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# The Economics
# of the Informal Sector

## A Simple Model and Some Empirical
## Evidence from Latin America

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An increase in the size of the informal sector hurts growth by reducing the availability for public services for everyone in the economy and increasing the number of activities that use some existing public services less efficiently or not at all.

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## Summary findings

Loayza presents the view that informal economies arise when governments impose excessive taxes and regulations that they are unable to enforce.

Loayza studies the determinants and effects of the informal sector using an endogenous growth model whose production technology depends essentially on congestable public services. In this model, changes (in both policy parameters and the quality of government institutions) that promote an increase in the relative size of the informal economy will also generate a reduction in the rate of economic growth.

Using data from Latin American countries in the early 1990s, Loayza tests some of the model's implications and estimates the size of the informal sector in these countries — identifying the size of the informal sector to latent variable for which multiple causes and indicators exist.

The results suggest that:

• The size of the informal sector depends positively on proxies for tax burden and restrictions on the labor market.

• It depends negatively on a proxy for the quality of government institutions.

• An increase in the size of the informal sector hurts growth by reducing the availability of public services for everyone in the economy and by increasing the number of activities that use some existing public services less efficiently or not at all.

# THE ECONOMICS OF THE INFORMAL SECTOR
## A Simple Model and Some Empirical Evidence from Latin America

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# INTRODUCTION

The presence of large informal sectors is one of the most important characteristics of developing countries. The study of the informal economy is important inasmuch as it sheds light on how the state's regulatory and enforcement systems affect economic performance.

There are a few different definitions and approaches to the study of the informal sector in the development economics literature.[1] This paper's approach follows the work by Hernando de Soto (1989)[2], according to which the informal sector is defined as the set of economic units that do not comply with government-imposed taxes and regulations. As Portes, Castells, and Benton (1989, p. 12) put it, "The informal economy is ... a process of income-generation characterized by one central feature: *it is unregulated by the institutions of society, in a legal and social environment in which similar activities are regulated.*"

The informal sector arises when excessive taxes and regulations are imposed by government that lack the capability to enforce compliance. An excessive regulatory system makes the formal economy unattractive by imposing high entry costs to legality -through license fees and registration requirements- and high costs to remain legal -through taxes, red tape, and, among others, labor and environmental regulations.

However, escaping taxes and regulations is not costless. An informal status entails many disadvantages. Informal activities are subject to stiff penalties in the form of fines or capital confiscation. Furthermore, because of their illegal status, informal agents do not fully enjoy public services, particularly those that allow them full, enforceable property

rights over their capital and output. This has a number of negative consequences: First, informal producers are poorly protected by the police and the judicial courts from crimes committed against their property. Second, since they lack the capacity to enter into legally binding contractual obligations, their access to capital markets, for financial, insurance, and corporative purposes, is seriously impaired. Lastly, they find obstacles to use other public services such as social welfare, skill training programs, and government-sponsored credit facilities.

The state, as the institution that both monitors the regulatory and enforcement systems and administers public services, plays a crucial role in the formation of informal economies. If state officials, or interest groups related to them, profit in some way from the presence of the informal sector, they will create an environment that makes informality attractive or simply unavoidable. To the extent that excessive regulations are created to benefit particular interest groups and not society in general, the presence of the informal sector is a result of the failure of political institutions to protect and promote an efficient market economy.

This paper attempts to organize the current information on the determinants of the informal sector and its effect on economic growth through, first, a simple endogenous growth model and, second, empirical evidence from Latin America. The next section describes the main determinants and features of the informal sector.[3] Then, the paper models the presence of the informal sector in the economy and its relationship to output growth within the framework of the endogenous growth literature,[4] specifically, the work in which government's provision of public goods and services is considered explicitly, as

in Barro (1990) and Barro and Sala-i-Martin (1992). The empirical section of the paper uses data from Latin American countries to test some of the implications of the model and to provide estimates of the relative size of the informal sector throughout these countries.

## THE RATIONALITY OF BEING INFORMAL

Economic units choose to be partially or completely informal by weighing the costs and benefits a legal status entails and considering their particular institutional and resource constraints. In this sense, the choice to be informal is a rational one, a fact which does not imply that some firms are not forced by their constraints to be either formal or informal.

The costs and benefits of legality are now analyzed in detail. The presentation adopts de Soto's analytical framework as well as some of his reported evidence. De Soto studied the informal sector in Peru. Other researchers have applied his methodology to a variety of different countries. Chickering and Salahdine (1991) present evidence from selected underdeveloped Asian countries. Tokman (1992) offers evidence from Latin America and the Caribbean. These empirical findings also contribute to the following presentation.

### The Costs of Formality

The costs of formality can be divided into costs to access the formal sector and costs to remain in the formal sector.

**Costs to access the formal sector.** De Soto and his research group conducted various experiments to quantify the access costs. In one of them, they set up a small clothing factory in the outskirts of Lima and tried to register it legally. Four university

students were hired to do the necessary paperwork under the supervision of a lawyer specialized in Administrative Law. It was convened that no bribes would be offered unless there was no other means to proceed with the registration. During the months the experiment lasted, government officials asked for bribes ten times; in two cases, it was absolutely necessary to pay them. It took ten months to complete the registration procedure. Licenses and other requirements cost 195 dollars, and the loss in utilities caused by the ten-month waiting period was estimated at 1,037 dollars. In fact, the total cost of legal registration was equivalent to 32 times the minimum monthly salary. By way of comparison, Chickering and Salahdine (1991) report that a similar procedure takes three-and-a-half hours in Florida and four hours in New York.

Tokman (1992) also finds high access costs to legality in other Latin American countries. Financial costs of entry, excluding required modifications in the business' premises, are estimated at an average of ten percent of annual profits; when modifications in the premises are required as part of the registration procedure, these financial costs rise significantly. Tokman finds that the average time to register a small firm in his group of Latin American countries is ten months, going from about one month (in Bolivia, Brazil, and Chile) to two years (in Guatemala). Given the long time involved in fulfilling business registration requirements, Tokman (1992, p.12) concludes that "... the combination of regulation inadequacy and bureaucratic inefficiency ... applies to most countries and particularly to [Ecuador, Guatemala, and Peru]."

**Costs to remain in the formal sector.** Staying formal can also be very costly. De Soto finds that, in a sample of 50 small manufacturing firms, the costs of staying

formal represent an average of 348 percent of after-tax profits. De Soto reports that 22 percent of such costs are due to taxes, 5 percent due to higher public utility rates, and 73 percent due to regulations (mainly labor related) and bureaucratic requirements.

The costs of staying formal can be divided into three broad categories: taxes, regulations, and bureaucratic requirements.

Taxes on formal firms constitute a major source of government revenue, particularly in developing countries. Since formal firms are registered with state organizations and, thus, can be audited with relative ease, they are attractive targets for taxation. This is especially true in countries that lack strong, well-equipped tax administrations to properly monitor individuals and informal firms. Burgess and Stern (1993) report that in developing countries, corporate income taxes represent 17.8 percent of total tax revenues, while individual income taxes, only 10.6 percent. In contrast, for industrial countries corporate income taxes account for only 7.6 percent of total tax revenues, while individual income taxes carry most of the weight with 27.7 percent. Confronted with a narrow base of formal firms, most underdeveloped countries have imposed, at least until recently, very high marginal tax rates.

Regulations control the use of resources, the manner of production, and the distribution of output and profits. Common types of regulations are those related to environmental protection, allocation of imported inputs, consumer protection and quality control, financial capital availability, and workers' welfare. Of all types of regulations, those related to workers' welfare are the most restrictive and costly in underdeveloped countries (and in many developed countries as well). Regulations designed, in theory, to

improve workers' welfare appear in various forms, namely, minimum wages, fringe benefits (paid vacations and sick leave, indemnities, health insurance), social security, constraints on free hiring and dismissal, and protection to unions. Portes, Castells, and Benton (1989, p. 30) argue that "the best-known economic effect of the informalization process is to reduce the costs of labor substantially," costs which are mostly due to "indirect wages" such as benefits and social security contributions. Tokman writes that for small firms in Latin America, the additional costs related to labor regulations are the most important component of the permanency costs in the formal sector. Tokman (1992) reports that such regulations increase labor costs by an average of around 20 percent, which is about equally divided between benefits and social security contributions. Nipon (1991) estimates that informal firms in Thailand, by ignoring labor-protection laws, save about 13 to 22 percent of labor wages.

Mazumdar (1976) cites the interesting example of the labor practices in the Bombay textile industry: Unions, enforcing government regulations, protected formal workers against salary decreases or dismissals and ensured social benefits for them. In response, textile companies kept the number of formal workers as low as possible; and when their business required a higher labor input, they would supplement the stable core of formal workers with casual day laborers, who were abundant in Bombay. Not surprisingly, these casual day workers, who constitute the informal labor force for the industry, were paid lower wages, had no job security, and enjoyed no fringe benefits. This example illustrates labor market conditions in many cities of the developing world.

In most developing countries, capital is scarce relative to labor. This should

induce firms to choose labor-intensive technologies. However, because labor-employment regulations raise labor costs, formal firms in developing countries tend to be abnormally capital intensive. [5]

Bureaucratic requirements (red tape and paper work) are also a significant cost of remaining formal. Alonzo (1991, pp. 48-49) reports that in the Philippines, "no matter how small the business, an owner needs an accountant and a lawyer to comply with all of the requirements." Chickering and Salahdine (1991, p. 191) write that in Egypt, "much of the country's entrepreneurial talent is consumed in circumventing the country's nightmare bureaucratic regulatory system." De Soto (1989) surveyed 37 formal firms operating in areas in which informal firms abound. He found that 40 percent of the administrative personnel working time is spent fulfilling the bureaucratic paper work imposed by the state.

**The Costs of Informality**

Informal enterprises face two kinds of costs: First, penalties when the informal activity is detected, and second, the inability to take full advantage of government-provided goods. Penalties for informal activities are usually stiff; very often, detected firms have to surrender a considerable part of their output or physical capital stock. De Soto (1989) finds that informal entrepreneurs pay between 10 to 15 percent of their gross income in bribes to corrupt government officials, whereas formal entrepreneurs pay an average of only 1 percent of gross income in bribes (without counting bribes used to become formal). In order to avoid being caught, firms scale down the size of their informal operations. In the case of purely informal firms, the efforts to avoid detection

prevent them from achieving economies of scale and from choosing an optimal capital-labor mix; this is so because larger and more physical capital-intensive firms are easier to detect.

The second cost of informality is the inability to take full advantage of government-provided goods, in particular the legal and judicial system and the police. Since informal activities are illegal, informal businessmen cannot exercise full property rights over their capital and product. Therefore, contracts related to informal activities can not be enforced through the judicial system and, thus, their value and usefulness are greatly diminished. The inability to sign contracts enforceable through the courts creates uncertainty and increases the transaction and monitoring costs in all business dealings conducted by informal companies. This reduces investment that comes both from internal sources (retained earnings) and from capital markets. De Soto (1989) provides an interesting example of low investment from internal sources; he studies informal housing, that is, construction on land over which families have not yet secured a property title. De Soto finds that before obtaining their land titles, families invest as little as possible in building their houses and prefer investing in other durables; however, once the property titles are issued by the state, families shift their investment to build and improve their houses.

Investment from capital markets is also severely affected by the lack of proper contracts. In fact, the inefficiency of capital markets is manifested in several ways: the high borrowing rates paid by informal firms, the relatively low value of informal physical capital, and the difficulty to transfer property and create common-stock corporations. De Soto (1989) points out that in Lima, in June 1985, the nominal borrowing rate for informal

firms was 22 percent monthly, whereas for formal firms of comparable size, it was 4.9

percent. Huq and Sultan (1991) report that in Bangladesh, in 1988, firms which depended

on noninstitutional sources to meet their financial needs paid rates between 48 to 100

percent annually, whereas the borrowing rate from commercial banks was around 12

percent. The difficulty to transfer and mortgage property and create common-stock

corporations limits the informal firms' ability to expand, manage their risk, and use more

advanced technologies.

The high cost of capital faced by informal firms coupled with their low cost of

labor (due to their non-compliance with labor laws) induces them to be more labor

intensive than their formal counterparts.

As the costs of informality rise, the incentives for an enterprise to become formal

become stronger. On the other hand, paradoxically, the higher these costs are, the more

difficult it is for an informal enterprise to accumulate the wealth that would enable it to

enter the formal sector. Credit constraints and the inability to form common-stock

corporations prevent informal companies from growing and, thus, from being able to

afford the access costs to the formal economy.

## A SIMPLE ENDOGENOUS GROWTH MODEL

The following model attempts to organize some of the information presented in the

previous section on the determinants of the informal sector and its effect on economic

growth. To keep the model manageable, the paper ignores some aspects of informality

that, although important, have been well studied in other papers, namely, the issues of

capital-labor intensity, labor-market segmentation, and size of firms. These aspects of

informality have been examined by, among others, Chaudhuri (1989), Gupta (1993), Rauch (1991), and Loayza (1994).

**Setup[6]**

The economy is populated by agents endowed with a (possibly different) starting level of a broad measure of capital, which is meant to include physical as well as human capital. They operate a technology that exhibits constant returns to capital (à la Rebelo 1991) to produce a single good, which can be either consumed or invested. Raw labor is not an input of production. We follow Barro and Sala-i-Martin (1992) in assuming that the capital rate of return depends on the available amount of public services relative to aggregate production. The basic production function is then given by

$$Y_i = A\left(\frac{G}{Y}\right)^{\alpha} k_i, \qquad 0<\alpha<1 \tag{1}$$

where, $Y_i$ and $k_i$ are, respectively, production and capital owned by agent $i$; $A$ is an exogenous productivity parameter; $G$ is the flow of public services; $Y$ is total production in the economy; and $\alpha$, the elasticity of output with respect to $G/Y$, measures the productivity of public services *relative* to private services.

There are two sectors to which agents choose to belong at any point in time: The formal and informal sectors. Formal agents pay a proportional income tax, the proceeds of which are used to both finance the provision of public services ($G$) and partially pay for the enforcement system. As explained below, tax revenues can also be wasted; this

captures the fact that some regulations and taxes imposed by government are unproductive and/or misused. Informal agents pay a proportional fraction of their income as penalties. We assume that the proceeds from penalties are used both as bribes to government officials and to partially finance government's enforcement system (the tax administration in this simple case); therefore, informal penalty revenues are not used to pay for public services contained in $G$. Because of their illegal status, informal agents have access only to a fraction of available public services. Therefore, according to the sector agent $i$ belongs to, his net-of-tax/penalty income is given by

$$y_i^F = (1-\tau)A\left(\frac{G}{Y}\right)^\alpha k_i, \qquad 0<\tau<1$$

$$(2)$$

$$y_i^I = (1-\pi)A\left(\frac{\delta G}{Y}\right)^\alpha k_i, \qquad 0<\pi<1$$

where, $\tau$ is the tax rate, $\pi$ is the effective penalty rate, $\delta$ is the fraction of public services available to informal agents, and the superscripts $F$ and $I$ denote, respectively, formal and informal status.

Define $I$ as the relative size of the informal sector, that is,

$$I \equiv \frac{Y^I}{Y} \tag{3}$$

Public services are exclusively financed by taxes (on formal production) according to the following rule,

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$$G = \eta(q,\lambda) \left( \tau Y^F \right), \qquad 0 < \eta(.) \leq 1$$

$$\frac{\partial \eta}{\partial q} > 0, \qquad \frac{\partial \eta}{\partial \lambda} < 0, \qquad \frac{\partial^2 \eta}{\partial \lambda \partial q} > 0$$

(4)

where $\eta(.)$ is the fraction of tax revenues available for the provision of public services. The fraction $1-\eta(.)$ of tax revenues is in part wasted and in part used to finance the enforcement system. We assume that $\eta(.)$ is a positive function of the quality of government institutions (proxied by the parameter $q$). This captures the fact that higher-quality government institutions impose fewer wasteful regulations and administer fiscal resources more efficiently. Also, given that increasing enforcement effectiveness takes away fiscal resources, $\eta(.)$ is a negative function of enforcement strength (which, as explained below, is represented by the parameter $\lambda$). The positive partial cross-derivative implies that the amount of resources it takes to raise enforcement strength decreases with the quality of government institutions. (The efficiency of governemnt institutions itself is assumed to be exogenous.)

The ratio of public services to total production is then given by

$$\frac{G}{Y} = \eta(q,\lambda) \left( \tau(1-I) \right)$$

(5)

For given $\eta(.)$ and $\tau$, an increase in the relative size of the informal sector, $I$, lowers capital productivity for all agents in the economy. This is so because informal production congests public services but does not contribute to financing them.

We assume that the effective penalty rate, $\pi$, depends on both the strength of the enforcement system and the extent of public dissatisfaction with the informal sector (as argued below, this dissatisfaction is due to the fact that an increase in the relative size of the informal sector is most likely associated with a decrease in everyone's productivity.) The strength of the enforcement system affects the effective penalty rate because it determines the ability to detect and punish informal activities. As explained above, increasing enforcement effectiveness takes away fiscal resources, the more so the lower the quality of government institutions.

The penalty rate is then given by

$$\pi = \pi(\lambda, I), \qquad 0 < \lambda \leq 1$$

$$\frac{\partial \pi}{\partial \lambda} > 0, \qquad \frac{\partial \pi}{\partial I} > 0 \tag{6}$$

where $\lambda$ measures the strength of the enforcement system, and the relative size of the informal sector, $I$, measures public dissatisfaction with the effects of informality on capital's rate of return. Having the effective penalty rate partially depend on the size of the informal sector is a simple way to endogenize public policy in the face of informality (although there is no claim that such policy is optimal.)

A simple functional form that conforms with equation (6), additionally presenting positive interaction between the parameters $\lambda$ and $I$, is the following:

$$\pi = \lambda I \tag{7}$$

**Equilibrium**

We restrict ourselves to the study of an interior solution, that is, one where the model's parameters are such that both sectors, formal and informal, coexist in the economy. Then, given that there is free mobility across sectors, in equilibrium the formal and informal rates of return must be equalized at all times. This condition determines the relative size of the informal sector in equilibrium. From equations (2) and (7),

$$\left(1 - \pi(\lambda, I)\right)\delta^{\alpha} = (1 - \tau) \tag{8}$$

Therefore,[7]

$$I = \frac{\delta^{\alpha} + \tau - 1}{\lambda \delta^{\alpha}}$$

$$\rightarrow I = I\left(\overset{-}{\lambda}, \overset{+}{\tau}, \overset{+}{\delta}, \overset{-}{\alpha}\right) \tag{9}$$

where the sign above each parameter indicates the sign of the partial derivative of $I$ with respect to this parameter. The following results concerning the determination of the informal sector's relative size are obtained from equation (9). When the tax rate and, thus, the incentive to evade taxes rise, the informal sector expands. If in the composition of public services, a larger share corresponds to those services not available to informal agents (e.g., police, judicial, and legal systems), then the equilibrium size of $I$ drops. The relative size of the informal sector also decreases when enforcement strength rises. Given that an improvement in the quality of government institutions allows strengthening

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enforcement without higher drain on fiscal resources, an increase in $q$ is also likely to lead to a smaller informal sector. Finally, when public services are more productive *relative* to private services, making public services forgone by informal activities more important in production, the relative size of the informal sector is smaller.

Given the equilibrium value for $I$, the economy's net capital rate of return, $r$, is given by,

$$r = \left[A(1-\tau)\tau^{\alpha}\right]\left[\eta\left(\overset{-}{\lambda},\overset{+}{q}\right)\left[1 - I\left(\overset{-}{\lambda},\overset{+}{\tau},\overset{+}{\delta},\overset{-}{\alpha}\right)\right]\right]^{\alpha} \tag{10}$$

The expression in the first set of brackets corresponds to the case when there is no informal sector. The rate of return in such case is first increasing and then decreasing in the tax rate. The informal sector, through its detrimental impact on the availability of public services, creates an additional negative effect of the tax rate on the capital rate of return.

**Utility Optimization**

Agents in the economy maximize the value of discounted utility subject to their budget constraint:

$$Max \quad U = \int_{0}^{\infty} \frac{c_i^{1-\theta}(t) - 1}{1 - \theta} \, e^{-\rho t} \, dt$$

$$\text{subject to} \quad \dot{k}_i(t) = y_i(t) - c_i(t) \tag{11}$$

$$= r k_i(t) - c_i(t)$$

where $\rho$ is the constant rate of time preference. We follow the common practice of assuming that the instantaneous utility function has a constant intertemporal elasticity of substitution, which is equal to $1/\theta$ in equation (11). As in other $Ak$ growth models, the rate of return, $r$, is independent of the path of capital accumulation. The first-order and transversality conditions imply the following constant rate of consumption growth:

$$\frac{\dot{c}_i(t)}{c_i(t)} = \gamma = \frac{1}{\theta}(r - \rho) \tag{12}$$

## Growth

As in the Rebelo (1991) $Ak$ growth model, there are no transitional dynamics in this model. The growth rates of aggregate capital ($K$), aggregate production ($Y$), as well as formal ($Y^F$) and informal ($Y^I$) production, are constant and equal to the consumption growth rate, $\gamma$.[8] The economy's long-run growth rate depends on the technology, preference, and policy parameters; in this sense, the model is one of "endogenous" growth. From equations (10) and (12), we obtain an expression for the economy's growth rate:

$$\gamma = \frac{1}{\theta}\left[ [A(1-\tau)\tau^\alpha]\left[ \eta\left( \overset{-}{\lambda}, \overset{+}{q} \right)\left[ 1 - I\left( \overset{-}{\lambda}, \overset{+}{\tau}, \overset{+}{\delta}, \overset{-}{\alpha} \right) \right] \right]^\alpha - \rho \right] \tag{13}$$

As the quality of government institutions improves (higher $q$), the growth rate rises because a larger share of tax revenues is allocated to finance public services. As explained

above, an improvement in the quality of government institutions can also lead to a stronger, less costly enforcement system and, therefore, to a smaller informal sector; this results in less congestion of public services and, thus, higher growth. A decrease in the amount of public services available to informal agents (lower $\delta$) also improves growth by reducing congestion of public services due to informality.

The effect of strengthening enforcement on the growth rate is ambiguous. On the one hand, it decreases congestion of public services due to informality; but on the other hand, it takes away fiscal resources that could be used to finance public services. However, given a standard cost function for enforcement (e.g., U-shaped average cost curve), strengthening enforcement when it is initially at a small level will produce a congestion-reduction effect that outweighs the resource-cost effect, thus increasing the economy's growth rate.

The effect of an increase in the tax rate on growth, discussed in the next section, can also be positive or negative: even though an increase in the tax rate both induces more public-service congestion due to informality and reduces the private net rate of return, it may also lead to a larger amount of public services.

**Optimal Tax Policy**

To examine optimal tax policy, we compare this model with the Barro and Sala-i-Martin, 1992 (henceforth B-SM) model, in which the informal sector is not present. The optimal tax rate when public services are subject to congestion in the B-SM model is given by

$$\tau_{B-SM}^{*} = \frac{\alpha}{1+\alpha} \qquad\qquad (14)$$

It can be shown that in the present model, under certain parameter conditions[9], the optimal tax rate involves some informality and is related to the other parameters of interest as follows,[10]

$$\tau^{*} = \tau(\overset{+}{\alpha}, \overset{+}{\lambda}, \overset{-}{\delta}) \qquad\qquad (15)$$

$$\tau^{*} < \tau_{B-SM}^{*}$$

The optimal tax rate in this model is lower than in the B-SM case because here an increase in tax rates has the additional negative effect of inducing more public-service congestion due to informality. (In the B-SM case, an increase in the tax rate has two opposite effects on growth. In the first place, a higher tax rate increases the amount of public services, holding production constant. On the other hand, a higher tax rate reduces the private net rate of return, holding public services constant. For lower-than-optimal tax rates, the public-service positive effect dominates the private-net-rate-of-return negative effect. Given that in our model the optimal tax rate is lower than that in the B-SM model, at $\tau^{*}$ the public-service effect dominates the private-net-rate-of-return effect, but they are balanced by the additional "informality" effect.)

The optimal tax rate, $\tau^{*}$, increases with $\alpha$ because this parameter determines the extent of the public-service congestion externality to be internalized by the proportional production tax (which in this case acts as a user fee; see Barro and Sala-i-Martin, 1992).

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The effects of enforcement strength ($\lambda$) and the share of public services available to informal agents ($\delta$) on the optimal tax rate are explained as follows: When informality becomes less attractive (because of higher $\lambda$, and/or lower $\delta$), a sufficiently small increase in the tax rate does not lead to more public-service congestion due to informality.

In Figure 1, the solid line graphs the growth rate, $\gamma$, as a function of the tax rate, $\tau$, in our model; the dotted-line graphs this relationship in the B-SM model, which does not allow informality and where all tax revenues are used to finance public services. As $\delta$ decreases, $\lambda$ increases from a sufficiently low level, and $q$ rises, the growth function in our model shifts upwards and to the right; therefore, the growth rate becomes higher for all values of the tax rate, and the optimum tax rate becomes larger.

**Growth and Informality**

From the model presented above, the following conclusion can be drawn. In countries where the tax burden is larger than optimal and where the enforcement system is too weak, the relative size of the informal sector is negatively correlated with the rate of economic growth; in other words, changes, both in policy parameters and in the quality of government institutions, that promote an increase in the relative size of the informal economy will also generate a reduction in economic growth.

**THE INFORMAL SECTOR IN LATIN AMERICAN COUNTRIES**

This section presents some evidence on both the determinants of the informal sector and its effect on the provision of public services and economic growth in Latin American countries. The estimation period is the early 1990's.[11]

**Determinants and Size of the Informal Sector**

Estimating the size of the informal sector is difficult, particularly when it is defined as the sector that evades regulations and taxes. Several approaches have been used in the literature, all with limited success.[12] This paper uses a statistical model that considers the relative size of the informal sector (informal production as a percentage of total production) as a *latent variable* that potentially has multiple causes and for which multiple indicators can be found. This Multiple-Indicator Multiple-Cause (MIMIC) model was first used for the estimation of the size of the informal sector by Frey and Weck-Hanneman (1984); they concentrated their study on OECD countries. We have chosen this approach for the following reasons. First, in the process of estimating the size of the informal sector, we obtain and test the significance of the estimated effects of some causal variables on the informal sector. Second, given that we estimate the size of the informal sector jointly for all countries in the sample, we can make cross-country comparisons and use those estimates to assess their correlation with other variables of interest. Third, we can use the information contained in different alternative or complementary indicators of the informal sector in a single estimation process.

The variables serving as either causes or indicators of the informal sector have been selected in accordance with the theory and discussion presented in the previous sections of the paper. The causal variables considered are the following: First, the tax burden, proxied by the highest statutory corporate income tax rate in the country.[13] Second, government-imposed restrictions on labor markets, measured by the Rama (1995) index divided by per capita GDP to control for differences in labor productivity across countries.

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The Rama index is constructed by averaging the normalized values of eight labor-related variables, namely, number of days of annual leave with pay, number of days of maternity leave, social security contribution as a percentage of wages, government employment as a percentage of labor force, minimum wage as a percentage of average wage, severance pay, number of ILO conventions ratified, and percentage of labor force in unions. Rama calculated this index for 31 countries in Latin America and the Caribbean for the period 1980-92, when labor regulations remained basically unchanged. The third causal variable considered in the model is the strength and efficiency of government institutions proxied by an average of three subjective indicators reported by International Country Risk Guide (ICRG), namely, quality of the bureaucracy, corruption in government, and rule of law.[14]

Restrictions on labor markets were not explicitly included in the theoretical model; however, they can be understood as a form of tax burden in the model, particularly the portion of tax burden that is not transformed into productive public services. As discussed in section II, restrictions on labor markets are important factors in the formation of informal economies, particularly in Latin America where these regulations are some of the most stringent in the developing world. The variable strength and efficiency of government institutions is directly related to two variables in the theoretical model, namely, the strength of enforcement ($\lambda$) and the quality of government institutions ($q$).

We expect that, in the sense of multiple regression analysis, the variables proxying for tax burden and labor market restrictions be positively related to the size of the informal sector, and that the variable proxying for the strength and efficiency of government institutions be negatively related to it.

The variables serving as indicators are, first, the rate of value-added tax (VAT) evasion and, second, the percentage of the non-agricultural labor force does not contribute to social security. VAT evasion data are taken from an IMF study conducted in 1993 by Silvani and Brondolo. Data on the percentage of non-agricultural labor force that does not contribute to social security are taken from the World Bank study *Averting the Old Age Crisis* (1995). These indicators reflect the two most important aspects of the informal sector in Latin America, namely, non-compliance with taxes and labor market regulations. Whereas the rate of VAT evasion proxies directly for the share of informal production, the percentage of non-agricultural workers not covered by social security proxies for the share of informal employment.

**The MIMIC Model**

The MIMIC model of a latent variable (Joreskog and Goldberger, 1975) is specified as follows,

$$I = \beta'X + \epsilon$$

$$Z = \phi I + \mu \tag{16}$$

$$and \quad E(\epsilon\mu') = 0', \quad E(\epsilon^2) = \sigma_\epsilon^2, \quad E(\mu\mu') = \Omega, \ a \ diagonal \ matrix$$

In the first equation, the latent variable $I$ *is linearly determined*, subject to a disturbance, by a set of observable exogenous causes $X$. In the second equation, the latent variable *linearly determines*, subject to disturbances, a set of observable endogenous indicators $Z$.

A reduced-form equation is obtained by substituting the first into the second

equation,

$$Z = \phi(\beta'X + \epsilon) + \mu$$

$$= \Pi'X + \nu$$

(17)

Estimation of the structural parameters is obtained through maximum likelihood, making use of the restrictions implied in both the coefficient matrix $\Pi$ and the covariance matrix of the error term $\nu$. The basic idea of the MIMIC model is that the latent variable $I$ accounts completely for the intercorrelations of the indicators $Z$. Once the effects of the causal variables $X$ and the disturbance $\epsilon$ on each of the indicators are removed, there is no correlation among the indicators.

Note that the reduced-form parameters remain unchanged when $\phi$ is multiplied by a scalar and $\beta$ and $\sigma_\epsilon$ are divided by the same scalar. Therefore, in order to remove the indeterminacy in the structural parameters, it is necessary to adopt a normalization, setting, for instance, one of the coefficients in $\phi$ equal to one. A normalized estimate of the latent variable can be obtained from the estimated values of the causal-variable coefficients $\beta$ (see the first equation in (16)). We can then compare the differences in the latent-variable values of any two units (countries in our case) and, thus, rank all units accordingly. The *level* of the latent variable, however, remains undetermined unless additional information is obtained (or assumed.)

Given that it is difficult to compare the effects of different explanatory variables on the same dependent variable when they have different units of measurement (and

specially when the regression coefficients have been normalized by setting one of them equal to an arbitrary value), it is useful to standardize the regression coefficients as follows,

$$\hat{\beta}_x^s = \hat{\beta}_x \left( \frac{\hat{\sigma}_x}{\hat{\sigma}_I} \right) \tag{18}$$

where $\beta$ represents an estimated regression coefficient, $\sigma$ represents an estimated standard deviation, and the subscripts $x$ and $I$ denote, respectively, a given explanatory variable and the dependent variable. The standardized coefficient is, therefore, the expected change in standard-deviation units of the dependent variable that is produced by a one standard-deviation change of a given explanatory variable when the other variables are held constant.

**Estimation Results**

Figure 2 reports the estimation results. The standardized regression coefficients and their respective t-values (in parenthesis) are presented by the arrow pointing in the direction of influence in the model.[15]

The coefficients on the three causal variables in the model have the expected signs and are statistically significant at the 10% level. Both the tax burden and labor-market restrictions affect positively the relative size of the informal sector, with a one standard-deviation increase in each of them producing a rise in the informal sector of 0.33 and 0.49 standard deviations, respectively. The strength and efficiency of the government institutions has a negative impact on the informal sector, with a one standard-deviation

increase in the former leading to a decrease of 0.42 standard deviations in the latter. Therefore, the theoretical model's conclusions concerning the determinants of the informal sector are validated by the statistical evidence of the MIMIC model.

The VAT evasion rate and the percentage of non-agricultural workers not covered by social security perform well as indicators of the relative size of the informal sector. The estimated latent variable explains 75% of the variance of the first indicator and 34% of the variance of the second one.

Although the small size of the sample merits caution on the evaluation of the results, several goodness-of-fit statistics, including those that adjust for degrees of freedom, support the underlying model (see the bottom of Figure 2). The Chi-square statistic for the null hypothesis that the constraints on the residual covariance matrix implied by the model are valid has a p-value of 0.78. The Joreskog and Sorbom (1985), Bentler and Bonett (1980), and Bollen (1986) indices (which do not have a known distribution and whose values may range from 0 to 1) also support the statistical model as they are quite close to 1, a value which represents perfect fit.

Using the procedure outlined in the previous section, we can estimate the standardized values (z-values) of the relative size of the informal sector for all countries in our sample. These estimates are presented in Table 1. The countries with the largest informal sector are Bolivia, Panama, and Peru, countries which in the early 1990's were notorious for their restrictive labor-market regulations and poor quality of their enforcement systems. They are followed by two Central American countries, namely, Guatemala and Honduras. In the middle of the list we find, Brazil, Colombia, Uruguay,

Venezuela, Ecuador, and Mexico. Finally, the countries with the smallest informal sector are Costa Rica, Argentina, and Chile; in the early 1990's these three countries were the most advanced in the region in terms of market-oriented economic reforms.

The correlation of the size of the informal sector with real per capita GDP in 1990 is -0.70, and its correlation with the share of urban population in the same year is -0.53. This suggests that the size of the informal sector is related to the development level of the country. Governments in less developed countries may attempt to regulate and tax their economies according to the standards of the more developed ones without having the capacity to enforce compliance. Enforcement of regulations and taxes is difficult in less developed countries because they tend to have weak bureaucracies, frail legal institutions, and poorly educated, largely rural populations.

As mentioned above, the standardized z-values of the latent variable enables us to determine only the relative position of countries in the sample. In order to obtain the absolute value of the size of the informal sector (as a percentage of GDP), two points must be fixed: one to set the overall scale, another to set the distance between the ranks. We use the following two assumptions: First, the average size of the informal sector is the same as the average of the VAT evasion rate. Second, the size of the informal sector in Chile is the same as its VAT evasion rate. These assumption are sensible because, first, the VAT evasion rate is directly related to the share of informal production (whereas our second indicator is more closely linked to informal labor employment); second, a large fraction of the variance of the VAT evasion rate is explained by the size of the informal sector according to our statistical model. The last column of Table 1 show our estimated

values of the size of the informal sector, as a percentage of GDP.

The VAT evasion rate is calculated as a ratio to *official* GDP. Therefore, given that the VAT evasion rate has been used to pin down the overall scale and the distance between the ranks of the informal sector, the estimated values of the informal sector reported in Table 1 are also given as a percentage of *official* GDP. The question remains whether official GDP includes informal production. National account authorities in Latin America are aware of the large presence and order of magnitude of the informal sector in their respective countries. For this reason they rely not only on income reports to estimate GDP but, most importantly, on sampling and surveys of production and prices by economic sectors. Therefore, although actual GDP may be measured with error, the direction of the bias is uncertain. At any rate, official GDP does not ignore the contribution of the informal sector.

**The Relation Between the Informal Sector, Public Infrastructure, and Economic Growth**

The theoretical model presented in section III links the informal sector with the provision of public services and the rate of economic growth. The model predicts that the relative size of the informal sector is negatively correlated with both the availability of public services and the economy's growth rate (except when the increase in the informal sector is due to a small rise in the tax rate from a sufficiently small level or a drop in enforcement strength from a high and costly level. Nonetheless, the case of suboptimally low statutory tax rates or excessive enforcement strength hardly applies to any Latin American country).

Table 2 reports some regression results. The economy's growth rate is represented by the average growth rate of real per capita GDP for the period 1980-92.[16] This period is long enough to minimize the effect of business-cycle fluctuations on the growth rate and short enough to be able to assume that the informal sector is basically stable throughout the period. The provision of public services is proxied by an index of public infrastructure, which consists of the average of standardized values of four indicators. These indicators are per capita electricity consumption, per capita telephone mainlines, percentage of population with access to safe water, and per capita roads in good condition. There are some important public services not included in these indicators, most notably, the police and the judicial system. Nevertheless, to the extent that these omitted public services are correlated with the four indicators considered, the proposed public-infrastructure index is a good proxy for all available public services.

Columns 1 and 3 of Table 2 show that the size of the informal sector has a significantly negative impact on real per capita GDP growth, whether or not the public-infrastructure index is included as an explanatory variable in the regression. The fact that the informal sector's size has a negative effect on growth when the index of public infrastructure is held constant can be explained in two ways, both probably correct. First, an increase in the informal sector's size means that more activities are using some of the existing public services less efficiently or not at all; second, our public-infrastructure index does not account for all productive public services. Comparing columns 2 and 3 shows that the public-infrastructure index affects positive and significantly the rate of economic growth when it is included as the only explanatory variable in the regression;

however, when the size of the informal sector becomes an additional explanatory variable, the coefficient on the public-infrastructure index becomes insignificant. The informal sector, being strongly negatively correlated to the public-infrastructure index, captures most of the index's explanatory power in the growth regression.

In regression number 4, the determinants of the informal sector are used directly as explanatory variables. Although their respective coefficients present the expected sign, they are not *individually* significant. However, they are *jointly* significant (the p-value of the F-statistic is 0.0798), which, when coupled with the lack of individual significance, indicates the presence of multicollinearity. As a "weighted average" of the tax burden, labor-market restrictions, and the quality of government institutions, the size of the informal sector serves as an overall indicator of regulatory efficiency.

There is the possibility that the negative correlation between the size of the informal sector and economic growth is spurious, in the sense that the size of the informal sector may be proxying for something different from regulatory efficiency; for example, the informal sector size may be proxying for fiscal and monetary discipline, lack of overall development, low human capital, and trade restrictiveness, variables which have been shown to be correlated with economic growth. To address this issue, we ran "augmented" growth regressions, which consider several explanatory variables that represent different aspects of policy and economic development. The results are presented in Table 3. The conclusion is that the size of the informal sector remains significantly negatively correlated with economic growth, thus demonstrating to be an independent determinant of growth.

## CONCLUSION

This paper presents the view that the informal economy arises when excessive taxes and regulations are imposed by governments that lack the capability to enforce compliance.

The determinants and effects of the informal sector are studied in an endogenous growth model whose production technology depends essentially on congestable public services. The model concludes that in economies where the statutory tax burden is larger than optimal and where the enforcement system is too weak, the relative size of the informal sector is negatively correlated with the rate of economic growth; in other words, changes, both in policy parameters and the quality of government institutions, that promote an increase in the relative size of the informal economy will also generate a reduction in the rate of economic growth.

Many Latin American countries have (or had until recently) a tradition of excessive regulations and weak government institutions. The paper uses data from Latin American countries in the early 1990's to test some of the implications of the model and to provide estimates for the size of the informal sector throughout these countries. The empirical approach consists of identifying the size of the informal sector to a latent variable for which multiple causes and multiple indicators exist. The size of the informal sector is found to depend positively on proxies for tax burden and labor-market restrictions, and negatively so on a proxy for the quality of government institutions. Furthermore, the empirical results indicate that an increase in the size of the informal sector negatively affects growth by, first, reducing the availability of public services for everyone in the economy, and, second, increasing the number of activities that use some of the existing

public services less efficiently or not at all. These results hold even when additional explanatory variables are added to account for other aspects of economic conditions and policies.

Finally, it is estimated that the largest informal sectors in Latin America are found in Bolivia, Panama, and Peru, and the smallest, in Chile, Argentina, and Costa Rica.

**ENDNOTES**

1. The concept of informality was first introduced by the 1972 ILO Employment Mission to Kenya. For an excellent survey regarding definitions, empirical studies, and policy recommendations on the informal sector, see Lubell (1991).

2. The work by Hernando de Soto, presented in his book *The Other Path* (1989), has contributed enormously to the understanding of the role of political institutions and legal structures in the rise of informal sectors. De Soto's analysis draws from the contributions of Douglas North (1981) and Mancur Olson (1982).

3. Readers familiar with the determinants of informal economies may want to go directly to the theoretical model.

4. See Romer (1986), Lucas (1988), Barro (1990), and Rebelo (1991).

5. Given that the codes of labor legislation are also rather extensive in developed countries, it is not surprising to find "clandestine," or informal, employment in those countries as well. However, given that the productivity of labor is higher in developed than in underdeveloped countries, the distortionary power of labor regulations in developed economies is less important. Kaltzmann (cited in De Grazia, 1982, p. 34), discussing the French experience, writes that "the main reason for clandestine employment is economic: one of the parties increases his income, the other reduces his costs. Two economic causes play a dominant role: inadequate remuneration and the burden of taxation and social security costs." De Grazia (1982, p. 35) writes that "In Italy, the phenomenon [of informal employment] is ... more blatant, if not universal. Entire neighborhoods of Naples have been transformed into secret workshops (specializing particularly in shoe- and

garment-making) which move on quickly or disappear the moment a visit by the labor inspectors seems likely." De Grazia (1982) also reports that in Milan only 5,000 homeworkers, from a total of 100,000, and 1,000 small enterprises, from a total of 50,000, are listed on the city's commercial register. Indeed, the practice of subcontracting as a means to avoid labor-protection legislation (including prohibitions to employ illegal immigrants) has become particularly popular in developed countries, especially the United States, Canada, Italy, Spain, and France (Portes, Castells, and Benton, 1989.)

6. The model presented here is a substantially modified version of the model in Braun and Loayza (1994).

7. From equation (9), an interior solution for $I$ requires the following parameter restrictions:

$$\delta^{\alpha}+\tau-1 > 0 \qquad (\Rightarrow I>0)$$

$$(1-\lambda)\delta^{\alpha}+\tau-1 < 0 \qquad (\Rightarrow I<1)$$

8. We assume that the technology, policy, and preference parameters are such that

$$\frac{\rho}{1-\theta} > r > \rho$$

The second inequality ensures positive growth, and the first one ensures that attainable utility is bounded and the transversality condition holds (see Barro and Sala-i-Martin, 1995).

9. If $1-\delta^{\alpha} < \alpha\lambda/(\alpha+\lambda+\alpha\lambda)$, the growth-maximizing tax rate implies some informality.

Otherwise, that is, if $1-\delta^\alpha \geq \alpha\lambda/(\alpha+\lambda+\alpha\lambda)$, the optimal tax rate brings about a fully formal economy. We assume that the first inequality holds.

10. In general, it is not possible to obtain an explicit solution for $\tau^*$. However, for the case when $\lambda=1$ (maximum strength of the enforcement system), $\tau^*$ takes a simple form: $\tau^*=\alpha/(1+2\alpha)$. The comparative statics results presented in equation (15) for the general case are obtained applying the implicit function theorem.

11. From 1993 to the present, a few countries (notably Peru) have undertaken an accelerated pace of market-oriented reforms. Given that the period of estimation considered in this paper is the early 1990's, the estimated results may not apply to the recent experience of such countries.

12. For a good survey on different approaches to the estimation of the informal sector, see Gupta and Gupta (1984).

13. It would have been preferable to use the average marginal corporate tax rate as the proxy for tax burden; unfortunately, data on tax revenue by rates was unavailable. Nevertheless, the highest tax rate is not only a good measure of the *level* of tax rates but also of their *dispersion*.

14. The appendix presents the data used in the paper and their sources.

15. In order to remove the indeterminacy of the structural coefficients, the coefficient on the VAT evasion rate was set equal to one; therefore, a t-test can not be applied to this coefficient. Setting the coefficient on the other indicator equal to one produced essentially the same results.

16. The average growth rate was calculated using the least-squares method, in order to

make use of the observations for all years in the period.

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Appendix I  Data Sources

Causal Variables:

1. Corporate income tax rate.  Data on corporate income tax rates in 1991 are taken from Shome (1992).  When the country has more than one rate, the highest rate is used.  Bolivia is a special case.  In 1991, there was no tax on corporate income *per se*.  A tax of 3% of net worth was levied instead.  In order to estimate the implied corporate income tax rate, the net-worth tax rate is divided by the real interest rate.  For the calculation of the real interest rate, the neoclassical-growth-model relation between growth, real interest and depreciation rates  is used.  Using the parameter values presented in Barro and Sala-i-Martin (1995), the real interest rate in Bolivia is estimated at 8.1%.

2. Labor market restrictions.  The proxy for labor market restrictions is the ratio of the index of labor market regulations presented in Rama (1995) to real per capita GDP.  The Rama index is divided by real per capita GDP in order to account for differences in labor productivity across countries.  Rama considers eight types of labor-market regulations for 31 countries in Latin America and the Caribbean during the period 1980-92, when these regulations remained basically unchanged.  The eight variables considered by Rama are number of ILO conventions ratified, number of days of annual leave with pay, number of days of maternity leave, social security contribution as a percentage of wages, government employment as a percentage of labor force, minimum wage as a percentage of average wage, severance pay and percentage of labor force in unions.  After normalizing each variable, the Rama index is obtained by averaging over the eight variables.  The real per capita GDP data correspond to the year 1990 and are taken from Summers-Heston Penn

World Table 5.6.

3. The strength of the enforcement system. The strength of the enforcement system is proxied by an average of three subjective indicators reported in International Country Risk Guide (ICRG) for the period 1990-92. The three indicators considered are quality of the bureaucracy, corruption in government, and rule of law. For the indicator *quality of the bureaucracy*, high scores indicate "autonomy from political pressure" and "strength and expertise to govern without drastic changes in policy or interruptions in government services", also existence of an "established mechanism for recruiting and training." For *corruption in government*, lower scores indicate "high government officials are likely to demand special payments" and "illegal payments are generally expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, police protection, or loans". *Rule of law* "reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes." Higher scores indicate "sound political institutions, a strong court system, and provisions for an orderly succession of power." Lower scores indicate "a tradition of depending on physical force or illegal means to settle claims." ICRG is a publication of Political Risk Services of Syracuse, NY and is cited in Knack and Keefer (1994).

Indicators:

1. Value-added tax evasion rate. Data for this variable correspond to one of the years in the period 1990-93 for each country in the sample. The VAT evasion rate is calculated as one minus the tax compliance rate, where the tax compliance rate is calculated as

follows,

$$compliance\ rate\ =\ \cfrac{\cfrac{VAT\ revenue}{Potential\ base\ of\ VAT}}{Average\ VAT\ rate}$$

The VAT evasion rate data are obtained from Silvani and Brondolo (1993) for Chile, Honduras, Guatemala, Panama, Uruguay, Argentina, Ecuador, Mexico, Bolivia, Colombia and Peru. For Brazil, Costa Rica and Venezuela, the compliance rates are not available. However, the revenue productivity (the percentage of GDP collected per point of the VAT rate) can be obtained from the IMF. Data on countries with both compliance rate and revenue productivity are used to fit a line relating these two measures. The relationship is then used to estimate the compliance rates for those three countries.

2. Fraction of labor force not contributing to social security. This variable is obtained from *Averting The Old Age Crisis*, the World Bank, 1995. The variable measures the number of workers not contributing to social security as a percentage of the labor force. Data are available for all Latin American countries in our sample. The years for which data are available , however, are not the same. For most countries the figures correspond to years around 1991, but for some the latest available year is in the mid 80's (e.g. Bolivia 1985, and Guatemala 1986).

<u>Infrastructure</u>:

1. Electricity Consumption (KWH per person) in 1992. This is calculated as electricity production × (1 - system losses). Electricity production (KWH per person) and system

-45-

losses (% of total output) are obtained from the *World Development Report 1995*, the World Bank.

2. Telephone Mainlines (per 1,000 persons) in 1992. This variable is obtained from the *World Development Report 1995*, the World Bank.

3. Roads in good condition (km per million persons) in 1988. This is calculated as Road density (km per million persons) × Roads in good condition (% of paved roads). Data are from the *World Development Report 1994*, the World Bank.

4. Population with access to safe water (% of total) in 1990. Data are from the *World Development Report 1994*, the World Bank.

5. Public infrastructure index. It is the simple average of the standardized values of the above four indicators. All indicators are standardized by computing $z$-values, that is, dividing the deviations from the mean by the standard deviation.

Growth Rate:

The growth rates of real per capita GDP from 1980 to 1992 are calculated using the least-square method. Real per capita GDP data are from the World Bank National Accounts.

**Table 1. The Size of the Informal Sector: Standardized and Absolute Values**

| Country | Standardized Value | Absolute Value (% of GDP) |
|---|---|---|
| Chile | -1.342 | 18.2 |
| Argentina | -1.107 | 21.8 |
| Costa Rica | -1.012 | 23.3 |
| Mexico | -0.762 | 27.1 |
| Venezuela | -0.523 | 30.8 |
| Ecuador | -0.494 | 31.2 |
| Colombia | -0.240 | 35.1 |
| Uruguay | -0.236 | 35.2 |
| Brazil | -0.062 | 37.8 |
| Honduras | 0.516 | 46.7 |
| Guatemala | 0.754 | 50.4 |
| Peru | 1.243 | 57.9 |
| Panama | 1.518 | 62.1 |
| Bolivia | 1.746 | 65.6 |
| | | |
| Mean | 0.000 | 38.8 |
| Standard deviation | 1.000 | 15.3 |

| Table 2. The Growth Effects of Public Infrastucture and the Informal Sector (t-statistics in parenthesis) | | | | | |
|---|---|---|---|---|---|
| Dependent Variable | Growth Rate of Real Per Capita GDP (1980-92) | | | | Public Infrastructure Index |
| | (1) | (2) | (3) | (4) | (5) |
| Size of the Informal Sector | -0.8852 (-2.61) | | -0.8435 (-2.16) | | -0.5814 (-2.98) |
| Public Infrastructure Index | | 0.5622 (1.69) | 0.0718 (0.24) | | |
| Corporate Income Tax Rate | | | | -0.4436 (-1.09) | |
| Labor-Market Restrictions | | | | -0.4333 (-0.84) | |
| Strength and efficiency of government institutions | | | | 0.3598 (1.16) | |
| P-value (F-Statistic) | | | 0.0233 | 0.0798 | |
| Adjusted $R^2$ | 0.3584 | 0.1201 | 0.3068 | 0.2537 | 0.3381 |
| Number of Observations | 14 | 14 | 14 | 14 | 14 |

Note: The above t-statistics are computed using heteroskedasticity-corrected standard errors. Regression coefficients are standardized so that they reflect the change in the growth rate produced by a one-standard deviation of the explanatory variable.

| Table 3. The Informal Sector and Other Determinants of Economic Growth (t-statistics in parenthesis) | | | | | |
|---|---|---|---|---|---|
| Dependent Variable | Growth Rate of Real Per Capita GDP (1980-92) | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| Size of the Informal Sector | -1.2482 (-3.33) | -1.3165 (-4.30) | -1.3303 (-3.79) | -1.4555 (-3.45) | -1.2245 (-3.44) |
| Real Per Capita GDP, 1980 | -0.6418 (-2.04) | -0.7956 (-2.92) | -0.8906 (-2.80) | -0.1523 (-3.84) | -1.9685 (-4.36) |
| Secondary School Attainment, 1980 | | 0.4302 (1.86) | 0.7341 (2.32) | 0.8426 (2.66) | 0.7118 (2.34) |
| Average Tariff for Intermediate and Capital Goods, 1985 | | | -0.5226 (-1.26) | -0.6138 (-1.46) | -0.3439 (-0.86) |
| Average Inflation Rate, 1980-92 | | | | -0.2497 (-0.46) | -0.6027 (-1.60) |
| Public Infrastructure Index, 1990 | | | | | 1.1966 (2.04) |
| P-value (F-Statistic) | 0.0046 | 0.0077 | 0.0305 | 0.0724 | 0.0365 |
| Adjusted $R^2$ | 0.4595 | 0.5119 | 0.5222 | 0.4735 | 0.6490 |
| Number of Observations | 14 | 14 | 12 | 12 | 12 |

Note: The above t-statistics are computed using heteroskedasticity-corrected standard errors. Regression coefficients are standardized so that they reflect the change in the growth rate produced by a one-standard deviation of the explanatory variable.

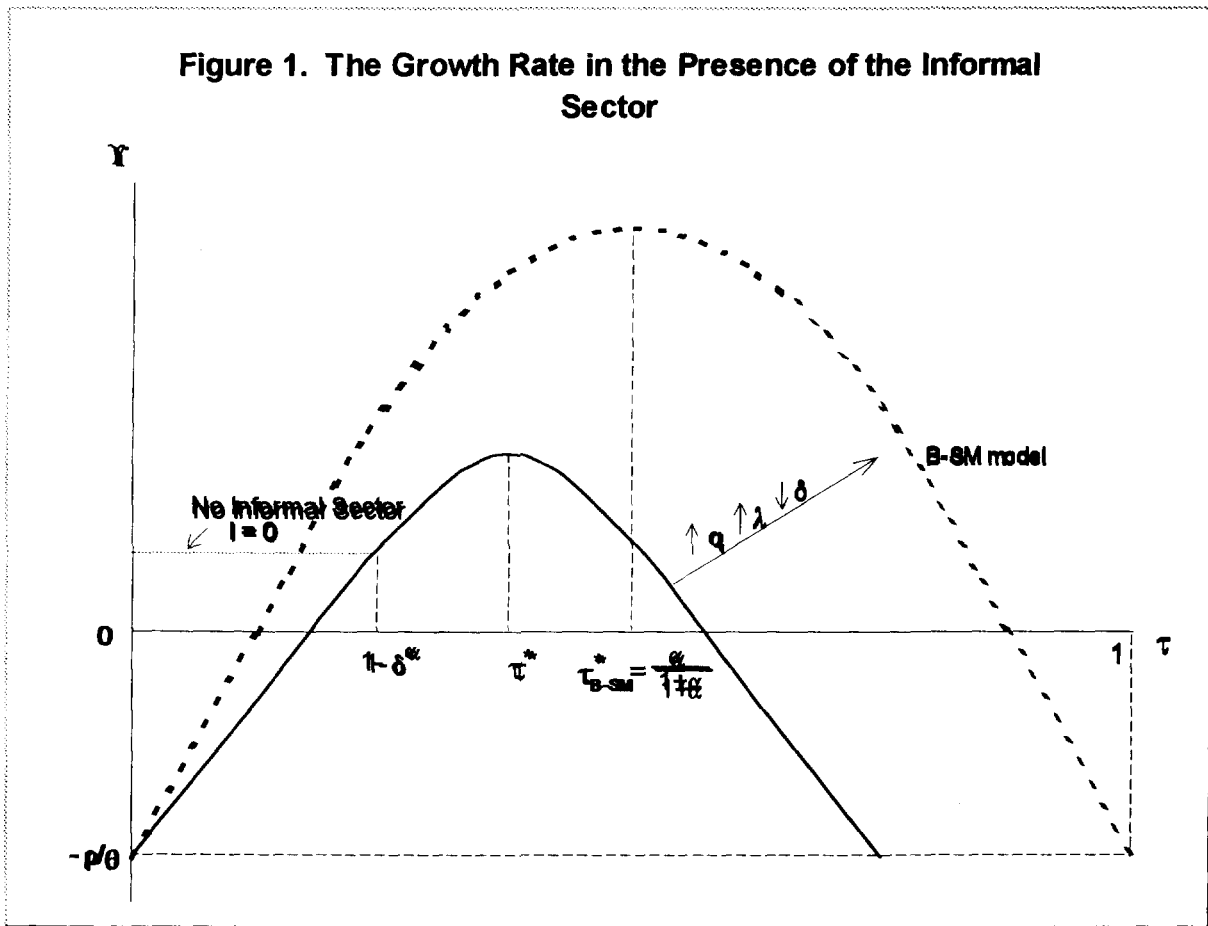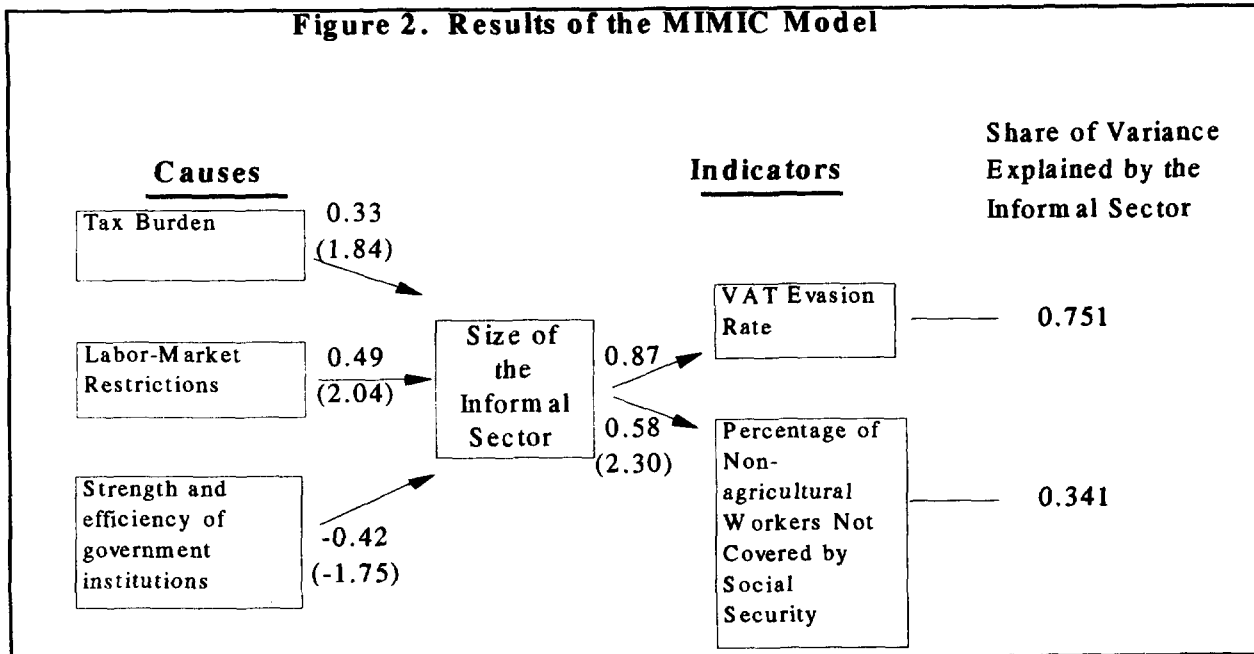Figure 1. The Growth Rate in the Presence of the Informal Sector

## Figure 2. Results of the MIMIC Model



| Causes | | Indicators | Share of Variance Explained by the Informal Sector |
|---|---|---|---|
| Tax Burden | 0.33 (1.84) | | |
| Labor-Market Restrictions | 0.49 (2.04) | Size of the Informal Sector | VAT Evasion Rate — 0.751 |
| Strength and efficiency of government institutions | -0.42 (-1.75) | 0.87 / 0.58 (2.30) | Percentage of Non-agricultural Workers Not Covered by Social Security — 0.341 |

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Period of Estimation: 1990-1993

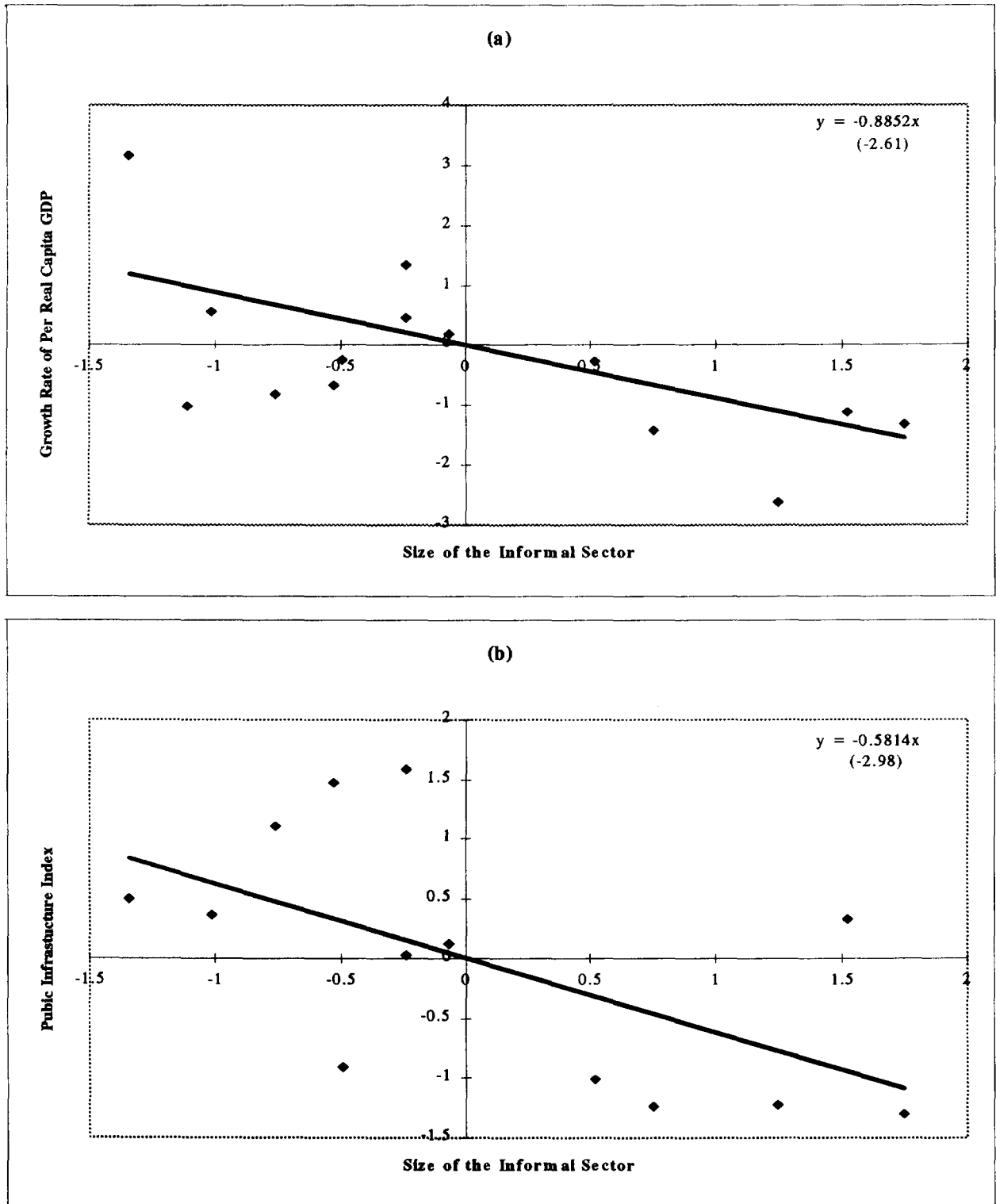Number of Observations: 14

Overall Model Fit:

-- $H_0$: Constraints on residual covariance matrix implied by the model are valid
$\chi^2(2) = 0.5095$, p-value $= 0.7751$

-- Joreskog and Sorbom 1986: Goodness of Fit (GFI) $= 0.9849$
GFI Adjusted for Degree of Freedom $= 0.8864$

-- Bentler and Bonett 1980: Normed Index $= 0.9810$

-- Bollen 1986: Normed Index (Accounting for Degrees of Freedom) $= 0.9051$

**Figure 3. The Relation of Public Infrastructure and Growth with the Informal Sector**

**(a)**

$y = -0.8852x$
$(-2.61)$

Growth Rate of Per Real Capita GDP

Size of the Informal Sector

**(b)**

$y = -0.5814x$
$(-2.98)$

Public Infrastructure Index

Size of the Informal Sector

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