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Has Black Income as a Proportion of GDP in India Declined in the Post-Reform Period?

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ABSTRACT

Though the rapid growth of black income in India in recent years poses to be a serious economic threat, some recent studies report that it has been declining in the post-reform period. This decline in black income – as these studies claim – has been attributed to the ameliorative effects of economic reforms and liberalization ushered in India in the early nineties.

Studies such as Schneider *et al.* (2003), and Schneider *et al.* (2010) estimating black income in India from 1960 to 1997 and from 1999 to 2007 respectively conclude that black income in India has declined since 1992-93. Likewise, a recent draft report of the National Institute of Financial Management (NIFM) also notes that the share of black income in the GDP has declined during the 1990's. Apparently this decline in the share of black income in GDP post-reform could be a sign of great relief to the policy makers as well as to the Indian government, reinforcing their belief on the benign effects of structural reforms and liberalization. But such inferences could be highly misleading.

The present study contradicting the findings of Schneider *et al.* (2003), Schneider *et al.* (2010), and the draft NIFM Report observes that from 1951 to 2011 black income in India has increased at an increasing rate with no sign of abatement even after 1992-93 in the post-reform liberalization period. This contradictory finding of the present study vis-a-vis the earlier studies should be a clarion call to the government and the policy makers to take a serious note of the problem.

Keywords: Shadow Economy, Black Economy, Black Income, MIMIC, SEM, MLE.

JEL Classification: C39, C52, E26, H26, O17.

1. INTRODUCTION

The problem of black income is a highly sensitive economic and political issue today in India. It has recurred many a times earlier in the past in public discourses in India in the seventies and eighties. But in the nineties, somehow the problem got eclipsed in the background by other economic issues of liberalization and structural reforms in India. In the recent years it has once again revived to be in the limelight.

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To curb the growth of black income - popularly known as black money in the media - through legislative measures, the Indian Parliament passed a bill[2] augmented with stiff penalties in 2014. Thereafter, the Government of India constituted a Special Investigation Team (SIT) to probe into the black money stashed abroad. Though such proactive measures of the Indian government to contain the growth of the black money are highly laudable, they are not much buttressed by any reliable and recent[3] estimates of black money. There still remains a lack of serious, consistent and a continuous effort, on the part of the government and the academia, to understand the problem. While there could be genuine reasons[4] for this lack of effort, yet an assessment and analysis of the problem's extent and nature cannot be entirely done away with when legislative measures and economic policies are being increasingly sought by the government to curb its growth.

To start with, what are black money and black income? What do we understand by the terms such as the shadow economy, unaccounted income, hidden economy, etc.? Why there is a genuine need for a recent estimate of black money/income in India? These are some pertinent questions that usually crop up in one's mind on the issue. Therefore, it is vital to understand at the start the definition of black money/income, and to know the reasons as to why the estimation of black money/income is so critical for macroeconomic policies.

The unaccounted or black income – popularly known as black money in India – is perceived to be as the income that escapes taxes or that which is earned in illegal activities or that which remains unreported in the official GDP[5]. It has been expressed in the literature relatively as the percentage of GDP in studies estimating it. Black economy – the aggregate of sectors of the economy from where black income originates - *"... is also known by different names such as the parallel, the unaccounted, informal, unofficial, irregular, second, underground, subterranean, hidden, invisible, unrecorded, or shadow economy, meaning different things to different people"* (NIFM, p.1). In fact, there is no dearth of definitions of black income when one surveys the literature on it. However, given the numerous nomenclative complexities of black income that may go beyond the narrow confines of this paper, this study, to avoid such complexities, adopts the definition of black income as the income from the shadow[6] economy. This definition – used in many international and Indian studies on the issue - not only covers tax evaded incomes

2 Black Money Bill, 2014.

3 The recent estimates found in The White Paper on Black Money, Ministry of Finance, Govt. of India, 2012, are unacceptably low. Likewise, the estimates of the Global Financial Integrity, IMF, and of Bhalla (2013) are also very low.

4 The estimates of black income are usually difficult to obtain. The reasons are varied such as people are usually secretive in declaring their actual income, usual infirmities in the income data, methodological conundrums, conceptual problems, etc. All these factors compound the problem of estimating black income.

5 See Table 1.1 in National Institute of Financial Management (NIFM) (2012), p. 4, and Feige (1997).

6 Shadow economy, as a concept, in Schneider *et al.* (2010, p. 429) covers "*all unregistered economic activities that contribute to the officially calculated (or observed) GDP.*" This amount to "*the portion of income earned from legal or illegal activities that cannot be accounted for by the standard measurement procedures of the national income accounts.*" A similar definition has been adopted by Schneider *et al.* (2003).

in legal economic activities, but also includes unreported legal incomes not included in the GDP, as well as incomes from illegal activities. Both Schneider *et al.* (2003), and Schneider *et al.* (2010) mentioned earlier have chosen this definition to estimate black income in India.

There are many compelling reasons on the need to estimate black income. First, black income distorts key macroeconomic statistics such as the GDP, the inflation rate, interest and exchange rates, rate of unemployment, etc., that may lead to inappropriate policy - monetary, fiscal policy, etc. - responses by the government when they are based on such distorted statistics. Thus, prior to policy formulation and execution, it becomes essential to estimate the extent of black income so that such statistical distortions are accounted for and taken care of in policy designs. Second, black income reduces the size of potential government revenue from the taxes resulting into a vicious circle of increased budget deficit, hike in tax rates, and reduction in public expenditure on social and welfare programs. Such reductions in public expenditure might negatively impact the GDP and its growth rate. Thus, to mitigate the associated problems of tax evasion, tax revenue loss, etc. one requires an understanding of the magnitude of black income in the economy. Third, the existence of black economy might have serious macroeconomic implications for business cycles. For example, a prospering black economy might attract away workers from the official economy on a downswing by competing with the official economy. This may have serious negative implications for the GDP and employment in the official economy that would necessitate the need to have a more reliable estimate of black income. Fourth, the growth of black income from illegal activities in narcotics, prostitution, terrorism, etc. would not only hurt the legal economy but could also endanger the existence of a civil society. Thus, one needs to know the extent of black income to formulate proactive measures to curb such social evils.

Notwithstanding the general lack of national effort to estimate black money in India mentioned earlier, two studies: one somewhat dated – Schneider *et al. (2003)*, and one not very recent - Schneider *et al.* (2010) – have managed to provide black income estimates from 1960 to 1997, and from 1999 to 2007 respectively using the modern methodology of Multiple Indicators and Multiple Causes (MIMIC).

The overall picture that emerges from them is that in India the share of black income in the reported GDP has declined in the post-reform liberalization period. The former study indicates that this decline is more pronounced in the post 1992-93 phase, while the latter indicates that this declining trend continues even over the period 1999-2007. Both studies find that this decline in the share of black income to be the outcome of the economic reforms and liberalization started in India in the early nineties. On a very similar note, a recent draft NIFM Report[7] also mentions that the share of black income

7 Vis-à-vis the two studies mentioned earlier the draft NIFM Report does not provide any data series of black income though the period of the study is 1970-2009. The dynamic MIMIC estimates of NIFM in the Table 2.9, p. 53 do not match with the Figure 2.12, p. 50. Only the MIMIC estimate in the Table 2.9, p.53 corresponds with the Figure 2.8, p. 43.

in the GDP (as percentage of GDP) has been declining during the 1990's. The study based on the same MIMIC methodology finds that the share of black income in GDP that was nearly 33% in 1971-72 declined to nearly 21% in 1990-91, and then to nearly 17% of GDP in 2009-10. The study contends that, *"... perhaps ... reforms in various sectors, i.e. taxation and regulatory sides, have helped reduce the relative size of the shadow or the underground economy."*[8] In fact, all the three studies mentioned above unanimously claim for the decline in black income in GDP in the post-reform period as a result of economic reforms and liberalization. But to believe in such a decline in black income in GDP could be highly misleading.

Contrary to the findings of these three earlier studies, the present study finds that over the period 1951-2011, black income in India has increased at an accelerating rate showing no sign of any significant abatement even in the post-reform liberalization phase, i.e. post 1992-93 years. This obverse finding of the present study - contradictory to the claims of the three former studies - should be a clarion call to the government and to the policy makers to take note of the growing menace of black income in the Indian economy.

This study is in ten sections. Section 2 is a brief review of recent literature, mainly on the MIMIC approach to estimate black income in India. Section 3 postulates the theoretical model of black income of the study that is followed by its econometric model. Section 4 is on the econometric methodology to estimate the hypothesized model. Based on the standard definition of "shadow economy", this study estimates a fairly long-series of black income, starting from 1951, to 2011, using the state-of-the-art MIMIC methodology. Section 5 presents the estimation results of the six different model specifications of the study. Only one of them is selected for estimation purposes. The variables, their data sources and their stationarity status are reported in the same. Section 6 is on the selection of one of the estimated model from the six specifications based on the standard indices of the goodness-of-fit of models. Section 7 is mainly on calibration and benchmarking the selected model. A comparative analysis of black income estimates derived from the selected model is done in Section 8. Section 9 is on the reliability and accuracy of black income estimates of the study. Section 10 concludes the study.

2. REVIEW OF LITERATURE

Probably no economic problem has been so intensively discussed, or has covered more space in the Indian print media today than the issue of black money. Yet, when one reviews the existing literature in India on the issue one feels that there still remains a lack of serious, consistent and continuous national effort to understand the problem.

8 See Executive Summary of the draft NIFM Report.

Many studies have estimated[9] black income in India in the past. The earliest was Kaldor (1956), followed by Wanchoo (1971), Rangnekar (1971), Chopra (1982), Gupta and Gupta (1982), NIPFP (1985), Gupta (1992), and many others. But all these past estimates were for certain time points only, and not continuous time series that could further economic analyses of the problem. Besides, they were contentious and unconvincing for their crude methodologies, unrealistic assumptions, and questionable data. While a few of them were econometric, others were mostly simple numerical exercises with shaky methodology, or were only unfounded surmises. With gradual improvements in the estimation methodologies and quality of data over time, the estimates have improved considerably to become more convincing. Presently, the MIMIC (Multiple Indicators and Multiple Causes) approach to estimate black income is the most modern and accepted methodology in the recent global literature on the issue. While the earlier methodologies[10] used only one indicator to capture all the different facets of a black economy, the MIMIC approach incorporates all of them as indicators to utilize scarce information on black economy more efficiently than the earlier methodologies.

The central idea in MIMIC approach is to treat black income as an unobservable latent variable (η) in order to to estimate it. It hypothesizes that certain exogenous variables/ causes (xs) determine the latent variable (η). Though η is not directly observable, it manifests/reflects in other observable variables, which are its indicators (ys). Thus, the observable variables, that comprise the data, are the determinants and the indicators of the latent variables. In a nutshell, the intuition behind the MIMIC approach is to estimate the unobserved variable black income from the observed variables or the observables in the data. The mentioned studies[11] are all based on the MIMIC approach besides many other international studies[12].

Schneider *et al.* (2003) find that the size of the Indian shadow economy increases from 8.99% of the GDP in 1960-61 to a peak of 23.86% in 1992-93, and thereafter declines to 23.19% in 1997-98[13]. This declining trend in black income is evinced further in Schneider *et al.* (2010)[14]: from 23.2% in 1999 to 20.7% in 2007 of the GDP of India. Its average size during 1999-2007 was at 22.2% of the GDP[15] of India.

The causal factors in Schneider *et al.* (2003, p.17) are direct and indirect taxes, inflation rate, and public sector employment while in Schneider *et al.* (2010, p. 449) they are government expenditure, share of direct taxes, total tax burden, fiscal, business, and

9 These different estimates are not comparable for various reasons such as methodological differences, differences in assumptions, and different sources of data. For different estimates in the past, see Table 6.

10 Currency approach, electricity approach, fiscal approach, etc.

11 Schneider *et al.* (2003), Schneider *et al.* (2010), and the recent draft NIFM Report.

12 Frey and Weck-Hannemann (1984), Aigner, *et al.* (1988), Giles (1999a, b), Giles and Caragata (2001), Giles and Tedds (2002), Chaudhuri *et al.* (2006), Thießen (2010) and Ruge (2010).

13 See p. 16 and p. 21 of Schneider *et al.* (2003).

14 The study estimates the size of shadow economy of 162 countries belonging to the developing, the East European, the Central Asian and the high-income OECD countries over the period 1999-2007.

15 p. 455.

economic freedom, per-capita GDP, unemployment rate, regulatory quality, government effectiveness, openness and inflation rate. The respective indicator variables of black income are the growth rate of real GDP, the currency to M3 ratio, the level of real currency in Schneider *et al.* (2003, p.17); growth rate of per-capita GDP, per-capita GDP, labour force participation rate, growth rate of labour force and currency in Schneider *et al.* (2010, p. 449).

Chaudhuri *et al.* (2006) estimate black income in 14 major states of India from 1974-75 through 1995-96 using the same MIMIC method. It finds that the average growth of black income has declined after the liberalization and reforms since 1991-92 (p. 428). Haryana has the smallest shadow economy, closely followed by Tamil Nadu; Bihar has the largest shadow economy. Tamil Nadu, Andhra Pradesh, Karnataka, Kerala have relatively small shadow economies. The causal factors (p. 435) are the ratios: capital developmental expenditure to NSDP, capital non-developmental expenditure to NSDP, tax revenue to NSDP, non-tax revenue to NSDP, current developmental expenditure to NSDP, and current non-developmental expenditure to NSDP. The two indicators in the model are growth in real net state domestic product and total number of employees in registered manufacturing adjusted by the total number of factories in a state.

Kar (2011) finds that from 1948 to 2008 the total illegal capital outflow from India was to the tune of $213.2, or 17.7% of the GDP of 2008. The illicit capital outflow grew at a compounded nominal rate of 11.5% per annum, and in real terms at 6.4% per annum during the period. The White Paper on Black Money (Ministry of Finance, GOI, 2012) dismisses some recent estimates of Indian black money held abroad by international agencies as "baseless exaggerations" (p. 19). It finds (p. 13-17) that the Swiss Bank's estimate of deposits worth 1.945 billion Swiss Francs (Rs. 9295 crores) in the Swiss National Bank at the end of 2010 to be the most authentic estimate (p.14) of Indian black money held abroad. On the whole, the document concludes that there are no correct estimates of black money held abroad (p.17).

After the Black Money Bill, 2014, the Department of Revenue, Ministry of Finance, constituted the Special Investigation Team (SIT)[16] in 2014. The Terms of Reference (TOR)[17] of the SIT (p. 2-3) do not in any way indicate that it is entrusted to determine the amount of black income in the economy. Thus, as far as its interim reports[18] submitted to the Supreme Court are concerned there are no mentions in them of the exact magnitude of black income at the national level. Despite this apparent lack of national effort to estimate the recent magnitude of black income, the White Paper on Black Money

16 A thirteen member team under the order of the Supreme Court dated 4/7/2011 on the Writ Petition (Civil) No.176 of 2009 (GOI, 2014, p. 3-4).

17 The TOR are that the SIT is charged (1) with investigation/prosecution (civil/criminal) on unaccounted monies in India or stashed abroad in foreign banks, (2) to prosecute sources of unaccounted monies in criminal activities/unlawful means, and (3) to prepare an action plan to curb black money.

18 The SIT has submitted in total 5 interim status reports to the Supreme Court. The latest 5th report recommends: (1) a ban on cash transaction above Rs. 3 lakhs, and (2) an upper limit on cash holding of Rs. 15 lakhs.

expresses most succinctly: *"the need for more reliable estimates of the extent of black money both inside and outside the country ... through rigorous research and estimation ... for (the) purposes of policy formulation..."* (p. 17) as the immediate national concern on black money. To that end, a memorandum of understanding (MOU)[19] between the Central Board for Direct Taxes (CBDT), and the National Institute of Public Finance and Policy (NIPFP), the National Council for Applied Economic Research (NCAER), and the National Institute of Financial Management (NIFM) was signed[20].

However, a draft of the NIFM Report submitted to the CBDT was available at its website. The definition (p. 6) of unaccounted income in the draft NIFM Report is, *"... is the income from those economic activities that circumvent or otherwise avoid government regulation and taxation"*. It covers unaccounted incomes from all legal and illegal economic activities and is expressed in terms of percentage of GDP at current prices (p. 6).

Broadly, two types of econometric exercises are done by the NIFM (Ch. 2, p. 8-53) to estimate black income at the aggregate level for the period 1970-2009 using: (1) the currency approach (p.20-31), and (2) the multiple indicators multiple causes (MIMIC) approach (p. 32-50).

Under the currency approach, two currency demand equations with a common set of explanatory variables are estimated. The first currency demand equation has real currency holding (C/P), i.e. nominal currency deflated by the consumer price index for the industrial workers, as the dependent variable. It is estimated[21] using the Ordinary Least Square (OLS), Fully Modified Ordinary Least Square (FMOLS), and Canonical Cointegrating Regression (CCR). The second currency demand equation has currency to broad money ratio (C/M3) as the dependent variable. The common set of explanatory variables used in both the equations are: tax revenue to GDP at current prices (tax/GDP), interest rate (IR)[22], wholesale price index (WPI), per-capita real GDP, government expenditure to GDP (exp/GDP), and total domestic credit to GDP at current prices (domcrd/GDP). It is estimated by the Dynamic Ordinary Least Square (DOLS) in addition to OLS, FMOLS and CCR.

19 The MOU (p.17-18), had seven terms of reference: (1) to assess unaccounted income and wealth both inside/ outside the country, (2) to profile money laundering and its impact national security, (3) to identify sectors prone to black income, (4) to examine methods in generation and laundering of black money, (5) to suggest ways and means to curb black money (6) to suggest methods to bring back black money kept abroad, and (7) to estimate the quantum of tax evasion by the registered corporate bodies of India.

20 These three institutions seem to have submitted their respective reports recently to the government but they are yet to be made public.

21 Prior to the estimation of the two currency demand equations, the study first conducts the test of stationarity using the Augmented Dickey Fuller (ADF) and Ng-Perron (NP) unit roots tests, and then conducts the test of structural break. It finds (p. 22-23) three structural breaks for the variables in the first equation in the years 1991, 1997, and 2002, and for the second equation in the year 1997. The results of the stationarity tests and of the structural breaks, which were supposed to be in its appendices, as mentioned by the study (p. 23) are absent.

22 Commercial banks' average deposit rate.

Likewise, under the MIMIC approach, the study estimates two MIMIC models. In the first MIMIC model, which is static (p. 35-43), the seven causal variables of black income are tax burden – the shares of personal income tax, corporate tax, and indirect taxes in GDP, the share of total central government expenditure in GDP, inflation in terms of consumer price index, reported economic crime, election years as dummy, economic reforms, and labour market transition captured in the ratio of private to public workers in the organized sector. The three indicator variables of black income are national income, money supply to GDP (M3/GDP), and per-capita consumption of electricity. The estimation results of this model may not be very reliable since the study makes no stationarity test of the causal and indicator variables of the model. Consequently, the estimated model might suffer from the problems of spurious regressions. The second MIMIC model (p. 44-50) is dynamic taking into account of the problem of non-stationarity of variables. The causal and indicator variables are the same as in the first MIMIC model. The variables are reported to be non-stationary of the order I(1).

The conclusion[23] of the study that the share of unaccounted income in the GDP has been declining in the recent years (during the post-reform period), and "perhaps indicates that reforms in various sectors, i.e. taxation and regulatory sides, have helped reduce the relative size of the shadow or underground economy" is based on the estimation results of the dynamic MIMIC model. The Figure 2.12 (p. 50) of the dynamic MIMIC model in the report shows that the decline is almost continuous from 1975-76 through 2009-10 except for some transient increases during 1970-75, in 1979-80, in 1987-88, and in 1995-96, and from 2005 to 2009. A similar pattern of decline is observed in the Figure 2.8 (p. 43) of the static MIMIC model whose estimates are probably not reliable as mentioned earlier. The Executive Summary of the NIFM Report notes (p. ii), " ... *for the period under study (1970-2010) the size of the shadow economy in India in terms of share of GDP is found to be evidently declining.*"

However, the study's estimation of black income based on the currency demand equations mentioned earlier do not support such a continuous decline in black income as is evident from the estimation of the MIMIC models. The share of black income by its estimation of real currency demand model shows a declining trend from 1973 to 1996 (Figure 2.1, p.29) and then an upward trend till 2005, while its currency to M3 model shows first an increasing trend roughly from 1970 to 1987, then a declining trend till 2001, and thereafter, an increasing trend from 2001 onwards (Figure 2.4, p. 31). But NIFM draws its major conclusion in its Executive Summary only from its econometric analysis of the MIMIC models, without delving deeper into the problem of its self-contradictory findings. Its estimation results of the currency demand models contradict its estimation results of the MIMIC models.

23 See the Executive Summary.

Besides, there is another interesting point that needs to be mentioned here. The study finds that the share of black income in GDP has declined post-reform. But a careful scrutiny of the Figures 2.8 (p. 43), 2.10 (p. 49), and Figure 2.10 (p. 50) of its estimated MIMIC models shows that the share of black income in India has been declining even prior to the ushering of the economic reforms in India in the early nineties. While the decline in the share of black income in the post-reform period is probably explicable in terms of the benign effects of the reforms, the decline in the pre-reform period has no such explanation, at least in the report.

This notable point of the NIFM study that the share of black income in GDP has been declining even prior to economic reforms and liberalization contradicts the findings of Schneider *et al. (2003)* that noted, *"the size of the Indian shadow economy increases from 8.99% of GDP in 1960-61 to a peak of 23.86% in 1992-93, and thereafter declines to 23.19% in 1997-98*[24]*."* In others words, while Schneider *et al.* (2003) find that prior to economic reform in India in 1992-93 the share of black income in GDP has been increasing, the NIFM study infers that, instead of increasing in the pre-reform period, the share of black income has been declining. This contradictory finding of the NIFM study makes the reliability of the findings of Schneider *et al. (2003)* and NIFM questionable, at least for the pre-reform period. This issue of contradictory findings is discussed further in Section 9.

To conclude this section, a recent estimate by Bhalla (2013) contends that black income was 4% of GDP in 2011-12. The estimate of Bhalla seems to be implausibly low vis-à-vis the estimates of Schneider *et al.* (2010, p. 455).

3. THEORETICAL AND ECONOMETRIC MODEL OF THE STUDY

The theoretical model of our study differs considerably from the earlier ones[25] on two counts. First, the present model is based on a firm theoretical grounding of the causal variables of black income. Two, it also provides explanations on why certain indicators of the black income need to be preferred over to the indicators of the previous studies.

Thus the present model is structured on a different line of theoretical reasoning with different causal and indicator variables. Besides, the sample period from 1951 to 2011 has been enhanced also so as to have a consistent black income series for a longer period of time. The estimation of black income of India for such a long time-span has been never attempted probably in any of the earlier studies.

24 See p. 16 and p. 21 of Schneider *et al.* (2003).
25 Schneider *et al.* (2003), Schneider *et al.* (2010), and NIFM (2012).

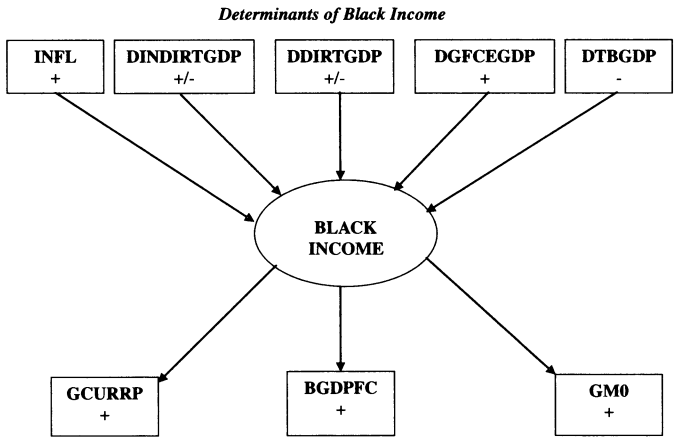

Figure 1: Theoretical Model of the Study

It is hypothesized here (and explained below) that inflation, first differences in indirect (DINDIRTGDP) and direct tax to GDP (DDIRTGDP), government final consumption expenditure to GDP (DGFCEGDP), and trade balance to GDP (DTBGDP) are the likely determinants of black income. Besides, it is also hypothesized that black income could be reflected/indicated in the growth of currency, proportion of potential black GDP, and in the growth of reserve/base money, which are considered to be the indicators of black income,. The path diagram in Figure 1 summarizes the theoretical model of the study. The determinants of black income in the hypothesized model are:

1. Inflation rate (INFL): The impact of inflation (INFL) on black income is *a priori positive.* Inflation provides an incentive for the tax evader to retain their purchasing power through tax evasion when it erodes the real value of a given level of nominal disposable income (Fishburn, 1981). Under the non-indexed progressive taxation, the increases in nominal income at the rate of inflation through cost-of-living adjustments would keep the real before-tax-income unchanged. However, the real after-tax-income could still decline with inflation since inflation could push taxpayers into higher tax brackets. This may induce tax evasion. Crane and Nourzad (1986) term this phenomenon as the "bracket-creep" effect of inflation causing more tax evasion and black income.

2. Tax Rates: The effect of tax rates – indirect (DINDIRTGDP) and direct (DDIRTGDP) - on evasion is likely to be ambiguous. It could be either positive or negative because a change in tax rate has a substitution and an income effect. The substitution effect is always positive because an increase in tax rate results in higher evasion. With higher tax rates, tax evasion on the margin would be more profitable. The income effect, on the other hand, could be either positive or

negative depending on the attitude of taxpayer towards the risk of detection. As the disposable income declines with higher tax rates, the effect on tax evasion would depend on whether risk aversion increases or decreases as the disposable income declines. Lower tax evasion could result when the absolute risk aversion increases[26] as income declines. A priori, the total effect of an increase in tax rate on the tax evaded or black income could be ambiguous due to the opposing income and substitution effects. If the substitution effect dominates the income effect then higher tax rates could result into increased tax evasion and black income even when the Arrow absolute risk aversion holds. But in a negative relationship between black income and tax rates this hypothesis is only a necessary condition. When absolute risk aversion is independent or is a positive function of income, there would be no opposing income and substitution effects of a change in the tax rate. There would be no substitution effect if the penalties were levied on evaded taxes instead of on evaded income (Yitzhaki, 1974). Consequently, the sign of tax rate in the function would be the same as that of the income effect. In the earlier studies, taxation as a determinant of black income has been treated simplistically to be positive without taking into consideration of the income and substitution effects of taxation.

3. Government Expenditure: One likely source of black income could be the government expenditure (DGFCEGDP). Its sign would be *a priori positive*. Increasing government expenditure would generate black incomes, such as bribes, commissions etc., paid to corrupt bureaucrats and public servants by the private sector.[27] While such black incomes could be costs[28] to the private sector they would be recovered by the private sector by overpricing government purchases from it.

4. Trade balance: The balance of trade (DTBGDP) could be yet another source of black income. Manipulating invoices of exports and imports (to save on import duties) would generate black income in the external sector[29]. Besides, the rising prices of gold, silver, etc. in the economy would induce their smuggling and deplete trade balance (Sundaram and Pandit, 1976, p. 125). Thus, decreasing trade balance or increasing trade deficit could increase black income in the economy. Its sign would be a priori negative.

The indicators of black income in the model are:

1. Growth of currency (GCURRP): Black transactions are usually done in cash. Thus, with black income increasing the increasing use of currency in the economy

26 Arrow Hypothesis.
27 Bhattacharyya and Ghosh (1998).
28 op. cit.
29 Sinha (2014) p.37-39, 59-60.

is quite likely. Therefore, as an indicator of black income, the present study prefers to use the growth of currency over the ratio of cash to M3 as used in one of the earlier studies[30] because black income is likely to impact both the demand side and the supply side of money[31]. On the one hand, it is likely to increase the use of cash in the economy on the demand side, and on the other hand, it could increase the stock of money in the economy on the supply side by increasing the monetary base. Consequently, M1, M2, and M3 are likely to increase. This could result into one of the two possibilities: one, either the cash to M3 ratio would decrease if the growth of currency is less than the growth of M3, or, two, the cash to M3 ratio would increase if the growth of currency is more than the growth of M3. In India, studies[32] indicate that cash to M3 ratio has been declining secularly (Figure 2). *In our opinion, cash to M3 ratio, which was used in the previous study, is not at all an appropriate indicator of increasing cash transaction in a black economy.* A better indicator of black income could have been the growth of currency used in the economy.

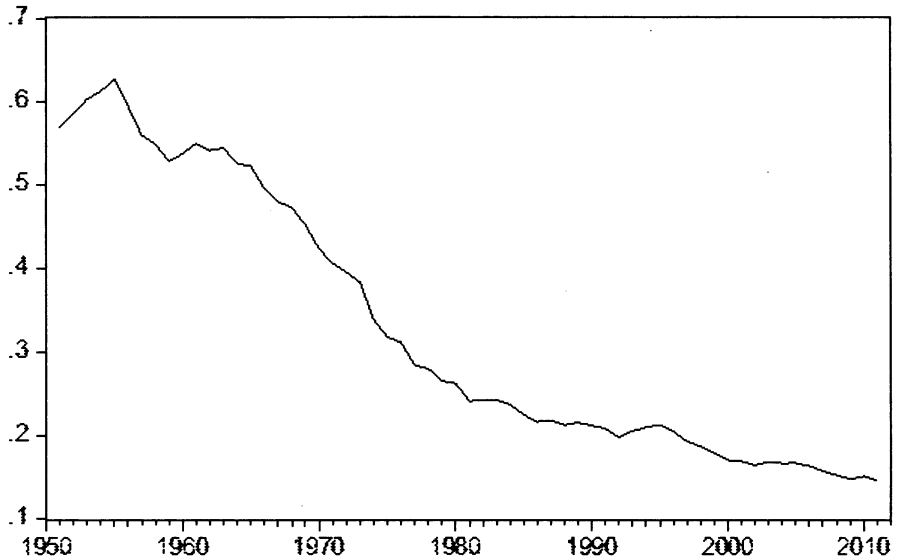

Figure 2: Ratio of Currency to M3 from 1950 through 2012

2. The percentage of potential black GDP (BGDPFC): Certain sectors and activities of an economy are more prone to tax evasion and generation of black income than other sectors and activities. NIPFP (1985) indicates that such sectors of the Indian economy are registered and unregistered manufacturing, transport by other

30 Schneider Chaudhuri and Chatterjee (2003).
31 Sinha, 2014, p.142-145, 148-151.
32 See Jadhav (1999).

means and storage, trade, hotels and restaurants and other services. Beside these sectors, our study also includes mining and quarrying[33] and construction[34] as sectors that have more potential for black income generation. In the classification of GDP at factor cost by industry of origin, agriculture and allied activities are excluded because they are statutorily untaxed. Similarly, public administration and defense are excluded as sources of tax evaded black income though they could be susceptible to black income from bureaucratic corruption in the government. What is left in the GDP at factor cost after excluding agriculture and allied activities, and public administration and defense is the GDP at factor cost from those sectors that are likely to be more prone to black income generation. These are sectors mentioned in NIPFP (1985) plus mining and quarrying, and construction. Incidentally, the draft NIFM Report also identifies some such sectors that are more prone to black income generation on similar lines. The report mentions them[35] to be real estate, mining, pan-masala, gutka and tobacco industry, and diamond industry, bullion and commodity markets, film industry, securities market, educational institutes and professionals.

3. Growth of base money (GM0)[36]: Black income is likely to impact both the supply of and demand for money. On the supply side of money, tax evasion could result into higher budget deficit, which could be covered partly by the credit from the central bank to the government. This could lead to increase in the reserve or the base money in the economy. On the other hand, trade deficits caused by black income could decrease the stock of base money in the economy. The net impact of black income on base money and its growth would depend on its relative impact on budget and trade deficit. In the case of India, since the trade deficit is usually smaller than the budget deficit, the positive impact of black income on budget deficit is likely to prevail over the negative impact of trade deficit. Consequently, the impact of black income on the growth of reserve or base money is likely to be positive. *The possibility that the growth of black income is likely to affect the stock of base money in the economy and thereby impact its money supply base has never been considered in earlier studies.* Previous studies simplistically modeled the monetary impact of black income as increased use of currency from the demand side of money. The impact of black income on the supply side of money through the stock of base money was never foreseen theoretically in previous studies.

33 The Hindu, August 4, 2014 reports that incomes in higher education, real estate and mining have large black components.

34 The number of sectors that are suspected to generate black income in India is more than what the NIPFP (1985) enumerates. See also executive summary of the draft NIFM Report.

35 See executive summary of the draft NIFM Report.

36 Sinha (2014), p. 128, 142-144, 182-185, 227, 245.

Given the theoretical understanding of a black economy as stated above, the derived model is translated as a MIMIC model for econometric purposes. A MIMIC (Multiple Indicator Multiple Cause) model[37] is a sub-model in the general[38] class of SEM (Structural Equations Model)[39] that is estimated by the Maximum Likelihood Estimator (MLE). The full general SEM defined in mean deviation form of variables[40] comprises of three sets of equations/ models:

1. The measurement model for y: $y = \Lambda_y \eta + \varepsilon$
2. The measurement model for x: $x = \Lambda_x \xi + \delta$
3. The structural model: $\eta = B\eta + \Gamma\xi + \zeta$ where

i. y – p x 1 vector of observed response or outcome variables or indicator variable

ii. x – q x 1 vector of predictors or input variables

iii. η – m x 1 random vector of latent dependent or endogenous variables

iv. ξ – n x 1 random vector of latent independent or exogenous variables

v. ε – p x 1 vector of measurement errors in y

vi. δ – q x 1 vector of measurement errors in x

vii. Λ_y – p x m matrix of coefficients of the regression of y on η

viii. Λ_x – q x n matrix of coefficients of the regression of x on ξ

ix. B – m x m matrix of coefficients of the η variables in the structural relationship. B has zeros in the diagonal, and (I-B) is required to be non-singular.

x. Γ- m x n matrix of coefficients of the ξ variables in the structural relationship.

xi. Z – m x 1 vector of equation errors (random disturbances) in the structural relationship between η and ξ

The covariance matrices are:

i. Cov(ξ) or Φ (nxn) - phi matrix

ii. Cov(ζ) or ψ (mxm) - psi matrix

iii. Cov(ε) or θ_ε (pxp) - theta-epsilon matrix

37 Joreskog and Goldberger (1975).

38 The generality of the SEM comes from the fact that it accommodates various sub-models involving latent variables, measurement errors in dependent and independent variables, reciprocal causation, simultaneity and interdependence. The various sub-models are estimated by different econometric techniques such as OLS, WLS, GLS, 2SLS, FIML, LIML, etc.

39 For a general overview on SEM see Hayduk (1987), Bollen (1989), Hoyle (1995), Maruyama (1997), Byme (1998), Muthen (2002) and Cziraky (2005).

40 The model does not include an intercept term.

iv. Cov(δ) or θ_δ (qxq) - theta-delta matrix

The minimal assumptions of the MIMIC model are

i. ε is uncorrelated with η

ii. δ is uncorrelated with ξ

iii. ζ is uncorrelated with ξ

iv. ξ, ε and δ are mutually uncorrelated

The model comprises of: (1) the structural equations model and (2) the measurement models. The structural equation model is:

$$\eta = \gamma' \mathbf{x} + \zeta \qquad \text{....(1)}$$

where the latent variable - black income - is η, $\gamma = (\gamma_1, \gamma_2, ..., \gamma_q)$ is a (1xq) vector and $x' = (x_1, x_2, ..., x_q)$ in which each x_i, i = 1, 2, ..., q is a potential determinant of the latent variable η. Since the determinants of the latent variable η partially explain it the error term ζ represents the unexplained component. The variance of ζ is denoted by ψ and Φ is the (q x q) covariance matrix of the determinants or the causal variables (xs) of η. The link between the latent variable η and its indicators is the measurement model, which is specified as follows

$$\mathbf{y} = \lambda \eta + \varepsilon \qquad \text{....(2)}$$

where $y' = (y_1, y_2, ..., y_p)$ is a (1x p) vector of several indicator variables. λ is the vector of regression coefficents, and ε′ is a (1x p) vector of white noise disturbances. θ_ε is the (p x p) covariance matrix of the white noise disturbances. The MIMIC model of the study in Figure 1 is obtained within the general structure of the SEM in the following way:

1. In the model there is one latent dependent variable η (black income), which is a scalar. In the measurement model of y, η (black income) is indicated by y_1 (GCURRP) and y_2 (BGDPFC) and y_3 (GM0). Normalising with respect to the currency indicator GCURRP would mean λ_y (1,1)[41] or element (1,1) in Λ_y matrix (3x1 matrix) is set to unity.

2. The measurement model for x comprises of the vector x, which is purely exogenous. In the Figure 1, it consists of INFL (x_1), DINDTGDPFC (x_2), DDIRTGDP (x_3), DGFCEGDP (x_4), and DTBGDP (x_5). In the MIMIC model, since x is the independent latent variable ξ this would imply Λ_x = I (5 x 5 identity matrix). Further, x is measured without errors i.e. Cov(δ) = θ_δ = 0 (5 x 5 null matrix). In the structural model, x impacts η through ξ because $x_i \equiv \xi_i$.

41 Or LY(2,1) in the LISREL code.

4. ECONOMETRIC METHODOLOGY

MIMIC methodology is founded on the statistical theory of unobserved variables[42]. MIMIC model is a sub-model of the Structural Equation Model (SEM) with one latent or unobserved variable (black income). Black income here is the unobserved variable over time within a factor-analytic framework. The unknown coefficients are estimated through a set of structural equations that depict how the various observed causes impact the unknown unobserved variable. The SEM, as in the MIMIC approach, examines the relationship between unobserved variables in terms of the relationship among a set of observed variables using the covariance information of the observed variables. It compares a sample covariance matrix of the observed variables where a hypothesized model imposes a parametric structure on it. The relationships between the observed variables described in the covariance matrix are assumed to be generated by the unobserved variables. The amount of black income – as the unobserved variable - is analyzed in terms of its relationship with the observed variables using the covariance matrix of the observed variables. As a first step the unobserved variable (black income) is related with the observed indicators in a factor-analytical measurement model. In the second step the relationships between the unobserved variables and observed explanatory (causal) variables are specified as the structural model. Thus a MIMIC model is a simultaneous specification of a factor and a structural model.

The MIMIC model tests the consistency of the "structural" theory using the data in a confirmatory rather than in an exploratory manner. In its confirmatory analysis, a model is specified to find out whether an unobserved (latent) variable or factor influences an observed variables or not imposing parameter constraints. Thus, the economic theory is tested by examining the consistency of actual data with the hypothesised relationship between the observed or the measured variables and the unobserved variable with two objectives: (1) estimating the parameters and then (2) assessing the fit of the model. For the present study the two objectives are: (1) measuring the relationship between a set of observed determinants of black income (the latent variable) and (2) testing if the hypothesised relationships fit the data.

The reduced form multivariate regression equation model, in which the endogenous variables or the indicators of latent variable η are y_j, j=1, 2, ..., p and x_i, i=1, 2 , ..., q its causes or determinants, is obtained by putting equation (1) in equation (2). The reduced form model is:

$$\mathbf{y} = \Pi\mathbf{x} + \mathbf{z} \qquad \text{....(3)}$$

where $\Pi = \lambda\gamma'$ is a matrix with unit rank and $z = \lambda\,\zeta + \varepsilon$ is the composite error term of y. The error term z in equation (3) is a (px1) vector of linear combinations of the white noise error terms ζ and ε from the structural equation and the measurement

42 See Zellner (1970), Goldberger (1970) and Joreskog and Goldberger (1975).

model i.e. $z \sim (0, \Omega)$. The covariance matrix Ω: $Cov(z) = E[(\lambda\zeta+\varepsilon)(\lambda\zeta+\varepsilon)'] = \lambda\lambda'\psi + \theta_\varepsilon$ is constrained similarly as Π. The identification and estimation of the model (3) requires normalisation of one of the elements of the vector λ to a priori value (see Bollen, 1989). The covariance matrix $\Sigma(\theta)$ of the MIMIC model derived from equations (3.1) and (3.2) describes the relationships between the observed variables in terms of their covariances. Decomposing $\Sigma(\theta)$ yields the structure between the observed variables and the latent variable as

$$\Sigma(\theta) = \begin{bmatrix} \lambda(\gamma'\Phi\gamma + \psi) + \Theta_\varepsilon & \lambda\gamma'\Phi \\ \Phi\gamma\lambda' & \Phi \end{bmatrix} \quad ...(4)$$

where $\Sigma(\theta)$ is a function of the parameters λ and γ and of the covariances contained in Φ, Θ_ε, and ψ. If the hypothesised model is correct and the parameters are known the estimated model would exactly reproduce the population covariance matrix Σ i.e $\Sigma = \Sigma(\theta)$. In practice, the population variances and covariances are unknown. Hence, the sample covariance matrix of the observed variables y (the vector of indicators) and x (the vector of determinants), and sample estimates of the unknown parameters are used for estimating the model. The main objective of the method is to estimate the parameters and covariances that produce an estimate for $\Sigma(\theta)$ i.e. $\hat{\Sigma} = \Sigma(\hat{\theta})$ as close as possible to the sample covariance matrix of the observed causes and indicators. The function that measures how close a given Σ^* is to the sample covariance matrix S is a fitting function. The most widely used fitting function for SEM is the Maximum Likelihood (ML) function:

$$F_{ML} = \log |\Sigma(\theta)| + \text{tr}\,[\mathbf{S}\,\Sigma^{-1}(\theta)] - \log |\mathbf{S}| - (p + q) \quad ...(5)$$

where $\log |*|$ is the log of the respective matrix's determinants and $(p + q)$ is the number of observable variables. In general, there is no closed form or explicit solution for the structural parameters such that F_{ML} exists. The estimates that minimize the fitting function are derived by applying iterative numerical procedures (details in Appendix C of Bollen, 1989).

The model tests the 'structural' theory in the data first by estimating the parameters of the model i.e. coefficients, variances, etc., and then tests whether the theory or the hypothesis fits the data used. The estimated MIMIC parameters determine only the estimated relative amount of black income as a pattern over time in terms of the MIMIC index or rankings, and not the actual amount of black income. To calculate the actual amount of black income the MIMIC indices are converted into a numerical magnitude of black income as percentage of the official GDP. This final step, known as benchmarking or calibration, is unfortunately not very standardized in the MIMIC literature. Presently there is no consensus in the literature on the calibration procedures. The indices are converted into absolute values of black income taking a base value of black income for a particular known magnitude in the base year.

5. ESTIMATION RESULTS OF THE MIMIC MODEL

Table 1 lists the variables of the model in Figure 1, their stationary status and their data sources. The first step in the MIMIC model estimation is to confirm statistically the hypothesized relationships between black income (the latent variable) and its causal variables and indicators. Once the relationships are identified and parameters estimated the MIMIC model results are used to calculate the MIMIC indices or the rankings of the latent variable. These rankings only provide relative estimates, and not absolute estimates of black income. The absolute value of black income for each year is obtained by calibrating the rankings using one year's black income amount as the benchmark. The MIMIC model depicted in Figure 1 is estimated by the method of Maximum Likelihood Estimator[43]. By keeping the indicator variables of black income unchanged, six variants of the model are estimated in this study by dropping the causal variables of black income one at a time. The results of the estimation are in Table 2.

TABLE 1
DATA, VARIABLES AND STATIONARITY OF VARIABLES

Sample	**1951**	**2011**	
Labels	**Indicators**	**Description**	**Stationary/ Non Stationary**
GCURRP	Growth Rate of Currency with the Public	Annual Growth Rate of Currency with the Public	Stationary
BGDPFC	Black GDP at Factor Cost. NIPFP (1985) noted that sectors where *prima facie* there was a greater likelihood of underestimation of output and value added were *registered and unregistered manufacturing, transport by other means and storage, trade, hotels and restaurants and other services*. In this exercise, mining and quarrying, and real estate, ownership of dwellings and business services were also included.	GDP at factor cost at current prices originating in mining & quarrying, manufacturing, construction, trade, hotels and restaurants, transport by other means and storage, real estate, ownership of dwellings and business services, and other services as percentage of GDP at factor cost at current prices	Stationary

43 Using the LISREL software.

TABLE 1 continued...

Sample	1951	2011	
Labels	**Indicators**	**Description**	**Stationary/ Non Stationary**
GM0	Growth Rate of Reserve or Base Money	Annual Growth Rate of Reserve or Base Money	Stationary
INFL	Inflation Rate	Annual inflation rate in GDP deflator. GDP deflator is GDP at Current prices (base year: 2004-05) to GDP at Constant prices (base year: 2004-05).	Stationary
INDIRTGDP	Percentage of Indirect Tax in nominal GDP	Indirect Tax as percentage of GDP at Current prices (base year: 2004-05)	Non-Stationary, I(1)
DIRTGDP	Percentage of Direct Tax in nominal GDP	Direct Tax as percentage of GDP at Current prices (base year: 2004-05)	Non-Stationary, I(1)
GFCEGDP	Percentage of Government Final Consumption Expenditure in nominal GDP	Government Final Consumption Expenditure at Current Prices as percentage of GDP at Current Prices (base year: 2004-05)	Non-Stationary, I(1)
TBGDP	Percentage of Trade Balance in nominal GDP	Trade Balance at Current Prices to GDP at Current Prices (base year: 2004-05)	Non-Stationary, I(1)

Source: *The Handbook of Statistics for the Indian Economy,* R.B.I., Various Issues

A comparative analysis of the indicators in the six variants of the model shows that all the indicator variables of black income are significant[44]. The two indicators – the percentage of the potential sources of black GDP at factor cost (BGDPFC) and the growth rate of reserve or base money (GM0) are both significant indicators of the

44 Note that annual growth rate of currency (GCURRP) is normalised to one. The statistical significance of its coefficient is not relevant.

latent variable black income in all the six variants. Both the indicators have their expected signs and are significant at 1% level of significance. This result indicates two things:

1. The growth of black income in the Indian economy is positively reflected in the GDP originating in sectors (BGDPFC) suspected to be prone to black income generation. These sectors were mining and quarrying, registered and unregistered manufacturing, construction, transport by other means, storage, trade, hotels and restaurants, real estate, ownership of dwelling, business services, and other services.

2. The generation of black income in the Indian economy is also positively reflected in the growth of reserve or base money (GM0). This reinforces empirically that the supply side of money in the Indian economy has been more affected by the generation of black income than the demand side of money[45] in the Indian economy. The chronic budget deficit of the Indian government caused by tax evasion but financed by the RBI credit to the government have caused phenomenal growth in the Indian money supply/liquidity due to the increase in the stock of base money in the economy.

A comparative analysis of the causal variables of black income across the six variants shows the following:

1. Inflation rate (INFL) is a significant positive cause of black income in India. It is significant at 5% level in variants 2, 4, and 5. In variant 3 it is significant only at 10% level.

2. Indirect tax to GDP ratio (DINDIRTGDP) is a significant negative cause of black income in India. That the increases in the indirect taxes have reduced black income is probably due to the fact that the positive income effect of indirect tax rate increase is outweighing the negative substitution of risk aversion. The variable is significant at 1% level of significance in model 1, at 5% level in variants 5 and 6, and at 10% level in variants 3 and 4. The expected sign of the variable is maintained consistently in all the six variants.

3. Direct tax to GDP ratio (DDIRTGDP) is a significant positive cause of black income only in variants 4, 5, and 6, and that too at 10% level of significance. Unlike the indirect taxes, the positive impact of direct taxes on black income could be due to the fact that the positive income effect is outweighing the negative substitution effect of risk aversion caused by increase in the direct tax rates. While the variable has the expected sign consistently maintained in all the six estimated models, it is an insignificant causal variable in variants 1 and 2.

45 Sinha (2014), p.181-183.

4. Across all the six variants, the ratio of government final expenditure (DGFCEGDP) to GDP and ratio of trade balance to GDP (DTBGDP) are insignificant causes of black income in India. While the former variable has the expected sign, the estimated sign of the latter variable is opposite to its hypothetical sign.

TABLE 2
ESTIMATES OF THE SIX VARIANTS OF MIMIC MODEL OF THE STUDY

Hyp. Sign		**Variant_1**	**Variant_2**	**Variant_3**	**Variant_4**	**Variant_5**	**Variant_6**
Indicators							
GCURRP	+	1.00	1.00	1.00	1.00	1.00	1.00
BGDPFC	+	0.54 (4.94)*	0.58 (5.32)*	0.53 (4.92)*	0.59 (5.53)*	0.60 (5.55)*	0.59 (5.53)*
GM0	+	0.72 (7.30)*	0.76 (7.86)*	0.70 (7.19)*	0.78 (8.38)*	0.79 (8.47)*	0.78 (8.40)*
Causes							
INFL	+		0.30 (2.37)**	0.21 (1.77)***	0.27 (2.23)**	0.26 (2.12)**	0.27 (2.20)**
DINDIRTGDP	+/-	-0.30 (2.22)*		-0.21 (1.72)***	-0.23 (-1.87)***	-0.26 (-1.99)**	-0.28 (-2.08)**
DDIRTGDP	+/-	0.10 (0.79)	0.10 (0.81)		0.18 (1.49)***	0.21 (1.68)***	0.21 (1.65)***
DGFCEGDP	+	0.12 (0.97)	0.02 (0.15)	0.09 (0.72)		0.10 (0.78)	0.11 (0.91)
DTBGDP	-	0.07 (0.59)	0.06 (0.52)	0.11 (0.91)	0.08 (0.65)		0.10 (0.80)
Degrees of Freedom (df)		8	8	8	8	8	10
Chi-Square		25.744	26.012	7.193	28.076	23.847	28.151
p-value		0.0012	0.0010	0.5160	0.0005	0.0024	0.0017
Chi-Square/df		3.22	3.25	0.90	3.51	2.98	2.81
RMSEA		0.19	0.19	0.00	0.20	0.18	0.17

TABLE 2 continued...

	Variant_1	Variant_2	Variant_3	Variant_4	Variant_5	Variant_6
p-value for the Test of Close Fit (RMSEA<0.05)	0.004	0.004	0.62	0.002	0.01	0.006
Goodness of Fit Index (GFI)	0.91	0.91	0.97	0.91	0.92	0.92
Adjusted Goodness of Fit (AGFI)	0.69	0.69	0.89	0.67	0.72	0.70
Comparative Fit Index (CFI)	0.81	0.80	1.00	0.81	0.85	0.83
Non-Normed Fit Index (NNFI)	0.50	0.49	1.02	0.50	0.61	0.52

Note: Level of Significance: 1% (*), 5% (**), and 10% (***)

6. GOODNESS-OF-FIT AND MODEL SELECTION

One objective in a confirmatory factor analysis is to examine the consistency of theoretical model with the actual data i.e. to assess[46] the fit of the model. The chi-square statistic, which is widely used to assess the goodness of fit[47] of a model, measures the difference between a hypothesized model and the data by testing *"the null hypothesis that the estimated variance-covariance matrix deviates from the sample variance-covariance matrix only because of sampling error"* (see Bagozzi and Heatherton, 1994, p.149). Significant chi-square statistic implies that there is a significant difference between the model and the data. In such a case, the hypothesised model is rejected when the chi-square statistic is significant under the null hypothesis. But Baumgartner and Homburg (1996) maintain that chi-square as a statistic for goodness of fit has limited practical usefulness because it tends to inflate as the sample size increases thereby causing the rejection of models with only slight divergences from the data. So, it has been always advisable to report additional measures of fit along with the reporting of chi-square statistic (Bagozzi and Heatherton, 1994; Baumgartner and Homburg, 1996). For our purposes, four absolute fit indices and two incremental fit indices are chosen that assess the overall fit of the model with the data following Bollen (1989) and Hair *et al.* (1998).

The absolute fit indices are chi-square statistic (χ^2), the ratio of chi-square to degrees of freedom (χ^2/df), the root mean squared error of approximation (RMSEA),

46 There is no consensus on assessing the overall goodness-of- fit of a model.

47 See Bagozzi and Heatherton (1994), Baumgartner and Homburg (1996) and Ping Jr.(2004).

the goodness-of-fit index (GFI), and the adjusted goodness-of-fit index (AGFI). The incremental fit indices are the comparative fit index (CFI) and the non-normed fit index (NNFI) because they compare the target model to the fit of a baseline model, normally one in which all the observed variables are assumed to be uncorrelated (Baumgartner and Homburg, 1996). The indices and their suggested cut-off values for the evaluation of goodness of fit of the estimated models are produced in Table 3. Besides estimating the six variants, selecting a suitable model out of them to estimate black income in India for the period 1951-2011 is equally important. Our next problem is which one of these six variants is to be selected for the purposes of estimation of black income? The model selection is based on the criteria of the goodness-of-fit mentioned above in this section. The indices of fit for all the six variants are reported in Table 2. A cursory glance on the fitness indices of the model points out that variant 3 of the model is most suitable for our purposes, and hence should be selected. We judge all the variants in terms of their fitness indices and thresholds/cut-offs given in Table 3.

A comparative analysis of the fitness indices across all the six models shows the following:

1. Chi-square statistic: A well-fitted model as per Table 3 should have a p-value of chi-square statistic more than 0.05. By the criteria, we find all the variants except variant 3 have p-value of chi-square less than 0.05. Only variant 3 has a p-value greater than 0.05. The significance of chi-square statistic at 5% level for variant 3 indicates that the null of the test that the estimated variance-covariance matrix of parameters deviating from the sample variance-covariance matrix due to sampling errors stands rejected. The inference from the rejection of the null is that the estimated variant 3 is able to reproduce the observed variance-covariance matrix than other variants. In other words, the variant 3 reproduces the data more closely than the other variants.
2. Chi-square/df statistic: Following Table 3, the cut-off value for the statistic is in the range 2-1 or 3-1. In fact the value of the statistic for all the variants except variant 3 is within 3-1. For variant 3, the value of the statistic is 0.90, which approximately equals 1, falls within 2-1 interval.
3. RMSEA: The Table 3 shows that for RMSEA the cut-off for a good fit should be less than 0.05, and for a reasonable fit it should be less than 0.05. By the criteria, variant 3 has the lowest RMSEA value of 0.0, which is far less than the prescribed cut-off of RMSEA<0.05. All other variants have the RMSEA value exceeding 0.08. The p-value of 0.62 for the test of close fit (RMSEA<0.05) indicates that the null of close fit cannot be rejected.
4. GFI: The GFI for all the variants exceed the benchmark cut-off of 0.90. Only variant 3 has a GFI value of 0.97, which is the maximum among all the variants.
5. AGFI: The AGFI of all the variants falls short of the benchmark cut-off of 0.90. However, the AGFI of 0.89 for variant 3 is the highest among all of them, and

may be approximated to 0.90 though it does not exceed the value prescribed in Table 3.

6. CFI: While the CFI of all the variants are far below the benchmark cut-off of 0.90, only variant 3 has the CFI value of 1.00, which far exceeds the cut-off of 0.90.
7. NNFI: Here also the NNFI value of variant 3 far exceeds the cut-off value of 0.90. The CFI values of other variants are far short of the cut-off value prescribed in Table 3.

To sum up, among the six variants estimated so far only the variant 3 of the model is eligible to be selected on the basis of goodness-of- fit criterion and to be used for the estimation of black income in India for the period 1951-2011.

7. CALIBRATING AND BENCHMARKING THE MODEL

After obtaining the latent scores or the rankings of the latent variable black income from the selected model 3, our study uses the "proportional" rule mentioned earlier to calibrate the model. To recapitulate, the rule is as follows:

$$\frac{\hat{\eta}_t}{\hat{\eta}_{1989-90}} = \frac{black_t}{black_{1989-90}}$$

TABLE 3
GOODNESS OF FIT INDICES AND THEIR THRESHOLDS FOR ASSESSMENT OF ESTIMATED MODELS OF THE STUDY

Index	Description	Thresholds
χ^2	Indicates the discrepancy between hypothesised model and data. Tests the null hypothesis that the estimated variance-covariance matrix deviates from sample variance-covariance matrix only by sampling error.	p>0.05
χ^2/df	Since Chi-square test is sensitive to sample size, the test is meaningful if degrees of freedom are taken into account. The Chi-square statistic is thus divided by the degrees of freedom.	2-1 or 3-1
RMSEA	Indicates how well the model fits the population covariance matrix considering the degrees of freedom.	< 0.05 => Good fit < 0.08 => Reasonable fit

TABLE 3 continued...

Index	Description	Thresholds
GFI	Comparison of the squared residuals from prediction with the actual data without considering the degrees of freedom.	>0.90
AGFI	GFI adjusted for the degrees of freedom	>0.90
NNFI	Fitness of model compared to a baseline model, normally the null model, and adjusted for the degrees of freedom. The index can take values greater than unity.	>0.90
CFI	Fitness of model compared to a baseline model, normally the null model, and adjusted for the degrees of freedom.	>0.90

Source: Bagozzi and Yi (1988), Baumgartner and Homburg (1996), MacCallum *et al.* (1996), Cote *et al.* (2001), Diamantopoulus and Siguaw (2000), Ping Jr. (2004) and Vieira (2011, p.14).

In the rule $\hat{\eta}_t$ is the ranking or the Z-score of the variable black income in the year t, $black_t$ is size of black income (as percentage of nominal GDP) in the year t, $black_{1989\text{-}90}$ is the bench-mark value of black income in the year 1989-90 (i.e. 22.5% of GDP from Schneider *et al.*, 2003, p.11)[48], and $\hat{\eta}_{1989-90}$ is the latent variable score corresponding to the benchmark year 1989-90 generated by the model. Given $\hat{\eta}_t$, $\hat{\eta}_{1989-90}$ and $black_{1989\text{-}90}$, the unknown $black_t$ can be obtained from the rule for the year t.

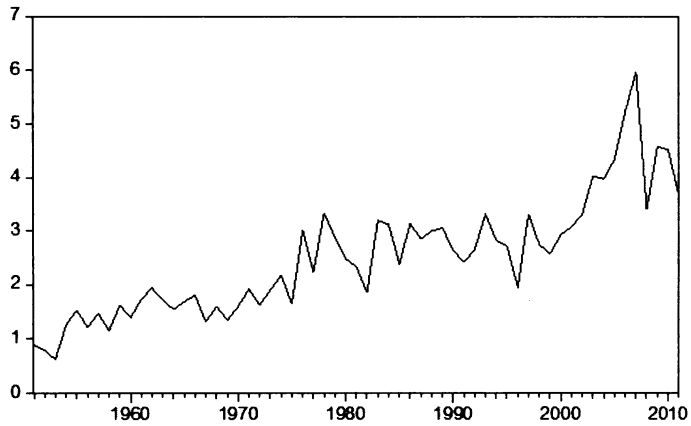

Figure 3: The Graph of Latent Scores of the Study from 1951 to 2011

The Z-scores of the latent variable black income is an ordinal series of the rankings of the latent variable for different years. For variant_3 the ordinal series derived is

48 The study claims to have taken from Bhattacharyya (1999).

presented in Table 4 as η_3 its graph is plotted as Figure 3. Using the latent score for variant 3 (η_3) and the benchmark value of black income for the year 1989-90 (i.e. 22.5% of GDP) from Schneider *et al.* (2003, p.11) in the benchmark rule, we generate black income estimates (black_13) for the period 1951-2011 in Table 4. Besides the series black_13, the table also contains series black_0. The series[49] black_0 is the estimates of black income from Schneider *et al.* (2003, p.20) for the period 1961 to 1997 and from Schneider *et al.* (2010, p.455) for the period 1999 to 2007.

8. COMPARATIVE ANALYSIS OF SERIES

For a comparative analysis[50], we contrast series black_13 generated by our model variant_3 against composite series black_0 from Schneider *et al.* (2003, p.11) and Schneider *et al.* (2010, p.455). Since the sample period of the composite series is 1961 to 2007, we have taken the series of our study for the same sample period. The descriptive statistics given for the two series black_0 and black_13 are given in the Table 5. Figure 4 depicts the graphs of the series black_0 and black_13. A comparative study of the graphs indicates that the graph of our series black_13, closely tracks the graph black_0 of the former studies though there is some overestimation during the period 1951-1966 and underestimation after 1990. While the two former studies suggest that there is a definite decline in black income post 1992, which is apparent from the graph black_0, such a conclusion cannot be drawn from the graph black_13 of our study. In fact, the graph in Figure 4 and the data of series black_13 in Table 4 indicates that though the black income is fluctuating year to year it still has an upward trend during the period 1951 to 2011.

TABLE 4
LATENT SCORES OF VARIANT_3 (H_3) OF THE MODEL AND ITS BLACK INCOME ESTIMATES (BLACK_13) IN COMPARISON WITH BLACK INCOME ESTIMATES OF THE COMPOSITE SERIES (BLACK_0) FROM SCHNEIDER *ET AL.* (2003) AND SCHNEIDER *ET AL.* (2010)

YEAR	η_3	black_13	black_0
1951	0.89	6.59	
1952	0.80	5.86	
1953	0.62	4.58	
1954	1.26	9.31	
1955	1.53	11.29	

49 The data of this composite series is consistent since both the studies adopt the same methodology to generate their respective series. The missing data for the year 1998 is calculated as a simple average of the values of 1997 and 1999.

50 One caveat in this comparative analysis is that strictly the black income estimations of different studies are incomparable as they follow different methodologies and use different sets of assumptions.

TABLE 4 continued...

YEAR	η_3	black_13	black_0
1956	1.21	8.92	
1957	1.47	10.83	
1958	1.15	8.47	
1959	1.63	12.00	
1960	1.39	10.26	
1961	1.73	12.75	8.99
1962	1.94	14.29	9.59
1963	1.72	12.64	10.11
1964	1.55	11.39	10.65
1965	1.69	12.44	11.20
1966	1.81	13.30	11.52
1967	1.31	9.67	11.72
1968	1.61	11.84	12.09
1969	1.34	9.89	12.47
1970	1.60	11.76	12.83
1971	1.92	14.13	13.40
1972	1.63	11.97	14.32
1973	1.90	14.01	14.93
1974	2.18	16.03	15.39
1975	1.65	12.13	15.98
1976	3.02	22.27	16.59
1977	2.24	16.46	17.27
1978	3.34	24.57	17.65
1979	2.88	21.20	18.03
1980	2.48	18.23	18.52
1981	2.33	17.13	19.07
1982	1.86	13.66	19.68
1983	3.19	23.51	20.17
1984	3.12	22.97	20.65
1985	2.38	17.52	21.14
1986	3.13	23.08	21.55
1987	2.85	20.99	21.91
1988	3.00	22.06	22.20
1989	3.06	22.50	22.50
1990	2.63	19.37	22.79
1991	2.42	17.80	22.97
1992	2.65	19.49	23.86

TABLE 4 continued...

YEAR	η_3	black_13	black_0
1993	3.31	24.38	23.25
1994	2.82	20.78	23.28
1995	2.72	20.00	23.21
1996	1.95	14.38	23.01
1997	3.31	24.36	23.19
1998	2.74	20.17	23.20
1999	2.57	18.95	23.20
2000	2.93	21.56	23.10
2001	3.08	22.66	22.80
2002	3.31	24.37	22.60
2003	4.03	29.67	22.30
2004	3.97	29.27	22.00
2005	4.34	31.93	21.70
2006	5.23	38.53	21.20
2007	5.98	44.03	20.70
2008	3.39	25.00	
2009	4.58	33.70	
2010	4.51	33.24	
2011	3.65	26.85	

TABLE 5

COMPARATIVE ANALYSIS OF THE BLACK INCOME ESTIMATES OF THE STUDY (BLACK_13) AND BLACK INCOME ESTIMATES OF THE COMPOSITE SERIES (BLACK_0) FROM SCHNEIDER *ET AL.* (2003) AND SCHNEIDER *ET AL.* (2010)

	black_0	black_13
Mean	17.50	17.16
Median	18.03	17.13
Maximum	23.86	24.57
Minimum	8.99	9.67
Std. Dev.	4.84	4.68
Skewness	-0.26	0.10
Kurtosis	1.63	1.62
Jarque-Bera Stat.	3.31	2.99
Probability	0.19	0.22
Sum	647.68	634.93

TABLE 5 continued...

	black_0	black_13
Sum Sq. Dev.	844.90	788.88
Observations	37.00	37.00

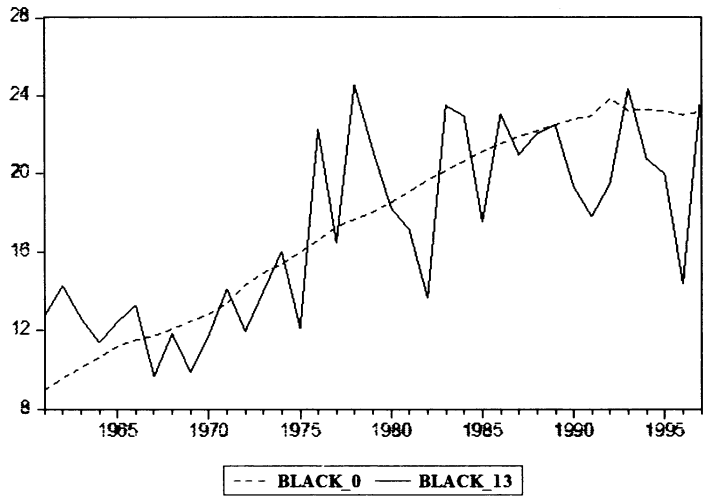

Figure 4: Comparison of the Graph of Black Income Series of the Study (black_13) and the Graph of the Composite Series from Schneider *et al.* (2003) and Schneider *et al.* (2010) for the period 1961-1997.

Finally in Table 6 the generated series black_13 is contrasted with black income estimates collated from major studies in 1951-2011. The studies are Kaldor (1956), Wanchoo (1971), Rangnekar (1971), Ojha and Bhatt (1964), Chopra (1982), Gupta and Gupta (1982), NIPFP (1985), Gupta (1992), Kumar (1999), Schneider *et al.* (2003), and Schneider *et al.* (2010)[51]. Our estimate of black income from 1951 to 2011 is more or less in line with the estimates of other studies for different years except with some differences with Gupta and Gupta (1982) for the years 1976 and 1977, Gupta (1992), and Kumar (1999). These estimates appear to be overestimates but like all estimates of black income such differences have been always contentious in this field of study. Our series indicates that black income in India has increased from 6.6% in 1951 to 26.9% of the nominal GDP in 2011. In the interregnum, it fluctuates with an upward trend. Unlike Schneider *et al.* (2003), and Schneider *et al.* (2010) and even the draft NIFM Report (p.29, 31, 43, 49) our series shows no decline of black income even after 1992. Instead our series indicates that black income in India has increased with an upward trend in the post 1992 period. The simple correlation coefficient between the composite series and our series is 0.62 for the period 1961-2007 suggests that the two series are fairly correlated with each other.

51 The composite series depicts the black income data combined from Schneider *et al.* (2003), and Schneider *et al.* (2010).

TAB

ESTIMATES OF BLACK INCOME IN INDIA FROM 1

Year	Kaldor (1956)	Wanchoo (1971)	Rangnekar (1971)	Ojha and Bhatt (1964)	Chopra (1982)	Gupta and Gupta (1982)	
1951							
1952							
1953	6			7			
1954							
1955							
1956				8			
1957							
1958							
1959							
1960					7		
1961		4	7		5		
1962							
1963							
1964							
1965		4	10				
1966							
1967						10	
1968		4	9				
1969							
1970					6	22	
1971							
1972							
1973							
1974							
1975			11				
1976					12	39	
1977						49	
1978							
1979							
1980			16				

LE 6
951 TO 2011 (% OF GDP) FROM VARIOUS STUDIES

	NIPFP (1985)	Gupta (1992)	Kumar (1999)	Schneider *et al.* (2003)	Schneider *et al.* (2010)	Composite Series	This Study
							6.6
							5.9
							4.6
							9.3
							11.3
							8.9
							10.8
							8.5
							12.0
							10.3
				8.99		8.99	12.8
				9.59		9.59	14.3
				10.11		10.11	12.6
				10.65		10.65	11.4
				11.20		11.20	12.4
				11.52		11.52	13.3
				11.72		11.72	9.7
				12.09		12.09	11.8
				12.47		12.47	9.9
				12.83		12.83	11.8
				13.40		13.40	14.1
				14.32		14.32	12.0
				14.93		14.93	14.0
				15.39		15.39	16.0
	15-18			15.98		15.98	12.1
				16.59		16.59	22.3
				17.27		17.27	16.5
				17.65		17.65	24.6
				18.03		18.03	21.2
	18-21	41.71	15	18.52		18.52	18.2

TABLE 6 Continued...

Year	Kaldor (1956)	Wanchoo (1971)	Rangnekar (1971)	Ojha and Bhatt (1964)	Chopra (1982)	Gupta and Gupta (1982)	
1981							
1982							
1983							
1984							
1985							
1986							
1987							
1988							
1989							
1990							
1991							
1992							
1993							
1994							
1995							
1996							
1997							
1998							
1999							
2000							
2001							
2002							
2003							
2004							
2005							
2006							
2007							
2008							
2009							
2010							
2011							

	NIPFP (1985)	Gupta (1992)	Kumar (1999)	Schneider *et al.* (2003)	Schneider *et al.* (2003)	Composite Series	This Study
				19.07		19.07	17.1
				19.68		19.68	13.7
	19-21	45.81		20.17		20.17	23.5
				20.65		20.65	23.0
				21.14		21.14	17.5
				21.55		21.55	23.1
		50.71		21.91		21.91	21.0
				22.20		22.20	22.1
				22.50		22.50	22.5
			35	22.79		22.79	19.4
				22.97		22.97	17.8
				23.86		23.86	19.5
				23.25		23.25	24.4
				23.28		23.28	20.8
			40	23.21		23.21	20.0
				23.01		23.01	14.4
				23.19		23.19	24.4
						23.20	20.2
					23.2	23.20	18.9
					23.1	23.10	21.6
					22.8	22.80	22.7
					22.6	22.60	24.4
					22.3	22.30	29.7
					22	22.00	29.3
					21.7	21.70	31.9
					21.2	21.20	38.5
					20.7	20.70	44.0
							25.0
							33.7
							33.2
							26.9

9. RELIABILITY AND ACCURACY OF THE ESTIMATES OF THE STUDY

It is a very well-known fact that black income estimates are highly controversial[52]. Usually, there are no unanimity on the accuracy and reliability of an estimate. Estimates have always been criticized on the grounds of unrealistic assumptions, infirmities in the applied methodologies, questionable data, etc. Further, no two estimates are comparable due to the differences in the assumptions, methodology and the data. Consequently, no estimate of black income is accepted to be sacrosanct. For it cannot be cross-checked due to the absence of direct and reliable information on black income.

Given these handicaps that an estimate usually suffer, the two central issues concerning reliability and accuracy of our estimates are: (1) was the share of black income in the GDP of India declining in the post-reform period (1992-93 onwards) as we claim, and (2) how accurate are our estimates of black income?

On the first issue, as mentioned earlier, Schneider *et al.* (2003), Schneider *et al.* (2010), and the NIFM study - all three claim that in the post-reform period the share of black income in the Indian GDP has been declining due to the beneficent effects of reforms. But the claim that our study makes is that the share of black in GDP has been increasing with an increasing trend not only in post-reform period but also in the pre-reform period, contradicting the position taken by the first three studies mentioned above for the post-reform period.

For the purpose of a comparative analysis of the studies, let us, for the sake of convenience and simplicity, accept the pre-reform period to be prior 1992-93 and the post-reform period to be post 1992-93 as in Schneider *et al.* (2003)

For the pre-reform period, both our study, and Schneider *et al.* (2003) find that the share of black income was increasing. There are no[53] findings of Schneider *et al.* (2010) for this period. But the study of NIFM based on the MIMIC estimates claim that the share of black income has been declining even in the pre-reform period (as per the Figures 2.8, p. 4; Figures 2.10, p. 49; and Figure 2.12, p. 50 in the NIFM Report).

This claim of NIFM that the share of black income in the GDP was declining even before reforms in the Indian economy could be challenged on two grounds: (1) the circumstantial evidence from other studies during the period in question, and (2) the contradictions in the estimates of the currency demand models and the MIMIC models of the NIFM study.

Given the earlier caveat that the estimates of the studies are incomparable, some rough idea could be still formed about the share of black income in the pre-reform if we look at the estimates of various other studies during the period in question.

52 See footnote no. 3.

53 Since the period of the study was from 1999 to 2007.

Looking at Table 6 on the various estimates of black income in India from 1951 to 2011, it can be inferred – starting from Chopra (1982) to Kumar (1999) – that the share of black income in GDP increased from a low level of 6% in 1970 to 35% in 1999. So the evidence from other studies during the period 1970 – 1992 vindicates our claim (and also of Schneider *et al.*, 2003), that the share of black income in GDP increased in the pre-reform period. The claim of NIFM that it has been declining even in the pre-reform period finds no support in the extant literature of the period.

Further, the NIFM claim is contradicted if the estimates of black income from its currency demand approach are considered. As mentioned earlier the study's estimation of the currency demand equations do not support a continuous decline in the share of black income in the pre-reform period. The share of black income by its estimation of real currency demand model shows first a downward trend from 1973 to 1996 (Figure 2.1, p.29) and then an upward trend till 2005 while its currency to M3 model shows first an increasing trend roughly from 1970 to 1987, then a decreasing trend till 2001, and thereafter, again an increasing trend from 2001 onwards (Figure 2.4, p. 31).

For the post-reform period, Schneider *et al.* (2003), Schneider *et al.* (2010), and NIFM all claim that the share of black income in GDP has been declining; our study claims that it has been increasing. To defend our claim for the post-reform we appeal again to the circumstantial evidence from related literature on the issue and data of the period in question.

The recent literature on income inequality in India and latest taxation data released by the Income Tax Department throw some light on the issue and provide guidance to vindicate our claim for the post-reform period.

First, we consider the latest taxation data (GOI, 2016a)[54] released by the Income Tax Department. Some of the important findings from the data[55] could be indicative of the increasing black income generation in the post-reform period. These are as follows:

The direct tax collection in total tax though increased from nearly 36 percent in FY 2000-01 to peak at nearly 61 percent in FY 2009-10, has declined to nearly 51 percent in FY 2015-16 (p.5).

For the period of 15 years: 2000-2015, the direct tax to GDP ratio has been within the range of 3 to 6 percent (p. 6), which is abysmally low in comparison to that many developed economies (25 to 30 percent).

The tax buoyancy factor for the direct taxes has been less than one for the decade 1991-2000 except for the year 1998-99. In the decade 2001-10, direct taxes have been buoyant (buoyancy factor being greater than one), except for years 2003-04, 2006-07,

54 These are (a) the time-series data for the FY 2000-01 to 2014-15 (b) the PAN allotment statistics for the FY 2013-14, and (c) detailed statistics for the AY 2012-13. FY stands for Financial Year; AY stands for Assessment Year.

55 Supplemented with additional information from the NIFM Report.

and 2007-08. For the period 2011-16, the direct taxes only for the years 2012-13 and 2013-14 (p. 6). Overall, the trend of direct tax buoyancy has been declining in the post-reform period till 1997-98 and then increasing with wide fluctuations. The indirect taxes have been less buoyant than the direct taxes (p. xviii-xix, Annexure 2.2, NIFM Report) and show almost a similar trend as the direct taxes (see Figure 6.8, Annexure 2.2., p. xxvii, NIFM Report).

Table 3 (p. xxviii, Annexure 2.2) of the NIFM Report shows that the percentage of Indian population paying tax i.e. tax base has increased from a very low level of 1.2 percent in 1996-97 to a maximum of nearly 2.7 percent in 2003-04, and then decline to less than 1 percent in 2012-13 (as found in the latest data released by the Income Tax Department). Effectively less than 1.5 percent of the population is paying substantial amount of direct taxes (Kumar, 2016, p. 27). In others the tax base has remained to be very narrow despite reforms (in taxation).

Nearly one-third (33 percent) of the effective assesses do not file returns. Such assesses are highest for the Association of Persons, Body of Individuals, Government, Artificial Juridical Persons, Local Authorities and Trusts in the PAN categories (data for the AY 2012-13). Almost 56 percent of the effective assesses pay zero tax.[56]

The interest income reported by all assesses is much less than the interest paid by all commercial banks. The total interest income declared was less than 40 percent of what the commercial banks. Likewise, while 24 million households admit renting of property in the 2011 Census, only 2 million admits that they are receiving rent in their income tax returns.[57]

Besides, the inferences from the recent literature of income inequality in India are probably a more convincing pointer to our claim that the share of black income in GDP has risen in the post-reform.

Banerjee and Piketty (2005) analyze the top 1 percent[58] of Indian incomes from 1922 to 2000 using the individual income tax return. The study finds (p.1) that the shares of the top 0.01 percent, 0.1 percent and 1 percent in total reported income in India have declined substantially from the 1950s to the mid 1980's (due to the socialist policy in a mixed economy) but then increased again from mid-1980's to 2000 (due to partial liberalization under the Prime Ministership of Mr. Rajiv Gandhi followed by pronounced pro-business structural reforms and liberalization in the 1990's). The income inequality curve of India appears to be U-shaped during the period 1922-2000 (p. 7) with a turnaround in 1980-81. The study infers that income inequality has increased in the post-reform period.

56 Tiwari and Chandra (2016).

57 Tiwari and Chandra (2016).

58 The study does not go below the top 1 percent because incomes below this level are largely exempt from income tax in India.

The study further notes that the gradual liberalization and reforms of the Indian economy made the rich (the top 1 percent) to substantially increase their in total income. In the 1980's, the gains in income were more equitably distributed in the top 1 percent. But in the 1990's the gains in income went only to top 0.1 percent. This top 0.1 percent is the class of ultra-rich who cornered most economic gains from the reforms and liberalization in the 1990's. It contends that, "... *the average income of the top 0.01 percent of income distribution was about 150-200 times larger than the average income of the entire population during the 1950s. The difference fell to less than 50 times larger than the average income in the early 1980s, but then rose again to 150-200 times larger during the late 1990s.*" (p. 7).

The study finds that the share of the very rich in India is currently much higher than in the Europe (p. 13). Besides, within the top 1 percent of income distribution, it finds that top 0.01 percent has increased its share in income substantially in the post-reform period that the income inequality even within the rich has phenomenally increased in the post-reform period. The findings of Banerjee and Piketty (2015) are consistent with the findings of Nagaraj (2000) and Tendulkar (2003) for the period, and finds support from Kar (2011, p. 51) also. Kar mentions that despite rapid economic growth in the post-reform period, there has been a rising trend towards greater income inequality during the period. Kar's inference that income inequality has increased post-reform is corroborated also by Sarkar and Mehta (2010) and Sengupta *et al.* (2008).

The top 0.01 percent of the income distribution is the category of ultra-rich or the high networth individuals (HNI) whom Bhalla (2013)[59] defends as the highest tax payers of the country on the question of application of a three-percentage point income tax surcharge by the Ministry of Finance on the super-rich in the income category of Rs. 20 lakhs and above per annum.

To sum up, the background literature on income inequality in India and the latest income tax data for the post-reform period suggest that the share of black income in GDP has increased in the post-reform period. For if it had not (as contended by three mentioned studies), then the findings of Banerjee and Piketty (2015) that income inequality has increased post-reform would be contradictory. The contradiction is serious because the findings of Banerjee and Piketty (2015) are based on the returns data of the income tax which in India is a progressive taxation meant to minimise income inequality. So if income inequality has increased post-reform it only suggests that undeclared black incomes have increased post-reform. This is very evident in the findings of our study also. Our contention is also supported by Kar (2011, p. 50) who notes: "... *the post-reform period is characterised by a much larger underground economy (averaging 42.8% of official GDP compared to just 27.4% in the pre-reform period).*"

59 January 12, 2013 (p.15), January 23, 2013 (p. 11), and February, 8, 2013 (p.11) of The Indian Express.

Given the caveat about an estimate mentioned before (in the first paragraph of this section), the question of its accuracy is very relative. In other words, in the absence of direct information on black income, no estimate can claim to be accurate since it cannot be cross-checked. So the accuracy of any estimate is relative as to how it compares with other existing estimates.

The estimate of black income of our study is fairly comparable with Schneider *et al.* (2003) and Schneider *et al.* (2010).[60] To reiterate (see Table 6), Schneider *et al.* (2003) covers the period 1961-1997, and Schneider *et al.* (2010) covers 1999 through 2007. The composite series[61] covers the period 1961-2007. Our study covers a much longer period than the two earlier studies: from 1951 to 2011.

From the Table 6, average black income (percentage of GDP) for the pre-reform and post-reform period, and different periods within them has been calculated for the series of Schneider *et al.* (2003) and Schneider *et al.* (2010), composite series, and for the series of our study. These are presented in Table 7 below. It follows from the Table 7 that our estimates are fairly comparable with Schneider *et al.* (2003) and Schneider *et al.* (2010).

TABLE 7
COMPARISON OF THE AVERAGE ESTIMATED BLACK INCOME IN GDP (PERCENT) IN PRE AND POST-REFORM PERIOD FROM OUR STUDY VIS-À-VIS SCHNEIDER *ET AL.* (2003), SCHNEIDER *ET AL.* (2010), AND THE COMPOSITE SERIES

Period	Schneider *et al.* (2003)	Schneider *et al.* (2010)	Composite Series	Our Study
Pre-Reform 1961-91	18%	—	16%	17%
1951-91	—	—	—	15%
Post-Reform 1992-2007	—	—	23%	25%
1992-97	23%	—	—	
1999-2007	—	22%	—	
1992-2011	—	—	—	26%

60 Draft NIFM Report provides no such data.
61 Both the studies follow the same methodology and comparable data for India.

For the pre-reform period 1961-91, the average magnitude of black income is 18 percent of the GDP in Schneider *et al.* (2003) while our study shows it to be 17 percent. The composite series indicates that it is 16 percent for the period which is also comparable to our estimate. Since our study covers 1951 to 2011, our average estimate for the pre-reform period 1951 to 1991 is 15 percent.

For the post-reform period, Schneider *et al.* (2003) covers 1992 through 1997 with an average magnitude of black income at 23 percent of the GDP of India. Schneider *et al.* (2010) indicates an average of 22 percent of GDP in the period 1999-2007. Since both the studies do not cover the entire range of the post-reform period individually, we compare our estimate with the composite series for the post-reform period constructed out of the estimates of the two former studies. Our estimate for the post-reform period 1992-2007 stands at 25 percent on an average vis-à-vis 23 percent of the composite series.

To sum up, our estimates of the average magnitude of black income in both pre-reform and post-reform period are fairly comparable with Schneider *et al.* (2003) and Schneider *et al.* (2010).

10. CONCLUSION

Though the problem of black income has been of considerable importance in India, systematic and continuous efforts to estimate its extent and understand its nature are conspicuously absent even today. The extant estimates of black income in India are sporadic and discontinuous. Presently there are no estimates for it in recent times, or for a considerable period of time. The estimated series of the present study from 1951 to 2011 is probably the first long series on black income available in India, and probably the most recent.

The lack of information on black income could have serious consequences on the formulation of economic policies to curb it. This is very evident from the recent Income Declaration Scheme (IDS), 2016. While the government is claiming it to be highly successful, the data released by the government after the scheme closed show it to be otherwise. The released data (GOI, 2016b) shows that a total of just Rs. 65250 crores of domestic undisclosed income and assets were declared. The total number of declaration was 64275. Considering Rs. 35.05 lakh crores as the estimated GDP at current prices for the year 2016-17 (GOI, 2016c), back-of-the-envelope calculations show that the declared black money about which the government is trumpeting about the grand success of the scheme is just 1.86 percent, or nearly 2 percent of the GDP. This amounts to nearly Rs. 1 crore per declaration. Like the earlier VDIS[62] scheme, even the recent IDS scheme has only been able to garner only a miniscule fraction (nearly 2 percent) of the black

62 Voluntary Disclosure of Income Scheme.

money circulating in India when our estimate show it to be nearly 27 percent of the GDP in 2011 (see Table 6), or more in the recent years.

But despite all the obstacles in this area of research, three sources: Schneider *et al.* (2003), Schneider *et al.* (2010), and NIFM Report[63] have managed to estimate black income in India from 1960 to 1997, from 1999 to 2007, and from 1970 to 2009 respectively using the modern MIMIC methodology. The overall picture that emerges from these studies is black income in India in the recent years since 1990 has declined. The first study indicates that this decline in black income is more pronounced in the post-liberalization period since 1992-93; the second indicates that the declining trend continues even in the period 1999-2007, and the third (p. 52) notes that in the recent years black income has been declining. This declining trend in black income could be an encouraging yet a misleading sign of relief to the Indian policy makers and the government.

The present study also based on the same MIMIC methodology finds contrarily that over the period 1951-2011 black income in India has increased with an increasing trend with no sign of its abatement even after 1992-93 in the post-reform period. This contradictory finding of the present study should be a clarion call for the government and policy makers to take a serious note of the problem.

The theoretical model of black income developed in the study is very different from those in the former studies. The causal variables in the model of the study are direct and indirect tax rates, government final consumption expenditure to GDP, and trade balance to GDP. Except the two tax rates, the two other causal variables in the study are very different from the earlier studies. Besides, the indicator variables in the study are also different from the former studies. The present study uses the growth rate of currency, proportion of potential black GDP in GDP at factor cost and the growth rate of reserve money as indicators of black income. The growth rate of currency instead of currency to M3 ratio is preferred and used by the study explaining why the currency to M3 ratio as used in the earlier studies fails to be a consistent indicator of black income. Besides the growth rate of currency, the study also justifies the use of the growth rate of reserve money as one of the indicators. These two variables have never been included in the earlier studies.

The study uses six different MIMIC specifications for estimation. The sixth specification is the full model. In estimating[64] these six specifications, it is found that all[65] the indicators of black income are statistically of high significance. Among the causal variables, the inflation rate, the ratio of direct tax, and the ratio of indirect taxes to GDP are significant in explaining black income in all the six specifications maintaining

63 The report does not provide any data series of black income.
64 Using the Maximum Likelihood Estimator.
65 Except the one that is normalized.

their hypothetical signs. However, the two remaining causal variables - government final consumption expenditure to GDP and trade balance to GDP - remain insignificant in all the six specifications.

After estimating the six specifications, only one of them is selected based on the standard statistical criteria of the goodness-of-fit. The chosen model is then used for estimating black income for the period 1951 to 2011. The model is first calibrated and then benchmarked to estimate black income. For calibration, black income for the year 1989 from Bhattacharyya (1999) is used. The estimated black income series closely tracks the composite series of black income obtained from the two former studies, and indicates that the share of black income in the nominal GDP of India has increased from 6.6% in 1951 to 26.9% in 2011. In the interregnum, it has fluctuated with an upward trend. Besides, the estimated series is fairly correlated with the series from Schneider *et al.* (2003), and Schneider *et al.* (2010). Unlike former studies, the series of the present study shows no sign of black income declining post 1992. Instead it indicates that black income has increased with an upward trend after 1992.

The study rationalizes this main finding using the circumstantial empirical evidence from the literature on income inequality in India and the recent tax data released by the Income Tax department. Both these literature suggest strongly that the proportion of black income in GDP in post-reform period has increased as contended by this study.

Particularly, the literature on income inequality points towards increased income inequality in the post-reform phase, which is consistent with the main contention of study. Otherwise, the increase in income inequality during this phase would contradict the decline in black income as contended by the mentioned studies. This consistency of the main finding of the study with the findings of income inequality literature in the post-reform phase probably makes it more reliable and convincing than the previous studies.

On the accuracy of black income estimates of the study, contrasting the estimated series with the sporadic estimates obtained from other studies during 1951 to 2011 we find that, except a few, our estimates are fairly in agreement with the estimates obtained from other studies.

The estimates of our study for the pre and post-reform period when compared with the estimates of two mentioned study (Schneider *et al.*, 2003, 2010) appear to be in line with them though it is not claimed here that our estimates are very accurate. Our estimates provide only a plausible idea of the magnitude of black income in India over the period 1951 through 2011.

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