

# Informality and Taxation in Developing Asia

Gabriel Ulyssea

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# INFORMALITY AND TAXATION IN DEVELOPING ASIA\*

Gabriel Ulyssea  
UCL and IFS

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## Abstract

This paper investigates the relationship among informality, formalization policies, and taxation in developing Asian countries. It proceeds in three steps. First, I review the literature, focusing on the relevant issues for developing Asian countries. Second, I provide some basic facts to contextualize the main potential determinants of the high informality and low taxation in the region. Third, I use the model developed in Ulyssea (2010b) to perform counterfactual policy simulations to investigate the effects of different formalization policies on unemployment, informality, average productivity, and total tax revenues in the region. The results indicate that the most effective policy to reduce informality and increase tax revenues is to reduce the formal sector's entry costs. It does so while also reducing unemployment and increasing wages.

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## I. INTRODUCTION

Developing countries are typically characterized by a large informal sector, which accounts for between a third and half of their economic activity.<sup>1</sup> These high levels of informality have important implications for economic development. In particular, informality implies widespread tax avoidance (e.g., Auriol and Warlters 2005, and Kanbur and Keen 2015). Given the importance of building fiscal capacity in developing countries (e.g., Besley and Persson 2010), these large informality levels are likely to constitute a major obstacle to these countries' development.

This can be of particular importance for countries in developing Asia. These economies are characterized by low tax revenues and high informality, even when compared to countries of similar income levels. Figure 1 shows how the countries in the region compare to the averages among the Organisation for Economic Co-operation and Development, Latin America and the Caribbean (LAC), and African countries. Except for some smaller countries (e.g., Cook Islands and Samoa), most countries in the region have from half to a third of the tax revenues to gross domestic product ratio observed in the average Organisation for Economic Co-operation and Development country. At the same time, these countries also have extremely high levels of informality, regardless of the measure used, even when compared to other high informality regions, such as Latin America (Figure 2, section IV).

Despite its negative consequences, informality might be a second best in the face of inefficient and burdensome institutions. Moreover, it can represent a buffer that absorbs low productivity individuals that would not be able to relocate to the formal sector if there was perfect enforcement. Indeed, when compared to other middle-income and low-income countries, most countries in developing Asia are clustered in a very high informality but very low unemployment quadrant (Figure 2, section IV). Thus, any policy discussion about the benefits of reducing informality and increasing taxation should also consider the potential adverse consequences of such policies on unemployment levels.

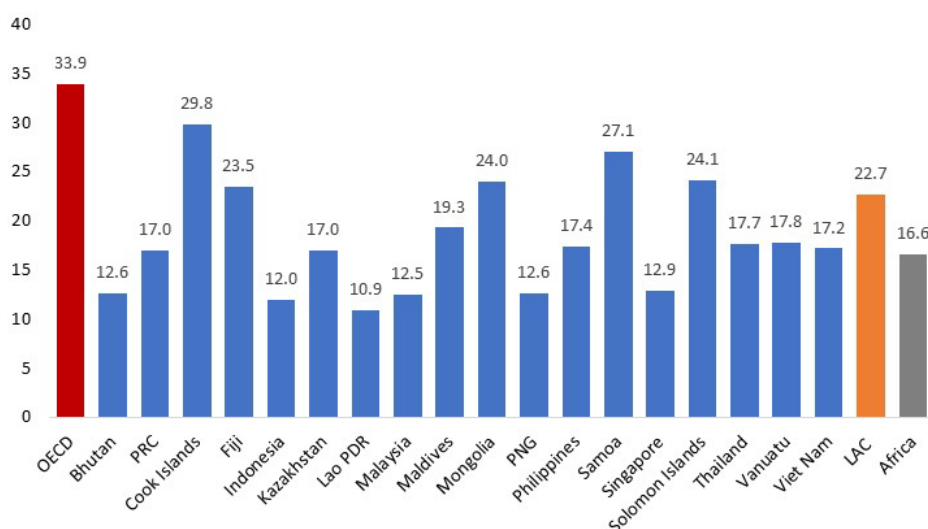
The goal of this paper is to investigate the relationship between informality, formalization policies, and taxation in developing Asia. For that, I proceed in three steps. First, I review

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<sup>1</sup> For cross-country evidence on the size of the informal sector, refer to Schneider (2005) and La Porta and Shleifer (2008, 2014).

the relevant literature, focusing on the relevant issues for developing Asia. Second, I provide some basic facts with the goal of better contextualizing the main potential determinants of the high levels of informality in the region. Third, I use the model developed in Ulyssea (2010b) to perform counterfactual policy simulations to investigate the effects of different formalization policies on unemployment, informality, average productivity, and total tax revenues. I do so for the average country in the region, but also individually for the nine largest countries for which I have data.

**Figure 1: Tax Revenues as Share of Gross Domestic Product**



LAC = Latin America and the Caribbean, OECD = Organisation for Economic Co-operation and Development, PNG = Papua New Guinea, PDR= People's Democratic Republic, PRC = People's Republic of China.

Source: Data from Organisation for Economic Co-operation and Development.

As already mentioned, developing Asia countries are characterized by low unemployment, high informality, and low tax revenues, even after controlling for income per capita. However, contrary to other high informality regions, like LAC, developing Asia countries typically show lower levels of regulatory costs, although there is some dispersion across countries within the region. The exception to this regularity refers to the fixed costs of starting and registering a formal business, which are very high in most countries in the region. Moreover, although the de jure costs associated to regulations are not high, the de facto costs might be because of corruption. Indeed, different measures of incidence of corruption suggest that it is particularly high in the region and it is systematically indicated as a major obstacle to doing business.

As for the policy simulations, they are based on simple two-sector (formal and informal) equilibrium matching model developed in Ulyssea (2010b). This model is very simple, but captures many of the relevant dimensions discussed so far: (i) it includes the costs of entering the formal sector (i.e.. registration costs), as well as the costs of remaining formal (i.e.. taxes); (ii) it has unemployment and transitions in and out of the formal and informal sectors; (iii) it allows for variations in enforcement intensity; and (iv) it provides the main relevant aggregate outcomes, such as aggregate productivity and tax revenues.

The simulation results for the average developing Asia country show that reducing entry costs is the most effective policy to reduce informality and increase tax revenues, while also reducing unemployment. These positive effects come from the fact that reducing these costs eliminates a deadweight loss in the economy, which leads to greater entry and production in the formal sector, lower informality, and higher total output.

Increasing enforcement of existing regulations is effective in reducing informality, but it produces much lower gains in tax revenues. This occurs because the policy produces two opposing forces: (i) higher enforcement increases the costs of operating in the informal sector, which reduces the share of informal activities and leads to an increase in tax revenues; and (ii) a reduction in total output, which leads to a reduction in tax revenues. Even though the first force prevails, the second lowers the potential gains in tax revenues.

Reducing profit or labor taxes does not have any effect on unemployment and leads to small reductions in informality rates. When it comes to increasing taxes, however, there is more scope for increasing tax revenues via the labor tax, as the responses in terms of higher informality are much lower than in the case of the profit tax. The results also indicate that there is "Laffer Curve" for both labor and profit taxes, and all countries in the region are far to the left of the curve's peak. Therefore, there could be scope for increasing tax revenues via higher tax rates. However, if the policy goals go beyond increasing tax revenues, then these policies are not ideal because they tend to increase informality and decrease wages and average productivity.

The analysis for individual countries generally confirms the results obtained for the average developing Asia country. However, there is substantial heterogeneity in policy effects across countries. Thus, policy recommendations should be country-specific, rather than for the region as a whole.

Finally, it is important to highlight that the model used here does not have firm heterogeneity (in productivity), nor firm size, as it is a one-to-one matching model. Hence, it does not account for richer composition effects from the policies simulated here, nor does it allow reallocation of workers from less to more productive firms, for example. This can be a strong force in the case of policies that increase enforcement on informal firms, as shown in Dix-Carneiro et al. (2021). If firms are very heterogeneous and there is scope for expansion of more productive formal firms (e.g., there are no strong frictions or diseconomies of scale), then increasing enforcement could be a successful policy in increasing tax revenues and productivity (Ulyssea 2018). In contrast, policies that reduce the cost of entry would most likely lead to the entry of less productive firms in the formal sector. The present model does not capture this force because of the absence of firm heterogeneity. Thus, some potentially important effects from these policies are muted in the current analysis and are left as topics for future research.

## **II. DETERMINANTS OF INFORMALITY AND TAXATION: LESSONS FROM THE LITERATURE**

In this section, I focus on the determinants of informality (and therefore tax evasion) on the firms' side, and what policies have been shown to lead to greater formalization of firms. I focus on the results for developing Asia countries whenever possible.

Before discussing determinants, however, it is important to highlight some empirical regularities. In particular, it is important to highlight that, even though formal and informal firms look very different on average,<sup>2</sup> formal and informal firms coexist even within narrowly defined industries, which contradicts the dualistic view of informality (Ulyssea 2020). Moreover, there is a substantial overlap in formal and informal firms' productivity distributions, even within industries, which is also inconsistent with the dual view of informality.

For the case of developing Asia, Allen et al. (2018) illustrate this point using data from India. Additionally, Hsieh and Olken (2014) find no evidence of a "missing middle" in firm size distributions in the manufacturing sectors of India and Indonesia. This is important to this paper because it changes how one thinks about the informal economy, and

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<sup>2</sup> The literature has shown extensively that informal firms, on average, are smaller (both in terms of employees and revenues), pay lower wages, are run by less-educated individuals, hire less-educated workers, and earn lower profits than formal firms (e.g., Perry et al. 2007, and La Porta and Shleifer 2008, 2014).

formalization policies. The dual view of informality implies that formalization policies would likely have limited effects on tax revenues, for example, as informal firms operate in a completely different economic space. However, if one moves away from the dual view and more towards this integrated view (e.g., Ulyssea 2018), then formalization policies are likely to have more far-reaching consequences for taxation and, ultimately, development levels.

A second important point is the relevance of the different margins of informality. I focus on two margins that I have emphasized in previous work (Ulyssea 2018). The first is the extensive margin, which corresponds to the decision of individuals whether to formalize their business (by paying the relevant registrations costs). The second is the intensive margin, which refers to firms that are formal in the first sense, but which might hire unregistered, informal workers to avoid the costs imposed by the labor regulation. The literature has shown that the extensive margin of informality declines with firm size, which means that the share of informal firms declines with firms' size (e.g., Perry et al. 2007, and De Paula and Scheinkman 2011). This fact implies that the costs of operating in the informal sector are increasing in firm size. More recently, the literature has increasingly emphasized the intensive margin, which accounts for a substantial fraction of informal employment in developing countries (de la Parra 2016, Ulyssea 2018, and Cisneros-Acevedo 2019). The intensive margin also declines as firms grow larger, which can be also rationalized by the fact that larger firms are more visible and, therefore, more likely to be inspected.

#### **A. Determinants of Firms' Informality**

As I argue in Ulyssea (2020), the costs of being formal can be broadly divided into the costs of entering the formal sector—largely stemming from the regulation of entry, as discussed in Djankov et al. (2002)—and the costs of remaining formal. The latter corresponds to tax rates (or the overall tax burden) and the ongoing costs associated to complying with tax and other relevant regulations. Relevant to the analysis in section VI, if policy makers want to incentivize firms to formalize, they can reduce the costs of entering the formal sector, the costs of remaining formal, or both. Another policy lever available is to increase the costs of informality, which could be done by increasing enforcement of the existing laws and regulations by increasing the intensity of government inspections, for example. I will simulate the impacts of these three policy levers in section VI. An additional route is to increase the benefits associated to formalization by offering access to cheaper credit lines, for example, but I will not discuss

these in this paper.

Most of the reduced-form evidence in the literature refers to policies that aim at reducing the costs of formality. In particular, the reduction of registration costs has been the type of policy more commonly evaluated, as these costs are often regarded as a major constraint to firm creation and formalization (e.g., De Soto 1989 and Djankov et al. 2002). However, the reduced-form results from these policy interventions have been limited in terms of inducing firms to formalize (Bruhn and McKenzie 2014). Indeed, taken as a whole, the results from both experimental and quasi-experimental studies indicate that reducing the costs of entering the formal sector has very limited effect on firm formalization.

Importantly, however, these pieces of evidence come from mostly Latin America and, to a lesser extent, Sub-Saharan Africa. These countries have different regulatory characteristics than the one observed in developing Asia countries, as I discuss in section III. Moreover, even if the evidence points to limited effects at the micro level, these are partial equilibrium effects, which can be quite different from the equilibrium, aggregate effects. In many countries, these entry costs generate substantial deadweight losses, as they accomplish little apart from reducing entry into the formal sector. Reducing these barriers can generate substantial aggregate gains, as they might increase entry, production, and employment in the formal sector. These potentially large aggregate gains are completely missed by the micro estimates that are only able to recover relative effects (by design).

Indeed, there is an extensive literature that has shown that reducing entry costs into the formal sector can produce substantial positive aggregate effects (Ulyssea 2010a, D'Erasmus and Boedo 2012, Charlot et al. 2015, and Ulyssea 2018). For example, D'Erasmus and Boedo (2012) argue that differences in formal sector's entry costs can explain about three fourths of the gap in Total Factor Productivity (TFP) between the United States and the average low-income and middle-income country. However, this type of evidence is not available for developing Asia countries.

Increasing the costs of informality by increasing enforcement of existing laws and regulations has been far less analyzed in the literature. To the best of my knowledge, the exception in terms of reduced-form evidence is the work of de Andrade et al. (2014), who find strong effects: their Instrumental Variables (IV) estimate of the impact of



receiving an additional inspector visit is of 21–27 percentage points in firms' registration. The authors find no evidence of spillovers on neighboring firms. At the aggregate level, the results from the macro and structural literature indicate that increasing enforcement could lead to substantial gains in aggregate productivity.

As I discuss in Ulyssea (2020), the relevant tradeoff comes from the potential adverse consequences of greater enforcement. Using equilibrium matching models calibrated to the Brazilian economy, Ulyssea (2010a) and Charlot et al. (2015) find results consistent with this tradeoff: greater enforcement substantially reduces informality, but it increases unemployment and reduces welfare. More recently, Meghir et al. (2015), Haanwinckel and Soares (2016), and Dix-Carneiro et al. (2019) find no unemployment effects from higher enforcement. A key difference between these different frameworks is that the most recent ones move away from the one-to-one matching structure. This is important because these latest frameworks allow for the presence of large and productive formal firms that can absorb workers displaced from the informal sector.

An additional less emphasized, but important determinant of firm informality refers to the tax structure of the economy (rather than just the overall tax burden). An exception is the work of de Paula and Scheinkman (2010), who analyze the role of value-added tax in transmitting informality along the production chains. They show that the formal status of a firm's suppliers and buyers is correlated with the firm's own formal status, and greater enforcement upstream or downstream the production chain implies a higher probability of being formal. In a related paper, Naritomi (2018) uses administrative data from Brazil to show that introducing incentives similar to the value-added tax for final sales leads to substantial increase in firms' reported revenue. The idea is that consumers could act as "tax enforcers" if they can enjoy tax benefits (e.g., tax rebates) from registering transactions and requesting invoices. This could produce a positive chain effect down the supply chain, as the final retailers would now be more likely to request invoices from their suppliers, and their suppliers from their suppliers, and so on. Both of these papers have valuable insights that, even though I will not explore them in this paper, could have interesting policy implications for countries in developing Asia.

Finally, a key factor for most developing countries, and perhaps in particular for developing Asia, is the role of international trade. The connection between trade and informality has traditionally emphasized the potential negative effects of trade. The

basic concern is that trade opening would generate increased competitive pressure in domestic markets, which could lead to a reallocation of firms and workers from the formal to the informal sector (Goldberg and Pavcnik 2003). Indeed, Paz (2014), Dix-Carneiro and Kovak (2019), Cruces et al. (2018), and Ponczek and Ulyssea (2021) find positive and substantial effects of trade opening (tariff reduction) on informal employment in Argentina and Brazil.

However, the recent study of McCaig and Pavcnik (2018) in Viet Nam shows the opposite, as they document positive effects from trade opening. Their study looks at the effects of increased market access by a developing country on formality and productivity. They show that a positive export shock in Viet Nam (because of the US-Vietnam Bilateral Trade Agreement) led to a substantial reallocation of workers from informal microenterprises to formal sector firms. This reallocation, by its turn, caused an increase in aggregate productivity. In Dix-Carneiro et al. (2021), we develop an equilibrium trade model with firm dynamics and firm heterogeneity, formal and informal sectors, labor market frictions, and a rich institutional setting, which is estimated using several data sources from Brazil. Our counterfactual results are broadly consistent with these results. We show that reductions in (bilateral) trade costs lead to a sizable reduction in informality within manufacturing and substantial productivity gains. However, the overall effect on informality, including both the tradable and non-tradable sectors, is ambiguous.

More broadly, the lesson from the positive effects of trade documented in Viet Nam is that increasing the benefits of formality can also be a powerful engine of formalization, productivity gains, and growth. In this case, trade opening increased the benefits of formality by increased market access, which was only available to formal firms (simply put, informal/unregistered firms cannot export). This is also connected to the results from de Paula and Scheinkman (2010) and Naritomi (2018), who document that firms are more likely to be formal if their buyers are also formal. This could be taken to other contexts and generalized to policies that increase the returns to being formal.

### **III. DATA AND FACTS**

This paper uses three main data sources. First, I use country level data from the Doing Business project, which provides measures of regulatory costs along different dimensions that are comparable across 190 countries. Particularly relevant to this

paper, it covers the costs related to starting a formal business and paying taxes. Second, I use the World Bank Enterprise Survey, which provides firm level data on different dimensions, including the main difficulties faced by firms, as well as measures of the costs imposed by regulations and questions directly related to informality. Finally, I use country level data from the International Labour Organization (ILOSTAT), which provides comparable information on unemployment informal employment.

Data from ILOSTAT provide a key measure of the size of the informal sector across countries, which is the share of informal workers in the labor force. This data set is very comprehensive, but it implies the loss of some developing Asia countries. In particular, it does not contain information on the People's Republic of China (PRC), which is one of the largest and most important economies in the region. From a conceptual standpoint, however, it is hard to define what informality would mean in a country with the characteristics of the Chinese economy, which is probably the reason for this lack of information. Given the centrality of the informal sector in this paper, I choose to exclude the PRC from the empirical analysis. The final data set used to generate the main facts contains 88 countries, including 20 developing members of the Asian Development Bank.<sup>3</sup>

**Table 1: Basic Descriptive Statistics**

	Data Source	Developing Asia	Latin America and the Caribbean	Sub-Saharan Africa
<b>Regulatory costs</b>				
Labor tax (% of profits)	DB	16.9	27.9	14.1
Profit taxes	DB	22.5	19.2	20.3
Total taxes (% of profits)	DB	47.6	61.1	39.9
Time paying taxes (hours)	DB	297.9	1212.2	275.7
Cost of starting a formal business	DB	34.9	16.3	63.6
Days to start a business	DB	32.4	67.4	29.5
<b>Informality and unemployment</b>				
Informal workers (share)	ILO	84.5	57.4	82.2
Unemployment rate	ILO	3.1	6.9	7.6
Share of unregistered startups	WBES	16.8	9.9	14.4
<b>Corruption (all in %)</b>				
Expected to give gifts to get a license	WBES	26.9	11.2	14.0
Expected to give gifts to tax officials	WBES	19.5	8.1	14.6
Bribery incidence	WBES	26.1	11.9	20.8

<sup>3</sup> Appendix A contains a list of countries that are included in the final data set, and the variables used.

	Data Source	Developing Asia	Latin America and the Caribbean	Sub-Saharan Africa
<b>Firm's biggest obstacle</b> (all in %):				
Tax rates	WBES	11.1	21.6	8.1
Tax administration	WBES	3.3	4.9	4.8
Practices of the informal sector	WBES	13.1	15.3	9.8
Labor regulations	WBES	3.6	6.0	1.1
Business licenses and permits	WBES	2.3	4.0	1.7
Access to finance	WBES	10.9	8.4	24.9
Corruption	WBES	14.4	8.0	7.6

DB = Doing Business Initiative, ILO = International Labour Organization, WBES = World Bank Enterprise Surveys.

Sources: Doing Business Project, multiple years; ILOSTAT, multiple years; and WBES, multiple years.

#### IV. FACTS

Table 1 shows important differences between developing Asia, LAC, and Sub-Saharan Africa regions. In particular, focusing on the contrast with LAC, which is a high informality region, developing Asia shows very low levels of unemployment and high levels of informality, but lower measures of regulatory costs in many dimensions. This is interesting because regulatory costs are widely regarded as one of the main drivers of informality (Ulyssea 2020). This section further investigates these issues.

I start by plotting country-level rates of informal employment and unemployment, together with two lines corresponding to the median values of unemployment and informality in the sample. As Figure 2, panel A shows, developing Asia countries are largely clustered in the upper-left quadrant, which corresponds to high informality (above the median) and low unemployment (below the median). When examining the two measures of informality used in this paper—share of informal employment and share of unregistered firms upon entry—Figure 2, panel B shows a strong correlation between the two, as expected. Even though there is some dispersion, developing Asia countries tend to be clustered in the upper-right quadrant, with above the median informality among firms and workers, especially for the most populous countries in the region.

I now consider the two main potential determinants that naturally emerge from Table 1: registration costs and corruption. The measure of registration costs is taken from the Doing Business data, and represents a broad measure of the fixed costs involved in starting up a formally registered business. It includes, for example, the number of

procedures required for an entrepreneur to start up a formally registered business, as well as the time and monetary costs. (The description of the variables used is in the Appendix.) Figure 3, panel A, shows that developing Asia countries are quite spread across the spectrum of registration costs. However, panel B shows that they are concentrated in the upper-right quadrant, which corresponds to the high informality and high corruption one (above the median).

This descriptive analysis thus indicates that, even though the *de jure* costs of operating in the formal sector are not high for all countries, the *de facto* costs might be high because of corruption. This could help in rationalizing why developing Asia countries have extremely high informality, even though the objective measures of regulatory costs associated to formality are not particularly high. The exception to the latter refers to the costs of registering a business, which are quite high in the region. Thus, there could be an interaction between the objective measures of the costs of entry and corruption, which could lead to potentially very high costs associated to formality.

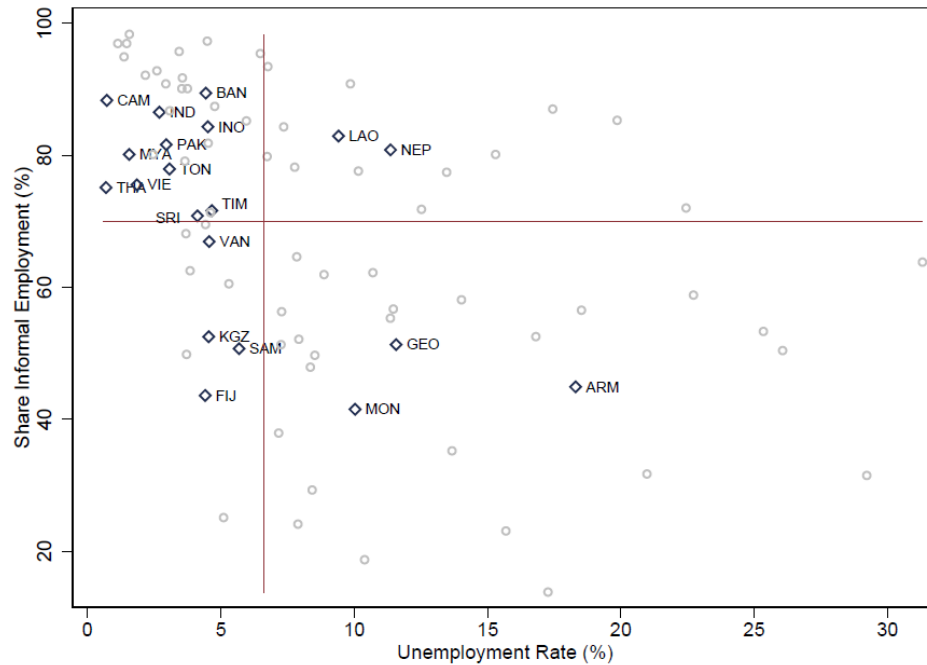
To go slightly beyond the simple, unconditional correlations presented in the previous figures, Table 2 shows the results of regressing labor informality onto each of the potential determinants (connected to regulatory costs and corruption), individually and all at the same time. The regressions include an interaction term of each determinant with a dummy for developing Asia country, they control for the logarithm of gross domestic product per capita and are weighted by population, to reduce the influence of small outliers. Interestingly, Table 2 shows that corruption, in fact, is associated to less informality in developing Asia countries. This result is a simple correlation, but it suggests that corruption might also help “greasing the wheels”, as it might add flexibility that effectively reduces formality costs. The main determinant that remains strongly and positively associated to higher informality in developing Asia countries is precisely a measure of registration costs, which is the time to register a business.

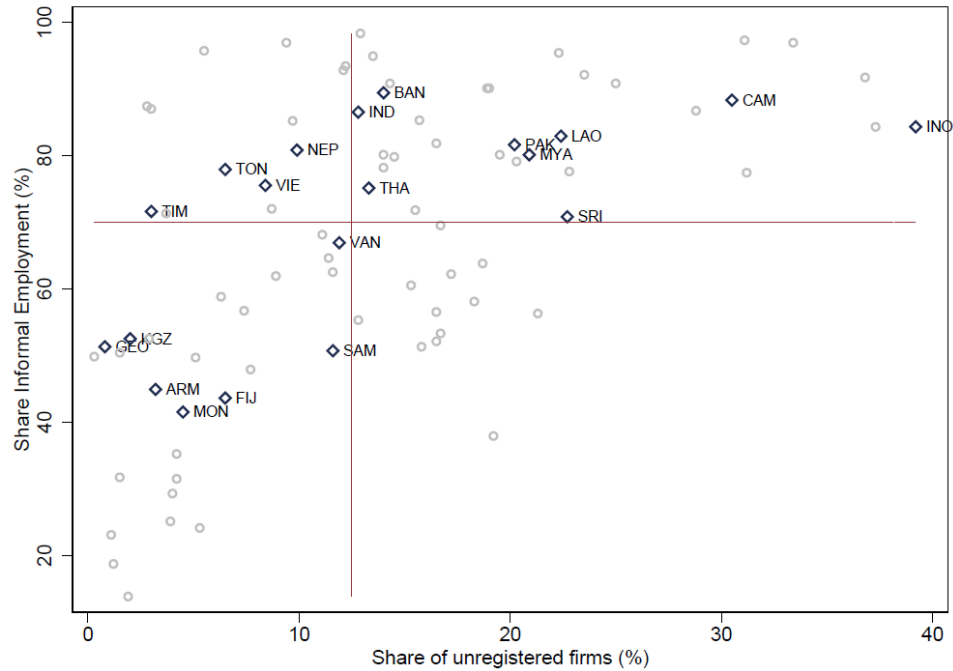
Taken together, the descriptive facts presented in this section suggest that, even though developing Asia is not an outlier in terms of regulatory costs associated to formality, these costs seem to play an important role in determining the large size of the informal sector in the region. Of the different dimensions of regulatory costs, those related to registering a business play a central role, rather than the overall tax burden or the bureaucracy associated to complying with the tax regulation. This highlights the

importance of unpacking the different dimensions of regulatory costs of operating in the formal sector. In particular, the costs of entering the formal sector (i.e., entry costs) and the costs of remaining in the formal sector (e.g., taxes). These two dimensions will be considered separately in the model.

**Figure 2: Informality and Unemployment**

**A. Labor Informality versus Unemployment**

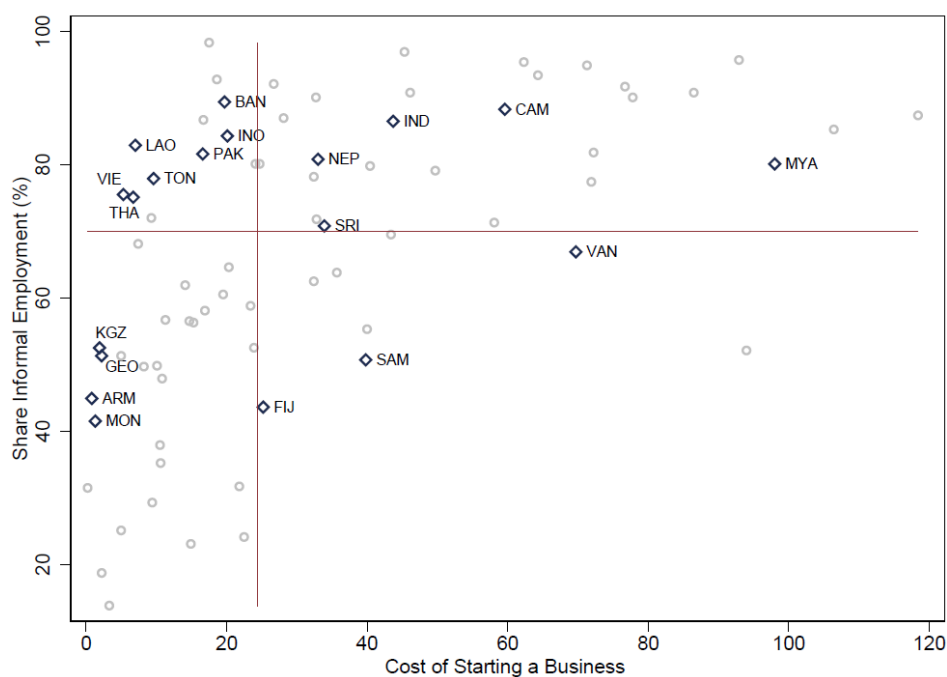




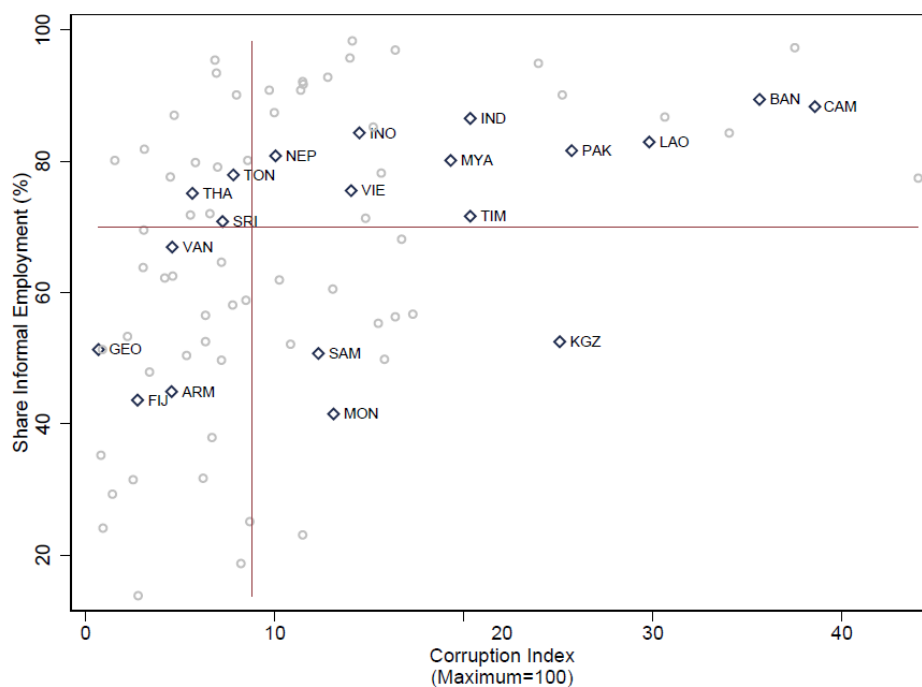
ARM = Armenia, BAN = Bangladesh, CAM = Cambodia, FIJ = Fiji, GEO = Georgia, IND = India, INO = Indonesia, KGZ = Kyrgyz Republic, LAO = Lao People's Dem. Rep., MYA = Myanmar, MON = Mongolia, NEP = Nepal, PAK = Pakistan, SAM = Samoa, SRI = Sri Lanka, THA = Thailand, TIM = Timor-Leste, TON = Tonga, VAN = Vanuatu, VIE = Viet Nam.

Sources: Data from ILOSTAT and World Bank Enterprise Survey.

**Figure 3: Informality, Registration Costs, and Corruption**



**B. Informality and Corruption**



ARM = Armenia, BAN = Bangladesh, CAM = Cambodia, FIJ = Fiji, GEO = Georgia, IND = India, INO = Indonesia, KGZ = Kyrgyz Republic, LAO = Lao People's Dem. Rep., MYA = Myanmar, MON = Mongolia, NEP = Nepal, PAK = Pakistan, SAM = Samoa, SRI = Sri Lanka, THA = Thailand, TIM = Timor-Leste, TON = Tonga, VAN = Vanuatu, VIE = Viet Nam.

Sources: Data from ILOSTAT and World Bank Enterprise Survey.



**Table 2: Cross-Country Correlations**

	(1)	(2)	(3)	(4)	(5)	(6)
Developing Asia	14.80 (12.33)	78.59*** (20.64)	15.08** (6.192)	-41.69*** (13.38)	19.80*** (6.187)	39.66 (25.83)
Total taxes	0.152 (0.141)					0.137 (0.0941)
Developing Asia×Total taxes	-0.141 (0.222)					-0.132 (0.137)
Log(time paying taxes)		1.587 (2.388)				3.525 (3.253)
Developing Asia×Log(time paying taxes)		-12.46*** (3.477)				-11.84*** (4.082)
Registration cost			0.182*** (0.0531)			0.124* (0.0658)
Developing Asia×Registration cost			-0.127 (0.113)			-0.107 (0.0831)
Log(time to register a business)				0.194 (1.558)		-3.100 (2.725)
Developing Asia×Log(time to register a business)				14.35*** (3.929)		15.79*** (3.982)
Corruption					0.404* (0.225)	0.313 (0.248)
Developing Asia×Corruption					-0.696** (0.300)	-0.464 (0.321)
Observations	79	79	79	79	81	77
R-squared	0.736	0.750	0.769	0.778	0.765	0.852

Notes: Robust standard errors in parentheses; significant at the \*\*\*1%, \*\*5%, and \*10% levels.

Source: Author's calculations.

## V. MODEL AND CALIBRATION

This section uses the model developed in Ulyssea (2010b) to perform counterfactual policy simulations related to formalization and tax policies. I start by providing a brief description of the model,<sup>4</sup> and I then move to the discussion of the calibration and results.

### A. Model

This is a simple continuous time, equilibrium matching model with two sectors – formal and informal – and undirected search. The costs and benefits of being formal or informal are mostly related to regulations and can be separated in two broad categories: (i) the costs of entering the formal sector, which broadly correspond to the costs of registering a business so it can become formal; and (ii) the costs of staying in the formal sector, which in the model are associated to taxes (on profits and labor).

There are two goods in the economy: a consumption good and an intermediate good. The latter can be produced in the formal or informal sectors, while the consumption good is produced by a single representative firm that uses the intermediate goods produced in the formal and informal sectors as inputs in a constant elasticity of substitution (CES) production function:

$Y_f = (aY_i^\rho + (1 - a)Y_f^\rho)^{\frac{1}{1-\rho}}$ , where  $0 < a < 1$  and the elasticity of substitution between formal and informal output is given by  $1/(1 - \rho)$ . The price of the final good is normalized to one, both intermediate goods are sold in a competitive market and cannot be stored. Hence, prices are given by their respective marginal productivity:

$$\begin{aligned} p_f &= aY_i^{\rho-1}Y^{1-\rho} \\ p_i &= (1 - a)Y_i^{\rho-1}Y^{1-\rho} \end{aligned}$$

Therefore, even though firms are homogeneous, there can be differences in productivity between formal and informal firms because of the parameter  $a$ . In particular, if  $a \in (0, 0.5)$  then informal firms, on average, are less productive than formal ones, which is

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<sup>4</sup> The interested reader can find the details in Ulyssea (2010b).

consistent with the existing evidence (Ulyssea 2020).

Firms only use labor to produce  $Y_s$ ,  $s = i, f$ , and each firm hires only one worker who produces one unit of the good. There is a continuum of homogeneous and risk-neutral workers with measure one, and a larger continuum of firms. To match with a worker and produce, firms must create a vacancy, and must also decide whether to operate in the formal sector or informal sector. The fixed cost of creating a vacancy in either sector is given by  $K_s$ , and I assume that  $K_f > K_i$ . The entry informal sector entry cost can be interpreted as the capital requirement to produce in this industry/economy, while the difference between the two costs is interpreted as being entirely driven by regulations, in particular the regulation of entry (Djankov et al. 2002). There are frictions in the labor market, so that workers and vacancies/firms do not meet instantaneously and there is unemployment. The labor market is characterized by two matching functions that determine how unemployed workers and open vacancies translate into matches in the formal and informal sectors:

$$m_s(u, v_s) = A_s v_s^{1-\eta} u^\eta$$

where  $A_s$  denotes the efficiency with which unemployed workers and open vacancies translate into matches in sector  $s = i, f$ ,  $v_s$  denotes vacancies in sector  $s$  and  $u$  denotes aggregate unemployment. The probabilities of an unemployed worker finding a job in either sector are given by  $\lambda_s(\theta_s) = \frac{m_s(u, v_s)}{u}$ , while the probabilities of an open vacancy to be filled is given by  $q_s(\theta_s) = \frac{m_s(u, v_s)}{v}$ .

The payoffs of firms and workers are characterized by value functions that capture the present discounted value of each possible state in the labor market. Firms in either sector can have an open or filled vacancy, while workers can be unemployed, or employed in a formal or informal job. Section B of the Appendix describes these value functions.

The counterfactual simulations focus on steady state equilibria, in which no sector can be expanding nor contracting, and therefore the flow of workers out of unemployment and into either sector must be equal to the flow from these sectors and into unemployment. The latter is governed by an exogenous separation rate of the match, denoted by  $s_f$  and  $s_i$ . In Ulyssea (2010b), I show that the equilibrium is unique for a broad range of parameters.

## B. Calibration

I conduct 10 calibration exercises, which correspond to the average developing Asia country and then individually to the 9 most populous countries in the region (excluding the PRC, as discussed above). The average DA country is obtained by averaging all the key values and targeted moments across all countries in the region and weighting by population.

Each calibration exercise proceeds as follows. I use as starting point the calibration in Ulyssea (2010b), which provides the values for the discount rate ( $r$ ), the formal and informal bargaining power coefficients ( $\varphi_s$ ),<sup>5</sup> the elasticity parameter ( $\rho$ ), matching function elasticities ( $\eta$ ), and formal-informal productivity gap parameter ( $\alpha$ ).

I use the reported values in the Doing Business and World Bank Enterprise Survey data sets to pin down the values of profit and labor tax rates ( $\tau_{pi}$  and  $\tau_w$ ), and entry costs ( $K_s$ ). The  $\tau_{pi}$  and  $\tau_w$  are well-defined rates that are directly observable in the Doing Business data. The actual value of formal sector's registration cost in the model, however, does not necessarily correspond to the value of the estimate provided in the data. To create a correspondence between the two, I calibrate  $K_f$  as follows:

$$K_{f,DA} = \frac{\text{Cost}_{DA}}{\text{Cost}_{\text{Brazil}}} \times K_{f,\text{Brazil}}$$

where  $\text{Cost}_{DA}$  and  $\text{Cost}_{\text{Brazil}}$  correspond to the measures of registration costs provided by the Doing Business data, which are computed as a share of countries' income per capita.<sup>6</sup> The  $K_{f,\text{Brazil}}$  is obtained directly from Ulyssea (2010b), and therefore is compatible with the model. Hence, the calibrated values of  $K_f$  retain the relative magnitudes observed in the data (which are anchored by the cost observed in Brazil), but are determined relative to the model-compatible value used in Ulyssea (2010b). Importantly, they represent the monetary value of all the fixed costs of starting a formal business, both monetary and nonmonetary costs (e.g., time).

The unemployment benefit is set to zero as many countries in the region do not have

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<sup>5</sup> The wage determination follows a Nash bargain over the match surplus (Appendix B).

<sup>6</sup> According to the Doing Business methodological notes, this cost includes "all official fees and fees for legal or professional services if such services are required by law or commonly used in practice. Fees for purchasing and legalizing company books are included if these transactions are required by law." Importantly, this measure excludes bribes.

a well-developed Unemployment Insurance system. I calibrate the remaining parameters to match the unemployment and informality rates as measured in the ILO data.

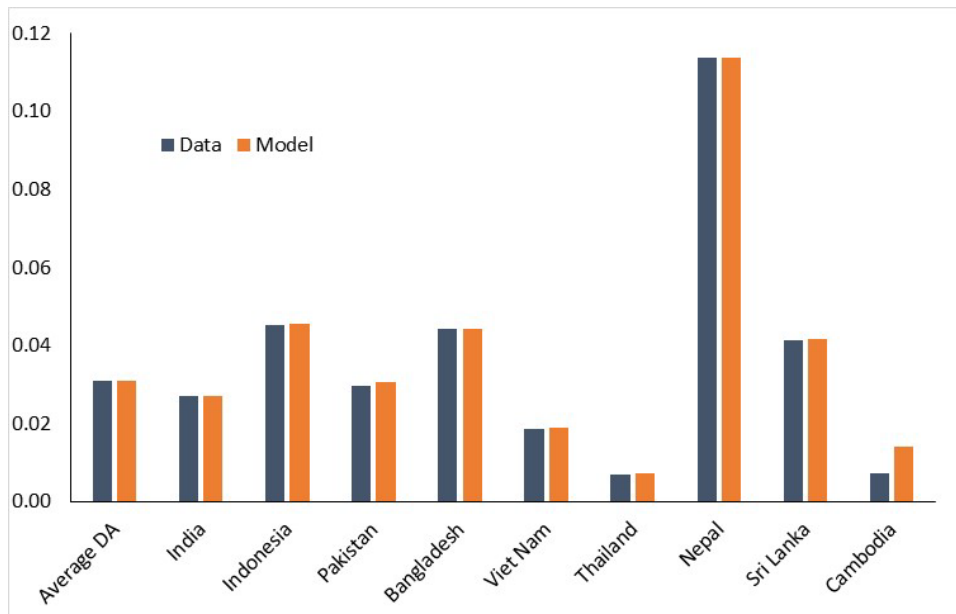
Table 3 shows the results of this calibration exercise. Even though formal sector's entry costs are high on average, and substantially higher than, say, in Latin America, there is a lot of heterogeneity across countries. In particular, Viet Nam and Thailand show the lowest costs, while Cambodia has a cost that is about 10 times higher (data from the Doing Business project). Similarly, there is a lot of heterogeneity in terms of the tax burden in each of these countries and relative to the region's average. As Figure 4 shows, the model fits extremely well the targeted moments (formality not shown, for conciseness).

### Table 3: Calibration

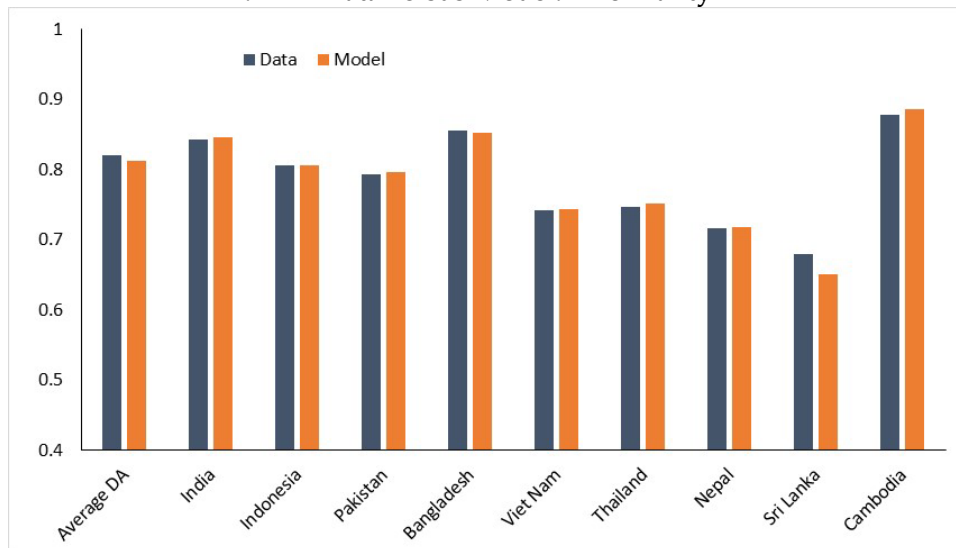
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**Figure 4: Model Fit**

**A. Data versus Model: Unemployment**



**B. Data versus Model: Informality**



DA = Developing Asia  
Source: Data from ILOSTAT.

## VI. POLICY SIMULATIONS

This section uses the model discussed in section V to perform counterfactual policy simulations. I start by discussing the effects on the "average developing Asia country", and then I move to discuss the results for each of the nine largest countries in the region. For the average developing Asia country, I consider the following policy simulations: (i) reductions in the formal sector's entry cost ( $K_f$ ); (ii) increasing enforcement of laws and regulations, which in the model translates into higher separation rates in the informal sector ( $s_i$ ); (iii) variations in the profit tax ( $\tau_\pi$ ); and (iv) variations in the labor tax ( $\tau_w$ ). Tables 4–7 show the results.

Of these policy counterfactuals, the one with an arguably less clear empirical counterpart is the one on enforcement (exercise [ii]). The idea behind this counterfactual is that a tightening of enforcement—via, say, a greater number of inspections—would inevitably lead to a higher exit rate in the informal sector. That is, greater enforcement leads to more informal firms having to pay fines, bribes, or exit altogether. This would imply an overall greater exit rate in the informal sector. However, I completely abstract away from the actual mapping between enforcement activities and enforcement technologies and exit rates in the informal sector. Some of the policies could be very low cost, such as leveraging the ever-growing availability of micro data from different sources to flag firms that seem to be not complying with tax regulations. Of course, conducting door-to-door inspections is more costly. Nevertheless, it is often the case that informal firms are geographically clustered, which substantially reduces the cost of enforcement. As for entry costs, these typically stem from red tape and regulatory requirements (monetary and nonmonetary) that are imposed on entrepreneurs who want to register their businesses. Therefore, the policy counterfactuals here are done considering a progressive elimination of such regulatory costs.

I start by examining the effects of reducing formal sector's entry cost (i.e., registration costs). The starting point is the calibrated value for the baseline economy, which is determined using the Doing Business data and the calibration process discussed in section V. I consider three alternative values, which go from the baseline value to the cost observed in Brazil. It is important to note that, even though the cost in the average developing Asia country is more than four times larger than Brazil's, the country still



has a very high cost compared to the rest of the world, and it sits in the 138th place in the rank for starting a business.

The results in Table 4 show that substantially reducing entry costs would have limited effects on unemployment, which is very low in the baseline already, but would have very strong effects on informality. If the cost of registering a business was to be reduced to Brazilian levels, it would lead to a reduction of nearly 23 percentage points in the informality rate. This strong reduction in informality mechanically leads to substantial gains in average productivity, as the low-productivity sector is reducing its share in aggregate production. Crucial to the discussion of increasing the tax base in developing Asia, the results indicate a very strong increase in tax revenues. In the case of halving entry costs, tax revenues could increase by 44%. Of course, this result relies on strong assumptions, such as the absence of evasion in the formal sector. Thus, this number should be seen as an upper bound of potential gains.

**Table 4: Reducing Formal Sector Entry Costs**

	$K_f = 1.4$	$K_f = 3$	$K_f = 4.5$	$K_f = 5.96$ (initial)
Unemployment	0.024	0.029	0.030	0.031
Informal sector	0.586	0.694	0.763	0.811
Average wage	1.115	1.060	1.024	1.000
Average productivity	1.410	1.238	1.105	1.000
Total tax revenue	1.830	1.442	1.185	1.000

Moving to the analysis of increasing enforcement of laws and regulations, which means that governments increase inspections on informal firms, Table 5 shows interesting results. Even though this policy is effective in reducing the size of the informal sector, it generates substantial increases in unemployment. This is intuitive, as a greater crackdown on informality means that less vacancies are created in the informal sector and, therefore, the probability of workers transiting out of unemployment decreases.

Importantly, for comparable reductions in the share of informality, the gains in total tax revenue are substantially lower than those obtained with reducing entry costs (Table 4). The reason for this difference is that reducing entry costs reduces a major deadweight loss in the economy, which leads to a substantial increase in total output, which is completely driven by an increase in formal sector's output. When there is greater

enforcement only without changes in the regulatory framework, two opposite forces are at play: (i) an increase in the costs of operating in the informal sector, which reduces the share of informal activities and leads to an increase in tax revenues; and (ii) a reduction in total output, which leads to a reduction in tax revenues. The first force dominates (there is a net increase in tax revenues), but the total gain is far less than the one obtained when reducing entry costs.

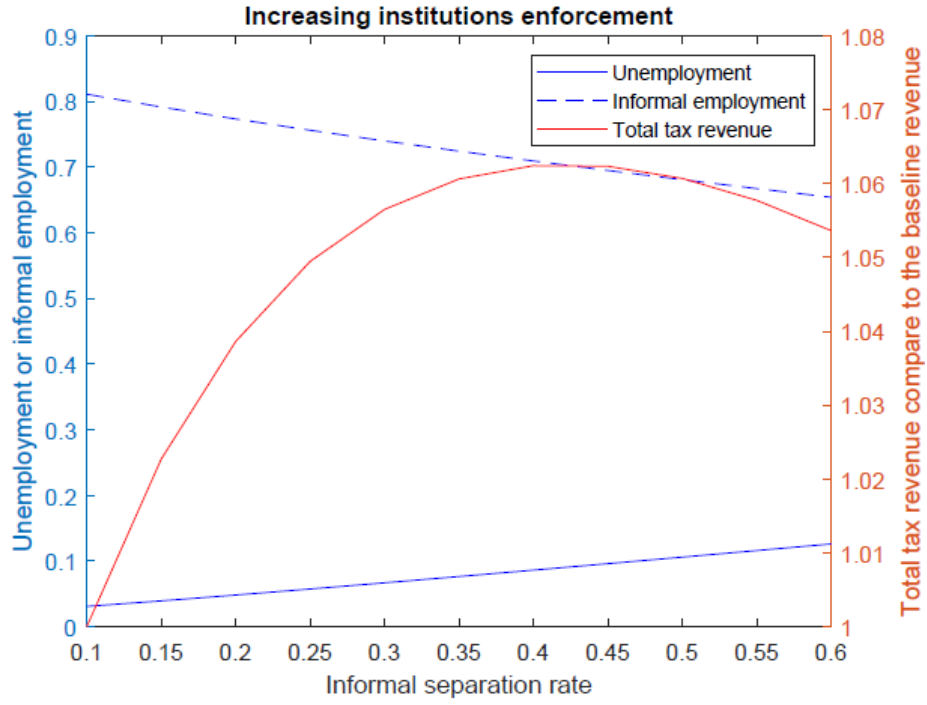
**Table 5: Increasing Enforcement**

	$s_i = 0.1$ (initial)	$s_i = 0.28$	$s_i = 0.5$
Unemployment	0.031	0.063	0.106
Informal sector	0.811	0.746	0.681
Average wage	1.000	1.020	1.037
Average productivity	1.000	1.064	1.107
Total tax revenue	1.000	1.054	1.061

Figure 5 illustrates this point by plotting unemployment (which is a proxy for economic activity in this model), informality rate, and tax revenues as a function of different levels of enforcement (here equated to informal sector's separation rate). Unemployment increases monotonically with enforcement intensity, but total tax revenues show an inverse-U shape, reaching a peak at about  $s_i = 0.4$ . After that, even though informality continues to decline, the negative effects on activity (unemployment) start dominating and the policy generates less and less gains in tax revenues, eventually leading to net reductions relative to the baseline

Tables 6 and 7 show the results of varying the profit and payroll taxes, respectively. The message from both tables is similar. Reducing either tax does not have any effect on unemployment and generates very limited reductions in informality rates. On the other hand, increasing taxes has a negative effect on the size of the formal sector.

Figure 5: Enforcement, Unemployment, and Tax Revenues



There seems to be a clearer Laffer Curve for profit taxes, as moderate increases in the tax rate can generate sizable increases on total tax revenues. However, a large increase in tax rates leads to a substantial decline in tax revenues. There seems to be more scope for increasing tax revenues via labor tax, as the responses in terms of higher informality are much lower than in the case of the profit tax. Nevertheless, these increases in payroll tax lead to substantial reductions in the average wage, which are led by lower formal wages.

Table 6: Changes in Profit Tax

	$\tau_{\pi} = 0.1$	$\tau_{\pi} = 0.15$	$\tau_{\pi} = 0.225$ (initial)	$\tau_{\pi} = 0.35$	$\tau_{\pi} = 0.7$
Unemployment	0.032	0.032	0.031	0.030	0.031
Informal sector	0.786	0.796	0.811	0.839	0.924
Average wage	1.012	1.007	1.000	0.987	0.943
Average productivity	1.076	1.048	1.000	0.905	0.556
Total tax revenue	0.678	0.825	1.000	1.150	0.556

**Table 7: Changes in Labor Tax**

	$\tau_{\omega} = 0.1$	$\tau_{\omega} = 0.15$	$\tau_{\omega} = 0.225$ (initial)	$\tau_{\omega} = 0.35$	$\tau_{\omega} = 0.7$
Unemployment	0.031	0.031	0.031	0.030	0.029
Informal sector	0.806	0.810	0.811	0.827	0.876
Average wage	1.003	1.001	1.000	0.992	0.968
Average productivity	1.008	1.002	1.000	0.975	0.877
Total tax revenue	0.898	0.973	1.000	1.224	1.348

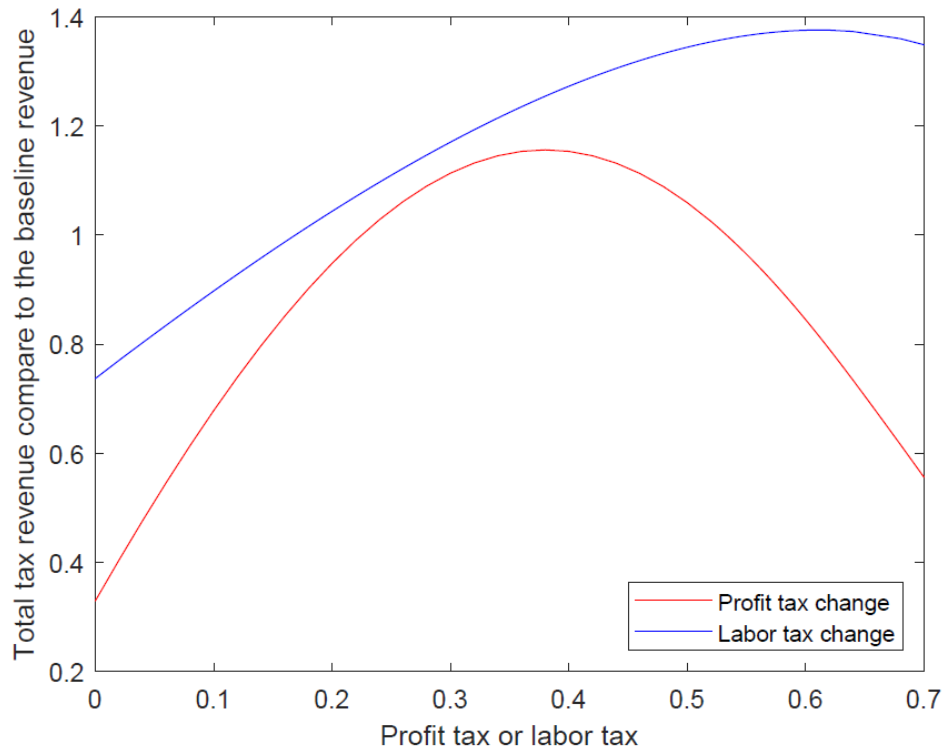
To further investigate to what extent developing Asia countries might be to the left side of the Laffer Curve (through the lenses of the model, of course), I plot total tax revenues for different values of the profit and labor tax rates. All tax revenues outcomes are normalized by revenues at baseline (which equals one). As Figure 6 indicates, the countries in the region seem to be quite to the left of the Laffer Curve, especially when it comes to the payroll tax. To make this point visually clear, Figure 7 plots countries in the region according to their labor and profit tax, vertical and horizontal lines denoting the Laffer Curves' peaks for the profit and labor taxes, respectively (observations are weighted by countries' size in terms of population). As it is clear from these pictures, it seems that these countries would still have scope to increase taxation if the sole goal is to increase tax revenues. However, if the goal is to reduce informality, increase output and tax revenues simultaneously, then these are not the ideal policies.

### **A. Analysis for Individual Countries**

This section reproduces the main counterfactuals discussed in section VI for the nine largest countries in the region.<sup>7</sup> Figure 8 shows that the different policies can have very heterogeneous effects across countries. Even though most countries show little effects in terms of unemployment responses to different policies, Nepal and Sri Lanka could observe more expressive declines in unemployment if entry costs were to be cut by half. Similarly, Sri Lanka would observe a substantial increase if the profit tax was doubled.

<sup>7</sup> As discussed in section III, the PRC is not included in the analysis because the ILO does not report information on labor informality for the country. More broadly, the Chinese economy is unique along many dimensions, and many of the discussions about informality and taxation are not well defined.

**Figure 6: Laffer curves – Profit and Labor Taxes**

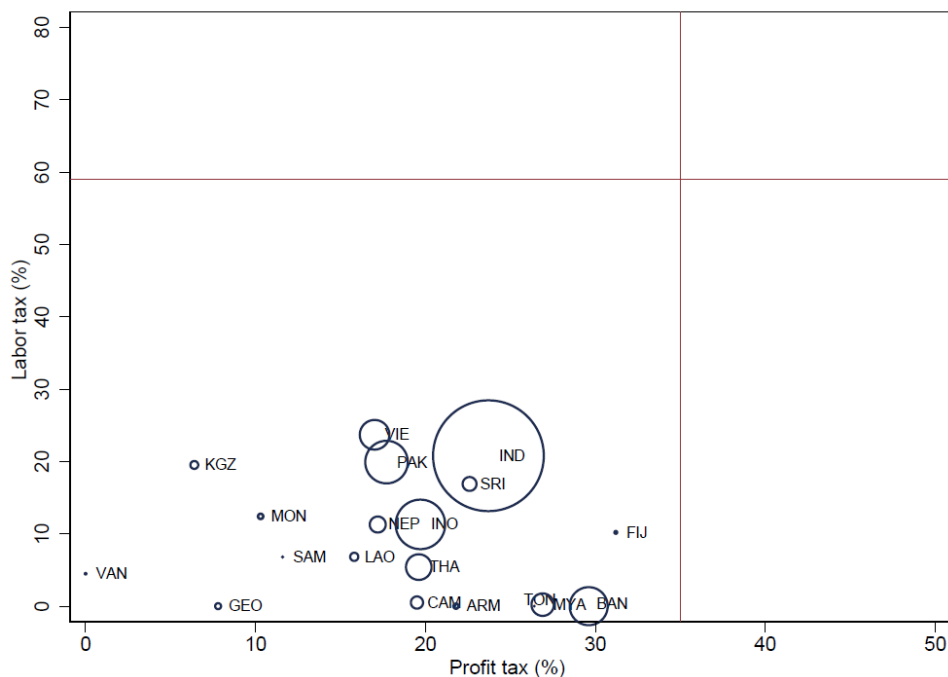


As discussed in section VI, the effects are much larger in terms of the size of the informal sector. However, there are also strong heterogeneous effects across countries. As Figure 8, panel B shows, the decline in the size of the informal sector as a response to halving formal sector's entry cost could range from 3.4 percentage points in Viet Nam, to 19.7 percentage points in Sri Lanka. The responses to doubling the profit tax are also strong (but less than the reduction in entry costs), but in the direction of increasing informality.

Interestingly, the relative intensity of informality effects does not translate one-to-one to the relative intensity of changes in tax revenues, as Figure 9 shows. Nevertheless, the countries that experience greater reductions/increases in informality (as shown in Figure 8, panel B) are those that tend to present the larger gains/losses in tax revenues. The effects of increasing the profit tax on informality and tax revenues are more detached, and the latter shows a stronger degree of heterogeneity across countries. Nevertheless, apart from Thailand, Figure 10 shows that there seems to be a negative correlation with the magnitude of the baseline profit tax, and the scope to produce

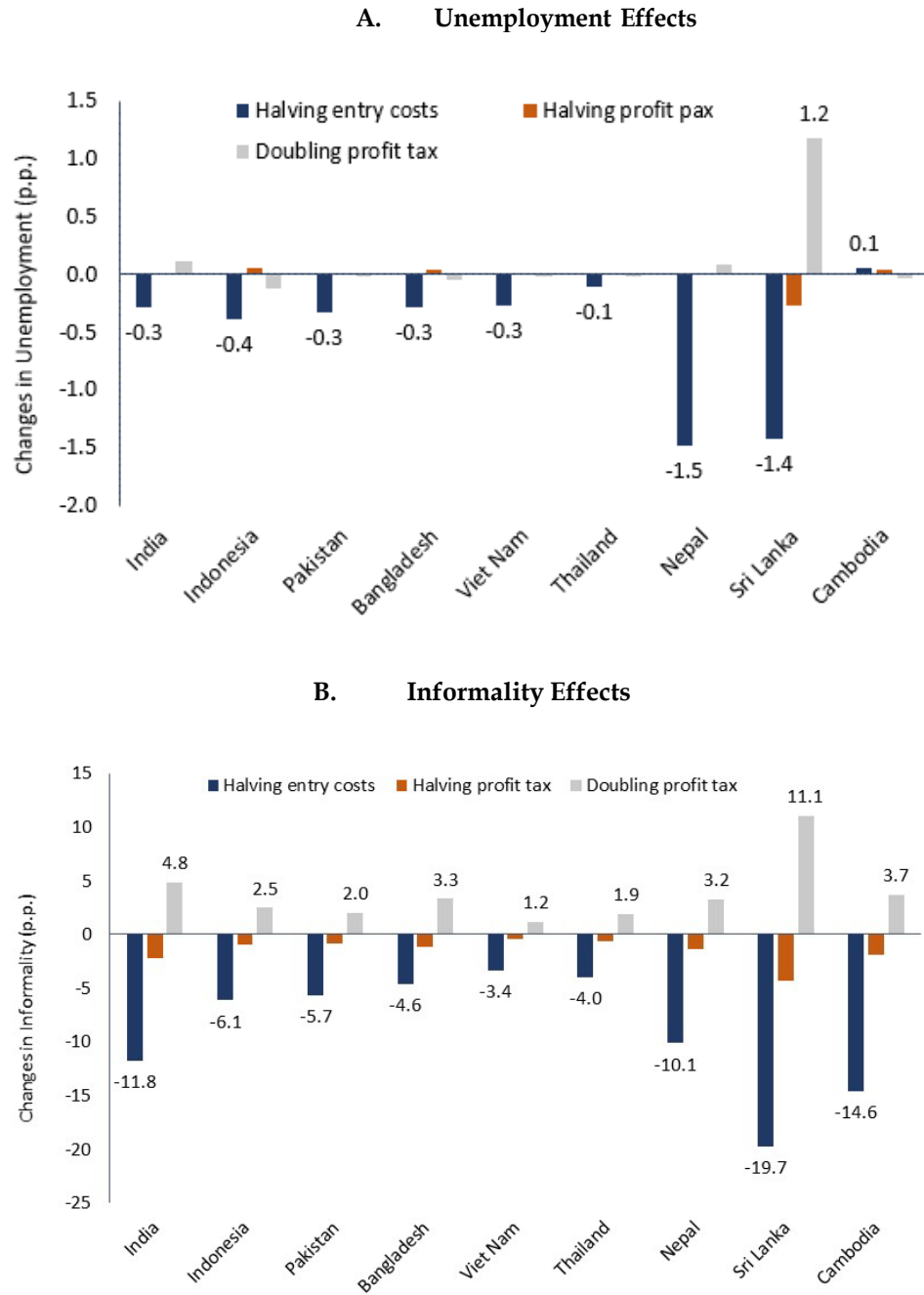
substantial tax revenues gains by increasing the tax rate, which is consistent with the Laffer Curve results from section VI.

**Figure 7: Distance to the Laffer curves' peaks**

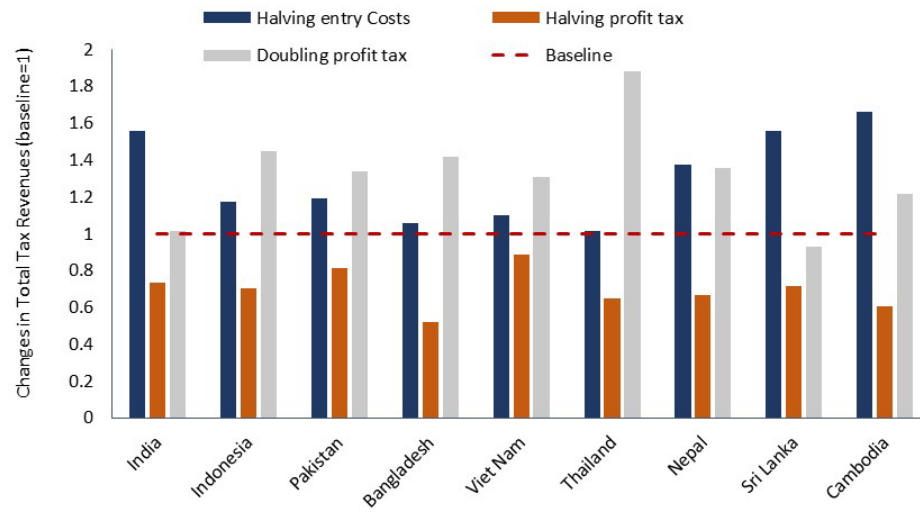


BAN = Bangladesh, CAM = Cambodia, FIJ = Fiji, GEO = Georgia, INO = Indonesia, KGZ = Kyrgyz Republic, LAO = Lao People's Dem. Rep., MYA = Myanmar, NEP = Nepal, PAK = Pakistan, SAM = Samoa, SRI = Sri Lanka, THA = Thailand, TON = Tonga, VAN = Vanuatu, VIE = Viet Nam.

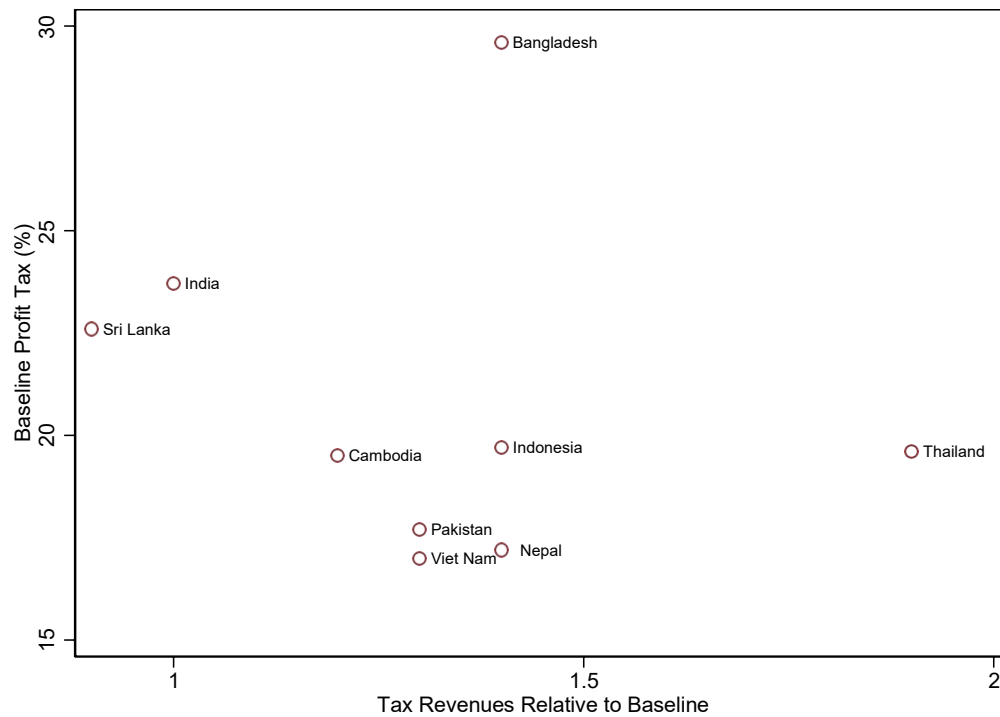
Figure 8: Country-Level Policy Results – Unemployment and Informality



**Figure 9: Country-Level Effects on Tax Revenues**



**Figure 10: Initial Profit Tax and Variations in Tax Revenues**





## VII. POLICY IMPLICATIONS

This paper analyzes the determinants of informality and taxation in developing Asian countries. Focusing on the policy counterfactuals, the results show that reducing entry costs is the best isolated policy to reduce informality, increase tax revenues, while concomitantly reducing unemployment, and increasing wages and productivity. Increasing enforcement is also very effective in reducing informality, but produces lower gains in tax revenues, while causing reductions in wages and leading to higher unemployment.

These results are based on a simple model and, therefore, should be seen as indicative of the potential effects of these different policies, rather than precise estimates of the expected magnitudes of these policies, if implemented. Importantly, the model used in the simulations does not have firm size and firm heterogeneity. This is important because it implies that the model does not account for composition effects from the different policies, nor does it allow reallocation of workers from less to more productive firms. In the case of reductions in entry costs, the absence of firm heterogeneity is likely to lead to an overstatement of the effects on tax revenues, as it does not account for the fact that, at the margin, this policy is likely to induce less productive firms to formalize. In contrast, it is likely to lead to an underestimation of the effects from greater enforcement, as it does not account for the fact that it might lead to a reallocation of resources from less productive informal firms to more productive formal ones.

Overall, the present results show that, even though most regulatory costs are not high in developing Asia, the same is not true for the costs of entry into the formal sector, which might explain a substantial fraction of the high informality levels observed in the region. Reducing these costs would reduce wasteful barriers to entry, which could lead to a virtuous cycle of lower informality, greater economic activity, higher wages, and higher tax revenues. The results from the literature suggest that greater enforcement is also likely to be needed, as otherwise compliance might remain low even if regulatory costs are reduced. Moreover, models with firm heterogeneity suggest that greater enforcement can produce positive effects on the economy via a reallocation of resources from less productive informal firms to more productive formal firms. Thus, a combination of reducing regulatory (entry) costs and increasing enforcement is likely the best policy mix to reduce informality, increase tax revenues, and foster economic development.

## A. DATA APPENDIX

The data used contains 88 low-income and middle-income countries. The 20 members of the Asian Development Bank are Armenia, Bangladesh, Cambodia, Fiji, Georgia, India, Indonesia, the Kyrgyz Republic, the Lao People's Democratic Republic, Mongolia, Myanmar, Nepal, Pakistan, Samoa, Sri Lanka, Thailand, Timor-Leste, Tonga, Vanuatu, and Viet Nam. The 68 non-Asian Development Bank members are Albania, Angola, Argentina, Barbados, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Burkina Faso, Burundi, Cabo Verde, Cameroon, Chad, Chile, Colombia, Congo Democratic Republic, Congo Republic, Costa Rica, Cote d'Ivoire, Djibouti, Dominican Republic, Ecuador, Egypt, Arab Republic, El Salvador, Eswatini, Ethiopia, Gambia, Ghana, Guatemala, Guyana, Honduras, Jordan, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mexico, Moldova, Mozambique, Namibia, Nicaragua, Niger, North Macedonia, Panama, Paraguay, Peru, the Russian Federation, Rwanda, Senegal, Serbia, South Africa, St. Lucia, Sudan, Suriname, Tanzania, Togo, Turkey, Uganda, Uruguay, West Bank and Gaza, Yemen Republic, Zambia, and Zimbabwe

The main variables used from the different data sources are.

- (i) Informal employment rate (%), International Labour Organization statistics.
- (ii) Unemployment rate (%), International Labour Organization statistics.
- (iii) Total labor force: people aged 15 and older who supply labor to produce goods and services during a specified period. It includes people who are employed currently and people who are unemployed but seeking work as well as first-time job-seekers (number of people), International Labour Organization statistics.
- (iv) Labor tax rate (in %): the government-mandated labor contributions that are borne by the business in the second year of operation, expressed as a share of commercial profit, Doing Business.
- (v) Profit tax (in %): the profit tax measures the amount of income taxes borne by the business in the second year of operation, expressed as a share of commercial profit, Doing Business.
- (vi) Total taxes (in %): the amount of taxes and mandatory contributions borne by the business in the second year of operation, expressed as a share of commercial profit, Doing Business.

- (vii) Time taken to prepare, and pay three major types of taxes and contribution (hours per year), Doing Business.
- (viii) The time of the median duration that business incorporation experts indicate is necessary for entrepreneurs to complete all procedures required to start and operate a business with minimum follow-up and no extra payments (calendar days), Doing Business.
- (ix) Registration costs (% of income per capita): total cost required for entrepreneurs to complete the procedures to incorporate and operate a business, Doing Business.
- (x) Gross domestic product per capita (constant 2010 US dollars), World Development Indicators.
- (xi) Total population, United Nations Population Division.
- (xii) Dummy for ADB member.
- (xiii) Share of informal firms (%): 100 minus the percent of firms that are formally registered when they started operations, World Bank Enterprise Surveys Indicators.
- (xiv) Percent of firms choosing access to finance as their biggest obstacle, World Bank Enterprise Surveys Indicators.
- (xv) Percent of firms choosing business licensing and permits as their biggest obstacle, World Bank Enterprise Surveys Indicators.
- (xvi) Percent of firms choosing corruption as their biggest obstacle, World Bank Enterprise Surveys Indicators
- (xvii) Percent of firms choosing labor regulations as their biggest obstacle, World Bank Enterprise Surveys Indicators
- (xviii) Percent of firms choosing practices of the informal sector as their biggest obstacle, World Bank Enterprise Surveys Indicators.
- (xix) Percent of firms choosing tax administration as their biggest obstacle, World Bank Enterprise Surveys Indicators.
- (xx) Percent of firms choosing tax rates as their biggest obstacle, World Bank Enterprise Surveys Indicators.

- (xxi) Bribery incidence: percent of firms experiencing at least one bribe payment request, World Bank Enterprise Surveys Indicators
- (xxii) Percent of firms expected to give gifts in meetings with tax officials, World Bank Enterprise Surveys Indicators.
- (xxiii) Percent of firms expected to give gifts to get an operating license, World Bank Enterprise Surveys Indicators.
- (xxiv) Percent of firms identifying corruption as a major constraint, World Bank Enterprise Surveys Indicators.

## B. MODEL DETAILS

The following equations represent the present discounted value of a filled vacancy in formal and informal sectors, respectively, and of an unfilled vacancy in both sectors:

$$rJ_f = (1 - \tau_\pi) (p_f - w_f) - s_f (J_f - V_f) \quad (1)$$

$$rJ_i = p_i - w_i - s_i (J_i - V_i) \quad (2)$$

$$rV_j = q_j (J_j - V_j) \quad (3)$$

where  $\tau_\pi i$  denotes the tax on profits.

As for workers, the following equations depict the present discounted value of being employed in the formal and informal sectors, respectively, and of being unemployed (common to all workers):

$$rE_f = (1 - \tau_w) w_f - s_f (E_f - U) + s_f b \quad (4)$$

$$rE_i = w_i - s_i (E_i - U) \quad (5)$$

$$rU = \lambda_f (E_f - U) + \lambda_i (E_i - U) \quad (6)$$

where  $\tau_w$  denotes the payroll tax and  $b$  denotes the unemployment benefit, which is only received when workers are separated from their formal firms;  $s_f$  and  $s_i$  denote the exogenous separation rates in the formal and informal sectors, respectively.

Wage determination is assumed to follow a Nash bargain over the match surplus.

The first order conditions of the bargain imply that formal and informal wages must respect the following conditions:

$$(1 - \varphi_s) (E_s - U) = \varphi_s (J_s - V_s)$$

where  $\varphi_f$  and  $\varphi_s$  denote workers' bargaining power coefficients in the formal and informal sectors, respectively.

Finally, there is free entry, which means that the value of creating a vacancy must be equal to the entry cost,  $rV_j = rK_j$ .

## REFERENCES

- Allen, J., S. Nataraj, and T. C. Schipper. 2018. Strict Duality and Overlapping Productivity Distributions Between Formal and Informal Firms. *Journal of Development Economics* 135, 534–554.
- Auriol, Emmanuelle and Michael Warlters. 2005 Taxation Base in Developing Countries. *Journal of Public Economics* Vol. 89, No. 4, pp. 625–46.
- Besley, T. and T. Persson. 2010. State Capacity, Conflict, and Development. *Econometrica* 78(1), 1–34.
- Bruhn, M. and D. McKenzie. 2014. Entry Regulation and the Formalization of Microenterprises in Developing Countries. *The World Bank Research Observer* 29 (2), 186–201.
- Charlot, O., F. Malherbet, and C. Terra. 2015. Informality in Developing Economies: Regulation and Fiscal Policies. *Journal of Economic Dynamics and Control* 51, 1–27.
- Cisneros-Acevedo, C. 2019. *Unfolding Trade Effect in Two Margins of Informality. The Peruvian Case*. Job Market Paper, University of Nottingham.
- Cruces, G., G. Porto, and M. Viollaz. 2018. Trade Liberalization and Informality in Argentina: Exploring the Adjustment Mechanisms. *Latin American Economic Review* 27(1), 13.
- de Andrade, G. H., M. Bruhn, and D. McKenzie. 2014. *A Helping Hand or the Long Arm of the Law? Experimental Evidence on What Governments Can Do to Formalize Firms*.
- de la Parra, B. 2016. *Formal Firms, Informal Workers and Household Labor Supply in Mexico*. Job Market Paper, University of Chicago.
- de Paula, A. and J. A. Scheinkman. 2010. Value-Added Taxes, Chain Effects, and Informality. *American Economic Journal: Macroeconomics* 2(4), 195–221.
- De Paula, A. and J. A. Scheinkman. 2011. The Informal Sector: An Equilibrium Model and Some Empirical Evidence. *Review of Income and Wealth* 57, S8–S26.
- De Soto, H. 1989. *The Other Path*. New York: Harper e Row.
- D’Erasmus, P. and H. Boedo. 2012. Financial Structure, Informality and Development.

*Journal of Monetary Economics* 59 (3), pp. 286–302.

- Dix-Carneiro, R., P. K. Goldberg, C. Meghir, and G. Ulyssea. 2021. *Trade and Informality in the Presence of Labor Market Frictions and Regulations*. No. w28391. National Bureau of Economic Research.
- Djankov, S., R. L. Porta, F. Lopez-de Silanes, and A. Shleifer. 2002. The Regulation of Entry. *The Quarterly Journal of Economics* 117 (1), pp. 1–37.
- Goldberg, P. K. and N. Pavcnik 2003. The Response of the Informal Sector to Trade Liberalization. *Journal of Development Economics* 72 (2), 463–496.
- Haanwinckel, D. and R. R. Soares. 2016. Workforce Composition, Productivity, and Labor Regulations in a Compensating Differentials Theory of Informality. IZA DP No. 9951.
- Hsieh, C.-T. and B. Olken. 2014. The Missing "Missing Middle". *Journal of Economic Perspectives* 28 (3), 89–108.
- Kanbur, R. and Keen, M. 2015. Reducing Informality. *Finance and Development* Vol. 52, No. 1 (March).
- La Porta, R. and A. Shleifer. 2008. The Unofficial Economy and Economic Development. *Brooking Papers on Economic Activity* 105 (3), 473–522.
- La Porta, R. and A. Shleifer. 2014. Informality and Development. *The Journal of Economic Perspectives* 28 (3), 109–126.
- McCaig, B. and N. Pavcnik. 2018. Export Markets and Labor Allocation in a Low-Income Country. *American Economic Review* 108 (7), 1899–1941.
- Meghir, C., R. Narita, and J.-M. Robin. 2015. Wages and Informality in Developing Countries. *The American Economic Review* 105 (4), 1509–1546.
- Naritomi, J. 2018. *Consumers as Tax Auditors*.
- Paz, L. S. 2014. The Impacts of Trade Liberalization on Informal Labor Markets: A Theoretical and Empirical Evaluation of the Brazilian Case. *Journal of International Economics* 92 (2), 330–348.
- Perry, G., W. Maloney, O. Arias, P. Fajnzylber, A. Mason, and J. Saavedra-Chanduvi 2007. *Informality: Exit or Exclusion*. Washington, DC: World Bank.

- Ponczek, V. and G. Ulyssea. 2021. Enforcement of Labor Regulation and the Labor Market Effects of Trade: Evidence from Brazil. *Economic Journal*.
- Schneider, F. 2005. Shadow Economies Around the World: What Do We Really Know? *European Journal of Political Economy* 21 (3), 598–642.
- Ulyssea, G. 2010a. The Formal-Informal Labor Market Segmentation Hypothesis Revisited. *Brazilian Review of Econometrics* 30 (2), 311–334.
- Ulyssea, G. 2010b. Regulation of Entry, Labor Market Institutions and the Informal Sector. *Journal of Development Economics* 91, 87–99.
- Ulyssea, G. 2018. Firms, Informality, and Development: Theory and Evidence from Brazil. *American Economic Review* 108 (8), 2015–47.
- Ulyssea, G. 2020. Informality: Causes, and Consequences for Development. *Annual Review of Economics* 12, 525–546.