ESTIMATING THE SIZE OF THE HIDDEN ECONOMY IN BARBADOS

ABSTRACT

In Barbados, and the Caribbean as a whole, very little research has been done on the topic of the informal economy. This paper attempts to estimate the size of the Barbadian informal sector, using two indirect techniques. Annual data from 1974 to 2001 was applied to the currency demand approach, while the labor force statistics method utilized data from 1975 to 1998. Both systems generated similar results, showing that the informal economy in Barbados is very small. However, this sector, no matter how small its size, should be taken into account while making policy decisions, and hence, deserves further investigation.

1. Introduction

The informal economy is a phenomenon that spans all income classes and all economic sectors. It consists of various types of activities, ranging from domestic work (maids, ironers, gardeners) to registered businesses that underestimate their sales and overestimate their expenditure. It is a known fact that the informal economy does exist, however, there have always been problems in trying to estimate its size and value. The informal economy data are not reflected in the national statistics and may lead to an overestimation of unemployment rates or an underestimation of the growth rates of real income. These miscalculations can consequently cause erroneous policy decisions.

This paper is the first stage in a two-stage process in trying to assess the size and relevance of the informal economy in Barbados. In this stage, an attempt was made to measure the size of this sector using appropriate indirect approaches. The results will determine whether or not it is worthwhile to proceed to the second stage, which entails surveying and quantifying the contributions of the sub-sectors to GDP.

The next section attempts to define the informal economy, and identify its main causes. It also discusses the advantages and disadvantages of this economy and looks at the methods used in estimating its size. The following section deals with some of the studies that were conducted in the Caribbean and gives a review of their results. In section 4, estimates for the size of the informal economy in Barbados are made, using indirect approaches. Suggestions follow as to whether further study of this sector should be done.

2. A Literature Review of the Underground Economy

2.1 Definition of Terms

Several different terms are used in defining the unmeasured economy. Terms such as informal, hidden, underground, invisible and shadow are but a few. Many of these concepts are used interchangeably to mean the same thing. However some distinction must be made in order to effectively measure this activity.

Any economic activity that does not appear in the statistics of the national income and GDP is considered to be part of the hidden economy. When asked, many people think of the hidden economy as being illegal activities; however this opinion is not necessarily so. While it may be true that all illegal activity lie within the hidden economy, there are many legal ones that also contribute. For example, when a carpenter who is employed in the official economy is paid to do work for a friend outside of his working hours, and does not report this income to the tax authorities, he too is participating in the hidden economy. A teacher who gets paid for out-of-class lessons may also be participating in this economy if this income is not reflected in the tax form. This information would normally have been measured if brought to the attention of the relevant authorities. Table 1 shows some of the various ways, both legal and illegal, in which people can participate in the hidden economy.

Some of these legal activities fall under what is considered to be the informal economy. This is, according to the International Labor Organization, economic activity that employs a handful of workers who earn low wages, use rudimentary equipment and work outside the framework of laws and regulations (Rampersad, (1987)). This definition is widely used by statistical agencies. It is true that some illegal activities also fall under the informal economy; and that not all-informal economic activity goes unmeasured.

Table 1. Types of Underground Economic Activities

Type of Activity	Monetary Transactions		Non-monetary Transactions	
ILLEGAL ACTIVITIES	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud.		Barter of drugs, stolen, or smuggled goods. Producing or growing drugs for own use. Theft for own use.	
	Tax Evasion	**Tax Avoidance**	**Tax Evasion**	**Tax Avoidance**
LEGAL ACTIVITIES	Unreported income from self-employment. Wages, salaries, and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits.	Barter of legal services and goods.	All do-it-yourself work and neighbor help.

Source: Lippert and Walker, *The Underground Economy: Global Evidence of its Size and Impact.* Vancouver, B.C., The Frazer Institute, 1997.

In summarizing, it can be said that the total economy is made up of the measured economy and the hidden economy. The measured economy comprises of the official economy, (that which follows all laws and regulations), and a fraction of the informal economy. The hidden economy refers to the illegal economy, the unmeasured portion of the informal sector, and all other economic activity that goes unrecorded as contributing to the statistics of national income and GDP.

2.2 Reasons for the Increase in the Hidden Economy

The growth in hidden economies is creating a problem for governments and policy makers around the world. This rise in hidden economic activity is due to several identifiable reasons. The most important of these being the increase of the tax burdens and social security contributions, increased regulations in the official economy, especially in the labor markets, poor governance and the presence of significant corruption in government operations.

Taxes and Social Security

High tax rates lead to a worsened tax morality (the willingness of persons to pay the correct taxes at the correct time). This worsened tax morality leads to individuals becoming more willing to participate in the hidden economy, in order to evade tax laws and regulations. Studies have shown

that in the official economy, as net wages increase, there is a decrease in the work force of the hidden economy. Factors such as national insurance and health contributions create a difference between the total wages earned and the amount that employees actually receive. In the official economy, the bigger the difference between input and the after tax earnings from work, the greater the incentive for all persons to participate in the hidden economy. Since the tax regime and the social security system greatly influence this difference, they are important factors in the shadow economy.

Government Regulations

Research has indicated that countries with more regulations on their economies have larger hidden economies (Johnson, Kaufmann and Shleifer (1997)). Regulations such as licensing requirements, labor market regulations, restrictions for foreigners, and trade barriers, all aid in increasing the cost of labor and consequently cause many people to shift to the hidden economy. It is often the case that employers react to these high costs by transferring them to their employees or even by reducing their labor force. These employees then find other sources of income, often through the hidden economy. Intense regulations can also cause employers to stay in the informal economy to avoid higher and non-transferable legal burdens.

Some countries, such as France, have even implemented restrictions on hours worked in order to reduce unemployment. While this is a commendable attempt to distribute limited working opportunities more fairly, it creates the incentive and the time for people to participate in the hidden economy.

Governance and Corruption

Countries with strong and efficient government institutions have smaller hidden economies. It has been found that there is an increase in the growth of the shadow economies in societies where governments do not effectively and fairly carry out their tax laws and regulations.

According to the Webster's New Collegiate Dictionary, corruption is the inducement to wrong by bribery or other unlawful or improper means. This abuse of public power is usually done for private benefit. Studies suggest that there is a relationship between the level of the corruption and the size of the hidden economy. Officials with the power to control factors such as hiring and

promotion or the provision of tax incentives have the opportunity to involve themselves in corruption and consequently influence the growth of the hidden economy.

2.3 Advantages and Disadvantages of the Hidden Economy

Along with the fact that policy makers can make accurate decisions with the knowledge of the hidden economy, there are several other advantages to both the individual and the society from the presence of this activity. Unfortunately, there are also negative repercussions from the underground sector. It steals from the government and consequently affects public benefits.

Some of the advantages of the hidden economy are that it

- Encourages entrepreneurship and creativity.
- Aids the official economy. At least two-thirds of the income that is earned in the hidden economy is spent in the official sector.
- Forces prices in the official economy to fall in order to remain competitive. This benefits the consumers, including those who work in the official sector.
- Gives displaced workers the opportunity to generate their own income, rather than relying on government benefits or nothing at all.
- Provides employment, especially in times of scarce work opportunities, and gives families an avenue through which they can meet their needs and improve their way of life.
- Contributes to high productivity and encourages growth if supported.
- Is often used as an outlet for built up frustration and tension in the public system.

Some of the disadvantages are that it

- Takes away valuable government revenue. This causes increased tax rates in order to replenish budget deficits. This lost revenue simultaneously causes a fall in the provision of public goods and services that would have otherwise benefited the general public.
- Creates a problem for policy makers by distorting economic information. This results in overstating unemployment and inflation rates, and understating growth rates. The consequent policies are often erroneous and cause adverse reactions.

- Develops unfair competition against the official economy. The competition effectively lowers the official economy's income. This causes a worsened working environment with little or even no benefits to be derived by its labor force.
- Has low income and productivity. Additionally, there is few development strategies implemented in this economy, causing a lack in productive growth.
- Increases corruption and political lobbying.

2.4 Measuring or Estimating the Hidden/ Informal Economy

The process of measuring the informal economy is a difficult one. This is because there is often a lack of information pertaining to the hidden economy, due to persons wanting to remain anonymous for fear of the relevant consequences. Nevertheless, there are many techniques used to estimating the size and structure of the hidden economy. These processes can be placed into three main categories: Direct, Indirect, and Model approaches. Most of the techniques used are indirect and may provide a wide range of estimates.

2.4.1 Direct Approaches

There are two methods of this approach, the Sample Survey and the Tax Audit procedures. Both techniques provide detailed information about the structure of the hidden economy, however they only provide lower-bound estimates (minimum range which may be considered accurate) for the size of the activity. The direct approaches are sometimes referred to as micro approaches.

The Sample Survey

The survey technique is relatively new, only being actively used in the last two decades. The main benefits from using this method are the in-depth conclusions that can be drawn from its results. Useful information about the size and structure of the hidden economy can be derived from this process. However, the obtained results greatly depend on the structure of the questionnaire. A badly formulated questionnaire does not give persons the incentive to reveal their participation in the hidden economy and cooperate with the survey. This unwillingness can lead to unreliable results, and hence accurate estimations and inferences are unable to be made.

It is suspected that this procedure would be successful in the Caribbean, generally because the topic of the hidden economy is not a sensitive one and because the participants enjoy and, in most cases, rely on public support.

The Tax Audit

Differences between the income submitted for tax purposes and that which is calculated by tax audits lead to information on the hidden economy (Frey and Pommerehne, (1984)). Threats of fines and imprisonment force participants to reveal this hidden income, which would have otherwise provided the government with useful revenue.

The tax audit method leads to a few difficulties. The estimates based on this technique do not provide complete information about the size of the hidden economy and these results tend to be biased. The data that is used (tax compliance data) may itself be a biased sample of the population. Only persons who complete tax forms are considered for audit but most persons submitting these forms will comply and submit accurate information. However this bias is somewhat lessened because the selection of those persons to be audited is done based on tax forms that show some possibility of fraud. This procedure only displays the fraction of this economy that the authorities were able to catch.

2.4.2 Indirect Approaches

These techniques allow for estimates to be drawn from seemingly unrelated information. This is useful because, as stated before, many persons do not want the relevant authorities to know of their participation in this economy, and hence try their best to conceal it. These procedures try to deal with this problem. The indirect processes are sometimes called macro approaches since they use macroeconomic indicators to extract information about the development of the informal economy. This system consists of the accounting statistics, the labor statistics, the monetary balances, and the physical outputs approaches.

The indirect approaches have many benefits but they also have their shortcomings. They provide information on the size of the economy but are unreliable when it comes to determining its structure. Another problem is that they often require some assumptions to be made, which often cannot be proven.

Accounting Statistics

The accounting statistics approach can be used on both the individual and the national level to make estimates on the hidden economy. It uses discrepancies between expenditure and income to draw conclusions (Schneider and Enste, (2000)). This is because, in the presence of the informal economy, the income (and production) measure of national income will not be the same as the expenditure measure, and in fact, the latter will be much higher. Therefore, the surplus of expenditure over income is an indicator of the size of the shadow economy.

Working on the individual level, rather than a national one, yie lds better results. Processes like the Family Expenditure Survey in the United Kingdom, separately measure income and expenditure on a daily basis, using record books and information on credit and hire purchase. It provides more detailed information about the sectors and industries in which work can be obtained. The figures generated are almost identical to those on the national level.

Nationally, this technique is useful and easy when the relevant information on expenditure is available, however it will only capture the lowest range of estimates of the shadow economy that can be considered to be accurate, (on the individual level, the range is higher). The expenditure data is difficult to collect because it is almost impossible to keep accurate records of every transaction that takes place. Expenditure information may even be dependent on income information. This may lead to inaccurate estimates. In addition the discrepancy used to make these estimates often include errors and omissions in the accounting statistics. In fact, the difference between the two aggregates is almost always attributed to the error and omission terms. This factor makes the resulting estimates unreliable.

Labor Force Statistics

The labor force statistics method assumes that the participation in the official labor force remains constant. Hence any decline in the participation in the official work force can be assumed to be an estimate for growth in the shadow economy, *ceteris paribus*, (O'Neill, (1983)). More specifically, this approach assumes increasing underground economic activity when the ratio of employment to population is decreasing and the ratio of labor supply to population relatively constant.

However, although it is relatively simple in its calculations, this method is flawed in its major assumption, the constancy of the participation rate. This is because individuals may leave the official economy for other reasons other than to participate in the hidden economy. Furthermore, it is compounded by the fact that persons can work in both the official and hidden economies. These persons go undetected, and are not considered as part of the hidden economy's work force, using the labor force statistics process. To use this assumption leads to somewhat unreliable results and gives only weak estimates of the size of the hidden economy.

Monetary Balances

The monetary balances approach seems to be the most commonly used system of trying to estimate the hidden economy. There are three procedures that fall under the monetary balances approach. They involve assumptions, about the volume of monetary transactions, and the use of currency.

(a) Currency Demand

The currency demand technique is one of the three monetary approaches for calculating underground economic activity. Cagan (1958) was the first to use this method followed by Gutmann in 1977. The approach was very simple, using only the ratio between currency and demand deposits. Tanzi (1980, 1983) further developed the original method. Under the assumption that all hidden economic activity takes place, using cash as means of exchange, it is further assumed that the increase in demand for cash indicates an increase in the shadow economy. He included in his equation the factor that is identified as the main reason for participation in the hidden economy, tax burdens. This method is now commonly used to find estimates for the size of the hidden economy.

The basic equation that Tanzi proposed is:

$$\ln(C/M_2)_t = \beta_0 + \beta_1 \ln(1+TW)_t + \beta_2 \ln(WS/Y)_t + \beta_3 \ln R_t + \beta_4 \ln(Y/N)_t + u_t$$

Where $\beta_1>0$, $\beta_2>0$, $\beta_3<0$ and $\beta_4>0$ and, ln denotes the natural logarithm, C/M_2 is the ratio of the cash holdings to current plus deposit accounts, TW is a weighted average tax rate (to proxy changes in the size of the hidden economy), WS/Y is the proportion of wages and salaries in

national income (to capture changing payment and money holding patterns), R is the interest rate paid on savings deposits (to capture the opportunity cost of holding cash), and Y/N is the per capita income.

The unexplained value u_t, which is the excessive increase in currency, is then attributed to factors leading individuals to participate in the hidden economy, for example tax burdens. The model estimates twice: once in its current state and again by imposing zero tax rate values. The difference between these two estimates represents the volume of currency in circulation in the underground economy. Multiplying this difference by the velocity of money yields the nominal aggregates of the underground economy.

However there are problems associated with this method and its assumptions. This procedure may provide an underestimate for the size of the economy, because not all of the transactions take place-using cash as means of exchange. Because a lot of the relevant data regarding the factors that influence persons to participate in the hidden economy is unavailable or unreliable, many studies only include tax burdens as the reason for hidden economic activity. An increase in currency demand may be due to the fact that the US dollar is used as an international currency and it is also held as cash reserves in other countries. The process does not take this into consideration. This method assumes that there is a base year of no hidden economic activity. Furthermore, due to the uncertainty of the velocities of money in both economies, it must be assumed that they are the same.

(b) Transactions

Feige developed the transaction method in 1979. This approach estimates the size of the shadow economy with the use of information on the overall volume of transactions in the total economy. Information can be generated using the equation:

$$MV = pT$$

Where M = money supply
V = velocity of money
p = price level of transactions
T = volume of transactions

It is assumed that there is a constant relationship between the volume of transactions and the total official GDP over time (Feige, (1979, 1989, and 1996). Assumptions are also made about the velocity of the money and also, that there is a base year of no hidden economic activity. From this data the total GDP can be calculated. The difference between the total GDP and the official GDP is the GDP of the hidden economy.

This technique has many problems associated with its assumptions. To assume that there is a base year of no hidden economy becomes problematic. This is compounded by the assumption of a fixed transaction ratio over time. It is also assumed that the hidden economy is the only factor affecting a change in the transaction ratio. These are strong assumptions and they leave questions about the reliability of the results. Additionally, the reliability of the estimates is again in doubt, due to the sensitivity of the volume of transactions data. This information must be precise. For cash transactions, this is difficult because the volume is influenced by other factors that are not taken into consideration using this model.

Physical Outputs - (Electricity Consumption)

The physical outputs method assumes that electricity consumption is the best indicator for overall economic activity (official and hidden) (Kaufman and Kaliberda, (1996)). Because the electricity/GDP elasticity has been observed to be close to one, the growth rate of the official GDP can be subtracted from the growth rate of electricity consumption. This resultant value is attributed to the growth of the hidden economy.

This method is easy to use because of the availability of the information required. However, there are problems that have arisen with its application. Firstly, not all of the hidden economic activity requires electricity, and due to the fact that other sources of energy are being used, for example gas and oil, this method yields an underestimate of this economy. Secondly, due to technological advances, electricity consumption has become more efficient in both economies, and thirdly, across countries, the electricity/ GDP elasticity may vary. This variation may also take place over time.

2.4.3 The Model Approach

This technique is beneficial because it simultaneously considers both the causes and the effects of the hidden economy over time. It is based on the dynamic multiple-indicators multiple causes (DYMIMIC) model. It consists of two parts: a measurement model linking the observed indicators to the size of the informal economy; and a structural-equations model specifying causal relationships among the observed indicators. This process aids in determining the factors that the structure of the hidden economy depend on. It is also useful in economic forecasting.

The three main causes identified are:

1. Tax Burdens
2. Government Regulations
3. Tax Morality

The three main indicators are:

1. Development of monetary indicators
2. Development of labor market
3. Development of production market

This method is in-depth and comprehensive. In addition, a structured output of the behavior of the hidden economy can be gained. However it requires a lot of data. This information is often not available, making this technique inapplicable, especially in Caribbean countries.

3. The Hidden Economy in the Caribbean

Research on the hidden economy in the Caribbean has not been given as much attention as its importance merits. There have been very few studies in the Caribbean, with only a handful being identified throughout the region, in Jamaica, Trinidad and Tobago, and Barbados. Given the critical role that the underground sector is now playing in the overall economies of many countries, more research should be considered in the near future.

3.1 Jamaica

The information generated from the Jamaican informal economy was mainly done as case studies of sidewalk vendors and hagglers. Not much work was done on the sidewalk vendor aspect of this economy: only a quasi-survey conducted by the Urban District Council (UDC), and student research papers at the University of the West Indies. However, the higgler aspect was given more attention (Smikle and Taylor, (1977)), (LeFranc, MacFarlene-Gregory and Taylor, (1987)).

Investigations were done in the form of surveys. One of these targeted informal commercial importers, while the others sought to collect data on the traditional higgler, who traded in parochial and kerbside markets. These studies did not provide information on the size of the economy. They only generated information on the kinds of activities that were taking place, giving the profile of the typical higgler and a breakdown of their average weekly costs.

Smikle and Taylor (1977) estimated that 115,006 members of the higgler population traded in the markets and their environs, while another 1,046 existed in curbside markets. 36% of these merchants sold sweets and snacks, 24% sold fruits, 17%, ground provisions, 15%, beverages, and another 15% sold cigarettes. The total percentage is greater than 100, this is due to an overlap in the categories. The surveys were unable to provide reliable data on the financial activities of these members of the informal economy.

3.2 Trinidad & Tobago

Mootoo, Sookram and Watson (2002) obtained preliminary estimates for the hidden economy in Trinidad and Tobago utilizing the Tanzi currency demand approach, applied to data spanning the period 1970-1999. Firstly, least squares regression was applied to the equation. The interest rates and wages and salaries variables were found to be insignificant; hence the equation was re-estimated with these variables omitted. The resultant model was deemed optimal and under the assumption that the velocity of "illegal" money is the same as that of legal money, the researchers concluded that the hidden economy represented 2.6-6.8% of the measured GDP. However they felt that this was a gross underestimation of the actual value based on their knowledge of the Trinidadian economy. They suggest that the use of a direct survey would yield more meaningful results.

3.3 Barbados

An extensive Informal Sector Survey was conducted in Barbados by the Statistical Service Department in 1997-1998. This survey sought to improve the social and economic statistics on the informal sector in the island, analyze the situation of the workers and better design support policies to increase productivity of this sector.

The survey was designed using a two stage stratified sampling method, the first stage being Enumeration Districts, (an ED is a small geographic area with a well mapped boundary comprising of approximately one hundred and fifty households), and the second being the households of informal economy business operators. The island was divided into 458 EDs. These EDs were then divided into four distinct groups, called Strata. This division was done on the basis of the parish in which the ED was located. Because not all strata contained the same amount of enumeration districts, and the fact that EDs were of various sizes, measures had to be put in place to ensure fairness. 52 enumeration districts were chosen from across the strata in numbers proportionate to the relative size of each stratum. Then the actual districts to be surveyed were selected within each stratum using a probability proportionate to size method. This technique gave larger EDs (those with a higher number of households) a greater chance of being chosen.

From the 52 districts 522 informal sector operators were interviewed. The information gathered from this survey showed various forms of informal economic activity - agriculture, construction, distribution and tourism, to name a few. Distribution and agriculture were identified as being the most populous of these sectors with 2,313 and 1,562 persons respectively. It was estimated that there were 5,720 informal business operators, compared to 14,172 in the official labor force. The total employment calculated in the informal economy numbered 6,904, as apposed to 117,575 in the official economy.

Detailed information was gathered on the backgrounds of informal economy operators, such as, level of education, starting capital, credit information, input costs, and the duration of their informal business lives, but no indication of the size of the informal economy was provided. However, care must be taken when using this technique, because most interviewees tend to understate profits and overstate expenses, thus obscuring results.

4. Estimates for Barbados

Given the various advantages and disadvantages of the indirect methods discussed in section 2, the currency demand and the labor force statistics approaches were chosen. This is because (i) reliable time series data is available concerning labor and the monetary sector and also for the main cause of the informal economy, the tax burden; (ii) the currency demand approach in the most widely used indirect method for other countries; (iii) the labor statistics method can be easily applied to the available data.

4.1 The Currency Demand Approach.

Attempts to apply the currency demand equation as specified by Tanzi (1983) were unsuccessful, resulting in a negative coefficient on the tax-GDP variable. Further analysis revealed the tax–GDP ratio is negatively correlated with the currency in circulation- money supply ratio, although growth in currency in circulation and growth in tax are positively correlated. We therefore modified the Tanzi equation using the procedure developed by Klovland (1980,1984) and Ogunc *et al* (2000). Klovland's model is of the form:

$$\log(CCR)_t = a_0 + \sum_{i=1}^{n} b_i \log CCR_{t-i} + \sum_{i=1}^{n} d_i \log GDP_{t-i} + \sum_{i=1}^{n} l_i \log R_{t-i} + \sum_{i=1}^{n} w_i \log(T/GDP)_{t-i} + e_t \quad (1)$$

As in Klovland (1984), the lag structure (i) is investigated by testing whether any restricted model (i = 0, or 1) could be rejected against an unrestricted model (i =2). The result of the empirically optimal model is presented in Table 2.

Ogunc et al (2000) suggested a variation of the Tanzi (1984) model of the form:

$$DLCCR = b_0 + b_1 DLRGDP + b_2 TAX + b_3 DINT \quad (2)$$

Where D refers to the first difference, RGDP is the real gross domestic product, TAX is the ratio of tax revenues to consolidated revenues and INT is the one-year nominal savings deposit rate. Since tax as defined in the equation would be almost one in the case of Barbados we substitute the growth rate of taxes in its place. Again the results of this equation are in Table 2.

Both equations were subjected to a battery of diagnostic tests. From these tests it can be concluded that the residuals from the sample are approximately normal. This is based on the values of the Jarque-Bera statistics, 0.612 and 0.739 respectively, and their corresponding probabilities, 0.691 and 0.736. Furthermore, there is no serial correlation between the variables as evident by the Breusch-Godfrey statistics, and to a lesser extent the Durdin-Watson statistics. The Breusch-Godfrey serial correlation Lagrange multiplier test generated values of 0.018 and 0.012 respectively, and these are less than the critical value of $P^2_{0.95}$ with two degrees of freedom, 6.0.

Table 2. Currency Demand Equations for the Barbadian Informal Economy.

Eq.1: Dependent Variable Log (CC/CPI)			Eq.2: Dependent Variable Dlog (CC/CPI)		
Sample (adjusted): 1976 2001			Sample (adjusted): 1975 2001		
Variable	Coefficient	t-Statistic	Variable	Coefficient	t-Statistic
LOG (CC (-1)/CPI (-1))	0.648	8.833	DLOG (RGDP)	1.370	5.258
LOG (GDP)	0.543	5.057	DLOG (T)	0.228	1.937
LOG (GDP (-2))	-0.487	-4.568	D(R)	-1.071	-1.561
LOG (T/GDP)	0.403	3.474	C	-0.016	-1.101
LOG(R (-1))	-0.134	-5.139			
C	0.506	1.363			
R-squared	0.967		R-squared	0.637	
S.E. of regression	0.032		S.E. of regression	0.043	
Durbin-Watson stat	2.023		Durbin-Watson stat	1.987	
Jarque-Bera	0.612		Jarque-Bera	0.739	
Breusch-Godfrey	0.018		Breusch-Godfrey	0.012	

To estimate the size of the informal economy the fitted values for the CCR are obtained in each of the above equations and labeled cc_1* and cc_2* respectively. The equations are then re-estimated without the tax variable and the fitted values labeled cc_1** and cc_2** respectively. The amount of cash circulating in the informal economy is calculated as $C_I = cc_1$* - cc_1** (for equation 1) and $C_I = cc_2$* - cc_2** (based on equation 2).

Assuming that the velocity of money in the informal economy is the same as that of the formal economy, then the size of the informal economy is estimated by

$$GDP_I = C_I \times V$$

Where V, the velocity of money, is obtained by dividing GDP at market prices by the money supply.

Table 3 reflects the estimates for the hidden economy in Barbados generated by Klovland's (1984) and Ogunc's (2000) equations, equation 1 and equation 2 respectively.

The Klovland (1984) model estimates the informal economy in Barbados to be between the range of 0.01- 0.46% of the measured GDP, while Ogunc's (2000) model generates figures of 0.03-1.38% of the measured gross domestic product. These results suggest an almost none existence of the informal economy.

In an effort to solidify the results, different definitions for the tax burden were used. In doing so it was found that the coefficient on the tax variable in all cases, except one, was insignificant. The single significant case was w hen tax burden was defined as a weighted average of the effective tax rates in the three- income categories, low, medium and high (see, Boamah and Maxwell (2002) for calculations). However, the sign of the coefficient was negative. An explanation for this may be that any increase in the effective tax rate, within the various income categories, are the results of expected turns in the economy and hence the population is prepared for its effects. Consequently, there is no move towards informal economic activity. These findings are in agreement with the above results.

4.2 Estimates For Barbados Using the Labor Force Statistics Method

Table 4 and Figure 1 show that the labor force-population ratio and the employment- population ratio move similarly over the given time period. This agrees with the results of the currency demand model; the informal economy in Barbados is very small. There is no significant evidence to show that there is a decline in the official labor force, *ceteris paribus.* Hence, there is no noticeable indication of an increase in the informal economy.

5. Conclusion

This paper was the first stage in a two-stage process in trying to assess the size and relevance of the informal economy in Barbados. The estimated size of the informal economy is very small

and, in our view, could be underestimated. Nevertheless, we believe that the actual size of this sector is not significantly larger. This is perhaps why in the last recession (1991-92), and also in this current one, there has been no development of a parallel market for foreign exchange.

No matter how small these values are it is important for all economic activity to be taken into consideration if effective policy decisions are to be made. It is also our opinion that we should proceed to the second stage and utilize a direct survey method. There is no doubt that there is an informal sector in Barbados, although it may be small, and it is possible that the direct survey technique will yield a more meaningful result.

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Appendix:

Table 3. Estimates for the Size of the Barbadian Hidden Economy Using the Currency Demand Approach.

	Based on Equation 1						Based on Equation 2					
	cc_1*	cc_1**	Hidden money	V	GDP_{UE}	Ratio	cc_2*	cc_2**	Hidden money	V	GDP_{UE}	Ratio
1974												
1975							38.23	36.79	1.44	2.15	3.09	0.38
1976	46.48	44.59	1.89	2.11	3.99	0.46	44.54	41.60	2.93	2.12	6.20	0.71
1977	54.31	52.89	1.42	2.17	3.08	0.31	50.93	48.01	2.93	2.17	6.36	0.64
1978	64.50	62.84	1.66	1.97	3.27	0.29	60.04	56.33	3.71	1.98	7.35	0.66
1979	79.76	76.88	2.89	1.93	5.58	0.41	78.55	72.36	6.19	1.94	12.01	0.89
1980	103.72	101.73	1.99	2.10	4.18	0.24	98.22	89.69	8.52	2.11	18.02	1.04
1981	118.34	115.75	2.58	2.08	5.38	0.28	109.54	97.51	12.03	2.10	25.31	1.33
1982	113.19	112.96	0.24	2.05	0.48	0.02	115.18	102.21	12.97	2.07	26.91	1.35
1983	114.48	114.10	0.38	2.02	0.76	0.04	124.23	110.00	14.23	2.05	29.19	1.38
1984	122.09	121.97	0.12	2.04	0.25	0.01	137.10	122.13	14.97	2.07	30.91	1.34
1985	129.64	128.92	0.72	2.00	1.45	0.06	146.11	131.05	15.06	2.02	30.49	1.27
1986	138.82	138.69	0.13	2.03	0.26	0.01	162.24	145.40	16.83	2.06	34.69	1.31
1987	160.33	159.75	0.58	1.97	1.14	0.04	172.61	156.71	15.90	1.99	31.63	1.09
1988	182.81	180.90	1.91	1.83	3.49	0.11	187.82	172.16	15.66	1.85	28.91	0.93
1989	197.89	196.74	1.15	1.98	2.28	0.07	210.33	190.04	20.29	2.00	40.64	1.19
1990	193.03	191.00	2.04	1.71	3.49	0.10	210.13	188.06	22.07	1.73	38.18	1.11
1991	192.94	191.81	1.13	1.76	2.00	0.06	203.66	186.31	17.35	1.78	30.87	0.91
1992	184.95	183.74	1.22	1.53	1.86	0.06	199.83	183.09	16.75	1.54	25.76	0.81
1993	193.50	192.29	1.21	1.56	1.89	0.06	198.87	186.62	12.25	1.57	19.25	0.58
1994	198.96	197.20	1.76	1.45	2.55	0.07	208.94	200.57	8.37	1.46	12.18	0.35
1995	209.91	207.29	2.62	1.38	3.62	0.10	218.10	212.09	6.01	1.39	8.33	0.22
1996	225.10	219.40	5.70	1.20	6.83	0.17	232.16	226.10	6.06	1.20	7.26	0.18
1997	249.12	246.59	2.53	1.25	3.18	0.07	260.89	257.67	3.22	1.25	4.04	0.09
1998	274.15	262.94	11.20	1.27	14.24	0.30	281.27	272.56	8.71	1.27	11.06	0.23
1999	293.38	279.85	13.53	1.20	16.20	0.33	293.30	287.56	5.75	1.19	6.87	0.14
2000	297.52	285.77	11.75	1.15	13.46	0.26	312.85	311.60	1.25	1.14	1.43	0.03
2001	305.93	292.14	13.79	1.11	15.31	0.30	312.37	312.37	0.00	1.11	0.00	

Table 4. Estimates for the Barbadian Informal Economy Using the Labor Force Statistics Approach

Year	Labor Force	Employment	Population	Labor Force/ Population	Employment/ Population
1975	106.0	82.1	246.1	43.07	33.36
1976	104.0	87.7	246.7	42.16	35.55
1977	103.4	87.2	247.5	41.78	35.23
1978	103.2	83.4	248.2	41.58	33.60
1979	109.8	88.7	248.8	44.13	35.65
1980	114.8	94.4	249.4	46.03	37.85
1981	112.2	95.4	250.5	44.79	38.08
1982	112.0	91.7	251.2	44.59	36.50
1983	112.2	90.3	251.8	44.56	35.86
1984	112.3	88.0	255.8	43.90	34.40
1985	113.3	87.0	257.0	44.09	33.85
1986	116.9	90.8	258.0	45.31	35.19
1987	128.0	91.8	258.8	49.46	35.47
1988	121.1	100.3	259.4	46.68	38.67
1989	121.9	103.2	260.3	46.83	39.65
1990	123.9	105.2	260.8	47.51	40.34
1991	129.6	107.1	262.5	49.37	40.80
1992	132.1	101.7	263.1	50.21	38.65
1993	132.8	100.4	263.9	50.32	38.04
1994	134.9	105.6	264.3	51.04	39.95
1995	137.0	110.1	264.4	51.82	41.64
1996	135.8	114.3	264.6	51.32	43.20
1997	135.8	116.4	266.1	51.03	43.74
1998	136.3	119.7	266.9	51.07	44.85

Figure 1: Movements in the Ratios of Labor Supply/Population and Employment/Population.