

National Economic Research Associates (NERA) and Oxford Policy Management, 2004, “Addressing the Impact of Preference Erosion in Bananas on Caribbean Countries,” Report Prepared for Department for International Development, London.

National Economic Research Associates (NERA), 2003, “Banana Exports from the Caribbean since 1992,” Preliminary Report Prepared for the Caribbean Banana Exporters Association, London.

Sanchez, J., 2004, “Obtaining the Tariff Equivalent to the Current Banana Regime in the European Union (25), According to the Attachment to Annex 5 of the WTO Agreement on Agriculture,” mimeo (Madrid: World Trade Organization).

Sandiford, W., 2000, *On the Brink of Decline: Bananas in the Windward Islands* (St. George’s: Cedon Books).

Subramanian, A., 2003, “Financing of Losses from Preference Erosion,” Paper prepared for the World Trade Organization, WT/TF/COH/14, February.

Williams, O., and R. Darius, 1998, “Bananas, the WTO and Adjustment Initiatives in the Eastern Caribbean Central Bank Area”, mimeo, Eastern Caribbean Central Bank.

Williams, O., W. Sandiford, and A. Phipps, 1999, “Banana Price Shocks and Adjustment Within a Unified Currency Area,” *Applied Economics*, Vol. 31, pp. 1455–66.

### III. THE SIZE OF THE INFORMAL ECONOMY IN THE CARIBBEAN<sup>36</sup>

#### A. Introduction

56. **The existence of large informal sectors is an important characteristic of many developing countries.** The informal economy can have sizeable budgetary implications, and implications for tax incidence and income distribution (Giles, 1999; Dabla-Norris and Feltenstein, 2003). As a result, measuring the informal economy has evoked considerable interest and methodological debate among both academics and policymakers (see Tanzi, 1982; 1999). This chapter extends the empirical literature on the analysis of the size of the informal economy to the countries of the Caribbean.

57. **There is no single definition as to what constitutes the informal economy.** A wide range of similar terms have been used in the literature such as hidden economy, shadow economy, clandestine economy, parallel economy, subterranean economy, unreported economy, cash economy and black economy. More recently, however, there appears to be a growing consensus regarding the definition of several of these terms. Following Feige (1996), the informal economy is defined to comprise those economic activities that circumvent the costs and are excluded from the benefits and rights incorporated in the laws and administrative rules covering property relationships, commercial licensing, labor contracts, torts, financial credit and social systems. Thus, a measure of the informal economy is the income generated by economic agents who undertake the stated activities.<sup>37</sup>

58. **Measuring the size of the informal economy is important for several reasons.** First, there appears to be strong evidence of a direct link between the size of the informal economy and tax evasion. Table III.1 shows, using data for the early 1990s, that there is a positive relationship between these two concepts. As extreme cases, Bolivia, which had an informal economy of approximately 65 percent of GDP, experienced VAT tax evasion of about 45 percent of GDP; while New Zealand, which had a small informal economy of around 12 percent, had a much lower level of tax evasion at close to 5 percent of GDP (Schneider and Enste, 2000a; Silvani and Brondolo, 1993). Second, employment in the informal economy has an impact on the financial viability of social security and social protection systems, which depend on revenues from the formal sector.<sup>38</sup> Third, the magnitude of the informal economy provides an estimate of the potential revenue gain from tax reforms targeted at enhancing compliance and broadening the tax net.

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<sup>36</sup> Prepared by Guillermo Vuletin.

<sup>37</sup> Similarly, Portes, et al. (1989) define the informal economy as "...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."

<sup>38</sup> For additional details on Caribbean social security systems, see Roache (2006).

59. **This is the first study that estimates the size of the informal economy for a large cross-section of the countries of the Eastern Caribbean Currency Union (ECCU) and the wider Caribbean.** The size of the informal economy in the early 2000s is found to vary considerably—from a low of around 15 percent of measured GDP for The Bahamas to a high of over 50 percent of measured GDP for St. Vincent and the Grenadines. However, the average size of the informal economy for the ECCU and Caribbean countries (around 33 percent of GDP) is lower than that found for Latin American economies (which average about 43 percent of GDP).<sup>39</sup>

60. **The remainder of the chapter is organized as follows.** Section B describes the different methods used in the literature to estimate the size of the informal economy, and outlines the estimation approach used in this chapter—“Multiple Indicators, Multiple Causes” (MIMIC). Section C presents the set of countries and variables used in the analysis. The empirical results are discussed in Section D, while Section E concludes.

## **B. Methods of Estimating the Size of the Informal Economy**

61. **Different methods have been used in the literature to measure the size of the informal economy.** While some studies use direct methods based on surveys, most studies use indirect methods such as (i) the “electricity consumption” approach of Kauffman and Kaliberda (1996); (ii) the “monetary transaction” approach of Feige (1979); (iii) the “currency demand” approach of Cagan (1958) and others; and (iv) use of the “Multiple Indicators, Multiple Causes” (MIMIC) approach of Frey and Weck-Hanneman (1984).<sup>40</sup> This paper draws on Loayza (1997) and uses the MIMIC approach to both estimate the size of the informal economy and gauge its effect on the provision of social security, unionization, and school enrollment.

62. **The MIMIC method is based on a structural equation model approach that treats the size of the informal economy as a latent (unobserved) variable with several causes and several indicators (or effects).** The methodology uses associations between the observable causes and the observable effects of a latent variable (i.e., the informal economy),

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<sup>39</sup> The study is based on data from: Antigua and Barbuda, Argentina, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Cyprus, Dominica, Dominican Republic, Ecuador, El Salvador, Fiji, Grenada, Guatemala, Guyana, Honduras, Jamaica, Malta, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, The Bahamas, Trinidad and Tobago, Uruguay and Venezuela. However, only the findings for the Fund-member countries of the ECCU (Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines) and other Caribbean countries are reported in this chapter. For a complete discussion of the remaining countries, see Vuletin (2007).

<sup>40</sup> A thorough review of these approaches is discussed in Schneider and Enste (2000a, 2000b) and OECD (2002).

to estimate the unobserved factor itself (Loayza, 1997).<sup>41</sup> Additional details regarding the MIMIC methodology can be found in Appendix I.

**63. Several reasons underpinned the choice of the MIMIC method to calculate the size of the informal economy in the Caribbean.**<sup>42</sup> These include:

- Tax auditing and other similar survey based methods are not available for most Caribbean countries in the sample.
- The electricity, transaction and currency demand approaches require country-specific information about the informal economy in at least the base year, which is not available for the ECCU and other Caribbean countries.<sup>43</sup> The cross-section MIMIC approach only requires information regarding the absolute value of the informal economy for one country in the sample.
- In addition, the transaction and currency demand approaches would tend to underestimate the relevance of the informal economy in countries subject to a high degree of dollarization in circulating currency (such as in the ECCU).<sup>44</sup> This occurs because although monetary data is easily obtained for local currency, it is not for the circulation of foreign currency outside the domestic banking system.

### C. Data and Methodology

**64. Due to constraints in obtaining data on foreign currency in circulation in the ECCU, this study only considers non-financial cause and indicator variables.** The variables chosen as cause and indicator variables have been selected according to economic theory on the determinants of the informal economy, and on the basis of data availability. A brief description of the causal and indicator variables, as well as the expected relationship with the informal economy in the context of the MIMIC estimation strategy, is presented in

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<sup>41</sup> Loayza (1997) measured the informal economy for 14 Latin American countries for the early 1990s, using variables such as: the tax burden, labor market restrictions and governance variables that capture the strength and efficiency of government institutions as *causal* variables; tax evasion information and the share of labor force contributing to social security schemes as *indicators* of the informal economy.

<sup>42</sup> A more detailed discussion about the main advantages and weaknesses of each methodology, and the justification for using the MIMIC approach, can be found in Vuletin (2007).

<sup>43</sup> See below, however, for a study on Jamaica.

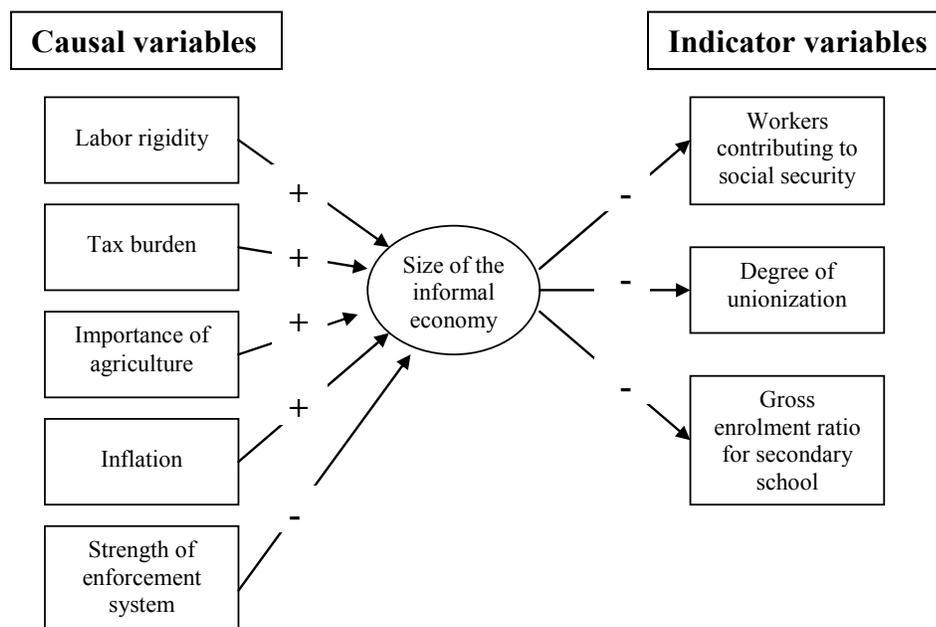
<sup>44</sup> Recent work (Feige, et al. (2001, 2002) and Feige (1996, 2003)) confirm that dollarization is relevant for both low-inflation countries like the ECCU (because of tourism and currency substitution issues) and for high-inflation countries like Argentina and Mexico (due to asset substitution).

Box III.1 and Box III.2, and in Appendices I and II. The estimation period is the early 2000s, using data on the previously-listed 32 Caribbean, Latin American and island countries.<sup>45</sup>

### Box III.1. Representation of the “Multiple Indicators, Multiple Causes” (MIMIC) Methodology

The MIMIC methodology is a structural equation-based modeling approach that treats the size of the informal economy as a latent variable. While the measure of the informal economy is *unobservable*, many of its causes and indicators or manifestations are *observable* variables. This methodology relies on the associations between the causes and indicators to estimate the size of the (unobservable) informal economy itself. For example, if a higher tax burden is believed to (cause) an increase in the size of the informal economy and the latter variable is supposed to (indicate) a likely decrease in the number of workers contributing to the social security system, then there should be a negative relation between the tax burden and workers contributing to the social security system. The MIMIC approach estimates the coefficients linking the cause variables with the informal economy, and those connecting the informal economy with its indicators, based on the *actual* relationships between the cause and indicator variables. If the *actual* correlations strongly match the *expected* ones, then the estimated coefficients should have the appropriate signs and be statistically significant. The coefficients linking the cause variables and the informal economy can then be used to effectively calculate the size of the informal economy. See Appendix I for additional details.

Considering the set of proposed variables (see Box III.2), the MIMIC strategy as well as the expected sign of the coefficients (where + (-) denotes that the former variable is positively (negatively) related to the latter) can be represented by the following diagram.



<sup>45</sup> Since 2000, several Caribbean countries have introduced market-oriented reforms and tax reforms designed to broaden the tax base and enhance compliance. Accordingly, given that the period of estimation is the early 2000s, the results obtained here may represent an upper bound to the actual size of the informal economy.

### Box III.2. Variables Considered in the Analysis

#### Causal variables:

*Tax burden:* calculated as the average of the highest statutory corporate and personal tax rate.

*Labor rigidities:* proxied with two alternative indices that include minimum wage constraints (captured as the ratio of minimum wage to GDP per capita) and mandated benefits (based on social security contribution rates).

*Importance of agriculture:* measured by agriculture and food exports as percentage of total exports. Included as many studies endorse the idea that informal work is highly segmented by sectors of the economy, with clear prevalence in agriculture and related sectors.

*Inflation:* included following Giles (1999), to allow for the upward “creep” of taxpayers through the tax brackets induced by it, and the associated incentive for taxpayers to engage in informal activities.

*Strength of enforcement system:* as in Loayza (1997), is captured by an average of quality of bureaucracy, corruption in government and rule of law, taken from International Country Risk Guide.

#### Indicator variables:

*Workers contributing to the social security system:* measured as a percentage of the labor force.

*Degree of unionization:* percentage of labor force with membership of a labor union.

*Gross enrollment ratio for secondary school:* most countries in the world have signed the International Labor Organization Convention 138, which made fourteen the minimum working age; however, one of the well-recognized consequences of the informal economy is related to child labor and the effect it has on rates of education enrollment. Due to the lack of data on the primary net enrolment rate, the secondary gross enrolment rate is used.

## D. Empirical Results

65. **The correlations between causal and indicator variables match the expected signs, providing preliminary support for the abovementioned hypotheses.** Aside from the relationship between tax burden and degree of unionization (top-right cell) all remaining observed correlations match their expected signs (Table III.2).

66. **The MIMIC estimations strongly validate the expected associations between the causal and indicator variables and the informal economy.** The results from the benchmark MIMIC specification, Model 1, are represented in Figure III.1. Labor rigidity (index #1, proxied by minimum wage constraints), tax burden, importance of agriculture and inflation are the *causal* variables of the informal economy, while the number of contributors to the social security system, the degree of unionization and the gross enrollment ratio for secondary school are the *indicator* variables.<sup>46</sup> Before analyzing the estimation results it is important to remark that several goodness-of-fit statistics support the underlying model (see box in Figure III.1). The coefficients on the causal and indicator variables have the expected signs and are statistically significant (typically at the 1 or 5 percent level).

<sup>46</sup> Although most variables are subject to endogeneity, strength of enforcement system is one that has the potential to be most severely affected. For this reason it is not included in the benchmark specification (Model 1).

67. **The size of the informal economy appears to be affected by excessive taxes and labor regulations, high inflation, as well as a dependence on agriculture.** An increase of one standard deviation in the tax burden, labor rigidities, importance of agriculture, and inflation increases the size of the informal economy by 0.27, 0.52, 0.40, and 0.47 standard deviations, respectively. Importantly, the joint influence of the four causal variables explains around 80 percent of the variance of the informal economy (Figure III.1).

68. **The variables identified as key indicators of the effect of the informal sector perform well.** As expected, it is found that an increase in the size of the informal economy reduces the number of contributors to social security, the extent of unionization and education enrollment. An increase of one standard deviation in the size of the informal economy reduces the number of workers contributing to the social security system, the degree of unionization, and the secondary enrollment ratio by 0.87, 0.59 and 0.76 standard deviations, respectively. Importantly, the size of the informal economy explains 76, 35 and 57 percent, respectively, of the variance of social security contributions, unionization and school enrollment.

69. **Alternative MIMIC specifications support the results obtained in the benchmark model.** Models 2 and 3 include an alternative measure of labor rigidity (index #2, including mandated benefits) and the strength of enforcement system, respectively (see Figures III.2 and III.3). Both models confirm the results obtained in the benchmark model, producing very similar estimates for the impact of the size of the informal economy on the indicator variables. Model 3 also presents evidence suggesting that the strength of enforcement system appears to be an important determinant of the size of the informal economy.<sup>47</sup>

### **Estimation of the size of the informal economy**

70. **The standardized values of the (unobserved) size of the informal economy only enable an ordinal ranking of countries in the sample.** In order to determine the absolute value of the size of the informal sector (as a percentage of GDP)—a cardinal measure of informal economies—one requires an exogenously-determined measure of the size of one country’s informal economy, which will then be used to scale the absolute size of all Caribbean informal economies. Hence, we first calculate the “predicted” ordinal values for the informal economy, as listed in Table III.3 (derived using equation (A2) of Appendix I). Then, using information regarding the specific value for the size of the informal economy of Jamaica (see De La Roca et al. (2002), who estimates the size of Jamaica’s informal

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<sup>47</sup> As a further robustness check, for the 15 common countries analyzed here and in the study by Schneider (2002), a rank correlation test is able to reject the null hypothesis of no positive relationship between the sets of rankings of informal economies.

economy at about 35 percent of measured GDP in 2000–01), the within-sample ordinal rankings for the informal economy are converted into a cardinal series.<sup>48</sup>

71. **The size of the informal economy is found to vary widely across the Caribbean.** As a percentage of GDP, the informal economy varies from a low of around 15 percent for The Bahamas to a high of over 50 percent for St. Vincent and the Grenadines (Table III.3 and Figure III.4). The Bahamas, Grenada, St. Kitts and Nevis, and Trinidad and Tobago are among those countries with relatively small informal economies, with values about one-fifth of GDP. These values are among the lowest not only for the Caribbean region, but also in relation to most Latin American countries. On the other hand, St. Vincent and the Grenadines, Belize, and the Dominican Republic are among those countries with relatively large informal economies, with values close to half of GDP. It should be noted that these estimates are smaller than for those countries with large informal economies in Latin America, such as Paraguay and Nicaragua, which have informal sectors measured at around 70 percent of GDP. The remaining Caribbean countries have informal economies similar in size to the most developed countries of Latin America, such as Argentina, Chile, Mexico, and Uruguay (see Vuletin, 2007).

72. **The implied series for the size of the informal economy are robust to alternative specifications.** Table III.4 shows the absolute values of the informal economy for the ECCU and other Caribbean countries, derived using the different specifications employed in Models 1, 2, and 3. The informal economy estimates are similar across these models.

73. **Previous estimates of the size of individual Caribbean underground economies are broadly consistent with those derived in this chapter.** In a currency demand-based analysis, Faal (2003) finds that the underground economy in Guyana averaged about 45 percent of official GDP in the 1990s, and was about 35 percent of official GDP in 2000—this result is close to the 37 percent of official GDP found here for Guyana for the early 2000s (see Table III.3). Again using a currency demand-based model, Maurin, et al. (2006) find that in the late 1990s, the informal economy of Trinidad and Tobago was about 20 percent of official GDP and growing rapidly—a smaller estimate than calculated in this chapter. Finally, Schneider (2004) finds that the informal economy in the Dominican Republic was about 35 percent of measured GDP in the early 2000s, which is close to the results found here.

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<sup>48</sup> Since De La Roca et al. (2002) uses different methodologies and data collected as part of the 2001 *Jamaica Survey of Living Conditions*, it represents a very attractive data source to calculate the absolute series of the informal economy. Since the *order* of countries according to the size of the informal economy is independent of the above-mentioned additional information, but the *absolute* values of the informal economy do depend on this data, caution is advised regarding use of the latter values as accurate measures of the degree of informality.

### **Relative contribution of each cause variable to size of the informal economy**

74. **There is a wide dispersion across Caribbean countries in the relative contribution of each causal variable to the measured size of the informal economy.** On average the tax burden, labor rigidity, importance of agriculture and inflation contribute around 40, 24, 32 and 4 percent to the overall size of the informal economy respectively. However, this profile differs greatly across countries (Figure III.5). Key features are:

- For some countries (such as Antigua and Barbuda and Grenada) the main component influencing the informal economy is the tax burden.<sup>49</sup> For example, in the late 1990s, Antigua and Barbuda had the ECCU region's highest marginal statutory corporate tax rate of 40 percent.
- For other countries (such as St. Vincent and the Grenadines, St. Lucia, and Belize) the agriculture sector was a key driver of the informal economy, with approximately 75 percent of goods exports consisting of agricultural and food products.
- For countries such as the Dominican Republic, the significance of labor rigidities appears to be decisive, with minimum wages equivalent to about 90 percent of the corresponding GDP per capita.
- Importantly, for most of the Caribbean economies, inflation does not seem to be an important factor in determining the size of the informal economy, most likely due to the relative price stability observed in these countries.

### **E. Concluding Remarks**

75. **There have been several key drivers of the size of informal economies in the Caribbean.** In particular, a burdensome tax system, rigid labor markets, higher inflation and dominance of the agriculture sector are factors that are positively related to the size of the informal economy. Moreover, the relative contribution of each factor varies across countries. For some countries (such as Antigua and Barbuda and Grenada) the most important factor influencing the size of the informal economy is the tax burden. For others (such as St. Vincent and the Grenadines and St. Lucia) the importance of the hard-to-regulate agriculture sector is dominant, while for some economies (like the Dominican Republic) the significance of labor rigidities appears to be crucial. Importantly, inflation does not appear to be an important determinant of the informal economies in the Caribbean. Further, the

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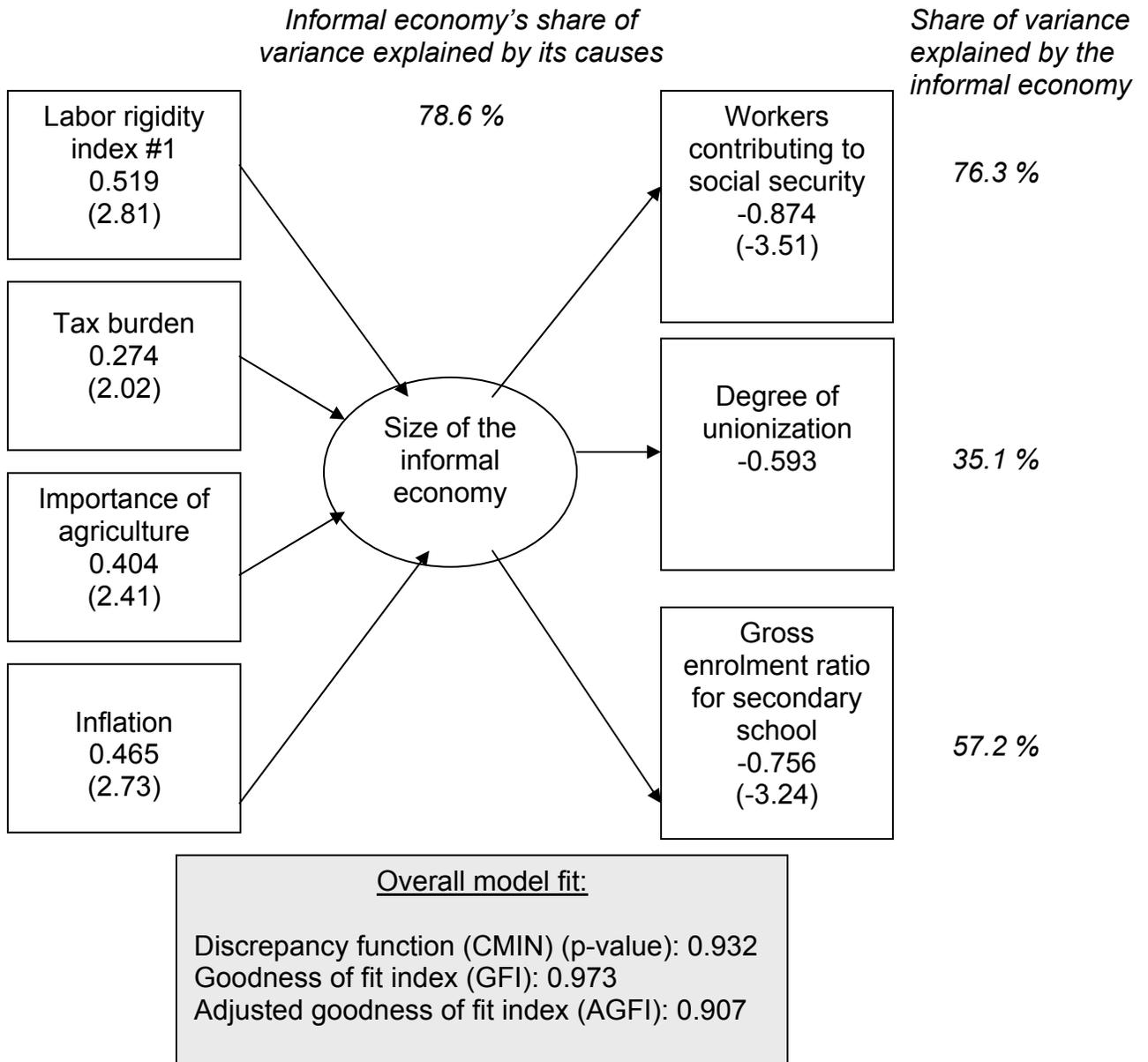
<sup>49</sup> This result is consistent with work by Giles and Caragata (2001) for New Zealand and Giles and Tedds (2002) for Canada, who found that an expansionary fiscal policy (through a reduction in the effective tax rate) leads to a reduction in the size of the underground economy as a share of measured GDP. In contrast, there is little or no empirical evidence on the relationship between monetary policy and the relative size of the underground economy.

empirical results indicate that a large informal sector tends to reduce labor unionization, the number of contributors to social security schemes, and enrollment rates in education.

76. **The above analysis has several policy implications:**

- In countries where the informal economy is related to the tax burden, the results suggest the advantages of policies to broaden the tax base and reduce marginal tax rates. Several countries in the region are at present moving in that direction by broadening tax bases, introducing value-added taxes (e.g., Dominica, Antigua and Barbuda and St. Vincent and the Grenadines) and income taxes (e.g., Antigua and Barbuda).
- In economies where labor market rigidities are severe, steps need to be taken to accelerate labor market reforms and enhance flexibility. Such reforms are being introduced by all Caribbean countries, in the context of the CARICOM Single Market and Economy, which envisages greater mobility of labor and flexibility of labor markets across CARICOM countries.
- Given the high debt burden borne by most Caribbean countries, a reduction in the size of the informal economy should assist in bolstering fiscal and debt sustainability.
- The large size of the informal economy in many Caribbean countries suggests that official economic indicators (including the size of the official economy and the national tax base) may be understated. All Caribbean countries are endeavoring to improve the coverage, timeliness and quality of their economic statistics, particularly the coverage of the services sector in their national accounts, as most countries are making (or have made) the transition from agriculture-based to services-based economies.

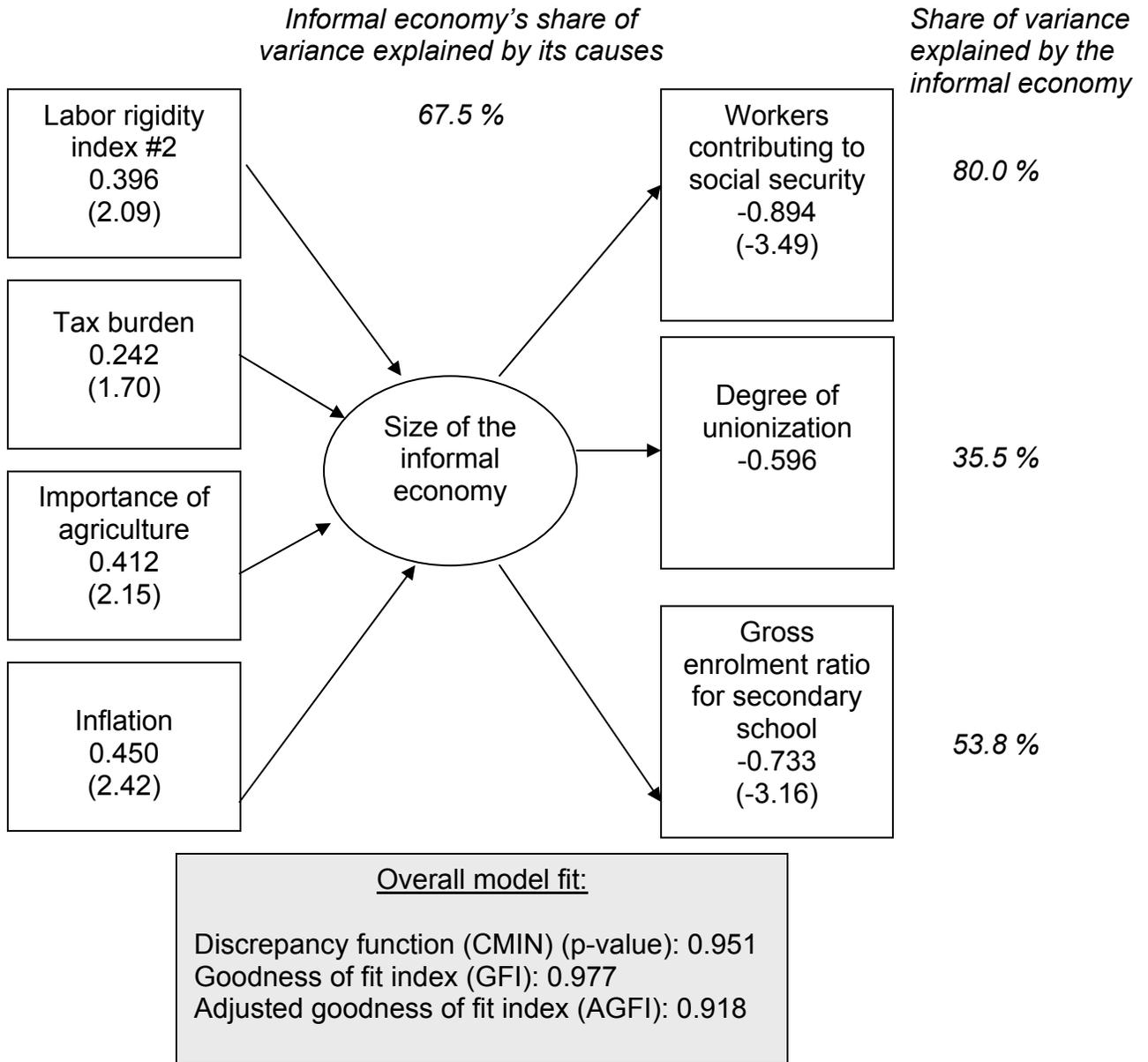
Figure III.1. MIMIC Estimation Results, Model 1 1/



Source: Author's calculation.

1/ The arrow points in the direction of influence of the standardized regression coefficients and their respective *t*-values, indicated in parenthesis. In order to remove the structural indeterminacy of the coefficients, the non-standardized coefficient associated with *Degree of unionization* was set to -1. For this reason a *t*-test cannot be performed on this coefficient. The same standardized coefficients are obtained by setting the coefficient of another indicator equal to -1.

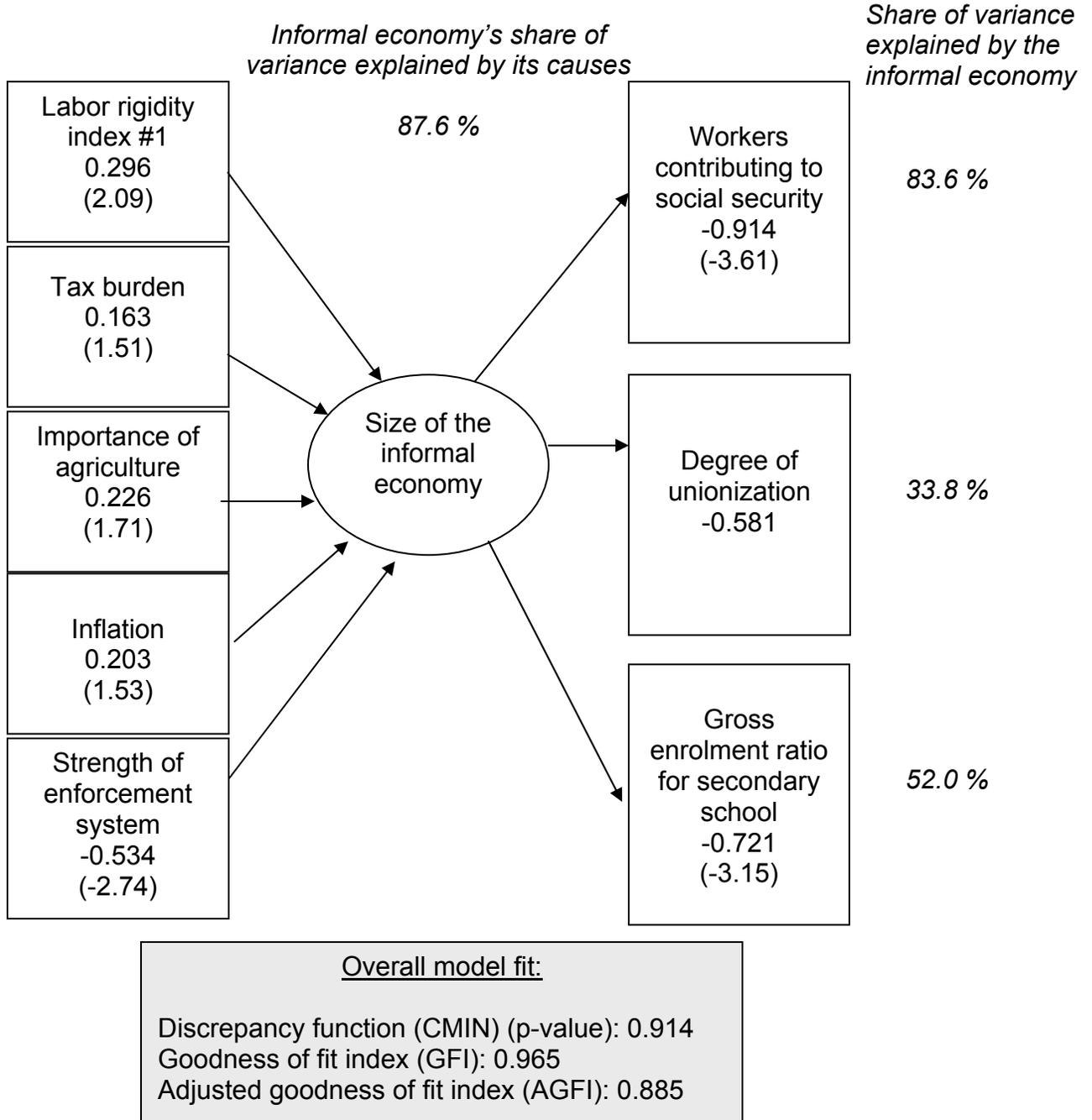
Figure III.2. MIMIC Estimation Results, Model 2 1/



Source: Author's calculation.

1/ The arrow points in the direction of influence of the standardized regression coefficients and their respective *t*-values, indicated in parenthesis. In order to remove the structural indeterminacy of the coefficients, the non-standardized coefficient associated with *Degree of unionization* was set to -1. For this reason a *t*-test cannot be performed on this coefficient. The same standardized coefficients are obtained by setting the coefficient of another indicator equal to -1.

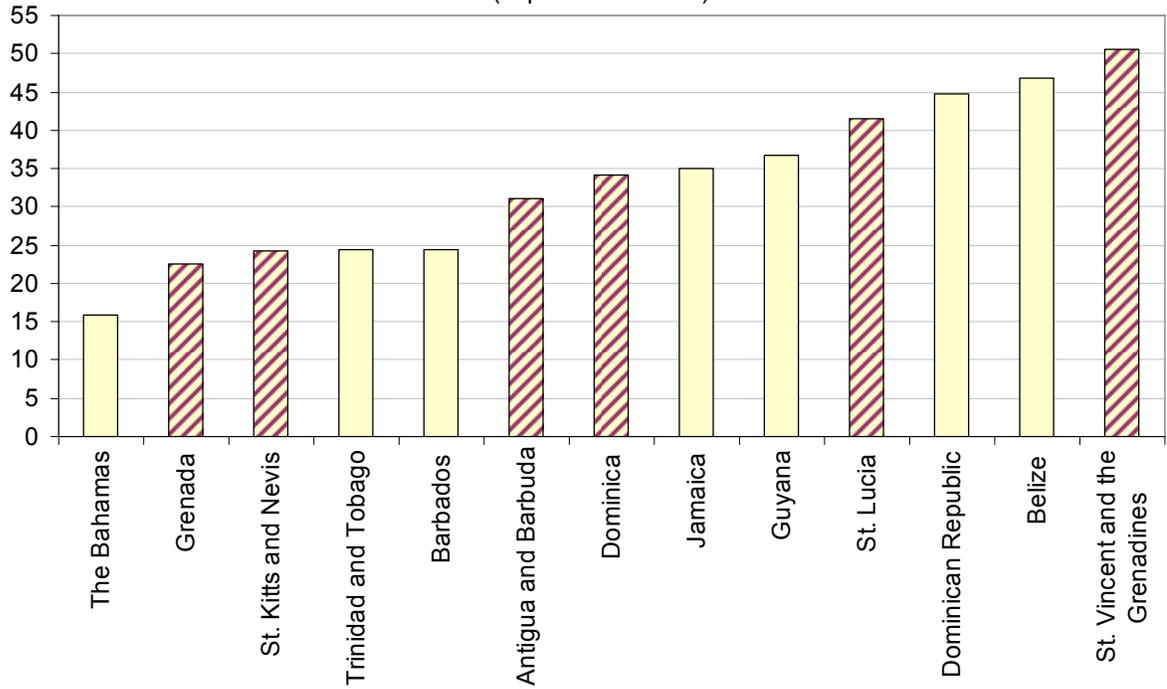
Figure III.3. MIMIC Estimation Results, Model 3 1/



Source: Author's calculation.

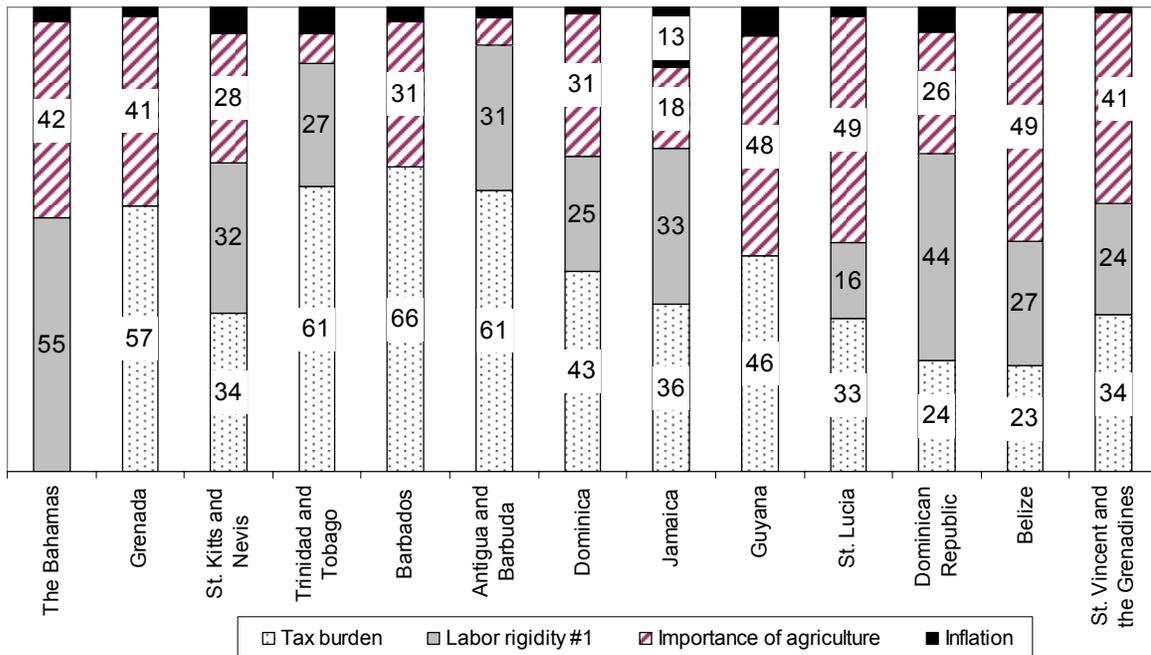
1/ The arrow points in the direction of influence of the standardized regression coefficients and their respective *t*-values, indicated in parenthesis. In order to remove the structural indeterminacy of the coefficients, the nonstandardized coefficient associated with *Degree of unionization* was set to -1. For this reason a *t*-test cannot be performed on this coefficient. The same standardized coefficients are obtained by setting the coefficient of another indicator equal to -1.

Figure III.4. Caribbean: Estimated Size of the Informal Economy, early 2000s  
(In percent of GDP)



Source: Author's calculation based on Model 1 MIMIC results.

Figure III.5. Caribbean: Contribution of Causal Variables to Size of the Informal Economy  
(In percent)



Source: Author's calculations based on Model 1 MIMIC results.

Note: Only contributions greater than 7 percent display the associated share.

Table III.1. Size of the Informal Economy and VAT Tax Evasion (In percent of GDP)

	Informal economy (early 1990s)	VAT tax evasion (early 1990s)
New Zealand	12	5
Sweden	16	6
Argentina	21	30
Honduras	47	35
Bolivia	66	44

Sources: Schneider and Enste (2000), and Silvani and Brondolo (1993).

Table III.2. Correlations Between Causal and Indicator Variables

	Workers contributing to social security	Gross enrolment ratio for secondary school	Degree of unionization
Tax burden	-0.14	-0.12	0.07
Labor rigidity index #1	-0.59	-0.60	-0.39
Labor rigidity index #2	-0.59	-0.53	-0.36
Importance of agriculture	-0.39	-0.32	-0.31
Inflation	-0.40	-0.29	-0.30
Strength of enforcement system	0.82	0.58	0.49

Source: Author's calculations.

Table III.3. Caribbean: Estimated Size of the Informal Economy, Standardized and Absolute Values, early 2000s

Country	Standardized value	Absolute value (% of GDP)
The Bahamas	-1.766	15.9
Grenada	-1.244	22.5
St. Kitts and Nevis	-1.108	24.2
Trinidad and Tobago	-1.092	24.4
Barbados	-1.087	24.5
Antigua and Barbuda	-0.562	31.2
Dominica	-0.322	34.2
Jamaica	-0.259	35.0
Guyana	-0.122	36.7
St. Lucia	0.251	41.5
Dominican Republic	0.515	44.8
Belize	0.673	46.8
St. Vincent and the Grenadines	0.974	50.6

Source: Author's calculation based on Model 1 MIMIC results.

Note: As detailed in Appendix I, in order to calculate the absolute value of the informal economy, extra information regarding the size of the informal economy of a particular country is required. According to the results of a comprehensive study conducted by the Inter-American Development Bank (De la Roca et. al., 2002), the informal economy in Jamaica accounted for about 35 percent of the total GDP in 2000-01, and is the benchmark study used in this chapter.

Table III.4. Caribbean: Estimated Absolute Size of the Informal Economy, Alternative Specifications, early 2000s (In percent of GDP)

Country	MIMIC Model 1	MIMIC Model 2	MIMIC Model 3
The Bahamas	15.9	11.5	15.1
Grenada	22.5	31.8	22.9
St. Kitts and Nevis	24.2	24.6	24.4
Trinidad and Tobago	24.4	25.2	24.8
Barbados	24.5	36.6	24.3
Antigua and Barbuda	31.2	29.7	31.7
Dominica	34.2	38.8	35.0
Jamaica	35.0	35.0	35.0
Guyana	36.7	57.3	37.3
St. Lucia	41.5	52.0	41.8
Dominican Republic	44.8	46.1	45.3
Belize	46.8	56.5	47.4
St. Vincent and the Grenadines	50.6	58.4	51.4
<b>Average</b>	<b>33.3</b>	<b>38.7</b>	<b>33.6</b>

Source: Author's calculations.

Note: As detailed in Appendix I, in order to calculate the absolute value of the informal economy, extra information regarding the size of the informal economy of a particular country is required. According to the results of a comprehensive study conducted by the Inter-American Development Bank (De la Roca et. al., 2002), the informal economy in Jamaica accounted for about 35 percent of the total GDP in 2000-01, and is the benchmark study used in this chapter.

### Appendix I: MIMIC Methodology

The Multiple Indicators, Multiple Causes (MIMIC) approach, initially developed by Zellner (1970), Goldberg (1972) and Joreskog and Goldberg (1975), considers several causes, as well as the multiple effects of the informal economy. This more flexible approach is considered potentially inclusive of all previous indirect methods. The methodology makes use of the associations between the observable causes and the observable effects of an unobserved variable, in this case the informal economy, to estimate the unobserved factor itself. The model for one latent variable can be described as follows:

$$y = \lambda IE + \varepsilon \quad (\text{A1})$$

$$IE = \gamma' x + \nu \quad (\text{A2})$$

where  $IE$  is the unobservable scalar latent variable (the size of the informal economy),  $y' = (y_1, \dots, y_p)$  is a vector of indicators for  $IE$ ,  $x' = (x_1, \dots, x_q)$  is a vector of causes of  $IE$ ,  $\lambda$  and  $\gamma$  are the  $(p \times 1)$  and  $(q \times 1)$  vectors of the parameters and  $\varepsilon$  and  $\nu$  are the  $(p \times 1)$  and scalar errors. Equation (A1) links the informal economy with its observable, exogenous indicators, while equation (A2) associates the informal economy with a set of observable, exogenous causes. Assuming that these errors are normally distributed and mutually uncorrelated with  $\text{var}(\nu) = \psi$  and  $\text{cov}(\varepsilon) = \Theta_\varepsilon$  a reduced-form equation is obtained by combining equations (A1) and (A2):

$$y = \pi x + \mu \quad (\text{A3})$$

where  $\pi = \lambda \gamma'$ ,  $\mu = \lambda \nu + \varepsilon$  and  $\text{cov}(\mu) = \lambda \lambda' \psi + \Theta_\varepsilon$ .

Because the system of  $p$  equations (A3) has a regressor matrix of rank one and the error covariance matrix is also constrained, it is not possible to obtain *cardinal* estimates of all the parameters. Only certain estimable functions of the parameters can be identified, meaning that the *relative* magnitudes of the parameters can be estimated but not their levels. The estimation of equation (A1) and (A2) requires a normalization of the parameters in equation (A1), and a convenient way to achieve this is to constrain one element of  $\lambda$  to some pre-assigned value. Because both  $y$  and  $x$  are observable data vectors, equation (A3) can be estimated by restricted maximum likelihood, and the estimates obtained are consistent and asymptotically efficient estimates of the elements of  $\pi$ , and hence of  $\lambda$  and  $\gamma$ . Since the estimation of  $\lambda$  and  $\gamma$  is obtained by constraining one element of  $\lambda$  to some arbitrary value, it is useful to standardize the regression coefficients  $\hat{\lambda}$  and  $\hat{\gamma}$  as follows:

$$\hat{\lambda}^s = \hat{\lambda} \begin{pmatrix} \hat{\sigma}_{IE} \\ \hat{\sigma}_y \end{pmatrix} \quad \hat{\gamma}^s = \hat{\gamma} \begin{pmatrix} \hat{\sigma}_x \\ \hat{\sigma}_{IE} \end{pmatrix}.$$

The standardized coefficient measures the expected change (in standard-deviation units) of the dependent variable due to a one standard-deviation change of a given explanatory

variable, when other variables are held constant. Using the estimates of the  $\gamma^s$  vector and setting the error term  $\nu$  to its mean value of zero, the “predicted” *ordinal* values for the informal economy (*IE*) can be estimated using equation (A2). The differences between the ordinal values of each country’s informal economy can then be compared, and each country ranked accordingly.

Then, using information regarding the specific value of the informal economy (*IE*) of some particular country (if it is a cross-country study) or for some particular point in time (if it is a time-series study), obtained from some other source, the *ordinal* within-sample predictions for *IE* can be converted into a *cardinal* series. For this purpose, this chapter uses the information derived from a comprehensive study conducted by De La Roca et al. (2002), according to which, the informal economy in Jamaica accounted for about 35 percent of the country’s total GDP in 2000–01. Since the latter study uses different methodologies and data collected as part of the 2001 *Jamaica Survey of Living Conditions*, it represents a very attractive data source to pin down the absolute series of the size of Caribbean informal economies. Since the *order* of countries according to the size of the informal economy is independent of the abovementioned additional information, but the *absolute* values of the informal economy do depend on this data, caution is advised regarding use of the latter values as accurate measures of the degree of informality.

## Appendix II: Data Construction and Sources

### *Causal variables*

1. *Tax burden:* The proxy for tax pressure is the average of statutory corporate and personal marginal income tax rate. The highest rate is used when there is more than one rate. This proxy measure is normalized between 0 and 100. The data corresponds mostly to 2003, and is obtained from the World Bank's *World Development Indicators* and Bain and dos Santos (2004).
  
2. *Labor rigidity indices:* Two alternative measures of labor rigidity are constructed. The first (labor rigidity index #1) is represented by the ratio of minimum wage to GDP per capita, normalized between 0 and 100. The minimum wage corresponds to the most general minimum wage regime. When minimum wages vary across sectors, the one for manufacturing (or for commerce, if manufacturing is not available) is reported. When minimum wages vary across regions, the value reported is either a simple average or the minimum wage applicable in the main urban centers. A zero indicates that the country has no government-set minimum wage, although minimum wages negotiated at the sectoral level may exist. The second measure (labor rigidity index #2) is the normalized average of two components divided by real GDP per capita. The first component captures minimum wage restrictions and corresponds to labor rigidity index #1, while the second element represents mandated benefits and is measured by the contribution rates (as percentage of salaries) for all social security programs for both the employee and the employer. Only for Belize, where the contributions are flat-rate according to earning classes, the normalized legal number of days of maternity leave with full pay without complications is used. Following Loayza (1997), the normalized average of these components is divided by real GDP per capita in order to account for differences in labor productivity across countries.

The data for minimum wages correspond to 2002 and it is mainly obtained from the U.S. Department of State (2002), "Country Reports on Human Rights Practices." These reports are submitted annually by the U.S. Department of State to the U.S. Congress and cover internationally-recognized individual, civil, political, and worker rights, as set forth in the Universal Declaration of Human Rights. The social security contribution data correspond mostly to 2003, and are obtained from United States Social Security Administration (2002), "Social Security Programs Throughout the World". Maternity leave information corresponds to the average of the period 1999–2002 and it is obtained from several online publications from The Clearinghouse on International Developments in Child, Youth, and Family Policies, Columbia University.

3. *Importance of agriculture:* Measured by agricultural raw material and food exports (as percentage of total exports), mainly for 2000, and is taken from the World Bank's *World Development Indicators*. For the Dominican Republic, information from 2001 and 2002 is used.

4. *Inflation*: Annual average consumer prices inflation for the period 1995–99. Aside for Antigua and Barbuda in which IMF *International Financial Statistics* data is used, the rest of the information is obtained from the World Bank’s *World Development Indicators*.

5. *Strength of enforcement system*: Following Loayza (1997) the strength of enforcement system is proxied by an average of three subjective indicators reported in the International Country Risk Guide (ICRG) for 2002. The three variables considered are quality of bureaucracy, corruption in government and rule of law. Quality of bureaucracy scores high under “autonomy from political pressure” and “strength and expertise to govern without drastic changes in policy or interruption in government services.” Low scores in corruption in government indicate “high government officials are likely to demand special payments” and “illegal payments are generally expected throughout lower levels of government.” The variable 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 values are associated with “sound political institutions, a strong court system, and provisions for an orderly succession of power.” ICRG is a publication of Political Risk Services of Syracuse, NY.

### ***Indicator Variables***

1. *Workers contributing to social security*: Active contributors to old-age pension schemes, in percent of the labor force. It is based on national social security agencies, household surveys and IMF country desk information, predominantly for 2002.

2. *Degree of unionization*: Total union membership considering both public and the private sectors, in percent of the labor force. The data is mainly from U.S. Department of State (2002) “Country Reports on Human Rights Practices,” complemented by information from national authorities.

3. *Gross enrolment ratio for secondary school*: Total secondary enrolment as a percentage of the corresponding official school-age population, mostly for 2001. The sources of information are UNDP (2005) and World Bank (2005).

## REFERENCES

- Bain, L., and P. dos Santos, 2004, "CARICOM-Survey of the Caribbean Tax Systems," Prepared for the CARICOM Secretariat (Georgetown, Guyana: CARICOM).
- Cagan, P., 1958, "The Demand for Currency Relative to the Total Money Supply," *Journal of Political Economy*, Vol. 66, pp. 302–28.
- Dabla-Norris, E., and A. Feltenstein, 2003, "An Analysis of the Underground Economy and Its Macroeconomic Consequences," IMF Working Paper 03/23 (Washington DC: International Monetary Fund).
- De La Roca, J., M. Hernandez, M. Robles, M. Torero, and M. Webber, 2002, "Informal Sector Study for Jamaica," Group of Analysis for Development, mimeo (Washington DC: Inter-American Development Bank).
- Faal, E., 2003, "Currency Demand, the Underground Economy, and Tax Evasion: The Case of Guyana," IMF Working Paper 03/7 (Washington DC: International Monetary Fund).
- Feige, E., 1979, "How Big is the Irregular Economy?," *Challenge*, Vol. 22, pp. 5–13.
- Feige, E., 1996, "Overseas Holdings of U.S. Currency and the Underground Economy," in S. Pozo (ed.), *Exploring the Underground Economy: Studies of Illegal and Unreported Activity* (W.E. Upjohn Institute for Employment Research: Kalamazoo, MI), pp. 5–62.
- Feige, E., 2003, "The Dynamics of Currency Substitution, Asset Substitution and *De Facto* Dollarization and Euroization in Transition Countries," *Comparative Economic Studies*, Vol. 45, pp. 358-83.
- Feige, E., V. Šošić, M. Faulend, and V. Šonje, 2001, "Currency Substitution, Unofficial Dollarization and Estimates of Foreign Currency Held Abroad: The Case of Croatia," in Blejer, M. and M. Skreb (eds.), *Financial Vulnerability and the Exchange Rate Regime* (Boston: MIT Press).
- Feige, E., V. Šošić, M. Faulend, and V. Šonje, 2002, "Unofficial Dollarization in Latin America: Currency Substitution, Network Externalities and Irreversibility," in Dean, J.W., D. Salvatore and T. Willett (eds), *The Dollarization Debate* (New York: Oxford University Press).
- Frey, B., and H. Weck-Hanneman, 1984, "The Hidden Economy as 'Unobserved Variable'," *European Economic Review*, Vol. 26, pp. 33–53.
- Giles, D., 1999, "Modeling the Hidden Economy and the Tax-Gap in New Zealand," Working Paper 9905, Department of Economics, University of Victoria, Canada.

- Giles, D., and P. Caragata, 2001, "The Learning Path of the Hidden Economy: Tax and Growth Effects in New Zealand," *Applied Economics*, Vol. 33, pp. 1857–67.
- Giles, P., and L. Tedds, 2002, *Taxes and the Canadian Underground Economy* (Toronto: Canadian Tax Foundation).
- Goldberger, A., 1972, "Structural Equation Methods in the Social Sciences," *Econometrica*, Vol. 40, pp. 979–1001.
- Jöreskog K., and A. Goldberger, 1975, "Estimation of a Model with Multiple Indicators and Multiple Causes of a Single Latent Variable," *Journal of the American Statistical Association*, Vol. 70, pp. 631–39.
- Kaufmann, D., and A. Kaliberda, 1996, "Integrating the Unofficial Economy into the Dynamics of Post-Socialist Economies: A Framework of Analysis and Evidence," in B. Kaminski (ed.), *Economic Transition in Russia and the New States of Eurasia* (Armonk, NY: M. E. Sharpe, Inc).
- Loayza, N., 1997, "The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America," World Bank Policy Research Working Paper WPS 1727 (Washington DC: World Bank).
- Maurin, A., S. Sookram, and P. Watson, 2006, "Measuring the Size of the Hidden Economy in Trinidad and Tobago, 1973–99," *International Economic Journal*, Vol. 20, pp. 321–41.
- Organization for Economic Cooperation and Development, 2002, *Measuring the Non-Observed Economy: A Handbook* (Paris: OECD Publications Service).
- Portes, A., M. Castells, and L. Benton, 1989, "World Underneath: The Origins, Dynamics, and Effects of the Informal Economy," in Portes, A., M. Castells and L. Benton (eds.), *The Informal Economy: Studies in Advanced and Less Developed Countries* (Johns Hopkins University Press: Baltimore).
- Roache, S., 2006, "Social Security in the Eastern Caribbean Currency Union," in *Eastern Caribbean Currency Union—Selected Issues*, Chapter IV.
- Schneider, F., and D. Enste, 2000a, "Shadow Economies: Size, Causes, and Consequences," *Journal of Economic Literature*, Vol. 38, pp. 77–114.
- Schneider, F., and D. Enste, 2000b, "Shadow Economies Around the World: Size, Causes, and Consequences," IMF Working Paper 00/26 (Washington DC: International Monetary Fund).