Saltanat Kondybayeva, PhD

Al-Farabi Kazakh National University

saltanatkondybayeva@gmail.com

The theoretical remarks about the shadow economy

Measuring the shadow economy – MIMIC method

Outline

- 1. Estimation of the size of the shadow economy
- 2. MIMIC Estimation Procedure
- 3. Problems and critique of the MIMIC method
- **4. The main causes of the shadow economy**
- **5. Econometric results**
- **6. Policy Conclusions**

Goal of this lecture:

(i) **Updating estimates for the shadow economy in 10 transition, 6 developing and 23 highly developed OECD countries until the year 2010.**

(ii) **Discussing the development of the shadow economy in those countries until 2010.**

(iii) **Analysing the most influential factors on (driving forces of) the shadow economies in these countries.**

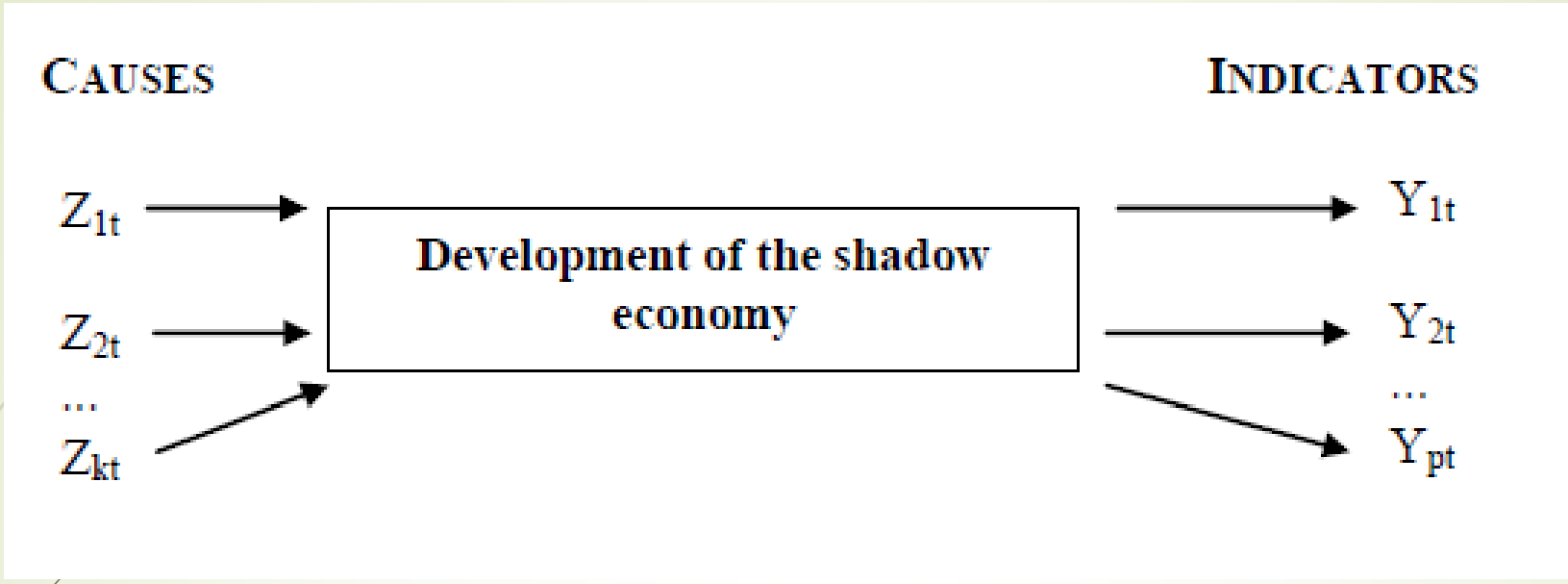
Introduction - Measuring the shadow economy

Three methods of measurement:

1. *Direct procedures* using the micro level and aiming at determining the size of the shadow economy. An example of this method are surveys.
2. *Indirect procedures* that make use of macroeconomic indicators following the development of the shadow economy over time.
3. *Statistical models* that use statistical tools to estimate the shadow economy as an "unobserved" variable.

A detailed description of the MIMIC model

The concept of the MIMIC model is to examine the relationships between a latent variable “size of shadow economy” and observable variables in terms of the relationships among a number of observable variables by using their information of covariance. The observable variables are grouped into causes and indicators of the latent variable (see figure 1). The key advantages of the MIMIC approach are that it allows modeling of shadow economy activities as an unobservable (latent) variable and that it considers its multiple determinants (causes) and multiple effects (indicators). A factor-analytic approach is applied to measure the size of shadow economy activities as an unobserved variable over time. The unknown coefficients are estimated in a set of structural equations, as the “unobserved” variable, meaning that the size of the shadow economy cannot be measured directly. Formally, the MIMIC model consists of two parts: a structural equation model and a measurement model.


CAUSES
INDICATORS
Z_{1t}
Z_{2t}
...
Z_{kt}
Development of the shadow economy
Y_{1t}
Y_{2t}
...
Y_{pt}

Estimation of the size of the shadow economy

MIMIC Estimation Procedure

- **Modeling the shadow economy as an unobservable (latent) variable.** The structural model determines the unobservable variable *ηt* by a set of exogenous causes *x't = (x1t, x2t,..., xqt)'* that may be useful in predicting its movement and size, subject to a structural disturbance error term *ςt*.

- **Description of the relationships between the latent variable and its causes in a structural model:**

$$\eta = \gamma x + \varsigma$$

Estimation of the size of the shadow economy

MIMIC Estimation Procedure

- In the measurement model, the unobservable variable *ηt* determines a *p* vector *y't = (y1t, y2t,..., ypt)'* of indicators, that is, observable variables that reflect shadow economy activities, subject to a *p* vector of random error terms *ε't = (ε1t, ε2t,..., εpt)'*. The unobservable variable *ηt* is a scalar and *λ* is a *p* column vector of parameters that relates *yt* to *ηt*.
- **Link between the latent variable and its indicators is represented in the measurement model:**

$$\boldsymbol{y = \lambda\eta + \varepsilon}$$

η: **latent variable (shadow economy)**

x: **q vector of causes in the structural model**

y: **p vector of indicators in the measurement model**

γ: **q vector of coefficient of the causes in the structural model**

λ: **p vector of coefficient in the measurement model**

ς, **ε:** **error terms in the structural model and the measurement model, respectively**

Estimation of the size of the shadow economy

MIMIC Estimation Procedure

- Substituting (1) into (2) yields a reduced form equation which expresses the relationships between the observed causes and indicators, that is, between *xt* and *yt*. This is shown in equation (3):

$$y_t = \Pi x_t + z_t$$

- where $\Pi = \lambda y'$ is a reduced form coefficient matrix and $zt = \lambda \varsigma t + \varepsilon t$ is a reduced form vector of a linear transformation of disturbances that has a reduced form covariance matrix $\dot{\omega}$ given as:

$$\Omega = \mathrm{Cov}(z_t) = \mathrm{E}[(\lambda \varsigma_t + \varepsilon_t)(\lambda \varsigma_t + \varepsilon_t)'] = \lambda \psi \lambda' + \Theta_\varepsilon$$

- In equation (4), $\psi = \mathrm{Var}(\varsigma t)$ and $\Theta\varepsilon = \mathrm{E}(\varepsilon t\, \varepsilon t')$ is the measurement error's covariance matrix.

In general, estimation of a MIMIC model uses covariance information of sample data to derive estimates of population parameters. Instead of minimizing the distance between observed and predicted individual values, as in standard econometrics, the MIMIC model minimizes the distance between an observed (sample) covariance matrix and the covariance matrix predicted by the model the researcher imposes on the data. The idea behind such an approach is that the covariance matrix of the observed variables is a function of a set of model parameters:

$$\boldsymbol{\Sigma} = \boldsymbol{\Sigma}(\boldsymbol{\theta})$$

where Σ is the population covariance matrix of the observed variables, θ is a vector that contains the parameters of the model and $\Sigma(\theta)$ is the covariance matrix as a function of θ, implying that each element of the covariance matrix is a function of one or more model parameters. If the hypothesized model is correct and the parameters are known, the population covariance matrix would be exactly reproduced, that is, Σ will equal $\Sigma(\theta)$. In practice, however, one does not know either the population variances and covariances or the parameters, but instead uses the sample covariance matrix and sample estimates of the unknown parameters for estimation

Estimation of the size of the shadow economy

It is commonly accepted by most scholars who estimate the size of shadow economic activities using the MIMIC model or more general Structural Equation Models (SEMs) with more than one unobservable variable, that such an empirical exercise is a “minefield,” regardless of which method is used. In evaluating the currently available shadow economy estimates of different scholars, one should keep in mind that there is no best or commonly accepted method.

SEMs/MIMIC models offer several advantages for the estimation of shadow economic activities

- the MIMIC approach is a wider approach than most other competing methods, since it allows one to take multiple indicator and causal variables into consideration at the same time.
- this approach is quite flexible, allowing one to vary the choice of causal and indicator variables according to the particular features of the shadow economic activity studied, the period in question, and the availability of data.
- SEMs/MIMIC models lead to formal estimation and testing procedures, such as those based on the method of maximum likelihood. These procedures are well known and are generally "optimal" if the sample is sufficiently large
- these models lead to some progress in estimation techniques for the size and development of the shadow economy, because this methodology allows wide flexibility in its application.
- SEMs/MIMIC models do not need restrictive assumptions to operate.
- the only real constraint of this approach lies not in its conceptual structure, but in the choice of variables

Criticism of the MIMIC model

1. The most frequent objection is around the meaning of the latent variable (e.g. Helberger and Knepel, 1988; Dell'Anno, 2003). The confirmatory rather than exploratory nature of this approach means that one is more likely to determine whether a certain model is valid than to "find" a suitable model. Therefore, it is possible that the specified model includes potential definitions or informal economic activities other than those studied. For example, it is difficult for a researcher to ensure that traditional crime activities such as drug dealing are completely excluded from analysis of the shadow economy. This criticism, which is probably the most common in the literature, remains difficult to overcome as it goes back to the theoretical assumptions behind the choice of variables and empirical limitations on data availability.

Criticism of the MIMIC model

2. Helberger and Knepel (1988) argue that SEM/MIMIC model estimations lead to unstable coefficients with respect to changes in the sample size and alternative model specifications. Dell'Anno (2003) shows, however, that instability disappears asymptotically as the sample size increases. Another issue is the application of SEMs to time series data because only simple analytical tools such as q- and stemand-leaf plots are available to analyze the properties of the residuals (Dell'Anno, 2003).

3. Criticism is also made with respect to the benchmarking procedure used to derive "real world" figures of shadow economic activities (Breusch, 2005a, 2005b). As the latent variable and its unit of measurement are not observed, SEMs only provide a set of estimated coefficients from which one can calculate an index that shows the dynamics of the unobservable variable. Application of the so-called calibration or benchmarking procedure, regardless which one is used, requires experimentation, and a comparison of the calibrated values in a wide academic debate. Unfortunately, at this stage of research it is not clear which benchmarking method is the best or the most reliable.

Estimation of the size of the shadow economy

MIMIC Estimation Procedure (cont.)

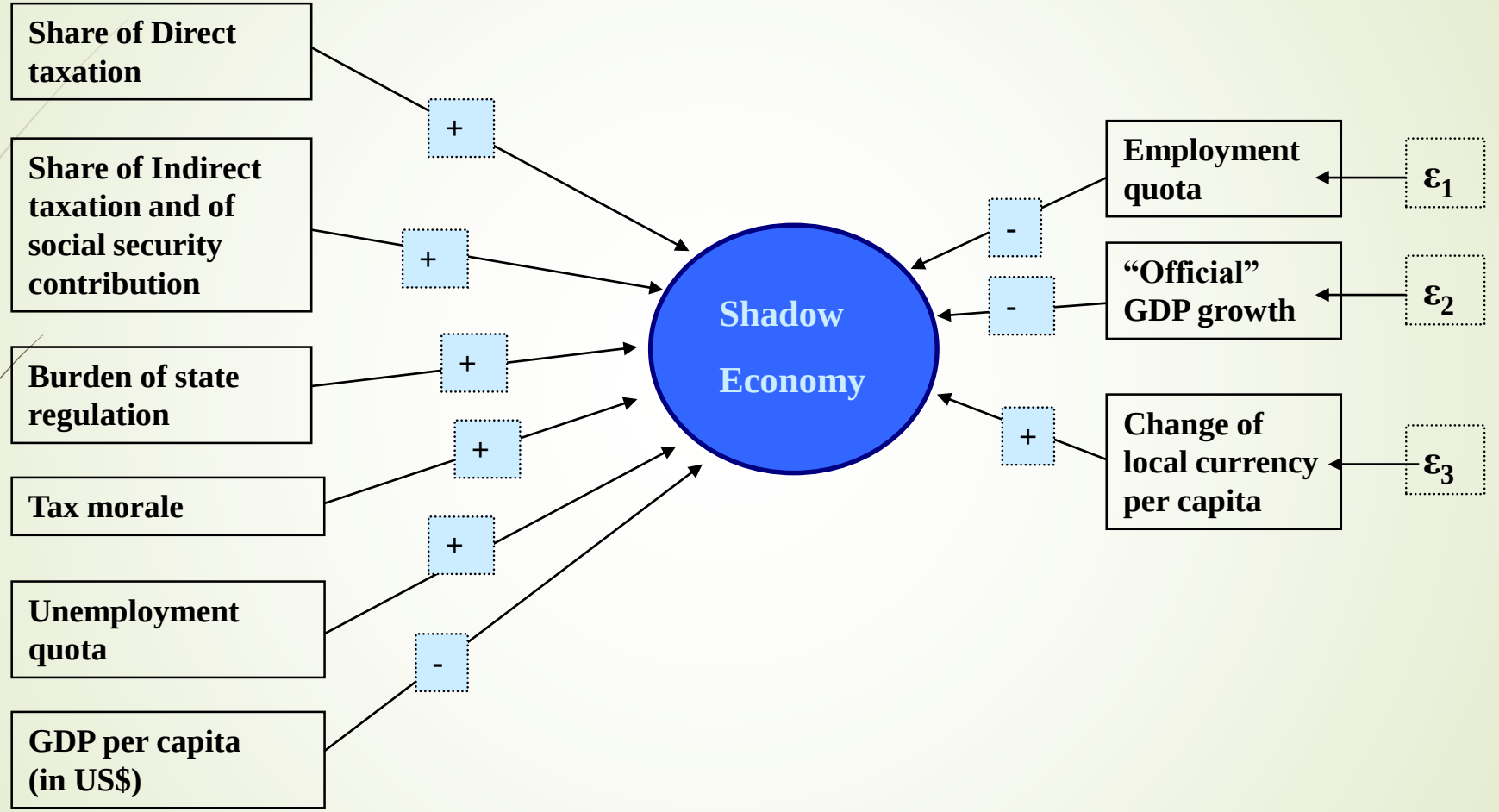
- Specification of structural equation:

$$[\text{Shadow economy}] = [\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6, \gamma_7, \gamma_8] \cdot \begin{vmatrix} \text{[Share of direct taxation]} \\ \text{[Share of indirect taxation]} \\ \text{[Share of social security burden]} \\ \text{[Burden of state regulations]} \\ \text{[Quality of state institutions]} \\ \text{[Tax morale]} \\ \text{[Unemployment quota]} \\ \text{[GDP per capita]} \end{vmatrix} + \varsigma$$

- Specification of measurement equation:

$$\begin{vmatrix} \text{Employment Quota} \\ \text{Change of local currency} \\ \text{Official GDP growth} \end{vmatrix} = \begin{vmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{vmatrix} \cdot \left(\text{Shadow Economy} \right) + \begin{vmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{vmatrix}$$

Figure 1 Path diagram of the MIMIC model



Estimation of the size of the shadow economy

Calibration Procedure

(i) This step requires an additional procedure so called benchmarking or calibration procedure. Unfortunately, no consensus exists in the literature which benchmarking procedure to use.

(ii) In the first step, the MIMIC model index of the shadow economies is calculated using the structural equation (1), i.e., by multiplying the coefficients of the significant causal variables with the respective time series.

Estimation of the size of the shadow economy

For the numerical example of specification 2 in Table 1 the structural equation is given as

$$\tilde{\eta}_t = 0.15 \cdot x_{1t} + 0.06 \cdot x_{2t} - 0.03 \cdot x_{3t} - 0.05 \cdot x_{4t} - 0.26 \cdot x_{5t}$$

x_{1t} is size of government, x_{2t} is the share of direct taxation, x_{3t} and x_{4t} are the fiscal and business freedom indices, and x_{5t} represents GDP per capita.

(iii) In the second step, this index is converted into absolute values of the shadow economies taking base values in a particular base year.

Estimation of the size of the shadow economy

(iv) Using the exogenous shadow economy estimates of Schneider (2007) derived from a currency demand approach, the size of the shadow economy at time t can be calculated as:

$$\hat{\eta}_t = \frac{\tilde{\eta}_t}{\tilde{\eta}_{2000}} \eta^*_{2000}$$

where $\tilde{\eta}_t$ denotes the value of the MIMIC index at t according to equation (1), $\tilde{\eta}_{2000}$ is the value of this index in the base year 2000, and $\tilde{\eta}^*_{2000}$ is the exogenous currency-demand-approach-estimate (base value) of the shadow economies in 2000.

Problems and critique of the MIMIC method

(1) When applying the MIMIC method, there is no clear division between *causal* variables, which directly influence (drive) the shadow economy and *indicator* variables, in which shadow economy activities are reflected. Hence one *caveat* of the MIMIC method is, that there is not a *theoretically oriented guiding rule* which are indicator and which are causal variables.

(2) A further disadvantage of the MIMIC procedure is that it "produces" only relative estimates of the size of the shadow economy.

(3) Estimation results are quite often not robust.

The main causes of the shadow economy

(1) Tax and Social Security Contribution Burdens

The concrete measurement of the tax and social security contribution burdens is not easy to capture. In order to have some general comparable proxies for this, we use the following variables:

a) *Personal income tax* revenues (% of GDP); *positive sign expected.*
b) *Payroll taxes (% of total tax revenue); positive sign expected.*
c) Indirect taxes (% of total tax revenue; *positive sign expected.*

(2) Institutional "Soft" Factors

a) *Tax morale; negative sign expected.*

The main causes of the shadow economy

(3) Intensity of Regulations

a) ***Business freedom:***

It ranges from 0 to 100, where 0 is least business freedom and 100 maximum business freedom; *negative sign expected.*

b) ***Rule of law:***

Rule of Law index summarizes the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence; (-2.5 = no compliance and 2.5 = total compliance); *negative sign expected.*

The main causes of the shadow economy

(4) State of the Official Economy

a) ***GDP per capita growth*** **based on Purchasing Power Parity (PPP), measured in constant 2005 values in $;** ***negative sign expected.***

b) ***Unemployment rate*** **(in percent of total labour force);** ***positive sign expected.***

c) ***Self-employment (self-employed workers as proportion of total employment); positive sign expected.***

Indicators of the shadow economy

(1) GDP per capita, PPP (constant 2005 values in $); *negative sign expected.*

(2) Currency in circulation (M0 over M1); *positive sign expected.*

(3) Labour force participation rate; *negative sign expected.*

Econometric results

Table 1: OECD countries included in the sample; estimation period: 1998/99-2010

Australia	Hungary	Poland
Austria	Iceland	Portugal
Belgium	Ireland	Romania
Bulgaria	Italy	Slovak Republic
Canada	Japan	Slovenia
Chile	Korea	Spain
Cyprus	Latvia	Sweden
Czech Republic	Lithuania	Switzerland
Denmark	Luxembourg	Turkey
Estonia	Malta	United Kingdom
Finland	Mexico	United States
France	Netherlands	
Germany	New Zealand	
Greece	Norway	

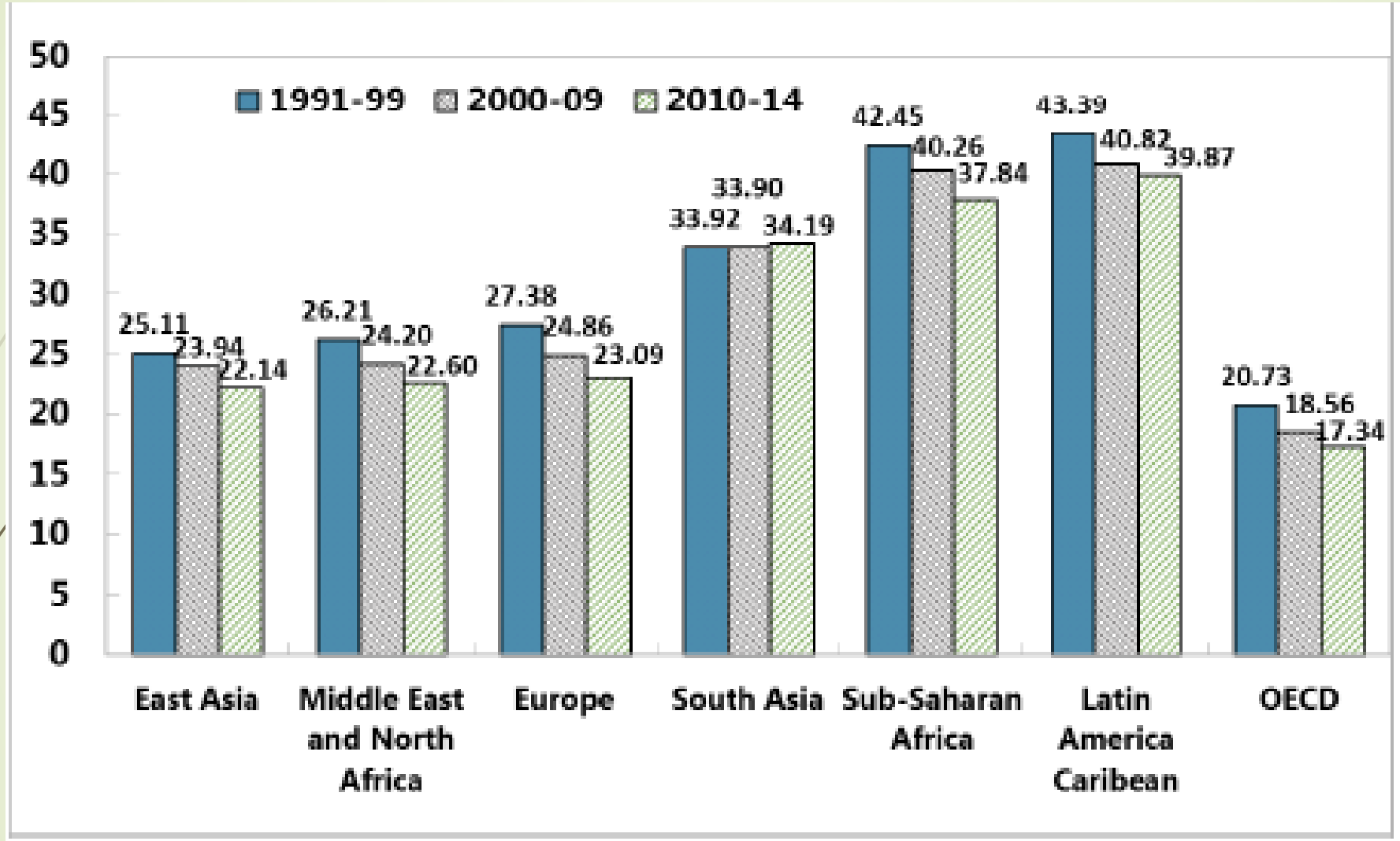


Figure 4: Informal Economy by Region (average, percent of GDP). Source: Medina and Schneider (2017).

Econometric results

Table 2: MIMIC model estimations (standardized coefficients) – Part 1

Specification	1	2	3
Causes			
Personal income tax	0.27*** (3.27)	0.33*** (3.99)	0.37*** (4.30)
Payroll taxes	-0.08 (0.98)	-0.11 (1.35)	–
Indirect taxes	0.24*** (2.75)	0.22*** (2.66)	0.31*** (3.85)
Tax morale	-0.31*** (3.29)	-0.22*** (2.40)	-0.26*** (2.84)
Unemployment	0.63*** (5.92)	0.65*** (6.30)	0.63*** (5.96)
Business freedom	-0.29*** (3.35)	-0.26*** (3.11)	-0.29*** (3.36)
Self-employment	0.29*** (2.68)	0.30*** (2.88)	0.34*** (3.17)
Rule of Law	-0.14* (1.81)	-0.14* (1.83)	-0.10 (1.31)

Econometric results

Table 2 MIMIC model estimations (standardized coefficients) – Part 2

Specification	1	2	3
Causes			
GDP growth	–	0.30*** (3.62)	0.31*** (3.70)
Education	–	–	–
Corruption	–	–	–
Indicators			
GDP pc	-0.52	-0.52	-0.48
Currency in circulation	0.09 (1.39)	0.07 (1.07)	0.10* (1.75)
Labour force participation	-0.56*** (6.42)	-0.55*** (6.58)	-0.52*** (6.36)
Observations	151	151	151
Degrees Freedom	44	54	42
Chi-square	88.88	89.68	24.10
RMSEA	0.08	0.06	0.00

Note: **The sample includes 39 OECD countries and the estimation period is 1998 to 2010. Absolute z-statistics are reported in parentheses. * , **, *** indicate significance at the 10%, 5%, and 1% level, respectively.**

Econometric results

Table 3 MIMIC model estimations (standardized coefficients) – Part 1

Specification	4	5
Causes		
Personal income tax	0.40***	0.39***
	(4.80)	(4.74)
Payroll taxes	–	–
Indirect taxes	0.21***	0.24***
	(2.67)	(2.97)
Tax morale	-0.22***	-0.21***
	(2.51)	(2.38)
Unemployment	0.55***	0.53***
	(5.56)	(5.47)
Business freedom	-0.35***	-0.35***
	(4.06)	(4.20)
Self-employment	0.33***	0.27***
	(3.18)	(2.57)
Rule of Law	-0.08	–
	(1.03)	

Econometric results

Table 3 MIMIC model estimations (standardized coefficients) – Part 2

Specification	4	5
Causes		
GDP growth	0.27***	0.29***
	(3.35)	(3.52)
Education	-0.31***	-0.26***
	(3.51)	(2.83)
Corruption	–	0.14
		(1.56)
Indicators	-0.51	-0.50
GDP pc	0.10*	0.08
	(1.69)	(1.26)
Currency in circulation	-0.50***	-0.51***
	(6.48)	(6.46)
Labour force participation	-0.51	-0.50
Observations	151	151
Degrees Freedom	52	52
Chi-square	32.51	34.57
RMSEA	0.00	0.00

Note: **The sample includes 39 OECD countries and the estimation period is 1998 to 2010. Absolute z-statistics are reported in parentheses. * , **, *** indicate significance at the 10%, 5%, and 1% level, respectively.**

Results – 2 Size and Development of the Shadow Economy of 10 transition, 6 developing and 23 highly developed OECD Countries

(1) In most countries, the shadow economy increases in the year 2009, which is due to the world financial and economic crisis.

(2) The countries with the largest shadow economies are Bulgaria, Romania and Turkey with 34.6%, 32.2%, and 30.6%, respectively; average values over 1999-2010.

Results – 2 Size and Development of the Shadow Economy of 10 transition, 6 developing and 23 highly developed OECD Countries

(3) The following table 3.3.1 present the size and development of the shadow economies of 10 transition and 6 developing countries:

(i) The Slovak Republic and the Czech Republic have the lowest shadow economies with an average value of 17.5% and 17.6% of official GDP, respectively.

(ii) Bulgaria has the largest with an average value of 34.6%, followed by Romania with 32.2%, Turkey (30.6%), Mexico (30.0%), Cyprus (27,7%) and Malta (27.3%).

Results – 2 Size and Development of the Shadow Economy of 10 transition, 6 developing and 23 highly developed OECD Countries

Table 3.3.1: Size and development of the shadow economy (in % of GDP)[1)] in 10 transition and 6 developing OECD countries – Part 1

Country/Year	1999	2000	2005	2008	2009	2010	Ø
Bulgaria	37.3	36.9	34.1	33.7	32.1	31.9	34.6
Chile	19.9	19.8	18.9	19.1	20.5	19.8	19.4
Cyprus	29.2	28.7	27.7	27.7	26.9	25.4	27.7
Czech Rep.	19.3	19.1	17.8	15.2	15.7	15.5	17.6
Estonia	-	25.6	23.4	20.8	24.3	22.5	21.7
Hungary	25.4	25.1	24.0	23.1	23.1	23.1	24.1
Korea, Rep.	28.3	27.5	26.3	25.6	24.5	24.7	26.3
Latvia	23.9	23.6	21.5	22.6	20.0	21.5	22.1
Lithuania	27.2	27.1	24.4	26.0	23.6	25.4	25.4
Malta	27.4	27.1	27.3	27.0	26.7	28.1	27.3

Results – 2 Size and Development of the Shadow Economy of 10 transition, 6 developing and 23 highly developed OECD Countries

Table 3.3.1: Size and development of the shadow economy (in % of GDP)[1)] in 10 transition and 6 developing OECD countries – Part 2

Country/Year	1999	2000	2005	2008	2009	2010	Ø
Mexico[2]	30.8	30.1	29.9	30.0	30.0	30.0	30.0
Poland	27.7	27.6	26.9	24.7	24.6	23.8	26.4
Romania	34.3	34.4	31.7	31.5	30.0	30.9	32.2
Slovak Rep.	18.9	18.9	17.6	16.0	15.8	15.8	17.5
Slovenia	27.3	27.1	25.8	24.6	23.5	23.7	25.7
Turkey	32.7	32.1	30.0	28.6	29.4	29.0	30.6
Average of 16 countries	27.3	26.9	25.5	24.8	24.4	24.4	25.7
Average of 39 OECD	20.9	20.7	19.9	19.2	19.3	19.3	20.0

Source: Estimates before 2007 are taken from Buehn and Schneider (2012).

1) Data for 2009 and 2010 are not available for all causes, hence 2009 and 2010 estimates are a linear interpolation of the 2008 estimate and the country average.

Results – 2 Size and Development of the Shadow Economy of 10 transition, 6 developing and 23 highly developed OECD Countries

Table 3.3.2: Size and development of the shadow economy (in % of GDP)[1] in 23 highly developed OECD countries – Part 1

Country/Year	1999	2000	2005	2008	2009	2010	Ø
Australia	14.4	14.3	13.7	13.2	13.5	13.4	13.8
Austria	10.0	9.8	9.8	9.5	9.7	10.6	9.8
Belgium	22.7	22.2	21.8	20.3	20.5	20.7	21.5
Canada	16.3	16.0	15.5	14.9	15.5	15.4	15.6
Denmark	18.4	18.0	17.6	15.3	16.2	16.2	17.3
Finland	18.4	18.1	17.4	16.4	16.7	16.8	17.4
France	15.7	15.2	14.8	14.0	14.5	14.6	14.8
Germany	16.4	16.0	16.0	14.8	14.6	15.1	15.7
Greece	28.5	28.7	26.9	26.0	25.3	25.1	27.0
Iceland	16.0	15.9	15.1	13.8	14.7	14.4	15.2
Ireland	16.1	15.9	15.6	15.9	17.5	16.5	16.1
Italy	27.8	27.1	27.1	26.7	26.5	26.7	26.9
Japan[2]	11.4	11.2	10.7	11.0	11.0	11.0	11.0
Luxembourg	10.0	9.8	9.7	9.1	9.3	9.6	9.6
Netherlands	13.3	13.1	13.2	12.7	12.9	13.6	13.2

Results – 2 Size and Development of the Shadow Economy of 10 transition, 6 developing and 23 highly developed OECD Countries

Table 3.3.2: Size and development of the shadow economy (in % of GDP)[1] in 23 highly developed OECD countries – Part 2

Country	1999	2000	2005	2008	2009	2010	Ø
New Zealand	13.0	12.8	12.1	11.8	12.0	12.0	12.2
Norway	19.2	19.1	18.5	17.7	18.6	18.2	18.6
Portugal	23.0	22.7	23.3	21.9	22.0	22.2	22.7
Spain	23.0	22.7	22.4	22.9	24.5	23.5	22.8
Sweden	19.6	19.2	18.6	17.7	17.9	18.1	18.6
Switzerland	8.8	8.6	8.5	7.2	7.8	8.0	8.3
United Kingdom	12.8	12.7	12.4	12.1	12.9	12.0	12.5
United States	8.8	8.7	8.5	8.6	9.3	9.1	8.7
Average of 23 countries	16.7	16.4	16.1	15.4	15.8	15.8	16.1
Average of 39 OECD	20.3	20.7	19.9	19.2	18.3	18.3	20.3

Source: Estimates before 2007 are taken from Buehn and Schneider (2012).

1) Data for 2009 and 2010 are not available for all causes, hence 2009 and 2010 estimates are a linear interpolation of the 2008 estimate and the country average.

Results – 3 The Driving Forces of the Shadow Economy

(1) We now present the average relative impact of the driving forces in 10 transition and 6 developing OECD countries between 1998 and 2010.

(2) Indirect taxes contribute the most to variations of the shadow economy in Mexico, Malta, Bulgaria, Estonia and Cyprus.

(3) The unemployment rate is a very important relative impact in the Slovak Republic, in Poland and in Bulgaria.

Results – 3 The Driving Forces of the Shadow Economy

(4) In Korea and Turkey, the state of the official economy measured by self-employment is the most important driving force.

(5) Tax morale – a "soft" factor – is very important in Lithuania and Romania.

(6) GDP growth is a minor factor in either of the 10 transition and 6 developing countries.

Results – 3 The Driving Forces of the Shadow Economy

(7) Table 3.4.1 shows the average relative influence (in %) of the causal variables on the size and development of the shadow economies for 10 transition and 6 developing countries between 1999 and 2010.

(8) Table 3.4.1 shows also that indirect taxation, self-employment and unemployment are the most influential determinants of the shadow economy for the majority of countries.

Results – 3 The Driving Forces of the Shadow Economy

(9) The average values indicate that indirect taxes have by far the biggest influence (33.1%) across countries.

(10) It is followed by:

(i) self-employment with an average relative impact of 25.2%,

(ii) the unemployment rate (18.7%),

(iii) tax morale (8.4%),

(v) the business freedom index (7.0%),

(vi) the personal income tax (6.4%), and

(vi) GDP growth with an average relative impact of 1.2% only.

Results – 3 The Driving Forces of the Shadow Economy

(11) The *personal income tax* shows a large variance with respect to the relative impact on the shadow economy; it has a relatively large impact in Hungary (12.3%) and in Estonia (10.0%), while it is negligible in Chile (1.8%) and Mexico (2.3%).

(12) The relative impact of *indirect taxes* is largest in Mexico (42.1%), followed by Malta (39.7%); the relative impact of indirect taxes is smallest in Romania (24.5%) and Korea (27.3%).

Results – 3 The Driving Forces of the Shadow Economy

(13) The *tax morale* variable has the highest relative impact in Lithuania with an average value of 17.5% and the lowest in Turkey (0.7%).

(14) The *unemployment* variable has the largest impact in the Slovak Republic (34.9%), followed by Poland (26.1%); it is smallest in Mexico (5.9%), Korea (9.8%) and Cyprus (11.2%).

(15) Self-employment is on average most important in Korea (44.3%), Turkey (41.4%), Romania (37.7%) and Mexico (33.8%)

Results – 3 The Driving Forces of the Shadow Economy

Table 4 **Average relative impact (in %) of the causal variables on the shadow economy of 10 transition and 6 developing OECD countries over 1999 to 2010 – Part 1**

Country	Average size of the shadow economy	Relative impact of						
		Personal income tax	Indirect taxes	Tax morale	Unem-ployment	Self-employ-ment	GDP growth	Business freedom
Bulgaria	34.6	5.1	37.7	5.7	25.9	17.5	1.9	6.2
Chile	19.4	1.8	35.3	5.5	17.3	32.7	0.8	6.7
Cyprus	27.2	4.3	35.9	9.1	11.2	29.9	0.8	8.7
Czech Rep.	17.6	7.8	30.7	9.4	19.0	23.5	1.2	8.3
Estonia	21.7	10.0	36.0	11.7	21.8	10.4	1.8	8.3
Hungary	24.1	12.3	34.9	6.4	18.6	18.5	1.2	8.0
Korea	26.3	5.7	27.3	3.4	9.8	44.3	1.4	8.0
Latvia	22.2	8.2	32.3	13.3	23.3	14.6	1.8	6.6
Lithuania	25.4	9.0	28.8	17.5	19.9	17.1	1.5	6.1
Malta	27.3	5.9	38.7	3.2	20.0	21.2	0.8	8.3

Results – 3 The Driving Forces of the Shadow Economy

Table 4 **Average relative impact (in %) of the causal variables on the shadow economy of 10 transition and 6 developing OECD countries over 1999 to 2010 – Part 2**

Country	Average size of the shadow economy	Relative impact of						
		Personal income tax	Indirect taxes	Tax morale	Unem-ployment	Self-employ-ment	GDP growth	Business freedom
Mexico	30.0	2.3	42.1	10.2	5.9	33.8	0.4	5.3
Poland	26.4	6.1	27.8	7.8	26.1	25.7	1.3	5.3
Romania	32.2	4.2	24.5	14.2	13.1	37.7	1.1	5.2
Slovak Rep.	17.5	4.8	31.7	6.4	34.9	13.7	1.5	7.1
Slovenia	25.2	9.6	33.9	9.6	15.4	21.7	1.2	8.6
Turkey	30.6	4.9	31.4	0.7	16.4	41.4	0.6	4.6
Average over 16 countries	25.5	6.4	33.1	8.4	18.7	25.2	1.2	7.0
Average over 38 OECD	20.2	13.1	29.4	9.5	16.9	22.1	0.9	8.1

Results – 3 The Driving Forces of the Shadow Economy

Table 4 **Average relative impact (in %) of the causal variables on the shadow economy of 22 highly developed OECD countries over 1999 to 2010 – Part 1**

Country	Average size of the shadow economy	Relative impact of						
		Personal income tax	Indirect taxes	Tax morale	Unem-ployment	Self-employ-ment	GDP growth	Business freedom
Australia	13.8	21.3	25.4	7.4	15.8	19.3	0.9	9.9
Austria	9.8	18.5	27.4	11.6	12.1	20.5	0.8	9.1
Belgium	21.5	19.2	20.2	19.1	16.5	17.3	0.4	7.2
Canada	15.6	22.1	17.5	7.7	19.2	22.4	0.7	10.4
Denmark	17.3	34.6	33.5	4.0	9.5	9.9	0.3	8.2
Finland	17.4	19.7	29.1	8.7	18.6	15.2	0.8	7.9
France	14.8	12.8	24.3	15.5	23.2	15.1	0.4	8.6
Germany	15.7	16.6	24.2	8.3	24.3	16.9	0.6	9.1
Greece	27.0	5.8	21.8	10.4	18.0	37.6	0.7	5.7
Iceland	15.2	19.9	39.7	6.5	7.1	17.9	0.6	8.2
Ireland	16.1	12.5	36.4	7.9	12.5	21.3	1.0	8.5
Italy	26.9	15.6	18.9	9.0	18.6	31.0	0.1	6.8

Table 4 **Average relative impact (in %) of the causal variables on the shadow economy of 22 highly developed OECD countries over 1999 to 2010 – Part 2**

Country	Average size of the shadow economy	Relative impact of: Personal income tax	Indirect taxes	Tax morale	Unem-ployment	Self-employ-ment	GDP growth	Business freedom
Luxembourg	9.6	13.2	33.4	20.0	10.4	11.9	1.2	9.8
Netherlands	13.2	13.6	32.5	13.0	10.4	19.7	0.8	10.0
New Zealand	12.2	21.8	25.4	8.4	11.9	22.9	0.6	9.1
Norway	18.6	21.2	31.5	12.5	10.8	13.0	0.5	10.5
Portugal	22.7	8.1	29.9	8.7	14.6	31.1	0.4	7.2
Spain	22.8	10.6	17.9	10.4	29.2	23.8	0.6	7.5
Sweden	18.6	23.5	30.6	8.7	15.2	13.2	0.8	8.0
Switzerland	8.3	17.7	30.7	9.0	9.6	23.8	0.5	8.7
UK	12.5	18.2	30.8	8.1	14.3	18.0	0.6	9.9
United States	8.7	27.5	5.1	13.2	22.0	16.0	0.9	15.4
Average over 22 countries	16.3	17.9	26.6	10.4	15.6	19.9	0.6	8.9
Average over 38 countries	20.2	13.1	29.4	9.5	16.9	22.1	0.9	8.1

Policy Conclusions

Summarizing:

The average relative impact of the causal variables on the shadow economy across the 10 transition and 6 developing countries between 1999 and 2010 is the following:

(i) indirect taxes have by far the largest relative impact (33.1%),

(ii) followed by self-employment (25.2%),

(iii) unemployment (18.7%),

(iv) tax morale (8.4%) and

(v) business freedom (7.0%).

Policy Conclusions

(1) Besides the indirect tax and personal income tax burden, which the government can directly influence by policy actions, self-employment and unemployment are very important.

(2) Unemployment may be controllable by the government through economic policy in a traditional Keynesian sense.

(3) The impact of self-employment on the shadow economy is only partly controllable and may be ambiguous from a welfare perspective.

Policy Conclusions

(4) Government can deregulate the economy or incentivize "to be your own entrepreneur", which would make self-employment easier.

(5) Such actions however need to be accompanied with a strengthening of institutions and tax morale to reduce the probability that self-employed shift reasonable proportions of their economic activities into the shadow economy.

(6) Our paper clearly shows that a reduction of the shadow economy can be achieved using various channels the government can influence.

Policy Conclusions

(7) The main challenge still is to bring shadow economic activities into the official economy in a way that goods and services previously produced in the shadow economy are still produced and provided but in the official economy.

(8) Only then, the government gets additional taxes and social security contribution.

Figure 1: Size and development of the shadow economy of Austria, France, Germany, Italy and Spain

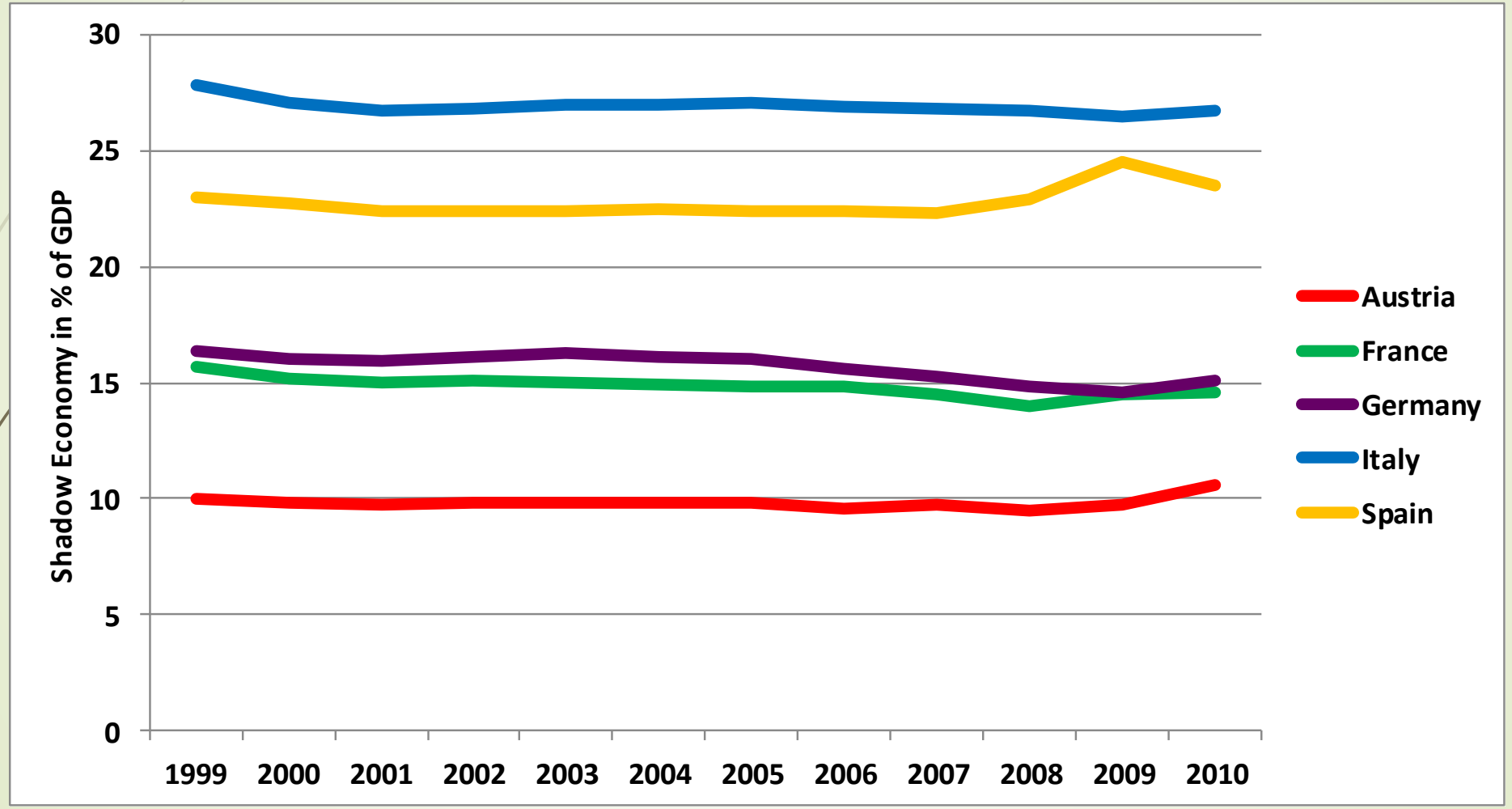


Table 5: The relative impact of the causal variables on the shadow economy of AUSTRIA over 1998 to 2010

Austria Year	Personal Income Tax (PIT)	Indirect taxes	Tax morale	Un-employ-ment	Self-employment	GDP growth	Business freedom
1998	19.2%	28.1%	8.4%	12.3%	21.5%	1.7%	8.9%
1999	19.6%	28.7%	8.7%	10.9%	21.6%	1.5%	9.0%
2000	19.0%	28.8%	9.5%	10.4%	21.5%	1.8%	9.0%
2005	17.2%	27.1%	12.4%	14.4%	19.7%	0.8%	8.4%
2008	18.4%	25.5%	14.6%	10.6%	20.4%	0.8%	9.8%
2009	17.2%	25.1%	14.2%	13.0%	19.4%	1.9%	9.2%
2010	17.8%	25.6%	14.5%	12.0%	20.4%	0.8%	8.8%
Average	18.4%	27.2%	11.8%	12.1%	20.5%	1.1%	9.0%

Table 5: The relative impact of the causal variables on the shadow economy of FRANCE over 1998 to 2010

FRANCE Year	Personal Income Tax (PIT)	Indirect taxes	Tax morale	Un-employ-ment	Self-employment	GDP growth	Business freedom
1998	11.0%	22.2%	16.6%	26.4%	14.6%	1.1%	8.0%
1999	11.5%	22.1%	16.7%	26.3%	14.3%	1.1%	8.1%
2000	12.6%	23.3%	17.3%	24.1%	14.4%	1.2%	7.2%
2005	13.7%	24.8%	15.0%	22.9%	15.3%	0.5%	7.9%
2008	14.0%	25.3%	13.5%	20.6%	15.6%	0.3%	10.6%
2009	12.7%	24.3%	12.7%	23.8%	15.2%	1.4%	9.9%
2010	13.4%	25.1%	13.2%	22.2%	15.6%	0.4%	10.2%
Average	12.8%	24.3%	15.4%	23.1%	15.1%	0.7%	8.7%

Table 6: The relative impact of the causal variables on the shadow economy of GERMANY over 1998 to 2010

GERMANY Year	Personal Income Tax (PIT)	Indirect taxes	Tax morale	Un-employ-ment	Self-employment	GDP growth	Business freedom
1998	17.0%	21.4%	11.8%	25.8%	16.4%	1.0%	6.7%
1999	17.2%	22.6%	11.4%	23.4%	16.0%	0.9%	8.4%
2000	17.8%	23.0%	11.0%	21.8%	16.4%	1.4%	8.6%
2005	14.2%	23.5%	7.2%	29.3%	17.3%	0.4%	8.0%
2008	18.0%	26.3%	5.7%	21.1%	17.4%	0.6%	11.0%
2009	17.1%	26.6%	5.6%	21.1%	16.8%	2.0%	10.7%
2010	17.1%	26.0%	5.6%	21.8%	17.1%	1.8%	10.7%
Average	16.5%	24.1%	8.3%	24.2%	16.9%	0.9%	9.1%

Table 7: The relative impact of the causal variables on the shadow economy of ITALY over 1998 to 2010

ITALY Year	Personal Income Tax (PIT)	Indirect taxes	Tax morale	Un-employ-ment	Self-employment	GDP growth	Business freedom
1998	13.6%	18.1%	8.5%	23.6%	29.9%	0.4%	5.9%
1999	14.6%	18.4%	8.3%	22.8%	29.5%	0.5%	5.9%
2000	14.0%	18.4%	8.5%	21.7%	30.2%	1.2%	6.1%
2005	15.4%	19.8%	9.2%	17.1%	31.6%	0.0%	6.7%
2008	17.6%	18.5%	9.3%	15.3%	31.0%	0.8%	7.6%
2009	17.1%	17.6%	9.0%	17.2%	29.4%	2.1%	7.5%
2010	17.4%	18.7%	9.3%	15.6%	31.0%	0.3%	7.7%
Average	15.6%	18.8%	9.0%	18.4%	30.9%	0.6%	6.8%

Table 8: The relative impact of the causal variables on the shadow economy of SPAIN over 1998 to 2010

SPAIN Year	Personal Income Tax (PIT)	Indirect taxes	Tax morale	Un-employ-ment	Self-employment	GDP growth	Business freedom
1998	8.7%	18.2%	8.0%	35.2%	22.9%	1.3%	5.7%
1999	9.0%	20.4%	8.1%	31.7%	23.2%	1.4%	6.2%
2000	9.1%	21.5%	8.7%	29.8%	23.0%	1.5%	6.5%
2005	11.2%	18.7%	11.7%	24.1%	25.4%	0.8%	8.0%
2008	12.1%	14.7%	12.0%	28.7%	23.8%	0.3%	8.6%
2009	9.8%	11.5%	10.4%	39.6%	19.8%	1.6%	7.3%
2010	11.7%	14.3%	11.7%	31.0%	22.9%	0.2%	8.1%
Average	10.7%	17.8%	10.6%	28.7%	23.8%	0.9%	7.6%

References

- **Shadow Economies in 10 Transition and 6 Developing OECD Countries: What are the Driving Forces? By Friedrich Schneider and Andreas Buehn *(May, 2013)***
- **Review Article.** Friedrich Schneider, Andreas Buehn **Shadow Economy: Estimation Methods, Problems, Results and Open questions** Open Economics 2018; 1: 1–29


Thank
you