

Formal sector enforcement and welfare

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Abstract

Higher tax enforcement is consistently associated with lower informality in the literature whereas the evidence is mixed for other factors affecting informality. We review the literature on the effect of tax enforcement on informality and provide further evidence in the form of subsample tests of the effect of tax enforcement identified in Liu-Evans and Mitra (2019). We find Rule of Law, the most commonly used proxy for tax enforcement, has a significant and robust negative effect on informality according to the continuous treatment test due to Belloni et al.(2014). Using a stylized general equilibrium model for developing economies, with credit constrained formal and informal firms, we conduct numerical simulations to study the enforcement-welfare relationship for varying levels of enforcement costs. We show that tax-enforcement is only desirable as a policy tool for reducing informality when, contrary to evidence for developing economies in the literature, enforcement costs are very low (almost zero).

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1 Introduction

Lowering the share of informal activity has been on the policy agenda of many governments of the developing world as evidenced by the numerous formalization programs instituted by these economies. Argentina and Brazil, for example, implemented major tax simplification programs starting in 1998 and 1996 respectively (Piza, 2018 Rocha et al 2018), Indonesia set up one-stop-shops to streamline business registration and lower formal sector entry costs (Rothenberg et al, 2016) and Colombia's 2011 Action Plan, which aimed to reduce the prevalence of informal labor saw the number of labor law inspectors double over four years (Pignatti, 2020).

Studies on the determinants of the informal sector find overwhelmingly that tax enforcement (or lack thereof) is a key driver of informality in developing economies. In fact, better enforcement related institutions is viewed as the main reason why informal sectors are smaller in developed and significantly larger in developing economies (Johnson et al, 1998; Friedman, 2000; Mitra, 2017; Aruoba, 2021). In this paper, we review the literature on informality and tax enforcement, and provide our own motivating evidence based on Liu-Evans and Mitra (2019). In a general equilibrium model with a representative formal and informal firm, financial frictions and costly tax enforcement, we show that higher enforcement reduces welfare for low to moderately high enforcement costs, where welfare is measured by aggregate private consumption. We incorporate costly tax enforcement in our model, which is a key departure from existing theoretical frameworks, but in line with empirical studies that consistently report significant costs of tax enforcement in developing economies (for eg., Benhassine et al, 2018; De Andrade et al, 2016; De Mel et al 2013). We discuss these studies in detail in the next section and use their findings to motivate the cost of enforcement in our model.

Our focus is on developing and emerging market economies in this paper. This is because, firstly, large informal sectors and lower tax revenue generation are issues widely associated with these economies¹. Large scale informality is correlated with a smaller tax base and

¹The informal sector in developing economies accounts for more than 50% of non-agricultural output on average and employs 93% of the total 60% of the world's employed population working informally (ILO, 2018; Charmes, 2012; La Porta and Shleifer, 2014)

lower fiscal capacity, which is known to constrain growth in developing economies (Bessley and Persson, 2013). Secondly, recent events, like globalization and the financial and debt crisis in the West, by necessitating a lower reliance on easy-to-collect trade taxes and foreign aid respectively, have put pressure on developing country governments to step up tax collection efforts. Finally, the inclusion of the transition from informal to formal sector employment in the United Nations Sustainable Development Goals (UNSDG goal no.8), with the UN calling for policymakers' "urgent attention" to this end (UNSDG, 2019) has added further to this pressure. Against this background, the question of whether or not tax enforcement is a suitable tool for shrinking informality, and increasing tax revenue, is an important one for developing economies.

We model tax enforcement along the lines of Allingham and Sandmo (1972), as the probability of being audited by a tax authority and any associated fines or penalties payable if found evading. We update this framework by allowing a fraction of the tax revenue generated by enforcement to be spent on enforcement related activities. Although widely used in the literature to study informality and tax evasion, as Kleven et al (2016) point out, the benchmark Allingham-Sandmo framework is not suited to studying enforcement in developed economies. This is because tax enforcement is excellent in developed nations not because of higher audit rates but because of widespread third party information reporting (see also Slemrod, 2019). Thus Allingham-Sandmo generates a key puzzle when applied to developed countries - why are tax compliance rates so high in developed economies while audit rates and penalties for tax evasion are so low on average?².

Kuhn (2014) emphasizes another key distinction when modeling informality in developed versus developing economies. She argues that in the former informality largely takes the form of tax evasion by registered firms while in the latter informal firms operate separately from the formal sector. In her model, aimed at studying developed economies, informal firms do not arise separately from the formal sector but constitutes formal firms hiding a part of their output.

²Even value added taxes, which are easier to enforce (than income or retail taxes), and widely adopted by developing economies in recent decades, work better when there is extensive record-keeping by firms (see Pomeranz, 2015). According to Ebrill et al (2001) no developing country with few large businesses can successfully implement a broad VAT.

We model informal firms as firms that are distinct from the formal sector in that they do not report any of their output or income to the authorities for the explicit purpose of avoiding tax payment. Informal firms also differ from the formal sector because they are less productive, operate a different technology and face more stringent financial constraints. We discuss these assumptions in more detail later (in Section 3). An increase in tax enforcement, in this model, lowers informal activity causing consumption associated with informal entrepreneurs to drop. In the absence of any cost of enforcing, the fall in informal sector consumption is offset by a rise in household consumption as lump sum transfers to households increase with the additional tax revenue generated from higher enforcement. In the presence of costly enforcement, however, the net increase in tax revenue and the associated transfer to households, is lower. Numerical simulations show that the fall in informal sector consumption exceeds the rise in household consumption under low to moderate enforcement costs, generating a welfare loss with rising enforcement.

Only two other papers, to our knowledge, have studied the welfare effects of higher tax enforcement, with contrasting results. Ulyssea (2018) finds tax enforcement causes a significant decrease in informality through a decline in the number of informal firms. The resulting increase in the number of formalizing firms in their model leads to an increase in inefficient entry and regulation costs associated with the formal sector. These costs are larger than the increase in tax revenue from higher enforcement in their model reducing welfare measured by aggregate private consumption. Meghir et al (2015) find, in contrast, welfare is increasing in the level of enforcement. This is because increasing enforcement increases coverage of costly regulations as in Ulyssea (they do not however consider a cost of entry like Ulyssea (2018)), but the reallocation of workers from less to more productive firms which increases productivity and output has the dominant effect on welfare. We contribute to this literature by considering the role of costly tax enforcement in a set-up with formal and informal firms and financial frictions.

The rest of the paper is organized as follows: Section 2 reviews the literature and presents some motivating evidence, Section 3, lays out our model, Section 4 includes the quantitative analysis of rising enforcement on welfare, and Section 5 concludes.

2 Literature and motivation

2.1 Cost of enforcement

In this paper we assume tax enforcement to be costly which is an important departure from the existing theoretical literature. Studies show that the cost of enforcement is significant, especially in developing economies, where effective tax enforcement requires a combination of: increased visits by tax inspectors, higher amount of time spent per visit, more number of required personnel, greater training and better infrastructure for audit inspectors, higher pay to make tax officers less susceptible to bribes etc.,.

Benhassine et al (2018), for example, in a randomized control experiment in Benin, found that simply providing information on the benefits of formality in the form of leaflets and a verbal explanation had no impact on informality. Instead, when tax inspectors physically visited informal firms and provided information as well as training, help with opening bank accounts of those who registered, and tax mediation services, there was an increase in formalization by 9.6 - 16.3 percentage points. The larger the number of services offered by the tax inspectors the higher was the rate of formalization. The authors reported however, that this formalization did not bring firms higher sales or profits, and the associated costs exceeded the added taxation these firms will pay over the next decade.

Similarly, De Mel et al (2013) found providing information about the registration process and reimbursing the direct costs are not enough to increase formal sector registration in Sri Lanka. Payments equivalent to one-half to one month (alternatively, two months) of the median firm's profits leads to registration of around one-fifth (alternatively, one-half) of firms.

In Belo Horizonte, Brazil, De Andrade et al (2016) tested which government actions work to encourage informal firms to register. They once again found zero or negative impacts of information and free cost treatments and a significant but small increase in formalization from inspections. The local average treatment effect estimates of the inspection impact were larger, providing a 21 to 27 percentage point increase in the likelihood of formalizing. The authors argue, firms in developing economies do not register unless forced to do so,

suggesting that formality offers little private benefit to these firms.

This last fact is borne out by the results of formalization programs across developing economies that aim to lower the registration or entry costs for businesses. Rothenburg et al, (2016) evaluating the impact of Indonesia's one-stop-shops for business registration - a large-scale program that attempted to reduce registration costs - find that the program had no effect on firms informality rates, nor did it reduce the probability that workers were informally employed. Galian et al. (2017) find that substantial reductions in the fixed costs of operating formally are not effective in formalization choices in Bogota, Colombia as such reductions had no lasting effect on formalization decisions. Using panel data from the Mexican employment survey, Bruhn (2011) studies the effect of a business registration reform in Mexico. She finds that the reform increased the number of registered businesses by 5 percent in eligible industries. However, the increase was due to former wage earners opening businesses and not due to former unregistered business owners registering after the reform. Rocha et al (2018) show that going a step further, by reducing taxes after all registration costs have been removed, reduces firm informality through the formalization of existing informal firms. The authors exploit firm-level administrative and individual panel data to study a large-scale formalization program in Brazil called the Individual Micro-Entrepreneur Program. However, they report a low implied formalization elasticity and through a cost-benefit analysis, identify that the program led to net losses in tax revenues.

Thus, while better welfare benefits, financial incentives for setting up a firm etc., make individuals in developed economies more likely to register as employees, unemployed, or entrepreneurs, these incentives are largely absent in developing economies (Ault and Spicer, 2020), increasing the burden and cost of enforcement. We explore this important role of institutions in understanding the link between informality and tax enforcement further below.

2.2 Informality and tax enforcement

Starting with the seminal work of Allingham and Sandmo (1972) the effect of tax enforcement on informality is well established in the theoretical literature. They show that a higher probability of audit and associated penalties lower the incentive to act informally (see Ihrig and Moe, 2001; Prado 2011; Leal-Ordonez, 2014; Mitra, 2017 - for more recent studies). In this section we focus on the empirical evidence in the literature regarding the effect of tax enforcement on informality, and conduct our own empirical exercise in the form of robustness analyses of related findings of Liu-Evans and Mitra (2019). While we discuss other factors affecting informality briefly as it relates to the enforcement-informality relationship, we do not review the vast literature on the determinants of informality in general (see Ulyssea (2020) for a recent comprehensive review on the subject).

The variable most commonly associated with tax enforcement in empirical studies of the informal sector is Rule of Law, or the quality of legal institutions within a country. In this section we use the terms Rule of Law, or the quality of legal institutions, and tax enforcement interchangeably. This is not only because the quality of legal enforcement captures the likelihood of detecting informal activity (Dabla-Norris et al, 2008) but also because, as Tyler (2006) argues, citizens are more likely to be law-abiding if they view legal authorities as legitimate, and the degree of legitimacy may itself be a function of the level of enforcement. When explicit enforcement is weak (e.g., few audits), legitimacy may erode, undermining the intrinsic willingness of taxpayers to comply with the law.

For example, Johnson et al (2000) find that across five transition economies less faith in the legal system is associated with larger informal sectors. Similarly, Friedman et al (2000) find that a weaker legal system is associated with higher informality in their study spanning sixty nine developed and developing economies. Both papers also find important roles for bureaucracy and corruption in driving informality. They however report contrasting results on the effect of taxes. While Johnson et al (2000) associate higher tax rates with greater informality Friedman et al (2000) find no relation, or in some cases, the opposite effect. The importance of taxes disappear however, when per

capita income - a measure of the level of development - is controlled for in Friedman et al (2000). The authors conclude that better tax administration in more developed economies, and not higher tax rates, causes informal sectors to be smaller. In a similar vein, Aruoba (2010) and Mitra (2017) argue that rule of law plays an important role in determining how taxes affect informality.

Financial constraints, or some measure of financial development, is often considered an important driver of informality across countries. This is due to the fact that informal firms cannot borrow against their output or assets since these are 'hidden', and are therefore more financially constrained than their formal counterparts. When the financial system is more developed, the incentive to become formal in order to take advantage of higher borrowing, is greater, which lowers the share of informal activity. Straub (2005), Quintin (2008) and Blackburn et al (2012) establish this idea theoretically while Antunes and Cavalcanti (2007) and D'Erasmus and Boedo (2012) explore the effects of financial development quantitatively for different country and regional groups. The last two papers however, do not explicitly take tax enforcement into consideration.

Dabla-Norris et al (2008) consider the role financial constraints, in addition to the quality of legal framework (or tax enforcement), taxes and regulations. They employ the World Bank Environment Survey, with responses from 4000 firms across 41 developed and developing economies, and find that the quality of legal framework is crucially important in determining the size of the informal sector, whereas the importance of taxes, regulations, and financial constraints is reduced in the context of a well functioning legal system. Capasso and Jappelli (2013) use regional Italian microeconomic data and judicial efficiency as their measure of quality of legal framework. They find that both local financial development and judicial efficiency are important determinants of underground activity.

Liu-Evans and Mitra (2019) explore the importance of the financial sector for informality further by including a measure of bank stability in addition to financial development. They argue that a stable banking system, by bolstering faith in banks makes firms more willing to register their business in order to access formal banking services. The authors find that bank stability only matters at higher levels of financial development but find

a highly significant negative effect of rule of law, on informal sector size, across all sub-samples. Further, their measure of the rule of law is selected across all sub-samples and specifications, via a relatively robust Lasso methodology appearing in Belloni et al. (2014), as a key predictor of informality.

The study by Liu-Evans and Mitra (2019) is unique because they consider a large number of institutional variables in addition to (the previously studied) financial development, taxes and the rule of law. Following on from the discussion on the importance of institutions in the previous subsection, most of the papers discussed in this paper so far emphasize quality of institutions as an important determinant of informality (Johnson et al, 2000; Friedman et al, 2000; D’Erasmus and Boedo, 2012; Dabla-Norris et al, 2008; Capasso and Jappelli, 2013; Ault and Spicer, 2020; Aruoba, 2021). In addition to rule of law, these papers assign important roles to regulatory quality, bureaucracy, corruption, quality of public and civic services, quality of the financial system and political stability³.

Against this background Liu-Evans and Mitra (2019) consider 15 institutional variables (other than the Rule of Law), capturing a wide range of perceptions, from the extent to which a countrys citizens are able to participate in selecting their government, to the likelihood that the government will be destabilized, the quality of public services provided, the ability of the government to formulate and implement sound policies and regulations and perceptions of corruption. Their study also includes measures for a range of economic and political freedoms such as freedom of expression, freedom of association, a free media, and freedoms associated with trade, business, investment and finance. We find this to be quite convincing evidence of the all-important role of rule of law, or the enforcement institutions of a country in driving informal economic activity. In the rest of this section, we provide some results from further sub-sample tests of the rule of law effect identified by Liu-Evans and Mitra (2019), using the same data set and methodology as these authors.

As in Liu-Evans and Mitra (2019), we use the Rule of Law index from the World Governance Indicators (WGI) of the World Bank to represent the level and quality of tax

³See Elgin (2015) and Ault and Spicer; (2020â,b) for the direct and indirect influence of political stability in driving informality.

enforcement within nations. According to the WGI data base, Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.⁴ The full list of institutional variables in Liu-Evans and Mitra (2019) includes five other WGI indices and ten measures of Economic Freedom from the Heritage Foundation. The five WGI indices are *Voice and Accountability*, *Political Stability and Absence of Violence*, *Government Effectiveness*, *Regulatory Quality*, *Rule of Law*, *Control of Corruption*. The ten Economic Freedom considered are, *Property Rights*, *Freedom from Corruption*, *Government Spending*, *Business Freedom*, *Labor Freedom*, *Monetary Freedom*, *Trade Freedom*, *Investment Freedom*, *Financial freedom*, and *Fiscal Freedom* (see the online appendix for a definition of each of these variables).

Estimates of informal sector output share in GDP are from Schneider et al (2010). The macroeconomic controls are sourced from the World Development Indicators data set at the World Bank. These are *tax rate* (total tax revenue as a % of GDP), *unemployment*, *inflation* (CPI), the *real interest rate*, and *GDP per capita*. The two financial system variables, *bank stability* (aggregate bank Z-score) and *FD* (Domestic Credit to the Private Sector as a % of GDP), were taken from the Global Financial Development Database (GFDD) provided by the World Bank⁵. The ratio of tax revenue to GDP from the World Development Indicators is the measure of tax rate used as it is available for the largest number of countries in the data set.

We also include the various interaction terms from Liu-Evans and Mitra (2019) since theory and evidence both point to the existence of dependencies between the effects of various institutional variables and financial development, tax rate and enforcement (as measured by Rule of Law). For example, a firm’s decision to operate formally or informally is shaped by the interaction between the cost of entry into formality and the

⁴The documentation is available at <https://info.worldbank.org/governance/wgi/Home/Documents>

⁵Bank Z-score, a Global Financial Development Database (GFDD) indicator provided by the World Bank is used in the literature as a measure of banking sector distance to default. It compares the buffer of a countrys banking system (capitalization and returns) with the volatility of those returns”, and is computed as $(ROA + (Equity/Assets))/sd(ROA)$, where ROA (Return on Assets), Equity, and Assets are aggregates of individual bank data (Liu-Evans and Mitra, 2019).

relative efficiency of formal versus informal credit mechanisms, and their related institutional arrangements (see for example, Straub (2005) and Capasso and Japelli (2013)). This is captured by the interactions between the various institutional variables and financial development in our study. Secondly, interactions between institutional variables and the tax rate follow the extant theoretical and empirical literature (Dabla-Norris and Gradstein, 2008; Aruoba, 2010; Elgin, 2015 and Mitra 2017) that finds the effect taxes have on informality is influenced by the level of enforcement and other institutional variables. Finally, an interaction between the tax rate and financial development helps to account for the fact that the effect of taxes on informal activity may depend on the level of financial development of an economy. More specifically, studies postulate that firms may avoid tax payments by shifting completely to cash transactions rather than use the financial system and this incentive, and therefore informal activity, is more pronounced in countries where the financial system is less well developed (Gordon and Li, 2009).

The set of possible control variables and suggested interaction terms sums to 56 variables in total and the observations are for subsamples of 84 countries (by income level, level of financial development, or random), using three-year average values over 2005-7. The lengths of the informality series and institutions series are relatively short, therefore as in Liu-Evans and Mitra we use the average values over the three year period where all of the variables are available. The authors performed a number of robustness checks and further explain in the paper that although a single-year panel approach was an option this would be subject to the concerns raised in Beck and Levine (2004) over possible business cycle movements. They state moreover, that by using country averages (instead of a single year panel), some of the unsystematic error in the index values may also be mitigated.

We use the continuous treatment test due to Belloni et al. (2014) as in Liu-Evans and Mitra (2019). This is especially suitable for this study given the large number of variables, since it uses a heteroskedasticity-robust version of the Lasso, called the rigorous Lasso in Chernozhukov et al. (2016), to select appropriate sets of control variables from a larger set.

The following model is considered for the informal sector size:

$$\begin{aligned} inform_i = & \alpha_0 Rule\ of\ Law_i + \gamma_1' other\ institutions_i + \gamma_2' financial\ system_i \\ & + \gamma_3' macroeconomic_i + \gamma_4' interactions_i + \varepsilon_i \end{aligned} \quad (1)$$

where i is the country index. The term $other\ institutions_i$ is a vector of the 15 measures above, while $financial\ system_i$ is a vector with two entries: $bank\ stability$ and FD . The macroeconomic controls, including $tax\ rate$, are collected in $macroeconomic_i$, while $interactions_i$ is comprised of interactions of $Rule\ of\ Law_i$, and $other\ institutions_i$ with $tax\ rate$ and with FD , and of the interaction of $tax\ rate$ with FD .

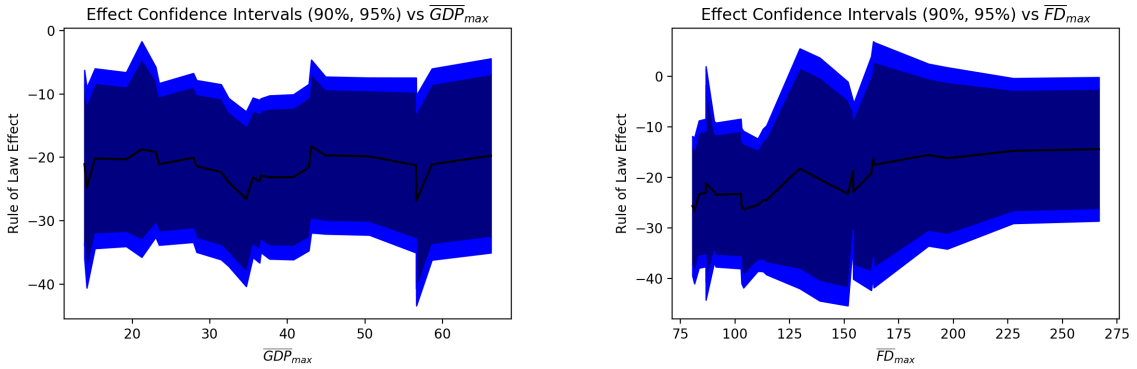


Figure 1: Rule of Law effect by GDP and FD (rolling windows). Left panel: Rule of Law effects and confidence intervals for a rolling window of 60 countries after ordering the countries by GDP, with \overline{GDP}_{max} being the maximum GDP in a given window. Right panel: the same, but ordering by FD, with \overline{FD}_{max} being the maximum FD in a given window

The Rule of Law effect emerges clearly in Figures 1 and 2. The effect is negative throughout, and samples of countries with an insignificant effect are rare. Figure 1 illustrates the estimated effect of Rule of Law on informal sector size for rolling windows of 60 countries ordered by GDP per capita (left) and by FD (right) along with confidence intervals. The effect is negative and, in all but a few windows, significant at the 5% level. The results show that the Rule of Law effect is robust to country income level, and the results provide further support for the robustness of the Rule of Law effect at different levels of FD. Liu-Evans and Mitra (2019) found the effect to be significant using the whole sample but

also for countries with values for the FD measure below 100% and below 75%. Figure 2 illustrates the estimated effect and significance in random subsamples of countries - for the vast majority of subsamples the effect is found to be significant at the 5% level, and it is always estimated to be negative.

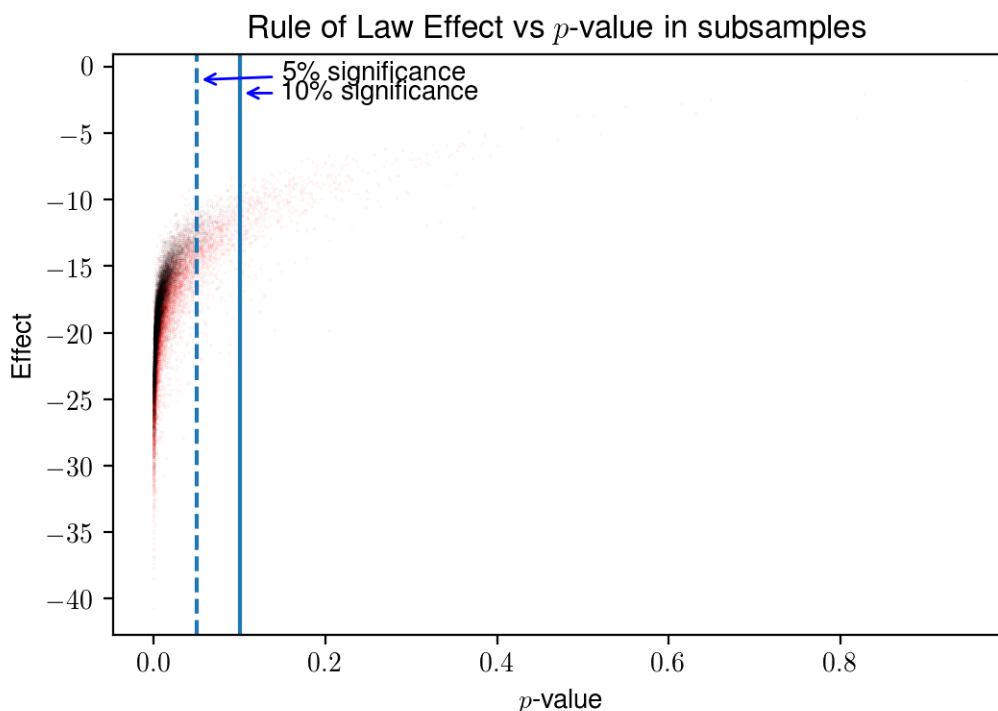


Figure 2: Rule of Law effect in random subsamples of countries. Rule of Law effects and test p -values for 10,000 randomly chosen groups of 70 countries (black dots) and 60 countries (red dots).

3 Model with costly tax enforcement

We study a theoretical framework with formal and informal firms and financial frictions, to understand the welfare effects of tax enforcement when enforcement is costly. We assume the economy is composed of entrepreneurs and households both of whom maximize their discounted lifetime utility from consumption. The main difference between the two is that the entrepreneurs own production technology while the household does not. Entrepreneurs hire labor from households and combine it with technology to competitively produce a homogenous consumption good. Households, aside from supplying labor to

entrepreneurs in exchange for a competitive wage, also lend to them. As in Ulyssea (2018) and Prado (2011), aggregate private consumption is our measure of economic welfare⁶.

3.1 Firms

Entrepreneurs maximize consumption over their lifetime as follows,

$$\text{Max} \sum_{t=0}^{\infty} \gamma^t \ln c_{i,t},$$

where $i = 1, 2$ stands for formal and informal entrepreneurs respectively. c is their consumption in period t and γ is the rate at which the entrepreneurs discount the future.

As in Koreshkova (2006), the formal entrepreneur operates a constant-returns-to-scale technology, $y_{1,t+1} = A_{1,t}(l_{1,t})$, while the informal business is subject to decreasing returns to scale, or $y_{2,t+1} = A_{2,t}(l_{2,t})^\alpha$. The difference in formal and informal technology reflects the fact that informal entrepreneurs face limits in operating their business. This is corroborated by the empirical results of Taymaz (2009) and the work of Amin and Islam (2015) who list a number of reasons why the cost of informal operations increase as they grow in size. The reasons range from being targeted by corrupt government officials to being more susceptible to crimes, and the fact that being outside the purview of legal protection of the state these firms may have to devote resources to protect property rights and enforce agreements etc. All of these factors are among reasons why an informal firm in a developing economy is unable to enjoy the benefits of scale economies.

y_i and l_i are output and labor in each sector respectively and α is labor's share in income. We assume for simplicity that no capital is used in production. $A_{i,t}$ is the productivity of the firm at date t and given the well documented fact that the informal sector is (much) less productive on average than their formal counterpart (see for example Gerxhani (2004)

⁶See Deaton and Zaidi (2002) for an account on the suitability of aggregate private consumption as a measure of economic welfare.

and La Porta and Shleifer (2008)), I assume $A_{2,t}/A_{1,t} < 1$. It is important to note here that while the *average* productivity difference between formal and informal firms is large, studies have found, within sectors for Brazil and Colombia for example, that those productivity gaps are much smaller than differences between the most productive and the least productive formal firms (Meghir, 2015; Ulyssea, 2018). We discuss later some specific reasons for why such a productivity difference between formal and informal firms may arise.

Labor hired in period t produces output in period $t + 1$ indicating that there is a working capital constraint in production. In other words, labor which is the working capital of the entrepreneurs, needs to be hired and paid for today for output that will only be available tomorrow. This is a common feature of production in developing economies where part or all of the input cost has to be paid for before production can be completed (Neumeyer and Perri, 2005 and Li, 2011). The need to finance the wage bill today creates a need for borrowing. This feature is similar to Aoki, Benigno and Kiyotaki (2010) and Aoki and Nikolov (2015). Following these authors, we allow for limited commitment in credit markets, which implies agents will only honour their promises if it is in their interest to do so. In other words, we assume that a fraction of the output generated by entrepreneurs can be seized by creditors, households in this case, in the event of non-repayment by entrepreneurs. Since creditors already know how much they can plausibly recover in the event of a default, they do not go above this limit when lending in the first place. Hence the collateral constraint takes the form,

$$R_t b_{1,t} \leq \theta y_{1,t}, \tag{2}$$

where R_t is the gross interest rate, $b_{1,t}$ is the amount of borrowing by the formal entrepreneurs and θ is the fraction of their income up to which they can borrow. θ represents the fraction of the entrepreneurs' income the creditors can recover in case of a default and it can be plausibly thought of as depending on factors like intermediation costs, debt enforcement, availability of credit market instruments and the quality of financial markets and institutions in the economy. In other words, θ is a measure of the

level of financial development and a higher θ implies more developed domestic financial institutions and therefore higher possible borrowing by formal entrepreneurs.

Since borrowing occurs against taxable income and informal firms, by definition, hide their output in order to evade taxes, it implies that the informal sector cannot participate in formal credit markets. We therefore assume the following borrowing constraint for the informal sector,

$$R_t b_{2,t} \leq 0. \tag{3}$$

This discrepancy in borrowing constraints between formal and informal firms has been documented by both micro and macro studies in economics. La Porta and Shleifer (2008) report that in less developed economies, both formal and informal firms perceive a lack of access to finance as an obstacle, but it is a much greater problem for the informal sector. They find that roughly 75.1% of the unregistered informal firms have never had a commercial loan, financing instead 74.9% of investment with internal funds and 10.5% with help from the family. Kenyon (2008) finds that firms that are evading taxes are less likely to undergo an independent audit and are more likely to be asked for informal payments by the tax authorities. As a consequence of the former, they may also be less likely to participate in modern capital markets. We therefore assume that the formal and informal sectors face heterogeneous borrowing constraints. We show later that the borrowing constraints for both formal and informal entrepreneurs are binding in equilibrium, such that $R_t b_{1,t} = \theta y_{1,t}$ and $R_t b_{2,t} = 0$.

Given the definition of informality in Section 1, output in the formal sector is taxed while that in the informal sector is not, implying the following budget constraints for the entrepreneurs,

$$c_{1,t} + w_t l_{1,t} = (1 - \tau)y_{1,t} + b_{1,t} - R_t b_{1,t-1}, \quad (4)$$

$$c_{2,t} + w_t l_{2,t} = (1 - p\tau)y_{2,t} + b_{2,t} - R_t b_{2,t-1}. \quad (5)$$

In both equations, consumption and wage bill on the left is financed by expected after tax income on the right. p is our measure of enforcement - it is the informal agent's probability of being detected. In countries with higher quality of enforcement, that is a better system of audits and fines, p is higher. When caught, if the agent only pays the tax evaded on output at the rate of τ , the value of $p\tau$ ranges from 0 to τ . Alternatively, the informal entrepreneur may be liable to pay a penalty on top of the tax payment. If this penalty is a percent of its output, then the value of $p\tau$ incorporates both the tax rate faced by the formal sector, τ , and the penalty. In this case $p\tau$ can end up being larger than the tax paid by the formal sector.

w_t is the real wage, which we assume is equalized across sectors. Thus we do not distinguish between formal and informal labor in light of the lack of strong evidence that such labor market segmentation exists in developing economies(cite). In developing nations, formal workers tend to be more experienced, more educated, and earn more than informal workers. These facts, Amaral and Quintin (2006) argue, are often interpreted as evidence that low-skill workers face barriers to entry into the formal sector. Informal firms in developing economies, however, are more unskilled-labor intensive while formal firms are more capital intensive. Moreover, these firms compete with each other, often directly, for the low technology products that the average developing economy specializes in. The large supply of low and unskilled labor, which acts as a substitute for physical capital in producing the same goods, drive down the wage in these economies. For example, soap is produced both formally by multinational corporations using capital intensive methods, and informally by small local producers relying on unskilled labor. Thus more productive formal sector labor competes with less productive informal sector labor in the same product segments with the difference in productivity and wages arising from a

larger concentration of physical capital and unskilled labor in the formal and informal sector respectively.

The first order conditions (f.o.c.) of the entrepreneurs with respect to labor and borrowing are as follows,

$$w_t \frac{1}{c_{1,t}} = E_t \left(\gamma \frac{1}{c_{1,t+1}} (1 - \tau) + \lambda_{1,t+1} \theta \right) A_{1,t} \quad (6)$$

$$w_t \frac{1}{c_{2,t}} = E_t \left(\gamma \frac{1}{c_{2,t+1}} (1 - p\tau) \right) \alpha \frac{y_{2,t}}{l_{2,t}} \quad (7)$$

$$\frac{1}{c_{i,t}} = E_t \left[\gamma R_{t+1} \frac{1}{c_{i,t+1}} + \lambda_{i,t} R_t \right]. \quad (8)$$

Here λ_i are the Lagrange multipliers for the borrowing constraints faced by the two types of entrepreneurs. Equations (6) and (7) are the f.o.c.'s with respect to labor for the formal and informal entrepreneurs respectively. Entrepreneurs equate the marginal benefit of hiring an additional unit of labor on the right hand side to its marginal cost on the left which is the wage rate. Note that the marginal benefit of hiring one unit of labor in the formal sector is given not only by its marginal product which is $A_{1,t}$ units of additional output weighted by the marginal utility from additional consumption stemming from it next period, but also by the marginal benefit of being able to borrow more next period. The latter is denoted by the second term of the equation ($\lambda_{t+1} \theta A_{1,t}$) which gives the additional borrowing that these entrepreneurs can do next period from their additional output weighted by the lagrange multiplier. This additional term which depends on the financial development parameter θ , is missing from the labor demand equation of the informal entrepreneurs in equation (7). This makes sense, since these entrepreneurs do not participate in formal credit markets and hence their demand for labor is unaffected by the financial development parameter θ . Equation (8) is the f.o.c. with respect to borrowing for the entrepreneurs where $i = [1, 2]$ stands for formal and informal entrepreneurs respectively. These equations are used later to determine the steady state levels of borrowing by the entrepreneurs.

3.2 Households

Households do not own any production technology. They supply labor and lend to the formal sector. They derive utility from consumption and disutility from labor and solve the following problem,

$$\text{Max} \quad \sum_{t=0}^{\infty} \beta^t \left(\ln c_{3,t} - \psi \frac{l_{s,t}^{1+\frac{1}{\eta}}}{(1+\frac{1}{\eta})} \right),$$

where c_3 is household consumption, l_s is labor supplied and β is the household discount factor. ψ is a disutility parameter. Note that as is standard in the literature on collateral constraints, we assume $\beta > \gamma$ which means that entrepreneurs are more impatient than the household (Campbell and Hercowitz (2005), Iacoviello (2005), Iacoviello and Minetti (2007), Iacoviello (2008), Iacoviello and Neri (2010)). This assumption ensures that in equilibrium entrepreneurs borrow from the household and the borrowing constraint matters as shown in the next section.

Households are subject to the following flow-of-funds constraint:

$$c_{3,t} + R_t b_{3,t-1} = w_t l_{s,t} + b_{3,t} + T R_t. \quad (9)$$

They choose consumption, labor supply and loans to be made every period $(c_{3,t}, l_{s,t}, b_{3,t})$ to maximize utility subject to this constraint. Their first order conditions are given by,

$$\frac{w_t}{c_{3,t}} = l_{s,t}^{1/\eta} \quad (10)$$

$$\frac{1}{c_{3,t}} = \beta R_t E_t \frac{1}{c_{3,t+1}}, \quad (11)$$

where (10) is the total labor supplied by the households and (11) is the Euler equation of

households which states that households are indifferent between consuming 1 unit today or R_t units tomorrow, discounted at the rate β .

3.3 Government

A government collects $\tau y_{1,t}$ in revenue from the formal sector with certainty and $\tau y_{2,t}$ from the informal sector with a probability p , where p is the probability of detection by authorities, as in Allingham and Sandmo (1972), depicting the level of tax enforcement in the economy. Total revenue from enforcement is therefore $p\tau y_{2,t}$.

We assume that enforcement comes at a cost, given by, $g_{e,t} = kp\tau y_{2,t}$. In other words, the government spends a proportion $k > 0$, of tax revenue generated from enforcement, in enforcement related activities. The government also spends on goods and services produced in the economy ($g_{n,t}$) and such spending is denoted by a fraction μ of total formal output of the economy such that, $g_{n,t} = \mu y_{1,t}$, $\mu \in [0, 1]$. Remaining tax revenues are transferred back to the household. The budget constraint of the government is then given by,

$$G_t = T_t - TR_t. \quad (12)$$

Where $G_t = g_{e,t} + g_{n,t}$ and $T_t = \tau y_{1,t} + p\tau y_{2,t}$.

Market clearing requires total labor demanded by the formal and informal firms must equal total labor supplied by the household ($l_{1,t} + l_{2,t} = l_{s,t}$), total borrowing equals lending, ($b_{1,t} + b_{2,t} + b_{3,t} = 0$), and the goods market clears such that, ($c_{1,t} + c_{2,t} + c_{3,t} + g_{e,t} + g_{n,t} = y_{1,t} + y_{2,t}$).

Steady state analysis

Equation (8) at steady state can be written as,

$$1 = (\gamma + \lambda_i c_i)R, \quad (13)$$

while from equation (11),

$$R = 1/\beta. \quad (14)$$

Substituting equation (14) into (13) and solving for λ_i gives us,

$$\lambda_i = (\beta - \gamma)1/c_i > 0. \quad (15)$$

Recall λ_i is the lagrange multiplier associated with the entrepreneurs' borrowing constraints and from equation (14) this multiplier is positive implying that the borrowing constraint is binding for both entrepreneurs, that is, $R_t b_{1,t} = \theta y_{1,t}$ and $R_t b_{2,t} = 0$ in equilibrium.

Equation (15) can be substituted into the steady state versions of equations (5) and (6) to give us the steady state values of l_1 and l_2 . Their ratio then gives us the steady state informal sector size as follows.

$$l_2 = \left(\frac{\gamma(1 - p\tau)\alpha\phi}{\gamma(1 - \tau) + (\beta - \gamma)\theta} \right)^{\frac{1}{1-\alpha}}. \quad (16)$$

From equation (16), it is straightforward to see that $\frac{\delta l_2}{\delta p} < 0$. That is, a rise in enforcement, p , lowers the informal sector size, l_2 . This confirms the well-known result in the literature that higher tax enforcement reduces informality. We are however, interested in understanding how tax enforcement affects welfare, given its effectiveness in lowering

informality and hence its desirability as a policy tool in economies with large informal sectors. Writing equation (12) as,

$$\begin{aligned}
TR &= T - G, \\
&= \tau y_{1,t} + p\tau y_{2,t} - g_{e,t} - g_{n,t} \\
&= (\tau - \mu)y_1 + (1 - k)p\tau y_2,
\end{aligned} \tag{17}$$

it is clear that transfers are negatively related to enforcement costs k . As costs increase, transfers to households fall causing household consumption to rise less with enforcement. For large enough k , an increase in enforcement causes the rise in TR to be just small enough such that the resulting increase in household consumption is lower than the decrease in the informal entrepreneur's consumption, causing welfare to fall. Thus there is a critical value of k below which welfare increases and above which it decreases, as tax enforcement is raised.

Note also from equation (17) that TR is decreasing in μ , the non-enforcement related, unproductive government expenditure parameter. An implication of this is that the critical value of k is lower for higher μ . Intuitively, a larger share of tax revenues spent on unproductive government expenditures implies household transfers are smaller to begin with. Thus household consumption changes less with enforcement making changes in the informal entrepreneur's consumption play a larger role in determining the overall impact on aggregate consumption. In other words, for the same increase in enforcement, the fall in informal sector's consumption has a larger effect on welfare when μ is higher. Thus when μ is higher, the critical value of k is smaller. Next we assign values to the model's parameters guided by the literature and aggregate data from developing economies, in order to quantitatively analyze the strength of the positive and negative influences on the enforcement-welfare relationship predicted by the model. We do this for a range of enforcement costs.

4 Numerical simulations

Parametrization

In this section we assign values to the various parameters of the model guided by the literature and aggregate data on developing economies. For our tax rate measure, τ , we use total tax rate as a share of commercial profits from the World Development Indicators (WDI) database. The total tax rate measures the effective corporate income tax rates across 85 countries in 2004, as captured by a survey, conducted by World Bank researchers Djankov et al (2010), jointly with Pricewaterhouse Coopers. We use this data for our calibration of the tax rate because it is dominated by developing economies, includes all taxes imposed on "the same" standardized mid-size domestic firm and importantly, as the authors find, is highly positively correlated with informal sector size. As in Mitra (2017), we set the tax rate to $\tau = 0.4$, which is the average tax rate in this dataset, excluding countries with either financial development or tax rate above 100%.

The FD parameter in the model, θ , measured as domestic credit to private sector (% of GDP) in the WDI, is set to the average of 0.5 in our sample of developing economies studied in Section 3. We vary the values of both tax rates and FD in Section 5.2 for a sensitivity analyses.

Recall from section 4.3 the cost of enforcement, k , is the proportion of tax revenues spent on enforcement related activities by the government. In the study by Benhassine et al (2017) discussed in Section 1, the cost of increasing enforcement exceeded the increase in tax revenue generated implying a value of $k > 1$. Prado (2011) on the other hand assumes $k = 1$, which implies all revenue earned via tax enforcement is used up in the process of enforcing. Since the purpose of this paper is to understand how the enforcement-welfare relationship is affected by enforcement costs, we assume a range of values for k in the next section. More specifically, we assume $k = \{0, 0.5, 1, 1.25\}$ reflecting the cases when enforcement costs 0%, 50%, 100% and 125% of the additional tax revenue generated from higher enforcement.

The government expenditure parameter, μ , as discussed earlier is important for how en-

enforcement costs affect the enforcement-welfare relationship. To calibrate this parameter, for the same set of countries used to parametrize tax rate above, we use the general government final consumption expenditure (% of GDP), from the WDI database. This value ranges from 5% in Bangladesh to 20% in Brazil and South Africa - all high informality economies (30-40% informal output share) according to Schneider et al (2010, Table 3.3.5, pp 25). Given the importance of μ in our results and its variation in the data for developing countries, we once again consider a range of values for μ given by, $\mu = \{0, 0.1, 0.2\}$.

The rest of the parameters' values are borrowed from the literature. We set the household discount factor to $\beta = 0.94$, corresponding to an annual interest rate of 6% in developing economies (similar to Chatterjee and Turnovsky, 2018; Ozbilgin, 2010; Aguiar and Gopinath, 2007). As noted in Chatterjee and Turnovsky (2018) the value of the discount factor for developing economies tend to be slightly higher than that used in macro-growth literature to reflect the relative impatience of households in these economies as well as higher mortality rates which end up raising the rate of time preference. The entrepreneurs' discount factor is set to $\gamma = 0.80$, such that $\gamma < \beta$ which guarantees the impatience motive of the entrepreneurs relative to the households in the economy and makes the borrowing constraints bind.

η , the Frisch elasticity of labor supply, is set to a standard value of 2 (Cho and Cooley, 1994, 1995) while ψ , the disutility parameter associated with household labor supply, is set to 1 which ensures, as is standard practice in the parametrization of macroeconomic models, that the household spends a third of their time working (or, $l_s = 0.3$). The elasticity of labor in informal production, α is set to 0.68, in line with Koreshkova (2006) and Turnovsky and Basher (2009). Let $A_2/A_1 = \phi$, $\phi < 1$. Assuming the productivity of the formal sector as numeraire, we set $\phi = 0.48$, consistent with the evidence in La Porta and Shleifer (2008).

4.1 Results

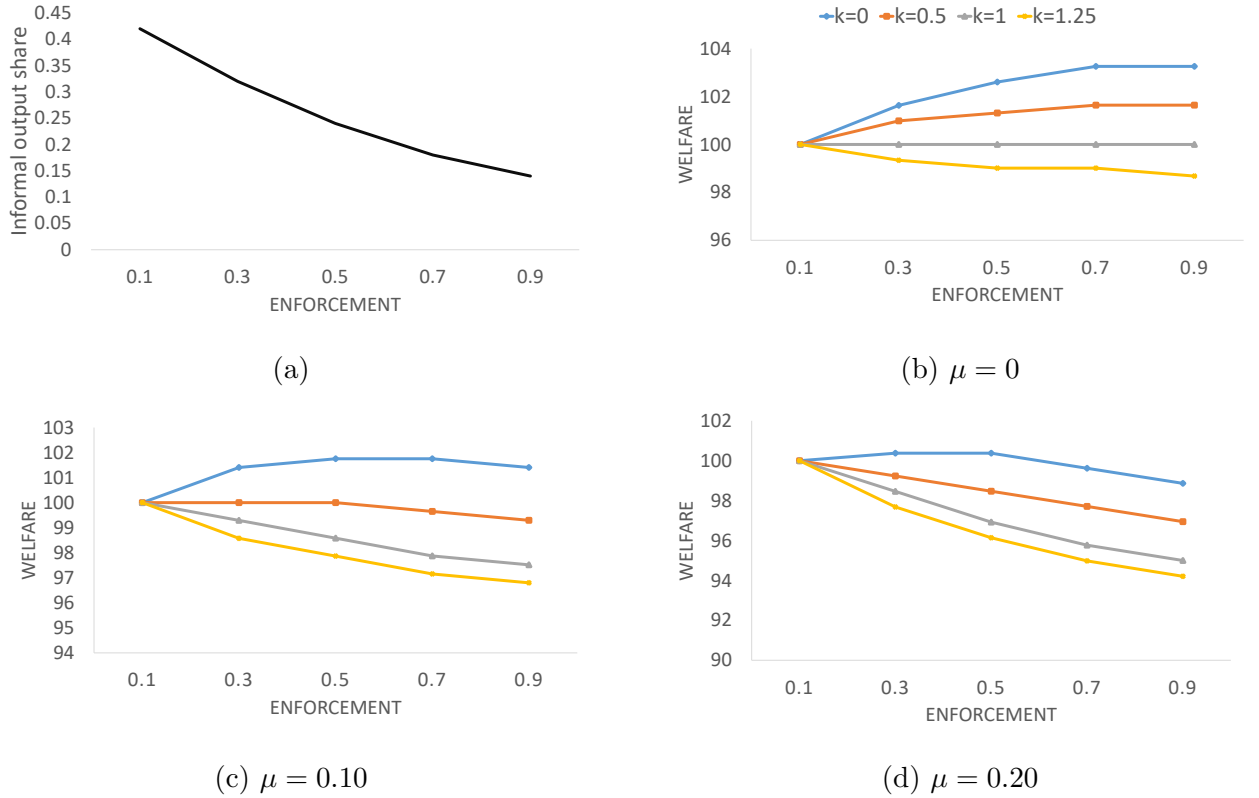


Figure 3: Response of informality and welfare (indexed) to enforcement changes for different enforcement costs (k) and unproductive government expenditures (μ). Informality is defined as the ratio of informal to formal output (y_2/y_1).

As predicted by equation (16), informality falls with enforcement in panel (a) of Figure 3. It decreases from 42% at $p = 0.1$ to 14% at $p = 0.9$, a 67% drop. While this drop in the informal sector size is unaffected by changes in enforcement costs (k) or government expenditures (μ), from panels (b) to (d), it is clear that the effect of enforcement on welfare varies with changes in k and μ . For ease of comparison of the slopes (that is *changes* in welfare with enforcement), we index all curves in panels b-d such that their initial values are always 100. In other words, steeper slopes imply larger changes in welfare.

When $\mu = 0$, there is no unproductive expenditure and enforcement is welfare-increasing for all $k < 1$ in panel (b). At $k = 1$ welfare is unaffected by enforcement changes and at $k = 1.25$, welfare falls with enforcement. Thus, absent any non-enforcement related unproductive government spending, enforcement is welfare-reducing when enforcement

costs are significantly high, that is, when costs exceed the tax revenues generated from the enforcement increase. Specifically, as enforcement (p) rises from 0.1 to 0.9, welfare rises by 3.3% when $k = 0$, by 1.6% when $k = 0.5$, remains unchanged at $k = 1$ and falls by 1.3% when $k = 1.25$.

For $\mu = 0.1$, in panel c, enforcement is welfare-reducing for all non-zero values of k considered. In other words, for the same increase in enforcement as above, welfare increases by 1.4% at $k = 0$, falls by 1% when $k = 0.5$, falls by 2.5% when $k = 1$ and falls by 3.2% when $k = 1.25$.

Finally, at $\mu = 0.2$, enforcement is welfare-reducing even when $k = 0$. Specifically, in this case, for the same increase in p , welfare falls by 1% when $k = 0$, falls by 3.1% when $k = 0.5$, falls by 5% at $k = 1$ and falls by 5.8% when $k = 1.25$. Thus welfare losses stemming from raising enforcement is large in economies with significant inefficiencies in government spending and positive enforcement costs serve to multiply the effect. That is, when μ is large, then even with costless enforcement, the share of additional tax revenues generated by higher enforcement, that is transferred to households, is too low to increase household consumption enough to offset the fall in informal sector consumption. In this case, an increase in enforcement reduces welfare even if it costs little or nothing to do so.

p	$k = 0$				$k = 0.5$				$k = 1$			
	0.10 (I)	0.5 (II)	0.9 (III)	$(III)/(I)$	0.10 (I)	0.5 (II)	0.9 (III)	$(III)/(I)$	0.10 (I)	0.5 (II)	0.9 (III)	$(III)/(I)$
c_1	0.004	0.005	0.006	1.5	0.004	0.005	0.006	1.5	0.004	0.005	0.006	1.5
c_2	0.04	0.022	0.011	0.275	0.04	0.022	0.011	0.275	0.04	0.022	0.011	0.275
c_3	0.242	0.262	0.272	1.12	0.24	0.256	0.265	1.10	0.238	0.250	0.258	1.08
C	0.285	0.29	0.289	1.01	0.283	0.284	0.281	0.99	0.282	0.278	0.275	0.975

Table 1: Changes in sectoral consumption with enforcement for different values of k , for $\mu = 0.1$

Table 1 presents the breakdown of aggregate private consumption by sector, where once again, 1 = *formal*, 2 = *informal* and 3 = *household*. Note that while there is a large increase in formal entrepreneur's consumption (c_1) with enforcement, the share of this entrepreneur's consumption is quite small at 1-3% of the total and therefore, changes in this sector's consumption does not affect the welfare results much. The main trade-off is between the falling consumption of the informal entrepreneur and the rising consumption

of the household as enforcement increases. Informal entrepreneur's consumption falls substantially with enforcement while household consumption rises. While the change in informal sector consumption with enforcement is much larger than that of the household, the latter's share in aggregate consumption is by far the largest (85-94% depending on p and k), causing small changes in this sector's consumption to matter a lot.

Aggregate consumption rises with enforcement for $k = 0$ but falls for the positive values of k considered. Again, the main reason is that higher enforcement costs make for smaller increases in household transfers as discussed in Section 3, causing the increase in household consumption with rising enforcement to be lower. This is clearly seen in Table 1, where c_3 increases by 12%, 10% and 8% respectively for $k = \{0, 0.5, 1\}$. Since the two entrepreneurs do not receive any transfers from the government, the change in their consumption with enforcement is not affected by a varying k . Initially, for $k = 0$, the increase in household consumption is large enough that it overwhelms the decrease in informal sector consumption causing aggregate consumption and hence welfare to rise. As k rises and the % increase in household consumption falls, eventually the net increase in household consumption falls short of the decrease in informal sector consumption causing welfare to decline as is the case under $k = 0.5$ and $k = 1$ in Table 1. All these values (in Table 1) are obtained under a fixed μ of 0.1.

4.2 Sensitivity analysis

In this section we briefly present results of the model for i) a lower tax rate and ii) a higher level of financial development, than in the benchmark model. The idea is to test if the results are sensitive to either of these key variables since degrees of taxation (τ) and financial market development (θ) differ across the range of the developing economies considered in the previous section. The calibration of the benchmark model in considers an average of the values of these variables in the data but the truth is, these values can vary significantly across countries. Moreover, the informal sector literature often finds important roles for both tax rates and financial development in determining informality, although there is a general lack of consensus on the direction and significance of these

effects (Friedman et al, 2000; Straub, 2005; Dabla-Norris et al, 2008). Particularly, the results on tax rates seem to differ based on whether developed, developing or transition economies are considered (see for example, Thieben (2003), Aruoba (2010) and Mitra (2017)).

Welfare						
k	$\tau = 0.3$			$\theta = 0.75$		
	$p = 0.1$	$p = 0.9$	% change	$p = 0.1$	$p = 0.9$	% change
0	0.374	0.374	0%	0.324	0.324	0%
0.5	0.373	0.369	-1.1%	0.32	0.318	-0.6%
1	0.372	0.363	-2.4%	0.032	0.312	-2.5%
1.25	0.371	0.36	-3%	0.32	0.309	-3.4%

Table 2: Sensitivity analysis of welfare changes with enforcement (for $\mu = 0.1$)

In Table 2, we present the welfare changes due to the same increase in enforcement as in Section 4 above and for the same set of enforcement costs but first, for a lower tax rate and second, for a higher level of financial development. We keep the value of μ , the level of unproductive government expenditures, fixed at $\mu = 0.1$ in these exercises. Note that for the costless enforcement case of $k = 0$, there is no change in welfare with enforcement, under both alternatives. Moreover as in the benchmark case in Section 4.2 with $\mu = 0.1$, in Table 2 enforcement is welfare-reducing for all non-zero values of k considered. Specifically, the change in welfare for positive enforcement costs ranges between -0.6% to -3% in Table 2, rendering the model's results quite robust to alternative parameter values for taxation and financial development.

5 Conclusion

The literature unequivocally finds a negative impact of tax enforcement on the share of informal activity in an economy. This is in contrast to other potential drivers of informality (like tax rates, financial development, formal sector registration or entry costs etc.,) the effects of which are not always clear cut. Liu-Evans and Mitra (2019) find rule of law to be the most important institutional variable for determining informal sector size. Out of sixteen measures of institution quality considered, and after allowing for a

large number of interaction terms via a robust lasso methodology, the World Governance Indicator measure Rule of Law was selected throughout and found to be highly significant. We provide further robustness analysis of the effect of rule of law on informality using the same methodology as these authors.

Given the unambiguous effect of rule of law on informality, and the substantial enforcement costs in developing economies in the literature, we next analyze the effect on welfare of a policy of higher firm tax enforcement. In a general equilibrium framework with representative formal and informal firms and financial frictions, we find that welfare, measured by aggregate private consumption, falls with rising enforcement for low to moderately high enforcement costs. Our results suggest that stepping up enforcement while very beneficial for lowering informality, is not always the most desirable policy tool in the presence of a large informal sector. A better policy recourse may be to identify and address other country- or region-specific drivers of informality, a host of which have been discussed in this paper, for shrinking informality without sacrificing welfare.

Appendix

Table 3: Financial System and Institutions variable descriptions

Financial system measures, from the Global Financial Development Database (GFDD)	
<i>Bank Stability</i>	Bank Z-score. It captures the probability of default of a country's commercial banking system. Z-score compares the buffer of a country's commercial banking system (capitalization and returns) with the volatility of those returns.
<i>FD</i>	Domestic Credit to the Private Sector (% of GDP).
Institutional measures, from World Governance Indicators (WGI) and Heritage Foundation (HF)	
<i>WGI variables</i>	
<i>Control of Corruption</i>	Captures perceptions of the extent to which public power is exercised for private gain.
<i>Government Expenditure</i>	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
<i>Political Stability</i>	Measures perceptions of the likelihood of political instability and/or politically-motivated violence.
<i>Rule of Law</i>	Captures perceptions of the extent to which agents have confidence in and abide by the rules of society.
<i>Voice and Accountability</i>	Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
<i>Regulatory Quality</i>	Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
<i>HF variables</i>	
<i>Property Rights</i>	Measures the degree to which a countrys laws protect private property rights and the extent to which those laws are respected.
<i>Freedom from Corruption</i>	Derived directly from Transparency Internationals Corruption Perceptions Index (CPI), which measures the level of perceived corruption in 175 countries.
<i>Fiscal Freedom</i>	A composite measure of the burden of taxes that reflects both marginal tax rates and the overall level of taxation, including direct and indirect taxes imposed by all levels of government, as a percentage of gross domestic product (GDP).
<i>Government Spending</i>	Captures the burden imposed by government expenditures, which includes consumption by the state and all transfer payments related to various entitlement programs.
<i>Business Freedom</i>	Measures the extent to which the regulatory and infrastructure environments constrain the efficient operation of businesses.
<i>Labor Freedom</i>	A quantitative measure that considers various aspects of the legal and regulatory framework of a countrys labor market.
<i>Monetary Freedom</i>	Combines a measure of price stability with an assessment of price controls.
<i>Trade Freedom</i>	A composite measure of the extent of tariff and non-tariff barriers that affect imports and exports of goods and services.
<i>Investment Freedom</i>	Evaluates a variety of regulatory restrictions that typically are imposed on investment. Points, as indicated below, are deducted from the ideal score of 100 for each of the restrictions found in a countrys investment regime.
<i>Financial Freedom</i>	An indicator of banking efficiency as well as a measure of independence from government control and interference in the financial sector.

WGI descriptions are taken from the series Metadata. Heritage Foundation descriptions are quoted from Heritage Foundation (2016).

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