The Size of Informal Economy in Pakistan

by

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June 2010

Outline

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Motivation

- It is important to have some sense of total volume of economic transactions taking place in a country for:
    - understanding the working/structure of an economy
    - economic analysis / research
    - making an effective macroeconomic policy
    - understanding policy implications, etc.

- However, the existence (and the nature) of informal economic activities make it difficult to record various dimensions, including the size, of the economy

- The official national accounts only partially record actual GDP

- An estimate of size of informal economy can fill the gap somehow

Approaches to Estimate Informal Economy

- **Direct Methods**

  – **Microeconomic in nature**

    - **voluntary survey data**

    - **tax audits**

BUT

…..there are problems in extrapolating/extending results of

directs method(s) to whole economy

Approaches to Estimate Informal Economy

- **Indirect Methods**

    - **Macroeconomic in nature**

        - **Monetary approach**

        - **Physical input (electricity) approach**

        - **Multiple Indicators - Multiple Causes (MIMIC) model**

Monetary Approach of Tanzi

• based upon currency demand

• Assumes that (a) the informal economy is a direct cause of taxes, (b) transaction are carried out by cash i.e., a high ratio of currency in circulation in total monetary assets indicates high volume of informal economy, and (c) income velocity of money is same across the economy

• $In\,(CM) = a_o + a_1\,In\,(1{+}TW) + a_2\,In\,(WS/NI) + a_3\,In\,(R) + a_4\,In\,(PY) + e$

• Estimated form of this equation is used to gauge the effect of a change in the tax level on demand for currency

• The equation is usually estimated by OLS (without taking care of time series properties (stationarity) of the variables

Monetary Approach of This Study

- **We use autoregressive distributed lag (ARDL) model as suggested by Pesaran and Shin (1999) and Pesaran et all (2001); it takes care of time series properties.**

- **Add education as explanatory variable for currency**

- **Also add financial sector development**

$$\Delta CM_t = \lambda_0 + \lambda_1 CM_{t-1} + \lambda_2 T_{t-1} + \lambda_3 F_{t-1} + \lambda_4 R_{t-1} + \lambda_5 E_{t-1}$$

$$+ \sum_{1}^{k} \alpha_{1i} \Delta CM_{t-i} + \sum_{0}^{k} \alpha_{2i} \Delta T_{t-i} + \sum_{0}^{k} \alpha_{3i} \Delta F_{t-i} + \sum_{0}^{k} \alpha_{4i} \Delta R_{t-i} + \sum_{0}^{k} \alpha_{5i} \Delta E_{t-i} + \varepsilon_t$$

A long run relationship between the currency ratio and other related variables is established through this model

Monetary Approach of This Study

- Long Run Relationship extracted from the ARDL model:

$$\hat{CM}_t = \beta_0 + \beta_1 T_t + \beta_2 F_t + \beta_4 R_t + \beta_5 E_t$$

$$\hat{CM}_t = 37.01 + 1.682\, T_t - 0.675\, F_t - 1.062\, R_t - 0.117 E_t$$

- Wald Coefficients Restriction Test: The computed **F-statistic is 8.13** which is above the upper level of the bound test (the bound is $4.93 - 5.73$ for lag 1 at 5 percent critical level).

- the informal economy as a ratio to the overall GDP is

$$\mu_t = \frac{Y_i}{Y} = \frac{\beta_2 T + \beta_5 E_t}{m_t}$$

Electricity Consumption Approach

- Kauffman and Kaliberda (1996) argue that electric-power consumption is regarded as the single best physical indicator of total economic activities in a country

- electricity consumption / GDP elasticity ..…. usually close to 1

- If we have data on electricity consumption, we can estimate total size of the economy.

- Assumption: Growth of electric consumption is an indicator of the growth of recorded and un-recorded GDP.

- We assume that official GDP of 1973-74 reflected all the economic activities of the year.

MIMIC Approach

- MIMIC is a particular form of LISREL models

- Informal economy is taken as a latent variable

- Informal economy is caused by a set of variables and effects other variables (indicators of informal economy)

MIMIC Approach

Causes

Indicators

T

F

P

Infomral Economy (L)

CM

EL
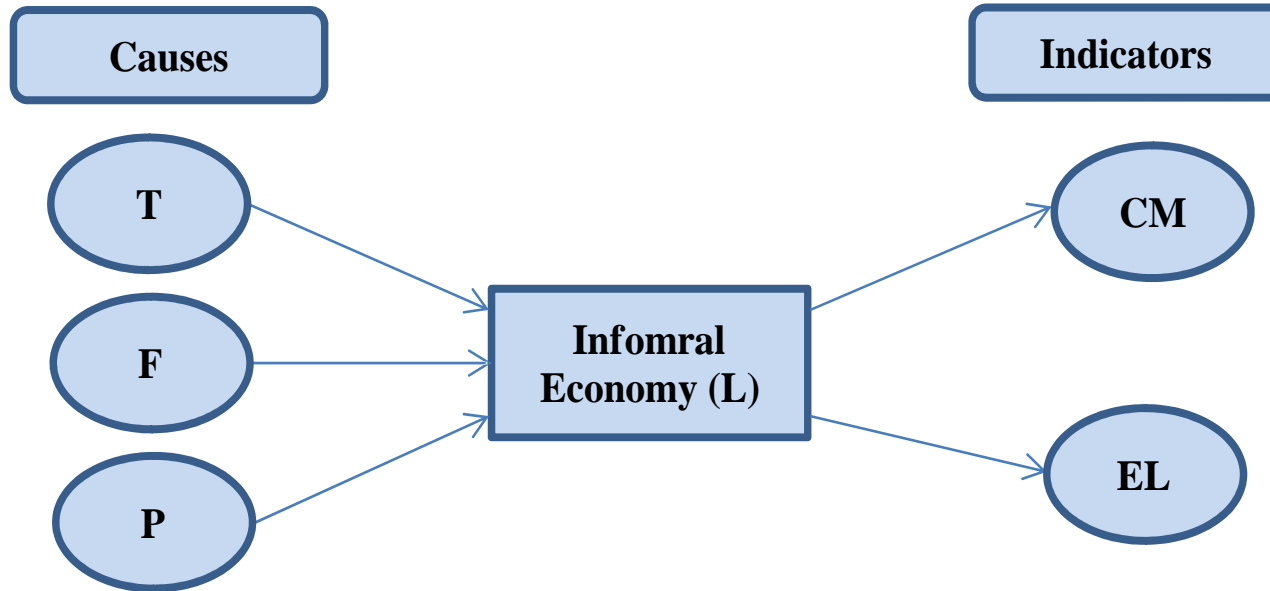
$$L = \gamma' X + v$$

$$Y = \lambda L + e$$

$$Y = \lambda \left[\gamma' X + v \right] + e$$

Results of ARDL Model

| Variable	Coefficient	Std. Error	t-Statistic	Prob.
Intercept	19.0802	4.542361	4.200504	0.0003
CM(-1)	-0.5155	0.091985	-5.60415	0
T(-1)	0.867144	0.198992	4.357685	0.0002
F(-1)	-0.34803	0.101478	-3.42959	0.002
R(-1)	-0.54746	0.11965	-4.5755	0.0001
E(-1)	-0.06049	0.045063	-1.34222	0.1911
ΔT	0.562054	0.195751	2.871264	0.008
ΔF	-0.61698	0.090162	-6.843	0
ΔR	-0.24625	0.111496	-2.20859	0.0362
ΔE	-0.59858	0.212965	-2.8107	0.0093
ΔCM(-1)	0.120674	0.127147	0.949092	0.3513
ΔT(-1)	0.060014	0.184081	0.326018	0.747
ΔF(-1)	0.20049	0.120632	1.661997	0.1085
ΔR(-1)	0.331716	0.13897	2.386954	0.0246
ΔE(-1)	0.054326	0.221229	0.245564	0.8079
R-squared	0.83561			
Breusch-Godfrey Serial Correlation LM Test:	F-statistic			0.26 (0.77)

Results of ARDL Model

Long-run relationship

$$\hat{CM}_t = 37.01 + 1.682\, T_t - 0.675\, F_t - 1.062\, R_t - 0.117 E_t$$

Results of MIMIC Model

	Estimated Coefficients	t-statistics
Cause Variables		
Tax/GDP (%)	0.16	4.26
M2/GDP (%)	-0.06	-3.55
Durable (regime durability)	-0.019	-1.53
Indicator variables		
Currency to M2 ratio (C/M2) (%)	11.13	6.68
Growth in electricity consumption (%)	1.00	
Diagnostic Tests		

Chi-square (p-value) = 1.40   (0.50)

RMSEA= 0

90% confidence interval for RMSEA = (0:0.29)

p-value for test of close fit (RMSEA<0.05) = 0.57

N=36

Goodness of Fit Index (GFI) = 0.98

 Adjusted Goodness of Fit Index (AGFI) = 0.88

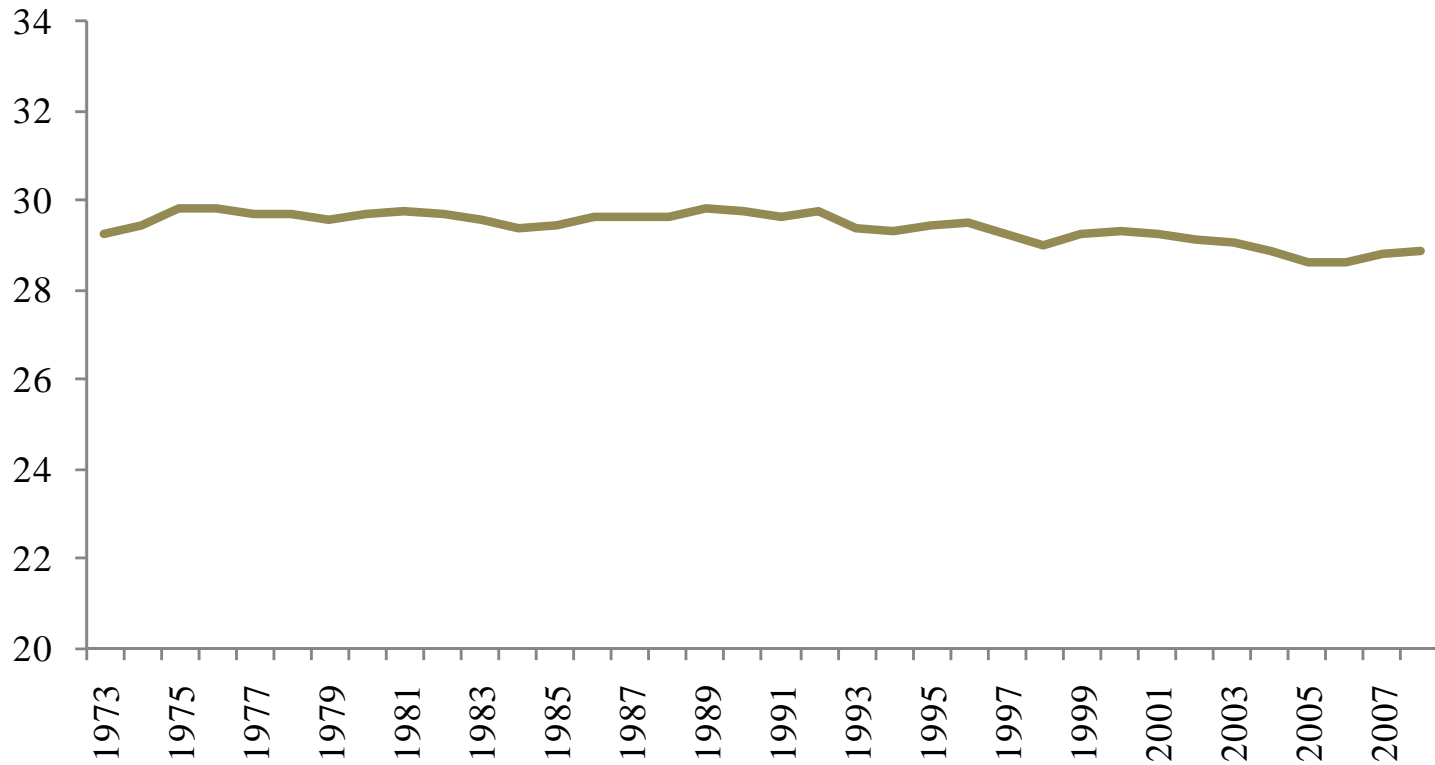Figure 2a: Informal Economy (%) by ARDL Approach
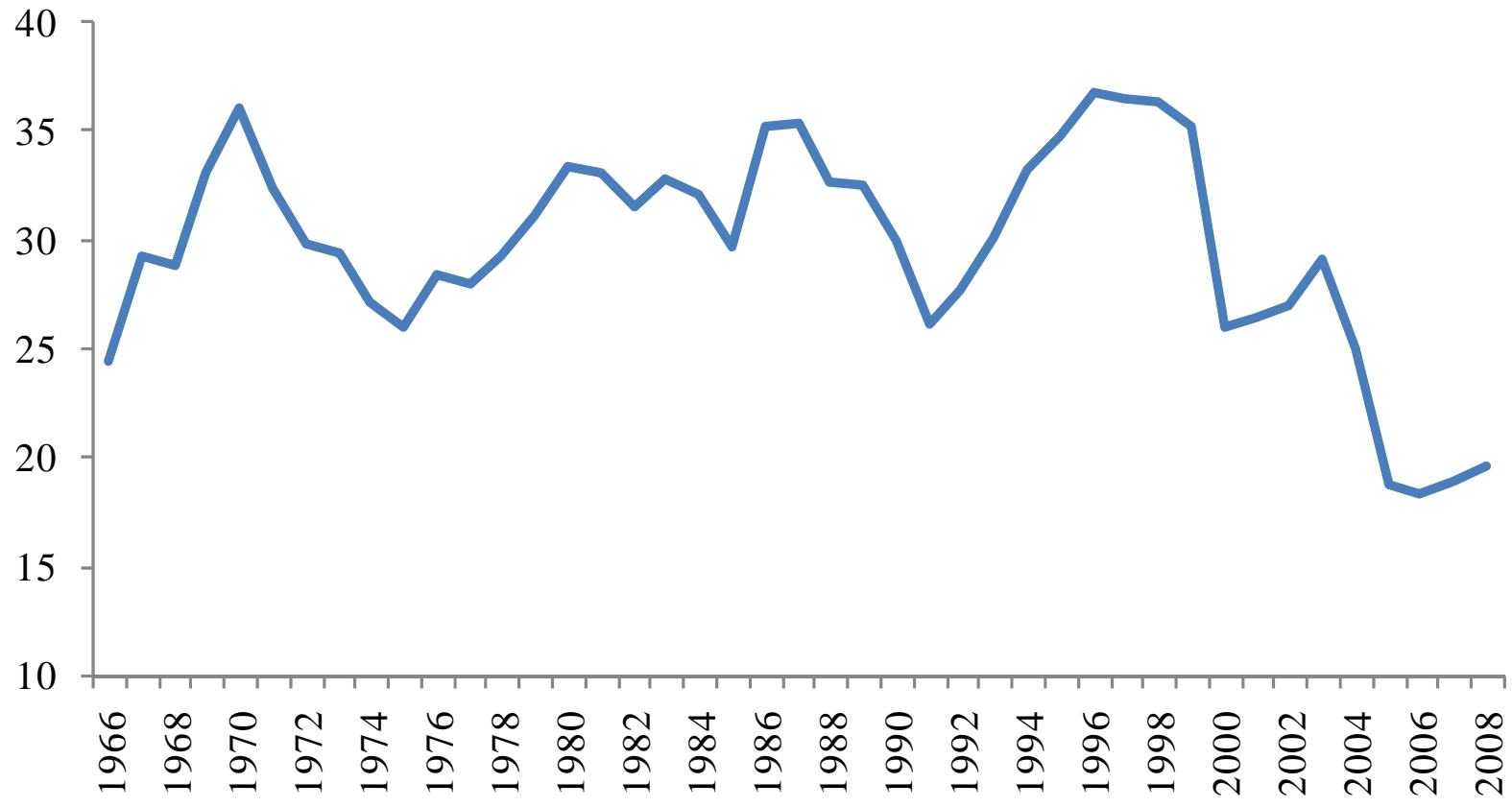
Figure 2c: Unmeasured Economy (%) by Electricity Consumption Approach
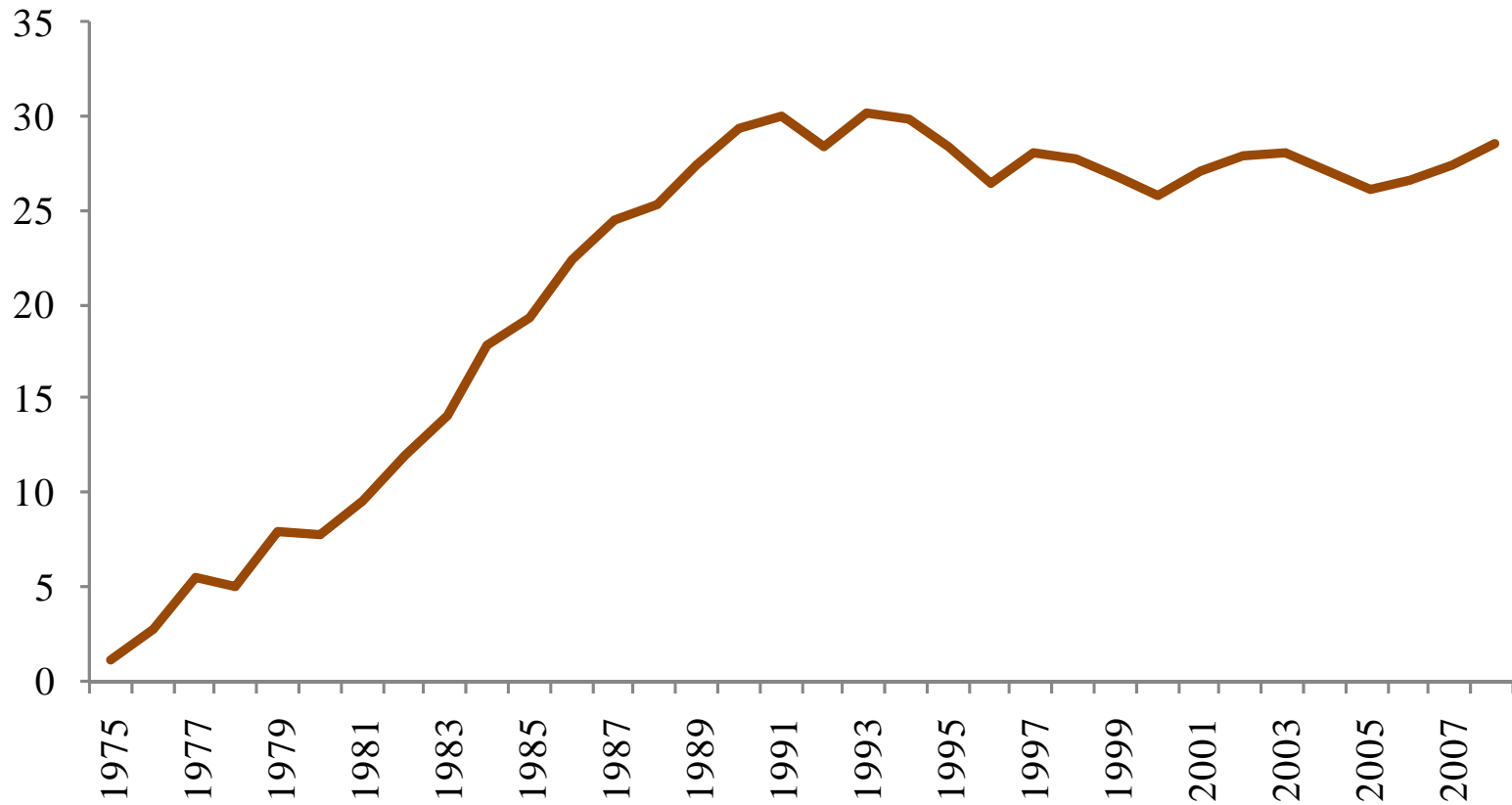
Figure 2b: Informal Economy (%) by MIMIC Approach

Informal Economy as % of Total GDP

	ARDL model	MIMIC	Electricity Consumption Approach
1960s	28.9		
1970s	29.7	29.6	4.5
1980s	32.8	29.6	18.1
1990s	32.7	29.5	28.6
2000s	23.2	29.0	27.3

Results

- The ARDL approach shows that the underground economy increased from less than 33 percent of the total GDP in 1960s to 33 percent in 1990s and then declined to 23 percent in 2000s.

- The electricity consumption approach shows that unrecorded economy increased from 5 percent of economy in 1970s to 29 percent in 1990s and then declined to 27 percent in 2000s.

- The MIMIC model shows that the informal economy has been around 30 percent

Underground Economy (%) Estimated by Different Studies*

	Shabsigh (1995)	Ahmad and Qazi (1995) 1	Aslam (1998)	Ahmed and Haider (2008) 1	Kemal (2007) 2	Arby (2009) 3
1960		52.06	29	60.2		
1965		50.97	33	35.2		
1970		48.31	40.6	27.9		36.0
1975	20.74	34.5	30.6	18.8	33.1	25.9
1980	22.53	49.46	52.6	31	45.6	33.3
1985	21.63	45.49	40.2	33.1	39.3	29.6
1990	23.56	39.27	43.9	32	39.2	30.0
1995			45.7	33.1	60.6	34.8
....						
2000				21.9	56.5	26.0
2001				22.2	65.7	26.3
2002				24	64.3	27.0
2003				27.1	68.2	29.0
2004					66.6	24.9
2005					64.8	18.7
2006						18.3
2007						18.9
2008						19.6

1 Based on equation which uses currency and bearer bonds

2 Based on equation 2 of the paper which produces highest estimates of underground economy

3 Results from ARDL model

*:Others' results are estimate of informal economy as % of recorded GDP whereas our results are estimate
 informal economy as % of overall economy