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Shadow economy, tax policies, institutional weakness and financial stability in selected OECD countries

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Abstract

We investigate the effect of taxation, corruption and financial stability on the shadow economy in 23 OECD countries. For this purpose, we use a panel framework and a difference-in-difference system-GMM model over the period 2001 to 2013. While the taxation effects are assessed through the corporate income tax and the average tax wedge, the banking sector Z-score computed based on four different models represents our proxy for the financial system stability. Our results show that only the average tax wedge by family has a positive influence on the shadow economy dynamics, whereas the effect of corporate income tax proves insignificant. Further, our findings indicate a negative influence of the financial stability on the shadow economy, but the significant effect depends on how the Z-score is calculated. Finally, the corruption perception positively impacts the shadow economy dynamics. All in all, our outcomes support the idea that excessive tax burden, financial instability and institutional weaknesses range among the factors influencing the shadow economy.

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1. Introduction

Analyses of the shadow economy determinants are scarce in the economic literature. However, it is commonly accepted that countries with higher levels of corruption also tend to have a wider shadow economy. In addition, increased levels of taxation or uncertainty about tax policies might incentivize economic agents to participate in a parallel economy. On the contrary, the impact of the financial and economic stability on the shadow economy is practically unknown. In this context, the purpose of the present paper is to provide a response to the following questions: Is the lack of financial stability a determinant factor of the shadow economy? How does the economic instability influence the size of the shadow economy?

Our paper makes three contributions to the literature. First, we investigate the role of financial stability and we associate it with a low-risk probability manifested in the banking sector, measured through the Z-score. Second, the macroeconomic stability is associated with a low level of the unemployment rates. Finally, we analyze the situation of the Organisation for Economic Co-operation and Development (OECD) countries and we take into account stationarity and endogeneity issues, using a difference-in-difference system-GMM model (Generalized Method of Moments) over the period 2001 to 2013.

The impact of institutional weaknesses on the shadow economy and tax evasion was already investigated by the early literature. But what do we understand by shadow economy, and how is the corruption measured? The shadow economy, also called underground, informal, or parallel economy, covers, according to Lippert and Walker (1997), both illegal activities (monetary and nonmonetary), and legal activities which are taxable but that are not reported to tax authorities. In the second case, the shadow economy is associated with tax evasion and tax avoidance. Corruption also takes different forms. As Martini (2014) shows, corruption manifests as bribery, revenue fraud, embezzlement, extortion, nepotism, regulatory capture, collusion between tax officers and tax payers, political interference and revolving doors. The corruption is usually assessed through the corruption-level perception, based on different surveys conducted on business people and analysts.

While several papers (i.e. Dreher *et al.*, 2009) sustain that shadow economy and corruption are substitutes, in line with other works (Johnson *et al.*, 1997; Hindriks *et al.*, 1999) we consider that their complementarity cannot be neglected. The mechanism throughout corruption impacts shadow economy is explained in the theoretical model of Johnson (1997). Entrepreneurs are determined to operate in the shadow economy because corruption is considered an extra tax, adding to the regulatory burden. In the same line, Hindriks *et al.* (1999) shows that tax inspectors under-reports the taxpayer's liability, in exchange for a bribe.

Several studies investigate the interdependence between corruption and shadow economy. For example, Çule and Fulton (2009) develop a theoretical model and highlight the existence of multiple equilibriums between business and tax inspection culture, underlying the role of tax evasion and corruption. Nawaz (2010) shows that corruption affects tax administration and has a negative impact on the levels of tax revenues, thus favoring the underground economy. Biswas *et al.* (2012) study how the shadow economy affects pollution and what the role is of the corruption levels in public administration. More recently, González-Fernández and González-Velasco (2014) study the relationship between the shadow economy and corruption as determinants of public debt in Spain. A different perspective is proposed by Dell'Anno and Teobaldelli (2015) who evaluate the effects of governmental decentralization on the shadow economy and corruption in 145 states.

The impact of taxation on the shadow economy is, however, less debated. In general, a high tax burden is considered favorable for the corruption climate, positively impacting the shadow economy. A series of studies ascertain that increased tax burdens are among the main causes of the shadow economy (Giles, 1999; Tanzi, 1999; Schneider, 2005, 2009). Indeed, increased labor taxation is associated with the incentive to reduce the tax wedge and to engage in the shadow economy. Corruption often intervenes in this relationship. In addition, the decision to increase taxation usually comes with new regulations. As Johnson *et al.* (1998) state, an increased intensity of regulations on the labor market and labor restrictions for immigrants, reduce the possibility of individuals to work in the official economy. In this line, Awasthi and Bayraktar (2015) investigate the link between tax simplification and corruption in tax administration, and find a positive relationship. Timmons and Garfias (2015) show that new information about corruption obtained from different municipal audit reports in Brazil affects municipal property tax collection and the structure of fiscal institutions.

In addition, the impact of tax policies on the shadow economy can also be assessed through the well-known Laffer curve that shows the relationship between the rates of taxation and the resulting levels of government revenue. Increased levels of taxation might generate a decrease in tax revenues. This happens because the shadow economy increases when the tax burden is high, or when tax policies are characterized by uncertainty. An endogeneity issue arises in this relationship, as shadow economy also affects the taxation level. Busato and Chiarini (2013) exploit this channel. The authors calculates various Laffer curves for income and corporate taxation in an economy with shadow sector and reports a significant impact of the shadow economy on taxation.

Financial stability can also have an important effect on the shadow economy. On the one hand, a stable financial system ensures the access to finance, and favors the investments. On the other hand, the financial instability diminishes the revenues of firms (the access to finance and investments is blocked), and pushes companies to develop illegal activities, or forces them to avoid taxes. Usually the financial stability is associated with the solidity of the banking system, due to the central role played by these institutions within the financial sector. If, for example, economic agents seek loans in order to undertake risky investment projects, they have disincentives to comply with tax obligations (Blackburn *et al.*, 2012). At the same time, the risks accumulated by the banking sector increase. This also happens because the corruption level influences the banks' risk-taking behavior (Chen *et al.*, 2015). The time-varying Z-score (advanced by Boyd and Graham, 1986) is a risk measure commonly used to reflect a bank's probability of insolvency, or the risk of the entire banking sector. Consequently, in the present paper we use different metrics of the Z-score in order to test for the financial stability's impact on the shadow economy.

Finally, the economic stability is associated with acceptable values of macroeconomic indicators, reflected by the price stability, small levels of exchange rate fluctuations or a reduced unemployment rate. Two reasons underlie our choice to retain, in the analysis, the unemployment rate as a determinant of the shadow economy. First, it is well known that in economic contraction periods, people lose their jobs and become unemployed. During the same periods of time, firms struggle to survive and might decide to move a part of their activities into the shadow economy zone. Second, people who lose their jobs search for alternative revenue sources and might also begin to participate in the underground economy.

The rest of this paper is structured as follows: the next section presents the data and the methodology, the subsequent section shows the empirical results, the last section concludes.

2. Data and methodology

The level of the shadow economy (as percentage in the GDP) is taken from the CesIfo database, created based on Professor Schneider's research (for a recent update see Schneider *et al.*, 2015).

For measuring the corruption we use the Transparency International Corruption Perception Index (TICPI), which is scaled from 1 to 10 until 2011, and from 1 to 100 afterwards (for harmonization purposes we divide the index by 10 after 2011). It is constructed as an average index which takes higher values for a reduced corruption environment. Therefore, in order to associate higher index values with more rampant corruption, we follow Chen *et al.* (2015) and we assess the corruption level (CR) as follows: $CR = 10 - TICPI$.

On one hand, the tax level is measured based on the corporate income tax rate, and on the other hand it is measured using the average tax wedge (we consider the tax wedge for a one-earner married couple with two children, at 100% of average earnings). Both metrics come from the OECD database and are available starting with 2000.

As we have already affirmed, the financial stability is assessed through a time-varying Z-score, which can be viewed as the reverse of the probability of banks' insolvency. A higher value denotes a higher level of the banking sector soundness. Therefore, an increased financial stability (high Z-score) is expected to have a negative influence on the shadow economy level.

The general formula of the Z-score is the following (for a discussion regarding the way of computing Z-scores for panel data analysis, see Lepetit and Strobel, 2013):

$$Z_t = \frac{CAR_t + ROA_t}{\sigma_{ROA,t}} \text{ or } Z_t = \frac{\mu_{CAR,t} + \mu_{ROA,t}}{\sigma_{ROA,t}}, \quad (1)$$

where CAR represents the capital-to-assets ratio, ROA is the return on assets, μ is the moving mean and σ the standard deviation.

As in Lepetit and Strobel (2013), we use different approaches to compute the Z-score (Z). In all the cases, a rolling window of three years ($n = 3$) is used: (i) Z1 (Boyd et al., 2006) supposes the use of the moving mean and standard deviation $\mu_{CAR,t}(n)$, $\mu_{ROA,t}(n)$ and $\sigma_{ROA,t}(n)$, calculated for each period $t \in \{1 \dots T\}$; (ii) Z2 (Yeyati and Micco, 2007) supposes the use of moving mean $\mu_{ROA,t}(n)$ and standard deviation estimates $\sigma_{ROA,t}(n)$ calculated for each period $t \in \{1 \dots T\}$, and the combination with the current value of CAR_t; (iii) Z3 (Hesse and Čihák, 2007) takes into account the standard deviation $\sigma_{ROA,t}$ calculated over the full sample $[1 \dots T]$, and combines it with the current values of CAR_t and ROA_t; and (iv) Z4 (Lepetit and Strobel, 2013) uses the mean $\mu_{ROA,t}$ and the standard deviation $\sigma_{ROA,t}$ calculated over the full sample $[1 \dots T]$, and combines these with the current values of CAR_t. Z1 and Z2 are very similar and show a considerable decrease of the Z-score during crisis episodes. At the same time, Z3 and Z4 represent smoother methods to assess the dynamics of the banking system default probability.

Data on banking stability are available in the OECD database starting with 1999, until 2009. Starting with 2010, the data used for the Z-score calculation (CAR and ROA) come from the Financial Soundness Indicators – International Monetary Fund (IMF).[1]

In this paper, we use the unemployment rate as a proxy for the economic instability. The data are extracted from the OECD database. Because the Z-score calculation supposes a rolling window of three years, the starting point of our sample is 2001 and because the shadow economy

[1] For Sweden, the CAR data are not available in the IMF database starting with 2010. In addition, the data are partially missing for the United Kingdom over the entire time-span. Consequently, we have used the World Bank data (World Economic Indicators) for these countries. In addition, the ROA data for the United Kingdom banking sector come from FED St. Louis (FRED database).

data are provided by CesIfo until 2013, our sample stops in 2013. All in all, we have obtained a balanced panel for 23 OECD countries[2] over the 2001 to 2013 period (299 observations).

The descriptive statistics of our variables are presented in Table 1.

Table 1. Summary statistics

	SE	ATV	CIT	CR	Z1	Z2	Z3	Z4	UNR
Mean	15.11	27.37	28.66	7.476	82.82	82.18	19.69	19.66	7.537
SD	5.820	10.90	6.714	1.649	177.8	173.8	10.10	10.06	3.887
Min	6.600	-1.07	12.50	3.400	2.170	2.799	2.379	2.897	1.900
Max	32.40	43.07	40.87	9.900	1710	1631	58.46	58.22	26.10

Note: SE – shadow economy, ATV – average tax wedge, CIT – corporate income tax, CR – corruption perception index, Z – Z-score, UNR – unemployment rate.

Two observations should be made. First, in the case of the average tax wedge, a negative value is recorded for New Zealand from 2009 to 2011, showing that contributors benefitted from tax exemptions during the crisis period. Second, compared to Lepetit and Strobel (2013) who calculate the Z-score for individual banks, the standard deviation of the Z-score computed for the entire banking sector is considerably smaller, showing that the problems related to the presence of outliers is avoided.

We continue our analysis with the panel unit root tests in order to determine the most appropriate econometric model that should be used. However, given the fact that our sample is very heterogeneous and most panel unit root tests are based on the assumption of independent cross-section units, we apply three cross-sectional dependence tests (Friedman, 1937; Frees, 1995; Pesaran, 2004), which show that for our panel, the null of the cross-sectional independence is rejected. Therefore, we check the presence of panel unit roots using a second generation unit root test, namely the Pesaran cross-sectional Augmented Dickey–Fuller (pCADF) test (Pesaran, 2007).

The results of the panel unit root tests for all considered variables are presented in Table 2. In all the cases, the pCADF test does not reject the null of unit roots presence, except for the corporate income tax. Our series are then nonstationary and we use the first difference of these variables to avoid biased estimates. In addition, a reverse causality problem may arise, as the shadow economy represents an environment favorable for corruption. Indeed, the presence of tax evasion nourishes the corruption environment, if we consider the tax administrators. In addition, the shadow economy means less tax revenues collected, which forces the authorities to increase the tax burden to achieve the budgetary planning. Further, the shadow economy means fewer jobs created and thus might influence the unemployment rate.

Therefore, in order to overcome the endogeneity issues, we use a GMM framework. In addition, because we have a $N > T$ sample, we use the Blundell and Bond (1998) approach, derived from the estimation of a system of two simultaneous equations, one in level and the other in first difference. However, because our series are not stationary, we are forced to apply a difference-in-difference system-GMM framework, where the taxation, corruption and unemployment are considered endogenous variables, while the financial stability is exogenous.

[2] Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zeeland, Norway, Poland, Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States.

Table 2. Cross-sectional dependence and panel unit root tests

Cross-sectional dependence tests

Pearson CD Normal	Friedman Chi-square	Frees Normal			
		test	10%	5%	1%
19.89 (0.00)	99.34 (0.00)	4.444	0.198	0.262	0.390

Pesaran pCADF panel unit root test

	Without trend				With trend			
	t-bar	10%	5%	1%	t-bar	10%	5%	1%
SE	-0.803	-2.070	-2.170	-2.340	-0.924	-2.590	-2.690	-2.880
ATV	-1.918	-2.070	-2.170	-2.340	-2.064	-2.590	-2.690	-2.880
CIT	-2.224	-2.070	-2.170	-2.340	-3.649	-2.590	-2.690	-2.880
CR	-1.876	-2.070	-2.170	-2.340	-2.642	-2.590	-2.690	-2.880
Z1	-0.823	-2.070	-2.170	-2.340	-1.481	-2.590	-2.690	-2.880
Z2	-0.781	-2.070	-2.170	-2.340	-1.105	-2.590	-2.690	-2.880
Z3	-1.882	-2.070	-2.170	-2.340	-2.839	-2.590	-2.690	-2.880
Z4	-1.741	-2.070	-2.170	-2.340	-3.722	-2.590	-2.690	-2.880
UNR	-0.751	-2.070	-2.170	-2.340	-1.947	-2.590	-2.690	-2.880

Notes: (i) SE – shadow economy, ATV – average tax wedge, CIT – corporate income tax, CR – corruption perception index, Z – Z-score, UNR – unemployment rate; (ii) pCADF test with two lags.

3. Results

Because the Z-score measuring the financial stability is computed based on four different approaches (Z1, Z2, Z3, Z4), we proceed to the estimation of four models (Table 3).

Table 3. Difference-in-difference system-GMM results

ΔSE	Model 1	Model 2	Model 3	Model 4
C	-0.339***	-0.339***	-0.338***	-0.338***
	(0.023)	(0.023)	(0.022)	(0.022)
L(1)	0.019**	0.019**	0.013*	0.014*
	(0.008)	(0.008)	(0.008)	(0.008)
ΔATV	0.035***	0.034***	0.029**	0.029**
	(0.013)	(0.013)	(0.013)	(0.013)
ΔCIT	0.015	0.016	0.022	0.021
	(0.015)	(0.014)	(0.014)	(0.014)
ΔCR	0.213***	0.213***	0.190**	0.198**
	(0.079)	(0.079)	(0.079)	(0.079)
ΔZ1	-0.000			
	(0.000)			
ΔZ2		-0.000		
		(0.000)		
ΔZ3			-0.011***	
			(0.004)	
ΔZ4				-0.009**
				(0.004)
ΔUNR	0.192***	0.193***	0.191***	0.194***
	(0.014)	(0.014)	(0.014)	(0.014)
Observations	275	275	275	275
Groups	23	23	23	23

*Notes: (i) *, **, *** mean significance at 10 %, 5 % and 1 %; (ii) Standard errors are reported in brackets; (iii) GMM errors are used; (iv) The maximum number of the dependent variables lags, used as instruments, is established to 1, in order to avoid the instrument proliferation problem associated to the system-GMM; (v) ATV, CIT, CR and UNR are considered as endogenous variables;(vi) LP(1) is the first lag of the dependent variable.*

In all the situations, the tax wedge by family has a positive influence on the shadow economy, which shows that a higher taxation of individual revenues and higher social contributions lead to parallel economic activities. In addition, the corporate income tax has no significant influence on the shadow economy, although the sign of the coefficient is positive. This can be explained by a reduced variability of this variable (there are countries that have the same taxation rate over the entire time span).

As expected, the corruption has a positive influence on the shadow economy, in line with previous results reported in the literature. At the same time, the unemployment rate positively impacts the level of the shadow economy, showing that people who lose their jobs might enter into the underground economy to obtain alternative revenues. However, financial stability has a negative influence on the shadow economy only in the case of Models 3 and 4. Indeed, the first two measures of the Z-score show considerable drops in crisis periods, which is not the case for the shadow economy, that records only moderate fluctuations. However, the last two models propose a smooth computation of the Z-score, where $\sigma_{ROA,t}$ is calculated over the full sample. In these cases, the financial stability negatively influences the shadow economy.

4. Robustness analysis

In order to check for the robustness of our findings, we retain in our analysis a different time-span, namely 2003 to 2013. We have chosen 2003 as starting point because this year is considered the moment of an increased shadow economy around the world (for explanations, see Dell'Anno and Schneider, 2004). The new set of results is presented in Table 4, below.

Table 4. Difference-in-difference system-GMM: robustness results

ΔSE	Model 1	Model 2	Model 3	Model 4
C	-0.390***	-0.390***	-0.396***	-0.392***
	(0.026)	(0.026)	(0.026)	(0.026)
L(1)	0.005	0.005	0.065*	0.050
	(0.038)	(0.038)	(0.037)	(0.037)
ΔATV	0.041***	0.040***	0.033**	0.032**
	(0.013)	(0.013)	(0.013)	(0.013)
ΔCIT	0.022	0.015	0.031*	0.027
	(0.017)	(0.015)	(0.016)	(0.017)
ΔCR	0.191**	0.189**	0.146*	0.157*
	(0.083)	(0.083)	(0.080)	(0.081)
ΔZ1	-0.000			
	(0.000)			
ΔZ2		-0.000		
		(0.000)		
ΔZ3			-0.015***	
			(0.004)	
ΔZ4				-0.012***
				(0.004)
ΔUNR	0.198***	0.199***	0.197***	0.200***
	(0.013)	(0.013)	(0.013)	(0.013)
Observations	230	230	230	230
Groups	23	23	23	23

*Notes: (i) *, **, *** mean significance at 10 %, 5 % and 1 %; (ii) Standard errors are reported in brackets; (iii) GMM errors are used; (iv) The maximum number of the dependent variables lags, used as instruments, is established to 1, in order to avoid the instrument proliferation problem associated to the system-GMM; (v) ATV, CIT, CR and UNR are considered as endogenous variables;(vi) LP(1) is the first lag of the dependent variable.*

The new findings confirm our main results and show that an increased tax wedge by family favors shadow economy activities. Corruption also have a positive impact on the shadow economy, although the level of significance for the corruption coefficients is smaller compared with the main analysis. The banking stability negatively influences the shadow economy under Model 3 and Model 4, results that prove the robustness of our previous findings.

5. Conclusions

Tax policies and institutional weaknesses are important drivers of the shadow economy all over the world. The financial and economic stability should be added to these categories of determinants because an inappropriate access to finance or poor economic and social conditions favor the shadow economy.

This paper uses a panel framework for 23 OECD countries and tests the impact of taxation, corruption, and the financial and economic stability on the level of the shadow economy. Addressing both the stationarity and endogeneity problems, we show that the average tax wage, the corruption, and the unemployment rate have a positive impact on the shadow economy. While the corporate income tax has no significant influence, the financial stability negatively impacts the shadow economy, but this result is influenced by the modality of computing the banking sector Z-score – a proxy for the financial stability.

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