



# CPD

**Working Paper**

**126**

**Potential of Personal Income  
Tax in Bangladesh**  
*An Examination of Survey Data*

Towfiqul Islam Khan  
Muntaseer Kamal  
Faiyaz Talukdar



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Publisher

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**Centre for Policy Dialogue (CPD)** was established in 1993 as a civil society initiative to promote an ongoing dialogue between the principle partners in the decision-making and implementing process. Over the past 25 years, the Centre has emerged as a globally reputed independent think tank, with local roots and global reach. A key area of CPD's activism is to organise dialogues to address developmental policy issues that are critical to national, regional and global interests, with a view to seeking constructive solutions from major stakeholders. The other key area of CPD's activities is to undertake research programmes on current and strategic issues.

CPD's dialogues are designed to address important policy issues and to seek constructive solutions to these problems. In doing so, CPD involves all important cross-sections of the society, including public representatives, government officials, business leaders, activists of grassroots organisations, academics, development partners and other relevant interest groups. CPD focuses on frontier issues which are critical to the development process of Bangladesh, South Asia and LDCs in the present context, and those that are expected to shape and influence the country's development prospects from the mid-term perspectives. CPD seeks to provide voice to the interests and concerns of the low-income economies in the global development discourse. With a view to influencing policies, CPD deploys both research and dialogue which draw synergy from one another.

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CPD also conducts periodic public perception surveys on policy issues and issues of developmental concerns. With a view to promoting vision and policy awareness amongst the young people of the country, CPD is also implementing a Youth Leadership Programme. CPD serves as the Secretariat of two global initiatives. *LDC IV Monitor* is an independent global partnership for monitoring the outcome of the Fourth UN Conference on the LDCs. *Southern Voice on Post-MDGs* is a network of 50 think tanks, which seeks to contribute to the ongoing global discourse on the SDGs. At the national level, CPD hosts the Secretariat of the *Citizen's Platform for SDGs, Bangladesh*—a civil society initiative that include more than 100 Partner organisations, founded with an objective to contribute to the delivery of the SDGs and enhance accountability in its implementation process.

Dissemination of information and knowledge on critical developmental issues continues to remain an important component of CPD's activities. Pursuant to this, CPD maintains an active publication programme, both in Bangla and in English. As part of its dissemination programme, CPD has been bringing out CPD Occasional Paper Series on a regular basis. It may be noted in this connection that since November 2011, the Series has been re-introduced as **CPD Working Paper Series**. Research work in progress, background papers of dialogues, investigative reports and results of perception surveys which relate to issues of high public interest are published under this series.

The present paper titled **Potential of Personal Income Tax in Bangladesh: An Examination of Survey Data** has been prepared by *Mr Towfiqul Islam Khan*, Senior Research Fellow, CPD <towfiq@cpd.org.bd>; *Mr Muntaseer Kamal*, Senior Research Associate, CPD <muntaseer@cpd.org.bd>; *Mr Faiyaz Talukdar*, former Visiting Research Associate, CPD <faiyazt@gmail.com>

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**Executive Editor:** *Ms Anisatul Fatema Yousuf*, Director, Dialogue and Communication, CPD

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# Abstract

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Revenue mobilisation in Bangladesh has not been commensurate with its rapid economic growth. It is often regarded that, income tax evasion is high in Bangladesh, which undermines income equality and development finance. The present study seeks to create favourable policy space towards extracting untapped domestic resources through enhancing the efficiency of the tax administration with new information and analysis. To this end, the study estimates the potential of personal income tax in Bangladesh, based on successive rounds of Household Income and Expenditure Surveys conducted by the Bangladesh Bureau of Statistics. Furthermore, based on a nationwide perception survey conducted in 2018, this study attempts to identify the key determinants of public compliance regarding tax submission, including networks, societal norms, scope of punishment and enforcement on individuals' tax compliance behaviour.



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# Acronyms

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BBS	Bangladesh Bureau of Statistics
BDT	Bangladeshi Taka
CPI	Consumer Price Index
GDP	Gross Domestic Product
HIES	Household Income and Expenditure Survey
ICC	Intra-Cluster Correlation
IT	Information Technology
IV	Instrumental Variable
LFS	Labour Force Survey
(2S)LSDV	(Two Stage) Least Squares Dummy Variable
MoF	Ministry of Finance
NBR	National Board of Revenue
(B)OLS	(Base) Ordinary Least Squares
PCA	Principal Component Analysis
PPP	Purchasing Power Parity
PPS	Population Proportion Sampling
PSU	Primary Sampling Unit
SDG	Sustainable Development Goals
SMA	Small Metropolitan Area
TIN	Taxpayer Identification Number
USD	United States Dollar
VAT	Value Added Tax
7FYP	Seventh Five Year Plan



## 1. CONTEXT

A major problem that most developing and transitional economies face in the modern economic climate, pertains to insufficient public revenue collection. In many parts of the developing world, government expenditures on public infrastructure and projects face implementation bottlenecks, and lags due to lack of funding. For some developing countries, revenue mobilisation has become an increasingly important issue due to low tax collection. Tax revenue, either through the persistence of a small tax base, underreporting of taxable revenue, or high levels of tax evasion, often misses yearly budget targets, and the regular discrepancy between potential and actual tax revenue—the tax effort—begs the discussion for determining the bottlenecks to tax compliance.

In the case of Bangladesh, the tax effort situation is rather dismal. With less than 1 per cent of the country's population declaring income tax, a major source of potential government revenue is being forgone, and poor tax infrastructure is making it difficult to enforce greater compliance. A multi-country study of tax efforts conducted by Fenochoietto and Pessino (2013), shows that, Bangladesh economy only taxes 43 per cent of its potential taxable revenue, which is one of the lowest effort ratios in the world (barring oil-rich economies, which do not need to rely on tax as the primary source of government revenue). In order to improve tax compliance, and help bring Bangladesh's tax-to-GDP (gross domestic product) ratio to the Sustainable Development Goals' (SDGs) stipulated target of 14.1 per cent<sup>1</sup>, policymakers must consider all aspects of tax compliance, including equitable access to tax instruments, labour market conditions and various socioeconomic factors, that can affect the 'demand' for tax compliance among taxpayers. The major area of growth remains in expanding the income tax net; as of 2017, Bangladesh's employed labour force stood at 60.8 million, meaning that much needs to be done in order to increase the number of compliant employed taxpayers in the near future.

Reducing tax evasion is not simply a matter of applying high penalties or increased auditing; in fact, such a setting might create scope for corruption and bribery, and in turn, further lowers tax compliance (Cummings et al., 2009). Bangladesh economy displays high variance in income earnings, and tax evasion punishment can have differential impacts on high- and low-income earners, if set as a function of evasion, rather than of taxable revenue. Regional variation in access to public infrastructure makes it difficult for citizens outside of major urban hubs to get information on tax declaration, filing and returns. Low e-literacy (source) complicates matters further, as the government has proposed digitisation of the tax declaration system; low literacy rates amongst adult members of the labour force would, therefore, further reduce compliance. Hence, designing effective policies for curbing tax evasion requires understanding the behavioural aspects of the tax compliance decision, particularly for income tax collection.

The present paper reports findings from a study on tax compliance and efforts, using two rounds of the nationally representative Household Income and Expenditure Surveys (HIESs) from 2005 and 2010, analysing the determinants of income and total tax compliance amongst Bangladeshi citizens. By analysing the supply-side determinants to tax compliance, the study intends to elicit a statistical relationship with various indicators of individual/household behaviour that affects the willingness to pay tax. Hence, the primary objective of this study is to critically estimate the size of potential personal income tax and number of taxpayers in Bangladesh. Furthermore, it attempts to identify the key determinants of public compliance regarding tax submission. To this end, a nationwide perception survey was conducted in 2018, since HIES data does not allow to explore the effects of networks, societal norms, scope of punishment and enforcement on individuals' tax compliance behaviour.

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<sup>1</sup>As of 2018, Bangladesh has a tax-to-GDP ratio of only 8.6 per cent.

In doing so, the study aims to gain insight on how to cater policies towards improved tax compliance behaviour. The reported results provide support for a discussion on tax compliance behaviour that extends beyond the typical ‘economics of crime’ approach, that emphasises enforcement effort and deterrence.

## 2. STYLISED FACTS

It can be safely argued that, revenue mobilisation has become the weakest link in the fiscal framework of Bangladesh economy. In terms of revenue mobilisation, Bangladesh has lost the momentum gained during the FY2014-15 to FY2016-17 period, and unquestionably, has been unable to keep pace with the demands of accelerating economic growth. As can be observed from Table 1, in FY2017-18, revenue–GDP ratio in Bangladesh was merely 9.6 per cent—with the tax–GDP ratio being 8.6 per cent. In fact, income tax–GDP ratio has been hovering around the 2.6 per cent mark for the recent few years. The ambition of the Seventh Five Year Plan (7FYP) to attain a revenue–GDP ratio of 16.1 per cent (and a tax–GDP ratio of 14.1 per cent) by FY2019-20, appears to be a far cry given the current scenario.

**Table 1: Revenue as share of GDP**

*(in Per cent)*

Source	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
a. Total revenue	9.2	9.5	10.1	10.9	10.7	10.4	9.6	10.0	10.2	9.6
a.1 Tax revenue	7.5	7.8	8.7	9.0	9.0	8.6	8.5	8.8	9.0	8.6
a.1.1 NBR tax	7.1	7.5	8.3	8.7	8.6	8.3	8.2	8.4	8.7	8.3
a.1.1.1 Income tax	1.9	2.0	2.4	2.7	2.9	2.8	2.7	2.6	2.7	2.6
a.1.2 Non-NBR tax	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
a.2 Non-tax revenue	1.7	1.7	1.5	1.8	1.7	1.8	1.1	1.2	1.2	1.0

**Source:** Authors’ calculations based on the data from the Ministry of Finance (MoF) and Bangladesh Bureau of Statistics (BBS).

**Note:** a. For FY2008-09 to FY2016-17, data used in this analysis was compiled from MoF’s *Budget in Brief* documents for the FY2010-11 to FY2018-19 period. Data for FY2017-18 was taken from MoF’s *Monthly Fiscal Report*.

b. NBR: National Board of Revenue.

In Bangladesh, the number of individual taxpayers has grown steadily during the FY2011-12 to FY2016-17 period. As per data of the National Board of Revenue (NBR), number of individual taxpayers in FY2011-12 was 1.2 million, which steadily rose to 1.7 million in FY2015-16. In FY2016-17, this number exhibited a sudden spike, and increased to 2.2 million. However, pace of identifying new taxpayers appears to be slowing down. Collection from the newly identified taxpayers also exhibit similar trend (Table 2). Limited data availability is a major concern to analyse over a long timeframe, and also for recent years.

**Table 2: Identification of, and collection from, new taxpayers**

Year	Target to identify new taxpayers	Actually identified new taxpayers	Achievement (per cent)	Collected tax from newly identified taxpayers (Crore BDT)
FY2013	120000	100000	83.3	-
FY2014	100000	67060	67.1	15.5
FY2015	200000	106237	53.1	5.4

**Source:** National Board of Revenue (NBR).

**Table 3: TIN registration scenario**

Year	Re-registration	New registration
FY2014	892138	299861
FY2015	94557	290403
FY2016	16571	303665
FY2017	7632	918931
FY2018 (up to May)	3332	544747

Source: National Board of Revenue (NBR).

On a positive note, registration for new individual Taxpayer Identification Number (TIN) has picked up the pace in recent years (Table 3).

Although the number of total TIN is about 3.4 million (as of May 2018), only half of them submit returns. The tax collection from individuals' submitted returns could not keep pace with the number of submissions. More than 80 per cent of return submitted are self-assessed, but the ratio is declining (Table 4).

**Table 4: Return submission scenario**

As of	General returns	Self-assessed returns	Total	Ratio of self-assessed-to-general returns
June 2014	104685	875075	979760	8.4
June 2015	112203	928151	1040354	8.3
June 2016	123028	947818	1070846	7.7
June 2017	245937	1280522	1526459	5.2

Source: National Board of Revenue (NBR).

### 3. SURVEY OF LITERATURES

#### 3.1 Tax effort and compliance

##### *Literature review*

Compared to other nations in the Global South, Bangladesh suffers from relatively low revenue mobilisation, as the government has struggled to meet revenue-to-GDP targets on an annual basis. As of FY2017-18, revenue only comprises of 9.6 per cent of GDP, which, compared to other countries in the region, is fairly low. Increased tax compliance, therefore, would provide a substantial gain in revenue, which, in turn, provides resource for policy implementation. For various reasons, stemming from low tax literacy to obsolete tax collection methods, tax evasion has been hard to tackle and punish. In the classic economic approach, frequent and efficient audits and severe fines appear as the most powerful strategies to combat tax crime (Allingham and Sandmo, 1972; Srinivasan, 1973). Assuming that taxpayers behave as rational agents, in the case of tax evasion their decisions to comply depend on the risk of being caught. However, while increased power of the authorities leads to less tax evasion, 'brute deterrence might backfire', especially when taxpayers' perceptions are not considered (Sheffrin and Triest, 1992).

Recent theoretical literature (Hashimzade, Myles and Tran-Nam, 2013) shows that, most people declare more taxes than what the standard models suggest, and not everybody engages in tax evasion. Existing literature also shows that, there is a tendency for deterrence to reduce tax evasion (Alm, 1999; Blackwell, 2010; Fischer, Wartick and Mark, 1992); however, the effect is small or even negligible

(Andreoni, Erard and Feinstein, 1998; Kirchler, 2007). It has also been suggested that, deterrence may crowd out the intrinsic motivation of paying taxes (Feld and Frey, 2002; Kirchler, Hoelzl and Wahl, 2008; Torgler, 2002). Psychological factors such as notions of guilt and shame (Erard and Feinstein, 1994), tax morale (Alm and Torgler, 2006; Frey and Torgler, 2007), social factors such as knowledge of successful evasion (Vogel, 1974), social norms (Alm, Sanchez and de Juan, 1995), and business ethics (Molero and Pujol, 2012), may also influence taxpayers' decisions to comply with tax laws.

Empirical evidence on tax compliance is limited (Alm and McClellan, 2012). Most empirical studies to date find a positive result for reducing tax evasion by increasing the rates or salience of penalties and audits (e.g. Slemrod, Blumenthal and Christian, 2001). Major macro factors that play a deterministic role in tax compliance, include—the size of the shadow economy (Alm and Torgler, 2006), high sense of societal obedience (Scholz and Pinney, 1995; Torgler et al., 2008), taxpayers' perceptions about tax code fairness and compliance (Cummings et al., 2006; Rawlings, 2004) and efficiency of tax revenue usage and allocation (Barone and Mocetti, 2009).

To this extent, the present study of household tax compliance using the HIES survey data, is a novel analysis for Bangladesh, and is the first paper that empirically explores the drivers of low total and income tax compliance in Bangladesh between 2005 and 2010. Literature such as Ahmed et al. (2012) and Faridy et al. (2014), explore tax compliance in Bangladesh at the firm level, involving value added taxes (VATs), but do not explore individual income tax behaviour. By taking the considerations of the existing literature into account, the paper looks to shed some light on the role that socioeconomic and geo-political factors play in explaining regional variations in tax compliance behaviour.

### **Theoretical framework**

The traditional approach employed by most tax research uses the 'economics of crime' model, which was first applied to tax compliance by Michael Allingham and Agnar Sandmo in 1972. In this model, a rational individual chooses to maximise expected utility of the tax evasion gamble, weighing the benefits of successful cheating against the risky prospect of detection and punishment. Individual taxpayers pay taxes, because they are afraid of getting caught or being penalised for not declaring all income. The 'portfolio' approach allows policymakers to assess the degree of compliance as a function of audit rates, fines and reported income. The present study proposes a small extension to the model, where the optimal level of compliance (taxable income reported) depends not only on total individual income, but also on socioeconomic conditions that affect compliance behaviour that is captured through (measurable) consumption channels. The model is illustrated below.

In a simple, linear model, an individual receives a fixed amount of income  $I$ , and chooses how much to report to the tax authorities. In the present study, the original model is appended by including household consumption expenditure, denoted by  $C$ . The individual pays taxes at rate  $t$  on every taka  $R$  of income declared. The individual may be audited with probability  $p$ ; and if found guilty, of partial or complete evasion, must pay a penalty at rate  $f$  on every taka not reported. Therefore, the individual's income, if caught or not caught underreporting, is given by:

$$I_C = I - tR - f[t(I-R)] - C, \text{ where } I_C \text{ represents income if caught, and}$$

$$I_N = I - tR - C, \text{ where } I_N \text{ represents income if not caught.}$$

The individual chooses the level of reported income  $R$  that maximises expected utility, given by:  
 $EU(I) = pU(I_C) + (1-p)U(I_N)$ , where  $E$  is the expectation operator, and  $U$  is utility.

The conventional approach assumes  $U$  is strictly concave, with  $U' > 0$  and  $U'' < 0$ . Therefore, for simplicity, the logarithmic utility function is used.  $R$  is endogenously chosen by the individual, solely based on total income.<sup>2</sup> Plugging in the respective income functions in the expected utility equation, the study gets:

$$EU(R) = p \cdot \log(I - tR - f[t(I-R)] - C) + (1-p) \cdot \log(I - tR - C) \dots\dots\dots [1]$$

Taking derivatives with respect to  $R$ , the study gets:

$$\frac{\delta EU}{\delta R} = \frac{p(ft-t)}{I-tR-ft(I-R)-C} + \frac{(1-p)(-t)}{I-tR-C} \dots\dots\dots [2]$$

The first order condition is equal to zero at the optimal level (level of  $R$  that maximises expected utility) of  $R^*$ , which yields:

$$\frac{p(ft-t)}{I-tR^*-ft(I-R^*)-C} + \frac{(1-p)(-t)}{I-tR^*-C} = 0 \iff \frac{p(ft-t)}{I-tR^*-ft(I-R^*)-C} = \frac{(1-p)(t)}{I-tR^*-C}$$

Rearranging terms, the study gets:

$$R^* = \frac{(I-C)(1-pf)-ftI(1-p)}{t(1-f)} \dots\dots\dots [3]$$

Since the amount of reported income is strictly bounded by total income, the following inequality is obtained:

$$R^* = \frac{(I-C)(1-pf)-ftI(1-p)}{t(1-f)} < I$$

$$\iff I - p f I - C + p f t C - f t I + p f t I < t I - f t I \dots\dots\dots [4]$$

Rearranging terms, equation [4] simplifies to:

$$t I < I - C \iff t < \frac{I-C}{I} \dots\dots\dots [5]$$

meaning that, in equilibrium, for a household to report non-zero income to tax authorities, the tax rate  $t$  must be smaller than the ratio of a household's disposable income after consumption to total income  $((I-C)/I)$ . While intuitive, the result is important when structuring a tax regime, so that poor households with a high consumption burden are not taxed excessively. In a country like Bangladesh, where households face high dependency ratios (few income-earners) and have displayed an increasing proclivity for current consumption, this result bears particular significance.

In the original model (where household consumption is not factored in),  $C$  drops out of equation [4]. Since  $p$  and  $t$  are weakly positive, and  $f$  is weakly greater than one, the first order condition in the original model holds, if:

$$p f - p f t < 1 - t \iff f < \frac{1}{p} \dots\dots\dots [6]$$

In the original model,  $R^*$  depends on the income, the tax rate and the penalty rate, and the probability of audit moves inversely with the penalty rate. As the tax or penalty rate increases, the amount of reported income will depend on the sensitivity of income to these two underlying rates. From the policymakers' perspective, the penalty rate that is imposed on tax evasion is an inverse function of the underlying probability of being audited. Intuitively, this means that, tax regimes that do not put a lot of effort into audit, risk losing out on substantial tax revenue through high tax evasion; therefore, the

<sup>2</sup>However, it needs to be noted here that, there is sufficient empirical evidence to suggest that,  $R$  depends on a host of both monetary and non-monetary factors that determine tax compliance behaviour. This relationship will be further explored in the empirical component of the present analysis.



potentially small amount of revenue generated through taxation should be offset by high punishment rates for non-compliance.

All in all, it can be said that, the optimal level of reported income  $R^*$  only depends on a host of exogenous (tax rate, penalty rate, probability of audit) and endogenous (income, consumption) factors in equilibrium. The first order condition simplifies to condition [5] for positive tax declaration that depends on endogenous factors only; empirical analysis, must therefore, account for household consumption measures in addition to earned-income, when exploring the determinants of tax compliance. By controlling for both the demand- and supply-side determinants of tax behaviour, this extension can help paint a richer picture of tax compliance, and in turn, can provide better identified mechanisms for expanding Bangladesh's tax base.

### **3.2 Factors influencing tax compliance**

#### ***Literature review***

Molero and Pujol (2004) attempted to probe into factors that determine justification of tax evasion behaviour in taxpayers in Spain. They considered the effects of the non-monetary psychological factors on tax evasion decision of taxpayers, incorporating data obtained from primary survey of 453 university students. A binomial logit model was used, in which the percentage of students considering tax evasion to be justified was expressed as a function of several factors that attribute to the psychological costs of tax evasion. According to the findings by Molero and Pujol (2004), justification of tax evasion decision is strongly influenced by the taxpayer's perceptions regarding how others pay taxes, and whether or not, the rich and famous people evade taxes. In addition, excessive tax pressures and inefficient use of tax revenue by the government are also significant factors in explaining justification of the tax evasion. The authors further concluded that, the sense of solidarity in the taxpayers also determines their tax morale and dictate decisions of tax payment. Furthermore, a positive correlation between parents' education levels and tax morality was also put forward in light of the estimated results.

In a study related to the factors attributing to non-tax compliance behaviour of taxpayers in Estonia, Kriz et al. (2007) conducted a primary survey on 744 randomly selected individuals in between 2002 and 2004. They used logit estimation techniques to identify the determinants of non-compliance for three different datasets prepared using three methods: (i) survey on self-reported tax evasion; (ii) audit reports of individual taxpayers; and (iii) the Labour Force Survey of Statistics in Estonia. The findings revealed that, tax evasion tendency is relatively higher in individuals who are part-time employees, have low educational achievements, earn low salaries, and are men. Moreover, the decision to evade taxes is more common in the young and elderly people, but not so in context of the middle-aged individuals. The study also found support in favour of tax evasion being correlated to geographic locations in which the taxpayers dwell in. Finally, the authors concluded that, most of the Estonian people are tax evaders in nature.

The attributes of income tax compliance behaviour of individual taxpayers of Mauritius were assessed by Beesoon, Hemavadi and Jugurnath (2016). Data, spanning from June–July, 2015, was collected using a combination of primary survey and interview tools, comprising of 250 taxpayers, incorporating the probability sampling technique. The questionnaire used in the study was classified into five sections, in order to include the economic, social, institutional, individual and demographic factors that can affect the tax compliance behaviour of an individual. In light of the estimated results, Beesoon, Hemavadi and Jugurnath (2016) identified tax knowledge as one of the key determinants of tax evasion behaviour amongst the respondents. In addition, tax compliance was also referred to coincide with the probability of the taxpayer being audited, good perception of the government's revenue expenditure patterns,

and on the magnitude of penalties linked to non-compliance. In contrast, a negative association between the degree of financial constraint faced by the taxpayer and his/her tax compliance decision was put forward.

Kiow, Salleh and Kassim (2017) reviewed the determinants of individual taxpayer's tax compliance actions in context of Malaysia. The authors analysed the existing literature, in order to draw conclusions on the tax compliance behaviour subject to different tax compliance determinants. The conclusions suggested that, a taxpayer's willingness to correctly reveal his/her taxable income in the tax return depends on his/her ethical judgement, which in turn, depends on his/her perceptions regarding the state of governance and transparency of the government's actions. The authors asserted that, an individual will pay more amount of tax than s/he does, if the benefits received from public goods exceed the costs incurred in terms of the tax payment made. Moreover, if the taxpayer is aware of how the revenue is being utilised, then it will act as an incentive for him/her to quote income correctly.

Gberegbe, Idornigie and Nkanbia-Davies (2015) examined the perception of tax fairness and its impacts on tax compliance in Rivers State in Nigeria, using a survey analysis to question 246 full-time employees and contract staffs in the country's Ken Saro-Wiwa Polytechnic School. The study employed Pearson Product Moment Correlation analysis, tests of hypotheses and factor analysis methodologies. In addition, three Hierarchical regression analyses were also conducted, keeping the mean values of—tax fairness indicators in general, tax fairness in terms of income tax distribution, and the decision to trade or exchange goods and services with friend or neighbour—in order to avoid additional tax payments. In accordance to the regression estimates, Gberegbe, Idornigie and Nkanbia-Davies (2015) concluded that, a good perception in context of tax fairness can be effective in influencing tax compliance behaviour positively in the Rivers State. In addition, trust in the government's mode of revenue utilisation and the nature of public services provided can also conform to personal income tax compliance. Thus, the authors also recommended that, the government can decide to increase the amount of social benefits through public investments, and simultaneously increase the tax rates too.

The determinants of individual income tax compliance in the United States was examined by IRS (1996). The study incorporated a panel data over a ten-year period from 1982 to 1991. Least Squares Dummy Variable (LSDV) and Two Stage Least Squares Dummy Variable (2SLS DV) estimation tools were hired to draw conclusions on tax compliance behaviours. In the empirical model used in this paper, reported tax returns, returns filed per capita and assessed liabilities, were the three dependent variables regressed against a set of non-compliance factors, namely—audit rate, tax burden, tax policy, criminal tax convictions, return form completion burden, filing threshold and average personal income. The results revealed that, filing threshold, defined as the sum of one's standard deduction and personal exemptions, adversely affects the return filing rate. In contrast, the burdens associated to filing returns and the expenses of hiring tax advocates tend to have reduced the filing rate as expected. Moreover, stringent tax authorities and frequent audits also contributed to higher rate on non-filing and non-reporting compliances in the country. The results also confirmed that, low-income earners are more compliant, following a rise in the marginal tax rate, which is not the case for the high-income earners. Furthermore, criminal tax convictions were also found to negatively influence tax compliance in the United States.

In a study by Ortega, Ronconi and Sanguinetti (2012), taxpayers' willingness to pay in 17 Latin American cities was analysed incorporating survey data analysis of 2011. The authors considered an ordered probit model, in which a taxpayer's willingness to comply to pay taxes was expressed as a function of his/her perceptions regarding government's performance, in terms of efficient utilisation of the tax revenue, tax compliance behaviour of others, and of tax morality in terms of how they

justify tax evasion decisions. In addition, a set of controlled variables were also considered. As per the methodology, Ordinary Least Squares (OLS) and Instrumental Variable (IV) estimation techniques were used to generate results. The results portray that, majority of the respondents are unwilling to pay additional amount of taxes, following a rise in the government's performance based on the parameters of corruption, transparency, tax collection procedure, and quality of public health and education. The results further assert that, there is a strong positive correlation between tax compliance behaviour and government's performance. In contrast, perceptions of others' non-compliance to taxes tend to have opposite impacts on tax compliance behaviour of individual taxpayers. Finally, results also suggest that, individuals with greater sense of tax morality are less likely to avoid taxes.

The attitudes of Turkish and Australian citizens towards tax evasion were examined by McGee, Devos and Benk (2016). A survey analysis was carried out, incorporating perceptions provided by 502 undergraduate and graduate students in Turkey and Australia. The authors ascertained the viewpoints of the surveyed students based on their responses to 18 general statements on a 7-point Likert scale. The dependent variable in the empirical model put forward was the taxpayers' willingness to pay taxes, based on their views on tax evasion justifications. Descriptive statistics on the mean values of the responses and Mann–Whitney U test were used to comment on the tax evasion justification behaviour of the respondents. Results confirm that, the overall mean of responses in context of Turkey is higher than that for Australia, which implies that Australian students are relatively less compliant to taxes. However, the paper also asserts that, the respondents in both the countries found it justified to evade taxes under certain circumstances.

Redae and Sekhon (2017) probed into the moral and compliance behaviour of 387 respondents from a survey conducted in the Tigray State of Ethiopia from October 2014 to September 2015. Multiple regression analysis and simple descriptive statistics tools were hired to analyse the data. In this paper, the tax compliance behaviour of the business taxpayers was classified as the dependent variable that was regressed against the independent variables in the form of tax moral and taxpayers' obedience towards tax rules and regulations. The results reveal that, tax moral is a crucial determinant of tax compliance behaviour. The mean value of the responses in context of tax-moral-defining statements suggested that, a rise in the moral judgement to declare taxable income correctly is matched by a corresponding rise in the degree of tax compliance.

The factors attributing to tax evasion in Nigerian taxpayers were explored by Mansor and Gurama (2016). The method of research used in this paper involved a 5-point Likert scale structured questionnaire to survey 303 taxpayers residing in the Gombe State in Nigeria. Tests of reliability, multicollinearity and descriptive statistics of the data set were used. The paper also hired a multiple regression model considering tax evasion as the target variable, while considering tax rate, tax system, corruption, income level and education as the explanatory variables. The results from the regression analysis revealed that, all the explanatory variables were positively related to the tax evasion behaviour of the taxpayers. However, only the quality of the tax system, and income and education levels of the taxpayers were found to be statistically significant in influencing tax evasion decisions. The authors have also recommended to enhance the efficiency and effectiveness of Nigerian tax administration, since a good tax system is not sufficient alone to induce tax compliances.

A cross-country re-examination of the tax evasion determinants was studied by Richardson (2016). The paper incorporated data from 45 countries, mostly in between 2002 and 2004. Base Ordinary Least Square (BOLS) regression and Pearson correlation matrix for cross-section country-specific analysis and sensitivity analysis techniques were employed to examine the linkage between tax evasion and its determinants. The corresponding regression model considered tax evasion score as the dependent variable, while age, gender, education level, household income level, proportion of employment in

agriculture sector, proportion of employment in services sector, marginal income tax rate, fairness score, complexity of tax filing, tax system dummy variable and tax morale, along with other control variables, were considered as independent variables. The regression analysis results suggest that, non-economic factors attribute to tax evasion decisions of taxpayers. In light of the results obtained, complexity associated with filing of tax returns was found to have a positive impact on tax evasion. In contrast, education level, income source, tax fairness and tax morale were found to be negatively related to tax evasion.

Ameyaw and Dzaka (2016) investigated the determinants of tax evasion decisions in taxpayers originating from 10 regional capitals of Ghana. A primary survey comprising of a structured questionnaire was used to accumulate data from 432 respondents, either employed in various public and private institutions, or self-employed. The authors resorted to use of multiple regression analysis tools, factor loading and other reliability tests to identify the relationships between tax evasion behaviour and its fundamentals. The regression model comprised of tax evasion as the dependent variable, while taxation and fiscal factors, administrative factors, economic factors, demographic factors and educational level were referred to as the explanatory variables. The results from the econometric tests suggested that, taxation and fiscal factors, administrative factors, economic factors and educational level exerted positive impacts on tax evasion. Demographic factors, including age and gender were found to be negatively related to tax evasion; however, the corresponding estimated coefficients were not statistically significant.

## 4. METHODOLOGY

### 4.1 Tax effort and compliance

Given the theoretical discussion in Section 3.1, it can be seen that, the taxpayer's incentive to report (or underreport) income depends on the likelihood of detection and punishment, the underlying taxation rate, and the total level of income. For the present analysis, the household is considered as the taxpaying unit. Since  $p$ ,  $f$  and  $t$  are determined exogenously, they cannot be controlled for in the empirical analysis, and it is assumed that, the household, when declaring tax, takes them as given.<sup>3</sup> More importantly, in application, it is recognised that, income is often an imperfect measure for empirical analysis, as individuals often do not disclose their true take-home income. Rather, the study maintains that, in practice, the household's ability to fully pay tax stems from the amount of revenue remaining after bearing necessary/essentials expenses. Therefore, income can be instrumented using current consumption as a proxy. Consumption, being an underlying function of net income, displays the same dynamics as income, while providing a more accurate picture of a household's resource constraints. In context of the previous section, it is contemplated that, taxpayers consume all of their take-home income net of tax payment (no savings or future-period investments). Therefore, in light of the underlying exercise, the present study has used survey data containing information of various socioeconomic indicators as additional control variables for determining tax compliance.

The data for this study comes from the latest available rounds of the HIES from 2005 and 2010.<sup>4</sup> The HIES datasets are the largest nationally representative cross-sectional surveys available for Bangladesh, providing rich, detailed socioeconomic information on households and individuals. These datasets offer extensive information for policy-centric government decisions by assessing poverty level and living standards of the Bangladeshi population. Both surveys were conducted using a two-stage sample design, based on the sampling frame used in the 2001 Population and Housing Census.

<sup>3</sup>Future research aims to complement this study with administrative information on tax rates, penalty rates and probability of audits.

<sup>4</sup>Due to planning delays and shortcomings in survey data collection, Bangladesh Bureau of Statistics (BBS) was unable to conduct the 2015 HIES on time; this paper will be updated with the latest round of HIES data when available.

In 2005, a total of 10,080 households were surveyed, with 6,400 coming from rural areas, and 3,680 from urban areas. In 2010, 12,240 households were sampled, where 7,840 were from rural areas, and 4,400 from urban areas.

The empirical analysis of this study was conducted using information on household income, education, professional activities, tax behaviour and other socioeconomic characteristics. Self-reports of income include—earnings from professional activities, own-production of goods and services, and assets. Detailed consumption information regarding all aspects of the household’s socioeconomic activities are recorded, and used to create a consumption index, using the Filmer–Pritchett method of principal component analysis (PCA) (Filmer and Pritchett, 2001), that allows to rank household consumption, using information on the level, amount and variety of goods and services consumed. This is used primarily in light of misreporting of household expenditure figures, as survey enumerators, across both rounds, have highlighted the difficulties respondents have, in recalling specific expenditures for specific time periods.

The analysis of household tax compliance and its determinants uses the following specifications, where all error terms are normally distributed (with zero mean and unit variance):

$$paidtax_{i,t}^* = \alpha_0 + \alpha_1 householdcharacteristics_{i,t} + \alpha_2 income_{i,t} + \alpha_3 fixedeffects_{i,t} + error_{i,t} \dots\dots\dots [7]$$

$$where, paidtax_{i,t} = \begin{cases} 1 & \text{if } paidtax_{i,t}^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

The incidence of tax compliance is considered using the probit (underlying latent) model, arguing that household-centric characteristics play a defining role regarding whether or not a household pays tax.<sup>5</sup> In order to control for region-specific effects on tax compliance, fixed effects are included for differentiating the various stratas surveyed. In order to determine the level (amount paid) of tax compliance, the following OLS model is considered:

$$taxamount_{i,t} = \beta_0 + \beta_1 householdcharacteristics_{i,t} + \beta_2 income_{i,t} + \beta_3 fixedeffects_{i,t} + error_{i,t} \dots\dots\dots [8]$$

Given this paper’s earlier discussion on income and expenditure, it is recognised that, a simple OLS regression, using income as a control variable, can yield potentially biased estimates due to underreporting. In light of this, the simple model is supplemented by introducing a first-stage equation that estimates the relationship between household consumption and income, and, using predicted income as the determinant, revisit the simple model in the second-stage, by instrumenting income using the first-stage predicted values. The advantage of using a two-stage regression model is that, it allows to ‘extract’ the component of income that determines the degree of tax compliance, while controlling for unobservables, that affect both income and the amount of tax declared. For this exercise, both income tax and municipal tax paid are observed, but the focus of the discussion is largely on income tax collection. The two-stage model is shown below, and the subsequent section will discuss results from both simple and two-stage models.

*First stage:*

$$income_{i,t} = \partial_0 + \partial_1 consumptionindex_{i,t} + \partial_2 fixedeffects_{i,t} + error_{i,t} \Rightarrow \widehat{income}_{i,t} \dots\dots\dots [9]$$

---

<sup>5</sup>The decision to pay tax can be modelled as a dummy variable, for which probit analysis provides a more consistent estimator (smaller variance) than OLS.

Second stage:

$$paidtax_{i,t}^* = \alpha_0 + \alpha_1 householdcharacteristics_{i,t} + \alpha_2 \widehat{income}_{i,t} + \alpha_3 fixedeffects_{i,t} + error_{i,t} \dots \dots \dots [10]$$

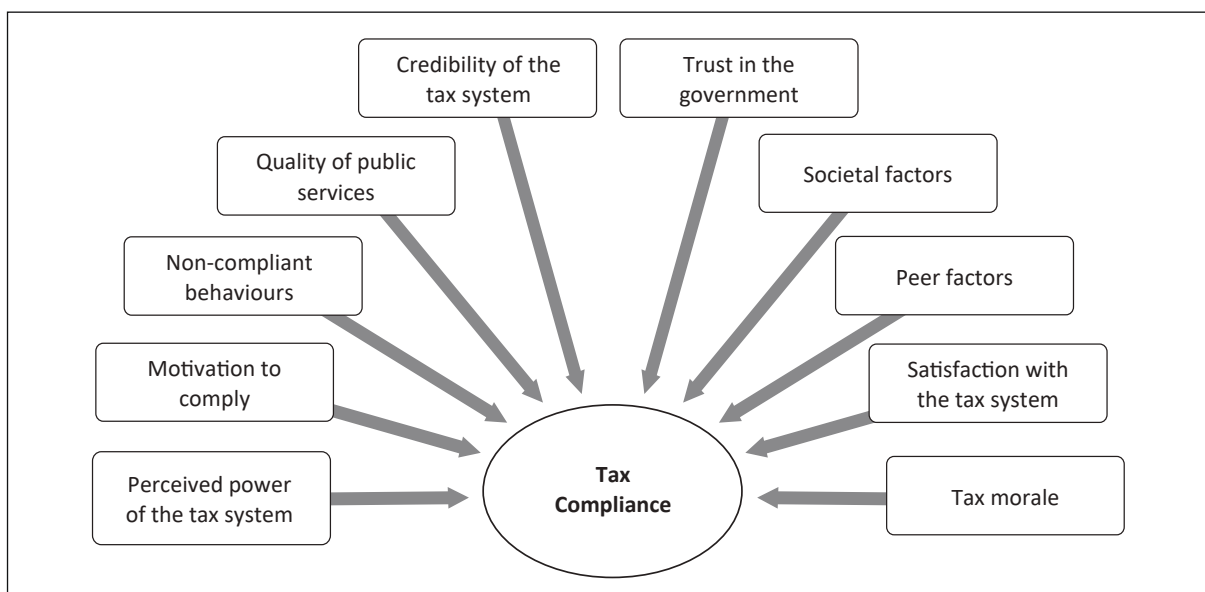
$$taxamount_{i,t} = \beta_0 + \beta_1 householdcharacteristics_{i,t} + \beta_2 \widehat{income}_{i,t} + \beta_3 fixedeffects_{i,t} + error_{i,t} \dots \dots \dots [11]$$

### 4.2 Factors influencing tax compliance

As mentioned earlier, HIES data does not allow to explore the effects of networks, societal norms, scope of punishment and enforcement on individuals tax compliance behaviour. To this end, a nationwide perception survey was carried out under the present study. Based on the Labour Force Survey (LFS) 2016-17, a multi-stage cluster sampling was done as part of the survey. Population proportion sampling (PPS) was carried out, using the primary sampling units (PSUs)—which are essentially mouzas/mahallas. As the target group of this survey was income-tax-eligible individuals (i.e. annual income being BDT 2.5 lakh or above), the eligible population in each PSU was estimated using the LFS data. As stratification variable, location of PSUs was employed, so that the distribution of the clusters follows the subsequent pattern—rural (27 per cent), urban (31 per cent) and city corporations (42 per cent). This distribution was estimated from the population eligible for paying income tax. Consequently, the selection included 16 PSUs from rural locality, 19 from urban locality and 25 from city corporations. The selected PSUs were located in 21 districts of Bangladesh. Based on the aforesaid considerations, the sample size was determined to be 1,200. Since LFS was used as the sampling frame, the weight factors associated with each PSU in the LFS were also appropriate for this survey. As the clusters had very small geographic boundary, a random walk method was followed while surveying the individual respondents. The respondents were first screened based on their previous year’s annual income before initiating the full interview. Based on the nature of the clusters, interviews were conducted both at houses and at workplaces of the respondents. Details regarding the sampling methodology is provided in the Annex of this paper.

The perception survey focused on the following ten aspects of tax compliance on the basis of literature review presented in Section 3.2 (Diagram 1). Based on these, a number of questions were asked during the survey. The responses to these questions were in Likert scale form, which is shown in Table 5.

Diagram 1: Considered aspects of tax compliance



Source: Authors’ elaboration.

**Table 5: Questions for the perception survey**

Question	Likert scale					
	0	1	2	3	4	5
Do you believe that the tax revenue is collected for social welfare?	No response/ comments	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
For me, paying taxes is an obvious thing to do.	No response/ comments	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
What is the probability that the NBR finds out that income is not declared or deductions are exaggerated?	Don't know	Very low	Low	Moderate	High	Very high
The taxation system is favourable towards the rich/elite section of the society.	No response/ comments	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The tax system in our country is overly complex.	No response/ comments	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
People will be more motivated to pay taxes, if the services provided by the government and their quality are increased.	No response/ comments	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
There is corruption in the taxation system.	No response/ comments	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
How common is it to pay for goods or services without a bill or invoice in order to avoid VAT?	Don't know	Extremely likely	Likely	Average	Unlikely	Extremely unlikely
Think about three adults you know best, like your close friend or family members. What would they think if they heard that you did not declare all of your income to the authority?	Don't know	Absolutely right	Right	Indifferent	Wrong	Absolutely wrong
Tax paying system is very easily accessible in my area.	No response/ comments	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Source: Authors' elaboration.

## 5. RESULTS AND DISCUSSION

### 5.1 Tax effort and compliance

Table 6 reports summary statistics pertaining to households' socioeconomic information from 2005 and 2010 HIES. Across 2005 and 2010, it is observed that, household heads are mostly male, and are 42 years old on average; female-headed households increased by 25 per cent in 2010 relative to 2005. A decrease in household heads' education level is observed—from 5.5 years of schooling in 2005 to 3.9 years of schooling in 2010. Household size has dropped slightly from 4.8 persons to 4.5, possibly as a sign of improved family planning. This is particularly important, in light of the (small) increase in the number of formal workers from each household, signalling that a greater share of the household is employed in the formal labour market, where access to tax instruments is available. Household income, adjusted for Consumer Price Indices (CPIs) to control for purchasing power parity (PPP) changes from 2005 to 2010, shows that, households earned 16.8 per cent more in 2010 than

**Table 6: Summary statistics regarding the households**

Year	2005	2010
Variable	Mean	Mean
Female household head	0.0334*** (0.00317)	0.0435*** (0.00290)
Age of household head	41.92*** (0.202)	42.09*** (0.177)
Education level of household head	5.529*** (0.0739)	3.862*** (0.0973)
Size of the household	4.811*** (0.0327)	4.495*** (0.0263)
Number of formal workers in the household	0.829*** (0.0138)	0.834*** (0.0163)
Urban residence	0.241*** (0.00450)	0.127*** (0.00239)
Rural residence	0.618*** (0.00405)	0.672*** (0.00626)
Household member dependency ratio	0.677*** (0.00307)	0.657*** (0.00418)
Household yearly income (adjusted for CPI)	137902*** (4971.87)	159712*** (11787.12)
Household consumption index decile	5.645*** (0.0427)	5.331*** (0.0744)
Household owns land	0.0536*** (0.0038)	0.0268*** (0.00247)
Household has potential income taxpayer(s)	0.1021*** (0.00511)	0.228*** (0.00839)
Household paid municipal tax in the past year	0.0734*** (0.00378)	0.0549*** (0.00519)
Household paid income tax in the past year	0.00302*** (0.000842)	0.00699*** (0.00200)
Household paid any tax in the past year	0.0760*** (0.00384)	0.0605*** (0.00545)
Total taxes paid by the household	14733.18*** (2194.28)	17312.77*** (4933.37)
Total income taxes paid by the household	13831.77*** (2216.31)	17063.6*** (4993.88)
Observations	10089	12240

Source: Authors' estimation.

Note: a) Standard errors in parentheses. b) \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

what they did in 2005, possibly stemming from nominal wage increases, and a slow but steady shift towards higher-skilled, formal employment.

Regarding tax compliance, it can be seen from Table 6 that, the share of households paying total, income and municipal taxes have experienced differential changes over time. Household (total and income) tax burdens increased proportionately from 2005 to 2010, as the table shows, the burden of taxation is largely stemming from income tax, which is roughly 94 and 98 per cent of the total tax



burden, respectively, across both survey years. As a result, the empirical component of the paper will primarily focus on income tax. Income tax payment doubled from 0.3 per cent to 0.6 per cent, which, while very low, is consistent with the current tax environment, where less than 1 per cent of the population is paying income tax. Municipal tax payment compliance dropped from 2005 to 2010, which caused the overall tax compliance rate to drop from 7.6 per cent in 2005, to 6 per cent in 2010.

When looking at the spatial distribution of tax compliance (Table 7), it is observed that, there has been substantial growth in urban household tax compliance in Barishal, Dhaka, Khulna and Rajshahi

**Table 7: Regional variance in tax compliance**

Year	2005	2010
Variable	Mean	Mean
Barishal rural	0.0321***	0.00741**
	(0.00746)	(0.00310)
Barishal urban	0.277***	0.331***
	(0.0278)	(0.0676)
Chattogram rural	0.00690***	0.0242*
	(0.00243)	(0.0137)
Chattogram urban	0.320***	0.225***
	(0.0218)	(0.0384)
Chattogram SMA	0.0778***	0.0542**
	(0.0200)	(0.0217)
Dhaka rural	0.0180***	0.0282***
	(0.00321)	(0.00987)
Dhaka urban	0.162***	0.205***
	(0.0136)	(0.0362)
Dhaka SMA	0.0500***	0.124***
	(0.00996)	(0.0376)
Khulna rural	0.00227	0.00909
	(0.00161)	(0.00567)
Khulna urban	0.359***	0.390***
	(0.0229)	(0.0530)
Khulna SMA	0.100***	0.106**
	(0.0254)	(0.0417)
Rajshahi rural	0.104***	0.0358***
	(0.00741)	(0.00904)
Rajshahi urban	0.371***	0.203***
	(0.0180)	(0.0379)
Rajshahi SMA	0.240***	0.299***
	(0.0429)	(0.0407)
Sylhet rural	0	0.00152
	(0)	(0.00152)
Sylhet urban	0.0313**	0.150
	(0.0138)	(0.0969)
Observations	10080	12173

Source: Authors' estimation.

Note: a) Standard errors in parentheses. b) \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

(small metropolitan area (SMA) only), where competing factors such as improved literacy, increase in wealth, and greater facilitation of tax instruments have played a vital role in increased tax collection. The spatial distribution of tax payment is largely concentric around more densely populated zones; the exception being Chattogram, for which there is no discernible explanation.

Table 6 also reports the potential amount of income tax that could have been generated by the Bangladesh Government under perfect tax compliance. Potential income tax compliance is determined using the Bangladesh Income Tax Ordinance, allowing to determine from each survey which households contained potential taxpayers; and on the basis of their reported income, the present study is able to calculate the amount that they would theoretically owe. It is observed from Table 6 that, the potential income taxpayer base increased over time, as the number of households with at least one (working) potential income taxpayer doubled from 10.2 per cent in 2005, to 22.8 per cent in 2010. This is largely attributable to a distributional improvement in household income across the country, due to a various macro and microeconomic factors, largely stemming from (slowly but steadily) increased formalisation of the workforce and steady economic growth. In-house calculations using NBR estimates show that, 1.67 per cent and 2.29 per cent of all households were paying income taxes in 2005 and 2010, respectively. Therefore, the ratio of potential-to-actual income taxpaying households actually fell from 16.37 per cent in 2005, to 10.04 per cent in 2010; this is a major policy concern, motivating a need for deeper analysis of drivers of tax compliance behaviour at the household-level, so as to better understand the bottlenecks to tax declaration.

From a prior exercise, it was observed that, Bangladesh was only able to collect 15.1 and 50 per cent of the total potential tax revenue in 2005 and 2010, respectively. While the improvement was quite substantial, the tax potential ratio (ratio of actual-to-potential taxpayers) for Bangladesh falls short of its neighbouring countries, as Sri Lanka and India, in 2012, had tax potential ratios of 55 per cent and 53 per cent, respectively.<sup>6</sup> To put this in macroeconomic context, full income tax compliance would increase the national GDP by 1.5 percentage points, which in (constant) nominal terms translates to an additional USD 1.69 billion in government revenue.<sup>7</sup>

Tables 8 and 9 report OLS regression results of the determinants of (income and total) tax compliance and payment amount, as given by equations [7] and [8], for 2005 and 2010, respectively. Tables 10 and 11 report the two-stage estimation results, as given by equations [9], [10] and [11], for 2005 and 2010, respectively.

Tables 8 and 9 provide overviews of drivers of tax compliance for 2005 and 2010, respectively. The present study was only able to determine extent of correlation, as tests for causality require either time series data, or structural estimation, when using cross-sectional data. It was immediately observed (from columns 1 and 2 in both Tables 8 and 9) that, across both years, the age and education level of the household head, household size and urban residence correlate positively with both total tax and income tax compliance. In 2010, household income and computer ownership are also strongly and positively correlated with total tax and income tax compliance, indicating that resource ownership eases the burden of taxation—making households more compliant, in turn. On the flip side, rural households are less likely to pay total tax; no discernible relationship is observed for income tax due to a persistently small rural tax base. Regarding total tax payment, urban households in 2005 paid substantially more total taxes than their rural counterparts; this effect is not observed in 2010, where richer households, regardless of location, pay significantly more. Income tax amounts do not

<sup>6</sup>Fenochietto and Pessino (2013).

<sup>7</sup>It should be noted that, the vast majority of income tax evasion stems from low-income or informal workers, whose contributions have a marginal impact on tax revenue. The Bangladesh Government asserts that, selectively pursuing high-income taxpayers would be a more efficient policy practice.

**Table 8: Determinants of household tax compliance: 2005**

Model	(1) Probit	(2) Probit	(3) OLS	(4) OLS
Variable	Household tax compliance	Household income tax compliance	Total tax amount	Total income tax amount
Age of the household head	0.000903***	1.09e-05*	-0.802	0.068
	(0.000214)	(5.89e-06)	(1.806)	(0.924)
Female household head	-0.0124	8.89e-05	-39.04	-52.11
	(0.00917)	(0.000334)	(55.98)	(45.80)
Education level of the household head	0.00213***	5.24e-05**	9.10	12.85*
	(0.000826)	(2.57e-05)	(7.86)	(7.24)
Household size	0.00248*	5.87e-05**	5.44	-2.09
	(0.00146)	(2.52e-05)	(12.07)	(10.78)
Number of formal workers in the household	-0.00250	-7.23e-05	4.96	-20.17
	(0.00345)	(6.78e-05)	(40.25)	(22.07)
Household daily income	-6.53e-05	9.60e-07	0.103	0.335*
	(4.31e-05)	(6.57e-07)	(0.269)	(0.184)
Household yearly income (adjusted for CPI)	6.10e-10	1.60e-05*	0.0002	0.0003
	(1.52e-09)	(9.60e-06)	(0.0002)	(0.0003)
Household owns land	0.0246*	0.000379	22.64	36.53
	(0.0143)	(0.000384)	(105.27)	(105.35)
Household bought a house recently	-0.0165		-98.06*	-62.92
	(0.0289)		(54.66)	(43.64)
Household owns/uses a computer	0.0413	0.00432	2724.22*	2545.50
	(0.0275)	(0.00377)	(1592.41)	(1588.41)
Rural residence	-0.0549***	0.0283*	88.49	93.76
	(0.0127)	(0.0163)	(64.25)	(60.19)
Urban residence	0.109***	0.606***	354.19***	169.40**
	(0.0155)	(0.157)	(121.23)	(78.31)
Constant			-155.84	-168.57***
			(101.26)	(63.61)
Observations	6544	6509	6544	6544
R-squared			0.0336	0.0425
F	39.24	776.6	1.83	0.94

Source: Authors' estimation.

Note: a) Standard errors in parentheses. b) \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

consistently correlate with any particular set of determinants. For 2010, it is observed that, female-headed households, households that receive a daily income, and land ownership correlate negatively with income tax amounts; this is likely due to most women and day-labourers being employed in the shadow economy, where income tax is not collected. As such, it is hoped, that data from the yet unavailable 2016 HIES will provide greater insight on the drivers of the level of income tax payment.

Based on Tables 8 and 9, it can be inferred that, skill (education) and experience play a role in increasing tax compliance; individuals, through tax fairs, communal workshops on Bangladesh's tax system, and increased access to digital information on tax structure, stand to gain a better understanding of the role that taxes play in the economy and its redistributive effect on social measures. Measures of literacy include both education level and access to computers, both of which are positively correlated with tax compliance; the present study discerns that, greater digitisation of the tax system—ranging from information to tax declaration—would ease access to tax compliance instruments for a large

**Table 9: Determinants of household tax compliance: 2010**

Model	(1) Probit	(2) Probit	(3) OLS	(4) OLS
Variable	Household tax compliance	Household income tax compliance	Total tax amount	Total income tax amount
Age of the household head	0.000574***	-3.20e-06	0.106	-0.331
	(0.000139)	(2.91e-05)	(1.1149)	(1.147)
Female household head	-0.00695	-0.00115	-158.38	-185.28**
	(0.00612)	(0.000885)	(-86.107)	(86.23)
Education level of the household head	0.00166**	0.000175*	-10.30	-12.109
	(0.000671)	(0.000100)	(13.112)	(13.30)
Household size	0.00222**	0.000452**	-25.039	-28.65
	(0.00103)	(0.000197)	(19.124)	(18.75)
Number of formal workers in the household	-0.00318	1.96e-05	-87.627	-92.99
	(0.00260)	(0.000445)	(71.86)	(73.08)
Household daily income	-1.19e-05	-1.61e-06	-0.277	-0.335*
	(1.75e-05)	(3.25e-06)	(0.187)	(0.176)
Household yearly income (adjusted for CPI)	2.12e-08***	2.52e-09**	0.0030***	0.0030***
	(7.38e-09)	(1.11e-09)	(0.00063)	(0.0006)
Household owns land	0.0187	0.000283	-310.83	-379.22*
	(0.0179)	(0.00189)	(220.65)	(224.85)
Household bought a house recently	0.0271		-783.65	-743.87
	(0.0436)		(493.47)	(484.73)
Household owns/uses a computer	0.0474**	0.00851*	3100.17	2973.9
	(0.0220)	(0.00497)	(1955.41)	(1982.73)
Rural residence	-0.0396**	-0.00114	-188.94	-154.78
	(0.0157)	(0.00142)	(157.71)	(158.72)
Urban residence	0.0961***	3.34e-05	-429.81	-440.69
	(0.0254)	(0.00134)	(279.14)	(284.32)
Constant			170.24	183.71
			(188.99)	(188.07)
Observations	12100	12061	12099	12099
R-squared			0.1655	0.1576
F	21.83	21.77	6.28	4.66

Source: Authors' estimation.

Note: a) Standard errors in parentheses. b) \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

share of the workforce. Urban households, largely by virtue of earning higher incomes and having more well-educated members, are better able to comply with tax laws; this is especially true in urban and semi-urban parts of Bangladesh, where access to tax information and instruments are far easier relative to rural areas. Existing tax norms of having only tax offices at the district level have made access to tax instruments difficult in rural areas, as observed by low compliance levels in those regions of Bangladesh.

In order to determine whether or not endogeneity or underreporting of income might be affecting the results, Tables 10 and 11 report 2005 and 2010 estimates from a similar exercise that runs a first stage regression on household income (equation [9]), and, using predicted values of household income, runs similar regressions (equations [10] and [11]) to the ones reported in Tables 8 and 9. Household consumption indices are used to instrument for household income. This stems from the idea that

**Table 10: Determinants of household tax compliance—2 stage model: 2005**

Model	(1) OLS	(2) Probit	(3) OLS	(4) OLS	(5) Probit	(6) OLS
	Total tax compliance			Income tax compliance		
Variable	1st stage: Household yearly income	2nd stage: Total tax compliance	2nd stage: Total tax amount	1st stage: Household yearly income	2nd stage: Total income tax compliance	2nd stage: Total income tax amount
Age of the household head		0.000903*** (0.000214)	-0.696 (1.78)		1.05e-05* (5.73e-06)	0.176 (0.874)
Female household head		-0.0123 (0.00916)	-27.41 (49.88)		8.12e-05 (0.000321)	-41.29 (38.55)
Education level of the household head		0.00214*** (0.000826)	10.87 (8.83)		5.14e-05** (2.44e-05)	14.66 (8.29)
Household size		0.00251* (0.00145)	18.29 (12.94)		6.13e-05** (2.47e-05)	10.99 (11.76)
Number of formal workers in the household		-0.00249 (0.00345)	6.61 (39.73)		-7.02e-05 (6.54e-05)	-18.49 (21.11)
Household daily income		-6.55e-05 (4.31e-05)	0.02 (0.24)		8.90e-07 (6.33e-07)	0.249 (0.129)
Predicted income values from 1st stage regression		-7.35e-08** (2.97e-08)	0.0004 (0.0005)		5.94e-10 (5.22e-10)	0.0004 (0.004)
Household owns land		0.0247* (0.0143)	34.27 (101.05)		0.000385 (0.000383)	48.38 (101.29)
Household bought a house recently		-0.0166 (0.0289)	-110.89* (59.61)			-75.99 (48.19)
Household owns/uses a computer		0.0415 (0.0275)	2756.9* (1644.16)		0.00415 (0.00356)	2578.8 (1641.26)
Rural residence		-0.0550*** (0.0127)	83.71 (59.95)		0.0298* (0.0173)	-88.88 (55.49)
Urban residence		0.109*** (0.0155)	359.25*** (121.76)		0.625*** (0.161)	174.56** (79.13)
Household consumption index	66904*** (8253)			66904*** (8253)		
Constant	132395*** (9505)		-241.84 (168.31)	132395*** (9505)		-259.89** (121.41)
Observations	10080	6544	6544	10080	6509	6544
R-squared	0.017		0.0249	0.017		0.0292
F	65.72	42.48	1.95	65.72	891.9	1.01

Source: Authors' estimation.

Note: a) Standard errors in parentheses. b) \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

households are more willing to declare ownership of various assets compared to their nominal income, and as such, consumption provides more accurate information, and in turn, is a much better proxy of a household's ability to pay taxes. Since one endogenous variable is being instrumented here with one instrument, the model is exactly identified, and as a result, does not call for a test for instrument exogeneity. Columns 1 and 4 from Tables 10 and 11 show that consumption is a very good proxy for household income, and, by construction, provides a richer picture of a household's underlying wealth.

**Table 11: Determinants of household tax compliance—2 stage model: 2010**

Model	(1) OLS	(2) Probit	(3) OLS	(4) OLS	(5) Probit	(6) OLS
	Total tax compliance			Income tax compliance		
Variable	1st stage: Household yearly income	2nd stage: Total tax compliance	2nd stage: Total tax amount	1st stage: Household yearly income	2nd stage: Total income tax compliance	2nd stage: Total income tax amount
Age of the household head		0.000592*** (0.000142)	1.405 (1.627)		3.45e-06 (2.82e-05)	0.954 (1.619)
Female household head		-0.00631 (0.00626)	-51.03 (71.79)		-0.00109 (0.000864)	-79.07 (69.95)
Education level of the household head		0.00194*** (0.000683)	17.72 (11.35)		0.000219** (9.21e-05)	15.62 (11.5)
Household size		0.00267*** (0.00103)	33.67 (39.045)		0.000484** (0.000218)	29.44 (38.97)
Number of formal workers in the household		-0.00193 (0.00279)	-4.58 (89.59)		0.000283 (0.000465)	-10.83 (89.53)
Household daily income		-1.10e-05 (1.81e-05)	-0.061 (0.188)		-1.31e-06 (3.39e-06)	-0.122 (0.182)
Predicted income values from 1st stage regression		9.40e-08*** (3.47e-08)	0.0015*** (0.0006)		2.19e-08*** (6.09e-09)	0.0013** (0.0006)
Household owns land		0.0193 (0.0176)	-291.68 (221.39)		0.000626 (0.00191)	-360.27 (225.02)
Household bought a house recently		0.0297 (0.0458)	-470.68 (363.36)			-434.18 (349.54)
Household owns/uses a computer		0.0608** (0.0245)	4289.8** (2156.94)		0.0110* (0.00610)	-4151.0* (2186.82)
Rural residence		-0.0418*** (0.0158)	-442.45** (199.3)		-0.00132 (0.00140)	-405.62** (201.66)
Urban residence		0.0936*** (0.0249)	-588.22* (324.61)		-0.000121 (0.00119)	-597.44* (330.21)
Household consumption index	66027*** (7273)			66027*** (7273)		
Constant	138598*** (5419)		13.81 (131.41)	138598*** (5419)		58.02 (128.46)
Observations	12173	12100	12099	12173	12061	12099
R-squared	0.114		0.0762	0.114		0.0691
F	82.42	21.82	2.98	82.42	21.22	1.76

Source: Authors' estimation.

Note: a) Standard errors in parentheses. b) \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

In the second stage, using predicted values for household income from the first stage, mostly similar results are observed compared to the simple regression analysis offered in Tables 8 and 9. Looking at columns 2 and 5, it can be observed that, household head's age and education level, household size and urban residence are still strongly and positively correlated with both total and income tax compliance; in 2010, however, income tax compliance does not correlate significantly with urban residence. A curious result worth noting is that, predicted income residuals from the first stage display

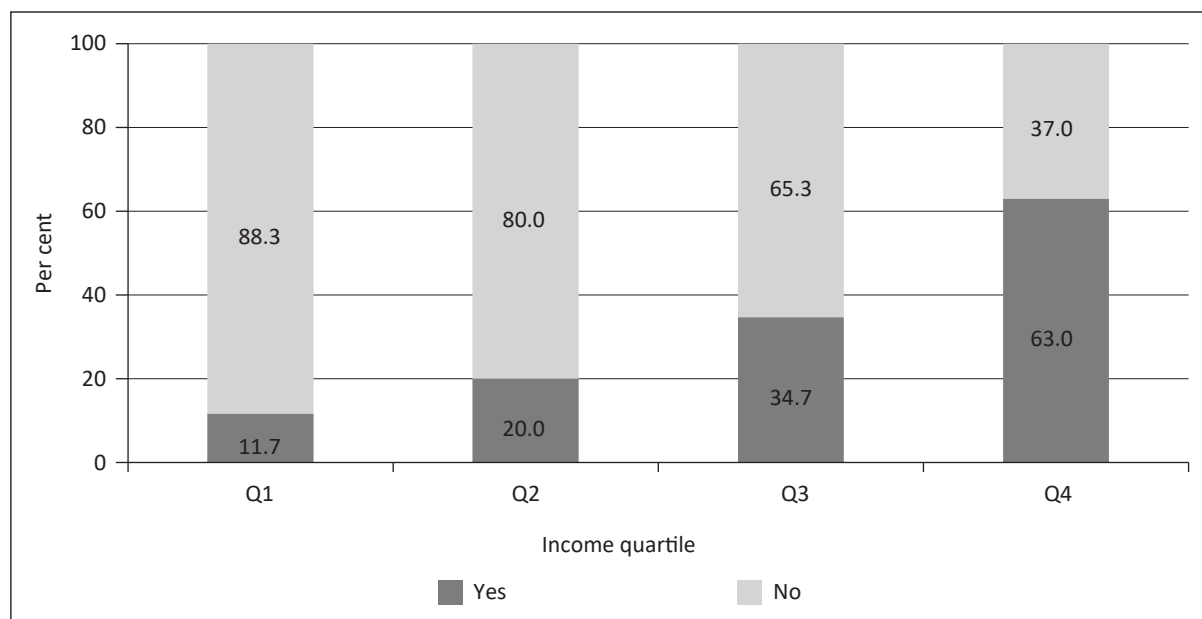
opposite relationships with respect to total tax compliance in 2005 and 2010; in 2005, the relationship is strongly negative, while in 2010, it is strongly positive. Qualitative evidence regarding increase in total taxpayers in Bangladesh during that time (coming from NBR reports, media briefs and interviews) could help explain this phenomena, as most new taxpayers stemmed from upper-income groups. This calls for a tax system that incentivises poorer households to declare their income, particularly as barriers to tax facilitation at the workplace affect lower-income groups, who are largely employed in the shadow economy. Successful incentive policies from other countries could provide a benchmark for expanding the lower-income tax base, primarily through provision of tax concessions for timely and transparent declaration. Further analysis of the 2016 HIES dataset should provide greater insight. In light of very low R-squared values, it is recognised that, merely capturing the supply-side scenario does not provide substantial insight into tax compliance behaviour, and greater analysis would require administrative information from the demand-side through the NBR.

Columns 3 and 6 display tax amount determinants using the second equation from the two-stage approach. Urban households were likely to pay higher levels of tax in 2005; curiously this relationship reversed in 2010. Compared to the simple OLS results from Tables 8 and 9, it would appear that non-consumption measures attributable to urban dwellers might be playing a role here, but given the scope of the data used, an exact relationship is difficult to elicit. Households that own a computer are likely to pay higher levels of total tax, as only relatively affluent households are able to afford home computers.

### 5.2 Factors influencing tax compliance

As per the perception survey, only 32 per cent of the respondents claimed to have paid income tax in the previous year, i.e. 2017. In terms of return submission, only 29 per cent of the respondents declared to have submitted their income tax returns. Income quartile-wise distribution reveals that tax compliance rises with the increase in income (Figure 1). Still, it can be evinced that, more than one-third of the top earners did not pay income tax in the preceding year. However, this does not imply that there was no tax evasion.

**Figure 1: Distribution of response to the question “did you pay income tax last year?”**



Source: Authors' calculation from the perception survey data.

To examine the difference in perception amongst the numerous types of respondents, the survey result of the questions presented in Table 5 were stratified into three groups. These are: i) responses from all respondents; ii) responses from respondents belonging to the highest income quartile; and iii) responses from respondents who paid income tax last year. The findings are presented in the following Tables 12, 13 and 14.

**Table 12: Perception survey findings—all respondents**

Question	Share of respondents						Comment(s)
	0	1	2	3	4	5	
Do you believe that the tax revenue is collected for social welfare?	1.4	0.3	1.1	3.8	74.3	19.2	93 per cent respondents believe that social welfare is the target to be achieved through tax collection • Exhibits signs of strong tax morale amongst the respondents
For me, paying taxes is an obvious thing to do.	0.3	0.4	0.8	3.4	59.3	35.9	95 per cent of the respondents consider paying taxes as an obvious duty • This implies that motivation to comply is high
What is the probability that the NBR finds out that income is not declared or deductions are exaggerated?	5.0	13.6	26.8	15.2	31.9	7.5	People's perception regarding the ability of the tax enforcement authority appear to be polarised • 39 per cent consider high or above and 41 per cent consider low or below
The taxation system is favourable towards the rich/ elite of the society.	5.7	2.1	5.7	11.4	56.2	19.0	75 per cent of the respondents feel that the tax system inherently favours the elite
The tax system in our country is overly complex.	11.0	2.2	22.1	16.3	40.8	7.7	About half of the respondents consider the tax system to be overly complex
People will be more motivated to pay taxes, if the services provided by the government and their quality are increased.	1.5	1.0	6.2	6.9	59.8	24.7	85 per cent believe that increased provision and quality of public services will induce people to pay taxes
There is corruption in the taxation system.	11.4	1.9	7.3	14.3	49.7	15.4	65 per cent believe that corruption is prevalent in the taxation system
How common is it to pay for goods or services without a bill or invoice in order to avoid VAT?	7.3	25.3	52.7	12.4	2.3	0.2	78 per cent of the respondents find incidences relating to VAT avoidance occurring regularly
Think about three adults you know best, like your close friend or family members. What would they think if they heard that you did not declare all of your income to the authority?	5.6	0.2	1.3	13.8	70.4	8.8	79 per cent of the respondents believe that their peers will not encourage non-compliant behaviour
Tax paying system is very easily accessible in my area.	20.8	3.0	20.7	17.2	36.8	1.6	Only 38 per cent believe tax paying system is easily available

Source: Authors' calculation from perception survey data.

**Table 13: Perception survey findings—respondents belonging to the highest income quartile**

Question	Share of respondents						Comment(s)
	0	1	2	3	4	5	
Do you believe that the tax revenue is collected for social welfare?	0.3	1.0	0.7	2.0	71.3	24.7	Similar to "All Respondents" (More towards higher scale)
For me, paying taxes is an obvious thing to do.	0.0	0.7	0.7	5.3	45.0	48.3	Similar to "All Respondents" (Less towards higher scale)

(Table 13 contd.)



(Table 13 contd.)

Question	Share of respondents						Comment(s)
	0	1	2	3	4	5	
What is the probability that the NBR finds out that income is not declared or deductions are exaggerated?	2.3	14.3	24.7	16.0	31.7	11.0	Similar to "All Respondents" • 43 per cent consider high or above and 39 per cent consider low or below
The taxation system is favourable towards the rich/ elite of the society.	3.3	3.7	6.0	9.7	51.0	26.3	Similar to "All Respondents" (More towards higher scale)
The tax system in our country is overly complex.	8.3	3.7	20.7	11.0	43.7	12.7	Similar to "All Respondents" (More towards higher scale)
People will be more motivated to pay taxes, if the services provided by the government and their quality are increased.	0.7	1.7	7.7	7.7	51.7	30.7	Similar to "All Respondents" (Less towards higher scale)
There is corruption in the taxation system.	9.3	1.0	8.3	12.7	45.0	23.7	More among richer group (69 per cent) think there is corruption compared to "All Respondents" group (65 per cent)
How common is it to pay for goods or services without a bill or invoice in order to avoid VAT?	3.0	28.7	48.3	17.0	2.7	0.3	Similar to "All Respondents" (Less towards lower scale)
Think about three adults you know best, like your close friend or family members. What would they think if they heard that you did not declare all of your income to the authority?	1.3	0.3	0.7	13.3	70.7	13.7	More among richer group (84 per cent) believe that their peers will not encourage non-compliant behaviour compared to "All Respondents" group (79 per cent)
Tax paying system is very easily accessible in my area.	15.0	4.7	22.0	14.0	42.3	2.0	More among richer group (44 per cent) believe tax paying system is easily available compared to "All Respondents" group (38 per cent)

Source: Authors' calculation from perception survey data.

**Table 14: Perception survey findings—respondents who paid tax last year**

Question	Share of respondents						Comment(s)
	0	1	2	3	4	5	
Do you believe that the tax revenue is collected for social welfare?	0.0	0.5	0.8	3.4	69.9	25.5	Similar to "All Respondents" (More towards higher scale)
For me, paying taxes is an obvious thing to do.	0.0	0.3	0.8	4.4	48.2	46.4	Similar to "All Respondents" (Less towards higher scale)
What is the probability that the NBR finds out that income is not declared or deductions are exaggerated?	2.3	10.6	27.1	17.0	33.0	10.1	Similar to "All Respondents" • 43 per cent consider high or above, and 38 per cent consider low or below
The taxation system is favourable towards the rich/ elite of the society.	2.6	3.4	8.8	11.9	55.2	18.3	Similar to "All Respondents" (Less towards higher scale)
The tax system in our country is overly complex.	1.0	4.4	28.6	11.9	42.5	11.6	Dissatisfaction regarding the complexity appear to be higher amongst people who paid tax last year • 54 per cent amongst who paid last year • 46 per cent amongst who did not

(Table 14 contd.)

(Table 14 contd.)

Question	Share of respondents						Comment(s)
	0	1	2	3	4	5	
People will be more motivated to pay taxes, if the services provided by the government and their quality are increased.	0.5	1.3	5.9	7.7	54.1	30.4	Similar to "All Respondents" (Less towards higher scale)
There is corruption in the taxation system.	9.8	2.6	12.1	17.3	41.8	16.5	Less among taxpayers (58 per cent) think there is corruption compared to "All Respondents" group (65 per cent)
How common is it to pay for goods or services without a bill or invoice in order to avoid VAT?	3.1	27.6	50.3	16.2	2.6	0.3	Similar to "All Respondents"
Think about three adults you know best, like your close friend or family members. What would they think if they heard that you did not declare all of your income to the authority?	0.5	0.0	1.3	13.1	71.4	13.7	More among taxpayers (85 per cent) believe that their peers will not encourage non-compliant behaviour compared to "All Respondents" group (79 per cent)
Tax paying system is very easily accessible in my area.	3.1	5.4	25.3	13.4	49.5	3.4	More among taxpayers (44 per cent) believe that tax paying system is easily available compared to "All Respondents" group (38 per cent)

Source: Authors' calculation from perception survey data.

As can be seen from the perception survey, 75 per cent of the respondents believe that the tax system is biased towards the rich or elite, while 50 per cent believe the tax system to be overly complex. Fifty-four per cent of the individuals who paid income tax in the preceding year, found the tax system to be complex. Eighty-five per cent of the respondents believe that, people will be more encouraged to pay taxes, if the delivery and the quality of the public services are increased. Sixty-five per cent respondents believe there is corruption in the tax system, while this share is 69 per cent for the top income-earners. Also, there is considerable divergence regarding ease of access, based on locality. Only 38 per cent of the respondents find the tax payment facilities in their locality easily accessible. However, only 29 per cent of the rural respondents share this notion. It appears that, dissatisfaction is higher among rural respondents (Table 15).

Table 15: Perception as regards ease of access

(in Per cent)

Ease of access	Share of respondents			
	Rural	Urban	City corporation	Total
No response/ comments	26.9	10.8	24.6	20.8
Strongly disagree	3.4	2.9	2.8	3.0
Disagree	23.4	20.5	19.0	20.7
Neutral	16.9	22.4	13.4	17.2
Agree	28.8	39.2	40.0	36.8
Strongly agree	0.6	4.2	0.2	1.6
Total	100.0	100.0	100.0	100.0

Source: Authors' calculation from perception survey data.

## 6. RECOMMENDATIONS

From the analysis of HIES data, it was found that, people who are more educated and employed in formal sector, are likely to pay tax. Hence, a greater governmental push for formalisation of labour could also potentially ensure greater tax collection through collection of advanced income tax and deductions at source, as well as provide scope for teaching workers about the necessity of tax compliance for welfare redistributive purposes. Improving the scope for employment in formal sector is crucial to this end. Encouraging self-assessment by simplifying the return submission process for lower-income groups might also be beneficial. Providing incentives to lower-income households to become taxpayers (e.g. prioritised public services, such as education for children, healthcare in public hospitals, etc.) could also be considered.

As urban households generally have higher incomes and more well-educated members, they are better prepared to comply with the tax laws. This is particularly valid for urban and semi-urban areas of Bangladesh, since access to tax information and instruments in such areas are much easier compared to their rural counterparts. The current system of having tax offices only at the district level has made access to tax instruments problematic for the rural dwellers. The low level of tax compliance in such regions of Bangladesh might be indicative of that. In this backdrop, a major recommendation would be to incorporate budgetary allocation for increases in tax officials in rural areas by providing tax offices at the sub-district level; proper and timely implementation and monitoring of these offices so as to reduce scope for corruption is strongly recommended. Enhanced use of information technology (IT) could also be considered.

As evident from the perception survey, people's valuation of tax policy formulation needs to change to positive. To achieve this, tax policies must be finalised and implemented through participatory and transparent manner. Ex-ante impact analysis needs to be carried out while undertaking major reforms. Also, while finalising and implementing planned reform measures including the proposed Direct Tax Act, ease of tax payment and return submission needs to be taken into cognisance. A fairer tax system needs to be developed, where introduction of more equitable and modern property and wealth tax should be considered. It has to be ensured that, tax laws will be enforced in a strict manner, particularly for richer groups.

Tax offices need to be more professional to cater as per people's requirements. The perception that there is corruption in the taxation system, might prevent people from participating, even when they believe it is their civic duty. Hence, there is a need to build tax offices as corruption-free institutions.

As can be seen from the perception survey, efficient use of public money and providing better public services encourage people to pay taxes. Hence, investing more on public services, such as education, health, infrastructure and social protection might be beneficial towards greater revenue mobilisation. But the quality of the said public investment must be ensured to guarantee the optimal use of people's hard-earned money. To this end, establishment of a Public Expenditure Review Commission might be considered.

Government initiatives need to be complemented by people's effort, when it comes to revenue mobilisation. Awareness among the taxpayers regarding their civic duty is key in this context. Responsible attitude from the taxpayers themselves is critically important. In the medium term, greater education of individuals about the importance of systemic tax compliance for the economy, through school-level initiatives, coupled with governmental support, could potentially improve tax compliance level.

Limited availability of data was a major impediment while conducting this study. The most up to date scenario could not be captured due to the yet unavailable HIES 2016 data. Also, there is a considerable time lag, when it comes to the availability of some key indicators. Hence, it can be unambiguously said that, data pertaining to tax needs to improve. More disaggregated and quality data needs to be made available in a timely manner. Accessibility of data for analysis without undermining privacy, has to be ensured.

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## ANNEX: SAMPLING METHODOLOGY OF THE PERCEPTION SURVEY

There are two key considerations in generating descriptive statistics from any survey data—a) statistical precision; and b) representativeness of the sample. While the first point about statistical precision is directly related to calculating the required *sample size*, the second point is primarily about the *sampling process* to avoid sample biases. The present study has addressed both the issues in the survey.

### Sample size

There are three steps in calculating the required sample size for statistically valid estimates. The first is to determine the level of precision that is considered desirable and feasible. The second step, which is also related to sampling process, is the adjustment for design effect. If the sample selection is done by (multi-stage) clustered sampling, there is a need for adjusting for design effect, based on the intra-cluster correlation. Finally, the sample size can be adjusted for finite population correction factor, if the sample size becomes more than 5 per cent of the population.

The approach for calculating sample size requirement for binary estimates (i.e. proportions) from a target population is:

$$n = \frac{pqz^2}{D^2}$$

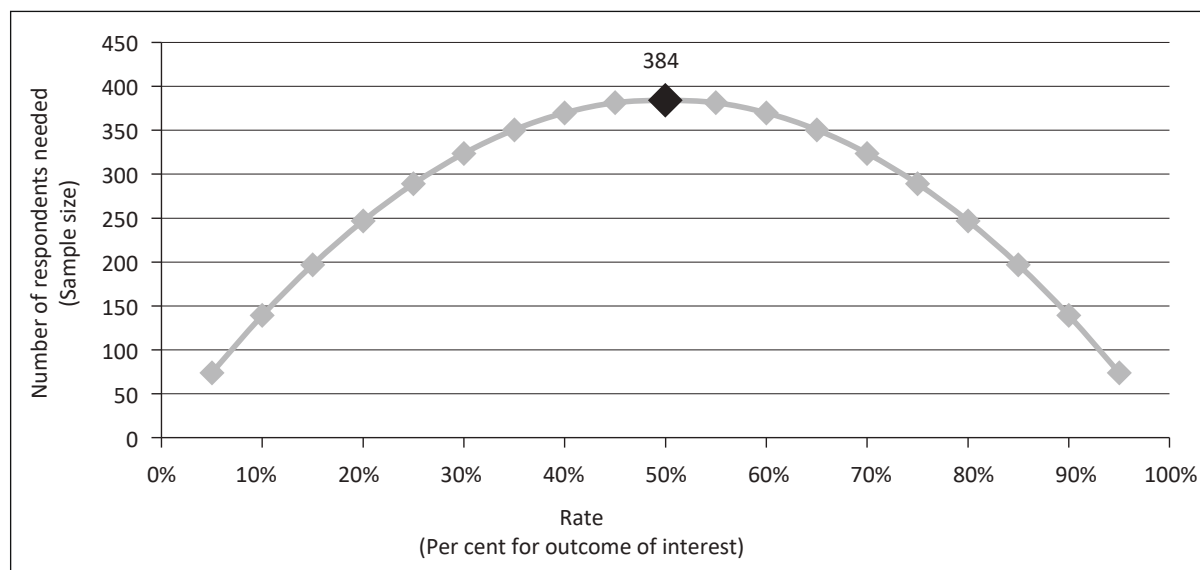
where,  $n$  stands for the sample size,  $p$  is the proportion or percentage estimate expected for specific indicators,  $q$  is the proportion who do not share the characteristics (i.e.  $p=1-q$ ),  $z$  is the z-statistics for specific confidence level, and  $D$  is the absolute level of precision. When there are multiple outcome indicators of interest, the most conservative sample size calculation is done based on the indicator that is expected to be closer to 50 per cent, since that gives the highest number for sample size requirement. In a situation where the expected ratio for the indicators are unknown, the same approach of using 0.5 for  $p$  is used. Using 0.5 for  $p$ , 95 per cent confidence level (i.e. z-score of 1.96), and absolute precision of 0.05 (i.e. 5 percentage points), the present research has yielded a required sample size of 384.

The second step for this sample size calculation is adjustment for design effect. Since it is not feasible to use an existing complete list of households as a sampling frame within the cluster, the natural choice was to conduct ‘cluster sampling’, where small geographies within the target area are sampled first, and then the households (or smaller units within this cluster) are subsequently sampled. The design effect estimate is done by multiplying the sample size calculated in step one with “ $1+(M-1)*ICC$ .” Here,  $M$  stands for the number of observations in each of the sampled clusters (assuming equal numbers), and ICC (intra-cluster correlation) is the level of correlation (or similarity) in the outcome indicator among the observations within the cluster. By assuming an ICC of 0.1 (i.e. relatively low level of correlation) and 20<sup>8</sup> observations (or households) per cluster, the design effect comes to 2.9. Multiplying the 384 sample size with 2.9, the required sample size is found to be 1,114 which was rounded to 1,200. With 20 households per cluster, 60 clusters were needed to reach this sample requirement. Annex Figure 1 shows the sample size requirement with these parameters, and how the number changes for any estimate that are either smaller or larger than 50 per cent.

<sup>8</sup>Considering operational feasibility, 20 observations per cluster were chosen.



**Annex Figure 1: Sample size by proportion**



Source: Authors' calculation.

### Sampling process

For this study, a multi-stage cluster sampling was done based on the LFS 2016-17, conducted by the Bangladesh Bureau of Statistics (BBS), and utilised the enumeration areas, which were used as PSUs from the population census for sampling frame. The PSUs, which are primarily mouzas/mahallas, were used for population proportionate sampling. The first step in sampling the clusters was to determine the target population in each of the clusters. Since the target group for this survey was individuals who are eligible for tax payment, secondary data was relied upon for estimating population size in each PSU. By using LFS data, the eligible taxable population was estimated in each PSU. In the actual sampling of clusters, from the LFS PSUs as the sampling frame, location of PSUs was used as stratification variable, such that the distribution of the clusters stood the following—rural (27 per cent), urban (31 per cent) and city corporations (42 per cent). This distribution was estimated from the eligible taxable population. Therefore, the study selected 16 PSUs from rural locality, 19 from urban locality and 25 from city corporation locality. These PSUs came from 21 districts. As the final step, the sample size in each PSU also included a male–female distribution, to mimic the overall male–female ratio of taxable population found in LFS data. Because of using LFS as the sampling frame, the weight factors estimated for each PSU in the LFS is also applicable for this dataset.

For sampling individual respondents, a random walk method was followed, since each cluster had very small geographical boundary. Before starting the full interview, the respondents were screened based on their last year's annual income. The interviews were conducted both at the houses and at the workplaces, depending on the nature of each clusters. For example, the urban clusters had more businesses among sample respondents, whereas respondent selection in rural clusters needed to be done primarily at their houses.

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