Using Ordinary Least Squares to Measure the Impact of the Factors Affecting Underground Economy: A Comparison between Pakistan and Turkey

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Abstract

Underground economy is a source of concern since it distorts policy framework of a country and weakens its government. This paper sheds light on developing countries that are in dire need of policies that tackle this issue and identifies the reasons as to why these countries have large shadow economies in the first place. Using secondary data from 2000-2013 and applying Ordinary Least Squares (OLS) regression model, the impact of tax revenue, unemployment rate, Index of Economic Freedom, population and GDP growth rates, inflation and internet users on the shadow economies of Pakistan and Turkey in absolute and comparative dimensions is tested. In the first part of the paper, the concept and significance of underground economy are discussed, the second part comprises literature review. The third, fourth and fifth parts of the study use OLS to estimate the impact of aforementioned variables on the size of underground economy. The paper concludes with a comparative analysis and suggests policies which can curtail the size of underground economies in the sample countries.

Keywords: Underground Economy, Ordinary Least Squares, Developing Countries

JEL Classification: E26, C10, O10

1.Introduction

In the literature, underground economy goes by several names; shadow, informal, unobserved, unrecorded, black and unofficial economy that refers to all the activities which are out of government's reach(Chaudhuri, Schneider, & Chattopadhyay, 2006). Like mainstream economy, underground economy produces goods and services, generates income and employs labor however unlike official economy, the output from this sector is neither taxed nor recorded or regulated (Weiss, 1987). Underground economy includes both legal and illegal activities. The types of activities which comprise underground economy are illustrated as under:

Table 1: Activities in the Underground Economy

Type of Activity	Monetary Transactions		Non Monetary Transactions	
ILLEGAL ACTIVITIES	Trade with stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud; etc.		Barter of drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
LEGAL ACTIVITIES	Unreported income from self-employment; wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbour help
1. Structure of the table is taken from Lippert and Walker ([1997], p. 5) with additional remarks.				

Source: (Schneider & Enste, 2000)

Since underground economy cannot be directly observed and is estimated through several different techniques, it is hard to state its size with complete precision however most cited estimates on underground economy have revealed that its weighted average size as a percentage of official GDP in Asia is 36.4%(Schneider, Buehn, & Montenegro, 2010).This is a relatively high figure and calls out for a look into the factors that are responsible for causing underground economy so that eventually policies can be devised to control these factors and to reduce its size. The hidden nature of underground economy means that social and economic conditions of individuals cannot be estimated with complete accuracy. If an individual is employed in underground economy, that figure will not be reported in official GDP and it will lead to overestimation of unemployment and underestimation of national income, drastically affecting macroeconomic and public policies. Since underground economy escapes taxes, it lowers tax revenue (Frey & Schneider, 2015) which has negative implications on the quality and provision of public goods and services. Furthermore, repercussions on the distribution of income is another adverse consequence (Gupta & Gupta, 1982). In order to compensate for the loss in tax revenue, governments are forced to raise revenue through tax rates which escalates the likelihood of tax evasion, thereby increasing the size of the underground economy further (Alkhdour, 2011). Hence, an economy gets traps in a vicious cycle which culminates in a weak state and adds to the lack of trust the public develops for the government.

The problems of underground economy are too many and damaging to neglect and the prolonged existence of the shadow economy would ultimately reduce the overall tax revenue and damage the macroeconomic policy framework hence it is important to look at this issue in detail, identify the root causes that determine its size and growth and devise policies that target those causes, bring most of the underground businesses to formal sector and enable the state and policy framework to become strong and efficient. Keeping the drastic consequences of underground economies and the large underground economies in developing countries that are in need of a reform in perspective, this study aims to identify the main determinants of underground economy, measure the impact of those determinants, conduct a cross-country comparison and arrive at measures to reduce the size of underground economies in Pakistan and Turkey.

2.Literature Review

Bulk of the literature on underground economy has treated it as a dependent variable and used its estimates from the studies conducted by Friedrich Schneider (2004, 2005; 2010). The extensive usage of these estimates indicates their authenticity. Keeping this in perspective, this study has made use of the latest estimates on the size of underground economy calculated in the study by Mai Hassan and Friedrich Schneider (2016). These estimates are used since they are the most recent ones and they are not used in any study to date. When it comes to the independent variables of this study, most of the studies have used tax rates and tax revenues to measure taxes. Tax rates take the form of indirect and direct taxes while tax revenue is used as a percentage of GDP. The studies have also identified that the impact of taxes cannot be seen in isolation rather its impact needs to be seen in combination with other variables especially with the regulatory framework in place. An efficient tax system is useless if there exists weak law enforcement(Alm, 2013; Halıcıoğlu, 1999; H. Hassan, 2016; Mehnaz Ahmed and Qazi Masood Ahmed, 1995; Savasan, 2003). According to the literature, both negative and positive relationship is observed between underground economy and inflation rate. When prices rise, the fall in real income prompts people to work in the official economy. At the same time, falling real incomes and lack of opportunities in the official economy also leads people to work in the shadow economy. The decision to operate in the shadow economy depends on other factors like tax morality, culture and expectations about the future price levels(Schneider, Chaudhuri, & Chatterjee, 2003). This means that the relationship between underground economy and inflation is ambiguous and requires further investigation. Most of the previous studies have measured inflation using consumer price index(Erdinç, 2016; Gulzar, Junaid, & Haider, 2010; Schneider & Bajada, 2003). There exists a debate on the relationship between unemployment and the size of shadow economy. According to Giles (1999), high unemployment and shadow economy are likely to be positively related since high unemployment in official economy will force people to operate in the informal economy while there could also be a negative relationship between the two since economic downturn would mean that unemployment exists in both official and unofficial economies. Unemployment in the previous studies has mostly been measured using unemployment rate as a percentage of total labor force. Its impact on the size of underground economy is influenced by other factors especially the level of education(Gulzar et al., 2010; M. Hassan & Schneider, 2016; Kanniainen, Pääkkönen, & Schneider, 2004; Saafi, Farhat, & Haj Mohamed, 2015; Sarac, 2012; Savasan, 2003).

Institutional quality and government regulations are widely discussed in the literature and there are numerous ways to measure them. Institutional quality has a negative relation with the shadow economy while high regulations tend to push up the business costs and force them to go underground. Most of the studies have identified index of corruption as the one most prevalent in developing countries (Dreher & Schneider, 2006; Elgin & Oztunali, 2014; B. A. Friedman, 2014; E. Friedman, Johnson, Kaufmann, & Zoido-Lobaton, 2000; Jamalmanesh, 2011; Nikopour, 2010). These studies has included indices for property rights, freedom from corruption, fiscal freedom, government spending, business freedom, trade freedom, investment freedom and financial freedom and test their impact on the size of underground economy. The average of all these indices has been taken to arrive at one overall index referred to as governance indicator/index of economic freedom.

With regards to the relationship between GDP and the size of underground economy, both positive and negative relationship has been observed. Most of the studies have made use of GDP/capita and annual GDP growth to measure GDP. With the development of literature on GDP overtime, it has been observed that its impact cannot be seen in isolation rather it is influenced by the institutional quality and governance(Elgin & Oztunali, 2014; Klinglmair & Schneider, 2004). Internet users have a negative relationship with the size of underground economy. This is because increased internet users raise awareness among the public about the drastic consequences of corruption. Since large underground economies give rise to high levels of corruption, an increase in internet users is likely to reduce the size of underground economy via reduction in the levels of corruption(Elbahnasawy, 2014; Elgin, 2012; Goel, Nelson, & Naretta, 2012; Shrivastava & Bhattacherjee, 2014).

According to the literature, there is no direct and clear link between population growth and shadow economy however it affects the level of corruption in developing countries. Most of the studies have established that shadow economy and corruption in developing countries are complements(Choi & Thum, 2005; Dreher, Schneider, Choice, & July, 2010; Johnson, Kaufmann, & Zoido-LobatóN, 1998)and the sample countries in our study especially Pakistan has high corruption level which has contributed towards their large underground economies. Since one of the factors leading towards corruption is population, particularly in developing countries, an indirect and positive link between underground economies and population growth via corruption can be established for this study. Apart from determining the size of underground economy through the channel of corruption, a high population growth, especially for developing countries, means more mouths to feed with limited resources and in such cases, people are forced to move underground since it offers them an income source. This puts an upward pressure on the size of underground economy.

From the reviewed literature, the following gaps are identified which this study aims to fill. They are:

1. Bulk of the work has been done on the underground economies of developed countries whereas developing countries are the ones in dire need of a reform hence their underground economies need to be looked at.
2. Previous studies have focused on measuring the size of underground economies whereas the reasons as to why these economies exist in the first place need to be investigated in depth.
3. Previous studies have identified ambiguity for unemployment and GDP which this study aims to investigate further. Internet users is a relatively new variable and its relation with the size of underground economy can be explored. Population is a variable relevant to developing countries and need to be looked at.
4. While previous studies have used older estimates of underground economy, this study is an extension since it uses the estimates from 2000-2013.

3. *Hypotheses*

The research model for this study is as under:
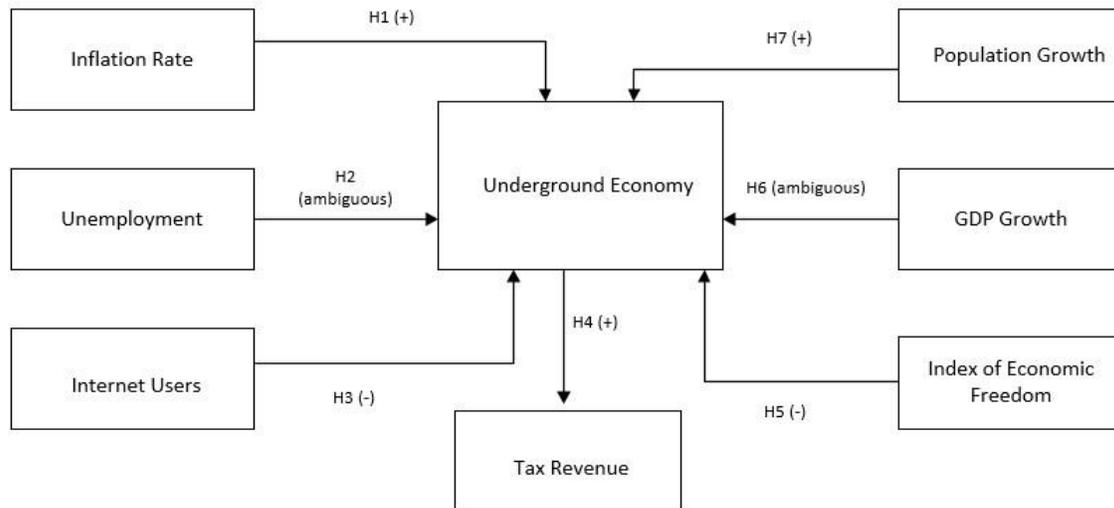
Source: Generated by the author herself using Microsoft Visio

The size of the underground economy in this study is determined by inflation rate, tax level, unemployment level, population growth, internet users, Index of Economic Freedom and GDP growth. The size of the underground economy is dependent while above mentioned determinants of underground economy are independent variables. The development of the hypotheses is done in the light of literature and economic theory. They are as under:

H1: *There is a positive relationship between the size of the underground economy and the inflation rate, ceteris paribus*

H2: *There is a significant relation between the size of underground economy and unemployment level but the direction of relationship is ambiguous, ceteris paribus*

H3: *There is a negative relationship between internet users and the size of the underground economy, ceteris paribus*

H4: *There is a positive relationship between the size of underground economy and tax revenue, ceteris paribus*

H5: *There is a negative relationship between Index of Economic Freedom and the size of underground economy, ceteris paribus*

H6: *There is a significant but ambiguous relationship between GDP growth and the size of underground economy, ceteris paribus*

H7: *There is a positive relationship between population growth and the size of underground economy, ceteris paribus*

4. *Research Methodology*

4.1. **Measurement of Variables:**

This is a quantitative study and has made use of annual secondary data from 2000-2013. The countries included in the study are Pakistan and Turkey. Data on underground economy has been gathered from Mai Hassan and Friedrich Schneider (2016). Data on Index of Economic Freedom is gathered from The Heritage Foundation. Data on remaining independent variables is taken from The World Bank. Ordinary Least Squares analysis has been used to estimate the model. Underground economy as a percentage of GDP is the dependent variable in this study and its measures are taken from Mai Hassan and Friedrich Schneider (2016). The study has measured underground economy for 157 countries (including sample countries) and has provided its most recent estimates from 1999-2013. With regards to independent variables, CPI has been used to measure inflation. This type of measure reflects changes in the cost to an average consumer of acquiring a basket of goods and services. This measure of inflation is employed by the study because it has been used widely in the literature as a suitable measure for capturing the change in prices overtime. Unemployment as a percentage of total labor force is used in order to capture both male and female rates of unemployment. Internet per 100 users has been used to measure the number of individuals who have used internet from any location in the past 12 months.

GDP growth refers to the annual growth rate of GDP at market prices based on local currency. Due to less usage of this type of GDP measure, this study has used it in order to check its impact on GDP growth. This variable, being more explanatory for the sample countries in this study, is also another reason of including it in the model. Tax revenue as a percentage of GDP has been used due to unavailability of data on tax rates, particularly for Pakistan. An overall governance index has been used comprising property rights, freedom from corruption, fiscal freedom, government spending, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom and financial freedom. This is the most crucial determinant of shadow economies across the globe hence this cannot be ignored in this study. Annual population growth for a year is the exponential rate of growth of midyear population from previous to current year expressed as a percentage. Population is one of those variables that has strong implications for developing countries. Previous studies which are mostly based on developed countries' underground economies have not made use of this variable therefore population growth is included in the model for this study in order to see its impact on developing countries' underground economies.

4.2. Model

The econometric form of the model is as under:

$Y = \alpha + \beta1 \pm \beta2 - \beta3 \pm \beta4 + \beta5 - \beta6 + \beta7 + \mu$

Where;
Y = Size of underground economy (% of GDP)
α = Constant
$\beta1$ = Inflation (CPI)
$\beta2$ = Unemployment (% of total labor force)
$\beta3$ = Internet users (per 100 users)
$\beta4$ = GDP growth (annual %)
$\beta5$ = Tax revenue (% of GDP)
$\beta6$ = Index of Economic Freedom (out of 100)
$\beta7$ = Population growth (annual %)
μ = Error term

5. Results

R-square for Pakistan is 0.87. The results of econometric estimation are as under:

H1: Inflation and underground economy (+)
Coefficient = - 0.11, t-stat = - 0.58, p-value > 0.05 ns
H2: Unemployment and underground economy (ambiguous)
Coefficient = - 0.45, t-stat = - 0.25, p-value > 0.05 ns
H3: Internet users and underground economy (-)
Coefficient = 0.40, t-stat = 0.67, p-value > 0.05 ns
H4: Tax revenue and underground economy (+)
Coefficient = 1.54, t-stat = 1.49, p-value > 0.05 ns
H5: Index of Economic Freedom and underground economy (-)
Coefficient = - 0.53, t-stat = - 0.81, p-value > 0.05 ns
H6: GDP growth and underground economy (ambiguous)
Coefficient = - 0.99, t-stat = - 3.23, p-value < 0.05 s
H7: Population growth and underground economy (+)
Coefficient = 10.46, t-stat = 0.78, p-value > 0.05 ns
For Pakistan, GDP growth is the significant variable at 5%

For Turkey, the R-square is highest at 0.88 which means that all the variables included in the model are most explanatory for Turkey. The estimated results are shown below:

H1: Inflation and underground economy (+)
Coefficient = 0.30, t-stat = 2.51, p-value < 0.05 s
H2: Unemployment and underground economy (ambiguous)
Coefficient = 1.71, t-stat = 2.96, p-value < 0.05 s
H3: Internet users and underground economy (-)
Coefficient = 0.63, t-stat = 2.87, p-value < 0.05 s

H4: Tax revenue and underground economy (+)
Coefficient = -1.66, t-stat = - 0.90, p-value > 0.05 ns
H5: Index of Economic Freedom and underground economy (-)
Coefficient = - 0.61, t-stat = - 2.33, p-value < 0.1 s (10%)
H6: GDP growth and underground economy (ambiguous)
Coefficient = - 0.09, t-stat = - 0.61, p-value > 0.05 ns
H7: Population growth and underground economy (+)
Coefficient = - 2.49, t-stat = - 0.43, p-value > 0.05 ns

Inflation, unemployment and internet users are significant for Turkey at 5% and Index of Economic Freedom is significant at 10%.

5.1. Comparative Analysis Between Pakistan and Turkey

The countries included in this study have one thing in common; Index of Economic Freedom and their underground economies are negatively related. This means that high quality institutions and governance is pivotal to reducing the size of underground economies in both sample countries. Positive relationship between population growth and the size of underground economy is observed for Pakistan and the opposite is true for Turkey. A likely explanation for this could be the fact that Turkey has relatively high level of literacy and even if it experiences a growth in its population, a literate population is likely to be absorbed in the formal economy. For Pakistan low level of literacy makes it difficult for people to find work in formal economy hence they are forced to move underground. A negative relationship between GDP growth and the size of underground economies is seen for both countries which means that increasing GDP makes the economy better off and reduces incentive to move to underground economy. Increase in internet users increases the size of underground economy in both countries which is not in line with the hypothesis of this study. Increased transparency and improved ICT will enable them to curtail the size of underground economy. High tax revenue leads to increase in underground economy for Pakistan but not Turkey. This indicates existence of an efficient fiscal framework and a wider tax base in Turkey as opposed to Pakistan. Tax morality is likely to be higher in Turkey which increases the willingness to pay taxes consequently less incentive to escape them by moving underground.

6. Conclusion

The first objective of this study was the identification of determinants of underground economy for emerging developing economies in Asia namely Pakistan and Turkey. Seven factors which determine the size of underground economy in these countries have been identified. The second and third objectives of the study have been achieved through using OLS regression model whereby the impact of seven variables namely inflation, unemployment, internet users, tax revenue, Index of Economic Freedom, GDP growth and population growth on the size of underground economy has been gauged. The results have been discussed along absolute and comparative dimensions. The final objective of the study is to recommend policies which can curtail the size of underground economy. The countries included in this study have underground economies ranging between 25-35% which is a large number and it is therefore important to have certain policy recommendations which can eventually curtail its size. Keeping the results of the study in consideration, it can be recommended that Pakistan can improve the efficiency of its tax system by widening tax base and lowering tax rates. Widening tax base would mean that the tax burden would be spread out and more tax payers would curtail the size of underground economy and increase tax revenue. Furthermore, tax collection system should be simple and comprehensive so that common people can understand it. This is likely to lessen the chances of tax evasion. Tax collection units should have staff that is efficient and honest in order to ensure proper tax revenue collection. High Index of Economic Freedom has a negative impact on underground economies for all the countries. It is therefore recommended that better quality institutions need to be in place which ensure that all the laws related to property rights, labor market, businesses, anti-corruption and trade and investment are properly enforced. This would create a favorable environment for businesses to operate in formally and there will be little incentive to move underground. With regards to internet users and the size of shadow economy, it is recommended that better transparency systems need to be in place and proper monitoring needs to be carried out in order to track any informal activity online. Effective campaigns on honest usage of ICT should be developed.

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