CBB Working Paper No. WP/13/9

ECONOMIC VOLATILITY AND THE INFORMAL ECONOMY

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Abstract

The informal economy has traditionally played an important role in most Caribbean economies. Indeed, small family-owned plots supplied most of the domestic demand for agricultural commodities. Most Caribbean economies are now primarily service-oriented, however, the informal sector still plays a major role in most of their economies. There are disadvantages to an over reliance on the informal sector: low tax yields and a focus mainly on the domestic market. This paper argues, nonetheless, that the informal sector is a key mechanism for insulating households from the effects of large negative economic shocks. The study therefore investigates the effects of the size of the informal economy on economic volatility in various Caribbean islands with emphasis on consumption volatility. The results are not meant to argue for policies to support the growth and penetration of the informal sector, but instead policies aimed at supporting entrepreneurship within the region.

Keywords: Informal economy; Economic volatility; crises; Caribbean

1. Introduction

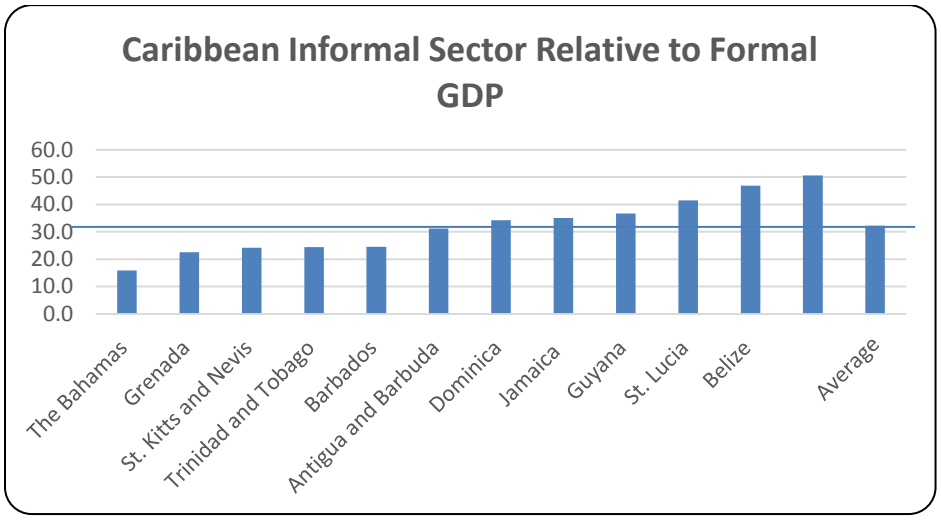
The informal economy is made up of those economic activities that evade the costs associated with transactions in the formal economy: licenses, labour contracts and taxes (Feige E. , 2005). The activities of entities operating in the informal sector are not illegal, but for whatever reason they have decided not to formalise their activities. Cheng and Gereffi (1994) note that there are three main motivations (or demarcations) for the informal economy: (1) social marginality; (2) state regulation; and, (3) small firms. In relation to social marginality, individuals who engage in casual work or petty business in order to meet their basic needs. Within this framework, the informal economy is therefore associated with dislocation and in some instance poverty. The state regulation approach focuses instead on a desire to avoid regulations as the rationale for informal activities (e.g. minimum wages, social benefits as well as occupational health and safety standards). The third and final rational, size, is based on the notion that in many industries start-up costs are small and there are limited barriers to entry and exit. These characteristics therefore make it easy for these firms to engage in casual hiring and non-reporting of income.

The informal economy has traditionally played an important role in most Caribbean economies. As former colonies, agricultural production was mainly for export markets in metropolitan countries. Production of agricultural commodities for domestic consumption was therefore primarily supplied from small family-owned plots and largely sold within the informal sector (Moore, 2010). While the economy of most Caribbean

countries is now quite different from the colonial era, the informal economy still represents a significant proportion of most economies in the region (Vuletin, 2008).

To our knowledge, only one study has sought to examine the size of the informal economies in the entire Caribbean. With macroeconomic data on 32 Latin America and Caribbean nations, Vuletin (2008) utilized a MIMIC (Multiple Indicators Multiple Causes) cross sectional framework to provide estimates of the Caribbean informal sectors in the early 2000s. His results indicate that the average size of the informal economy in the Caribbean is 32.3% of GDP. Vuletin's estimates also suggest that the largest informal sector (relative to GDP) is in St Vincent and the Grenadines at 50.6% and the lowest in Bahamas at 15.9%.

Figure 1: Estimated Size of the Informal Economy in the Caribbean (% of GDP)



Source: Vuletin (2008) Estimates

Using a MIMIC specification as well, with information on 162 nations, Schneider et al. (2010) show that the average size of the informal sector in the Caribbean, albeit from a broader regional context - Latin America and the Caribbean, is 34.7%, fairly similar to

Vuletin's average estimate. In their framework, Bahamas, Belize, Guyana, Jamaica and Trinidad and Tobago were the only Caribbean islands included. The authors' estimates indicate that, over the 1999-2007 period, informality in these islands were fairly steady around their respective mean – Bahamas (26.5%), Belize (42.9%), Guyana (33.7%), Jamaica (34.8%) and Trinidad and Tobago (33.4%).

At the country level, Prescod (1986) presented one of the early studies on the informal economy. Utilizing a demand for currency framework to estimate the rate of informality in Barbados, his estimates reveal that the informality rate moved from 6.6% of GDP in 1973 to a peak of 12.2% in 1981 then lowered to its initial level in 1985. Greenidge et al. (2005) studied the size and growth of the sector in a currency demand specification, using data spanning 1973-2003. Their results point out that the size of the informal economy was much larger than Prescod's estimates show. Precisely, in 1973, informality rate was approximately 29.6% of GDP and it grew steadily to roughly 38.3% in 2003. De La Roca et al. (2006), through the support of the Inter-American Development Bank (IDB), presented an in-depth and comprehensive inquiry into the informal economics of Jamaica. This inquiry was motivated by the believed that value added from this component of the economy contributed immensely to the development of the nation but continues to be highly overlooked. The authors were particularly alarmed by the fact that "despite Jamaica's lackluster economic growth during the 1990s, the decade saw a considerable reduction in poverty (from its peak of 44% in 1991 to 17% in 2001)" (De La Roca, Hernandez, Robles, Torero, & Webber, 2006). They asserted that while many factors unquestionably contributed, one unexplored possibility is that the buoyant performance

of the nation's informal sector lifted Jamaicans out of poverty without appearing in official economic statistics. Four approaches were used in the study, two of which are macro - the monetary approach and electricity consumption method, and the others micro - consumption function expenditure approach, and the method of additions. De La Roca et al., however, relied on the results presented by the monetary approach and the Method of Additions procedure which showed similar findings. Results of the monetary approach indicate a size of 39.1% and 43.7% in 2000 and 2001, respectively, while the method of additions procedure points to a size of 43.5% of GDP in 2001. In the case of Trinidad and Tobago, Maurin et al (2006) assessed the performance of the informal sector with the use of a cointegrating structural VAR framework in a demand for currency context. The study covered the period 1970 to 1999. Maurin's findings reveal that informality rose from a low of 14.0% in 1970 to a high of 36.0% in 1981 and then contracted to 20.0% of GDP in 1999.

One of the main benefits of the informal economy is that it provides a buffer against economic shocks for marginalised members of society: the informal economy allows those individuals that may have lost their jobs to still provide for the household by engaging in informal economic activities. There is, however, very little research on economic crises and the informal economy. Indeed, it is possible that crises may make the conditions of those in the informal sector worst as they are not able to access social insurance schemes and other formal measures designed to protect those workers at risk (Mehrotra, 2009). Using data from the most recent global crisis, Horn (2010) finds that formal income and employment has declined due to falling demand and wages as well as

rising competition in the informal sector. In contrast, Cheng and Gereffi (1994) argue that the informal sector played a fairly important role in the development of East Asia. In the context of the region, Paul (2008), through a study supported by the UNDP and the OECS, observes that "the informal sector, which is estimated to make up more than a third of the market sector in the OECS, expands as job prospects in the formal sector deteriorate and contracts when formal employment prospects improve" (Paul, 2008). Within this context, he notes that during times of economic slowdown the buffering effect of the informal economy helps to cushion the impact of economic shocks such as industry closure or privatization and down-sizing, as in the cases of the banana industry in the Windward Islands and the Sugar industry in St. Kitts. On this note, Paul (2008) study asserts that a strategy for poverty reduction must place emphasis on understanding the contrasts between the dynamics of the informal and market economies.

This paper investigates the relationship between business cycle fluctuations and measures of performance of the informal economy. It contributes to the literature in three main ways. First, it investigates the drivers of real per capita currency holdings in the Caribbean by articulating a parsimonious and stable currency demand model in an autoregressive distributed lag framework with fixed effects. Second, it makes use of this framework to gather estimates of the size and evolution of the informal economy in Caribbean States over the period 1991-2011. Third, and most important, this paper explores empirically the relationship between economic volatility and the performance of the informal economy to shed light on whether the informal economy is a key mechanism for insulating households from the effects of large negative economic shocks.

The rest of this paper is organised as follows. The next section provides an overview of the literature on the informal economy. Section 3, puts forward the empirical framework used to measure the size of the informal economy and discusses the results. Section 4 assesses the relationship between the informal economy and economic volatility and discusses the implications of the results. Section 5 concludes with a summary of the main findings of the study.

2. Review of Literature

2.1 Rationale for the Growth of the Informal Economy

Since the mid-20th century, a large number of studies have attempted to investigate the significance of the informal economy in various countries. Many attribute [2] this heightened attention to an appreciable upsurge in informal economic activities. This rise in informal activities is normally accredited to the rise in the size of governments around the world since World War II. Feige (1989) observes that, following World War II, greater government intervention resulted in higher tax rates, price controls, and rationing programs which provided incentives for firms and individuals to partake in various informal activities. Cagan (1958) notes that this increased informal production was evident by an increase in the demand for currency (increase in the currency-deposit ratio) as individuals and firms used more cash to conceal taxable transactions[3].

[2] See for example Fiege (1989), Lemieux (2007), and OECD Measuring the Non-Observed Economy: A Handbook (2002).

[3] "Income received, held, and spent without prior deposit in a bank usually defies detection. A tax on income thus leads some people to receive income and make expenditures as far as possible without the use of checks" Cagan (1958).

The literature on informal transactions date as far back as the 18th century: indeed, the underlying cause of this phenomenon was alluded to by Adam Smith in his '*An Inquiry into the Nature and Causes of the Wealth of Nations*'. Smith (1776) viewed the division of labour, which he associated with a natural tendency in humans to truck, barter and exchange goods and services, as the underpinning of modern society. Whenever this natural tendency is hindered, economic agents react by developing means to evade these hindrances to obtain what they perceive as the dividends of exchange. Precisely, when hindrances preclude exchanges in the formal economy, buyers and sellers often moved to the informal economy to convene their trade.

The size of the informal economy seems to be largest in developing countries. Schneider et al. (2010), for example, studied the informal economies for 162 nations, and estimated that the informal economy (as a percentage of GDP), based on weighted average estimates[4], was significantly larger in developing countries. In Sub-Saharan Africa the informal economy, as a percentage of the formal economy, was estimated at 37.6%, at about 36.4% in Europe and Central Asia (mostly transition countries) and 34.7% in Latin America and the Caribbean. In contrast, the size of the informal economy was only 13.4% in high-income OECD countries. Schneider et al. (2010) study also reveal that the forces driving the size of the informal sector were associated with state regulation

[4] To quantify how much of the GDP in the world is informal, Schneider et al. (2010) weighted by total country GDP. More precisely, for every country/year they weighted the rate of informality by the total GDP. This provides the GDP in current Billion US dollars that is informal for each country/year. Then this amount is summed and divided by the total GDP of the sample.

(hindrances to exchange) specifically the level of the tax burden (direct and indirect ones), combined with (labour market) regulations and the quality of public goods and services.

Vuletin (2008), however, brings an important innovation to the rationale for the growth of the informal economy. He conjectures that economic informality is a function not only of hindrances to exchange but also of the dominance of the agricultural sector in various economies. The contention is that a significant amount of the incomes generated by the agricultural sector goes unreported in national statistics because of the minimum enforcement capacity of government in rural areas where agricultural activities tends to be most prevalent. Using agriculture and food exports as a percentage of exports to proxy the importance of agricultural sector, his study reveals that this variable, indeed, plays an important role in informality rates in the Latin America and the Caribbean, accounting most significantly for the variance of the size of the informal economy in Belize (49.3 %), St Lucia (48.7%) and St Vincent and the Grenadines (41.0%). Vuletin's finding underscores the need for technical and financial support to formalise entrepreneurship in the agricultural sector so that those activities can be captured better in national statistics and to this end, help to enhance guidance in fiscal, monetary and private sector policies in the region.

Another strand of the literature argues that social marginality and small firms are two key determinants of informality. As it relates to social marginality, this argument links informality to demographic dislocation, poverty and social reproduction, and is largely associated with informal sector literature from the International Labour Office **(ILO)**.

The view is that the informal economy reflects challenges that arise out of poverty precipitated by demographic dislocation in the transition of uneven industrialization and modernization. Traditionally, the mainstay of most economies particularly small states was agriculture and related activities but as time progressed and industrialization became more eminent the importance of this sector declined exponentially. As Cheng and Gereffi (1994) observe, many have been squeezed out of the agriculture sector, as a result, but not yet absorbed in the modern sectors which has led to demographic dislocation and force many to rely on informal economic activities for survival. Cheng and Gereffi also note that, within this context, the social marginality argument gives causal precedence to the demographic-economic process of industrialization which then structures the income opportunities available for social reproduction. In relation to small firms, this argument postulates that low visibility, limited start-up costs and little barriers to entry and exit in many industries make it easy for small firms to engage in casual hiring and non-reporting of income. It is distinctive to the government intervention and social marginality perspectives in at minimum two ways. First, the small firms' argument adopts a more holistic approach to the idea of economic coordination as oppose to simply focusing on government interventions through regulations and taxation. Within this framework, Cheng and Gereffi claim that although government officials can easily detect and regulate the illegal aspects of many informal work, the patriarchal means of restrictions that exist in the supply and demand domain of family workshops are used to prevent the government from intervening in domestic relationships. Second, compared to the social marginality view, the small firms' perspective is very much fascinated in how economic agents allocate factors of production and overcome barriers not only to survive, but also

to develop and flourish. The approach therefore supports not just poverty but "the innovative entrepreneurship of small businessmen" (De Soto, 1989).

An important issue that has not seen ample empirical attention by the literature is the impact of economic crises on the behaviour of the informal economy. From mere inference, one would expect growth and resilience in informal activities during times of large economic deterioration as individuals develop unofficial means to earn income in the face of increasing unemployment, depreciation of capital and other related effects. If this is the case, then the informal economy cushions the entire nation during these times. Fiege and Urban (2003) refer to this as the conventional substitution effect. They also explain that the opposite can be the reality in some nations. Noting that, to the extent a reduction in official income also leads to a fall in the demand for unofficial income, Fiege and Urban inform that the income effect works in the opposite direction and if it dominates the substitution effect then the informal sector does not buffer the official sector direction during a crisis, as it declines as well.

Congruent to our conjecture, Kauffman and Kaliberda (1996), using data on 16 CEE (Central and Eastern Europe) and FSU (Former Soviet Union) countries spanning across 1989 – 1994 in an OLS regression framework, find that nations that experienced a particularly large decline in official GDP were able to mitigate such a drop through rapid growth in the unofficial economy. Their findings further show that for every 10% cumulative decline in official GDP, the share of the informal economy in the overall economy grew by almost four percentage points. Using data on transitional economies as

well, Eilat and Zinnes (2002) also report similar findings, accrediting that the substitution effect dominates during times of economic stagnation.

In the Caribbean context, only one study, to our knowledge, has examined this phenomenon. By simply eyeballing the series of real rate of official GDP growth and real rate of informal activity growth in Barbados, over the period 1973-2003, Greenidge et al. (2005) report a positive relationship between the two phenomena. His findings also reveal that during the noted periods of large contraction in the formal economy, the informal sector showed development and tenacity, implying that the substitution predominates in the Caribbean. However, given the differences in dynamics of Caribbean States it may not be wise to generalize the findings of Barbados context to the entire region. To this connection, the main intention of this article is to empirically investigate whether the informal economy in the Caribbean States provides a buffer for these open economies in times of economic difficulty by helping to smooth out economic volatility.

2.2 Measuring the Informal Economy

The unofficial economy is an unobservable phenomenon, made up of numerous elements, and for that reason is very difficult to quantify. Nevertheless a number of statistical approaches have been developed over the years to provide information in this regard. The literature divides these techniques into two groups - direct approach and indirect approach.

Direct techniques include the sample survey method and the tax audit procedure. They are often referred to as micro techniques because they employ well-crafted surveys hinged on voluntary responses or tax auditing. Direct techniques are considered much more useful than indirect approaches because they provide information not only on the causes, effects and size of the informal economy, but also its structure. However, a key limitation of these approaches is that they are quite costly in terms of monetary price and time to execute. In addition, direct techniques tend to provide only lower bound estimates given that just a fraction of the population is surveyed and the findings depend largely on the manner in which the questionnaire is devised and the interviewees' readiness to collaborate.

Indirect approaches, on the other hand, include the electricity consumption method, the currency-demand model, the transactions approach, and the MIMIC procedure (Multiple Indicators Multiple Causes). These techniques allow for estimates to be drawn from seemingly unrelated information (Greenidge et al. 2005). More precisely, they employ macro data provided by national statistics, and to some extent index data provided by surveys such as World Bank Survey Database to extract information about the development of the informal economy. They are particularly advantageous when compared to the direct approaches in wake of the reality that many people do not want relevant authorities to know of their participation in this sector, and to this light try their best to conceal it. Like all estimation techniques, indirect approaches are not without shortcomings. They are undependable when it comes to providing information on the sector's structure and often require some assumptions to be made, which often cannot be

proven. A summary of these various approaches is available in Schneider et al. (2010), Greenidge et al (2005) and Vuletin (2008).

To compensate for the benefits and drawbacks of each technique, it would be ideal to employ all the approaches and compare their findings. Sourcing information to perform each empirical approach can, however, be a challenging task particularly as it relates to the DYMIMIC approach and the direct techniques, where the required data may not even be available especially for Caribbean States. We therefore employ the currency demand procedure to obtain estimates of the size and trend of the informal economy in the Caribbean States.

3. The Informal Economy in the Caribbean

3.1 Approach

Obtaining data to derive estimates of the size of the informal sector is a challenging task, especially in small states given the lack of developed statistical databases. This paper, nevertheless, sources data from the World Bank, the International Monetary Fund, United Nations Database and the various Central Banks in the Caribbean to carry out the various estimations. The countries examined in the study are: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago, spanning the 1991 – 2011 period.

To derive estimates of the informal economy the study employs a panel currency demand approach in a fixed effects framework. Panel models are particularly useful in this study

because of their advantages over conventional time series and cross-sectional models. Among these advantages are (i) a larger number of data points is obtained in panel models which increases the degrees of freedom and reduces the collinearity among regressors and thus improves the efficiency and consistency of estimates; (ii) heterogeneity is properly control for as panel models statistically acknowledge that each unit (i.e. country) can have its own peculiarities (i.e. country specific effects) which can be correlated or uncorrelated with some or all the regressors; (iii) a better means to reducing the magnitude of the impact of omitted variables that are correlated with the regressors is provided in panel models; and (iv) panel approaches better deal with the issue of non-stationary[5] of variables by making use of the independent cross sectional units which makes the limiting distributions of many of the estimators remain asymptotically normal (by the central limit theorem across cross section units).

This paper departs somewhat from the conventional currency demand model of Tanzi (1983). Instead of the ratio of currency to money being the regressand, only currency is applied, following along the lines of Bajada (1999), Faal (2003) and Greenidge et al (2005). This currency variable is modified to show real per capita behaviour so as to eliminate the effects of population growth and the GDP deflator (inflation) on the demand for currency. The model examines the excess sensitivity of real currency per capita holdings to average tax rates. Since currency is part of money demand, the

[5] Non-stationarity in time series procedures gives rise to least squares or maximum likelihood estimators that are no longer normally distributed.

currency demand approach has the conventional money demand arguments - income and opportunity cost of holding money and is augmented with the tax burden variable.

Theoretically an increase in real income (economic development) should result in a reduction in the demand for currency as individuals substitute currency holding with higher-level financial instruments as their living conditions improve. Given the developing nature of Caribbean Islands, particularly, the underdeveloped status of the financial markets, however, we believe that increases in real disposable income permeate expansion in average amount of money economic agents hold, ceteris paribus. Since we are investigating the excess sensitivity of taxes on currency, we substitute real gross income with real disposable income for. Interest rate and inflation rate are included in the model to capture the impact the opportunity cost of holding money has on currency demand. Interest rate is the reward for saving and is therefore expected to be inversely related to the demand for currency. The impact of inflation is a bit subtler. On the one hand, an increase in the price level can cause individuals to hold more cash to meet daily demand. On the other, it can influence them to hold less cash as its value may be depreciated. The impact could even be insignificant since the regressand (real currency per capita) is adjusted to take into account inflationary shocks. The variable of interest in the currency demand approach is Tax burden (proxy as tax revenue divided by nominal GDP). As mentioned previously, driving the currency demand approach is the assumption that economic agents hold more cash to conceal taxable transactions or evade tax payments. Therefore, as a tax system becomes more burdensome, currency demand increases and the informal economy becomes larger.

We begin our estimation by placing the above mentioned variables in an autoregressive distributed lag framework with fixed effects to reflect short run dynamics and long run equilibrium of currency demand in the Caribbean. This technique helps to address the issue of non-stationary of variables, which if present, can render the results spurious. The model is expressed as follows:

$$\Delta \ln(C_{it}) = \alpha_1 \Delta \ln(YD_{it}) + \alpha_2 \Delta \ln(R_{it}) + \alpha_3 \Delta \ln(\pi_{it}) + \alpha_4 \Delta \ln(T_{it}) + \beta_1 \ln(YD_{t-1}) + \beta_2 \ln(R_{t-1}) + \beta_3 \ln(\pi_{t-1}) + \beta_4 \ln(T_{t-1}) + \beta_5 \ln(C_{t-1}) + \mu_{it} \quad \textbf{(1)}$$

Where C is real currency per capita, YD is real disposable income, R is the interest rate on deposits, π is the inflation rate, T is the tax burden and μ is an error term observed for each country *i* and each time period *t*. Ln indicates that the variables are expressed in natural logarithm. The coefficient on $\ln(C_{t-1})$ captures the speed of adjustment to changes in real currency per capita demand away from equilibrium real currency holdings. It allows for suitable economic interpretation of estimation results.

Table 1: Estimation Results of Dynamic Fixed Effects Model

EXPLANATORY VARIABLES	ORIGINAL MODEL	PARSIMINIOUS MODEL	
	$\Delta \ln(C_{it})$	$\Delta \ln(C_{it})$	$\Delta \boldsymbol{ln}(\boldsymbol{C_{it}})$
$\Delta \ln(YD_{it})$	0.830 (0.126)***	0.793 (0.109)***	
$\Delta \ln(R_{it})$	-1.079 (0.550)*	-1.187 (0.495)***	
$\Delta \ln(\pi_{it})$	-0.074 (0.172)	-	
$\Delta \ln(T_{it})$	1.716 (0.572)***	1.618 (0.553)***	**Long-run elasticities**
$\ln(YD_{t-1})$	0.314 (0.059)***	0.311 (0.059)***	0.757
$\ln(R_{t-1})$	-0.308 (0.420)	-0.504 (0.300)*	-1.226
$\ln(\pi_{t-1})$	-0.151 (0.420)	-	
$\ln(T_{t-1})$	1.537 (0.404)***	1.446 (0.387)***	3.518
$\ln(C_{t-1})$	-0.412 (0.060)***	-0.411 (0.059)***	
Constant	-0.903 (0.227)***	- 0.867 (0.222)***	
R-Squared	0.381	0.379	
Observations	231	231	
Number of groups	11	11	
Corr(u_i, Xb)	-0.859	-0.858	
sigma_u (sd of residuals within groups ui)	0.128	0.128	
sigma_e (sd of residuals (overall error term)	0.082	0.082	
rho (fraction of variance due to u_i)	0.708	0.710	

Notes: (1) Standard errors provided in parentheses below coefficients.
(2) ***, ** and * indicates statistical significance at the 1, 5 and 10 per cent levels of testing.

The results of the original model are reported in **Table 1**. All of the coefficients have expected sign. The inflation rate variables and the one lagged interest rate variable are however not significant. The insignificance of the price level variables is not surprising given that the regressand is modified to account for price shocks. This suggests that the model can be reduced to a more parsimonious and stable one. To arrive at the most

parsimonious model we systemically dropped the insignificant regressors. The results are presented in the Parsimonious Model column.

As displayed in the Parsimonious Model column, the explanatory power of the model is 37.9 %, which is fairly good within the context of panel data structure. Also, the **rho** estimate, which shows the percent of the variation that is explained by country specific effects, is relatively strong at 71.0%. The coefficient on $\ln(C_{t-1})$ indicates an adjustment speed of 0.41, suggesting that it takes approximately 2 years and 2 months for holders of currency to fully adjust to shocks affecting their demand**.**

The coefficients on the other variables did not change appreciably in this new model however, the one year lagged interest rate variable is now significant. The results reveal that income elasticity of real currency per capita, both contemporaneous and one year lagged and the one year lagged interest elasticity of real currency per capita are inelastic as they are below one. The Tax elasticity of real currency per capita holdings, both short and one year lagged and the contemporaneous interest elasticity of real currency per capita holdings are, on the other hand, elastic. This finding points to important policy implications for decisions makers in the Caribbean. As it relates to the interest rate elasticities, the results implicate that economic agents in the Caribbean are highly responsive to announcements of changes in the saving interest rate, immediately substituting currency holdings with financial instruments as the interest rate rises. In the context of the tax elasticities of real currency demand per capita, which had the highest estimated values, the findings signpost that Caribbean people hold more cash on average

largely to overcome burdensome tax systems and ply their trade in the informal economy. This finding underscores the need for tax and regulatory reform in the region targeted at improving the ease of doing business and encouraging entrepreneurship.

Using the parsimonious model, we can now obtain estimates of the informal economy in the Caribbean. First, we reorganize the model to make nominal currency holding the subject as follows:

$$CC_{it}^{*} = exp(X_{it}\boldsymbol{\beta} + \boldsymbol{\gamma}\Delta \ln(T_{it}) + \boldsymbol{\varphi} \ln(T_{t-1}) + \ln(CC_{t-1}^{*}) + \ln(P_{it}) + \ln(N_{it})) \quad \textbf{(2)}$$

where CC_{it}^{*} is the estimated active nominal currency held by individuals in the Caribbean, X_{it} is all the regressors in the parsimonious model exclusive of the two tax regressors, P_{it} is the implicit deflator and N_{it} is the population. We use the exponential operator (*exp*) to convert values expressed in natural logarithms into level terms.

Second, we formulate a corresponding series by removing the tax variables in **Equation (2)** and therefore the incentive to take part in informal economic transactions. Moreover, the assumption is that if $\boldsymbol{\gamma} = \boldsymbol{\varphi}$ = **0** then there is no excess sensitivity as there is no need to hold extra cash to evade taxable transactions. In the absence of taxes and the informal economy, nominal currency holding will therefore settle at its natural rate. This natural rate is shown as CC_{it}^{**} in **Equation (3).**

$$CC_{it}^{**} = exp(X_{it}\boldsymbol{\beta} + \ + \ln(CC_{t-1}^{*}) + \ln(P_{it}) + \ln(N_{it}) \quad \textbf{(3)}$$

The series generated by **Equation (3)** is also referred to as legal currency holdings. The difference between the two series gives nominal informal currency holdings over time (*t*) and across countries (*i*).

Third and final, to convert nominal informal currency holdings into informal economic output, we assume that the income velocity of currency circulation is tantamount in both the formal and informal economy. As such, we compute the income velocity in the formal economy by dividing nominal gross domestic product by nominal formal (legal) currency holdings and then multiplied this value by nominal informal currency holdings to obtain nominal informal economic output.

3.2 Size of the Informal Economy

Figure 2 and **Tables 2, 3** and **4** present the results of our model. The size of the informal economy in the Caribbean is sizeable and growing relative to formal output, and our results are similar to previous findings. The average size of the sector over the study period 1990-2011 is 30.8% (around 29.0% in the early 2000s), slightly lower than Vuletin's estimate of 32.3% in the early 2000s and Schneider et al. 34.7% for the Latin America and Caribbean grouping (1999-2007).

At the country level, our results show that the average estimate of informality in Jamaica (34.1%) and Trinidad and Tobago (37.1%) are in particular comparable to Schneider et al.

34.8% and 33.4%, respectively. The estimates for Barbados are similar to Greenidge et al. (2005) finding but roughly 11 percentage points larger than Vuletin's indication. Our average value for Belize is approximately 10 percentage points lower than that of Vuletin and Schneider et al., while Bahamas estimates (average 20.2%) averages Vuletin's (15.9%) and Schneider et al.(26.5%). As it relates to the ECCU, our estimations are not to distance from Vuletin's values with the exception of St Vincent and the Grenadines. Vuletin's estimate indicates that the sector in St Vincent and the Grenadines in the early 2000s was 50.6% while our model points to a value of 33.1%. We believe that the inclusion of the importance of agriculture variable in Vuletin's framework may have distorted his results somewhat (overestimating the informal economy in agriculture-based economies and under-predicting it in services-based ones) given that informality is not limited to agricultural activity but very common in service-oriented undertakings as well.

Table 2: Caribbean Informal Sectors Relative to GDP (1991-2011)

Informal Sector % of Nominal Formal GDP													
Year	Antigua	Bahamas	Barbados	Belize	Dominica	Grenada	Jamaica	St Kitts	St Lucia	St Vincent	Trinidad	Caribbean	ECCU
1991	21.8	17.2	33.6	32.1	30.6	34.6	34.2	18.1	32.2	28.8	38.5	29.2	27.7
1992	22.0	19.6	36.3	33.6	30.7	32.6	29.5	18.1	34.8	27.1	34.0	28.9	27.5
1993	21.8	19.1	34.0	30.9	28.9	34.8	33.2	19.3	35.3	28.1	35.3	29.2	28.0
1994	22.0	21.7	32.7	31.9	26.0	36.1	32.2	19.2	33.4	29.3	31.6	28.7	27.7
1995	22.4	23.0	32.5	29.5	29.7	34.0	33.2	25.1	33.9	29.4	34.3	29.7	29.1
1996	23.5	20.4	33.5	29.3	29.9	33.8	30.1	25.6	30.9	30.4	35.1	29.3	29.0
1997	22.7	19.8	33.1	28.9	29.5	32.1	30.0	26.1	32.5	29.9	32.5	28.8	28.8
1998	21.9	17.9	37.1	29.9	31.6	32.7	32.1	27.2	31.8	30.7	31.5	29.5	29.3
1999	21.7	19.6	37.1	27.1	29.2	34.2	33.7	26.4	33.9	30.7	29.1	29.3	29.3
2000	19.5	21.0	37.6	26.9	31.5	27.4	33.9	24.8	34.5	32.3	33.6	29.4	28.4
2001	22.4	18.1	39.3	27.8	27.0	26.8	32.0	23.4	32.9	31.4	31.0	28.4	27.3
2002	24.7	16.5	39.3	29.0	27.7	26.9	33.6	24.7	33.9	33.1	32.3	29.2	28.5
2003	24.6	17.6	37.8	28.3	29.7	27.6	36.9	28.6	32.8	31.4	33.3	29.9	29.1
2004	25.7	18.1	38.5	30.4	31.5	25.5	36.6	32.1	35.6	31.1	35.9	31.0	30.3
2005	25.9	19.5	34.9	31.6	36.0	27.1	34.6	36.5	36.2	30.9	44.2	32.5	32.1
2006	28.3	21.8	37.2	32.0	36.1	28.2	36.9	33.1	35.5	33.8	47.2	33.7	32.5
2007	30.2	21.8	34.7	36.0	38.8	29.7	38.0	32.6	36.8	32.7	39.2	33.7	33.5
2008	28.7	23.0	43.3	32.5	37.7	29.1	37.3	31.8	37.2	37.0	47.9	35.0	33.6
2009	26.5	21.6	37.5	33.3	36.9	27.3	37.4	32.1	38.6	36.3	38.9	33.3	32.9
2010	28.0	21.0	40.3	36.3	38.6	28.2	36.2	27.9	34.6	34.9	45.4	33.8	32.0
2011	27.0	25.2	41.2	34.6	34.9	26.4	34.8	32.5	34.2	33.5	48.6	33.9	31.4
Average	24.4	20.2	36.7	31.0	32.0	30.2	34.1	26.9	34.4	31.6	37.1	30.8	29.9

Source: Authors' estimates

The informal sector in all the Caribbean islands, with the exception of Grenada, trended upwards relative to measured GDP over the study period, propounding that sector accelerated at a faster pace than the formal one. The consolidated Caribbean estimate expanded from 29.2% of GDP (US$5.4 billion) in 1991 to 33.9% (US$21.6 billion) in 2011. According to our estimates, the highest rate of informality occurred in 2008 at the onset of the on-going global financial and economic crisis. Trinidad and Tobago (average 37.1%) and Barbados (average 36.7%) registered the highest average rate of informality while Antigua and Barbuda (average 24.2%) and Bahamas (average 20.2%) are estimated as having the lowest rates. The largest absolute informal economy in the Caribbean is in Trinidad and Tobago at US$10.6 billion, then in Jamaica at US$5.1 billion, following is Bahamas at US$2.0 billion and at the lower ends are Dominica at US$0.173 billion and Grenada at US$0.218 billion. These values are as at 2011. **Table 4** presents further information on the absolute values of the informal sector in the various Caribbean Islands over the period 1991 to 2011 in US currency while **Table 3** displays these values in national currencies.

Of important note, in St Kitts and Nevis, the informal sector relative to formal output doubled over the review period, moving from 18.1% in 1991 to a high of 36.5% in 2004 then declines to 32.5% in 2011. This upward trajectory can be attributed to numerous discretionary changes made to the tax system to boost revenue productivity so as to reduce the nation's unsustainably high and mounting debt. In fact, empirical research by Mapp (2012) reveals that the tax system in St Kitts and Nevis is quite buoyant but very

unstable owing to frequent discretionary tax adjustments, unintentionally causing fluctuations to the revenue stream. Also noteworthy, in Grenada, the informality rate stood at below average (30.2%) following the fiscal year 1999, suggesting that the sector's pace of growth was slower than that of the formal economy during that period. This outturn is likely a result of several natural disasters shocks particularly hurricanes depressing the sector's tenacity.

4. Informality and Macroeconomic Volatility

4.1 Descriptive Statistics

The study first presents some stylized facts regarding the informality and volatility relationship. Consumption volatility is measured as the squared residuals from an autoregressive fixed effects model of the household consumption to income ratio (average propensity to consume). Income volatility, on the other hand, is calculated as the squared residuals from an autoregressive fixed effects model of gross national income per capita. These two measures of volatility are therefore not directly comparable and measure two different concepts. The consumption volatility measure allows us to evaluate the extent to which the size of the informal sector can either result in higher or lower rates of change in the average propensity to consume. The output volatility measure, on the other hand, investigates overall macroeconomic volatility and provides an indication of whether informal activities are either more or less volatility than formal activities.

Table 5 provides the average of real consumption and output volatility for the first (less than 27%), second (27% to 32%), third (32% to 35%) and fourth (more than 35%) quartile of the size of the informal economy. The descriptive statistics seem to suggest that countries with a larger informal economy have a lower level of consumption volatility. However, there also appears to be a non-linear relationship between the size of the informal economy and consumption volatility: if the size the informal economy exceeds 35% (the third quartile), mean consumption volatility seems to increase.

Table 5: Size of the Informal Economy and Volatility

Full Sample	Volatility	
Size of the Informal Economy	Consumption	Output
<27%	19.967	0.002
27 to 32%	27.564	0.005
32 to 35	18.456	0.004
>35%	42.023	0.007
1990s		
Size of the Informal Economy	Consumption	Output
<27%	20.802	0.002
27 to 32%	36.190	0.003
32 to 35	18.106	0.005
>35%	33.536	0.012
2000s		
Size of the Informal Economy	Consumption	Output
<27%	19.225	0.003
27 to 32%	19.208	0.006
32 to 35	18.749	0.004
>35%	43.437	0.006

Source: Authors' calculations

In the case of output volatility, however, there seems to be a positive association between the size of the informal economy and volatility. This can occur if those activities that

constitute the informal sector are more volatile than the formal economy. Therefore, while these activities do assist with consumption smoothing at the household, overall output volatility seems to be increase as the size of the informal economy rises in the Caribbean.

When the sample is disaggregated into the 1990s and 2000s a broadly similar picture emerges relative to the association between consumption as well as output volatility and the size of the informal economy **(Table 5)**. The lowest rate of consumption volatility is associated with an informal sector of about 32 to 35% of the formal economy, with volatility rising for lower as well as small values for the size of the informal sector. In the case of output volatility, the highest rate of volatility occurred when the size of the informal economy exceeded 35% of the formal economy.

A similar analysis can also be conducted over time. **Figures 3** and **4** present stacked area charts where the volatility indices are summed and then expressed as a percentage of the total. The larger the size of the particular area in a given year, the larger the proportion of volatility due to economies with informality of less than 27%, 27 to 32%, 32 to 35% and over 35%. In all two diagrams the smallest proportion of overall volatility was due to economies where the informal economy was between 32 and 35% of the formal economy. While this result, was largely consistent across the business cycle there were some periods where this general finding did not hold. Indeed, the results in **Figure 3** suggest that for the period 2004 to 2008, Caribbean economies with relatively large informal

sectors experienced relatively higher rates of consumption volatility. A similar finding is obtained when one examines the output volatility chart **(Figure 4)**.

Figure 3: Volatility and Size of the Informal Economy over Time Consumption

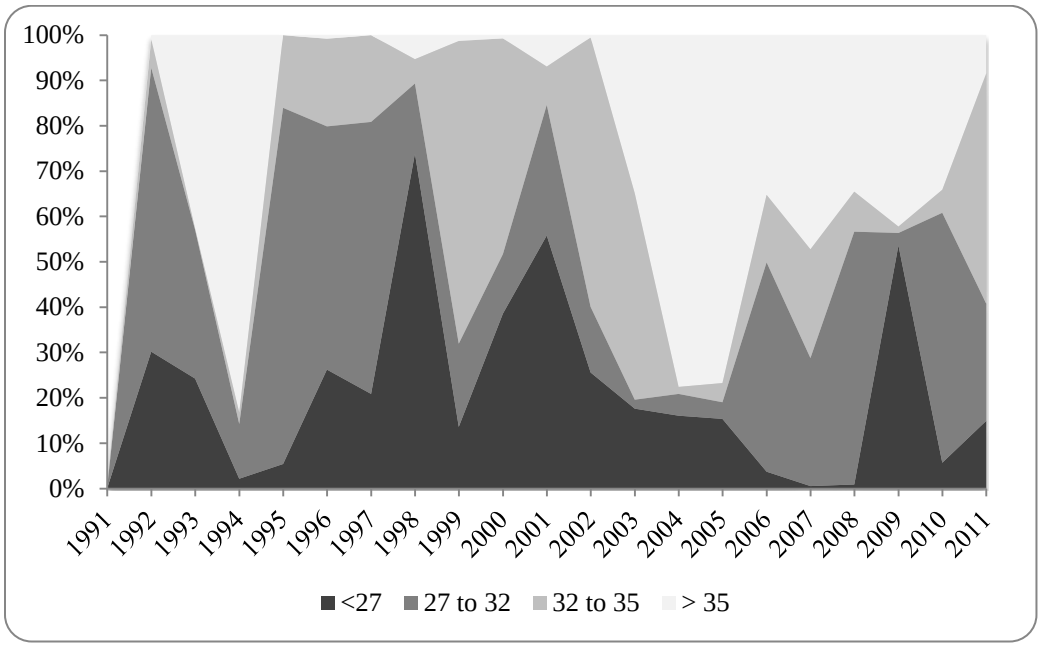
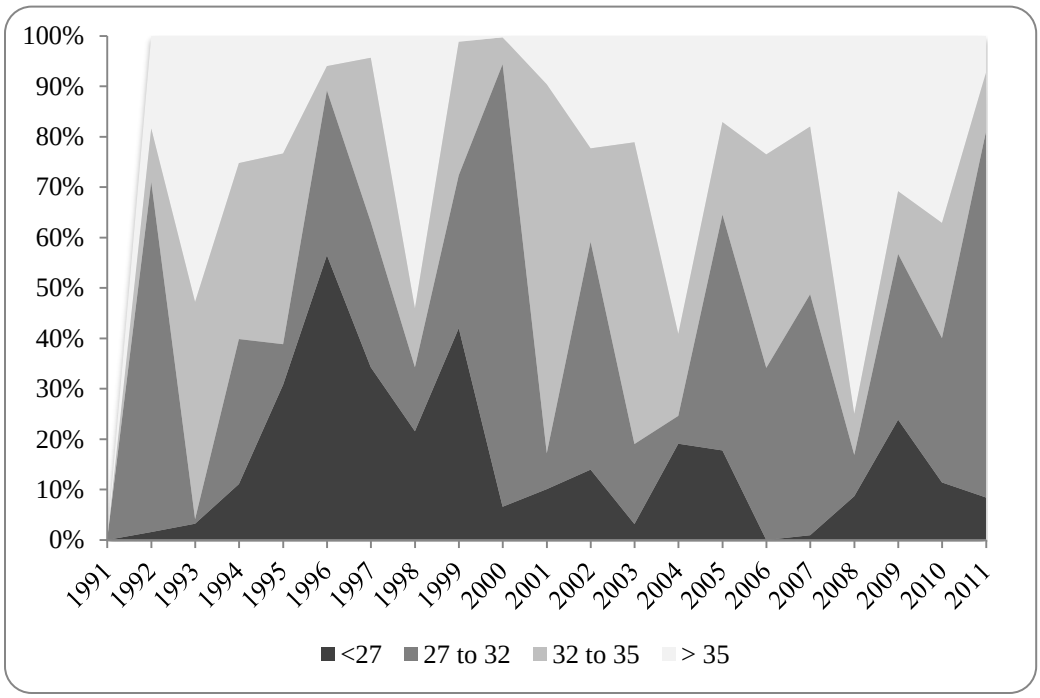


Figure 4: Volatility and Size of the Informal Economy over Time Output



Source: Authors' Calculations

The above descriptive statistics provide an initial characterization of the relationship between macroeconomic volatility and the size of the informal economy. These results, however, are only suggestive of a relationship between the two variables. This analysis has not considered the effects of third variables and the potential endogenous relationship between the two variables. To account for these and other shortcomings of the descriptive analysis, regression analysis is employed in the next section.

4.2 Regression Analysis

As a starting point for the analysis, the authors examine the bivariate relationship between the size of the informal economy and economic volatility. The following equation is therefore estimated:

$$vol_{it} = \alpha_i + \delta INFORMAL_{it} + u_{it} \quad \textbf{(4)}$$

where α_i are the country-specific effects, vol is a measure of economic volatility, *INFORM* is the size of the informal economy as a ratio to GDP and μ is an error term observed for each country i and each time period *t.* δ is the parameter to be estimated, with ambiguous sign since the informal economy can have either a positive or negative impact on economic volatility. If the informal economy acts as a buffer, it should aid in smoothing economic fluctuations. On the other hand, if the activities that make up the informal sector move pro-cyclically, informal activities may act as a catalyst for economic volatility. The model is estimated via the first difference estimator to eliminate the individual effects. The estimator is chosen since it does not require strict exogeneity, which is unlikely to hold in **Equation (4)**.

The estimated model results suggest that the size of the informal economy is negatively associated with consumption volatility. The coefficient on the natural logarithm of the informal economy variable is negative and statistically significant at normal levels of testing. Relatively similar results were obtained with and without the inclusion of time dummies. In the case of output volatility, however, the coefficient on the size of the informal economy variable was not statistically significant at normal levels of testing.

Table 6: Bivariate Panel Regression Results

Explanatory Variables	Consumption Volatility	Consumption Volatility	Output Volatility	Output Volatility
Informal economy	-6.465 (2.716)**	-6.605 (2.832)**	-3.003 (3.787)	-2.800 (3.432)
Constant	0.030 (0.042)	-1.426 (0.782)*	-0.023 (0.057)	0.560 (0.659)
R-squared	0.021	0.059	0.007	0.165
Observations	209	209	209	209
Time dummies	No	Yes	No	Yes
Robust standard errors	Yes	Yes	Yes	Yes

Notes: (1) Standard errors provided in parentheses below coefficients.
(2) ***, ** and * indicates statistical significance at the 1, 5 and 10 percent levels of testing.

The previous regressions present only a cursory analysis of the relationship between volatility and the size of the informal economy. There are a number of other factors that may affect volatility that are not explicitly taken into account when basic bivariate correlation or regression analysis is employed. To effectively incorporate these factors, a variety of empirical models linking economic informality to economic volatility are examined. Therefore, this study augments the simple regression of volatility on the size of the informal economy with some control variables that are popular in the literature. Formally,

$$vol_{it} = a_i + br_{it} + dINFORM_{it} + gX_{it} + u_{it} \quad \textbf{(5)}$$

where γ is parameter estimates on the matrix of control variables, X, that includes inflation (a proxy for monetary policy), government consumption (a proxy for fiscal

policy), trade openness, financial openness, growth in GDP per capita, inflation volatility, World GDP growth volatility, economic diversification, exchange rate and the levels and change in the terms of trade.

The results provided in **Table 6** are broadly consistent with the bivariate regression results reported earlier: the size of the informal economy does seem to reduce the volatility of the consumption-income ratio, but has no impact on output volatility. Of all the control variables included in the regressions, trade openness, economic concentration, inflation and financial openness were the most important determinants of economic volatility in the Caribbean. These results are broadly consistent with papers done on volatility in the region (see for example Moore and Walkes (2010)). While the inclusion of these variables changed the magnitude of the coefficient on the informal economy variable, the main conclusion that countries with a larger informal sector had a lower rate of consumption volatility could not be rejected.

Table 7: Panel Regression Results with Macroeconomic Control Variables

Explanatory Variables	Consumption Volatility	Consumption Volatility	Consumption Volatility	Consumption Volatility	Output Volatility
Informal economy	-8.098 (2.708)***	-8.135 (2.692)***	-8.089 (2.720)***	-8.105 (2.708)***	-1.314 (3.340)
Government consumption	-0.038 (2.514)	-0.477 (2.669)	-0.016 (2.412)	0.0644 (2.164)	-3.792 (1.787)**
Trade openness	7.476 (3.023)**	8.324 (3.200)***	7.442 (3.113)**	7.417 (2.976)**	-5.872 (2.007)***
Terms of trade	-2.577 (2.748)	-3.170 (2.556)	-2.397 (3.174)	-2.547 (2.766)	3.402 (5.076)
Concentration index	-7.110 (3.128)**	-7.554 (3.189)**	-7.138 (3.099)**	-7.051 (3.062)**	4.170 (4.530)
Inflation	-5.231 (1.645)***	-4.607 (1.975)**	-5.238 (1.619)***	-5.208 (1.608)***	-0.888 (3.393)
Financial Openness	-1.304 (0.699)*	-1.349 (0.716)*	-1.296 (0.685)*	-1.307 (0.698)*	0.682 (0.796)
Constant	0.166 (0.059)***	0.167 (0.060)***	0.166 (0.058)***	0.165 (0.059)***	-0.109 (0.072)
US Volatility	-	-14.502	-	-	-

		(10.360)			
Disasters	-	-	-0.081 (0.453)	-	-
Growth	-	-	-	0.006 (0.042)	-
R-squared	0.090	0.095	0.090	0.090	0.055
Observations	209	209	209	209	209
Time dummies	No	No	No	No	No
Robust standard errors	Yes	Yes	Yes	Yes	Yes

Notes: (1) Standard errors provided in parentheses below coefficients.
(2) ***, ** and * indicates statistical significance at the 1, 5 and 10 percent levels of testing.

To further evaluate the findings reported in **Table 6**, the consumption model is augmented with variables that have been found to be important determinants of growth dynamics in the Caribbean: volatility of the US economy (Cashin, 2006), disasters (Strobl, 2012) and growth (Craigwell, Jackman, & Moore, 2010). The impact of these variables on economic volatility in the sample of Caribbean countries under consideration was, however, insignificant at normal levels of testing. In addition, the coefficient on the variable of interest (the size of the informal economy) did not change appreciably.

The descriptive statistics analysed in **Section 4.2** suggested that the relationship between the size of the informal economy may be non-linear. To consider these non-linear effects, the sample is split into two: one for economies where the informal sector is less than 32% of the formal economy and the other for economies where the informal sector exceeds 32% of formal economic activities. The results are provided in **Table 8**. For brevity only the coefficient estimates on the size of the informal economy variable is provided. In addition, the coefficient estimate from the previous table is also provided. In line with the previous findings the coefficient estimate on the size of the informal economy

variable had a negative impact on consumption volatility, but the variable was statistically insignificant at normal levels of testing. This result could be due to the loss of degrees of freedom from disaggregating the database or from the approach to looking at non-linearity. Other approaches to the issue of non-linearity (e.g. higher order and exponential terms) were employed but these were highly correlated with the size of the informal economy variable and lead to problems with multicollinearity. The results therefore seem to suggest that the earlier findings of non-linearity may have been due to the exclusion of important control variables.

Table 8: Panel Regression Results Accounting for the Size of the Informal Economy

Explanatory Variables	Consumption Volatility - Small Informal Sector	Consumption Volatility - Small Informal Sector (without controls)	Consumption Volatility - Small Informal Sector (with controls)	Consumption Volatility - Large Informal Sector (without controls)	Consumption Volatility - Large Informal Sector (with controls)
Informal economy	-8.098 (2.708)***	-3.499 (2.899)	-3.353 (3.723)	-9.353 (5.002)*	-9.003 (6.094)
R-squared	0.090	0.006	0.069	0.081	0.084
Observations	209	104	104	97	97
Time dummies	No	No	No	No	No
Robust standard errors	Yes	Yes	Yes	Yes	Yes

5. Conclusion

The informal economy has traditionally played an important role in most Caribbean economies. Indeed, small family-owned plots supplied most of the domestic demand for agricultural commodities. While the economy of most Caribbean countries is now primarily service-oriented, the informal sector still plays a major role in most of their

economies. Economic informality is normally associated with socio-economic marginality. Indeed, Cheng and Gereffi (1994) identify three main motivations for the informal economy: (1) social marginality; (2) state regulation; and, (3) small firms. The informal economy is therefore related to dislocation and in some instance poverty.

This paper investigates the relationship between economic volatility (consumption and income) and measures of performance of the informal economy. It contributes to the literature in three main ways: (i) it investigates the drivers of real per capita currency holdings in the Caribbean by articulating a parsimonious currency demand model in a dynamic fixed effects framework (ii) it makes use of this framework to gather estimates of the performance of the informal economy in Caribbean States over the 1991-2011 period and (iii) this paper explores empirically the effects of the size of the informal economy on economic volatility in various Caribbean islands

The parsimonious currency demand model reveal that real currency per capita holdings in the Caribbean is driven mainly by short run and long run changes in real disposable income, deposit interest rate and tax burden. Short run interest rate, with an elastic coefficient, was identified as a key motivator of real currency per capita holdings, suggesting that Caribbean people are highly responsive to announcements of changes in the saving interest rate, immediately substituting currency holdings with financial instruments as the interest rate rises. In addition, the model reveals that real currency holdings was most responsive to short run and long run tax burden shocks, inferring that

Caribbean people hold more cash on average largely to overcome burdensome tax systems and ply their trade in the informal economy.

Using the parsimonious model, time series estimates of the size of the informal economy were then obtained for the 11 Caribbean islands. In many islands, the size of the informal economy relative to formal economic activities exceeds one third and appears to have increased during the recent economic downturn. The consolidated Caribbean estimate expanded from 29.2% of GDP in 1991 to 33.9% in 2011. Moreover, the highest rate of informality occurred in 2008, the onset of the on-going global financial and economic crisis.

The econometric analysis reported in the study suggests that this growth in the informal economy has reduced the volatility of consumption, but not output/income over the review period. The coefficient on the natural logarithm of the informal economy variable is negative and statistically significant at normal levels of testing. Relatively similar results were obtained with and without the inclusion of time dummies as well as various macroeconomic control variables. In the case of output volatility, however, the coefficient on the size of the informal economy variable was not statistically significant at normal levels of testing.

While the results reported in the study suggests that an informal income can have benefits for Small Island Developing States **(SIDs)**, the analysis provided in this paper only examines one aspect of welfare. The impact of informal activities on welfare at the

household and individual level are also of importance as well as the distribution of income. Ideally, it would be useful to evaluate the findings reported in this study using household-level databases. Such an analysis would allow one to examine the interaction between informality and welfare at the household level. Unfortunately, however, such household-level databases are not available in the Caribbean. And where available, are not provided at sufficient intervals to allow dynamic comparisons.

The findings of the study, nevertheless, suggest that policymakers in the region should mainstream efforts to include informal activities into the formal economy. Such policy measures would support regional efforts to reduce poverty and unemployment and would also support the entrepreneurial dynamism of the region. Attempts at encouraging informal economy participants to join the formal economy would need to confront issues regarding the ease or lack thereof of doing business in the Caribbean as well as regulatory hurdles.

References

Bajada, C. (1999). Estimates of the Underground Economy in Austria . *Economic Revolts Volume 75*, 369-384.

Cagan, P. (1958). The Demand for Currency Relative to the Total Money Supply. *Journal of Political Economy, 66*(3), 302-328.

Cashin, P. (2006). Key Features of Caribbean Business Cycles. In P. Cashin, D. Robinson, & R. Sahay (Eds.), *The Caribbean: From Vulnerability to Sustained Growth* (pp. 83-121). Washington: International Monetary Fund.

Cheng, L., & Gereffi, G. (1994). The Informal Economy in East Asian Development. *International Journal of Urban and Regional Research, 18*(2), 194-219.

Craigwell, R., Jackman, M., & Moore, W. (2010). Economic Volatility and Remittances. *International Journal of Development Issues, 9*(1), 25-42.

De La Roca, J., Hernandez, M., Robles, M., Torero, M., & Webber, M. (2006). The Informal Sector in Jamaica. *Economic and Sector Study Series*.

De Soto, H. (1989). *The Other Path: The Invisible Revolution in the Third World.* New York: Harper Collins.

Eilat, Y., & Zinnes, C. (2002). The Evolution of the Shadow Economy in Transition Countries: Consequences for Economic Growth and Donor Assistance. *CAER II Discussion Paper*.

Faal, E. (2003). Currency Demand, the underground economy, and tax evasion: the Case of Guyana. *IMF Working Paper*.

Feige, E. (1989). *The Underground Economies: Tax Evasion and Information Distortion.* Cambridge:Cambridge University Press.

Feige, E. (2005). *Overseas Holdings of US Currency and the Underground Economy.* EconWPA.

Feige, E., & Urban, I. (2003). Estimating the Size and Growth of Unrecorded Economic Activity in Transition Countries: A Re-evaluation of Electric Consumption Method Estimates and their Implications. *William Davidson Institute Working Paper*.

Greenidge, K., Holder, C., & Mayer, S. (2005). Estimating the Size of the Underground Economy in Barbados. Central Bank of Barbados Working Paper.

Horn, Z. (2010). The Effects of the Global Economic Crisis on Women in the Informal Economy: Research Findings from WIEGO and the Inclusive Cities Partners. *Gender and Development, 18*(2), 263-276.

Kaufmann, D., & Kaliberda, A. (1996). *Integrating the Unofficial Economy into the Dynamics of Post-Socialist Economies: A Framework of Analysis and Evidence.* B. Kaminski (ed.) Economic Transition in Russia and the New States of Eurasia. Armont, NY: M.

Lemieux, P. (2007). The Underground Economy, Causes, Extent, Approaches. *Montreal Economic Institute Research Papers*.

Mapp, T. (2012). Assessing the Responsiveness and Stability of Tax Systems in the ECCU: A Case Study of Saint Lucia, St Kitts and Nevis and St. Vincent and the Grenadines. *ECCB Working Paper Series Special Edition September 2012*.

Maurin, A., Sookram, S., & Watson, P. (2006). Measuring the Size of the Hidden Economy in Trinidad & Tobago, 1973-1999. *International Economic Journal, 20*(3), 321-341.

Mehrotra, S. (2009). The Impact of the Economic Crisis on the Informal Sector and Poverty in East Asia. *Global Social Policy, 9*(1), 101-118.

Moore, W. (2010). Trade and Industry Policy in the Caribbean. In *Growth and Development Strategies for the Caribbean* (pp. 125-150). Bridgetown: Caribbean Development Bank.

Moore, W., & Walkes, C. (2010). Does Industrial Concentration Impact on the Relationship between Policies and Volatility? *International Review of Applied Economics, 24*(2), 179-202.

Paul, R. (2008). *Towards a Strategy for Agriculture and Poverty Alleviation in the OECS.* UNDP Sub-regional Office for Barbados and the OECS and the OECS Secretariat.

Prescod, R. (1986). *The Underground Economy in Barbados.* Central Bank of Barbados Working Paper.

Schneider, F., Buehn, A., & Montenegro, C. (2010). New Estimates of the Shadow Economy all over the World. *International Economic Journal, 24*(4), 443–461.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations.* New York: Modern Library, 1937.

Strobl, E. (2012). The Economic Growth Impact of Natural Disasters in Developing Countries: Evidence from Hurricane Strikes in the Central American and Caribbean Region. *Journal of Development Economics, 97*, 130-141.

Tanzi. (1983). The Underground Economy in the United States: Annual Estimates, 1930–1980. *IMF Staff Papers, 33*, 283–305.

Vuletin, G. (2008). *Measuring the Informal Economy in Latin America and the Caribbean.* International Monetary Fund. Washington, DC: IMF.

Appendix 1

Figure 2.0: Graphical Snapshot of Informal Sector in the Caribbean, 1991-2011

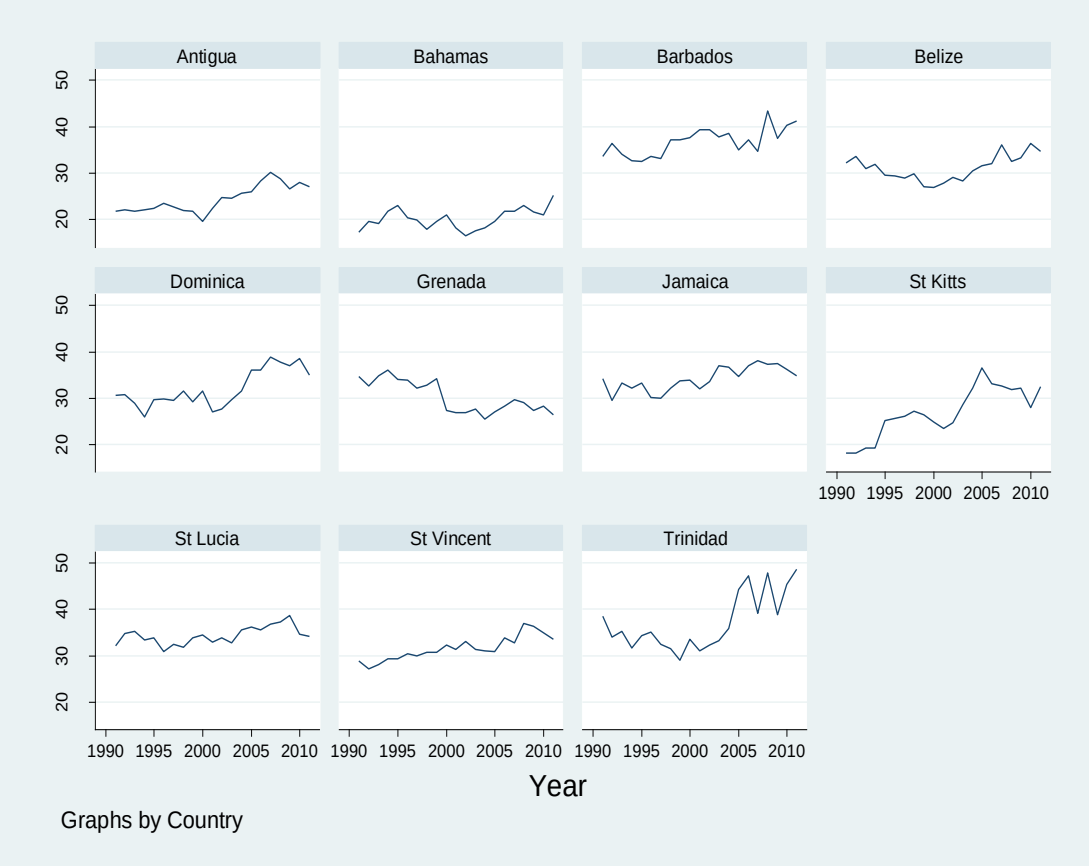


Table 3: Caribbean Informal Output in National Currencies, 1991-2011

INFORMAL ECONOMIC OUTPUT IN NATIONAL CURRENCIES ($Millions)											
Year	Antigua	Bahamas	Barbados	Belize	Dominica	Grenada	Jamaica	St Kitts	St Lucia	St Vincent	Trinidad
1991	286.1	624.7	1,345.1	278.1	175.3	222.9	17,596.9	101.8	389.1	195.7	8,693.1
1992	299.7	712.0	1,406.8	314.2	189.9	216.7	28,307.5	112.5	467.1	202.1	7,853.3
1993	318.1	691.2	1,391.0	328.0	187.2	235.8	44,406.8	130.6	474.5	214.3	8,646.1
1994	352.1	827.4	1,406.1	352.0	181.0	256.2	57,502.4	145.7	467.3	228.5	9,275.9
1995	354.4	922.0	1,469.9	346.7	210.4	254.4	76,288.4	197.0	505.6	248.5	10,874.8
1996	406.6	926.2	1,620.3	376.4	228.0	274.2	82,436.7	214.9	491.4	270.6	12,140.9
1997	421.6	974.5	1,692.5	378.6	233.8	280.5	89,430.3	245.5	524.9	281.6	11,653.9
1998	435.7	986.9	2,133.9	411.5	264.9	313.2	102,489.4	266.8	564.1	312.1	11,979.0
1999	452.4	1,179.6	2,235.6	396.4	252.4	353.1	116,160.5	274.5	632.9	324.2	12,491.9
2000	415.6	1,328.0	2,330.6	446.8	276.2	386.8	131,216.7	278.7	652.6	347.1	17,257.4
2001	471.2	1,177.7	2,433.7	483.8	241.6	379.0	135,196.6	287.1	591.6	364.9	17,026.0
2002	537.9	1,146.5	2,449.3	539.9	244.2	395.1	158,048.9	318.8	619.8	413.5	18,186.0
2003	563.7	1,226.3	2,452.5	559.9	273.3	443.7	200,812.3	356.7	650.1	409.0	23,723.0
2004	629.1	1,282.6	2,688.1	642.3	312.1	413.9	227,770.8	431.0	770.7	439.3	30,041.0
2005	699.7	1,502.7	2,729.5	703.5	351.7	513.4	242,017.5	528.2	827.6	459.6	44,476.0
2006	873.6	1,740.1	3,124.9	777.7	378.3	535.7	289,718.4	562.1	902.8	556.9	54,712.8
2007	1,057.1	1,810.2	3,108.7	920.2	438.7	612.6	336,209.8	603.7	1,012.3	604.3	53,716.4
2008	1,048.6	1,894.5	3,761.8	884.2	467.4	653.8	374,719.6	635.3	1,088.8	699.4	81,820.7
2009	869.3	1,664.5	3,294.4	899.1	485.3	570.7	404,062.7	597.0	1,106.4	659.1	48,267.2
2010	872.3	1,634.1	3,421.8	1,016.9	501.6	595.7	424,943.1	507.8	1,088.3	636.7	58,903.8
2011	816.7	1,966.2	3,550.2	1,019.6	467.4	588.6	440,362.4	624.4	1,156.7	622.9	68,187.5
Average	580.1	1,248.5	2,383.2	575.0	302.9	404.6	189,509.4	353.3	713.6	404.3	29,044.1

Source: Authors' estimates

Table 4: Caribbean Informal Economic Output in US Currency, 1991-2011

INFORMAL ECONOMIC OUTPUT IN US CURRENCY (US$Millions)													
Year	Antigua	Bahamas	Barbados	Belize	Dominica	Grenada	Jamaica	St Kitts	St Lucia	St Vincent	Trinidad	Caribbean	ECCU
1991	106.0	624.7	672.6	139.0	64.9	82.6	1,452.4	37.7	144.1	72.5	2,045.4	5,441.9	507.7
1992	111.0	712.0	703.4	157.1	70.3	80.3	1,232.9	41.7	173.0	74.8	1,847.8	5,204.3	551.1
1993	117.8	691.2	695.5	164.0	69.3	87.3	1,779.9	48.4	175.7	79.4	1,615.8	5,524.4	578.0
1994	130.4	827.4	703.0	176.0	67.0	94.9	1,738.0	53.9	173.1	84.6	1,565.6	5,613.9	604.0
1995	131.3	922.0	734.9	173.3	77.9	94.2	2,170.9	73.0	187.3	92.0	1,828.4	6,485.2	655.7
1996	150.6	926.2	810.2	188.2	84.5	101.5	2,220.8	79.6	182.0	100.2	2,021.8	6,865.6	698.4
1997	156.2	974.5	846.3	189.3	86.6	103.9	2,526.0	90.9	194.4	104.3	1,864.1	7,136.4	736.3
1998	161.4	986.9	1,067.0	205.7	98.1	116.0	2,804.1	98.8	208.9	115.6	1,901.9	7,764.5	798.8
1999	167.6	1,179.6	1,117.8	198.2	93.5	130.8	2,975.2	101.7	234.4	120.1	1,983.2	8,301.9	848.0
2000	153.9	1,328.0	1,165.3	223.4	102.3	143.3	3,052.6	103.2	241.7	128.5	2,739.4	9,381.6	872.9
2001	174.5	1,177.7	1,216.8	241.9	89.5	140.4	2,939.3	106.3	219.1	135.1	2,731.5	9,172.2	865.0
2002	199.2	1,146.5	1,224.7	269.9	90.4	146.3	3,264.4	118.1	229.6	153.2	2,910.4	9,752.7	936.8
2003	208.8	1,226.3	1,226.3	280.0	101.2	164.3	3,477.8	132.1	240.8	151.5	3,768.5	10,977.6	998.7
2004	233.0	1,282.6	1,344.1	321.1	115.6	153.3	3,721.9	159.6	285.5	162.7	4,769.2	12,548.6	1,109.7
2005	259.1	1,502.7	1,364.7	351.7	130.2	190.1	3,885.9	195.6	306.5	170.2	7,060.2	15,417.2	1,251.9
2006	323.6	1,740.1	1,562.4	388.8	140.1	198.4	4,406.8	208.2	334.4	206.3	8,667.7	18,176.7	1,410.9
2007	391.5	1,810.2	1,554.3	460.1	162.5	226.9	4,859.1	223.6	374.9	223.8	8,488.6	18,775.5	1,603.3
2008	388.4	1,894.5	1,880.9	442.1	173.1	242.1	5,150.3	235.3	403.3	259.0	13,009.2	24,078.3	1,701.2
2009	322.0	1,664.5	1,647.2	449.5	179.8	211.4	4,597.2	221.1	409.8	244.1	7,631.3	17,577.7	1,588.1
2010	323.1	1,634.1	1,710.9	508.4	185.8	220.6	4,873.4	188.1	403.1	235.8	9,239.1	19,522.4	1,556.4
2011	302.5	1,966.2	1,775.1	509.8	173.1	218.0	5,126.9	231.3	428.4	230.7	10,638.8	21,600.8	1,584.0
Average	214.8	1,248.5	1,191.6	287.5	112.2	149.8	3,250.3	130.9	264.3	149.7	4,682.3	11,681.9	1,021.8

Source: Authors' estimates