total social transfers paid by the government participated with 11% in the GDP and in 2010 with 9% in the GDP, however in absolute numbers the total amount of paid social transfers are increasing until 2008, when they remain steady at 38 million MKD. Analyzing the movements of the SE, in this particular period, the index of SE is decreasing from 28,14% in 2007 to 24,01 in 2010, thus confirming the previously expressed thesis that if the social transfers paid by the Government is decreasing (or stable) the SE is also decreasing. The reason for such dynamics can be explained by the efforts of the Ministry of Labor and Social Policy of "cleaning up" the registry of unemployed and socially deprived as a measure for the unemployed to confirm their status and incomes. This dissimulates the part of the registered unemployed people (who are working in the SE and receiving social transfers from the GoM) to undertake preregistration thus decreasing the total unemployment and the SE.

Regulation intensity - It has been accepted that high level of government bureaucracy and regulation creates hostile business environment (Friedman, Johnson, Kaufman and Zoido-Lobatón, 2000) creating incentives for unofficial economy operations. In order to have an indicator for the regulation level in Macedonia the business freedom index[12] (Heritage International) will be considered. According to the source, the Business Freedom Index[9] (based on the WB Doing Business Study) is a quantitative measure of the ability to start, operate, and close a business that represents the overall burden of regulation as well as the efficiency of government in the regulatory process. Since score of 100 indicates the freest business environment (based on the weighted factors for the time and procedures for starting a business, time, cost and procedures for obtaining licenses and closing the business) the chart indicated that there is notable increase of the business freedom in the period under observation (55 points in 2002 to 65 in 2008 and 80,9 in 2012) situating Macedonia in the category of "moderately free" countries, most of the years below the world average (except 2008 and 2012). If we consider the identified most problematic factors for doing business (as identified by the WB Doing Business Study) and compare these in the last five years still these are the areas of corruption, access to finance, inefficient bureaucracy, policy instability, poor work ethic in national labor force, etc. The significant improvement of the regulation level results from the "regulation guillotine" project for reduction of bureaucracy and regulation burden initiated in 2006 as well as with the progress by reforming the Central Registry.

Chart 4 Business freedom index

The WB Worldwide Governance Indicators among which is the Regulatory Quality reflecting the perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development ranks Macedonia higher in the period following 2006 and the estimate from weak increases to positive stronger values.

Figure 2.

Regulatory Quality – Worldwide Governance Indicator
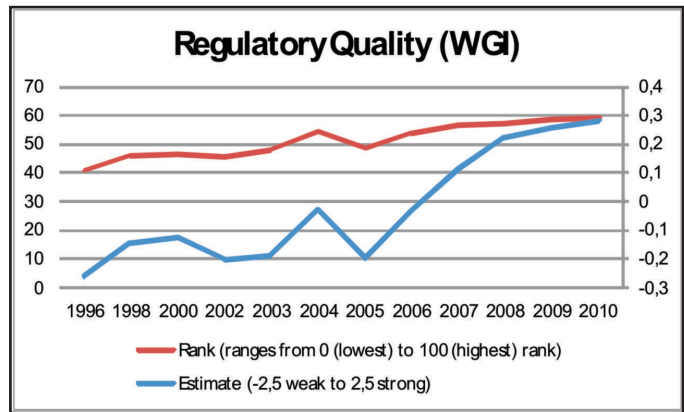
Source: World Bank Worldwide Governance Indicators

The Corruption Level within a country is another factor that boosts the shadow economy activities. In order to determine the level of corruption in Macedonia the Freedom from Corruption Index by Heritage will be considered, as one of the ten economic freedoms (which is based on the Transparency International's Corruption Perceptions Index (CPI)[14]) as a factor which erodes economic freedom by introducing insecurity and uncertainty into economic relationships. According to the index, the corruption level is stable in the period 2002-2004 than increasing and stabilizing until 2008 when it starts decreasing again in 2009 and onwards exceeding the world average (higher index indicates higher freedom from corruption). This trend is generally proportional with the decreasing trend of the shadow economy.

Chart 5. Freedom from corruption index
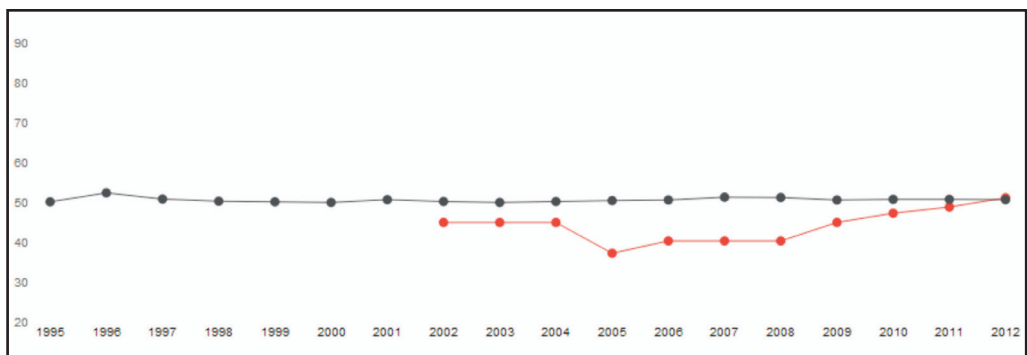
The WB Worldwide Governance Indicators covering Rule of Law reflecting perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence, and Control

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14) The CPI is based on a 10-point scale in which a score of 10 indicates very little corruption and a score of 0 indicates a very corrupt government. In scoring freedom from corruption, the Index converts the raw CPI data to a scale of 0 to 100 by multiplying the CPI score by 10.

of Corruption (reflecting perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption), as well as "capture" of the state by elites and private interests grades and ranks Macedonia significantly low and with ups and downs without significant improvement in the last decade on "Rule of Law" indicator and more significant improvement in the "Control of corruption" indicator especially in the period after 2003.

Figure 3

Rule of Law - Worldwide Governance Indicator

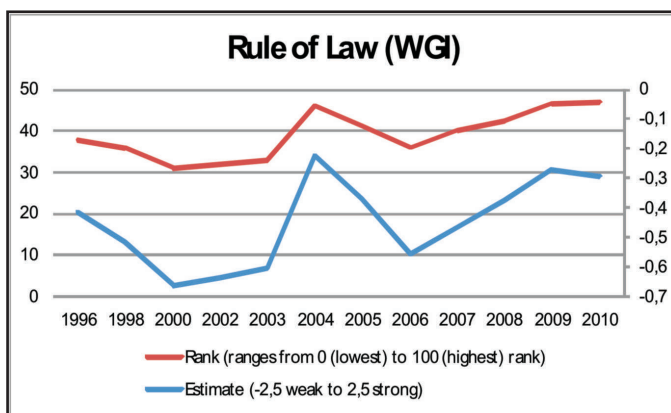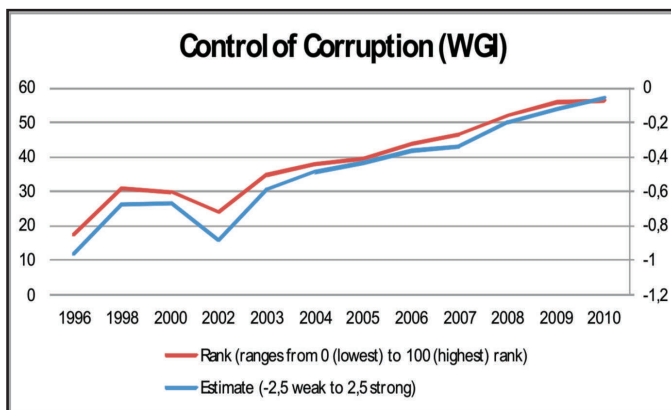*Source: World Bank Worldwide Governance Indicators*

Figure 4

Control of Corruption - Worldwide Governance Indicator

Source: World Bank Worldwide Governance Indicators

Raw estimates of the shadow employment rate

Macedonia is a country with a very high unemployment rate which can be related to the jobless economic growth. The unemployment rate in 2000 and 2010 was 32%. Meanwhile, the unemployment rate was growing and declining. Comparing 2000 and 2001 the unemployment rate declines by 1% points which can be attributed to the those people who were engaged by the GoM due to the crises in 2001 after which were dismissed, thus making pressure to the unemployment rate in the upcoming years[15]. The official unemployment rate is highest in the period of 2003, 2004 and 2005 established at 37% of the total active population. In the following years, the unemployment rate has been slightly lower decreasing to 32% in 2010. The decrease in 2006 can be explained with the tax relief created with the flat taxation encouraging the businesses to register a significant number of their workers, who have been officially unemployed.

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15) Report on the labor market in Macedonia, CEA, 2005

In the period following 2006 other measures for unemployment reduction have been undertaken. One of which still ongoing, is stimulation of self-employment which has significantly increased, as the number of self-employed from 53.508, in 2005 has increased to 91.095 in 2010.

In line with the above presented, an attempt for estimating the shadow employment will be made based on a simple approximation using the already calculated SE rate as percentage of the GDP using the ECM. If we assume that the unofficial economic output and the unofficial employment have the same percentage share in the economy we can estimate the unemployment rate i.e. the number of individuals who are working, however are officially registered as unemployed. The estimates are indicting lower unemployment rate by 7pp to 13pp compared to the official rate, depending on the year. For instance in 2010 the recalculated unemployment rate is 24% compared to the official 31% by reducing the total number of official unemployed by almost 71.000 officially unemployed. However, this is a simplified estimate and should be considered with caution.

Table 4 Estimated unemployment rate

Year	SE % of GDP	Number of unemployed (LFS)	Unofficial employment	Overall estimated unemployment rate	Official unemployment rate
2000	34,1%	261.711	89.243	21%	32%
2001	33,2%	263.196	87.455	20%	31%
2002	31,5%	263.483	82.978	22%	32%
2003	34,2%	315.868	108.101	24%	37%
2004	32,8%	305.899	100.193	26%	38%
2005	32,7%	320.136	104.594	25%	37%
2006	31,0%	324.766	100.735	25%	36%
2007	28,1%	316.247	89.001	25%	35%
2008	25,2%	306.006	77.004	25%	33%
2009	23,4%	298.814	69.877	25%	32%
2010	24,0%	295.371	70.919	24%	31%

Chart 6

Official vs. Shadow unemployment rate

Official vs Shadow unemployment rate
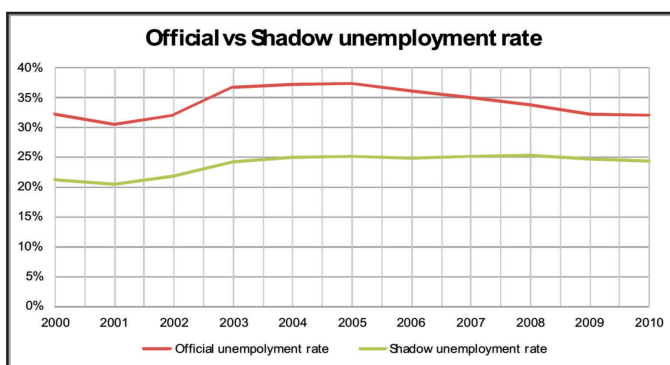
The impact of the Global Economic Crisis

In the end of 2007 beginning of 2008 the world financial markets crashed due to the American mortgage crisis. After a short period of time the crisis spread globally. If we compare the 2010 to 2009 estimates of SE in Macedonia, it increased from 23,38% to 24,01%. This confirms the assumption that during a period of an economic crisis the businesses and the people have incentives for migrating from the official to the shadow

29

economy in order to sustain their incomes creating pressure on the unemployment rate and to the SE as whole.

Structure of the shadow economy in accordance with the ECM method

The estimation of the shadow economy with the ECM can be brought to a sector level where the distribution of the SE can be observed. The following section considers only the two sectors (1) *industry* (covering steel & iron, non-ferrous metal, chemical, building material, ore-extraction, food and beverage, textile, paper and printing, engineering, other industries) and (2) *all other* (covering transport, households, agriculture and other sectors). We consider that the data for the "other" sectors are more reliable on an aggregated level and not on disaggregated levels as the electricity consumption for example in agriculture can often be intermingled and combined with households due to the registration form. Most of the agriculture producers are small privately owned farm households and the electricity are not adequately counted for the sector while their electricity consumption is counted as household consumption. The same logic goes for the micro sized service sector businesses.

Table 5 ECM method SE as % of GDP

ECM method SE as % of GDP										
Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
(1) Industry	34,1%	34,2%	28,7%	39,5%	40,7%	43,0%	41,8%	37,1%	32,8%	23,9%
(2) Other	34,1%	32,7%	32,5%	30,9%	28,4%	27,6%	25,9%	23,7%	21,3%	22,2%
Total	34,1%	33,2%	31,5%	34,2%	32,8%	32,7%	31,0%	28,1%	25,2%	23,4%

Table 6 ECM method Annual Growth Rate of SE

ECM method Annual Growth Rate of SE									
Sector	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009
(1) Industry	0,3%	-16,1%	37,5%	3,2%	5,6%	-2,9%	-11,2%	-11,5%	-27,1%
(2) Other	-4,2%	-0,5%	-4,9%	-8,0%	-2,9%	-6,2%	-8,5%	-10,0%	3,9%
Total	-2,6%	-5,2%	8,7%	-4,3%	-0,3%	-5,1%	-9,3%	-10,6%	-7,1%

Using the same method of calculation of the SE on a sector level and the same base year estimate of SE, the trends of the SE in the industries and other part of the economy can be estimated. The ECM indicates that as the overall SE aggregate as percentage of the GDP decreases, the industry SE has an increasing trend in the period between 2003 and 2006 after which it decreases. However the industry SE is higher than the other sectors.

Chart 7

Sector SE by ECM
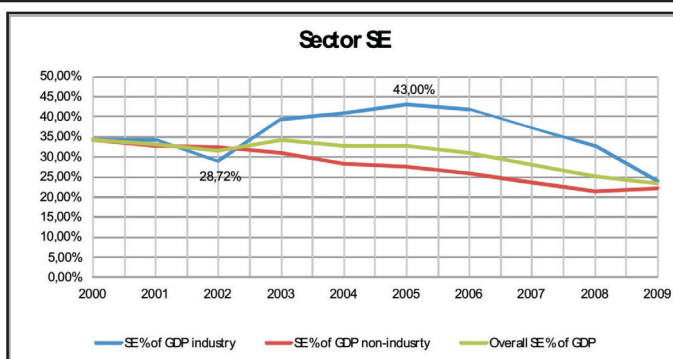
Source: Own calculations

Although the industry sector is expected to have lower share of shadow activities compared to the service sector the implementation of the ECM on the industrial sector shows opposite estimations. The reasons can also be seen as methodological or statistical and should be further investigated.

The handicraft economy takes a serious part of the calculated non-industry SE i.e. the non official economy activities which are usually used by the households. In 2009 a research has been conducted by CEA (CEA, 2009) on the assessment of the handicraft shadow economy in Macedonia using a direct approach (based on specifically designed questionnaires and survey sample of 85 households). The research has been conducted in the ten largest towns in Macedonia and the City of Skopje following the cluster sampling procedure. The research covered the following sectors: additional education, cleaning services, motor vehicle services, home maintenance, green markets, hair style and make up services, software and hardware services, cutting firewood and fortune tellers.

The results indicated that households in Macedonia are spending on average 22,8% from its income in the handicraft economy. The Table 7 for example illustrates that the average annual amount spent by a household on the green markets per annum is 41.645 MKD, which is the largest "recipient" of cash.

Table 7. Household expenditures by handicraft sectors in Macedonia
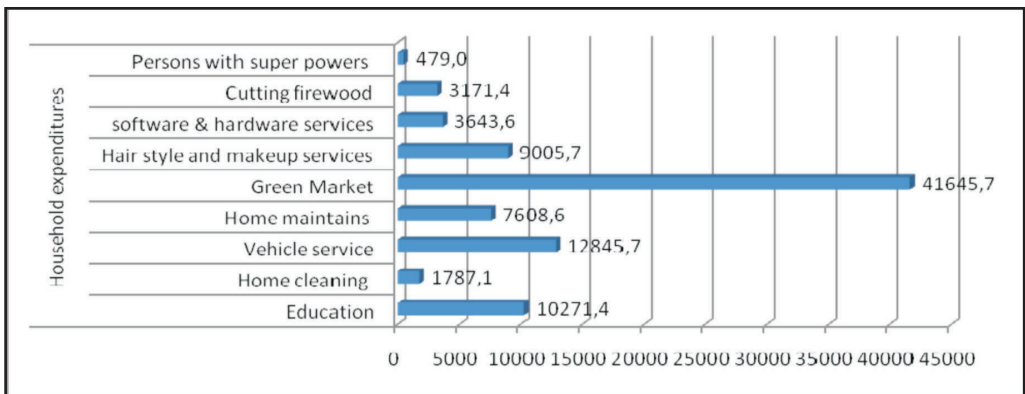
Source: Assessing handicraft shadow economy in Macedonia, CEA 2009

In addition a more concerning fact, assessed by the same research, is that more than 90% of the households have easy or very easy access to the services or products produced in the SE. This means that SE activities are largely present within the Macedonian economy and is easily accessible.

Criticism of the ECM approach

The ECM is one of the models used in the process of estimating the shadow economy of a country. As any other models the ECM model is criticized[16] because: (1) not all economic activities require electricity, other energy sources can be used thus only part of the SE can be captured; (2) the technical advantages result with more efficient usage of electricity applying in the official and shadow economy; (3) there might be considerable elasticity change of electricity/GDP over time. Thus for clearer and more specific policy recommendations it is necessary for further research and attempts to be made for more accurate measurement of the shadow economy.

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16) The Shadow Economy: An International Survey, F. Schneider, D. H. Enste, Cambridge University Press, 2002
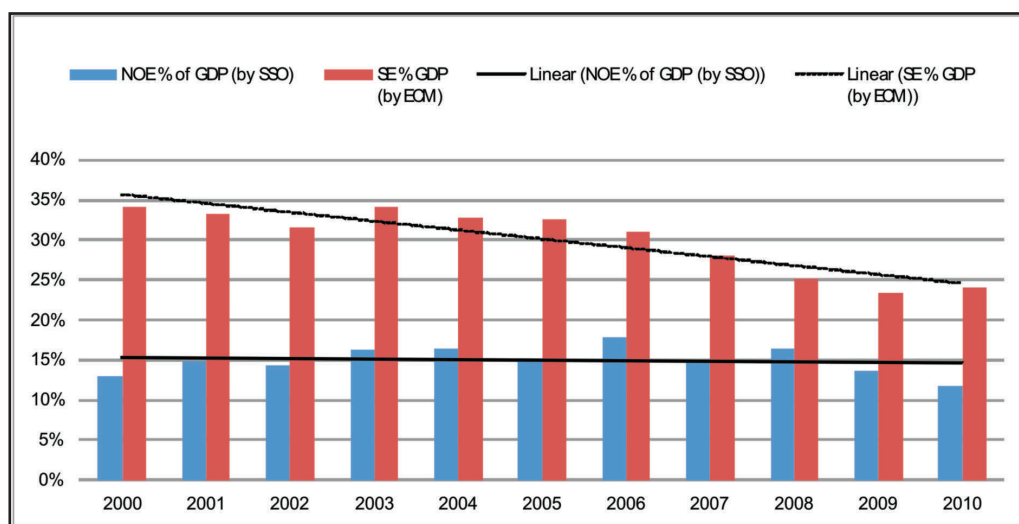
Statistically Measured SE

The SSO of Macedonia, using the OECD Handbook for measuring the non-observed economy and the Eurostat's tabular approach to exhaustiveness, implements adjustments to the GDP data with NOE data. The definition of "non-observed economy" and the methodology of OECD are already covered in previous section of the paper. The officially reported size of the NOE[17] as presented by the SSO is given in the table below indicating a general trend of increase of the SE as percentage of GDP from 2000 to 2006 and reduction from there on.

Table 8 NOE estimated data by SSO

Year	NOE Absolute data (in million denars)	% of GVA	% of GDP
2000	30.604	15,9	12,9
2001	34.815	18,4	14,9
2002	35.179	18,3	14,4
2003	41.026	20,0	16,3
2004	43.368	20,0	16,3
2005	43.832	18,8	15,3
2006	55.726	21,6	17,9
2007	52.061	17,7	14,7
2008	68.057	20,7	16,5
2009	56.136	16,9	13,6
2010	52.510	14,5	11,8

If we compare the absolute rates of SE as reported by the SSO and the estimated SE rates by the electricity consumption method as percentage of GDP, we see quite large differences however the general trends of decrease of the SE is evident by both methods.

Chart 8 ECM SE vs. NOE by SSO

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17) In 2007 the methodology of measurement of NOEis revised, for details see annual GDP publications by SSO

MIMIC Model: An attempt to estimate the shadow economy in Macedonia

The model allows to consider the SE as a "latent" variable linked, on the one hand, to a number of observable indicators (reflecting changes in the size of the SE) and on the other, to a set of observed causal variables, which are regarded as some of the most important determinants of the unreported economic activity. The MIMIC Model received its name from Jöreskog and Goldberger (1975), although however the applications of MIMIC models to estimate the SE as an 'unobservable variable' have been done by Frey and Weck-Hannemann (1984).[18]

In order to estimate the SE in Macedonia the analysis conducted by Dell'Anno for Portugal (2007) and Klaric for Croatia (2010) has been followed. An analytical representation of the most general specification (MIMIC 6-1-2: six determinants (Xq), one latent variable and two indicators (Yp)) is utilized in this research to measure the development of the Macedonian SE. This model framework is fundamental to qualify how correctly and comprehensively the MIMIC model is able to evaluate the SE because the model specification starts from the most general specification and continues omitting the variables, which do not have statistically significant structural parameters. In other words, the MIMIC 6-1-2 is the starting specification for subsequent model modification.

Figure 5

The structure of a MIMIC q-1-p model
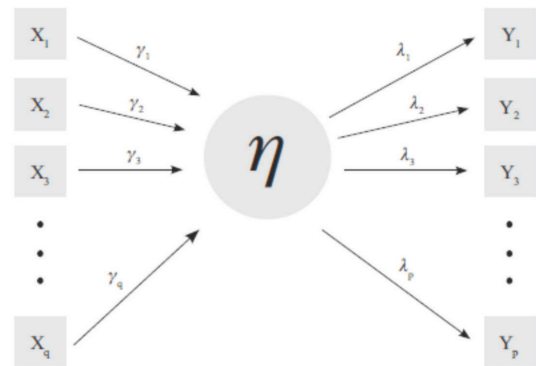
Source: Based on Giles and Tedds (2002)

In order to calculate the SE using the MIMIC approach, the indicators used are (1) real GDP index and (2) M1 monetary aggregates, and as causes the following parameters are used: (1) government employment / total labor force; (2) tax burden ((total direct + indirect + social contributions)/GDP); (3) real government consumption (government consumption/GDP); (4) social benefits paid by government/GDP; (5) self-employment/total active population and (6) unemployment rate.

The augmented Dickey-Fuller and Philips-Peron test has been used to test the stationarity of the time series which provided the following results:

Table 9 MIMIC estimated data

Test	Real GDP Index	M1 Monetary Aggregate	Government employment / total labor force)	Tax burden /GDP)	Real Government consumption	Social benefits paid by government /GDP	Self-employment/ Total active population	Unemployment rate/100
ADF C	-5,409	-5,359	-9,245	-5,607	-6,666	-7,330	-7,311	-5,066
ADF C&T	-5,405	-5,590	-9,086	-5,673	-6,500	-7,228	-7,661	-4,877
PP t-ratio	-18,672	-10,320	-6,862	-17,090	-8,418	-10,800	-7,381	-5,847

Source: Own calculations.

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18) http://www.ucema.edu.ar/publicaciones/download/volume10/dellanno.pdf

From the test it can be concluded that the time series of all variables are stationary and integrated of order 1 thus I(1). Next, the Engle-Granger two step approach has been used to see if all of the causes are cointegrated with each of the indicators (the assumption is that there is a long run relationship among these variables). Because all variables are deviations from their means, no constant is included in the regression equations. The algebraic presentation of the results from the regression is:

$$\frac{\Delta GDP}{GDP} = 0{,}177 \cdot \frac{\Delta EMP}{EMP} - 0{,}382 \cdot \frac{\Delta GOVCONS}{GOVCONS} + 0{,}609 \cdot \frac{\Delta GOVEM}{GOVEM} - 0{,}447 \cdot \frac{\Delta SOC}{SOC} - 0{,}878 \cdot \frac{\Delta TAX}{TAX} - 0{,}676 \cdot \frac{\Delta UNEM}{UNEM} + \varepsilon_{t1}$$

$$\frac{\Delta M1}{M1} = 0{,}056 \cdot \frac{\Delta EMP}{EMP} - 0{,}018 \cdot \frac{\Delta GOVCONS}{GOVCONS} + 0{,}355 \cdot \frac{\Delta GOVEM}{GOVEM} - 0{,}040 \cdot \frac{\Delta SOC}{SOC} - 0{,}401 \cdot \frac{\Delta TAX}{TAX} + 0{,}094 \cdot \frac{\Delta UNEM}{UNEM} + \varepsilon_{t2}$$

We analyze the assumed cointegration relationship's residuals by using the Augmented Dickey-Fuller (ADF) test. If the causes are cointegrated with the indicators, we expect the ADF test to reject the null hypothesis of a unit root against the alternative for both error terms i.e. for the residual series   and from the regressions above we test if they contain unit roots.

The ADF tests resulted in test statistic ADF1=-5.248 and ADF2=-5.219 thus, rejecting the null-hypothesis of unit roots in both regressions which means that causes are cointegrated with the indicators. The estimated parameters are illustrated in the next table.[19]

Table 10 MIMIC estimated parameters

Variables	GDP	M1	GOVCONS	TAX	SOC	EMP	GOVEM
Parameters unnormalized	0,003884	0,034008	0,000292	-0,059734	-0,044124	-0,010176	0,009418
Parameters normalized	1,000000	8,756972	0,075115	-15,38146	-11,36194	-2,620419	2,425139
t-statistics			(4,10230)	(0,51529)	(7,20741)	(5,72381)	(1,17403)	(1,40155)

t-statistics are for normalized parameters.

The 5% critical value for the parameters is 1,645 thus statistically significant causes are solely the tax burden and the social transfers variables.

Benchmarking for MIMIC

As we previously explained, for calculating the SE using the MIMIC model as in the ECM a base value for SE as percentage of the GDP which has been already established by some other researcher will be used. In this calculation, since the shadow economy as percentage of the GDP has been estimated by the electrical consumption method, thus the value of 34,22% for 2003 will be used as a baseline. In order to determine the SE as percentage of the GDP the benchmarking used by Roberto Dell'Anno (2005)[20] in the case with Portugal (equation 6 in his paper) will be used. The formula for convenience is presented here as well:

$$\frac{\sim \eta t}{GDP\ 2003} \quad \frac{\eta * 2003}{GDP\ 2003} \quad \frac{GDP\ 2003}{\sim \eta\ 2003} \quad \frac{GDP\ 2003}{GDPt} = \frac{{}^{\wedge}\eta t}{GDPt}$$

Where $\frac{\sim \eta t}{GDP\ 2003}$ is already calculated (See Table 10 and equation 5 in Roberto Dell'Anno 2005); $\frac{\eta * 2003}{GDP\ 2003} =$ 34,22% is the exogenous estimate of SE by the ECM estimate; $\frac{\eta * 2003}{GDP\ 2003}$ is the value of index estimated (See Table 10 and equation 5 in Dell'Anno 2005); $\frac{GDP\ 2003}{GDPt}$ is to convert the index of changes in respect to the GDP in the base year in a time series of SE/current GDP; $\frac{{}^{\wedge}\eta t}{GDPt}$ is the estimated shadow economy as a percentage of official GDP.

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19) We use E-Views for the regression.

20) The shadow economy in Portugal: An analysis with the MIMIC approach

The results from the calculations for SE as percentage of GDP according to the MIMIC model for Macedonia are:

Table 11: Shadow Economy in Macedonia estimated by the MIMIC approach

Years	2003 (base year)	2004	2005	2006	2007	2008	2009	2010	2011
Shadow Economy	34,22%	44,44%	40,18%	41,32%	52,48%	50,39%	41,58%	40,46%	46,99%

Source: Own calculations

Criticism of the MIMIC approach

As in all other models and methods for estimation of the shadow economy, the MIMIC approach is also criticized. Breusch (2005) critically examines the entire MIMIC approach, as well as its application by Giles and Tedds (2002), Bajada and Schneider (2005), and Dell'Anno and Schneider (2003) to demonstrate the errors and anomalies that might occur when using MIMIC to estimate the size of the SE. The main critique of Breusch (2005) of the MIMIC approach and its applications such as: (1) undocumented data transformations such as differencing, transforming into deviations-from-means, scaling to have unit standard deviation, etc. (2) Estimating coefficients using transformed data and then applying them to the untransformed variables. (3) Sensitivity to the change of units of measurement (4) differencing variables to insure stationarity being unnecessary, inefficient (5) the sign of the unit coefficient during normalization is sometimes chosen simply out of convenience or so that the signs of the other coefficients would make sense, (6) arbitrary benchmarking (7) a single causal variable can dominate the latent variable, etc.[21]

Bringing it all together

Comparing all the estimated results for Macedonia by the ECM and MIMIC approach as well as the estimates of the State Statistical Office of Republic of Macedonia, and other researchers, it can be concluded that generally the SE index in the period analyzed has a decreasing trend and all of the trends are in sync. Of course, due to the difference of the approaches and the methodologies there are differences as well.

The shadow economy estimates calculated by the MIMIC model shows certain differences compared to the ECM and the SSO results mainly due to methodology related to the time lag. Also, the MIMIC ties statistically the SE with the two strongly related causes of SE, the tax burden and the social transfers paid by the GoM.

On first sight in 2006, when the main tax reforms are implemented, the effects on the SE with the MIMIC are not immediately evident. Since the taxation modifications are applied in the last quarter of 2006 it can be assumed that there is a certain time lag for the business sector to implement the modifications and the effects evident (there are no time lags when applying the ECM method). The assumption is that with the MIMIC the taxation reform effects are incorporated in the SE estimates after 2007, when the trend of declining in the next three years starts.

The 2011 increase may be caused by the new wave of economic crisis which confirms the formally thesis that in economic crises larger number of economic entities decides to operate in SE.

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21) http://www.ijf.hr/eng/FTP/2011/1/klaric.pdf

Chart 9 Shadow Economy Measured by Different Methods and Authors
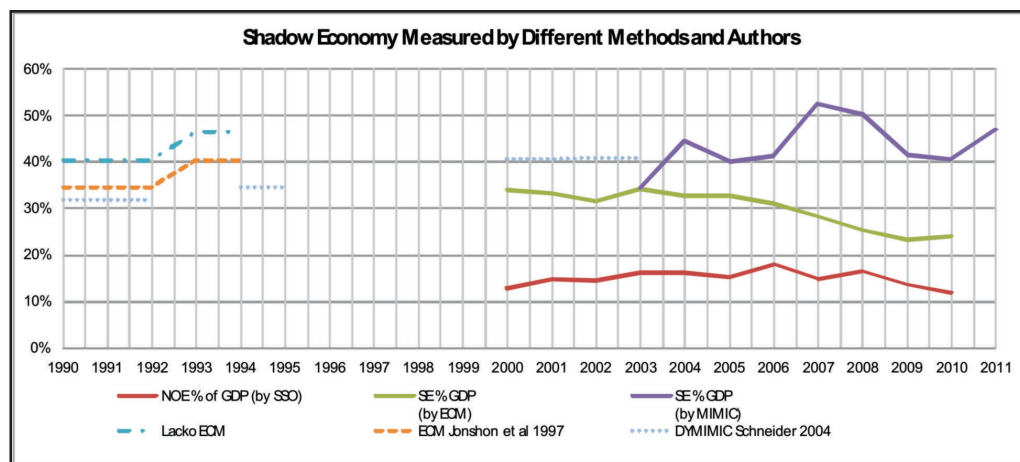
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