

Tax Enforcement, Revenue and Informality

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Abstract

In this paper, we explore the relationship between informality, tax enforcement and tax revenue. Previous studies have explored the relationship between taxes and the size of the informal sector and have observed a monotonic relation between the two. However, on observing the data of developing countries, we find that the relationship between the size of the informal sector and the level of taxation is non-monotonic, inverted-U shape in nature. In this paper, we build a theoretical framework involving government expenditure of tax revenue in the form of productive public services and tax enforcement allowing us to unravel the correlation between the size of the informal sector and taxes. Our numerical results suggest that as tax rates increase in a developing economy, the informal sector grows initially and then begins to shrink because of the interplay between tax enforcement and tax rates.

Keywords: Informality, taxation, tax revenue, enforcement

JEL Codes: H26, O17, E26

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1 Introduction

Developing countries have a large number of firms which operate outside the purview of tedious administrative regulations to avoid high registration costs and evade taxes. These firms constitute the informal economy or shadow economy. The non-compliance in payment of taxes and in other relevant laws and regulations by the large informal sector often poses serious challenges for developing economies. According to [Besley and Persson \(2014\)](#), the persistence of a weak tax base, owing to large informality, is the reason for the impaired fiscal capacity in developing countries. On the empirical side, the size of the shadow or informal economy is often taken as a measure of tax evasion.

The relationship between the level of taxation and informality has been studied theoretically and empirically. Theoretical models on the informal sector have shown the existence of a monotonic relationship between measures of taxation and the size of the informal sector. [Ihrig and Moe \(2004\)](#) suggest the existence of a positive relationship between informality and the measures of taxation as intuitively higher tax rates create incentives for people to evade them by joining the informal sector and escaping regulations. Their results are derived using a partial equilibrium exercise where an individual agent decides to allocate his labour between the informal and formal sector assuming that policy variables of level of taxation and enforcement are given exogenously. On the other hand, certain studies [Johnson et al. \(1998\)](#) and [Elgin and Solis-Garcia \(2015\)](#) show that higher level of taxation are linked with a smaller size of the informal sector. In the study, then incorporate an important fact of level of taxation being endogenously determined by the government and how it is impacted by institutional factors, therefore offsetting the positive impact of taxes on informality [Elgin and Solis-Garcia \(2015\)](#). Studies like [Loayza \(1996\)](#) and [Maiti and Bhattacharyya \(2020\)](#) have documented the empirical and theoretical effects of informal sector on growth by including the analysis of productive public services. [Loayza \(1996\)](#) study the factors and effects of the informal sector in an endogenous growth model in which they assume that the production technology in both informal and formal sectors are dependent on public services. Their

model indicates that both the policy factors of tax and enforcement increase the size of the informal economy and consequently decrease the rate of economic growth. [Maiti and Bhat-tacharyya \(2020\)](#) extend this study further by including labour union in their analysis. They suggest that in the presence of informality, the growth of an economy has an inverted-U shaped relationship with the enforcement level. Using different levels of tax enforcement and financial development in developing and developed economies, [Mitra \(2017\)](#) show how both these institutions are important in determining the nature of the relationship between taxation and informality. Many studies have highlighted the importance of institutions in determining the effect of tax on informality.

In this paper, we extend the growing literature on tax-informality relationship by providing a new view where the level of enforcement is endogenously determined by the interaction between the government and individual decisions. We study how the level of enforcement is determined by the government and how it helps us in understanding the tax-informality relationship better. The main contribution of our paper is to theoretically explore the effect of level of tax enforcement on the non-monotonic relationship observed between tax and informality in data. We build a theoretical framework using a simple two-sector model where the representative individual decides his labour allocation between the formal and informal sectors, given the policy variables of the government. In our model, both formal and informal sector employ labour and public services or infrastructure provided by the government. The formal sector is taxed by the government whereas the informal sector gets taxed only when caught by the government due to enforcement. The important addition in our model is that the government revenue is spent on providing both public services and enforcement taxes. This is motivated by the fact that the ability of the government to enforce taxes is a costly function and is funded by the revenue earned by the government ([Slemrod and Yitzhaki \(2002\)](#)). Our definition of enforcement is in line with seminal works of [Allingham and Sandmo \(1972\)](#) and [Ihrig and Moe \(2004\)](#); it is the probability that the informal sector will be audited and taxed by the government. This treatment of tax enforcement as

an endogenous variable is important in our analysis as it affects both revenue and labour movement, which helps us in examining the tax-informality relationship .

We run numerical simulations to solve our theoretical model. Based on our theoretical definitions, our numerical results show that an inverted U-shape relationship exists between the size of the informal sector and taxation because of the level of enforcement. This result corroborates our data findings. The fact that the government revenue is used in funding tax enforcement and public services, we find that enforcement and labour are interdependent on each other.

The rest of the paper is organized as follows. In Section 2, we present and observe data on measures of informality, taxation and level of enforcement along with the motivation to undertake the study. We formally model the relationship between tax and informality in Section 3. In Section 4, we numerically simulate the theoretical model using standard parameters available in the literature. The paper ends with concluding observations and ideas for future work in section 5.

2 Data and Motivation

In this section, we present data on informality, taxes and institutions of developing countries to motivate our theoretical model. We focus on developing countries because the share of the informal economy is higher in developing countries than in developed countries. The informal sector produces about 35% of the gross domestic product (GDP) and employs 70% of the labour force in a developing economy (Loayza (2016)) in comparison to around 15% of GDP in developed countries (Medina and Schneider (2018)). Since we explore the tax-informality relationship through the lens of tax administration, we compile a data set that includes measures of government taxation, informal activity and tax enforcement for 1991-2017.

Literature indicates several ways of calculating the size of the informal economy owing to the differences and inconsistencies in the measurement of informal sector across countries.

These different methods are often not comparable. One way to observe the size of the informal sector is by calculating the share of informal output in total GDP. The other way is by calculating the the share of the informal labour, measured by household surveys of countries. [Schneider and Enste \(2000\)](#) estimated the size of the shadow economy (as a percentage of GDP) for various countries in the early 1990s. They showed it varies hugely across countries - 76% in Africa, 60% in Central and South America, 70% in Asia, 28% in Central Europe, 43% in the former Soviet Union countries and 30% in OECD countries. Using household survey data from all countries, [International Labour Organization \(2018\)](#) estimates that 93% of the world's informal employment is in emerging and developing countries. According to the report, the proportion of informal employment is 85.8% in Africa, 68.2% in Asia and the Pacific, 68.6% in the Arab States, 40.0% in the Americas and 25.1% in Europe and Central Asia. For our analysis, we follow the simple definition of informality as stated by [Medina and Schneider \(2018\)](#): "Informal activities are a process of income generation that is unregulated by the institutions of society, in a legal and social environment in which similar activities are regulated."

We construct a data set with various indicators for developing and emerging economies. We use the latest shadow economy estimates provided by [Medina and Schneider \(2019\)](#) for the measure of informal economy. This is an important database in which they employ multiple indicator-multiple cause (MIMIC) approach to estimate a measure of shadow or informal economy for 157 countries over the period 1991 - 2017. We use the definition of IMF's World Economic Outlook ¹ to separate the emerging and developing countries from the above database.

For all other variables, we compile the data over the same years and same countries, depending on the data availability in the sources explained below. As a measure of taxes, we use three different variables of taxation. The first measure of tax is Tax revenue as a percentage of GDP which is obtained from the World Development Indicators (WDI)²

¹See <https://www.imf.org/en/Publications/WEO>

²See <https://datacatalog.worldbank.org/dataset/world-development-indicators>

database of the World Bank. This variable is most commonly used in the literature as a measure of the tax burden (Elgin and Solis-Garcia (2015)). We also use taxes on income, profits and capital gains as a percentage of total revenue from WDI (Bank (2019)). Thirdly, we use cross country data on corporate tax rates from data set constructed by Vekh and Vuletin (2015).

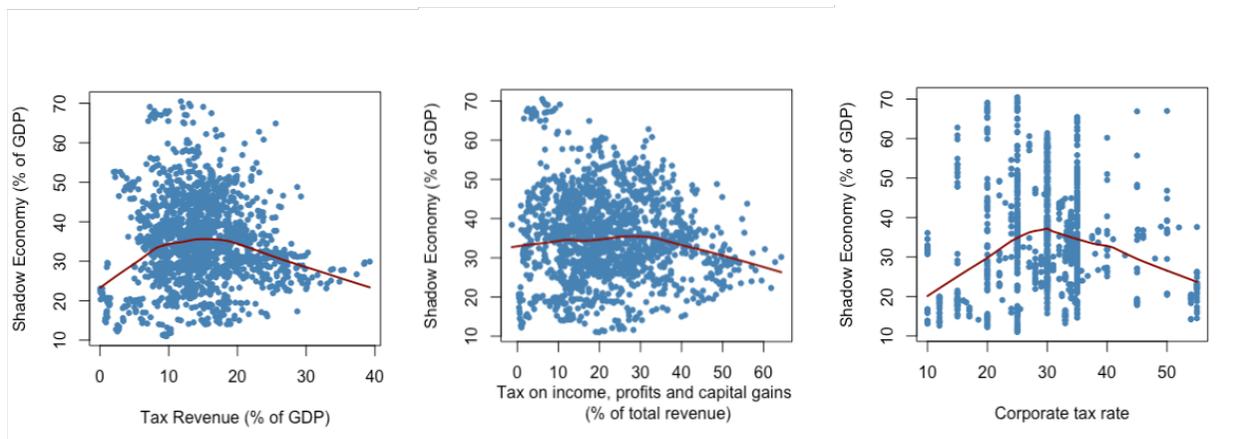


Figure 1: Relationship between the share of informal economy and tax measures (1991 - 2017)

On plotting against different measures of tax rates, informal economy (as a % of GDP) tends to show an inverted-U shape curve (see Figure 1). The trend line indicates that informal economy initially rises with the increase in taxes at a lower level and then begins to fall with the increase in tax.

We use the Efficiency of the tax administration indicator from the Institutional Profiles Database (IPD) ³ (IPD (2016)) as the proxy for level of tax enforcement. This data set is available only for the years 2001, 2006, 2009, 2012 and 2016. We use this data against measures of taxation for the same years owing to the lack of enforcement data over continuous time period. The Institutional Profiles Database (IPD) provides an original measure of institutional characteristics of various countries through composite indicators built from perception data. It covers 144 countries and contains 127 indicators describing a broad range of institutional characteristics including efficiency of tax administration. Efficiency of

³See <https://www.cepii.fr/institutions/EN/download.asp>

the tax administration is a composite indicator that takes into account the government's efficiency in collection of corporation tax, income tax of households with formal income and practical ability of the administration to limit tax evasion. We plot the relationship between the efficiency of tax administration and the measures of taxation defined above (Tax revenue and Tax on income, profits and capital gains). We have also used other institutional indicators such as Government Effectiveness and Regulatory Quality from Worldwide Governance Indicators (WGI)⁴ as proxies for enforcement and observed similar results.

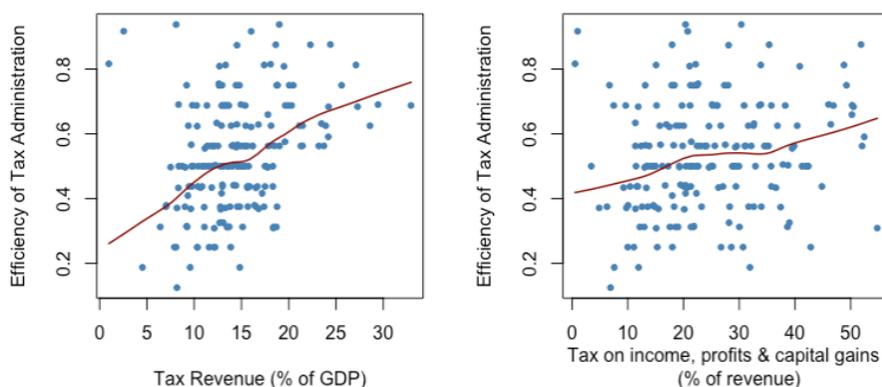


Figure 2: Relationship between efficiency of tax administration and taxation in developing countries (2001, 2006, 2009, 2012 & 2016)

It is observed in Figure 2 that tax administration's efficiency improves with the increase in tax rates for these developing countries. The correlation between the two variables is around 0.31 based on the number of observations indicating a positive relationship between the efficiency of tax administration and tax rates in developing countries. We also calculate the correlation between the level of informality and efficiency of tax administration in developing countries. We find the correlation to be around -0.29, indicating a negative relationship between the two. The summary statistics of the all the variables is given in Table 1.

The evidence gathered from data suggests that the relationship between taxation and informal sector is not strictly monotonic in nature. Secondly, tax enforcement proxied by

⁴See <https://info.worldbank.org/governance/wgi/>

	N	Mean	St. Dev.	Min	Max
Shadow Economy (% of GDP)	3,104	35.620	10.975	11.000	70.500
Tax Revenue (% of GDP)	1,882	15.193	8.123	0.043	149.283
Tax on income, profits and gains	1,813	21.012	12.126	1.351	75.238
Corporate tax rate	1,185	29.917	8.486	10.0	55.0
Efficiency of tax administration	356	2.019	0.745	0.0	4.0

Table 1: Summary statistics of developing countries

the efficiency of tax administration is positively related to the tax revenue in developing countries. It also points out that tax enforcement is an important determinant of informality in developing economies. All the above observations convince us to examine the relationship between informality and tax in developing countries and the impact of institutional ability of the government to administer taxes where the institutional ability is a function of total tax revenue earned by the government. This will form the basis of our theoretical modelling and quantitative analysis in the following sections.

3 Model

We model the formal and informal sectors based on the framework of [Ihrig and Moe \(2004\)](#) and [Loayza \(1996\)](#). We include important assumptions of productive public services and government revenue being used on provision of public services and tax administration. Public services are available to both the sectors as factor of production.

There are two agents in the economy; a representative individual or household and a government. The individual has access to two productive technologies, denoted formal and informal. Both the technologies are assumed to produce a homogeneous good. This is majorly indicative of a developing economy where manufacturing goods are produced in both sectors. The formal technology uses public services and labour to produce final output,

following the Cobb-Douglas production function,

$$y_f = Ag^{(1-\alpha)}l^\alpha \quad (1)$$

In the above equation, y_f represents the output produced using formal technology. A is defined as the total factor productivity exclusive to the formal technology, l is the amount of time that the representative individual spends working in the formal sector and g is the amount of public services available to the formal technology. For the purpose of analytical simplicity, we assume there is no private capital involved in the formal production process.

Informal technology uses both public services and labour input to produce output, also following a Cobb-Douglas production function,

$$y_i = A(\delta g)^{(1-\alpha)}(1-l)^\alpha \quad (2)$$

y_i is the final output produced using informal technology. It is assumed that the tax evading informal sector is not as productive as the formal sector based on the findings of La Porta and Shleifer (La Porta and Shleifer (2014)). Based on Loayza (1996), it is assumed that the amount of public services accessible to the informal sector is lower than the formal sector. Therefore, δg is the total amount of public services used in the informal sector production, where $\delta < 1$ represents the efficiency of public services in the informal sector. This is indicative of the fact that informal sector in developing countries does not have proper access to public services like electricity, road networks and communication. Hence, as a factor of production, government expenditure is not as productive in the informal sector. Total labour supplied by the representative individual is assumed to be 1 (or any other constant) and exogenously given which implies that $(1-l)$ is the amount of time that the representative individual contributes towards the informal sector.

Formal output in the formal sector is observable and therefore taxed by the government. On the other hand, the individual can evade taxes, without incurring any cost by engaging

in the production of informal output which is not regulated. Based on above definitions, the net disposable income of the individual is defined as follows,

$$(1 - \tau)Ag^{(1-\alpha)}l^\alpha + (1 - \rho\tau)A(\delta g)^{(1-\alpha)}(1 - l)^\alpha \quad (3)$$

where τ is the tax rate in the formal sector, $\rho\tau$ is the expected tax rate in the informal sector. Formal output is taxed directly by the government whereas the informal sector gets taxed only when it is detected by the government. In equation (3), the income from the informal sector is retained with probability $(1 - \rho)$ and with probability ρ , the informal sector is caught and is taxed for evading taxes. As defined in [Ihrig and Moe \(2004\)](#), ρ is a measure of the level of tax enforcement in the model. We further define how this probability (ρ) is determined by various factors. We assume that the government incurs a cost to ensure enforcement and therefore allocates some portion of its total revenue towards tax administration. In the model, the government chooses a value for the level of enforcement such that total revenue earned is maximised.

The individual's choice involves deciding upon his allocation of labour between the formal and informal sector. For this, the individual maximises his expected income given the policy variables, tax rate (τ) and the enforcement probability (ρ) are known to him. Therefore, the problem faced by the agent is,

$$\max_{\{l\}} (1 - \tau) Ag^{(1-\alpha)}l^\alpha + (1 - \rho\tau) A(\delta g)^{(1-\alpha)}(1 - l)^\alpha$$

The optimal allocation of labour between the formal and informal sector is given by,

$$(1 - \tau) \alpha Ag^{(1-\alpha)}l^{(\alpha-1)} = (1 - \rho\tau) \alpha A(\delta g)^{(1-\alpha)}(1 - l)^{(\alpha-1)} \quad (4)$$

$$l^* = \frac{1}{\left(\frac{(\delta)^{1-\alpha}(1 - \rho\tau)}{1 - \tau}\right)^{\frac{1}{1-\alpha}} + 1} \quad (5)$$

Equation (5) states the formal sector's size or labour allocation towards formal sector is a function of the enforcement level (ρ), the tax rate (τ) and the efficiency parameter of public services in the informal sector (δ). In our model, enforcement level (ρ) is a policy variable and the other two are parameters. However, the relationship between these variables is not very direct owing to ρ , which is also determined by the government's optimization problem. It is interesting to see that if we do not take into account government's role in determining the level of enforcement and take both tax rates and enforcement levels as exogenously given policy variables, then our results of labour allocation are in accordance with that of [Ihrig and Moe \(2004\)](#). We extend this result by analysing the inclusion of government's role in determining the level of enforcement (ρ) and its consequent implications on the labour allocation.

Government: The government earns revenue from taxing the formal output and taxing the informal sector when caught evading taxes. Therefore, the total revenue that the government earns is,

$$Revenue = \tau y_f + \rho \tau y_i \tag{6}$$

We assume that the government spends its entire revenue on two expenditures: government expenditure on public services (g) and on enforcement of taxes (ρ). As mentioned earlier, the government incurs a cost to enforce taxes and the cost of tax enforcement is defined as,

$$c(\rho) = F(1 - l)\rho^2 \tag{7}$$

In the equation above, the cost of enforcement is a function of size of the informal sector, the level of enforcement and monitoring cost of tax collection (F). In simple words, in order to strengthen its enforcement the government could hire more people for auditing or set up better infrastructure, which in turn increases the cost of enforcement. Similarly, the increase in the size of the informal sector (when $(1 - l)$ increases), will make audit more difficult

costly for the government.

The government's budget is a balanced one which looks like,

$$\underbrace{g + F(1-l)\rho^2}_{\text{expenditure}} = \underbrace{\tau y_f + \rho\tau y_i}_{\text{revenue}} \quad (8)$$

In order to understand the impact of choosing the level of enforcement by the government, we analyse different objective functions of the government. We assume two functions of the government here ⁵

Case 1 *Maximisation of output: $y_f + y_i$*

$$\max_{\{\rho\}} [Ag^{(1-\alpha)}(l^*)^\alpha + A(\delta g)^{(1-\alpha)}(1-l^*)^\alpha] \quad (9)$$

s.t

$$g + F(1-l)\rho^2 = \tau y_f + \rho\tau y_i$$

where $l^ = l^*(\rho, \tau)$*

Case 2 *Maximisation of total tax collection: $\tau y_f + \tau\rho y_i$*

$$\max_{\{\rho\}} [\tau(Ag^{(1-\alpha)}(l^*)^\alpha) + \rho\tau(A(\delta g)^{(1-\alpha)}(1-l^*)^\alpha)] \quad (10)$$

s.t

$$g + F(1-l)\rho^2 = \tau y_f + \rho\tau y_i$$

where $l^ = l^*(\rho, \tau)$*

We solve the model assuming that the government wants to maximise the either of the above two cases with respect to the level of enforcement. The government determines

⁵We also tried this analysis with the government maximising the individual's expected income. In this case, the simulation results suggest a monotonic relationship between informality and level of taxation, contrary to the observations from data in section 2.

the optimal level of enforcement in the system where the level of taxation is determined exogenously and labour allocation has been decided upon by the individual. We assume exogenous tax rates because there are multiple factors that affect the determination of tax rates and our prime focus is to study how the interplay between enforcement and the level of taxation can impact the level of informality in developing nations. In the model laid out, the level of tax enforcement (ρ) is not exogenously given but is determined by the amount of tax revenue earned by the government.

A key feature of this model is that the the government revenue is spent in a productive way, such that it enters the production function of both formal and informal sectors in the form of public services or infrastructure. Along with that, the government also spends its revenue on tax enforcement. This in turn impacts the ability of the government to enforce taxes and consequently the labour allocation of the individual. We solve the above model, first, to determine the government’s optimal level of tax enforcement (ρ^*) based on equation (9) and (10). We then determine individual’s labour allocation in the formal sector (l^*) based on government’s optimal level of enforcement and taxation. In the following section, we use the theoretical model and the solution concept described to numerically analyse the behaviour of informal sector with respect to changes in taxation.

4 Numerical Analysis

In this section, we solve the model outlined in Section 3 numerically that helps in explaining the trends observed in the data from Section 2. For that purpose, we first describe the parameter values we use, and then outline the results of the numerical exercises.

For the numerical simulation of the theoretical model, we use the `scipy.optimize` package in python. We simulate the relationships modelled in the previous section using values of the parameters, relevant for a typical developing economy, as most commonly used in the literature. We use the value 0.30 for the public services share ($1 - \alpha$) in both the production

functions (Chakraborty and Dabla-Norris (2011)). As stated earlier, in developing countries, it has been observed that the informal sector has limited access to the public services and is not as productive as the formal sector. Therefore, efficiency parameter of public services, δ , is assumed to be 0.5 in accordance with La Porta and Shleifer (2014) and Amin and Okou (2020). For the purpose of viable results, we assume the value of total factor productivity (A) to be 1 and that of monitoring cost of tax collection (F) to be 0.5.

Parameter	Value	Description
$1 - \alpha$	0.3	Public services share
A	1	Total factor productivity
δ	0.5	Efficiency of public services in the informal sector
F	0.5	Monitoring cost of tax collection

Table 2: Parameters used in the model

We numerically solve the theoretical model to find optimal values of enforcement (ρ) and formal labour allocation (l) against different levels of taxation. In our theoretical model, τ represents the different measures of taxation elaborated in the Section 2 which is exogenously given in our model. For numerical results, we consider the range of taxation (τ) from 0.1 to 0.5. After determining the behaviour of enforcement (ρ) and formal labour allocation (l), we plot the behaviour of informal output in the economy with respect to different levels of taxation (τ).

Using the parameter values in Table 2, we first plot government's objective function of total output maximisation stated in equation (9) against different values of enforcement (ρ). We find that for any level of taxation ($0 < \tau < 1$), an optimum of level of enforcement (ρ^*) exists which maximises the government's objective function in equation (9). As an example, the relationship between total output and level of tax enforcement is shown in Fig. 3 for a given value of $\tau = 0.3$.

We then maximise the government's objective function as stated in equation (9) with respect to level of enforcement (ρ). With the help of numerical optimization, we plot the optimum level of tax enforcement (ρ^*) as a function of tax rate (τ). On plotting the rela-

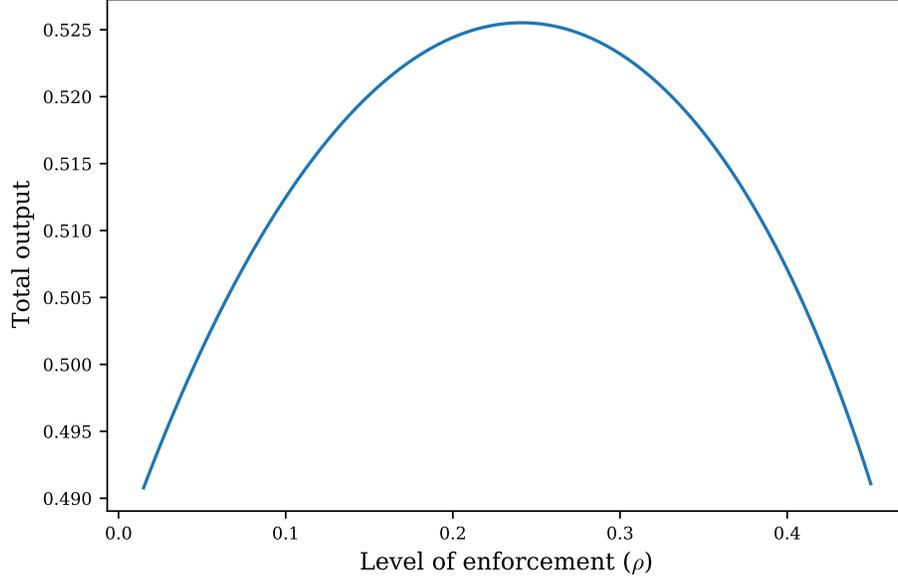


Figure 3: Total output of government with respect to tax enforcement

tionship between the two in Fig. 4, we find that optimum tax level of enforcement (ρ^*) is an increasing function of tax rate (τ). This finding is in accordance with the data trend indicated in Fig. 2 in Section 2. Intuitively, the government may need to set up a higher tax rate, in the event of higher probability of audit and enforcement, in order to maintain a certain level of government expenditure

After maximising government's objective function in equation (9) and finding the optimum values of enforcement (ρ) against different levels of taxation, we plot the individual's labour allocation as stated in equation (5) as a function of taxation (τ) in the Fig 5. We insert optimized values of tax enforcement (ρ^*) into equation (5) for every value of tax (τ) and plot the optimal formal labour allocation as seen in the Fig 5. This result is important as it shows that the formal labour allocation is not explicitly a negative function of taxation. We observe that as taxes increase from a lower level of taxation, formal labour initially contracts (owing to weaker enforcement) but begins to increase once enforcement strengthens and offsets the negative effect of increased taxation.

Using the theoretical model definitions from Section 3, we can define the informal output

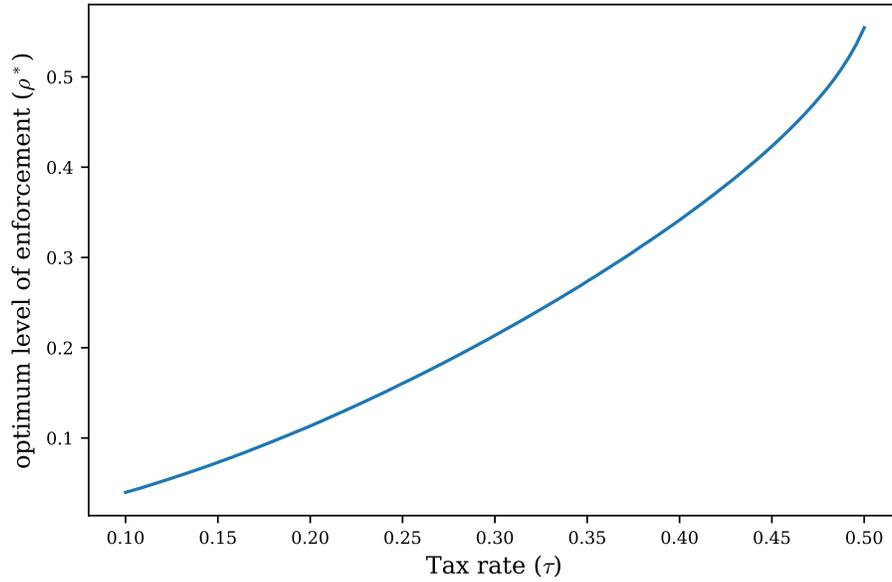


Figure 4: Optimum level of tax enforcement as a function of tax rate

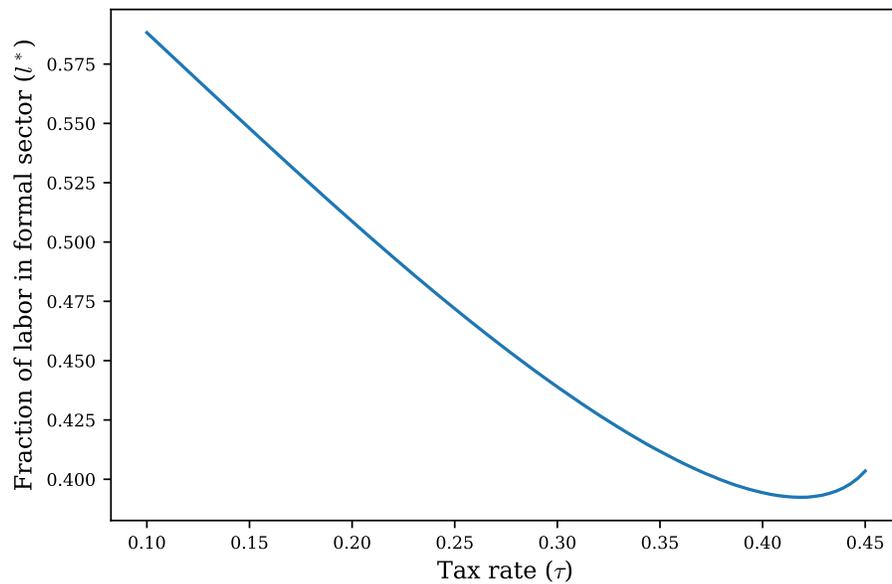


Figure 5: Formal labour allocation as a function of tax rate

in the economy as y_i/y . We plot informal output in the economy against different levels of taxation (τ) in Fig. 6. As seen in Fig. 6, the share of informal output first increases and then declines with the increase in tax rates. This result is in accordance with the non-monotonic trend observed in the data as shown in Fig. 1 provided in Section 2.

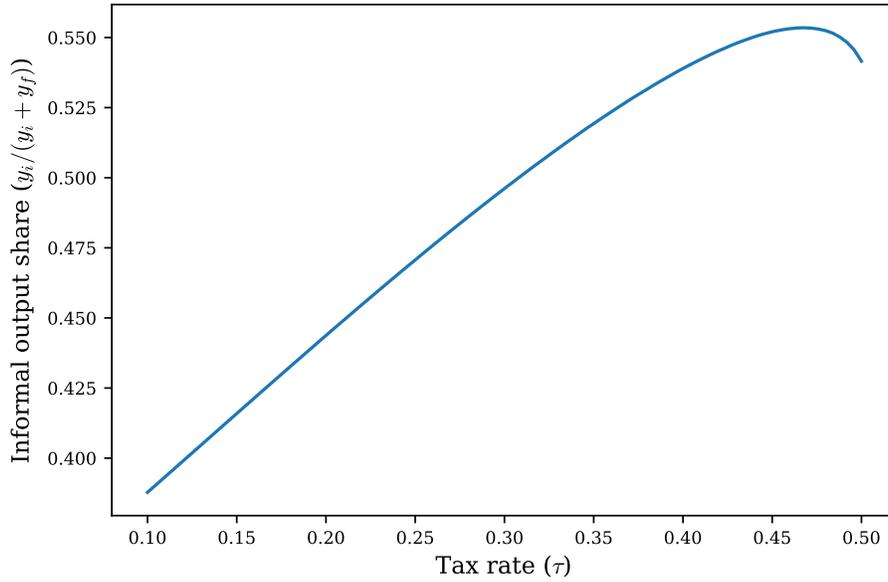


Figure 6: Share of informal output as a fraction of total output ($y_i / (y_f + y_i)$) vs. tax rate (τ). For lower levels of tax, increasing tax pulls labour away from the formal sector (Fig. 5) and thus improves production in the informal sector. However, the increase in tax improves the government’s ability to enforce taxes and detect informality as seen in Fig. 4. The continuous improvement in enforcement gradually offsets the negative effects of increased taxation and pushes labour back into the formal sector. As taxation reaches a certain point, the level of enforcement improves so much that the probability of being caught in the informal sector increases and the labour moves back to the formal sector to escape being caught causing an eventual decline in the informal output.

We repeat the above process for the **Case 2** of government’s objective function as stated in equation (10) wherein the government tries to maximise the total tax collection (or total tax revenue). We obtain the same results as explained above and these results are summarised in Fig. 7

Developing countries often have low tax revenue and high informality which often pose a serious problem in terms of raising tax rates. It is well documented that higher tax rates act as a deterrent for people to work in the formal sector and consequently increase the size of the informal sector. However, our analysis shows that this result is not strictly monotonic and highlights the importance of including the government’s strength in enforcing taxes as an important determinant in understanding the tax-informality relationship.

The mechanism underlying the non-monotonic relationship between informal output and

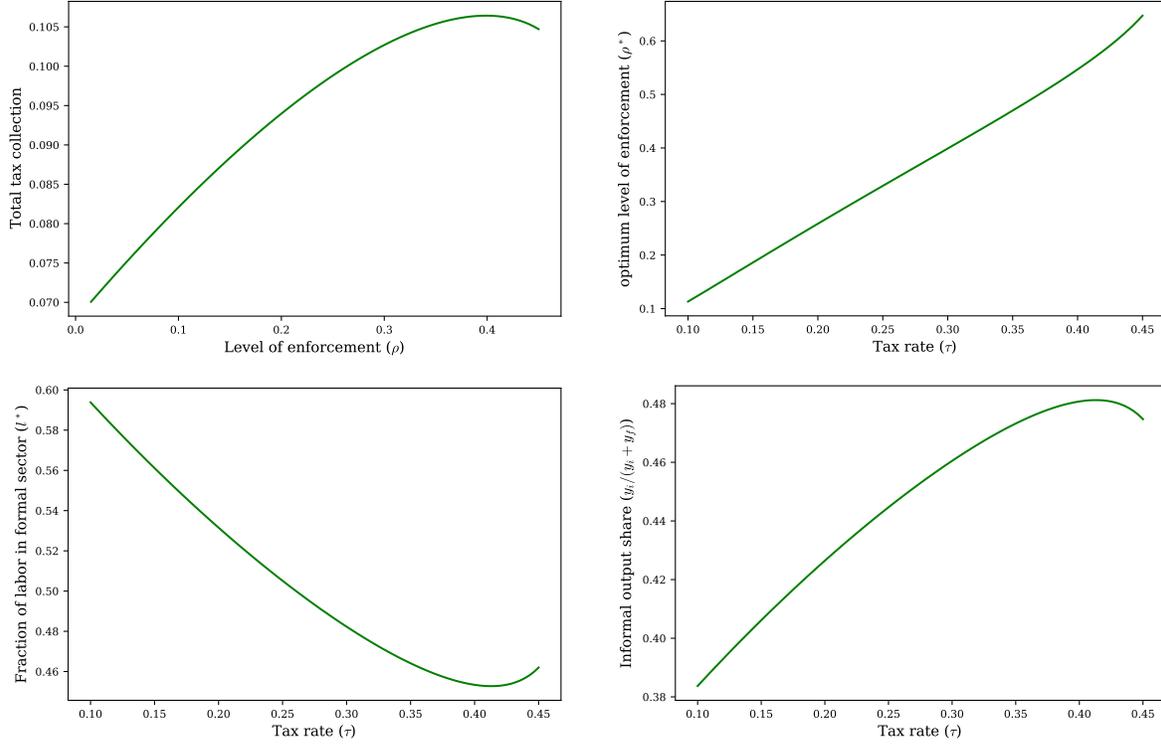


Figure 7: Results from government’s objective function of maximising tax collection

the level of taxation can be explained by the how strongly government can enforce taxes using its revenue and the consequent impact of enforcement on labour allocations in the economy. At lower levels of tax (τ), increasing taxes shrinks the labour in the formal sector (l) as observed in Figure 5 and Figure 7. This movement from formal to informal sector strengthens the informal output. The shrinkage in the formal output and consequent improvement informal output, owing to tax increase, leads to timid increase in the tax revenue. As seen in Figure 4, the optimal level of enforcement (ρ^*) improves with every increase in level of taxation (τ). Therefore, even with the contraction in formal labour (l^*), total revenue still increases because of increase in enforcement (ρ^*) as tax increases.

This increase in tax revenue strengthens the expenditure on public services (g) in turn increasing the output. Public services (g) increases as tax rate increases since portion of the government’s tax revenue is spent on it.

The continuous improvement in enforcement (ρ^*) because of increasing revenue owing to

increase in τ finally offsets the negative effects of the high tax taxation in the formal sector. At higher levels of enforcement, the informal sector begins to shrink and the labour gradually gets pulled into the formal sector. This movement is demonstrated in Figure 5. This could be explained by the fact that as level of enforcement improves, evading taxes becomes more costly because the probability of getting caught becomes high. This in turn pushes people to work in the formal sector.

As explained above, the association of enforcement and level of taxation helps us in understanding the relationship between the informal output and tax rates. As tax rates keep rising, the initial decline of the share of labour in formal sector leads to a consequent increase in the informal output. The increase in total revenue because of increase in tax rates improves the enforcement ability to an extent that it offsets the negative affect of increasing taxation on formal labour. Beyond a certain threshold of tax rate, continuous improvement in tax enforcement, causes the share of formal labour to increase and consequently the size of informal sector output to shrink.

5 Conclusion

In this paper, we analyse the relationship between the level of taxation and the size of the informal economy. The key feature of our analysis is to study how this relationship is affected when government chooses the level of enforcement based on the total revenue it earns. We base our theory on the observations gathered from data which indicates that for developing countries the relationship between taxation and the informal sector is not evidently monotonic.

We have attempted to explain this non-monotonic relationship by analysing how government tax revenue is used to incur the cost of tax enforcement. The tax enforcement ability in turn affects the labour allocation decisions and tax revenue. Our result indicate tax revenue has important implications in understanding the informality-tax dynamic as it affects the

production technologies of both formal and informal sector through public services and the enforcement ability of government.

We find that our model reproduces the relationship between informal sector and taxation consistent with the data set of developing countries we have observed. Developing countries have high informality which leads to serious issue of raising tax rates. Despite limitations of the model, our result highlights the importance of tax administration in understanding the relationship between tax rates and informality in developing countries. It is contingent upon the governing institutions of the economy. The dependence of enforcement on tax revenue is the reason for the non monotonic relationship between tax rates and the size of the informal sector. This model implies that lowering tax rate might not lead to reduction in the informal sector as there is some trade off between the effectiveness of tax enforcement. The government may need to set up a higher tax rate, in event of higher auditing probability, in order to maintain a certain level of government expenditure. In simple words, how effectively is the government spending its funds to strengthen its own institutions. By doing so, the government in developing economies can actually control informal sector as well as improve its tax revenue.

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