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Research Article

The Impact Of Electronic Payments On The Size Of The Shadow Economy

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ABSTRACT

The shadow economy is a multifaceted phenomena with many roots and consequences. The European Commission defines it as the unobserved part of the economy, which includes: (1) illegal activities in which the parties are willing participants in economic transactions, (2) hidden and underground activities in which the transactions are legal but are not reported to avoid official scrutiny, and (3) informal activities in which no records are kept. According to this definition, the shadow economy may be approximated by unreported transactions done by unregistered and registered companies.

This paper presents the impact of cashless payments on the size of the shadow economy. The empirical analysis of 57 countries over the period 2010-2015 shows a strong and persistent correlation between the size of the shadow economy and electronic payments volume. We specified the importance of the debit and credit card transactions as a main interested variable along with the GDP per capita, tax compliance, unemployment, agriculture production share in GDP as controlling variables, and the significant reducing effect of digital payment methods and size the informal economy.

Keywords: Shadow Economy, Credit cards, Electronic Payment, Payment Mechanism, JEL classification

INTRODUCTION

Tackling with underground (shadow) economy has always been central to policy reforms of governments. Due to its hidden nature, governments struggle to identify effective policies to reduce the hidden economic activities. Countries have exercised various instruments ranging from strict punitive measures to relaxed and incentivizing tax schemes; however, despite the numerous conducted reforms, some countries still face a persistent rising degree of economic

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informality (Schneider and Enste 2000). Most of the studies have explained supply-side motives of staying out of the informal economy by *arguing* evasion from the complexity of the tax system, fiscal and regulatory burden, corruption, unfriendly labor market regulations and conditions, inadequate governance and low economic freedom are the major contributors of the issue (Schneider and Enste 2000, Dreher et al. 2009) which in turn called governments for controlling and incentivizing business activities from different aspects. In some cases, too much control leads to further rise in the hidden economy by overburdening obedient legal entities who then decided to move into the illegal system or underreport their real income. At the same time, too much incentive leads to loss of potential government revenue, as explained by the Laffer curve. Another possible explanation is demand-side perspectives, which gained momentum in recent studies by Williams and Bezeredi (2017). The findings of these researches show the high propensity of consumers purchasing in the informal economy due to lower prices, social and redistributive rationals, and the failures of the formal economy in terms of the availability, speed and quality of goods and services. However, forcing consumers to buy in the formal economy may cause consumption distortion.

There is an optimum threshold for regulating and incentivizing schemes. Using excessive surveillance or incentive schemes for producers and consumers to curb the shadow economy may impose a burden on the supply and demand side of the economy and the government's regulatory bodies. That is why it is critical to analyze the means by which consumer and producer support their conduct of relationship, or the "bridge" supporting the flow of the goods from one party to another. Traditionally cash (paper notes) has been playing this role. The final goods and services are produced both in the informal and formal economy and are purchased by consumers, and most of the time, these transactions are carried out using cash (Schneider 2017). Analyzing the 36 highly developed countries by Schneider (2017) indicates that the larger the share of cash payments, the large the size of the shadow economy. Studies by Drehmann et al. (2002) and Bagnall et al. (2016) reveal that cash is still extensively used as a main mode of payment, especially in small volume transactions. So that countries have started to phase out traditional means of payment (cash) and massively encourage cashless payments to deter concealed transactions (Riccardi and Levi 2017).

The introduction of cheques, debit and credit cards has been the initial steps in transformation into cashless transactions. In this study, we analyze the significance of debit and credit cards on the size of the shadow economy as a whole due to their growing acceptance across countries compare to other substitutes.

Several related scientific works on this relatively new area find electronic cards an effective tool for eliminating cash use due to their cost-effectiveness and law enforcement due to their traceability. By analyzing 25 European Union countries from 2000-2012, Immordino and Russo (2016) show that debit and credit cards effectively curtail VAT evasion. Cohen et al. (2020) find that electronic payment systems have the premise to reduce shadow economy.

Another study by Sung et al. (2017) revealed that incentives for electronic payments helped to transform Korean economy into a more cashless economy, thereby reducing actual incomes and increasing income tax revenue by about 4.2 percent. Kearney and Schneider (2011) investigated components of the shadow economy in Europe using the MIMIC model (multiple indicators, multiple causes). They found the use of cash decreases traceability and increase anonymity of the transaction hence facilitating underreporting. In contrast, they indicate a strong negative relationship between electronic payments and the size of the underground economy. Similarly, Koyuncu and Ünal (2019) analyzed 135 countries for the year 2011 found debit and credit card

ownership ratio decreases anonymity and increases detection of the payments, contributing to the formal transaction and potentially contributing to negative correlation the size of the shadow economy.

MATERIALS AND METHODS

This paper attempts to empirically estimate to what extent cashless payment methods curb the informal economy's scope in developing and developed countries. The study includes observations from 57 countries (28 developed and 29 developing and less developed economies) over 2010-2015.

2.1 Dependent variable

The size of the shadow economy is used as an explained variable. The data are drawn from Medina and Schneider's (2018) calculations, estimated employing MIMIC (Multiple Indicator and Multiple Cause) models. The approach enables us to estimate the size of the shadow economy as a percentage share of GDP and its development over time by considering multiple causal and indicator variables (Schneider and Enste 2000). The average share of informality as for summary statistics shows 22.7 percent for all included 57 countries (see Table 1).

2.2 Independent variables

The study employs several debit card and credit card transactions as the main interested independent variable obtained from World Bank. The survey contains data on the volume of cashless payment and methods for 115 countries. Due to incomplete data points, we limited our analysis to 57 countries. Along with the concerned independent variable, we use a set of control variables (Dreher et al. 2009), specifically GDP per capita, unemployment rate, the share of agriculture in GDP, tax compliance, and the regulatory quality obtained from World Bank. The descriptive statistics of the key variables are presented in Table 1. Table 1 also shows the result correlation matrix and variance inflation factor (VIF) to check for possible leaner correlation between independent variables and tests discover that even there is a quite high correlation between some control variables, but VIF test shows the less overlapping effect of the variables. Considering the aforementioned theoretical explanation of variables, we formulate the following core hypotheses to carry out our empirical estimations:

Table 1

Descriptive statistics and correlation matrix

Hypothesis: H_{alt}: – The size of the shadow economy decreases with an increase in the volume of transactions carried out using debit and credit cards.

In the econometric analysis, we utilize a balanced longitudinal dataset. The panel data analysis allows us to control for unobserved heterogeneous country-specific and time effects. Our baseline equation consists of the following properties:

$$SE_{it} = \alpha + \beta X_{it} + \delta \acute{Z}_{it} + \varepsilon_{it}$$

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mean	**22.69**	**9.56**	**9.71**	**7.57**	**4.83**	**23 583**	**8.51**	**0.74**
Std.Dev.	**10.57**	**1.21**	**0.99**	**1.78**	**5.15**	**22 258**	**5.04**	**0.79**
VIF	**-**	**2.29**	**2.79**	**1.63**	**1.91**	**2.50**	**1.10**	**2.77**
1. Shadow Economy (GDP%)	1							
2. Credit card usage	-0.47	1						
3. Debit card usage	-0.59	0.71	1					
4. Tax compliance	-0.45	0.25	0.11	1				
5. Agriculture (GDP%)	0.56	-0.50	-0.49	-0.44	1			
6. GDP per capita	-0.64	0.41	0.53	0.46	-0.54	1		
7. Unemployment	0.01	-0.19	-0.18	-0.06	0.01	-0.19	1	
8. Regulatory quality	-0.77	0.46	0.56	0.49	-0.59	0.73	-0.11	1

Source: Authors calculation

$$i = 1, 2, 3, \ldots, N;$$
$$t = 2000, 2011, \ldots, T$$

where SE_{it} is i country's size of the shadow economy as a percentage of GDP in year t, the α denotes intercept, whereas β and δ symbolize standardized coefficients, the X stands for debit card or credit payment volumes, and $\acute{Z}$ refers to the set of controlling variables. The composite error term is denoted by the ε_{it}.

Due to the short nature (large N and small T) of our balanced fixed-panel dataset (Greene 2008), we follow Gujarati and Porters` (2009) suggestion to test our basic model, employing fixed and random effects model specifications. Besides accounting for cross-border relation between these variables, these models enable us to consider how various inclusive growth aspects within a country may affect the size and development of informality in an economy over time by treating country-specific heterogeneity differently in the analysis.

2.3 Analysis and discussion

Table 2 presents econometric results for the hypothesis set above. We start with the fixed effects estimates presented in Table 2. Eqn. (1) and Eqn. (2). In Eq.(1), we test the effect of the volume of debit card transactions on the size of the shadow economy and revealed negative correlations between them. It appears that 1 percentage point increase in the volume of debit card transactions is likely to reduce the size of the shadow economy by more than 2 percent, in ceteris paribus.

Similarly, credit card payment volume with a standardized coefficient that is statistically significant at 1 level also shows a negative effect on the size of the shadow economy (see Eq.(2)). Unlike debit card usage, credit card transaction has a lower negative effect on the share of informality in the economy: 1 percent increase in credit card payments reduces the underground economy's size by about 0.4 percent. It might be due to the lower rate of usage than debit cards.
Eq.(3) – Eqn. (4)) present random-effects model estimations that can withstand the stated disadvantages of the *FEM*. The results of the *REM* model strongly support our core hypothesis and report heteroskedasticity robust, standardized coefficients consistent with the results of Eqn. (1) - Eqn. (2) in Table 2. All concerned predictors have theoretically expected signs and conventional significance levels with minor deviations from previous findings. The results of the first two models (*FEM* and *REM*) are concluded with the Hausman specification test to check whether the nature of our panel data possesses fixed or random effects. The test is run for each equation separately (see Table 3), and except Eqn. (1) across all other specifications null hypothesis of nonsystematic difference in coefficients is rejected, implying individual effects are correlated with other regressors in the model, thereby favoring *FEM*.

Table 2

Estimation results: Determinants of the size of the shadow economy (% of the GDP)

	Fixed effect		**Random Effect**	
Shadow economy	Eq.(1)	Eq.(2)	Eq.(3)	Eq.(4)
Debit card payments	-2.425***			-2.380***
	(0.407)			(0.374)
Credit card payments		-0.444*	-0.527**	
		(0.242)	(0.236)	
Tax compliance	-0.777***	-1.232***	-1.114***	-0.836***
	(0.281)	(0.287)	(0.259)	(0.250)
Agriculture production (GDP%)	0.359***	0.408***	0.407***	0.373***
	(0.115)	(0.113)	(0.101)	(0.101)
GDP per capita	-0.000	-0.000*	-0.000***	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment	0.226***	0.205***	0.171***	0.180***
	(0.043)	(0.046)	(0.042)	(0.040)
Regulatory quality	-2.093***	-2.235***	-2.868***	-2.644***
	(0.630)	(0.671)	(0.628)	(0.593)
Constant	50.453***	36.693***	37.502***	52.316***
	(3.974)	(3.361)	(3.154)	(3.899)
Observations	*334*	*333*	*333*	*334*
Number of ID	*57*	*57*	*57*	*57*
R-squared	*0.400*	*0.325*	*0.55*	*0.59*
F-statistics	*0.000*	*0.000*	*0.000*	*0.000*

Robust standard errors in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

CONCLUSION

Most studies in determining principal factors of underground economy focus on either supply and demand-side aspects including critical significant fiscal and macroeconomic elements or separately examine social or institutional indicators. Payment methods considered a bridge between producer and consumer are also essential areas to focus on since most of the shadow economy is related to traditional payment methods (e.g. cash), which reduces effectively tracing tax authorities.

1. The incentive for using cash for sellers is the opportunity to underreport, and for consumers are convenience and cheaper prices (probably, due to avoid VAT) in the informal economy. These motives of both sides lead to matching interests conduct joint tax evasion. Using cashless payment methods increase traceability of transactions and enable governments to fight against tax evasion and the shadow economy.
2. To test the impact of the most widely used electronic payment methods on the size of the underground economy, we employ empirical analysis. Our empirical analysis involves observations from 57 advanced, developing, and less developed countries over 2010-2015. The results of the static panel models report high statistically significant levels for all interested variables, precisely the volume of transactions conducted using debit cards and credit cards. Both debit card and credit card involved transactions appeared to affect the size of the shadow economy negatively.

CONFLICT OF INTERESTS AND CONTRIBUTION OF AUTHORS

The authors declare the absence of apparent and potential conflicts of interest related to this article's publication and report on each author's contribution.

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