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The Impact of Regulation on Economic Performance in the Caribbean: A Panel Data Approach

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Abstract

The purpose of this paper is to investigate the impact of the aggregated and disaggregated levels of business regulation on the economic performance (real GDP per capita) in the Caribbean. Using data mainly from the World Bank Ease of Doing Business Databank, a panel data fixed effects model based on 14 Caribbean countries over the period 2004-2012 is fitted to investigate the impact of business regulation on the economic performance in the Caribbean. The results indicate that, for the Caribbean, in general a heavy regulatory burden is a drag on economies. This is also the case for the disaggregated measures of regulation. Indeed, there seems to be an inverse relationship between time taken to start a business and economic performance. Similarly, a large tax burden negatively affects output, and more regulations related to trading across borders depress economic performance. The paper also uncovers a positive relationship between good governance and economic performance as well as between enforcing contracts and economic performance. These results have policy implications. In terms of originality/value, first, this paper constructs a regulatory index which is specific and the first of this kind for the Caribbean. Second, this is, to the best of our knowledge, the first paper that quantitatively investigates the relationship between business regulation and economic performance within the Caribbean. Third, this is a rare paper which assesses the economic significance of statistical results. Fourth, given that the literature on the impact of regulation remains inconclusive, the findings of this paper are an important add-on to the literature that advocates a negative impact of regulation on economic performance.

Keywords: Caribbean, Regulation, Economic Performance, Fixed Effects Model, Regulatory Index.

JEL Classification: O54, C43, L51

Paper Classification: Research Paper

Introduction

Unquestionably, the regulatory environment of an economy is an important determinant of economic performance captured here by real GDP per capita. Indeed, while in some situations it

can be a key element of economic performance and even growth promotion, in other circumstances it can become a binding constraint. As such, it is important to identify and analyse those regulatory elements that are essential in influencing the overall economic health of an economy. This process must ensure that regulatory objectives are reviewed in order to determine whether they have been effectively met and have resulted in positive spill overs on gross domestic product. Similarly, it is important to investigate whether regulation has instead adversely affected the economic environment due to inefficiencies in its implementation or due to uneven welfare effects.

An optimistic outlook subscribes to the view that regulation is put in place by local authorities to address market imperfections that may negatively impact citizens (Gaush & Hahn, 1999). For example, negative externalities produced during the course of market activity (e.g., pollution) can be abated by regulatory stringency. Additionally, a regulatory environment that protects workers and investors via labour and property laws can be a major consideration for firms) (Tannenwald, 1997).

Few scholars, however, believe in the benevolent government argument. Instead, regulation is seen as a tool used by regulatory bodies and incumbent firms to capture economic rents by limiting competition (Stigler, 1971). By imposing significant barriers to entry, those firms that can potentially add to the productive capacity of the economy are restricted, and those that are able to enter the market may not perform optimally due to resources being deviated to address regulatory restrictions (Busse & Groizard, 2008). Additionally, a regulatory environment rife with bribery and corruption may discourage potential investors from considering such countries for investment.

The Caribbean has been subjected to poor regulatory performance rankings by various organizations. While there has been some improvement in regulatory reform over the recent past, it does not appear to have had a substantial impact on economic performance. This paper attempts to quantify and analyse the impact of business regulation on Caribbean economies. Using a sample of 14 Caribbean countries over the period of 2004-2012 with countries covering different time periods within the time frame due to data availability issues, an unbalanced fixed effects model is implemented in order to gauge the impact of regulation on the macroeconomic performance of the region at aggregated as well as disaggregated levels. Because of the short length of the time series and challenges related to the differing levels of data availability for the 14 territories, it is beyond the scope of this paper to incorporate all measures of regulation. Note that contrary to the common belief, enlarging the number of countries is not necessary a panacea.

In order to provide a holistic picture of the regulatory framework, specifically as it relates to the business environment, this paper uses data from the World Bank Ease of Doing Business database. The subcomponents that we find most pertinent to the policy environment include regulations that deal with starting a business, registering property, trading across borders, protecting investors, enforcing contracts and paying taxes.

This paper makes four contributions to the literature. First, this study constructs a regulatory index which is specific and the first of this kind for the Caribbean. Second, to the best of our knowledge, this is the first study that quantitatively investigates the relationship between economic performance (real GDP or real GDP per capita) and business regulation in aggregated as well as disaggregated ways within the Caribbean. Third, this is a rare study which dwells on the economic significance of statistical results. Fourth, given that the literature on the impact of regulation remains inconclusive, the findings of this paper are an important add-on to the literature that advocates a negative impact of regulation on economic performance; see also (Broughel & Hahn, 2020).

Estimation results indicate that regulations that affect starting a business, paying taxes, and trading across borders significantly and negatively impact economic performance. However, the analysis also highlights that the regulatory burden as it relates to enforcing contracts significantly and positively affects real GDP per capita. The paper also investigates whether government effectiveness is a contributing factor to economic performance, and finds that it is significantly and positively related to real GDP per capita.

The paper proceeds as follows. Section 2 succinctly reviews the literature on regulation. Section 3 outlines the methodology. Section 4 presents the estimation results and their interpretations. Section 5 contains concluding remarks and policy recommendations.

Literature Review

In the literature the impact of regulation is often analysed in relation to real economic growth or the change in real GDP per capita. In fact, the situation is more complex than that. Indeed, in a number of papers economic growth is represented by GDP level instead of GDP growth. In particular, in the cointegration literature the long-run relation is delivered in terms of GDP level and the short-run relation in terms of GDP growth.

Countries adopt regulation to ensure equitable distribution of economic rents, efficient productivity in the market and to temper any negative externalities that may occur due to economic activities (Gaush & Hahn, 1999). By removing certain market failures and improving economic efficiency, regulation can positively impact economic performance. On the other hand, regulation creates substantial compliance costs, and undesirable market distortions which can negatively impact GDP. Therefore, the impact of regulation in the literature remains inconclusive.

Investigations involving regulation are usually centered on either aggregated regulation or disaggregated regulation. The aggregated- economy wide form of - regulation focuses on the business environment and the cost of doing business in an economy, while the disaggregated measures of regulation concentrate on the drivers of economic performance or growth which include labour productivity, the product market and environmental regulations.

(Gorgens, Paldam, & Würtz, 2003), (Swanson, 2008), (Dawson & Seater, 2013), (Frye & Shleifer, 1997), (Broughel, 2017), (Costa-Campi, Garcia-Quevedo, & Trujillo-Baute, 2017) and (Broughel & Hahn, 2020) found that regulation negatively impacts economic growth. (Gorgens, Paldam, & Würtz, 2003), who investigated the functional form of the relationship between regulation and growth using a semi-parametric regression, acknowledged that countries with a higher level of regulation are more likely to have an adverse impact on growth. (Swanson, 2008) assessed how environmental regulation interacts with the development process. He noted that environmental regulation which entails restricting industrial access to environmental resources (air, water, eco-systems) in order to provide some of these resources to other sectors of society was found to have an unfavorable impact on economic performance and economic growth. (Costa-Campi, Garcia-Quevedo, & Trujillo-Baute, 2017) used a two-equation model for a panel of 22 European countries over the period 2007-2013 to study the impact of electricity regulation on electricity consumption and economic growth. They found that renewable energy promotion and network costs negatively affect electricity consumption and economic growth. (Broughel, 2017) in his book concluded that the key determinant of growth is indeed innovation which in turn is negatively affected by regulation. (Broughel & Hahn, 2020) in their survey found that economic regulation generally has a negative effect on economic growth. This consensus does not sit well with our observations.

In an attempt to model regulation, (Dawson & Seater, 2013) used a macroeconomic construct of regulation that captured its level, growth rate and transition dynamic effects and investigated how these impacted macroeconomic output in the United States. The authors concluded that regulation reduced the aggregate growth rate by about two percentage points over the sample period, 1949-2005. (Frye & Shleifer, 1997) determined that the small businesses in Moscow, Russia, were less productive due to the high level of regulation and corruption that existed, which in turn translated to lower economic growth. (Fernández-Torres, Gutiérez-Fernández, & Ramajo-Hernández, 2018) focussed on Latin America and the Caribbean and found that corruption indirectly affects economic growth through business regulation. Indeed, the larger the control of corruption, the greater the extent to which bureaucracy negatively impacts GDP per capita in Latin America and the Caribbean. Regulation in the form of labour policies relating to the hiring and firing of persons can restrict investment in research and development due to high compliance costs and restrictions on labour allocation that reduces productivity. (Bassanini & Ernst, 2002) as well as (Di Tella & MacCulloch, 2005) also noted that labour policies negatively impact employment rates and hence economic performance and growth. In contrast, in the Caribbean context, (Downes, Mamingi, & Antoine, 2004) found that labour market legislation was not a significant determinant of employment.

(Busse & Groizard, 2008) observed that those countries that had high amounts of regulation had less positive effects from foreign direct investment thus leading to unfavourable economic growth. According to the study, regulatory barriers prevented useful productive foreign technology being assimilated into the local economy. (Féres & Reynaud, 2012), (Mamingi, Dasgupta, Hong, & Laplante, 2008), (Dasgupta, Hong, Laplante, & Mamingi, 2006), (Dasgupta, Laplante, & Mamingi, 2001), (Lanoie, Laplante, & Roy, 1998), (Konar & Cohen, 1997), (Pargal & Wheeler, 1996) as well as (Hamilton, 1995) also investigated the relationship between informal institutions and economies.

In contrast, (Tannenwald, 1997) emphasised that countries with sound regulations — ensuring protection of property rights, safe working conditions and efficient institutions — may attract workers and investment which contribute positively to growth. Environmental regulation can promote productivity in firms that were operating at subpar levels before policy implementation while labour regulation that provides incentives to workers through autonomy in the work place and tenure can increase labour productivity and hence economic activity (Storm & Naastepad, 2007).

(Koeniger & Silberberger, 2015) used a panel data of 106 countries in the period 1970-2009 to study the impact of regulation on economic growth in the context of economic integration. They found that regulation and trade positively affect growth with the particularity that regulation is more impactful in the countries with worse regulatory quality as well as in middle-income countries.

(Djankov, Mc Liesh, & Ramalho, 2006), using a sample of 135 countries of differing levels of development and sourcing from the World Bank Ease of Doing Business Index, found that those countries with "less burdensome regulation" grew faster than those with restrictive policies. In a related study, (Messaoud & Teheni, 2014) examined the robustness of the relationship between business regulations and economic growth using a sample of 162 countries over the period 2007-2011. The results showed that most regulation indices are positively correlated to the average growth rate. (Haidar, 2009) investigated the relationship between investor protection and economic growth using a new measure of legal protection of minority shareholders against expropriation by corporate insiders—termed Investor Protection Index—for more than 170

countries around the world. The author found that the level of investor protection matters for cross country differences in economic growth: countries with strong protection tend to grow faster than those with poor investor protection.

A major shortcoming of some of the studies on regulation, for example, (Estache & Wren-Lewis, 2009), (Gørgens, Paldam, & Würtz, 2005) and (Petreski, 2014), is the underlying assumption that the institutions in the developed world work the same way as those in developing countries. In reality, regulatory reform may be less effective in lesser developed economies due to major structural inefficiencies found within the regulatory networks. Like many developing economies, Caribbean countries are plagued by underdeveloped institutions. Indeed, the Caribbean countries lack a sufficiently good environment for business as a result of their weak institutions (Holden & Howell, 2009). The latter authors indicate that in the Caribbean legal systems are costly and outdated, regulation is burdensome and taxes are discriminatory. Additionally, there is a shortage of persons with the requisite skill to work within the regulatory sector (Downes & Husbands, 2003). These inefficiencies make it difficult for regulatory reform to have its intended impact. (Downes, Mamingi, & Antoine, 2004) underlined the importance of the labour market regulation for economic growth and specially ascertained that it was imperative that the Caribbean countries of Jamaica, Barbados and Trinidad and Tobago correct the inefficiencies in the labour market system before they could benefit from the institutional reform found in countries with higher levels of development.

Empirically, there is the issue of scarcity of regulatory data that needs to be underlined as this limits the ability to capture static and dynamic effects of regulation on economic output and growth (Busse & Groizard, 2008). Additionally, most studies use qualitative data often amalgamated from business surveys and other indicators and composited into indices to reflect regulatory quality and stringency (Nicoletti, Scarpetta, & Boylaud, 2000). Most of those data do not pass the scientific rigor test. Not surprisingly, many studies have adopted the use of the World Bank Doing Business indicators which are more objective ((SAGPA, 2010), (Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2000) for studies including developing nations). At the very least, two lessons emerge from the literature review. First, the impact of regulation on output is really an empirical matter. Second, there is no thorough analysis of the impact of regulation in the large sense on output for the Caribbean.

Methodology

This section aims at developing the methodology to quantify the impact of regulation on the macroeconomic performance in the Caribbean as well as provide a description of the data used for such an enterprise. An economic performance model is proposed and comprises regulatory indicators as well as control variables for 14 Caribbean countries over the time period 2004 – 2012. The countries of interest are: Antigua and Barbuda, the Bahamas, Belize, Barbados, Dominica, Dominican Republic, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago. Panel data is useful as it boosts the sample size and helps to offset the constraints of limited data. Separate output regressions were run in order to gauge not only the relationship between disaggregated measures of regulation and GDP per capita, but also the overall regulatory burden and the region's economic performance.

Data

Data used to compile the key regulatory variables were sourced from the World Bank Ease of Doing Business index. This World Bank index ranks countries from 1 to 189 and is constructed

by aggregating the percentile ranks of countries based on 10 sub-indices. This databank was chosen in lieu of the many other regulatory indicators available because of its objectivity as well as the availability of a disaggregated component that could provide insight for policy purposes. Additionally, finding a relevant regulatory proxy that provided sufficient data for all 14 countries posed a challenge. Though the rankings provided by the index were insufficient for panel data modelling (time span of 2 years for most Caribbean territories), the underlying data used to construct the index seemed more promising since it was available over a longer period. In light of this, an alternative index was constructed, using information from the database for the relevant regulatory subcomponents used in the analysis.

Of the 10 sub-indices that comprise the World Bank Ease of Doing Business index, the 6 that seemed the most relevant and simultaneously contained the most observations were utilized. These subcomponents included starting a business, registering property, protecting investors, paying taxes, trading across borders and enforcing contracts.

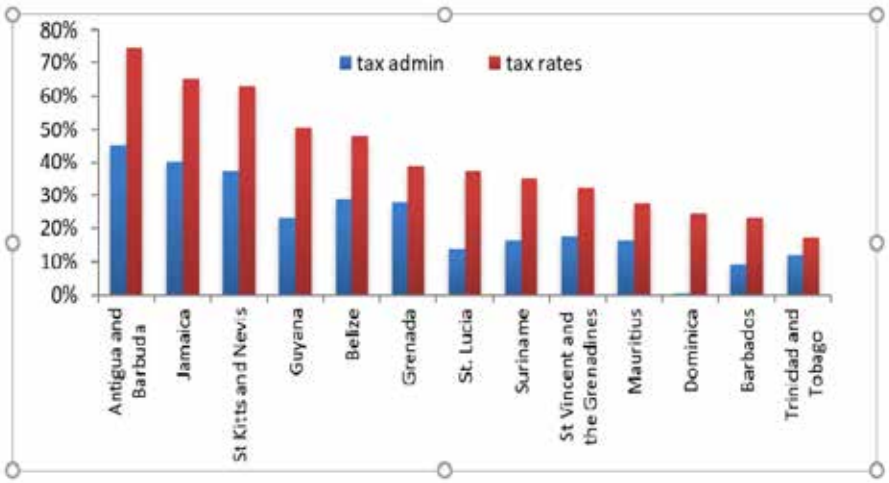
The Starting a Business measure essentially seeks to capture the investment climate for new firms. This includes the number of procedures as well as the time and cost required to meet government requirements to operate a business. Entry regulation can have either a positive or negative relationship with a country's economic performance. If the public interest theory holds, then a positive relationship is expected; on the contrary, if the capture theory is applicable, then a negative relationship is likely.

Registering property encapsulates the security of the property laws of a country. This measure includes regulations pertaining to procedures necessary for an investor to buy and transfer the property title from the seller (World Bank, 2014d). The transfer of property rights is important for investor incentive since it ensures that investment returns are allocated correctly. In this connection, according to the Doing Business report Trinidad and Tobago ranked almost last in this sub-category while (Holden & Holden, 2005) asserted that Jamaica's Torrens system was expensive and slow, making the registering process unattainable by the average citizen. Burdensome regulation can deter firms from pertinent investment opportunities.

The Protecting investors' proxy aims to capture the strength of protection provided to minority shareholders (World Bank, 2014a). These regulatory requirements (securities regulations, civil procedures, etc.) are important for stock market development of an economy which provides efficient credit for firms to invest (Djankov, La Porte, Lopez-de Silanes, & Shleifer, 2008). A lack of investor protection is seen as negatively related to economic performance as well as growth.

The "Paying Taxes" proxy measures the tax contributions as well as the tax burden that firms face. These include profit, property, labour taxes, etc. (World Bank, 2014b). Taxes can act as a disincentive for firms which minimize investment and income (Djankov, La Porte, Lopez-de Silanes, & Shleifer, 2008). An initial investigation into the tax environment suggests that though the governments of the respective countries place some emphasis on taxing firms, the tax administration burden is not high relative to other small open economies, for example, Mauritius. Figure 1 depicts the percentage of firms in the respective countries that views the tax rates and tax administration as a major obstacle to the operation of their firms. It is clear that a larger percent of firms find the tax rates to be burdensome. This is not surprising given the high tax to profit ratios found within the territories.

Figure 1: Percentage of firms that describes the tax rates and tax administration as a major constraint.



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According to World Bank survey, firms in Jamaica and Suriname take the longest to clear customs (13 days). Firms in Guyana also have a lengthy process where, on average, they spend 12 days to complete customs procedures. These numbers compare unfavourably to other comparator countries. For example, in Mauritius it takes 9 days for the average firm to clear customs.

Enforcing contracts is a measure of the effectiveness of the legal framework of an economy (World Bank, 2014c). Court systems generally aim at ensuring fair judgments by considering errors and possible corruption which can result in many procedures. The World Bank survey indicates that less than 5% of firms in Dominica describe the court system as presenting a major obstacle to the operation of their business. An outlier to this result is Suriname where 44% of the firms interviewed expressed that the court system was at least a major obstacle for business. According to (Holden & Howell, 2009), an IDB report, it takes the court on average three to four years to deliver verdicts due largely to issues highlighted above as well as a sense of ambiguity on the balance of power between the arms of the government.

Concerning judicial independence, the Caribbean has performed relatively well. The survey results indicate that in spite of the slow judicial process present in most Commonwealth countries, the majority of firms are confident in the efficiency and reliability of the legal system to render fair judgments. However, too many protocols can be cumbersome and costly and so deter potential investors, causing a negative correlation with income (Djankov S. , La Porta, Lopez-de-Silanes, & Shleifer, 2003). In spite of cumbersome and lengthy judicial procedures, it can be argued that the length of time can ensure fair judgements and so can positively affect economic performance.

We follow the methodology devised by (Loayza, Oviedo, & Servén, 2005) to create an index for the subcomponents of regulation (starting a business, protecting investors, etc.) in an effort to glean the regulatory performance of the respective Caribbean countries in relation to the world. In order to do this, the index is constructed using the values for the subcomponent for each country for each year under study. Additionally, the minimum and maximum values for each regulatory subcomponent for each respective year for the world are also used. The formula for the index is presented below and ranges from 0 to 1 where values closer to one indicate heavier regulatory

burdens. The index is derived from the following expressions

$$\frac{x_{ij} - \min[X_w]}{\max[X_w] - \min[X_w]} \quad (1)$$

and

$$\frac{\max[X_w] - x_{ij}}{\max[X_w] - \min[X_w]} \quad (2)$$

where higher values of X in formula (1) indicate larger regulatory burden; lower values of X in formula (2) indicate larger regulatory burden; *i* stands for country and *j* represents the year; x_{ij} denotes the value of each subcomponent for each year for the respective country; min[X_w] and max[X_w] represent the min and max value of each subcomponent for all countries in the world for every respective year.

A simple average was then taken to create the aggregate index value attributed to each Caribbean country where higher values connote heavier regulatory burden.

An initial look at the data reveals that the disaggregated indices discussed above are closely comparable to the doing business rankings. Data was used for 2012 as it ranked all those countries chosen in our sample (see Table A1).

Government effectiveness was chosen from among the six governance indicators provided by World Wide Governance indicators, as it most reflects the institutional component important in developing countries. Government effectiveness captures perceptions on the quality of public policy, government processes as well as the independence of the civil servants from political pressure (Jalilian, Kirkpatrick , & Parker, 2006); (World Bank, 2013). A positive sign is expected.

In this study, real GDP per capita has been found suitable to capture economic performance. In addition to the regulatory indicators, real GDP per capita is also dependent on various control variables included in the regression analysis. These comprise foreign direct investment (FDI) measured as net foreign direct investment inflows as a percentage of GDP, the investment ratio captured by gross capital formation as well as population growth. These indicators were all sourced from the World Bank development indicators database in an attempt to reduce data inconsistencies. In addition, natural disasters variable captured as a dummy variable with 1 if the event occurs in a particular year and 0 otherwise was also of interest. The variable was sourced from em.dat.

Methodology

The paper uses a panel data regression of the type

$$y_{it} = \alpha + X_t \beta + \alpha_i + e_t \quad (3)$$

where *y* is the dependent variable, *i=1,2,3,…,N* denotes the cross section index, *t=1,2,3,…,T* represents the time index, α denotes the overall constant, *X* is the matrix of explanatory variables, β is the vector of slope coefficients, α_i represents the unobservable individual-specific effect and e_t stands for the usual stochastic disturbance term.

At the very least, two static models can be derived from model (3): fixed effects (FE) model

and random effects (RE) model. Indeed, if α_i is fixed or correlated with all the variables in *X*, then model (3) qualifies as a fixed effects model, which can be written as

$$y_{it} = \alpha_i + X_i \beta + e_i \quad (4)$$

where the overall constant has been eliminated. βOn the contrary if α_i is random like the usual error term, that is, uncorrelated with all the variables in *X*, then model (3) becomes a random effects model and can be written as follows

$$y_{it} = \alpha + X_i \beta + v_i \quad (5)$$

where the new error term consists of two components: α_i and e_{it} , that is,

$$v_{it} = \alpha_i + e_i \quad (6)$$

Model (4) is estimated by pooled least squares methods. The fixed effects model is called within model if it uses time-demeaned variables, in which case the individual effects are eliminated. Model (5) is the random effects model or variance component model. It is estimated by generalized least squares (GLS) method to deal with the issue of autocorrelation.

The choice between the two types of models can be done at several levels although the Hausman specification test seems to have the edge over other means of choice decision. In final analysis, because of the plausible correlation between the unit specific effects and the explanatory variables, "fixed effects model is almost always more convincing than random effects model for policy analysis using aggregated data." (Woolridge, 2006).

The Hausman specification test is used to test the null hypothesis of random effects versus the alternative hypothesis of fixed effects. It is a chi-squared test whose rejection of the null hypothesis means that FE is adequate.

The first set of models used in this paper deals with the aggregated measure of regulation as explained above. Thus, we have the following

$$LGDP_{it} = \alpha_i + \beta_1 AR_{it} + \beta_2 GE_{it} + \beta_3 POPG_{it} + \beta_4 LDI_{it} + \beta_5 LFDI_{it} + \beta_6 DU_{it} + e_{it} \quad (7)$$

where *LGDP* is logged real GDP per capita, α_i is fixed country specific effects, *AR* denotes the aggregate regulatory measure, *GE* captures government effectiveness measure, *POPG* is population growth, *LDI* is logged domestic private investment as a percentage of GDP, *LFDI* is logged foreign direct investment as a percentage of GDP, *DU* is dummy variable capturing the incidence of natural disasters (1 if natural disasters occur in a given year in a given country and 0 otherwise) and *e* is the regular error term assumed to be well-behaved.

Model (7) is the aggregated form of our fixed effects model. The corresponding random effects model is given by

$$LGDP_{it} = \alpha + \beta_1 AR_{it} + \beta_2 GE_{it} + \beta_3 POPG_{it} + \beta_4 LDI_{it} + \beta_5 LFDI_{it} + \beta_6 DU_{it} + v_{it} \quad (8)$$

where $v_{it} = \alpha_i + e_i$ is the composite error term and other variables are defined as above.

The second set of models is concerned with disaggregated measures of regulation. The first model that we call disaggregated fixed effects model is as follows

$$LGDP_{it} = \alpha_i + \beta_1 SB_{it} + \beta_2 RP_{it} + \beta_3 PI_{it} + \beta_4 EC_{it} + \beta_5 TB_{it} + \beta_7 GE_{it} + \beta_8 PopG_{it} + \beta_9 LDI_{it} + \beta_{10} LFDI_{it} + \beta_{11} DU_{it} + e_{it} \quad (9)$$

where *SB* connotes the regulation measure for starting a business measure, *RP* represents the regulation measure for registering property, *PI* stands for the regulation measure for protecting investors, *PT* is a measure for paying taxes, *EC* captures a measure for enforcing contracts, *TB* is a measure for trading across borders and *GE* captures government effectiveness. All other variables are defined as in model (7), and *e* denotes the error term assumed to be well-behaved.

The second model is the analogue disaggregated random effects model given by

$$LGDP_{it} = \alpha + \beta_1 SB_{it} + \beta_2 RP_{it} + \beta_3 PI_{it} + \beta_4 EC_{it} + \beta_5 TB_{it} + \beta_7 GE_{it} + \beta_8 PopG_{it} + \beta_9 LDI_{it} + \beta_{10} LFDI_{it} + \beta_{11} DU_{it} + v_{it} \quad (10)$$

where variables are defined as in model (9), and v denotes the composite error term as above.

An issue that has not been addressed is that of endogeneity. It is possible that wealthier countries have better institutions and more effective regulatory systems. This gives rise to the issue of endogeneity. Endogeneity is understood as significant correlation(s) between right hand side explanatory variable(s) and the error term. As such the presence of endogeneity results in biasedness and inconsistency of the ordinary least squares estimators. Most studies approach this issue by applying two stage least squares (2SLS) method or IV Hausman-Taylor estimation procedure. In this study, endogeneity is tested before contemplating 2SLS.

This is illustrated with model (7) for which the aggregate regulation measure is suspected to be endogenous. In the first stage, the reduced form is obtained by regressing each endogenous variable on the exogenous or predetermined variables and retrieving the residuals from this auxiliary regression. Residual1 here denotes the residuals from the auxiliary aggregate regulation equation. In the second stage, model (7) augmented by residual1 is run. The *t* test statistic related to the coefficient associated to residual1 provides the test for endogeneity (Woolridge, 2006). A rejection of the null hypothesis (variable is exogenous) means there is endogeneity and appropriate method of estimation such as 2SLS in fixed effects form should be used. Note that if there are more than one right-hand side endogenous variable then an *F*-test is of interest to decide on endogeneity.

Model estimation, Results and Interpretations

The aggregated model gives insight on the overall effect regulation has on economic performance. Note that here an aggregate regulatory measure constructed from the World Bank Ease of Doing Business database is of interest along with control variables.

Table 1 contains the results of the regression estimation of models (7) and (8). The Hausman test statistic reveals that the null hypothesis of random effects is rejected in favor of fixed effects model at the 5% and 10% levels of significance. Moreover, Table 2 results indicate through the behaviour of residual1, obtained as explained above, that the aggregated measure of regulation is not an endogenous variable. Indeed, the value of the associated *t* statistic leads to the non rejection of the null hypothesis (the associated parameter value is null). Thus, there is no need for formal 2SLS. We consequently interpret the fixed effects results of Table 1. With p = 0.000, the chi-squared value indicates that the fixed effects model passes the overall fit test. This allows us to interpret individual coefficients.

Table A1: Disaggregated Regulation Indices from 2012 data.

Registering Property	Index	Ease of Doing Business rank
Guyana	0.23	4
Dominican Republic	0.24	1
Jamaica	0.24	3
Belize	0.27	5
Dominica	0.29	9
Barbados	0.29	2
Grenada	0.30	7
Antigua and Barbuda	0.30	8
St Lucia	0.30	6
St Vincent and the Grenadines	0.32	10
St Kitts and Nevis	0.34	12
Trinidad and Tobago	0.36	11
Bahamas	0.40	14
Suriname	0.42	15

Protecting Investors	Index	Ease of Doing Business rank
Trinidad and Tobago	0.34	1
Antigua and Barbuda	0.37	2
Dominica	0.37	2
Grenada	0.37	2
St Kitts and Nevis	0.37	2
St Lucia	0.37	2
St Vincent and the Grenadines	0.37	2
Guyana	0.48	8
Jamaica	0.48	9
Dominican Republic	0.51	9
Bahamas	0.54	11
Belize	0.58	12
Barbados	0.72	13
Suriname	0.82	15

Paying Taxes	Index	Ease of Doing Business rank
Bahamas	0.08	1
Dominican Republic	0.09	4
Belize	0.11	2
Suriname	0.11	3
St Lucia	0.11	5
Grenada	0.12	11
Barbados	0.13	8
St Vincent and the Grenadines	0.13	6
Dominica	0.13	7
Trinidad and Tobago	0.14	9
Guyana	0.14	10
St Kitts and Nevis	0.15	13
Antigua and Barbuda	0.20	14
Jamaica	0.26	15

Trading Across Borders	Index	Ease of Doing Business rank
Barbados	0.13	1
Dominican Republic	0.14	2
St Vincent and the Grenadines	0.14	3
Grenada	0.15	4
St Kitts and Nevis	0.16	6
Antigua and Barbuda	0.16	7
Bahamas	0.16	5
Guyana	0.19	8
Dominica	0.20	9
Trinidad and Tobago	0.21	10
St Lucia	0.21	14
Belize	0.22	11
Suriname	0.22	12
Jamaica	0.23	13

Enforcing Contracts	Index	Ease of Doing Business rank
Dominican Republic	0.28	2
Guyana	0.29	1
Antigua and Barbuda	0.31	3
Jamaica	0.34	8
St Vincent and the Grenadine:	0.34	5
St Kitts and Nevis	0.38	6
Bahamas	0.39	7
St Lucia	0.42	10
Grenada	0.43	9
Dominica	0.43	11
Barbados	0.46	12
Belize	0.51	13
Trinidad and Tobago	0.53	14
Suriname	0.63	15

Enforcing Contracts	Index	Ease of Doing Business rank
Dominican Republic	0.28	2
Guyana	0.29	1
Antigua and Barbuda	0.31	3
Jamaica	0.34	8
St Vincent and the Grenadine:	0.34	5
St Kitts and Nevis	0.38	6
Bahamas	0.39	7
St Lucia	0.42	10
Grenada	0.43	9
Dominica	0.43	11
Barbados	0.46	12
Belize	0.51	13
Trinidad and Tobago	0.53	14
Suriname	0.63	15

Source: (The World Bank Group , 2015), Custom Query (doingbusiness.org) and staff own calculations (The World Bank Group , 2015)

Table 1: Panel data estimation results for aggregated regulatory model (7) and model (8): The Caribbean, 2004-2012

Dependent variable: logged GDP capita (2005 US)					
Random Effects			Fixed Effects		
Variables	**Coefficient**	**Ste**	**Coefficient**	**Ste**	**Stdcoeff**
C	8.992*	.213			
AR	-2.496*	.442	-2.575*	.450	-0.222*
GE	.169*	.064	.131**	.067	.097**
POP	-.005	.060	-.011	.062	-.011
LDI	.048***	.034	.050***	.034	.025***
LFDI	.119*	.021	.118*	.026	.060*
DU	.092*	.019	.096*	.020	.052*
Hausman statistic=14.34 (0.026) $\chi^2_9 = 504.8$ (0.000)					

Notes: Fixed effects model (7) in within form and random effects model (8) are of interest. Ste stands for standard error. (…)=p-value., **, *** mean statistically significant at the 1%, 5% and 10% levels, respectively. Hausman statistic tests for random effects vs fixed effects. Chi-squared tests for the overall fit of the fixed effects model. Stdcoef: standardized coefficient from the fixed effects model calculated by us. Variables are defined as in model (7).*

Table 2: 2SLS fixed effects for testing for endogeneity of aggregate regulatory measure (AR) in aggregated regulatory Model (7): The Caribbean, 2004-2012.

Dependent variable: logged GDP per capita (2005 US)		
Variables	**Coefficient**	**Ste**
C		
AR	-3.218*	.673
GE	.148**	.067
POPG	.007	.063
LDI	.050***	.034
LFDI	.120*	.026
DU	.103*	.020
Residual1	1.154	.903
	p-value of $\chi^2_9 = 0.000$	

Note: see Table 1. WB: World Bank. Residual1 represents the residuals from the regression of AR (WB aggregate regulation measure) on all exogenous or predetermined variables of the model, which are the lagged aggregated regulatory measure and the five other explanatory variables of model (7) plus a constant term. Ste stands for standard error.

The standardized coefficients (see last column of Table 1) are reported for two major reasons. First, the standardized coefficients allow a valid comparison of the statistical impact of each variable as they are expressed in similar terms, i.e. standard deviations. Second, their relative sizes may be indicative of economic significance of the variables.

From Table 1, a one standard deviation shock to aggregate regulation brings about a 0.22 standard deviation decrease in real GDP per capita. This seems economically significant as a one standard deviation decrease in real GDP per capita requires only a 4.55 standard deviation increase in aggregate regulation. Overall, this confirms the conclusion reached by (Djankov, Mc Liesh, & Ramalho, 2006) which asserts that countries with higher regulatory burden do not perform economically as well as those that do not. The result also matches the conclusion by (Holden & Howell, 2009) that indicates that the regulatory burden in the Caribbean can be a

major constraint on economic performance or growth. Government effectiveness positively affects economic performance. Indeed, a one standard deviation positive shock to government effectiveness yields a 0.097 standard deviation increase in real GDP per capita. Population growth does not seem to affect real GDP per capita. This seems plausible as most Caribbean countries have not reached yet the population growth threshold that negatively affects economies. As expected, domestic private investment positively impacts economic performance. In fact, a one standard deviation positive shock to domestic private investment leads to a 0.025 standard deviation increase in real GDP per capita. Foreign direct investment has the expected positive impact on economic performance. A one standard deviation increase in FDI leads to a 0.060 standard deviation increase in real GDP per capita. At the limit, the above result is economically significant as indeed a 17 standard deviation increase in FDI is required to boost real GDP per capita by one standard deviation. The apparent counter-intuitive result generated by the positive impact of natural disasters can be easily explained in the context of short run. Overall, the biggest impact on economic performance of the region originates from business regulation.

At the outset we point out that since the disaggregated model has been derived from the aggregated model, we do not redo all tests (e.g., endogeneity test). That said, in lieu of aggregate regulatory index, Table 3 uses the following regulatory indices: starting a business, registering property, protecting investors, paying taxes, enforcing contracts and trading across borders. The Hausman test statistic indicates that the fixed effects model is statistically the appropriate one. The model passes the overall chi-square test as the size of the *p*-value indicates. As above, we interpret the standardized coefficients. Regulatory indices measuring starting a business, paying taxes, enforcing contracts as well as trading across borders were found to all significantly impact real GDP per capita. As per a priori expectations, all disaggregated measurements with the exception of the registering property and enforcing contracts regulatory proxies were negatively correlated with economic performance.

Table 3. Panel data estimation results: the disaggregated regulatory models (9) and (10): the Caribbean, 2004-2012.

Dependent variable: Logged GDP per capita (2005 US)					
	Random Effects		Fixed Effects		
Variables	**Coefficient**	**Ste**	**Coefficient**	**Ste**	**Stdcoeff**
C	7.730*	.306			
SB	-.936**	.435	-.580	.495	-.121
RP	.309	.315	.156	.323	.014
PI	-.204	.272	-.179	.295	-.037
PT	-.672**	.317	-.719**	.344	-.055**
EC	2.109*	.644	1.282**	.753	.159**
TB	-1.138*	.403	-1.098*	.408	-.056*
GE	.122**	.074	.024	.081	.018
POPG	.052	.051	.052	.054	.060
LDI.	.078*	.040	.073*	.031	.037*
LFDI	.113*	.026	.119*	.026	.061*
DU	.034	.028	.021	.029	.000
Hausman Statistic=39.96(0.000) $\chi^2_3 = 508.8$ (0.000)					

*Note: variables are explained in the text as in model (9). Stdcoeff: standardized coefficient. See also Note to Table 1. *, **, and ***:significant at the 1%, 5%, and 10% levels, respectively.*

As mentioned before, cumbersome regulation negatively impacts the economic performance of an economy. Note that because of a strong negative relationship between the two variables registered under random effects models, the lack of significance found in fixed effects is sidestepped. Time and cost factors largely impact investor decisions. The negative correlation between starting a business and income levels within the Caribbean context emphasizes this point. A one standard deviation shock to starting business decreases real GDP per capita by 0.121 standard deviation. This means that it takes approximately 8 standard deviation increase in starting business to decrease real per capita GDP by one standard deviation. Note that for most Caribbean territories the number of procedures to start a business is not as cumbersome and as much of a constraint when compared to the time and cost to complete these procedures. It took 694 days to complete all the necessary requirements to start a business in Suriname for the year 2013. This represents the worst scenario case in the region and is way above the world minimum of 5 days. (Holden & Holden, 2005) noted that registering a business in Jamaica is unreasonable and expensive, so much so that it has forced businessmen to operate within the informal economy, emphasizing the similarly drawn conclusions by (Djankov S., La Porta, Lopez-de-Silanes, & Shleifer, 2002).

The paying taxes measure indicates that the tax burden is also a constraint within the Caribbean. To corroborate, from Table 3, we conclude that a one standard deviation shock to paying taxes yields a 0.055 standard deviation decrease in real GDP per capita. Note that as seen above the tax burden is associated more so with the high tax rates characteristics of the region rather than administrative issues. Regulation associated with trade can also prove to be detrimental to economic performance. Excessive procedures and licenses can mean higher producer costs. This form of regulatory burden seems to be particularly important in determining macroeconomic performance in the Caribbean given the high level of significance of the trading across borders proxy. In fact, a one standard deviation shock to regulation associated -with trade brings about a 0.055 standard deviation decrease in real GDP per capita. This seems to be in keeping with (Djankov, Freund, & Pham, 2010) who assert that delays in exports can deter trade and by extension income levels across countries. The results match those from the enterprise survey. Indeed, according to the latter, businessmen within the region identified customs and trade regulation as major obstacles in the operation of their businesses. A reduction of these regulations may therefore benefit economic output. The enforcing contracts regulatory measure is positively and significantly correlated with economic performance. This variable seems to be the most impactful of all, at least according to the size of its standardized coefficient. The result shows that a one standard deviation shock to enforcing contracts leads to an increase of 0.159 standard deviation in real GDP per capita. In terms of economic significance, it takes approximately 6 standard deviation increase in enforcing contracts to yield a one standard deviation boost in real GDP per capita. This seems to confirm the opinion of most Caribbean businessmen in that the court systems are fair and uncorrupted and so create a good investment climate.

Though a lack of investor protection is seen as negatively correlated with real GDP per capita, the results indicate that this regulatory measure is not significant in the Caribbean context. Government effectiveness impact does not show up with fixed effects model but is present with random effects model. Because of its strong presence in the aggregated regulatory model we fully acknowledge its positive presence. This corroborates the argument that a well-functioning institution leads to increased economic welfare and thereby productivity growth.

Conclusion and Policy Recommendations

This paper examines the relationship between regulation and economic performance

captured by real GDP per capita in the Caribbean over the period 2004-2012. The paper derives the appropriate regulation indices to study the extent to which aggregated and disaggregated regulations are binding constraints to economic output in the Caribbean context.

The panel data estimation results indicate that in most cases a heavy regulatory burden is a drag on the economies. This also holds for the most part when the disaggregated measures of regulation are considered. Indeed, there seems to be an inverse relationship between time taken to start a business and economic performance. Similarly, a large tax burden negatively affects output, and also more regulations on trading across borders depress economic performance. The study also reasserts that a positive relationship exists between good governance, enforcing contracts and economic performance.

The results indicate that the coefficients of the regressions are not only statistically significant but also more importantly economically significant. In this regard, regulation as a whole seems to have an economic impact larger than that of FDI or private domestic investment. This is an important indicator for countries as it signals the critical role of regulation for the development of an economy. Thus care must be taken to not only address regulatory inefficiencies but also institutional weaknesses of these economies. For instance, while the regression estimations detail that an increase in regulation concerned with enforcing contracts positively affects economic performance, red tape and inefficiencies that deter a speedy and fair trial may have adverse effects on viable investments and firms. Providing sufficient funding or increasing salaries in occupations within legal institutions may encourage or can lead to quicker verdicts and perhaps a fairer distribution of access.

In reducing the regulatory burden associated with starting a business, possible policy prescriptions include decentralizing regulatory bodies in an effort to make them more accessible. Additionally, online applications and processing can reduce time and cost constraints (Holden & Holden, 2005). As such, documents can be scanned or mailed, reducing travel costs.

As noted above, the tax burden is largely as a result of high tax rates and not necessarily cumbersome administration. Reducing the tax burden entails addressing inefficiencies in the tax system rather than a direct cut in taxes as Caribbean countries have limited fiscal space. Reducing taxes as well as revisiting the economic agents who are taxed may be a better alternative. For example, many Caribbean economies offer exorbitant concessions and act as tax havens for offshore firms. Reducing these concessions (including those that supply an exemption from corporate tax), while reducing the high tax rates of domestic firms may enhance investment activity.

There is a need to redo the study with more recent data to check for the stability of results.

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