Measuring the Shadow Economy of Bangladesh, India, Pakistan, and Sri Lanka (1995-2014)

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Abstract

The underground, or "shadow," economy has many negative consequences for society at large. While evidence supports the assertion that the shadow economy is large and growing, the secretive nature of the shadow economy makes it notoriously difficult to measure accurately. Following the MIMIC model of Schneider (2006), we quantify the shadow economies of Bangladesh, India, Pakistan, and Sri Lanka for the years 1995-2014. We find that the average size of the shadow economies of these countries as a percentage of total official GDP range from the mid-20s to low-30s, with a clear upward trend. Further, we find that size of government is significantly positively associated with size of the shadow economy, while GDP per capita and fiscal freedom are significantly negatively associated with size of the shadow economy.

I. Introduction

The underground, or "shadow, "economy is commonly characterized by informal, hidden, or illegal economic activity. Generally speaking, the shadow economy consists of any unreported income that derives from the production of goods and services. Schneider (2006) provides a more specific, very useful working definition of the shadow economy: "the shadow economy includes all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons—to avoid payment of income, value added or other taxes; to avoid payment of social security contributions; to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc.; and to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms." In this paper we use Schneider's definition of shadow economy activities. Thus we do not examine either the informal household economy or illegal criminal activities such as drug dealing and robbery.

The presence of the shadow economy can have a profound negative impact on the economy at large. Chief among potential negative effects is the loss of tax revenue. Diminishing tax revenue leads to an attendant diminution in the quality of publicly funded goods and services. A country's health is reflected in the quality of its tax-funded infrastructure. Public education is especially important as the education level of a country's residents forms the backbone of its economy. The diversion of income from the formal economy to the shadow economy may lead to public schools falling short of meeting a baseline standard of educational quality. This will in later life manifest itself in lower household income, wealth, status, and health. Poor education and poverty are inextricably linked and reinforce each other in a vicious cycle.

Another harmful characteristic of the shadow economy is that its workers are not protected by labor laws and are thus especially vulnerable to exploitation. When shadow economic activity takes place in abusive workplace environments such as sweatshops, addressing the reality of the shadow economy becomes a human rights issue. It is important to redirect shadow economic activity into legitimate economic activity so that workers can enjoy a transparent and fear-free workplace in which their employers are held accountable to the law.

The rise of the shadow economy is in some ways a response to inefficiencies in the official economy. Thus, compiling data on the shadow economy can assist in the process of remedying shortcomings of the official economy. Some potential remedial measures include rethinking unnecessarily burdensome regulations, streamlining an overly complicated and unresponsive government bureaucracy, and reducing endemic government corruption.

But before anything can be done to reduce the negative impacts of the shadow economy, first a reliable and accurate assessment of its size and scope must be done. It is particularly important to quantify the shadow economy in lower income and developing countries that do not have the robust, stable public institutions of the developed world. With this in mind, we aim to identify the determinants of the shadow economy and estimate the size of the shadow economy in Bangladesh, India, Pakistan, and Sri Lanka over the period 1995-2014.

II. Literature Review

While the shadow economy is intrinsically hard to quantify, many studies have attempted to do so. Dreher and Schneider (2006) use empirical data from a cross-section of 120 countries and a panel of 70 countries over the period 1994-2002 to uncover the relationship between the shadow economy and corruption. Dreher and Schneider's study differs from the previous literature on this topic by incorporating a broader selection of countries that includes both high income and low income countries. They find that contrary to previous studies, corruption does not significantly impact the shadow economy. The crux of their paper is that corruption and the shadow economy function as substitutes in high income countries and as complements in middle and low income countries. Greater regulatory burden triggers greater corruption, while rule of law and democracy inhibit corruption. They do admit the caveat that their analysis suffers from a scarcity of high quality data, especially over time.

Building on Dreher and Schneider's 2006 work, Schneider (2006) also performs an empirical analysis of the correlation between the shadow economy and corruption. His study increases the sample size to 145 countries over the period 1999-2003, with the sample segmented into developing, transition, Communist, and highly developed OECD countries. Schneider uses the DYMIMIC (dynamic multiple-indicators multiple-causes) model as well as the currency demand approach to measure the size of the shadow economy in the sample countries. He finds that the average size of the shadow economy as a percentage of official GDP is similarly high in developing countries and transition countries, at 38.7% and 40.1%, respectively. The shadow economy is considerably lower in OECD countries, at 16.3% of the official GDP. As in Dreher and Schneider (2006), he finds that in low income countries presence of a shadow economy increases corruption, while in high income countries the presence of a shadow economy serves to decrease corruption. The fact that the shadow economy is positively associated with corruption and is so much larger in developing countries underscores the importance of accurately measuring it.

Buehn and Schneider (2008) elaborate and improve on the MIMIC model in analyzing economic loss caused by the shadow economy in France over the period 1982-2006. They take the standard MIMIC model, which is a type of structural equations model which treats the shadow economy as a latent variable. This means that the shadow economy is a hidden, or unobserved, variable that is assumed to be influenced by several observable and measurable causal and indicator variables. The MIMIC model provides a way to reveal the relationship between the causal and indicator variables and the unobservable latent variable. However, the traditional MIMIC approach has shortcomings when looking at time series data. Information is lost when taking first differences of no stationary variables. This is especially problematic because most macroeconomic data is no stationary. To solve this problem, Buehn and Schneider develop an EMIMIC (error correction multiple-indicators multiple-causes) model which incorporates cointegration and error correction in order to analyze the French shadow economy over the long-run. Examining the cointegration between variables allows for the detection of the long-run equilibrium relationship between variables while including error correction allows for measurement of short-run dynamics. Buehn and Schneider find that the French shadow economy grew from 12.88% of official GDP in Q1 1982 to 15.93% of official GDP in Q4 of 2006.

III. Data and Methodology

To measure the size of the shadow economy in Bangladesh, India, Pakistan, and Sri Lanka over the years 1995-2014, we follow the modified MIMIC approach of Dreher and Schneider (2006). Our causal variables are size of government, share of direct taxation, fiscal freedom, business freedom, unemployment rate, and GDP per capita. Our indicator variables are growth rate of GDP per capita, labor force participation rate, and currency. The data on government size, unemployment, and GDP per capita are gathered from the World Bank. The data on fiscal freedom and business freedom are obtained from the Heritage Foundation as part of the Economic Freedom Index. The full definition of each causal and indicator variable can be found in the Appendix.

The standard MIMIC model contains two parts: the structural equation model and the measurement model (Buehn and Schneider, 2008). The structural equation model is as follows:

Where is the latent variable, in this case, the shadow economy; is a (1xq) vector of time series variables; is a (1xq) vector of coefficients describing the causal relationships between the latent variable and its causes; and is the error term denoting the unexplained component.

The measurement model describes the relationship between the latent variable and its indicators and is as follows:

Where is a (1xp) vector of time series variables; is a vector of disturbances where every ε is a white noise error term; and λ is the magnitude of the projected change of an indicator for a unit change in the latent variable.

We run the MIMIC model on a series of 42 developing counties given data for the period 1996-2016. We exclude data regarding share of direct taxation due to missing values. Once we have obtained coefficients using the MIMIC method, we then translate these coefficients into absolute cardinal values by using year 2000 shadow economy values from Schneider (2006). This is necessary because the MIMIC model only yields relative, not absolute, values.

IV.   Results

Table 1 presents the summary statistics for our four sample countries over the years 1995-2014. All four countries can be characterized as low income developing countries with limited financial and business freedom. India, Pakistan, and Sri Lanka's government size are all similar, clustered slightly above 10, while Bangladesh is roughly half that size, registering a 5.07. Bangladesh and India have low unemployment at slightly less than 4%, while Pakistan's unemployment is just under 6%. Sri Lanka, while having the highest GDP per capita, also has the highest unemployment, at 7.32%. Furthermore, Sri Lanka is the most volatile, as it has the highest standard deviation for four out of five variables.

Table 1: Summary Statistics

Country	Variable	Mean	Median	Std.	Min	Max
Bangladesh						
	Government Size	5.07	5.10	0.19	4.63	5.44
	Unemployment	3.87	4.30	0.75	2.50	5.00
	GDP Per Capita	1839.76	1657.92	643.67	1050.65	3138.24
	Financial Freedom	28.50	30.00	10.62	10.00	50.00
	Business Freedom	50.42	40.00	11.97	40.00	70.80
India						
	Government Size	11.27	11.08	0.78	10.01	12.80
	Unemployment	3.97	4.00	0.29	3.50	4.40
	GDP Per Capita	3079.40	2718.71	1294.56	1500.68	5679.59
	Financial Freedom	33.00	30.00	4.58	30.00	40.00
	Business Freedom	49.72	55.00	7.67	35.50	55.00
Pakistan						
	Government Size	10.04	10.34	1.33	7.78	12.65
	Unemployment	5.97	5.50	1.02	5.00	7.80
	GDP Per Capita	3496.03	3439.96	787.97	2452.75	4833.66
	Financial Freedom	45.50	45.00	10.71	30.00	70.00
	Business Freedom	64.49	70.00	7.78	55.00	72.50
Sri Lanka						
	Government Size	10.04	10.34	1.33	7.78	12.65
	Unemployment	7.32	7.70	2.37	4.00	12.20
	GDP Per Capita	6308.51	5575.51	2465.20	3284.27	11210.30
	Financial Freedom	49.00	45.00	13.38	30.00	70.00
	Business Freedom	72.79	70.00	4.76	68.20	85.00

Table 1 shows summary statistics for our four sample countries for the years 1995-2014. Government Size, Unemployment, and
GDP Per Capita are collected from the World Bank. Financial Freedom and Business Freedom are gathered from the Heritage

Table 2 contains the results of difference in means testing for our sample countries. The results indicate that there are statistically significant differences between the population means for almost all pairs of countries for almost all macroeconomic variables obtained from the World Bank. However, differences in means for the freedom scores obtained from the Heritage Foundation are not statistically significant.

Table 2: Difference in Means Testing

	Bangladesh	India	Pakistan	Sri Lanka		
	(1)	(2)	(3)	(4)		
Government Size	5.07	11.27	10.04	10.04		
Unemployment	3.87	3.97	5.97	7.32		
GDP Per Capita	1839.76	3079.40	3496.03	6308.51		
Financial Freedom	28.50	33.00	45.50	49.00		
Business Freedom	50.42	49.72	64.49	72.79		
	=(1) - (2)	=(1) - (3)	=(1) - (4)	=(2) - (3)	=(2) - (4)	=(3) - (4)
Government Size	-6.20***	-4.96***	-4.96***	1.24*	1.24***	0.00
Unemployment	-0.10	-2.11***	-3.46***	-2.01***	-3.36***	-1.35***
GDP Per Capita	-1239.64***	-1656.27***	-4468.75***	-416.63***	-3229.12	-2812.48
Financial Freedom	-4.50	-17.00	-20.50	-12.50	-16.00	-3.50
Business Freedom	0.70	-14.07	-22.37	-14.77	-23.07	-8.30

Table 2 shows difference in means testing for the subject countries. (*** < 0.01, ** < 0.05, * < 0.10)

Table 3 illustrates the correlation among the dependent variables. Seven out of the ten possible pairs of variables exhibit statistically significant correlation. The only pairs of variables that are not statistically significantly correlated are government size and unemployment, government size and business freedom, and business freedom and financial freedom. The highest correlations are between business freedom and unemployment (67%) and business freedom and GDP per capita (56%).

Table 3: Correlation

	Government Size	Unemployment	GDP Per Capita	FIN Freedom	BUS Freedom
Government Size	1				
Unemployment	0.16	1			
	(0.16)				
GDP Per Capita	0.32***	0.36***	1		
	(0.00)	(0.00)			
FIN Freedom	0.35***	0.35***	0.21*	1	
	(0.00)	(0.00)	(0.07)		
BUS Freedom	0.15	0.67***	0.56***	0.12	1
	(0.18)	(0.00)	(0.00)	(0.28)	

Table 3 represents the correlation of dependent variables, with numbers in parentheses denoting p-values. (*** < 0.01, ** < 0.05, * < 0.10)

Table 4 presents the results of our MIMIC estimation. It is clear that size of government, degree of fiscal freedom, and GDP per capita are the key drivers of the shadow economy. The size of government has a positive relationship with the size of the shadow economy. The bigger the government is, the bigger the shadow economy tends to be in our four sample countries. This may be due to our sample countries having inefficient, bloated bureaucracies that do not effectively provide public goods. Not surprisingly, GDP per capita is significantly negatively related to the size of the

shadow economy. This is consistent with the hypothesis that wealthier, more developed countries tend to have smaller shadow economies. Fiscal freedom is also negatively associated with the size of the shadow economy, albeit at a lower level of statistical significance.

Table 4: MIMIC Estimation Results

Causal Variables	(1)	(2)
Size of Government	0.25***	0.27*** (0.00)
	(0.00)	
Share of Direct Taxation	0.06	
	**	
	(0.0	
	0)	
Fiscal Freedom	-0.26*	-0.22** (0.09)
	(0.04)	
Business Freedom	-0.11*	-0.05** (0.07)
	(0.04)	
Unemployment Rate	0.00	0.02*** (0.21)
	(0.00)	
GDP Per Capita	-0.26***	-0.22***
	(0.00)	(0.00)
Indicator Variables		
Growth rate of GDP per capita	-1.78***	-1.01*** (0.00)
	(0.00)	
Labor Force Participation Rate	0.43	0.32 (0.76)
	(0.54)	
Currency	1	1
Chi2	400.23	634
DF	14	12
N	721	832

Table 4 represents the results from running the MIMIC model on a series of 42 developing countries given data for the years 1996-2016. P-values are given in in parentheses (*** < 0.01, ** < 0.05, * < 0.1). Column (1) represents the MIMIC model with the share of direct taxation included while Column (2) excludes direct taxation. Following Schneider et. al (2006), we exclude direct taxation because of missing values.

Finally, Table 5 reveals the size of the shadow economies of Bangladesh, India, Pakistan, and Sri Lanka for the years 1995-2014. We use the year 2000 shadow economy size data of Schneider (2006) as the baseline from which we translate the coefficients obtained from the MIMIC method to

absolute values. Sri Lanka has the largest shadow economy, followed in descending order by Bangladesh, India, and Pakistan. Figure 1 illustrates this data graphically, clearly showing the stark upward trend in the shadow economy over time. This upward trend is especially pronounced in Sri Lanka and Bangladesh over the last decade.

Table 5: Size of Shadow Economy (% official GDP)

Year	Bangladesh	India	Pakistan	Sri Lanka

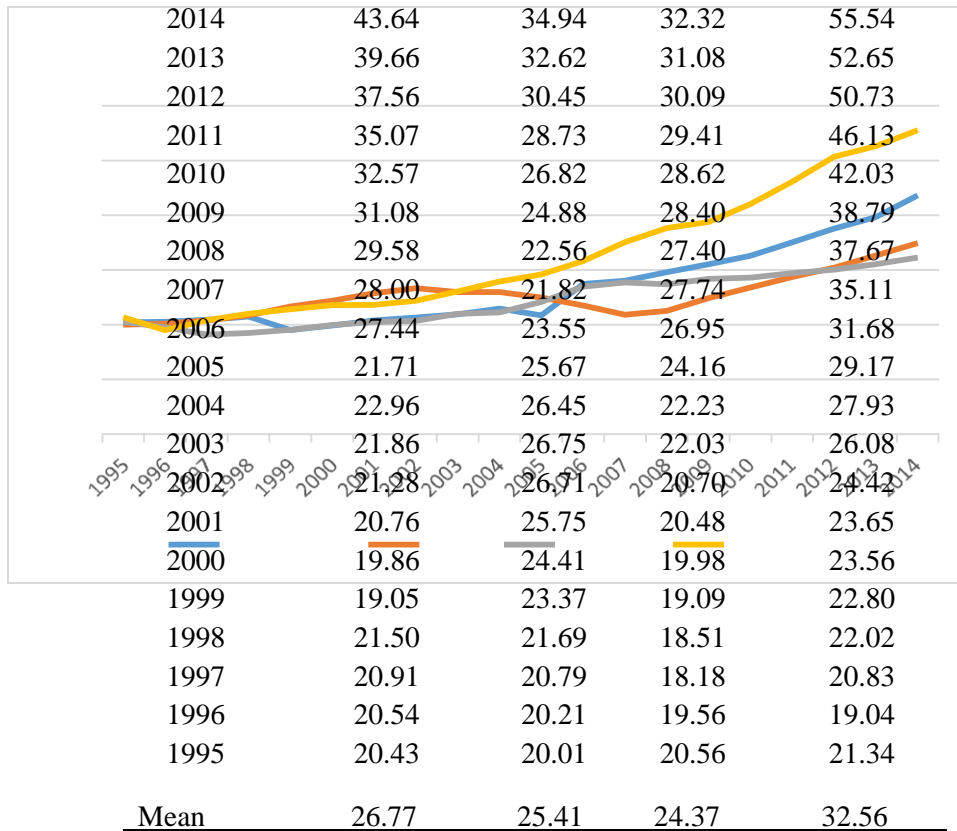| Year	Bangladesh	India	Pakistan	Sri Lanka
2014	43.64	34.94	32.32	55.54
2013	39.66	32.62	31.08	52.65
2012	37.56	30.45	30.09	50.73
2011	35.07	28.73	29.41	46.13
2010	32.57	26.82	28.62	42.03
2009	31.08	24.88	28.40	38.79
2008	29.58	22.56	27.40	37.67
2007	28.00	21.82	27.74	35.11
2006	27.44	23.55	26.95	31.68
2005	21.71	25.67	24.16	29.17
2004	22.96	26.45	22.23	27.93
2003	21.86	26.75	22.03	26.08
2002	21.28	26.71	20.70	24.42
2001	20.76	25.75	20.48	23.65
2000	19.86	24.41	19.98	23.56
1999	19.05	23.37	19.09	22.80
1998	21.50	21.69	18.51	22.02
1997	20.91	20.79	18.18	20.83
1996	20.54	20.21	19.56	19.04
1995	20.43	20.01	20.56	21.34
Mean	26.77	25.41	24.37	32.56

Table 5 represents the estimation size of shadow economies for four selected countries: Bangladesh, India, Pakistan, and Sri Lanka. Numbers provided are percentages of the official GDP. Each shadow economy is estimated by using the methodology of Schneider et. al (2006). After estimating using the coefficients from Table 4, the absolute values are calibrated using year 2000 shadow economy values from Schneider et. al (2006).

Figure 1: Shadow Economy Size Over Time

V.   Conclusion

Though the shadow economy is by its very nature notoriously difficult to measure, numerous studies have undertaken the task. The many negative effects of the shadow economy make the mission of accurately quantifying it all the more urgent. This is especially true in low income developing counties such as Bangladesh, India, Pakistan, and Sri Lanka. The reasons for the proliferation of shadow economic activity are manifold: refusal to pay taxes or contribute to social security; inability or outright refusal to abide by labor laws (i.e. minimum wage laws, child labor laws, workplace safety laws, worker legal status laws); reluctance to deal with burdensome government regulation; unwillingness to go through the proper channels of a plodding government bureaucracy; desire to hide illegal activities from the authorities, etc.

These reasons are especially prevalent in lesser developed or lower income countries where the official sector is not as efficient in providing public goods. In such countries, there is a great need for prudent and effective policies to combat the shadow economy. The first step in combating the shadow economy is to accurately quantify it. To this end, we use the MIMIC model of Schneider (2006) to measure the size of the shadow economies of Bangladesh, India, Pakistan, and Sri Lanka. We find that the shadow economies in these countries are substantial; the average size as a percentage of official GDP over the period 1995-2014 is 26.77% for Bangladesh, 25.41% for India, 24.37% for Pakistan, and 32.56% for Sri Lanka. Furthermore, there is a clear upward trend in the size of the shadow economy in each country. We also find that the size of the shadow economy is negatively related to GDP per capita, financial freedom, and business freedom, while it is positively related to size of government.

References

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Appendix: Variable Description

Variable Name	Variable Description	Source
BUSINESS FREEDOM	Subcomponent of the Economic Freedom Index. It measures the time and efforts of business activity. It ranges from 0 to 100, where 0 = least business freedom, and 100 = maximum business freedom.	Heritage Foundation
ECONOMIC FREEDOM	Economic Freedom Index. It ranges from 0 to 100, where 0 = least economic freedom and 100 = maximum economic freedom.	Heritage Foundation
FISCAL FREEDOM	Subcomponent of the Economic Freedom Index. It measures the fiscal burden in an economy, i.e., top tax rates on individual and corporate income. It ranges from 0 to 100, where 0 = least fiscal freedom, and 100 = maximum degree of fiscal freedom.	Heritage Foundation
CURRENCY	M0 over M1. It corresponds to the currency outside the banks (M0) as a proportion of M1.	International Monetary Fund
LABOR FORCE PARTICIPATION RATE	This corresponds to the labor force participation rate, total (% of total population). Labor force participation rate is the proportion of the population that is economically active.	World Bank
GDP PER CAPITA (PPP)	This corresponds to the GDP per capita based on purchasing power parity (PPP) (constant 2005 international $). GDP PPP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 international dollars.	World Bank
UNEMPLOYMENT RATE	Unemployment, total (% of total labor force). Unemployment refers to the share of the labor force that is without work but available for and seeking employment. Definitions of labor force and unemployment differ by country.	World Bank