Volume 38, Issue 2

Informality and exogenous regulations in regional economies

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Abstract

Higher taxation typically requires greater enforcement of formality to prevent tax evasion. However, in low productivity regional economies, exogenous regulations can severely constrain the size of the formal sector regardless of local government policies. As a result, tax rates can be higher, but possibly with weaker enforcement compared to an autonomous economy case. In addition, if there is significant labor mobility across borders, regional governments must take into account how the migration of different types of workers affects the regional economy.

1 Introduction

Producers may choose to operate informally to avoid taxation, regulation, and/or financial and legal constraints. In response, governments typically adopt punitive measures to prevent tax evasion and informality, but enforcement is costly and legal actions are often ineffective in countries with poor institutions. Schneider and Enste (2000) provided estimates for the size of the informal sector across countries, finding large rates of informality in less developed economies in Africa, Latin America, and Southeast Asia. Significant informal production (above 20% of GDP) was also found in some developed economies like Greece, Italy, Spain, Portugal, and Belgium.

The literature on how informality arises and its implications to the economy has expanded in the last two decades, taking into account different institutional and technological factors along with policy responses to increase social welfare.[1] However, the existent studies consider closed economies and immobile production factors. This paper presents a simple model of regional open economies constrained by exogenous production regulations. In the context of this model, regional economies include from local governments subject to state or federal laws to countries subject to international agreements or restrictions (e.g., members of the European Union or Word Trade Organization). Examples of such exogenous regulations include minimum wage laws and regulations on work conditions, immigration, pollution control, sanitary and phytosanitary measures (SPS), and quality standards. Each region is assumed to be too small to have any influence on the choice of such regulations, that is, a region's policies do not affect these regulations.

Typically, higher taxation requires stronger enforcement to prevent informality. However, in low productivity regional economies, exogenous regulations can severely constrain the size of the formal sector, so that changes in regional policies have no effect on formality as long as the regulations are binding. Consequently, taxation tends to be higher, but enforcement may be lower, saving resources and allowing informal workers to earn more. For instance, Figure 1 shows that, among a sample of OECD and emergent economies, enforcement efforts tend to rise with taxation, but Latin America and African economies have lower enforcement than richer economies for the same tax rate (OECD 2015, using data from 2010 and 2013).

Labor mobility is another important factor in policy making in regional economies. On one hand, competition for formal workers implies that policies should favor formal workers, with lower tax rates. On the other hand, if informal workers have a negative contribution to the economy, policies will be less favorable to them, with a reduction in the provision of public goods and an increase in the enforcement of formality.

In the next Section, the model setup is described. Section 3 introduces exogenous regulations. A numerical simulation is presented to help understand the effects of exogenous regulations on tax and enforcement policies. In Section 4, the effects of labor mobility is discussed. Section 5 concludes.

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[1]This literature includes, among others, De Soto (1989), Rauch (1991), Fortin, Marceau, and Savard (1997), Dessy and Pallage (2003), Straub (2005), Amaral and Quentin (2006), Antunes and Cavalcanti (2007), Dabla-Norris, Gradstein, and Inchauste (2008), Prado (2011), La Porta and Shleifer (2014), Mendicino and Prado (2014), Kuehn (2014), and Arbex, Mattos, and Ogura (2015).

Figure 1: Tax rate and enforcement
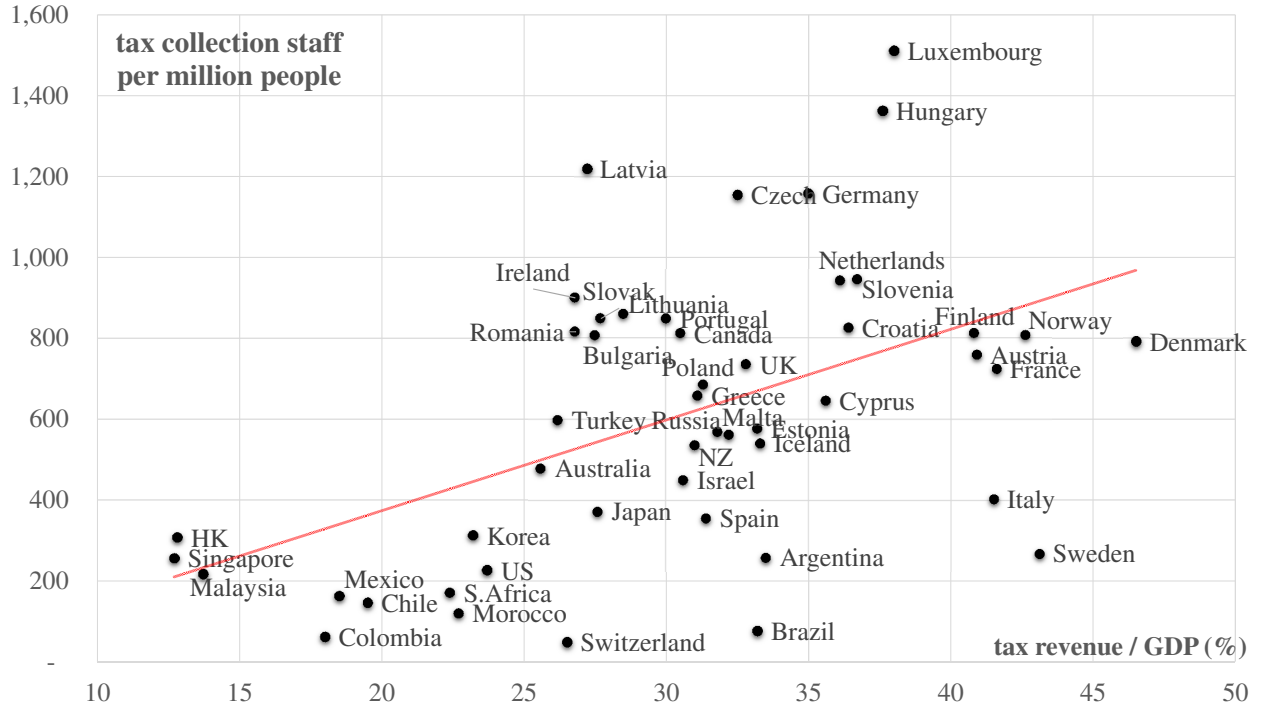
Source: OECD (2015), based on national tax revenue and full time equivalent staff.

2 Setup

Households: Each household has one worker who supplies one unit of labor, characterized by a productivity $h \in [0,1]$, with uniform distribution. Households derive utility from a private good c, with a price normalized to 1, and a government provided public good G. To simplify, assume a quasilinear function:

$$u = c + \phi v(G) \,, \tag{1}$$

where $v' > 0$, $v'' < 0$, and $\phi > 0$ is a scalar for the marginal utility of G.[2]

Production: Formal firms produce an output $y^F(h) = Ah$ using labor, where $A > 0$ is a scalar representing the economy productivity level, subject to taxation t, with $0 \leq t \leq 1$. Informal firms pay no taxes and disregard regulations, but are inherently inefficient (e.g., due to financial, legal, or other constraints), with output $y^I(h) = (1 - \alpha)Ah$, where $0 < \alpha < 1$ is the inefficiency factor. Informal producers also incur an increasing concealment cost $\gamma c(h)$, where $c'(h) > 0$, $c''(h) > 0$, and $\gamma > 0$ is a scalar for the strictness of government enforcement. This γ can be interpreted as a measure of the frequency or strictness of random inspections, affecting the concealment cost of informal production.

Due to constant returns, the formal wage rate is $w^F(h) = (1 - t)Ah$ and the informal wage is $w^I(h) = (1 - \alpha)Ah - \gamma c(h)$. A worker with productivity h prefers formal employment if $w^F(h) \geq w^I(h)$, i.e., if $(\alpha - t)Ah + \gamma c(h) \geq 0$, where the left-hand-side represents

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[2]Labor supply is assumed to be inelastic, without effort cost. If effort was required, some households may not supply labor, preferring to depend exclusively on the public good G if possible.

the formality advantage. If $\alpha \geq t$, formality would always be preferred, but for the sake of practicality this case will be ignored hereafter. Thus, there is a threshold $\bar{h}$ such that workers are informally employed if $h \leq \bar{h}$.[3] At this threshold, we must have $w^F(\bar{h}) = w^I(\bar{h})$:

$$(t - \alpha)A\bar{h} - \gamma c(\bar{h}) = 0. \tag{2}$$

From (2), we can show that $d\bar{h}/dt > 0$ (higher t expands informality) and $d\bar{h}/d\gamma < 0$ (higher γ hinders informality).

Since workers with $h \geq \bar{h}$ are employed formally, aggregate formal production is $Y^F = \int_{\bar{h}}^1 Ah \, dh = \frac{1}{2}A(1 - \bar{h}^2)$. Analogously, aggregate informal production is $Y^I = \int_0^{\bar{h}} [(1 - \alpha)Ah - \gamma c(h)] \, dh = \frac{1}{2}(1 - \alpha)A\bar{h}^2 - \gamma C(\bar{h})$, where $C(\bar{h}) = \int_0^{\bar{h}} c(h) \, dh$.

3   Government policy analysis

The social planner's objective is to maximize a utilitarian welfare function defined as:

$$W = Y^I + (1 - t)Y^F + \phi v(G) . \tag{3}$$

Revenue R from taxation equals $R = tY^F = \frac{1}{2}tA(1 - \bar{h}^2)$, but there is a cost $z(\gamma)$ to enforce formality, where $z' > 0$, $z'' > 0$, and γ is the degree of enforcement explained before. Hence, the planner's problem can be written as:[4]

$$\underset{\{t,\gamma\}}{Max W} \quad \text{subject to} \quad G = R - z(\gamma). \tag{4}$$

Without regulations, the optimality condition for t is, using equality (2):

$$\left[\frac{1}{2}A(1 - \bar{h}^2) - tA\bar{h}\frac{d\bar{h}}{dt}\right]\phi v'(G) = \frac{1}{2}A(1 - \bar{h}^2), \tag{5}$$

which balances the taxation tradeoff between more G (assuming R rises with t) and less private consumption of formal workers. Rewriting (5), we get:

$$\phi v'(G) = \frac{\frac{1}{2}A(1 - \bar{h}^2)}{\left[\frac{1}{2}A(1 - \bar{h}^2) - tA\bar{h}\frac{d\bar{h}}{dt}\right]}, \tag{6}$$

where the left hand side represents the marginal rate of substitution of G for c ($MRS_{G,c} = \phi v'(G)$). Equation (6) shows that, due to the informality threat (i.e., due to $d\bar{h}/dt > 0$), G is underprovided since the $MRS_{G,c}$ is less than 1, which is the marginal rate of transformation.

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[3]The $w^I(h)$ curve is assumed monotonic in the relevant range (below $\bar{h}$) to avoid the possibility of underemployment, i.e., choosing a lower skill job.

[4]The model ignores other informality issues besides tax evasion like labor exploitation, unfair competition, and unsafe quality, but they could be easily incorporated by increasing the social desirability of enforcement.

Since some enforcement is needed, the interior optimal γ is given by:

$$\left[-At\bar{h}\frac{d\bar{h}}{d\gamma} - z'(\gamma)\right]\phi v'(G) = C(\bar{h}) + \left[\alpha A\bar{h} + \gamma c(\bar{h})\right]\frac{d\bar{h}}{d\gamma}, \tag{7}$$

which reflects the tradeoff between more G (from additional formality) and less private consumption of informal workers (from the higher concealment cost). Thus, γ should stop being raised when either the marginal gain in G becomes too small or the aggregate concealment cost $C(\bar{h})$ and/or the enforcement cost $z(\gamma)$ become(s) too large.

3.1 Exogenous production regulations

Now, let's consider a regional economy subject to exogenous regulations requiring a minimum production value $\hat{y}$ from each unit of labor (e.g., a minimum wage or minimum quality requirement). First, if $y^F(\bar{h}) \geq \hat{y}$, the regulation is not binding and previous results hold. With a binding regulation, the marginal formal worker has a productivity $\hat{h}$, such that $y^F(\hat{h}) = \hat{y}$, and workers with $h \geq \hat{h}$ are employed formally. As long as the regulation is binding (i.e., $\bar{h}=\hat{h}$), the tax policy does not marginally affect $\bar{h}$, so the new optimal t for problem (4) is given by:

$$\phi v'(G)\left[\frac{1}{2}A(1 - \hat{h}^2)\right] = \frac{1}{2}A(1 - \hat{h}^2) \qquad \Rightarrow \qquad \phi v'(G) = 1. \tag{8}$$

Since G is not underprovided anymore ($MRS_{G,c} = 1$), t tends to be larger than before.

Normally, as t rises, enforcement has to be increased. But as long as the size of the formal sector is determined by the binding regulation, γ has no effect on it, so that $dW/d\gamma = -z'(\gamma)\phi v'(G) - C(\hat{h}) < 0$, i.e., higher γ would be wasteful. Intuitively, if γ made $w^I(\hat{h})$ lower than $w^F(\hat{h})$, it would be ineffective as workers below $\hat{h}$ cannot work formally anyway. Thus, γ should be just high enough so that $w^I(\hat{h}) = w^F(\hat{h})$:

$$(1 - \alpha)A\hat{h} - \gamma c(h) = (1 - t)A\hat{h} \qquad \Rightarrow \qquad \gamma = A\hat{h}\frac{(t - \alpha)}{c(\hat{h})}. \tag{9}$$

Unfortunately, because t and γ are chosen together, it is not clear whether the optimal γ will be smaller. However, in low productivity economies, the constraining effect of the exogenous regulation is much stronger, so that the need for stronger enforcement is less likely. Also, the population of informal workers would be much larger in that type of economy, so that a lower γ would have a larger social benefit. To help clarify how policies are affected by binding exogenous regulations, a numerical example is presented next.

Another interesting result is that low skilled workers may be helped by the resulting government policy changes when a binding regulation is introduced. On one hand, the exogenous regulation allows higher taxation, so the provision of the public good (G) may increase. On the other hand, because enforcement of formality may decrease, informal workers' net income (w^I) could rise.

It should be noted that the analysis above assumes perfect enforcement of the exogenous regulation, with zero marginal cost of enforcing compliance (that is, the enforcement cost

is fixed, with full compliance). In reality, it is possible that firms could remain formal (i.e., paying taxes) without being in compliance with the exogenous regulation. It is also possible that regulation is not fully enforced due to increasing costs of doing so. In this case, the government would have to balance the additional tax revenues received from the non-complying firms to the additional costs of enforcing tax payments and the exogenous regulation. The optimal t would likely be lower while the optimal γ would be higher to incentivize non-complying firms to pay taxes. Again, the results are not clear as there would be now three government policies (taxation, enforcement of taxation, and enforcement of the exogenous regulation) that are chosen together.

3.2   Numerical analysis

In this example, the utility function is assumed to be quasilinear, with a logarithmic term for G: $u(h) = w(h) + \phi log(G)$. The informality concealment cost and the government enforcement cost are quadratic functions: $c(h) = \mu h^2$ and $z(\gamma) = b\gamma^2$, respectively, where μ and b are scalars. The parameters are: $\alpha = 0.15$ (15% inefficiency of informality), $\mu = 1$ (higher μ raises the concealment cost), and $b = 0.05$ (higher b raises the enforcement cost).[5]

First, consider the case without exogenous regulations. Results are shown in Table I for varying levels of A and ϕ. As expected, higher A helps tax collection, so t and γ are lower, while higher ϕ induces higher t and γ. Accordingly, the informality sector size $\bar{h}$ decreases with A and rises with ϕ.

Table I: Taxation, enforcement, and informality without exogenous regulation

	ϕ=0.5:	ϕ=0.75:	ϕ=1:
A=2:	(0.28, 0.79, 0.342)	(0.36, 1.06, 0.405)	(0.42, 1.23, 0.437)
A=3:	(0.18, 0.48, 0.207)	(0.24, 0.85, 0.323)	(0.28, 1.06, 0.373)
A=4:	(0.15, 0.14, 0.046)	(0.18, 0.55, 0.207)	(0.21, 0.84, 0.294)

The values represent $(t, \gamma, \bar{h})$. Note that $\bar{h}$ represents the proportion of informal workers, not their production share (in the [A=2, ϕ=0.5] case, while $\bar{h} = 0.342$, the informal production share is only 9.1%).

Now, consider an exogenous regulation set to $\hat{y} = 1.5$, high enough to be binding. Because the binding regulation constrains the size of the formal sector, t tends to increase (see the new values in Table II), as explained before. For higher productivity of the economy (A=3 or A=4), γ has to rise to keep regulation-binding workers employed in the formal sector. For instance, developed economies (high A) with low demand for G (low ϕ) end up with low t and low informality, and thus low γ, while developed economies with high demand for G (high ϕ) end up with higher t and thus more informality and higher γ.

However, for low productivity economies (A=2), γ becomes lower despite the higher tax rate t, as theorized before. That is, in this example, poor economies can end up with high t and large informal sectors, but not necessarily with stronger enforcement.

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[5]The parameters were chosen so that the results for tax rates (t), size of the informal sector, and spending on enforcement fall on realistic ranges. For instance, based on the results in Tables I and II, t varies from near 15% to 55%, while the informal share of total production ranges from near 0% to 46% and the spending on enforcement ranges from near 0% to 8% of total production. The parameters chosen also ensure that the second order conditions for welfare maximization are satisfied.

Table II: Taxation, enforcement, and informality with exogenous regulation

	$\phi=0.5$:	$\phi=0.75$:	$\phi=1$:
A=2:	(0.41, 0.69, 0.750)	(0.5, 0.93, 0.750)	(0.55, 1.08,0.750)
A=3:	(0.26, 0.64, 0.500)	(0.31, 0.95, 0.500)	(0.34, 1.15,0.500)
A=4:	(0.19, 0.46, 0.375)	(0.22, 0.77, 0.375)	(0.24, 0.96,0.375)

The values represent $(t, \gamma, \bar{h})$.

Figure 2 depicts results for $[A=2, \phi=0.5]$. In panel (a), without exogenous regulation, the size of the formal sector is determined by the intersection of the formal and informal wage curves. In panel (b), the binding regulation severely constrains the size of the formal sector. The result is a higher t on the smaller formal sector, but a lower enforcement γ, set to a level that is just high enough to prevent informality from expanding beyond $\hat{h}$.

Figure 2: Informality, taxation, and enforcement

(a) No regulation case: (b) Exogenous regulation case:
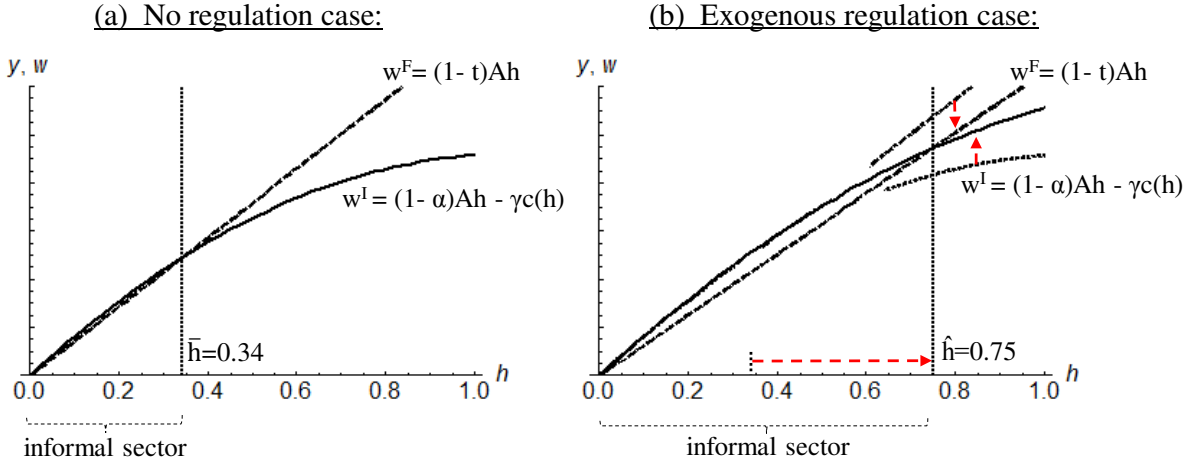
In Panel (a), informality extends to $\bar{h}=0.34$, where the w^I and w^F curves intersect. In Panel (b), the binding regulation expands informality to $\hat{h}=0.75$, resulting in higher t (w^F goes down), but lower γ (w^I rises).

4   Labor mobility

Regional government policies are often affected by labor mobility. In the model above, equation (1) implies that an informal worker's utility is given by:

$$u^I(h) = (1 - \alpha)Ah - \gamma c(h) + \phi v(G) , \qquad (10)$$

so she clearly prefers higher t (assuming G rises with t) and lower γ (which helps raise her private consumption).

For formal workers, utility is given by:

$$u^F(h) = (1 - t)Ah + \phi v(G) , \qquad (11)$$

which decreases with t, but rises with G. The higher the h, the larger the private cost of taxation for the same G. Hence, very high skilled workers are likely to want to move to a region with lower t, but lower skilled workers would prefer higher G, perhaps even if they have to pay more taxes. The optimal policies depend on how each group is affected and how mobile it is, which depends on migration costs.[6]

If high skilled workers are heavily burdened by taxation and are highly mobile, regional governments may need to reduce t to avoid a loss of formal production. This would lower the provision of G, hurting especially low skilled workers. To compensate, governments may lower enforcement to save resources and to allow informal workers to earn more.

In practice, if informal workers are numerous, their presence can lead to issues like congestion, unfair competition, and greater tax burden on formal producers. Hence, governments would discourage their inflow by raising enforcement and/or reducing G. A similar result was found by Bandyopadhyay and Pinto (2017), who concluded that the mobility of unauthorized immigrants would lead to overprovision of regional enforcement, but underprovision of regional public goods.

However, informal production in some regions may have a net positive contribution, so governments may be willing to support informal workers through more G and/or less enforcement. For instance, Breman (1996) studied the regional migration of millions of informal laborers in India seeking temporary jobs in farming, mining, manufacturing, urban services, etc., which support the formal economy, with no enforcement of formality by local governments. Also, Passel and Cohn (2015) find large shares of low skilled unauthorized immigrants employed in some industries in the U.S., while jurisdictions known as "sanctuary" states or cities choose to not enforce federal immigration laws in order to help immigrants to integrate into their communities (ILRC 2016).

5   Conclusion

In economies with informality, higher tax rates and stronger enforcement of taxation usually go together because more enforcement is needed to avoid evasion when tax rates are higher. However, regional economies are subject to exogenous regulations that constrains the size of the formal sector, regardless of tax or enforcement policies. With binding regulations, stronger enforcement becomes ineffective, so taxation can be higher while enforcement may even be weaker compared to the case without exogenous regulations. Interestingly, if that is the case, informal workers may be helped by the introduction of such regulations as they may benefit from greater provision of public goods and lower concealment costs.

Labor mobility across regions also changes the incentives to enforce formality depending on how informal workers contribute to the overall economy. Empirical research is needed to understand how the migration and economic contribution of informal workers affect government policies in reality. Discrimination against immigrants may also play a role, which must be taken into account in empirical studies.

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[6]In practice, governments can engage in regressive taxation or policy discrimination to attract or repel specific groups of workers. It can also increase the transaction costs of mobility through border barriers and legal measures against non-natives (imprisonment, deportation, housing restrictions, etc.).

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