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Potential Growth and Productivity in the Caribbean

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Prepared by Alexander Amundsen, Sophia Chen, Pierre Guérin, Sinem Kilic Celik, and Masahiro Nishida*

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ABSTRACT: Medium-term growth prospects of Caribbean countries have weakened in recent years. We examine these trends by providing new estimates of potential GDP growth for the region. Our findings reveal a broad-based decline over time, driven by declining contributions from human capital and total factor productivity. Linking these factors to firm-level data, we identify significant scope for aggregate productivity gains through the efficient reallocation of resources between firms and the removal of firm-level structural obstacles. Addressing issues such as the cost and access to finance, workforce education, tax administration, and business licensing and permits are associated with higher aggregate welfare.

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Introduction

The Caribbean economies' economic growth and medium-term growth prospects have weakened in recent decades. Five-year-ahead growth forecasts, which tend to be highly correlated with the assessment of potential growth, have declined in the last two decades from around 3.5 percent to 2 percent. The actual growth outturn has also correspondingly declined. For tourism dependent countries, growth has been on a downward trend in the last four decades before the COVID-19 pandemic, while for commodity-based exporters, growth is more volatile yet also remains at a low level on average historically. Growth in the post-2000 period has been lower than in the two decades prior in almost all Caribbean countries, except for two commodity exporters, Suriname and Guyana (Figure 1a). In a broader context, income levels in the Caribbean relative to those in the United States show no convergence since 1990, in contrast to emerging markets in Asia and Europe, which have seen clear convergence (Figure 1b). In fact, after the Global Financial Crisis, there has been divergence relative to the United States for the Caribbean region. Previous studies on Caribbean economies have highlighted the growth deceleration and suggested that declines in productivity may be a contributing factor (Coleridge Alleyne et al., 2017; Csonto et al., 2017). In line with the regional evidence, IMF (2024a) shows that weakening growth prospects are a global phenomenon.

Figure 1a

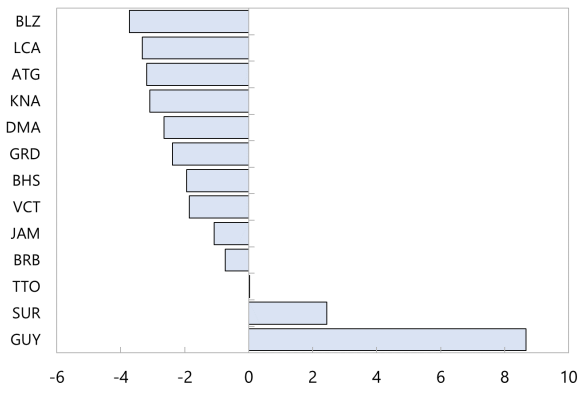
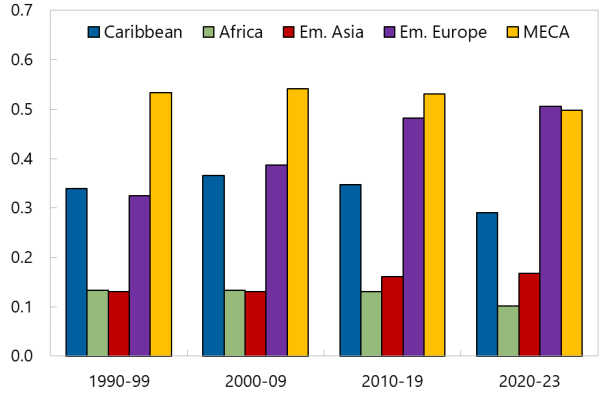


Figure 1b



Sources: IMF World Economic Outlook and Authors' calculations.
Note: Em. Asia = emerging markets Asia (China excluded); Em. Europe = emerging markets Europe; MECA = Middle East and Central Asia.

Against this backdrop, this paper studies the trends and prospects of potential growth in the Caribbean. We conduct two sets of analyses. First, we analyze potential growth and its components for each country in the region using macroeconomic data by two alternative approaches: i) medium-term growth projections by forecasters; and ii) a growth accounting framework. Second, we examine the components of potential growth by leveraging firm-level data from the Innovation, Firm Performance and Gender (IFPG) survey to study the misallocation of resources within each country and structural obstacles that impede firms' operations.

We ask three main questions. First, what is the region's potential growth: trends and prospects? Second, what are the key components of potential growth, and which have changed over time? Third, of these components, what can we infer on the causes and consequences from a micro perspective? We answer these questions by

combining macroeconomic and firm-level data in a complementary way. The macroeconomic data help provide potential growth estimates and assess the importance of total factor productivity (TFP), human capital, population, and capital stock contributions over time. The firm-level data help study the underlying causes behind lower potential growth.

Our main findings are as follows. First, forecaster growth expectations on the Caribbean have been declining over time, and robustness checks show this is not driven by rising forecaster pessimism or income convergence. Second, potential growth, estimated through a growth accounting framework, has been declining over the past few decades across all countries in our sample.[1] Average potential growth in the region declined from 4.2 percent between 1981-1990 to 1.2 percent between 2011-2019. Third, the decline in potential growth is largely driven by declining contributions of TFP and human capital, as opposed to developments in the population or the capital stock. If the TFP and human capital contributions remained the same as in 1981-1990, then potential growth would increase from 1.2 to 3.7 percent in the most recent period. Fourth, using the Hsieh and Klenow (2009) framework, we find aggregate TFP is significantly affected by firm-level resource misallocation, and this varies across countries in the Caribbean. If firm-specific distortions producing misallocation could be removed, our estimates show large TFP gains, ranging from 34 percent in Grenada to 107 percent in Guyana. In terms of convergence, this would imply a narrowing of the GDP per capita gap with the United States between 9 and 36 percentage points. Fifth, there are structural obstacles reported by firms to both TFP and human capital. Firms report workforce education as a major or very severe obstacle to their operations, and attribute it to the quality, skills, and number of professionals produced by local institutions. Regression analyses suggest that, in addition to workforce education, the cost and access to finance, tax administration, and business licensing and permits are significant obstacles. These are associated with a lower level of firm TFP, and vary across size and age dimensions, with firms that are small and young displaying the largest magnitudes (i.e., being the most severely affected). Assuming a causal relationship, we estimate that aggregate TFP could increase between 8 and 23 percent across countries if the structural obstacles were alleviated among firms.

Taken together, the results show that there has been a broad-based decline in potential growth in the Caribbean due to declining contributions of TFP and human capital, and evidence points to resource misallocation and firm-level obstacles as being contributing factors.

[1] For the growth accounting analysis, we explore Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and The Bahamas. For the firm-level analysis, in addition to those countries, we explore Guyana, Suriname, and Trinidad and Tobago.

Related Literature

Potential growth

Potential GDP growth represents the maximum noninflationary growth an economy can achieve given its resources and technological capacities. Various methods have been employed in the literature to estimate potential growth, often with different objectives. Long-term estimates typically rely on structural models incorporating a production function or growth forecasts, while short-term potential growth movements are often derived using time-series filtering techniques, such as univariate or multivariate filters. This paper focuses on potential growth at the medium- to long-term, drawing on the production function and growth forecast approaches.

In the production function approach, potential growth is driven by the growth of production factors, such as the capital stock, labor force, and technological progress (Solow, 1962). Accordingly, long-term potential growth depends on these fundamental drivers, with the assumption that the factors of production are allocated to their most productive use, independent of temporary supply shocks. Recent literature has extended this framework by incorporating the impact of natural disasters (NDs) to potential growth, addressing the distortions caused by such events. For example, natural disasters can lead to the destruction of the capital stock and reduce production efficiency, as noted by Samuel (2022) and Fernandez-Corugedo et al. (2023), which can distort potential growth estimates.

The literature has documented a broad-based slowdown in potential growth in recent decades. Kilic Celik et al. (2023) find potential growth to have declined based on nine common estimation methods, including the production function approach, long-term forecasts, and time-series filtering techniques. Chalaux and Guillemette (2019) and Kilic Celik et al. (2020) find similar declining trends. IMF (2024a) show a decline in potential growth—as measured by medium-term forecasts—driven by secular forces at the global level. This decline is present in countries across all income groups and regions, with the most significant in emerging market economies.

While the literature offers evidence on potential growth trends at the global level, coverage of the Caribbean region remains limited due to data constraints and the need for methodological adjustments to account for the region's unique characteristics. For example, whereas Kilic Celik et al. (2023) estimate potential growth for 173 countries, their estimates cover only two Caribbean countries: Barbados and Jamaica. Additionally, it is necessary to adjust the estimates of potential growth for NDs in the Caribbean given their frequency and impact. This paper contributes to the literature by providing new estimates of potential growth for the region utilizing a growth accounting framework. These estimates help identify which contributing factors are behind the region’s potential growth. Our methodology incorporating NDs is novel and easily applicable to other regions where NDs are systemically important.

Misallocation and structural obstacles

Understanding dynamics at the firm level is crucial to understanding overall economic growth (Alviarez et al., 2023). Firm-level data can provide an in-depth breakdown on the impediments to factors important for growth, such as productivity and human capital. For productivity, the misallocation of resources has been a prominent channel identified in the literature that generates differences in the standard of living across countries (Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009). Misallocation can be large if firms operate at an inefficient scale, either too small or too large, relative to their efficient size. This is reflective of firm-specific distortions, which prevent productive inputs—labor and capital—from reallocating to their most productive use. Misallocation can result from entry or exit barriers, a large informal sector, the presence of state-owned enterprises, differential tax rates, special treatment among groups of firms, and stringent regulations such as trade barriers.

A large literature since the seminal studies of Restuccia and Rogerson (2008) and Hsieh and Klenow (2009) on productivity and misallocation has emerged. Hsieh and Klenow (2009) develop a framework to measure the aggregate TFP gains when firm-specific distortions causing misallocation are removed. They find in the efficient scenario that aggregate manufacturing TFP would increase by 86-115 percent in China, 100-128 percent in India, and 30-43 percent in the United States. Using the same framework, Busso et al. (2013) find that misallocation significantly hinders productivity in Latin America, whereby the efficient allocation of resources could boost manufacturing TFP between 41-122 percent depending on the country and years considered. Camacho et al. (2024) document the productivity gains in Colombia and find that aggregate manufacturing TFP could increase by 45-60 percent. Bah et al. (2025) find that misallocation is prevalent across 57 low- and middle-income countries, with scope for aggregate manufacturing TFP to increase by 300 percent in Sub-Saharan Africa.

Changes in misallocation over time can significantly impact aggregate productivity growth. For example, Chen and Irrazabal (2015) find that a reduction in misallocation in Chile accounted for about 40 percent of Chile's TFP growth between 1983 and 1996. They attribute this reduction to banking sector reforms, which reduced related-party lending, and thus improved the allocation of credit within the economy. Gopinath et al. (2017) document increasing productivity losses from capital misallocation over time in Spain, Italy and Portugal following their entry into the euro area. This is associated with the decline in real interest rates that led to a decline in sectoral TFP as capital inflows were misallocated towards relatively unproductive firms. Baqaee and Farhi (2020) generalize the misallocation formulas like those in Hsieh and Klenow (2009) to encompass economies with input-output network linkages, factor mobility, and arbitrary elasticities of substitution. They document that improvements in allocative efficiency, driven by the reallocation of market share to high-markup firms over time, account for about half of the aggregate TFP growth in the United States from 1997 to 2015.[2]

The misallocation of resources can have important dynamic effects on firm productivity growth. If more efficient firms face larger distortions, it undermines firms' incentives to invest in better technology and expand over time (Hsieh and Klenow, 2016). There is evidence that Caribbean firms exhibit limited growth over time, which points to firm-specific distortions existing (IMF, 2024b). Bento and Restuccia (2018) find that lower average firm size is

[2] Other studies on the role of misallocation on productivity growth include: Misch and Saborowski (2018), who based on firm-level data for Mexico suggest that misallocation significantly hinders productivity growth due to factors such as informality, crime, corruption, market concentration, and lack of access to financial and internet services; Gorodnichenko et al. (2021), who examine resource misallocation in the European Union and document that cross-country differences in the dispersion of the marginal revenue products relate to differences in the business, institutional, and policy environments; and Chen and Tombe (Forthcoming), who find that labor and capital misallocation consistently worsened in Canada between 2001 and 2015, lowering aggregate productivity by 23 percent over that period.

associated with lower productivity and GDP per capita in a sample of 127 countries, indicating the importance of removing barriers that inhibit firm growth.

The literature has found that misallocation in the service sector is more pronounced than in the manufacturing sector, which is relevant for this study due to the dominance of the service sector, i.e., tourism, in Caribbean economies. In The Bahamas and Barbados, financial services also play an important role (OECD/IDB, 2024). Busso et al. (2013) find that misallocation in the retail sector is larger than in the manufacturing sector in Mexico and Uruguay, while De Vries (2014) and Dias et al. (2016) document a similar pattern in Brazil and Portugal, respectively. Although evidence points to greater misallocation in services, Restuccia and Rogerson (2017) emphasize a caveat that output in service sub-sectors, such as education or banking, may be poorly measured.

The literature on firms in the Caribbean region is sparse due to data limitations. Yet, firm-level datasets—LACES, PROTEqIN, and IFPG—from surveys conducted by organizations since 2011 (World Bank, Inter-American Development Bank, Compete Caribbean) have facilitated analysis in the region.[3] Studies exploring the LACES and PROTEqIN surveys include Ruprah et al. (2014), Mohan et al. (2016), Donhert et al. (2017), Broome et al. (2018), Khadan (2018), and Mohan et al. (2018). For the IFPG survey, most studies have explored firm innovation, which closely relates to TFP. Acevedo et al. (2023) find that innovation is mostly self-financed, leads to better performance, and is impacted by a lack of human capital. Ganotakis et al. (2023) explore different types of innovation—goods, services, processes, organizational, and marketing—finding that there are heterogenous impacts to firm sales growth. Mohan and Strobl (2023) conduct a stochastic frontier analysis, finding that different types of innovation asymmetrically affect technical efficiency. Rosenblatt et al. (2024) analyze innovation trends and propose policies to support innovation-driven growth, such as facilitating access to finance, digitalizing public services, and providing dedicated support services.[4]

In this paper, we build on the literature by providing, to the best of our knowledge, the first estimates of firm-level misallocation for the Caribbean region, highlighting that there is scope for large aggregate productivity gains from the efficient reallocation of resources. We also present analyses on TFP using the IFPG data, highlighting the structural obstacles that are significantly associated with firm productivity. These estimates are aggregated to get an overall effect on aggregate welfare.

[3] LACES refers to the Latin American and Caribbean Survey, which was conducted in 2011, and PROTEqIN refers to the Productivity, Technology, and Innovation Survey, which was conducted in 2014. Until 2011, the Caribbean region did not have a firm-level dataset that was internationally comparable for productivity analysis (Carrion Menendez, 2016). The surveys can be accessed at Complete Caribbean - LACES & PROTEqIN.

[4] At the macro level, recent studies find that digital technologies, such as artificial intelligence and big data, have the potential to improve productivity (Bakker et al., 2024) and the efficiency of government services (Chen et al., 2024) in the Caribbean.

Trends and Prospects of Potential Growth

We use two approaches to examine the medium- and long-term growth trends in the Caribbean. The first approach relies on forecasters' expectations of growth over the medium term. The second approach is based on estimates of potential growth using a growth accounting framework. Results from both approaches indicate a declining trend in the past few decades, demonstrating a downward shift in Caribbean economies to a lower growth regime.

Insights from growth forecasts

We begin by examining forecasters' views on medium-term growth. Our analysis focuses on five-year-ahead growth projections from the IMF's World Economic Outlook (WEO) database, which offers the most comprehensive coverage of medium-term growth forecasts at the country level for the Caribbean. The forecasts are made five years ahead—for example, the 2029 forecast is based on the April 2024 WEO—reflecting forecasters' expectations for growth in the medium term based on current information.

These growth forecasts have been steadily trending down since 2012, the first year that the WEO has real GDP growth for all countries in the sample (Figure 2a). The forecasted real GDP growth in the Caribbean, calculated as the purchasing power parity (PPP) weighted average of all the countries, declined from around 3.7 percent in 2012 to 1.9 percent in 2024, and to just above 2 percent in 2029.

To gain perspective from a longer horizon, we extend the data to the mid-1990s by inferring forecasts on real GDP growth based on levels of GDP sourced from the WEO database and IMF Staff Reports for individual countries in the region (Figure 2b).[5] We find that the growth forecasts for recent years are also lower compared to the period from the mid-1990s to the early 2010s. The growth forecasts at that time average around 3.5 percent, albeit with fluctuations from year to year, as large and idiosyncratic forecast revisions to some countries occurred. The magnitude of the medium-term growth slowdown in the Caribbean is comparable to the larger Latin American and Caribbean (LAC) region and the world. IMF (2024a) shows that the five-year-ahead WEO growth projections are about 1.5 percentage points lower between April 2008 and April 2024 for both LAC and the world.

[5] See Table A1 in the Appendix for information on the derivation of historical values.

Figure 2a

Five-Year-Ahead Yearly Real GDP Growth Forecasts, 2012-2029

(In percent)

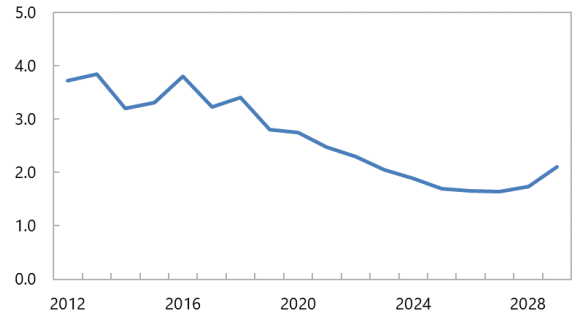
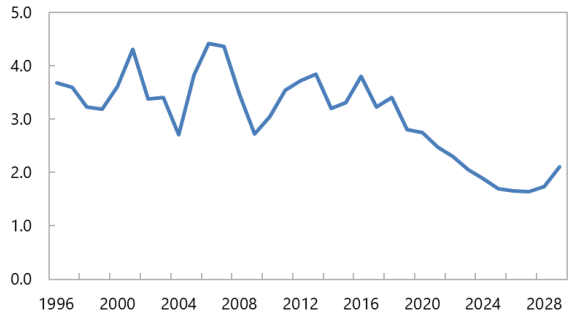


Figure 2b

Five-Year-Ahead Yearly Real GDP Growth Forecasts, 1996-2029

(In percent)



Sources: IMF World Economic Outlook, IMF Staff Reports, and Authors' calculations.

Note: The years on the horizontal axis refer to the year of the forecast, using the April WEO from five years earlier (e.g., the 2029 forecast is based on the April 2024 WEO). The sample includes Antigua and Barbuda, Aruba (starting WEO April 2019), The Bahamas, Barbados, Belize, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Haiti, Guyana (excluding forecasts from 2023 onwards), Suriname, and Trinidad and Tobago.

The dimming growth forecasts raise two potential concerns. First, they could be driven by rising pessimism among forecasters, especially after large global shocks such as the Global Financial Crisis and the COVID-19 pandemic. To resolve this, we track the average discrepancy between forecasted and realized growth. We calculate the forecast error, e_{it}, as the difference between actual growth and five-year-ahead forecasts for country i in year t. A time trend, α_t, is estimated for the forecast error from a cross-country regression, $e_{it} = \alpha_t + \varepsilon_{it}$, for each forecast year. From this regression, we do not find evidence of pessimism bias in recent years' forecasts for the average forecast errors (Figure 3a). The errors are not statistically different from zero for all the years before 2020. For 2020, the average forecast error is statistically negative, reflecting an unexpectedly negative growth shock from the pandemic, and this reverts to being statistically positive in 2023, reflecting the high growth when countries recovered from the pandemic. Using the extended sample period, we find that actual growth was higher than forecasted for most years between the mid-1990s and the early-2010s (Figure 3b). In other words, the forecasts for this historical period—already higher than those for recent years—were underestimates of actual growth. This suggests that forecaster pessimism is not playing a role for the downward trend in the medium-term growth projections.

Second, it could be the case that the declining growth trend reflects progress in living standards, where higher growth in the earlier decades reflect Caribbean economies' income convergence towards advanced economies. However, we find that income convergence has stalled in the most recent forecasts. We compare the historical pace of income convergence across countries using the five-year-ahead growth forecasts against the level of GDP per capita (Figure 4a). The five-year-ahead growth forecasts made in 2008 imply a positive and statistically significant rate of absolute convergence, with a beta convergence coefficient of -0.3021 for the sample of 191 countries. In contrast, the forecasts made in 2024 indicate a nearly zero and statistically insignificant coefficient of -0.0747 (Figure 4b). This suggests that recent forecaster expectations of lower growth in the Caribbean are not being driven by income convergence dynamics.

Overall, the evidence shows from a forecaster's perspective that trend growth is lower in the Caribbean, and we do not find evidence that this is due to either rising forecaster pessimism or income convergence. This points to potential growth, and its underlying growth factors, driving the decline in expected growth for the region.

Figure 3a

Actual vs. Five-Year-Ahead Yearly Real GDP Growth Forecasts, 2012-2023
(In percentage points)

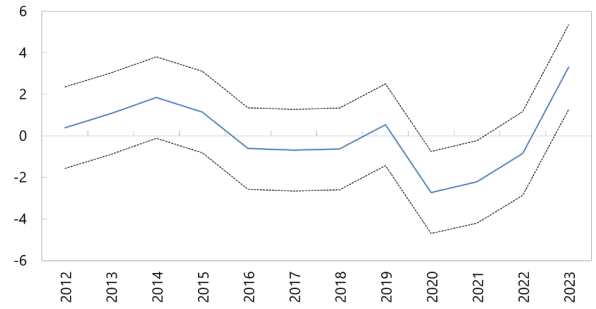
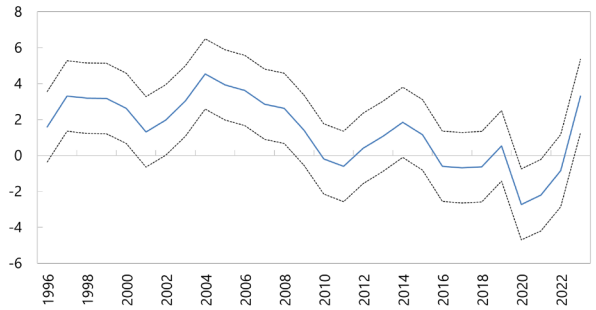


Figure 3b

Actual vs. Five-Year-Ahead Yearly Real GDP Growth Forecasts, 1996-2023
(In percentage points)



Sources: IMF World Economic Outlook, IMF Staff Reports, and Authors' calculations.
Note: Each plot presents the estimates of a time trend on the forecast error (actual growth minus five-year-ahead forecasts) from a cross-country regression. The years on the horizontal axis refer to the year of the forecast, using the April WEO from five years earlier (e.g., the 2029 forecast is based on the April 2024 WEO). The dashed lines show the 95 percent confidence interval. The sample includes Antigua and Barbuda, Aruba (starting WEO April 2019), The Bahamas, Barbados, Belize, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Haiti, Guyana (excluding forecasts from 2023 onwards), Suriname, and Trinidad and Tobago.

Figure 4a

Medium-Term Growth and Income Convergence, 2008-2023
(In percent)

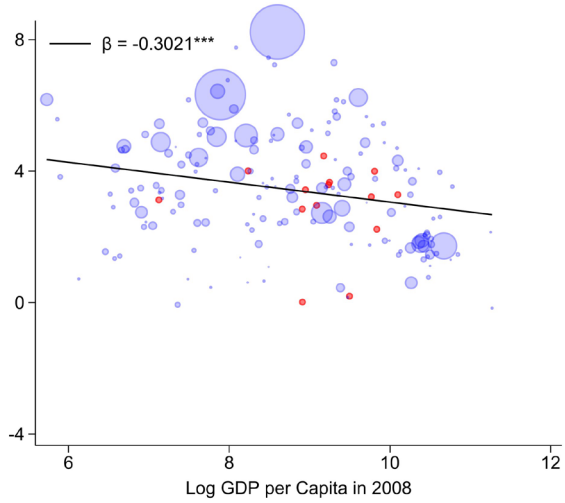
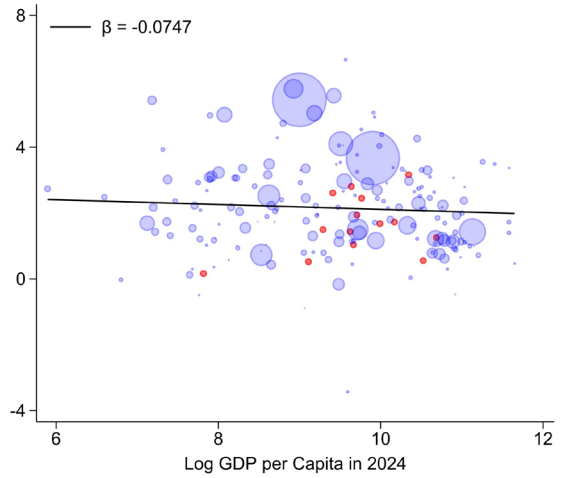


Figure 4b

Medium-Term Growth and Income Convergence, 2024-2029
(In percent)



Sources: IMF World Economic Outlook, IMF Staff Reports, and Authors' calculations.
Note: The verticle axis is the average annual growth rate of GDP per capita in PPP terms over a five year period. The horizontal axis is the log of GDP per capita in PPP terms at the beginning of the five year period. The regression specification is given by: $(\frac{\log GDPPC_{it+5} - \log GDPPC_{it}}{5} \times 100) = \alpha + \beta \log GDPPC_{it} + \epsilon_{it}$. The black line shows the estimated β convergence coefficient. Red bubbles represent Caribbean countries, and blue bubbles represent the rest of the world. Bubble size represents the population. Figure 4b excludes a growth outlier, Guyana. Regression results with the outlier are similar, with an estimated β of 0.0036 (not significant). *** p < .01, ** p < .05, * p < .1.

Insights from a growth accounting exercise

To estimate potential growth and its components, we employ a growth accounting framework under the production function approach. We assume a Cobb-Douglas aggregate production function with TFP, physical capital, and labor. Novel to the literature, we adjust the specification for NDs. This adjustment is important since NDs are a common and recurring event in the Caribbean with potentially large impacts on the estimates of the capital stock. This is because post-disaster investment does not adjust for damage to the capital stock yet includes reconstruction activities, which consequently can lead to biases in the capital stock estimates. Our approach separates the impact of NDs from the aggregate production function, which then allows the remaining components to reflect developments in potential growth. The approach can easily be applied to other countries where NDs are systemically important.

The aggregate production function is defined as:

$$Y_t = \theta_t A_t K_t^{\alpha} L_t^{1-\alpha},$$

where Y is output, K is physical capital, L is the labor input, α is the elasticity of output with respect to physical capital, $1-\alpha$ is the elasticity of output with respect to the labor input, and θ_t measures inefficiencies in production during and immediately after NDs. The followings steps are taken to adjust the capital stock for NDs and estimate θ_t and potential growth.

Step 1. Estimate investment excluding the impact of NDs, $\widetilde{I_t}$, using an ARIMA model:[6]

$$I_t = \phi(L)I_t + A(L)\epsilon_t + \gamma_1 z_t + \gamma_2 z_{t+1},$$
$$\widetilde{I_t} = \hat{\phi}(L)I_t + \hat{A}(L)\epsilon_t,$$

where z_t is a dummy variable for the year and year after a ND with γ_1 and γ_2 the associated coefficients, and $\phi(L)$ and $A(L)$ are the coefficients of lagged I_t and ϵ_t, where ϵ_t is the error term. $\hat{\phi}(L)$ and $\hat{A}(L)$ are the estimated coefficients.

Step 2. Calculate the capital stock excluding the impact of NDs, $\widetilde{K_t}$, using the perpetual inventory method:[7]

$$\widetilde{K}_{t+1} = (1-\delta)\widetilde{K}_t + \widetilde{I}_t.$$

Step 3. Estimate output excluding the impact of NDs, $\widetilde{Y_t}$, using an ARIMA model:

$$Y_t = \rho(L)Y_t + B(L)\varepsilon_t + \gamma_3 z_t + \gamma_4 z_{t+1},$$
$$\widetilde{Y_t} = \hat{\rho}(L)Y_t + \hat{B}(L)\varepsilon_t,$$

where z_t is the dummy variable defined in Step 1 with γ_3 and γ_4 the associated coefficients, and $\rho(L)$ and $B(L)$ are the coefficients of lagged Y_t and ε_t, where ε_t is the error term. $\hat{\rho}(L)$ and $\hat{B}(L)$ are the estimated coefficients.

Step 4. Calculate $\theta_t = Y_t/\widetilde{Y_t}$ for the year and year after a ND. Set θ_t equal to 1 for non-ND years.

[6] The ARIMA specification is selected for its flexibility and time-series attributes, and follows Hochrainer (2009) and Csonto et al. (2017). In order to determine the length of the lags, the Akaike information criterion and Bayesian Akaike information criterion are used. The augmented Dickey-Fuller test is used to determine the stationarity of the series for investment and output.

[7] The capital stock in the initial year—value in 1980 for most countries—is taken from Penn World Table (10.1).

Step 5. Calculate TFP as:

$$A_t = Y_t / \theta_t \tilde{K}_t^{\alpha} L_t^{1-\alpha}.$$

Step 6. Estimate potential TFP, A_t^{pot}, using a Hodrick–Prescott filter with smoothing parameter $\lambda = 6.25$.

Step 7. Calculate potential output as:

$$Y_t = \theta_t A_t^{Pot} \tilde{K}_t^{\alpha} L_t^{1-\alpha}.$$

For the components, the labor input is measured as human capital augmented population, $L_t = h_t P_t$, where h_t is human capital and P_t is the population. Human capital is calculated as: $h_t = \exp\left(\frac{\vartheta}{1-\omega} s_t^{1-\omega}\right)$, where s_t is the average years of schooling for the population aged 24 or older. The values of the parameters, ϑ = 0.32 and ω = 0.68, are set to follow the literature (Bils and Klenow, 2000; Sosa et al., 2013; Csonto et al., 2017). The average years of schooling, s_t, are estimated using skill-specific emigration rates from the Institute for Employment Research (IAB) database. This is done by regressing the average schooling years from Barro and Lee (2015) on the population ratio of each skill level (calculated from the skill-specific emigration rates) for the countries where data are available and then estimating s_t for Caribbean countries using those coefficients. However, data on skill-specific emigration rates are only available up to 2010. For post-2010 values, a regression utilizing secondary school enrollment from the World Development Indicators (World Bank) database is used. The elasticities, α and $1 - \alpha$, are taken from Gollin (2002), and are equal to 0.35 and 0.65, respectively. These values are close to those estimated in the IFPG survey, which provides a consistency check between the potential growth and firm-level analysis.[8] Table 1 provides the definitions and sources for each variable/parameter.

Table 1

Variable/Parameter	Definition	Source
Natural Disasters (NDs)	Dummy variable indicating the presence of a natural disaster (hurricanes, storms, floods, epidemics, insects' infestation, droughts, wildfires, earthquakes, volcanic activity, landslides).	EM-DAT, the international disaster database.
Output (Y_t)	Real output level.	IMF World Economic Outlook, and Penn World Table (10.1).
Human Capital (h_t)	Average level of education and skills in the population.	Estimated using s_t and Bils and Klenow (2000), Sosa et al. (2013), and Csonto et al. (2017).
Investment (I_t)	Real investment level.	IMF World Economic Outlook, and Penn World Table (10.1).
Population (P_t)	Total number of people in the country.	United Nations Population Division, and IMF World Economic Outlook.
s_t	Average years of schooling for the population aged 24 or older.	Barro and Lee (2015), Institute for Employment Research (IAB), and World Development Indicators (World Bank) databases.

[8] In the IFPG survey, we estimate the aggregate α and $1 - \alpha$ to be 0.34 and 0.66, respectively. These are close to the values of 0.35 and 0.65, respectively, in Gollin (2002).

$\alpha, 1-\alpha$	Elasticity of output with respect to physical capital, and elasticity of output with respect to the labor input.	Gollin (2002).
δ	Average capital depreciation rate.	Derived from capital and investment data in Penn World Table (10.1).

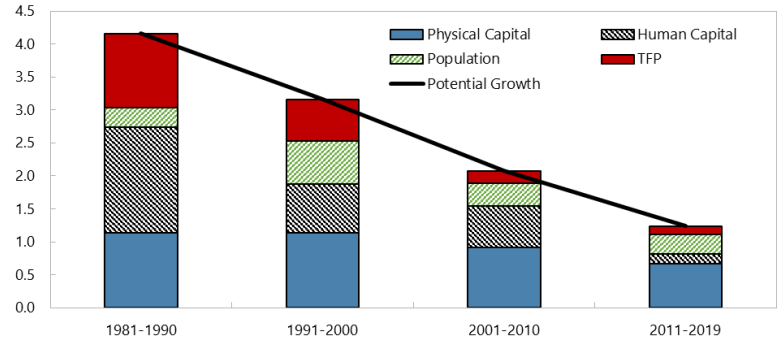
Results

The results of the potential growth estimates are presented for the Caribbean (Figure 5). Across the region, we find that potential growth has declined over time. Between 1981-1990, potential growth equaled 4.2 percent, between 1991-2000, it equaled 3.2 percent, between 2001-2010, it equaled 2.1 percent, and in the most recent period before the pandemic, it equaled 1.2 percent. This pace of decline is consistent and suggests going forward that potential growth in the Caribbean will remain at a marginal level.

Within each of the contributions, we find that declining contributions of TFP and human capital have been the main factors behind the region's decline. Between 1981-1990, TFP and human capital contributed 1.1 and 1.6 percent, respectively. However, by 2011-2019, these contributions declined to 0.1 and 0.2, respectively. This is in contrast to the contributions of the capital stock and the population. For these, between 1981-1990, the contributions equaled 1.1 and 0.3 percent, while between 2011-2019, they equaled 0.7 and 0.3 percent, respectively. If the contributions of TFP and human capital in the most recent period remained the same as in 1981-1990, then potential growth would increase from 1.2 to 3.7 percent. This highlights that to spur potential growth going forward, it is essential to determine the factors driving the lower contributions of TFP and human capital. This motivates the use of firm-level data to understand these underlying factors.

Figure 5

Potential Growth in the Caribbean
(In percentage points)

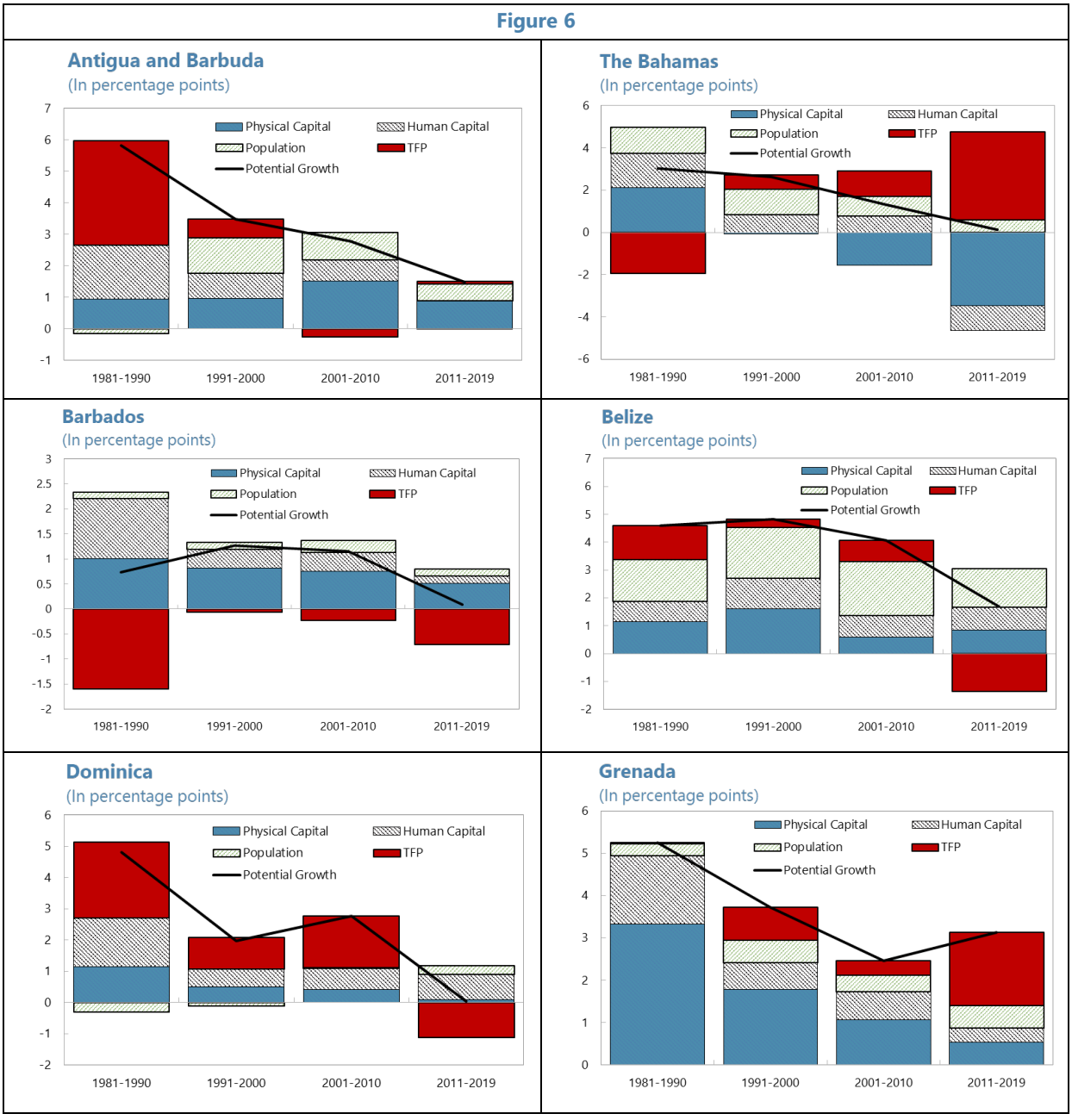


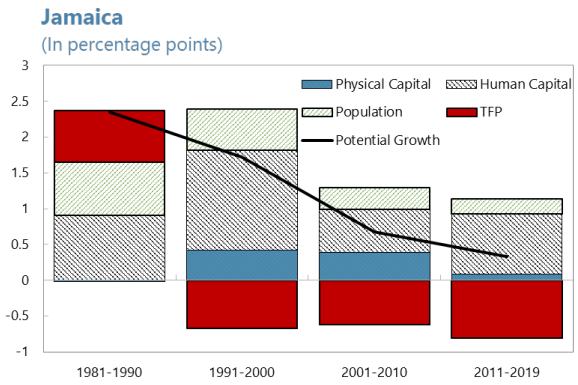
Sources: Barro and Lee (2015), EM-DAT database, IAB database, World Bank database, Penn World Table (10.1), and Authors' calculations.
Note: Caribbean-wide estimates are calculated as the median of each component across countries with the TFP component calculated as the residual.

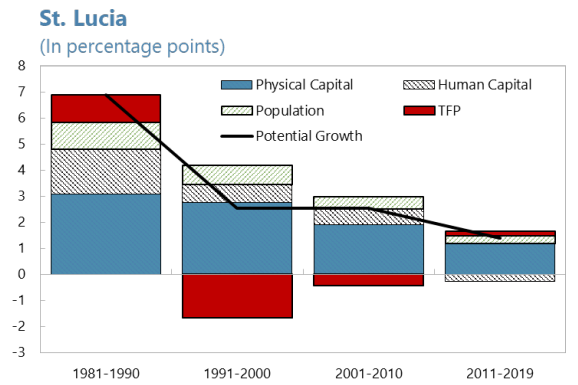
At the country level, the results display more variability on the trends and contributing factors (Figure 6). In some cases, the capital stock and population have also contributed to lower potential growth. For example, in Antigua and Barbuda, Belize, Dominica, Jamaica, St. Lucia, St. Kitts and Nevis, and St. Vincent and the Grenadines, we

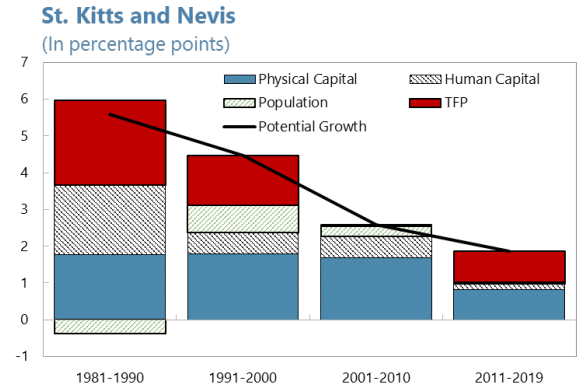
see similar dynamics from the Caribbean-wide results. Alternatively, in countries like The Bahamas and Grenada, TFP contributions increased over time. While the contributions vary, it is clear across the countries that the decline in potential growth is robust. In all countries in the sample, potential growth between 2011-2019 is strictly lower than its value between 1981-1990. This highlights that there has been a systemic decline in potential growth in the region and suggests that the underlying causes may be region wide.

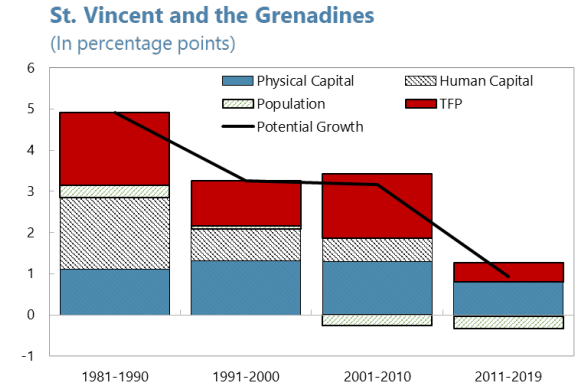
Figure 6











Sources: Barro and Lee (2015), EM-DAT database, IAB database, World Bank database, Penn World Table (10.1), and Authors' calculations.

Evidence from Firm-level Data

Overview

Our results of declining potential growth across the Caribbean region, driven by declining contributions of TFP and human capital, motivates the exploration of underlying factors driving these dynamics. To do so, we take a micro level approach by utilizing firm-level data on Caribbean firms.

Human capital at the firm level can represent the quality and education of employed workers, and depends on each firm's ability to find qualified labor that matches their needs. The extent that firms are unable to find skilled labor creates a channel through which the contributions of human capital to potential growth may decline.

For TFP, two dimensions can play a role in its contributions to potential growth. First, at the firm level, TFP may be inhibited by a poor business environment that reduces investment and technological progress. Second, at the aggregate level, TFP may be suppressed by poor allocative efficiency, which occurs when resources are inefficiently allocated across firms with different marginal revenue products of inputs. Under monopolistic competition, a Cobb-Douglas production function, and perfect input markets, dispersion in the marginal revenue products is reflective of firm-specific distortions. Reallocating inputs from firms with lower marginal revenue products to those with higher marginal revenue products will increase aggregate output for the same level of aggregate inputs. Consequently, eliminating firm-specific distortions can enhance allocative efficiency and contribute to potential growth.

Model

To look at allocative efficiency, we employ the seminal methodology of Hsieh and Klenow (2009). The aggregate output of each country c, Y_c, is a composite function of outputs from s industries:

$$Y_c = \prod_{s=1}^{S} Y_{cs}^{\theta_{cs}},$$

where each industry is weighted by its value added share θ_{cs} with $\sum_{s=1}^{S} \theta_{cs} = 1$.

Within each country-sector, there are M_{cs} firms producing differentiated goods Y_{csi} under monopolistic competition. The output at the industry level is a CES aggregate of each firm's output:

$$Y_{cs} = \left(\sum_{i=1}^{M_{cs}} Y_{csi}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

where σ is the elasticity of substitution between different produced goods. The production function for firm i is specified by:

$$Y_{csi} = A_{csi} K_{csi}^{\alpha_s} L_{csi}^{1-\alpha_s},$$

where A_{csi} is total factor productivity, K_{csi} is physical capital, and L_{csi} is the labor input. The parameter α_s denotes the industry-specific output elasticity with respect to physical capital, and under the assumption of constant returns to scale, $1 - \alpha_s$ denotes the industry-specific output elasticity with respect to the labor input.

The firm's profit function is given by:

$$\pi_{csi} = \left(1 - \tau_{Y_{csi}}\right)P_{csi}Y_{csi} - wL_{csi} - \left(1 + \tau_{K_{csi}}\right)rK_{csi},$$

where P_{csi} is the firm-specific output price, and the input costs are given by the wage rate w and capital rental costs r. Within the profit function, it is assumed that firms face output and input distortions, $\tau_{Y_{csi}}$ and $\tau_{K_{csi}}$, which are firm-specific. Although modelled in an abstract manner, they can represent structural obstacles that impede the operations of different groups of firms.

Under profit maximization, the marginal revenue products of labor and capital are set equal to:

$$MRPL_{csi} = w\frac{1}{1-\tau_{Y_{csi}}},$$
$$MRPK_{csi} = r\frac{1+\tau_{K_{csi}}}{1-\tau_{Y_{csi}}},$$

which shows that the distortions drive deviations in the marginal revenue products of inputs across firms, thereby leading to misallocation in the model.

The framework considers two distinct measures of productivity. The first measure is physical total factor productivity (TFPQ):

$$A_{csi} = \frac{Y_{csi}}{K_{csi}^{\alpha_s}L_{csi}^{1-\alpha_s}} = \kappa_{cs}\frac{(P_{csi}Y_{csi})^{\sigma/(\sigma-1)}}{K_{csi}^{\alpha_s}L_{csi}^{1-\alpha_s}},$$

where $\kappa_{cs} = w^{1-\alpha_s}(P_{cs}Y_{cs})^{-1/(\sigma-1)}P_{cs}^{-1}$ is a country-sector-specific coefficient. The output prices of each industry, P_{cs}, are defined relative to the aggregate price P_c. Since firm-level price data are unavailable, physical output Y_{csi} is unobservable. In markets characterized by monopolistic competition, however, a firm's higher output Y_{csi} necessitates a lower price P_{csi}, consistent with a downward sloping demand curve. Therefore, Y_{csi} can be backed out by taking nominal output $P_{csi}Y_{csi}$ to the power of $\frac{\sigma}{\sigma-1}$.

The second productivity measure is revenue total factor productivity (TFPR):

$$TFPR_{csi} = P_{csi}A_{csi} = \frac{P_{csi}Y_{csi}}{K_{csi}^{\alpha_s}L_{csi}^{1-\alpha_s}} = \frac{\sigma}{\sigma-1}\left(\frac{MRPK_{csi}}{\alpha_s}\right)^{\alpha_s}\left(\frac{MRPL_{csi}}{1-\alpha_s}\right)^{1-\alpha_s}.$$

Hsieh and Klenow (2009) show that the country-sector-level TFP is given by:

$$TFP_{cs} = \left(\sum_{i=1}^{M_{cs}}\left(A_{csi}\frac{\overline{TFPR}_{cs}}{TFPR_{csi}}\right)^{\sigma-1}\right)^{\frac{1}{\sigma-1}},$$

where the country-sector-level average revenue productivity, $\overline{TFPR}_{cs}$, is:

$$\overline{TFPR}_{cs} = \frac{\sigma}{\sigma-1}\left(\frac{\overline{MRPK}_{cs}}{\alpha_s}\right)^{\alpha_s}\left(\frac{\overline{MRPL}_{cs}}{1-\alpha_s}\right)^{1-\alpha_s},$$

and the country-sector-level average marginal revenue products of labor and capital, $\overline{MRPL}_{cs}$ and $\overline{MRPK}_{cs}$, are:

$$\overline{MRPL}_{cs} = \left(\sum_i \frac{1}{MRPL_{csi}}\frac{P_{csi}Y_{csi}}{P_{cs}Y_{cs}}\right)^{-1},$$
$$\overline{MRPK}_{cs} = \left(\sum_i \frac{1}{MRPK_{csi}}\frac{P_{csi}Y_{csi}}{P_{cs}Y_{cs}}\right)^{-1}.$$

Under the framework, if each firm in a country-sector is subject to identical distortions, then all firms will exhibit the same level of $MRPL_{csi}$ and $MRPK_{csi}$, and consequently all firms will have the average $\overline{MRPL}_{cs}$ and $\overline{MRPK}_{cs}$. The aggregate country-sector-level TFP in this case becomes:

$$\bar{A}_{cs} = \left(\sum_{i=1}^{M_{cs}} A_{csi}^{\sigma-1}\right)^{\frac{1}{\sigma-1}}.$$

To quantify the productivity gains attainable without misallocation, Hsieh and Klenow (2009) show that one can take the following ratio, which estimates the potential increase in aggregate output between the distorted and undistorted scenarios.

$$\frac{Y_c}{Y_{c,Efficient}} = \prod_{s=1}^{S}\left(\sum_{i=1}^{M_{cs}}\left(\frac{A_{csi}}{\bar{A}_{cs}}\frac{\overline{TFPR}_{cs}}{TFPR_{csi}}\right)^{\sigma-1}\right)^{\frac{\theta_{cs}}{\sigma-1}},$$

where $Y_{c,Efficient}$ is the output level when $\tau_{Y_{csi}}$ and $\tau_{K_{csi}}$ are equalized across firms within the country-sector.

At the efficient output level, the efficient size of each firm can be calculated following the derivation in Ha et al. (2016) as:

$$\frac{(P_{csi}Y_{csi})_{Efficient}}{P_{csi}Y_{csi}} = \frac{Y_{c,\,Efficient}}{Y_c}\left(\frac{Y_{cs}}{Y_{cs,\,Efficient}}\right)^{\sigma-1}\left(\frac{\left(1+\tau_{K_{csi}}\right)^{\alpha_s}}{1-\tau_{Y_{csi}}}\right)^{\sigma-1}.$$

To parameterize the model, we set the elasticity of substitution to the median value of our countries estimated in Broda et al. (2017), σ = 3.3. For the elasticities of output with respect to capital and labor, we estimate it in the firm-level data using the factor share approach. In this approach, we equate the input's cost share to its respective output elasticity. Pooling across all countries, α_s is equal to the ratio of capital rental costs and depreciation to the sum of the input costs, α_s = 0.4 for manufacturing and α_s = 0.33 for services, and $1-\alpha_s$ is the residual. We follow the literature by setting r = 0.1 and normalizing w = 1 (Hsieh and Klenow, 2009; Chen and Irarrazabal, 2015; Camacho et al., 2024). Value added is used for Y_{csi}, defined as sales minus intermediate inputs. The net book value of capital (land, buildings, machinery, vehicles, and equipment) serves as a proxy for physical capital K_{csi}, while total compensation (wages, social payments, salaries, and bonuses) is utilized for the labor input L_{csi}. Using total compensation for the labor input allows for variations in labor quality, number of employees, and hours worked. The capital stock is adjusted by the capacity utilization rate reported by firms since firms may not be operating at full capacity. For the TFP results, firms must have non-missing log values of value added, capital stock, labor input, and capital input costs. To deal with outliers, after deriving each firm's TFPR and TFPQ, we trim the top and bottom two percent of observations in the distribution of $\log\left(\frac{TFPR_{csi}}{\overline{TFPR}_{cs}}\right)$ and $\log\left(\frac{A_{csi}M_{cs}^{\frac{1}{\sigma-1}}}{\bar{A}_{cs}}\right)$ by sector. We then recalculate $\overline{TFPR}_{cs}$ and $\bar{A}_{cs}$ using the trimmed sample.

Data

The dataset employed is the Innovation, Firm Performance and Gender (IFPG) survey.[9] This cross-sectional survey, commissioned by the Inter-American Development Bank, was conducted in 2020 on 1,979 firms across 13 Caribbean countries, including: Antigua and Barbuda, Barbados, Belize, Dominica, Jamaica, Grenada, Guyana, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, The Bahamas, and Trinidad and Tobago. The survey was designed to be representative of the major economic sectors in each of the Caribbean countries, and therefore generalizable to the broader business environment. Within each country, the survey was stratified and randomly drawn, whereby individual observations were randomly chosen from the population of firms within each country-sector strata. These sectors are broadly classified into manufacturing and services.[10] Corresponding sample weights allow for calculating the aggregate effects. While the survey was conducted in 2020, with approximately 75 percent of observations surveyed between August and October, the financial variables used in the analysis refer to pre-pandemic values, largely fiscal year 2019. Therefore, the results should be interpreted as reflecting the period before the pandemic.[11]

The survey includes questions on structural obstacles, specifically, it asks firms to rate or choose the obstacles that severely affect their current operations. When rating, firms can respond with: “no obstacle”, “minor obstacle”, “moderate obstacle”, “major obstacle”, or “very severe obstacle”. The choice of obstacles include: “Telecommunications”, “Electricity”, “Transportation”, “Access to land for expansion/relocation”, “Tax rates”, “Tax administration”, “Customs and trade regulations”, “Labor regulations”, “Inadequately educated workforce”, “Business licensing and permits”, “Access to finance (e.g., collateral)”, “Cost of finance (e.g., interest rates)”, “Political environment”, “Macroeconomic environment (inflation, exchange rate, interest rate)”, “Corruption”, “Crime, theft and disorder”, “Practices of competitors in the informal sector”, and “Access to digital payment (e.g., online sales, digital currency transfers, mobile wallet)”. We leverage these obstacles to explore the firm-specific distortions that could be driving the misallocation of resources between firms and inhibiting TFP and human capital contributions to potential growth.

Table 2 presents the number of sample observations per country, their weight out of the population of firms, and the proportion of firms by different size and age buckets. For each country, roughly 150 firms are surveyed, representing between 2.5 percent of the total firms in Trinidad and Tobago and 17.5 percent in Grenada. Overall, the survey covers 7.2 percent of firms in the Caribbean. To get a sense of the types of firms being surveyed, the proportion of different size and age groups are provided. We find that the survey covers mostly firms within the 5 to 30 employee brackets (i.e., small-sized enterprises). However, we also find a substantial share of medium and large firms (with 50+ employees) are included in the survey as well, ranging from 12 percent in Barbados to

[9] The dataset is available at Complete Caribbean - IFPG.

[10] Manufacturing is defined as: agriculture, forestry, and fishing (ISIC Rev. 4 Code: 1, 3); mining and quarrying (for only Trinidad and Tobago, Guyana, and Suriname, ISIC Rev. 4 Code: 5, 6, 7, 8, 9); and manufacturing (ISIC Rev. 4 Code: 10, 11, 12, 14, 20, 23, 28). Services is defined as: electricity, gas, steam and air conditioning supply (ISIC Rev. 4 Code: 35); water supply, sewerage, waste management and remediation activities (ISIC Rev. 4 Code: 36, 37, 38, 39); construction (ISIC Rev. 4 Code: 41, 42, 43); transport and storage (ISIC Rev. 4 Code: 49, 50, 51, 52, 53); accommodation and food services (ISIC Rev. 4 Code: 55, 56); information and communication (ISIC Rev. 4 Code: 59, 60, 62, 63); professional, scientific and technical activities (ISIC Rev. 4 Code: 70); administrative and support service activities (ISIC Rev. 4 Code: 79, 82); arts, entertainment and recreation (ISIC Rev. 4 Code: 90, 91, 92, 93); and wholesale and retail trade, motor vehicle repairs (ISIC Rev. 4 Code: 46, 47).

[11] While the financial variables refer to pre-pandemic values, the non-financial variables, i.e., the obstacles that firms face to their operations, may reflect those during the pandemic. The obstacles ranked by firms, where only one choice was available, was specifically asked in absence of the pandemic, while the obstacles rated by firms did not include this condition. However, the close ordering of the obstacles between the two results provides support that these reflect pre-pandemic beliefs.

34 percent in Trinidad and Tobago. For age, we find most firms surveyed are between 10 and 29 years old, with the shares being relatively smaller for young and old firms. Belize stands out with the highest share of younger firms being surveyed. Overall, for structural analysis, the survey appears sufficient. It includes a variety of different sized firms that are established in their operations. These firms would face different obstacles over time as they grow and age and vary in their performance because of them. This variation can be exploited to identify the obstacles associated with better or worse performance.

Table 2

Summary Statistics

			Size Groups						Age Groups					
Countries	Obs.	Population Share	0-4	5-9	10-19	20-29	30-49	50+	0-4	5-9	10-19	20-29	30-49	50+
			Percent											
Antigua and Barbuda	150	7.1	0	26	20	26	13	15	0	12	35	24	17	13
Barbados	170	4.7	0	30	30	16	12	12	1	12	32	28	24	3
Belize	157	9.2	0	48	21	8	6	17	22	16	27	20	14	2
Dominica	137	13.4	7	28	25	15	11	15	0	8	41	26	14	11
Grenada	124	17.5	0	18	42	21	6	14	1	10	28	24	23	14
Guyana	155	16.1	11	23	19	20	6	21	5	12	28	26	19	11
Jamaica	172	7.0	4	17	23	17	9	30	2	14	28	23	21	13
St. Kitts and Nevis	130	15.2	3	28	23	17	8	21	4	8	36	22	19	11
St. Lucia	152	9.8	5	35	28	12	9	12	5	8	36	26	22	4
St. Vincent and the Grenadines	133	16.0	2	40	23	9	7	19	7	14	21	24	22	13
Suriname	162	9.3	5	8	27	34	12	14	3	13	30	20	18	16
The Bahamas	157	5.7	2	16	30	12	7	33	1	8	21	31	23	16
Trinidad and Tobago	180	2.5	2	18	39	4	3	34	3	13	35	27	11	11
Total	1,979	7.2	3	24	29	14	8	23	4	12	31	26	18	10

Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.

Results

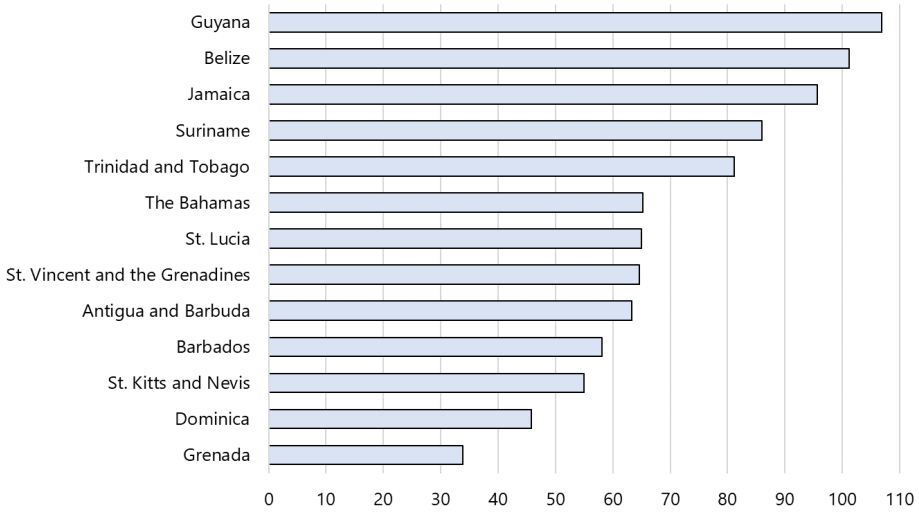
We begin by providing estimates of the aggregate TFP gains that would result from eliminating all misallocation (Figure 7). We find large and varying degrees in the Caribbean. The country with the largest gain to aggregate TFP is Guyana, whereby TFP would increase by 107 percent. This is followed by Belize (101 percent), Jamaica (96 percent), Suriname (86 percent), and Trinidad and Tobago (81 percent). The relatively higher share of commodity-based exporters in this group suggests that commodity-based economies may be susceptible to misallocation or that there is scope to implement structural reforms to diversify the economy. For the tourism-based countries, we find more modest levels ranging from Grenada (34 percent) to The Bahamas (65 percent). Most countries are between 50 and 70 percent, and are relatively close to one another. This suggests that the tourism-based economies face similar obstacles that generate misallocation.

These results are in line with the literature. The seminal Hsieh and Klenow (2009) study found gains of 86-115 percent in China and 100-128 percent in India, while Busso et al. (2013) reported gains of 41-122 percent in Latin American countries, and Camacho et al. (2024) estimated gains of 45-60 percent in Colombia. Our findings suggest that the Caribbean region exhibits levels of resource misallocation comparable to those in larger

economies and the broader region. Depending on the country, reallocating resources could increase aggregate TFP by between 34 and 107 percent.[12]

Figure 7

Aggregate TFP Gain through Resource Reallocation
(In percent)

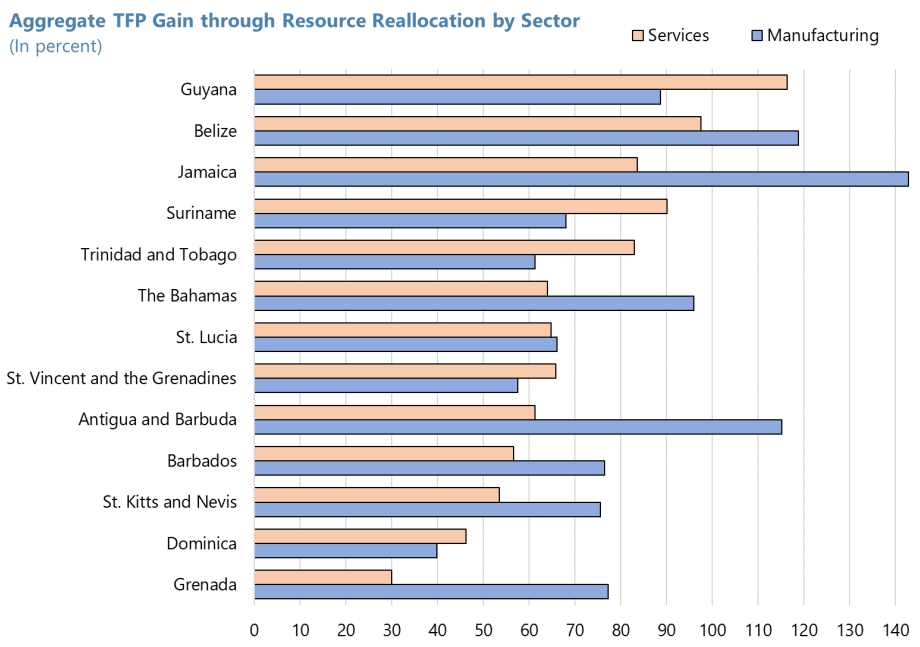


Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.

Misallocation at the aggregate level is reflective of sectoral dynamics (Figure 8). The literature has typically found larger misallocation among service industries than in manufacturing. In contrast to this, we find the results are country-specific, whereby in eight countries there is greater misallocation in manufacturing, while in the remaining five countries there is greater misallocation in services. For the commodity-based countries, Guyana, Suriname, and Trinidad and Tobago, we find the misallocation in services is greater by around 20 to 30 percentage points. Since the service sector is largely made up of non-energy sub-sectors, this suggests that diversification efforts away from oil and gas would be helped by structural reforms to boost reallocation in services to increase its contribution to aggregate output. While the manufacturing sector is typically small in the tourism-based economies, we continue to find in most cases that manufacturing displays evidence of greater misallocation. This is consistent with lesser competition relative to the service sector that would allow misallocated manufacturing firms to survive. It is also consistent with manufacturing firms having a limited market size that would reduce their ability to take advantage of economies of scale. Although it may not be advantageous from a comparative advantage standpoint to promote manufacturing in these countries, the evidence here suggests that the countries could improve aggregate TFP by targeting firm-specific distortions among existing manufacturing firms without the need to establish new firms.

[12] As a robustness, we also measure the aggregate TFP gains by different elasticities of substitution. In the baseline scenario, the elasticity is set to equal the median of our sample in Broda et al. (2017), where $\sigma = 3.3$. However, the literature has found that the results can vary depending on the magnitude of the parameter. We calculate the gains by two other values: i) the minimum in our sample in Broda et al. (2017), Grenada, and coincidentally the value typically used in the literature for the United States, $\sigma = 3.0$; and ii) the maximum in our sample in Broda et al. (2017), Belize, where $\sigma = 4.2$. We find that the order of countries and magnitudes are closely aligned with the baseline results (Figure A2 in the Appendix). Under $\sigma = 4.2$, the aggregate TFP gains range from 40 percent in Grenada to 127 percent in Guyana. The average increase between $\sigma = 3.0$ and $\sigma = 4.2$ equals around 19 percentage points, with the largest occurring in Jamica at 32 percentage points. Overall, the results are similar across specifications.

Figure 8

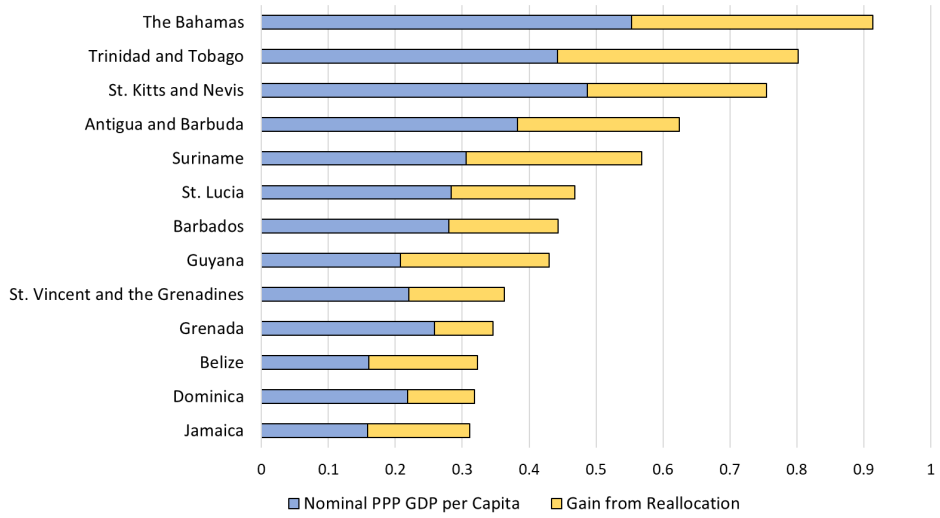


Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.

To understand the implications of the results for income convergence, we apply the misallocation gains to GDP per capita and scale the values out of the level in the United States (Figure 9). This calculation assumes that the gains to labor productivity are the same as the gains to TFP, and that labor participation does not change. We find that the reallocation of resources across firms could substantially improve income convergence, with The Bahamas achieving convergence to around 90 percent of the United States' GDP per capita level. For other countries, the gains are more modest yet remain substantial, where they vary between 30 and 60 percent. Consequently, improving the allocation of resources and removing firm-specific distortions provides a path to improving living standards in the Caribbean and closing the income convergence gap with advanced economies. This provides motivation behind the implementation of structural reforms to remove these distortions.

Figure 9

GDP Convergence through Resource Reallocation, 2019
(Relative to the United States)

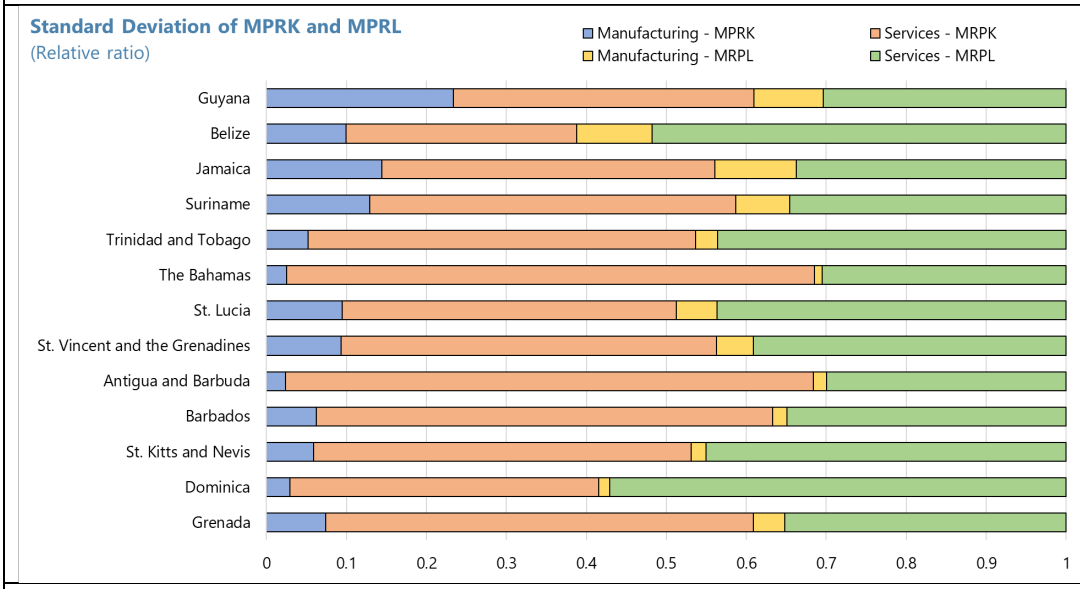


Sources: IMF World Economic Outlook, and Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) Survey.

While there is scope to target firm-specific distortions, it is not clear to what degree the distortions affect the capital and labor allocations and whether in the efficient scenario that firms should be larger or smaller relative to their distorted size. Under the framework, dispersion in $TFPR_{csi}$, which is a function of components $\left(\frac{MRPK_{csi}}{\alpha_s}\right)^{\alpha_s}$ and $\left(\frac{MRPL_{csi}}{1-\alpha_s}\right)^{1-\alpha_s}$, reflects misallocation. We present the relative ratios of the standard deviation of each component, weighted by the sectoral value added shares, to see whether firms show evidence of greater misallocation along capital or labor dimensions (Figure 10). We find that there is greater dispersion in the capital component, provided by a larger relative ratio, in both manufacturing and services for all countries except Belize and Dominica. This points to capital misallocation being relatively more severe, and partly reflects that capital faces its own distortion in the model. However, dispersion in the labor component is also substantial, with an average relative ratio of about 0.4 compared to 0.6 for capital. This suggests that both capital and labor adjustments are needed to achieve zero misallocation.

In the efficient scenario, where there is no misallocation, we find the distribution of firm size shifts to the right and is more dispersed relative to the actual firm size distribution (Figure 11). Between the two distributions, both the mean and variance of the efficient distribution are statistically significantly larger. This points to firms in the Caribbean on average needing to scale up, where the distortions are limiting firms from benefiting from factors such as economies of scale. However, the lower end of the distribution also has mass, implying that some firms are also inefficiently too large and need to scale down. The efficient firm size distributions by country display similar characteristics (Figure A3 in the Appendix).

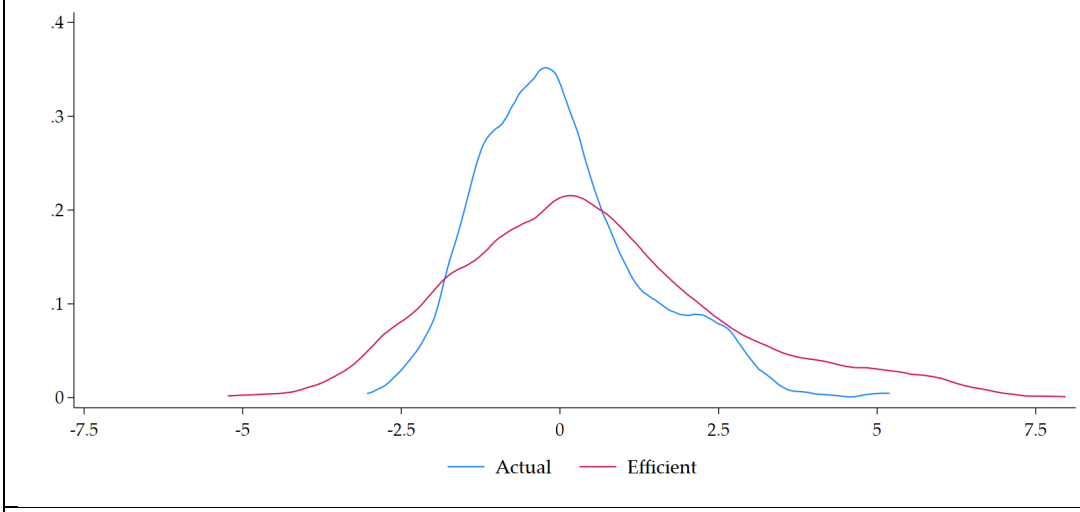
Figure 10



Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) Survey.

Note: Values reflect the weighted country-sector relative ratio of the standard deviation of $\left(\frac{MRPK_{csi}}{\alpha_s}\right)^{\alpha_s}$ and $\left(\frac{MRPL_{csi}}{1-\alpha_s}\right)^{1-\alpha_s}$.

Figure 11



Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.

Note: Firm size is given by value added. Log deviation is calcuated from the country-sector average.

To get a better sense of where firms are shifting between the two distributions, we track the movements by initial firm size percentiles into relative firm size brackets (Table 3 & Figure 12). We find across the entire distribution, firms become larger on average in the efficient allocation, where 36.1 percent of firms become smaller, and 63.9 percent of firms become larger. By initial firm size decile groups, we find that small firms are generally equally

spread between becoming smaller and larger, but as the decile groups increase, this becomes more dominated towards firms becoming larger. Thus, both inefficiently too small and too large firms exist, but the Caribbean region would benefit from firms becoming larger on average. At the upper end of the distribution, the largest 20 percent of firms are set to become substantially larger, with significant weight in the 300 percent plus category. As to be seen in Table 4, this is reflective of these firms being highly productive and thus they should expand their operations in the efficient scenario.

Table 3

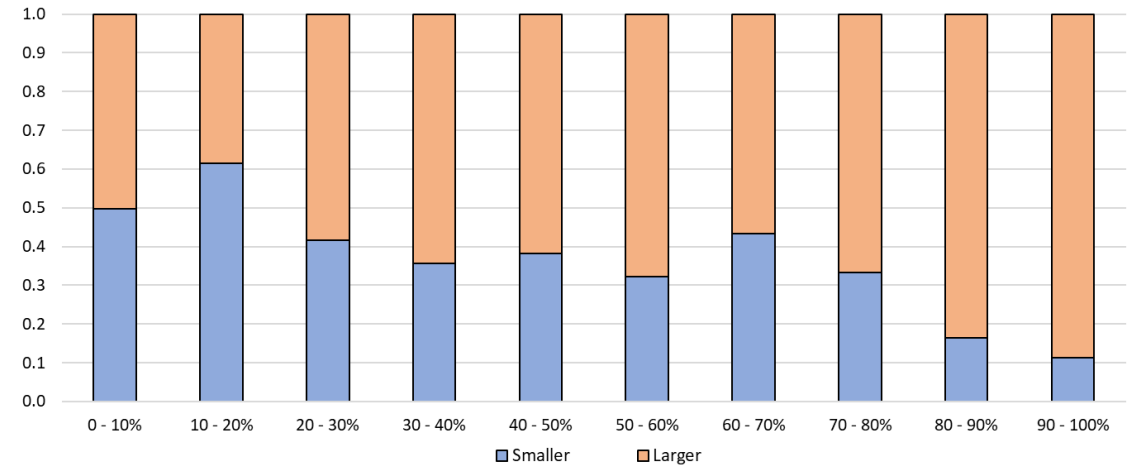
Change in Firm Size in the Efficient Allocation

	Smaller				Larger			
From (percentile) / To (relative size)	**0 - 25%**	**25 - 50%**	**50 - 75%**	**75 - 100%**	**100 - 150%**	**150 - 200%**	**200 - 300%**	**300%+**
	Percent							
0 - 10%	11.2	17.8	9.7	8.6	16.9	11.0	8.9	11.1
10 - 20%	10.3	27.4	10.9	12.8	10.2	3.6	10.9	13.7
20 - 30%	10.9	17.6	4.2	8.6	9.6	11.4	13.2	23.9
30 - 40%	4.1	11.5	9.9	10.2	13.5	14.2	14.2	22.5
40 - 50%	9.4	11.3	14.2	5.0	16.0	7.0	9.6	31.7
50 - 60%	6.6	7.5	8.0	8.7	10.8	15.1	15.1	23.8
60 - 70%	9.1	9.0	10.9	14.5	13.0	5.7	12.9	25.0
70 - 80%	1.5	8.5	12.2	10.8	19.3	13.2	6.9	26.9
80 - 90%	2.4	4.2	6.5	3.3	9.8	11.0	13.6	48.6
90 - 100%	1.1	3.7	4.0	3.3	9.7	11.1	9.7	64.2
Average	6.7	11.8	9.0	8.6	12.9	10.3	11.5	29.2
Total	36.1				63.9			

Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Firm size is given by value added.

Figure 12

Proportion of Firms in the Efficient Allocation by Initial Firm Size Percentiles
(Relative ratio)



Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Firm size is given by value added.

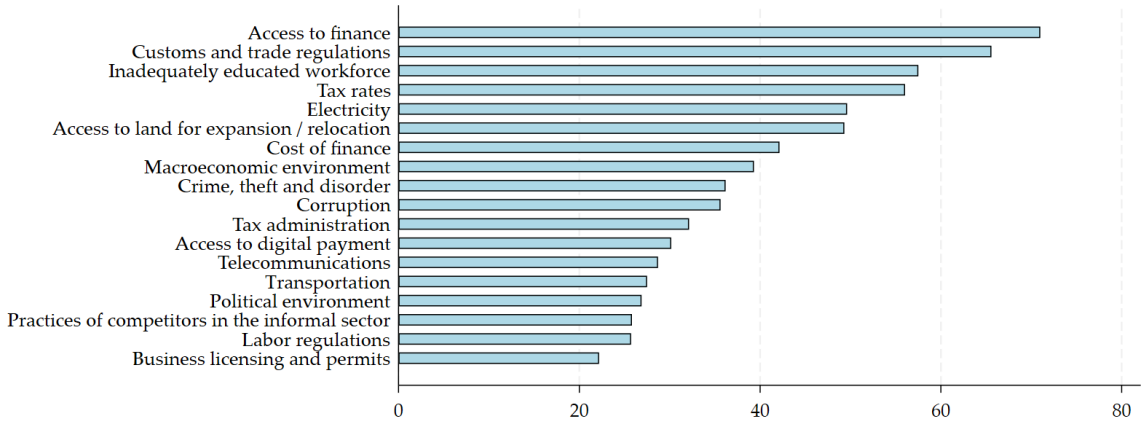
To identify the potential firm-specific distortions producing misallocation and inefficient firm size, we exploit the survey on the structural obstacles rated and ranked by firms that affect their operations. We find the top obstacles

among firms rated as major or very severe in the Caribbean are: “Access to finance”, “Customs and trade regulations”, and “Inadequately educated workforce” (Figure 13a). These account for 71 percent, 66 percent, and 58 percent of reporting firms, respectively, highlighting that the majority of firms are experiencing these issues. In an alternative specification, we look at the obstacles ranked by firms as their most serious, where they have a choice of only one obstacle, and we find the same top three obstacles. The order changes to “Inadequately educated workforce”, “Access to finance’, and “Customs and trade regulations” (Figure 13b). Conversely, the least impactful major or very severe obstacles are “Practices of competitors in the informal sector”, “Labor regulations”, and “Business licensing and permits”, while the least most serious obstacles are “Labor regulations”, “Tax administration”, and “Access to digital payment”. These results are in line with the literature where human capital and access to finance are important for Caribbean firms (Donhert et al., 2017; Acevedo et al., 2023; Rosenblatt et al., 2024). On the access to finance obstacle, aggregate private sector credit to GDP is low in the Caribbean compared to similar economies, including relative to the Pacific Island small states. The survey shows that Caribbean firms rely mostly on short-term financing options. On average, only 16 percent of firms rely on medium/long-term loans for financing. This suggests that access to finance is a prevalent and severe issue in the region.

At the country level, we find the top three obstacles are largely aligned with the Caribbean-wide results, although some variations exist (Figure A4 in the Appendix). For example, “Electricity” shows up as a major or very severe obstacle in Antigua and Barbuda, Guyana, St. Vincent and the Grenadines, and Suriname. Obstacles related to “Access to land for expansion / relocation” is an issue in The Bahamas and Dominica, while “Crime, theft and disorder” in reported by firms in Jamaica. For the top three most serious obstacles, we similarly find it is representative of the Caribbean-wide results, with a few differences in some countries (Figure A5 in the Appendix).

Figure 13a

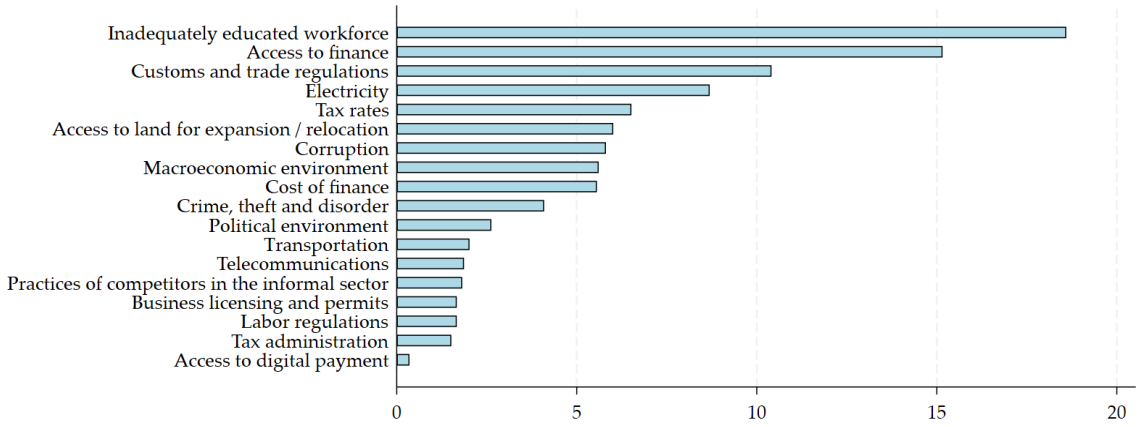
Rated Obstacles in the Caribbean
(In percent)



Source: Authors’ calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Values reflect the percent of firms who answered “major” or “very severe” to each obstacle.

Figure 13b

Ranked Obstacles in the Caribbean
(In percent)



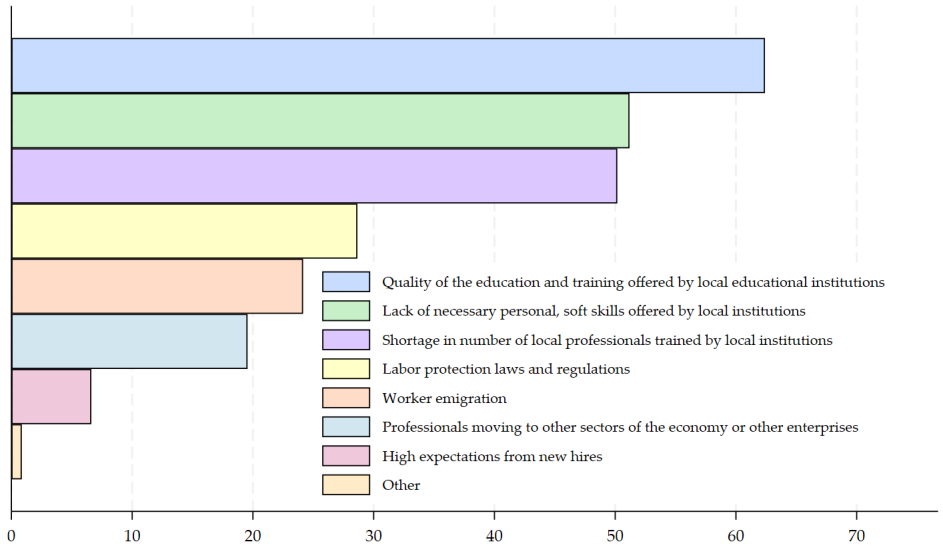
Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Values reflect the distribution of firms who chose one of 18 obstacles as their "most serious".

The finding that "Inadequately educated workforce" is a top obstacle in the Caribbean region and throughout the countries highlights that issues regarding human capital affect firms' operations. This matches the results of the declining contributions of human capital to potential growth. To understand the underlying causes of the lack of human capital, we explore answers provided by firms in the survey on the reasons behind a lack of skilled labor (Figure 14). The survey question asks: "Please specify the importance of the following factors in causing skills shortages for your establishment". We find that the top reasons reported by firms, those citing them as very important or critical are: "Quality of the education and training offered by local educational institutions", "Lack of necessary personal, soft skills offered by local institutions", and "Shortage in number of local professionals trained by local institutions". These reasons are reported by the majority of firms, at 62 percent, 51 percent, and 50 percent, respectively. The answers highlight that local institutions play a critical role, where they are not producing a trained workforce up to the standards required by firms on the quality of education, the training of soft skills, and the quantity of labor produced. In contrast, other factors are considered less important by firms and reported by a minority of them. These include: "Labor protection laws and regulations", "Worker emigration", "Professionals moving to other sectors of the economy or other enterprises", "High expectations from new hires", and "Other".

At the country level, we find the results are broadly similar (Figure A6 in the Appendix). The consistently top-rated issue is the "Quality of the education and training offered by local educational institutions". In Belize and Suriname, we also find "Labor protection laws and regulations" reaching the top three reasons. We do not find evidence of "Worker emigration" being stated as a top reason, where it lies mostly in the middle or bottom range of answers across countries. Overall, from a human capital perspective, the evidence here suggests that to increase human capital's contribution to potential growth, it is necessary to focus on creating new and upskilling educational opportunities and to invest in local institutions to maintain high quality education.

Figure 14

Causes of Labor Skills Shortages in the Caribbean
(In percent)



Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Values reflect the percent of firms who answered "very important" or "critical" to each factor.

To determine the link between the structural obstacles and firm performance, we regress each firm's productivity on firm controls and dummy variables representing each obstacle. In this case, aggregate TFP may be suppressed not only from misallocation, but also from a poor business environment that inhibits firm innovation and technological progress. The regression specification is given by:

$$ln(TFPQ_{csi}) = \beta_0 + \sum_{k=1}^{5} \beta_k X_{ki} + \sum_{d=1}^{18} \gamma_d O_{di} + \sum_{c=1}^{13} \sum_{s=1}^{2} \mu_{cs}, \qquad (1)$$

where $TFPQ_{csi}$ is physical total factor productivity, X_{ki} are firm controls (employment, age, capacity utilization rate, a dummy if the firm is majority foreign owned, and a dummy if the firm has a research department), O_{di} are dummy variables for each of the 18 obstacles (equal to one if the obstacle is major or very severe, and zero otherwise), and μ_{cs} are country-sector fixed effects. The regression includes robust standard errors clustered at the country-sector level. Since the regression is cross-sectional, we identify the coefficients by exploiting the variation within each country-sector strata between firms who face and do not face the obstacles and their associated firm performance. The coefficients of interest are γ_d, which provide the associated impact of the obstacles. It is expected that if the obstacles impact firm productivity, the coefficients γ_d would show up as significantly negative, implying the obstacles are associated with lower performance.

Although the regression in (1) exploits within country-sector variation and includes firm controls, the specification may be prone to endogeneity issues from either omitted variables, for example other firm-specific variables such as management quality that, if panel data was available, could be absorbed by firm-fixed effects, or from reverse causality. For firms with low productivity, obstacles such as the cost and access to finance may reflect banks'

reluctance to lend to these poorly performing firms, rather than the obstacles themselves inhibiting productivity. This causality may also occur simultaneously in both directions such that firms become stuck in a low productivity state with entrenched obstacles. With these considerations in mind, the results should be interpreted as associations between firm productivity and the obstacles, rather than a causal relationship.

Before turning to the regression results, we first regress each firm's $TFPQ_{csi}$ on dummy variables representing decile groups, D_p, of value added, employment, and age. This specification includes country-sector fixed effects, μ_{cs}, and robust standard errors, which are clustered at the country-sector level.

$$ln(TFPQ_{csi}) = \beta_0 + \sum_{p=1}^{10} \beta_p D_p + \sum_{c=1}^{13} \sum_{s=1}^{2} \mu_{cs}. \qquad (2)$$

The coefficient estimates denote the average increase in firm productivity by each decile group of firm size and age relative to the omitted decile (0-10 percent). We find in Table 4 that firm productivity is strongly linked with larger and older firms. The estimated coefficients strictly increase, whereby larger firms in terms of value added or employment, and older firms, are more productive. At the top decile group, 90-100 percent, we find that these firms are more than 200 percentage points more productive relative to the lowest decile. This highlights that productivity increases along size and age dimensions, and that there is dispersion in the productivity distribution. It suggests that one way to increase productivity would be to encourage firms to scale larger. This matches the previous results from the efficient firm size distribution where the largest firms are set to grow under the efficient scenario (Table 3 & Figure 12). They are also in line with the literature that productivity and firm size are positively correlated (Leung et al., 2008 for Canada; Dieppe (2021) for cross-country evidence). We find that productivity and firm size are positively related in the Caribbean region as well.

Table 4

Firm Productivity on Percentiles Regressions
(Estimates)

	Value Added	Employment	Age
Decile 90 - 100%	2.727***	2.074***	2.478***
	(0.098)	(0.114)	(0.071)
Decile 80 - 90%	1.762***	1.321***	2.063***
	(0.078)	(0.107)	(0.065)
Decile 70 - 80%	1.356***	0.835***	1.769***
	(0.078)	(0.080)	(0.066)
Decile 60 - 70%	1.238***	0.779***	1.536***
	(0.075)	(0.117)	(0.067)
Decile 50 - 60%	1.012***	0.532***	1.384***
	(0.066)	(0.077)	(0.066)
Decile 40 - 50%	0.875***	0.609***	1.253***
	(0.087)	(0.096)	(0.066)
Decile 30 - 40%	0.693***	0.481***	1.046***
	(0.068)	(0.075)	(0.067)
Decile 20 - 30%	0.554***	0.277***	0.853***
	(0.060)	(0.094)	(0.065)
Decile 10 - 20%	0.282***	0.146	0.608***
	(0.070)	(0.095)	(0.066)
Decile 0 - 10%	Omitted	Omitted	Omitted
Intercept	5.311***	5.650***	1.742***
	(0.056)	(0.066)	(0.060)
Country-Sector Fixed Effects	Yes	Yes	Yes
Adjusted R-squared	0.68	0.48	0.93
Observations	1,775	1,775	1,775

Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: *** p < .01, ** p < .05, * p < .1.

Turning to the association of obstacles with firm productivity, Table 5 presents the regression results. We break up the analyses into nine buckets: all firms, small firms (≤ 20 employees), large firms (> 20 employees), young firms (≤ 20 years old), old firms (> 20 years old), small and old firms (≤ 20 employees & > 20 years old), large and old firms (> 20 employees & > 20 years old), small and young firms (≤ 20 employees & ≤ 20 years old), and large and young firms (> 20 employees & ≤ 20 years old). In creating these buckets, we are mindful of the distribution of firms across size and age groups in Table 2, and that each bucket has a sufficient number of observations.

We find among all firms that "Cost of finance" and "Tax administration" are significantly associated with lower firm productivity by about 11 and 10 percentage points, respectively, while "Business licensing and permits" and "Inadequately educated workforce" are estimated around 8.5 and 5 percentage points, respectively. On the first obstacle, this suggests that firms may suffer from high costs to credit, which limits their ability to invest and scale up to their most efficient size. This is supported by complementary evidence in the survey, where we calculate the average interest rate on various debt instruments. We find that the average interest rate on a line of credit, overdraft facility, credit card, and medium/long-term loans are equal to 11 percent, 10 percent, 20 percent, and

13 percent, respectively. These values are high by international standards, where the global median interest rate was 4 percent for small- and medium-sized enterprises in 2018 (OECD, 2020). This suggests that the cost of finance for firms is relatively severe in the Caribbean region.

On the second obstacle, issues related to tax administration can point to an inefficient tax regime that is cumbersome for firms to fill out and submit, such as paper-based forms as opposed to electronic filing, as well as other issues such as delays in receiving VAT refunds which can impact firms' liquidity positions. As matched by the previous results that workforce education is an important obstacle facing firms, we find it is also associated with lower firm productivity. For business licensing and permits, this obstacle may reflect issues regarding accessing the necessary permits to run a business or expand operations, which would limit a firm's ability to scale up and take advantage of new opportunities.

Among small firms, we find both "Cost of finance" and "Access to finance", as well as "Tax administration" and "Inadequately educated workforce", are linked to lower productivity. Therefore, in addition to costs, financial access is also associated with lower productivity among small firms. Firms that are small may have relatively low collateral, and face issues regarding documentation and financial literacy to acquire loans. The regression estimates of these four obstacles have greater magnitudes compared to all firms, implying small firms are relatively more affected. For large firms, the estimates become insignificant. This is indicative of firm size playing an important role in overcoming the obstacles.

For young firms, we find "Business licensing and permits" shows up as a significant obstacle, which suggests that new firms starting out face issues regarding getting regulatory approval and this is correlated with their performance. As expected, the group displaying the most severe obstacles are small and young firms. They present significant estimates along "Access to finance", "Tax administration", "Business licensing and permits", and "Labor regulations". The magnitudes of these estimates are the largest compared to all of the other buckets, where firm productivity declines by around 23, 20, 16 and 13 percentage points, respectively. These results are in line with the literature where small and young firms are relatively financially constrained (Hadlock and Pierce, 2010; Amundsen et al., Forthcoming), which can limit their ability to conduct productivity-enhancing investments such as research and development. Among old firms, we continue to find "Cost of finance" to be an issue, and in this case, also "Transportation" becomes significant, suggesting that firms that have operated for longer may be suffering from issues around infrastructure and this is linked to lower productivity. Finally, for large and old firms, and large and young firms, we find no obstacles are significant, consistent with larger firms having grown out or adapted to the obstacles they face.

Table 5

Firm Productivity on Obstacles Regressions

(Estimates)

	All	Small	Large	Young	Old	Small & Old	Large & Old	Small & Young	Large & Young
Crime, theft and disorder	-0.043	-0.065	-0.005	-0.033	-0.056	-0.098	-0.017	-0.039	-0.005
	(0.041)	(0.056)	(0.060)	(0.059)	(0.050)	(0.062)	(0.076)	(0.070)	(0.099)
Business licensing and permits	-0.085*	-0.093	-0.031	-0.121**	-0.030	0.008	0.002	-0.163*	-0.032
	(0.047)	(0.057)	(0.074)	(0.054)	(0.067)	(0.098)	(0.107)	(0.081)	(0.082)
Inadequately educated workforce	-0.052*	-0.073*	-0.014	-0.026	-0.067	-0.096	-0.004	-0.075	0.050
	(0.028)	(0.042)	(0.061)	(0.052)	(0.049)	(0.059)	(0.094)	(0.063)	(0.110)
Cost of finance	-0.114***	-0.142**	-0.060	-0.051	-0.177***	-0.224***	-0.091	-0.090	-0.037
	(0.037)	(0.053)	(0.051)	(0.058)	(0.045)	(0.052)	(0.078)	(0.077)	(0.093)
Access to finance	-0.026	-0.081**	0.028	-0.124*	0.066	0.053	0.081	-0.231***	-0.030
	(0.037)	(0.037)	(0.058)	(0.061)	(0.050)	(0.072)	(0.068)	(0.064)	(0.092)
Telecommunications	0.018	-0.001	0.028	0.041	-0.021	-0.104*	-0.003	0.027	0.056
	(0.044)	(0.042)	(0.067)	(0.062)	(0.056)	(0.060)	(0.086)	(0.068)	(0.097)
Electricity	0.068	0.025	0.074	0.089	0.017	-0.029	0.026	0.057	0.059
	(0.048)	(0.035)	(0.086)	(0.062)	(0.063)	(0.058)	(0.095)	(0.054)	(0.117)
Transportation	-0.029	-0.009	-0.074	0.060	-0.137**	-0.161	-0.121	0.110*	-0.069
	(0.040)	(0.046)	(0.063)	(0.052)	(0.065)	(0.094)	(0.090)	(0.056)	(0.110)
Access to land for expansion / relocation	0.037	-0.013	0.094	0.062	0.031	-0.069	0.035	0.027	0.138
	(0.036)	(0.045)	(0.063)	(0.045)	(0.049)	(0.065)	(0.074)	(0.050)	(0.095)
Tax rates	0.012	-0.012	0.033	0.064	-0.037	-0.092	0.023	0.047	0.126
	(0.038)	(0.046)	(0.051)	(0.052)	(0.047)	(0.063)	(0.062)	(0.065)	(0.094)
Tax administration	-0.099**	-0.168**	-0.025	-0.139***	-0.047	-0.112	0.034	-0.199***	-0.093
	(0.044)	(0.062)	(0.061)	(0.049)	(0.062)	(0.088)	(0.064)	(0.065)	(0.101)
Customs and trade regulations	0.016	0.008	0.051	-0.033	0.060	0.069	0.113	-0.048	0.044
	(0.032)	(0.054)	(0.058)	(0.042)	(0.048)	(0.062)	(0.081)	(0.057)	(0.100)
Labor regulations	-0.004	-0.039	0.053	-0.063	0.063	0.054	0.109	-0.126*	-0.003
	(0.050)	(0.050)	(0.076)	(0.069)	(0.063)	(0.074)	(0.076)	(0.065)	(0.115)
Political environment	0.007	0.060	-0.079	0.008	0.018	0.061	-0.036	0.057	-0.025
	(0.029)	(0.043)	(0.074)	(0.053)	(0.048)	(0.062)	(0.093)	(0.076)	(0.110)
Macroeconomic environment	-0.062	-0.048	-0.071	-0.035	-0.071	-0.031	-0.150	-0.050	0.086
	(0.051)	(0.061)	(0.071)	(0.054)	(0.068)	(0.079)	(0.098)	(0.075)	(0.097)
Corruption	-0.040	-0.049	-0.019	-0.058	-0.048	-0.084	-0.023	-0.046	-0.041
	(0.030)	(0.040)	(0.065)	(0.047)	(0.053)	(0.082)	(0.073)	(0.066)	(0.101)
Practices of competitors in the informal sector	0.015	-0.029	0.075	0.008	0.007	-0.008	0.010	-0.073	0.119
	(0.037)	(0.061)	(0.047)	(0.053)	(0.058)	(0.084)	(0.071)	(0.064)	(0.120)
Access to digital payment	0.078	0.083	0.053	0.085	0.097	0.146	0.038	0.090	0.116
	(0.048)	(0.059)	(0.077)	(0.059)	(0.063)	(0.087)	(0.116)	(0.073)	(0.110)
Intercept	4.924***	5.166***	4.441***	4.846***	5.012***	5.519***	4.204***	4.852***	4.836***
	(0.219)	(0.283)	(0.411)	(0.315)	(0.339)	(0.507)	(0.470)	(0.510)	(0.696)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.49	0.24	0.48	0.46	0.52	0.25	0.51	0.25	0.46
Observations	1,775	1,065	710	872	903	493	410	572	300

Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.

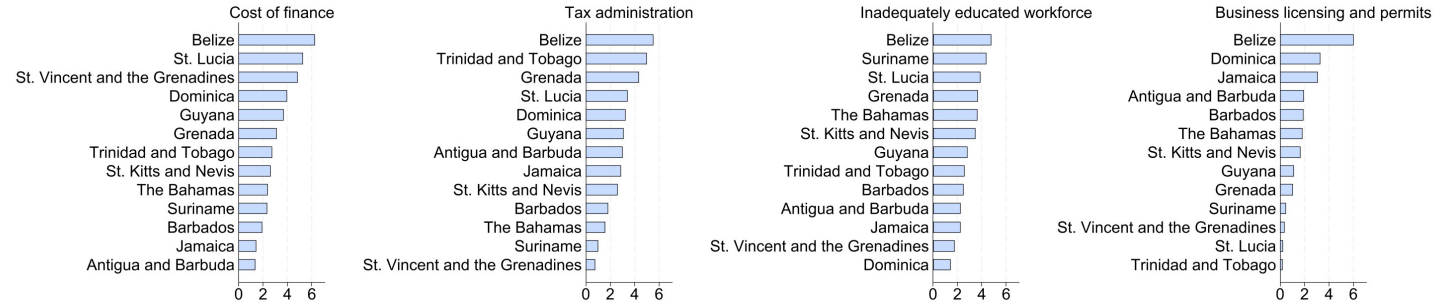
Note: Small firms have less than or equal to 20 employees, while large firms have greater than 20 employees. Young firms are those less than or equal to 20 years old, while old firms are those greater than 20 years old. *** p < .01, ** p < .05, * p < .1.

To understand the effect of these firm-level obstacles at the aggregate level, we utilize the Hsieh and Klenow (2009) framework to estimate the aggregate TFP outcome. This is done by increasing each firm's $TFPQ_{csi}$ by the estimated γ_d to simulate as if each obstacle was removed (i.e., setting the dummy to zero for all firms). We then apply the aggregator formula using value added and sectoral weights and calculate the increase in aggregate output Y_c.

The results show moderate gains from the removal of each significant obstacle among all firms (Figure 15). Removing "Cost of finance" would imply gains ranging from around 1.5 percent in Antigua and Barbuda to 6 percent in Belize. Similarly for the other obstacles, Belize has the largest gain for "Tax administration", "Inadequately educated workforce" and "Business license and permits" at around 5.5 percent, 5 percent, and 6 percent, respectively. In other countries, the gains are more modest, varying from close to zero to around 5 percent. These gains to aggregate TFP reflect the combined impact of the estimated coefficient, the number of firms reporting it as an obstacle, and the value added and sectoral weights.

Figure 15

Aggregate TFP Gain from Removing Firm-Level Obstacles
(In percent)



Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.

In Table 6, we present the total gains, taken as a simple sum, of the individual aggregate effects. At the 5 percent significance level, where "Cost of finance" and "Tax administration" are significant, we find total gains ranging from 3 percent in Suriname to 12 percent in Belize. At the 10 percent significance level, where "Inadequately educated workforce" and "Business license and permits" are also included, the total gains range from 8 percent in St. Vincent and the Grenadines to 23 percent in Belize. While these results assume that the gains are additive, there could also be possible interactions, particularly complementarities, that could result in larger gains than presented here. For example, addressing the cost of finance could support investments into human capital which would also address workforce education.

Table 6

Combined Aggregate TFP Gain from Removing Firm-Level Obstacles
(In percent)

Countries	Significance	
	5 percent	10 percent
Antigua and Barbuda	4	9
Barbados	4	8
Belize	12	23
Dominica	7	12
Grenada	8	12
Guyana	7	11
Jamaica	4	10
St. Kitts and Nevis	5	10
St. Lucia	9	13
St. Vincent and the Grenadines	6	8
Suriname	3	8
The Bahamas	4	9
Trinidad and Tobago	8	11

Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.

Conclusion

The Caribbean economies have experienced a decline in both economic growth and medium-term growth prospects in recent decades. Five-year-ahead growth forecasts have dropped from around 3.5 percent to 2 percent, with actual growth following a similar downward trend. This paper offers new insights behind these developments by providing estimates of potential GDP growth for the Caribbean region, using macroeconomic and firm-level data in a complementary way. Our findings indicate that potential growth is declining in the region, driven by declining contributions of TFP and human capital. From a micro perspective, we identify significant scope for resource reallocation between firms, with aggregate TFP increasing between 34 and 107 percent depending on the country. Structural obstacles such as workforce education, cost and access to finance, tax administration, and business licensing and permits are found to be associated with lower firm productivity, with the effects on small and young firms relatively more severe. Assuming a causal relationship, the removal of these obstacles could increase aggregate TFP by between 8 and 23 percent across the region.

Appendix

Data on Five-Year-Ahead Growth Forecasts

We collect five-year-ahead forecasts on real GDP growth for the Caribbean countries from the IMF World Economic Outlook (WEO) database from 2007 onward. For historical data, the WEO database does not report real GDP growth prior to 2007. We derive historical real GDP growth from real GDP levels reported in the WEO. Additionally, we use IMF Staff Reports (SRs) as an alternative source of information. The following steps were taken to use information from SRs and adjust for potential anomalies.

Step 1. Identify an anomaly in the historical WEO from derived GDP growth rates in years that are 2.5 percentage points higher or 2.5 points lower than the previous year, or years in which the derived real GDP growth rates are zero.

Step 2. Replace the potential anomaly with information from the SR of the relevant year where available. The relevant year is five years before the year of the forecast (e.g., the 2006 forecast is based on the 2001 SR). If no SR was published for the relevant year, we replace the potential anomaly with the average from the SR in year t-2, t-1, t+1, and t+2, where available.

The table below provides the data points adjusted from the SRs.

Table A1

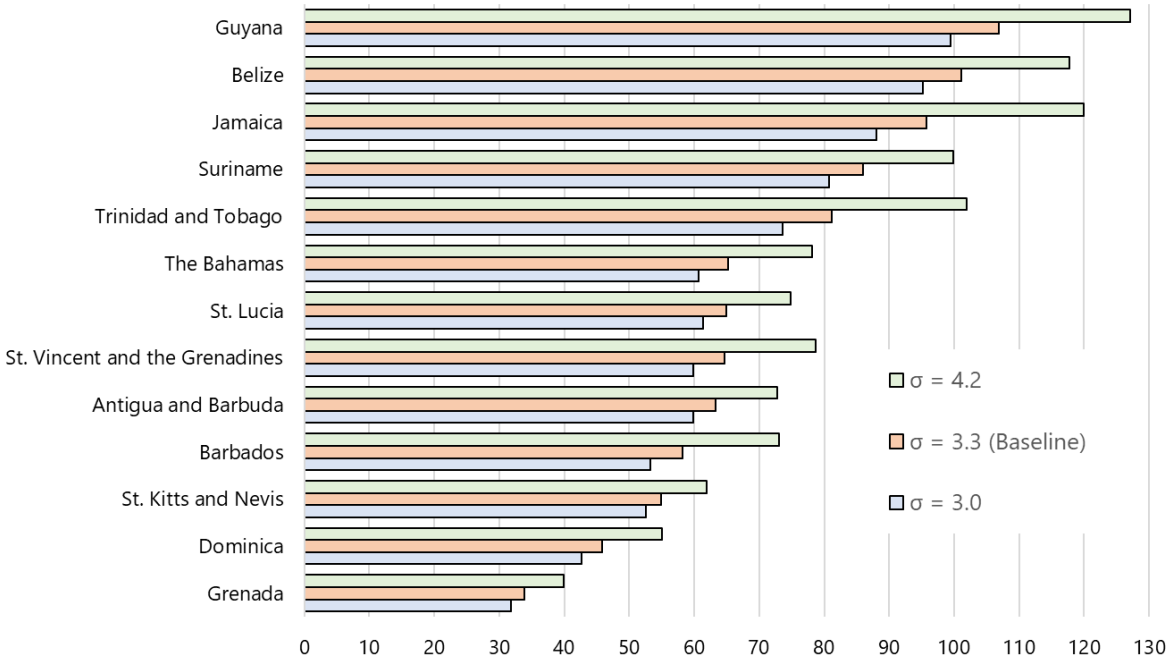
Adjustments for Five-Year-Ahead Growth Forecasts

Country	Five-Year-Ahead Forecast		Value	Adjusted Value	Source
	Year	WEO Vintage			
Antigua and Barbuda	2005	2000	5.50	1.23	SR Average t-2, t-1, t+1, t+2
	2006	2001	1.53	1.23	SR Average t-2, t-1, t+1, t+2
	2009	2004	0.00	1.60	SR 2004
	2010	2005	0.00	1.00	SR 2005
	2011	2006	0.00	4.50	SR 2006
Barbados	1995	1990	4.77	2.00	SR Average t+1,t+2 1/
Dominica	1996	1991	1.95	4.62	SR Average t-1, t+1, t+2 2/
Jamaica	2004	1999	0.00	1.50	SR 1999
St. Kitts and Nevis	2005	2000	2.00	4.20	SR 2000
St. Vincent and the Grenadines	1999	1994	2.60	5.30	SR Average t-2, t-1, t+1, t+2
	2007	2002	14.06	3.30	SR 2002
	2008	2003	0.00	1.80	SR 2003
	2009	2004	0.00	2.50	SR 2003
	2010	2005	0.00	2.50	SR 2005

Sources: IMF World Economic Outlook, IMF Staff Reports (SRs), and Authors' calculations.
1/ t-2 and t-1 are not available.
2/ t-2 is not available.

Figure A2

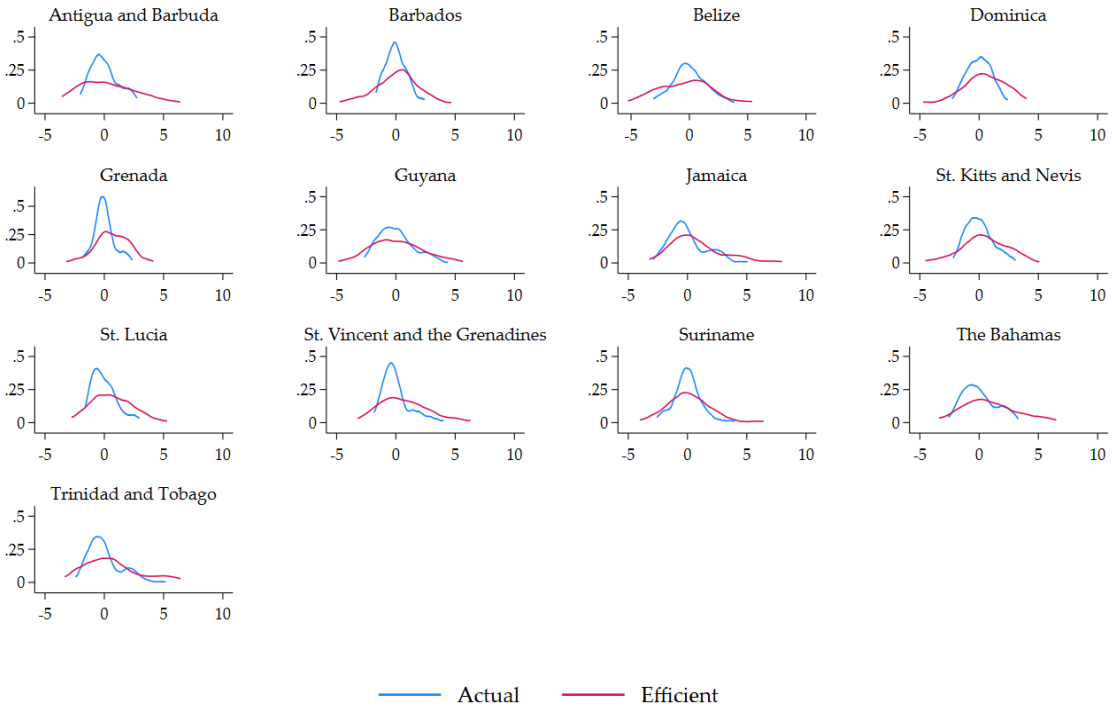
Aggregate TFP Gain through Resource Reallocation by Elasticity of Substitution
(In percent)



Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Values calculated using the baseline sample of firms.

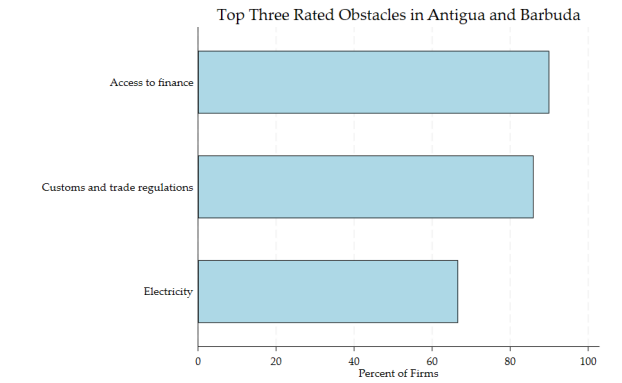
Figure A3

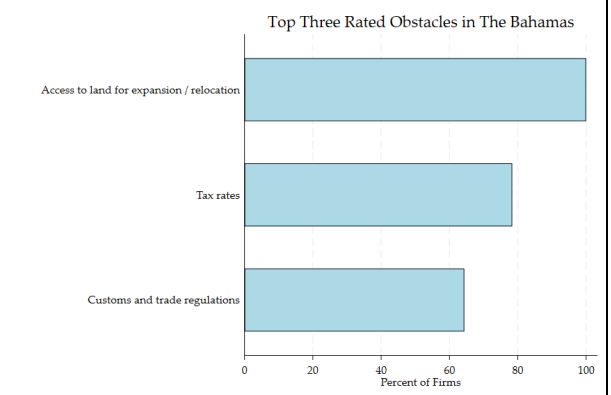
Actual vs. Efficient Firm Size Distribution by Country
(In log deviation)

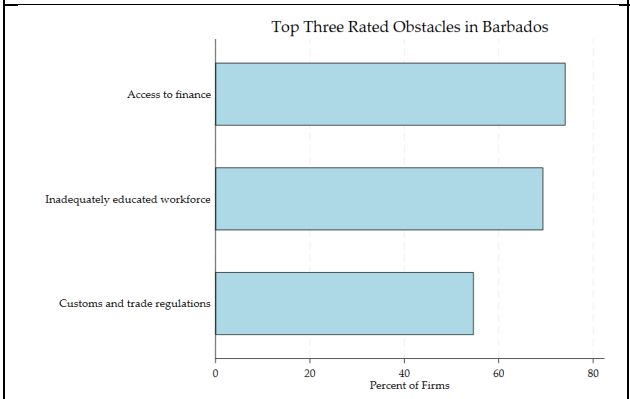


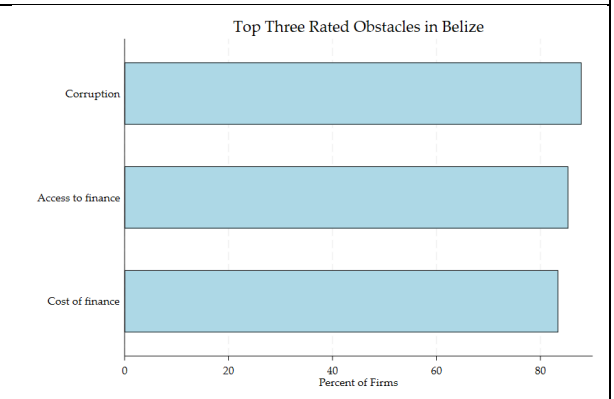
Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Firm size is given by value added. Log deviation is calcuated from the country-sector average.

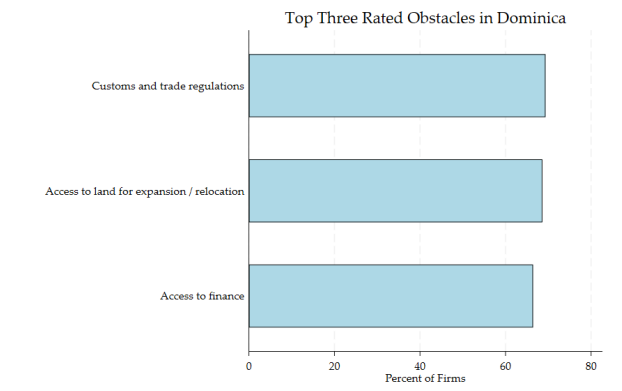
Figure A4

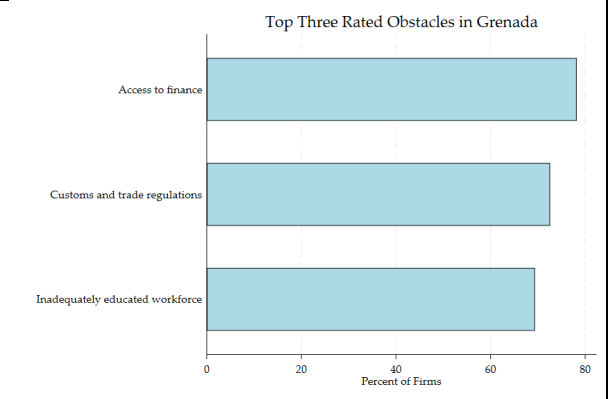

Top Three Rated Obstacles in Antigua and Barbuda
Access to finance
Customs and trade regulations
Electricity
0
20
40
60
80
100
Percent of Firms

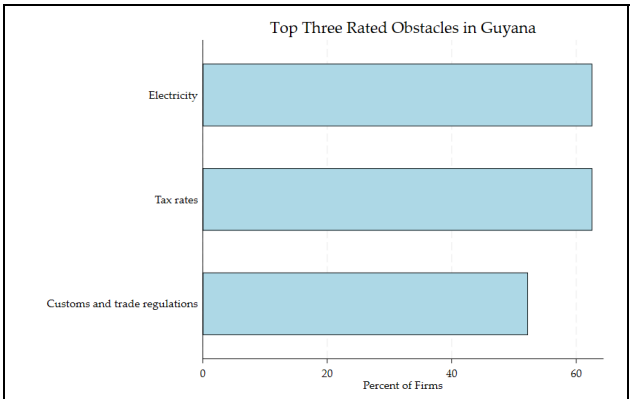

Top Three Rated Obstacles in The Bahamas
Access to land for expansion / relocation
Tax rates
Customs and trade regulations
0
20
40
60
80
100
Percent of Firms

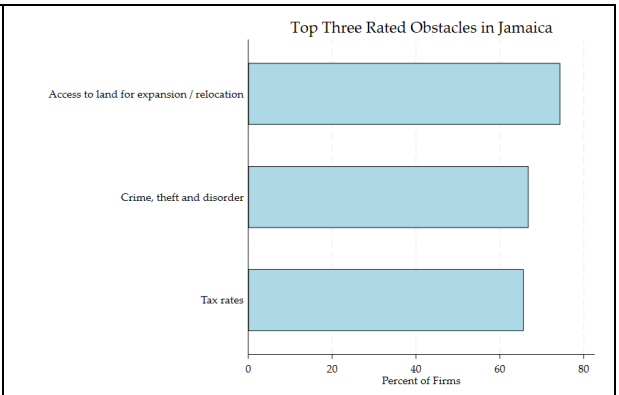

Top Three Rated Obstacles in Barbados
Access to finance
Inadequately educated workforce
Customs and trade regulations
0
20
40
60
80
Percent of Firms

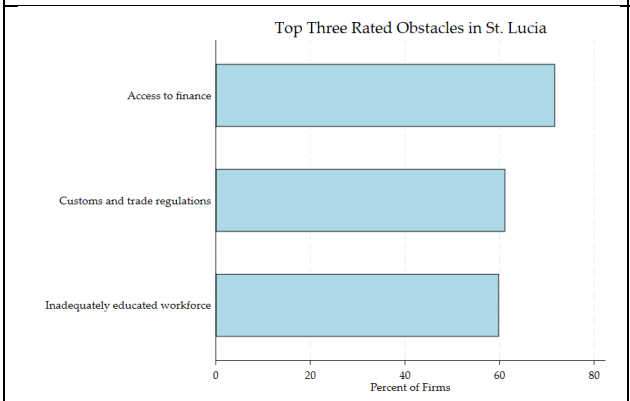

Top Three Rated Obstacles in Belize
Corruption
Access to finance
Cost of finance
0
20
40
60
80
Percent of Firms

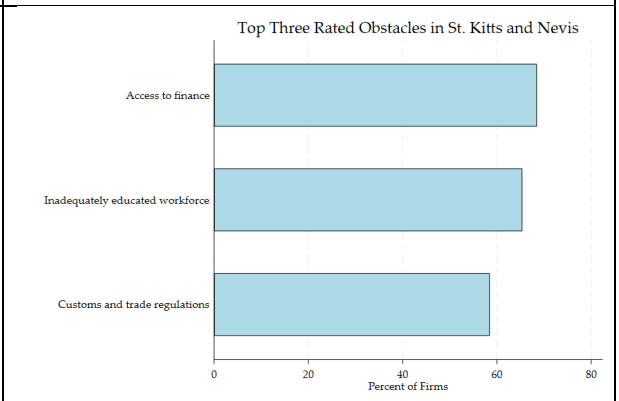

Top Three Rated Obstacles in Dominica
Customs and trade regulations
Access to land for expansion / relocation
Access to finance
0
20
40
60
80
Percent of Firms

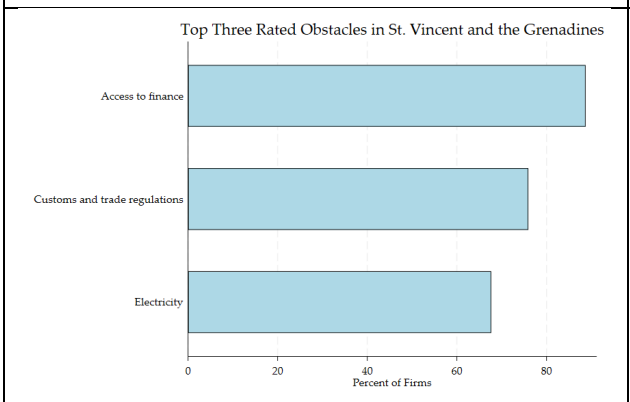

Top Three Rated Obstacles in Grenada
Access to finance
Customs and trade regulations
Inadequately educated workforce
0
20
40
60
80
Percent of Firms

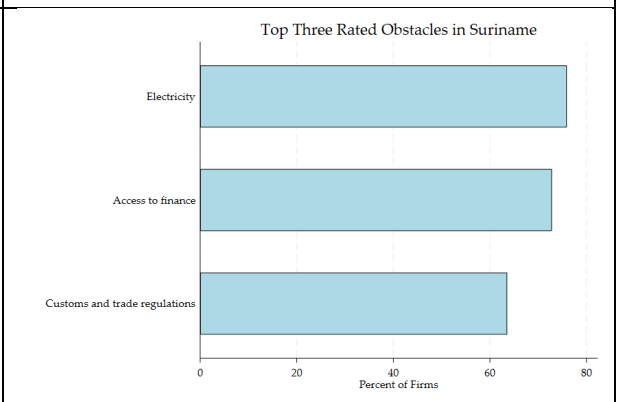


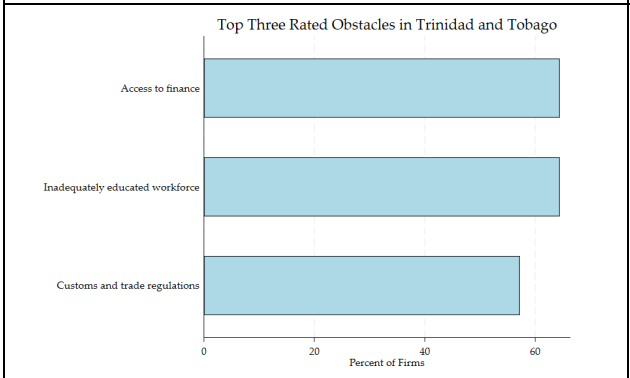






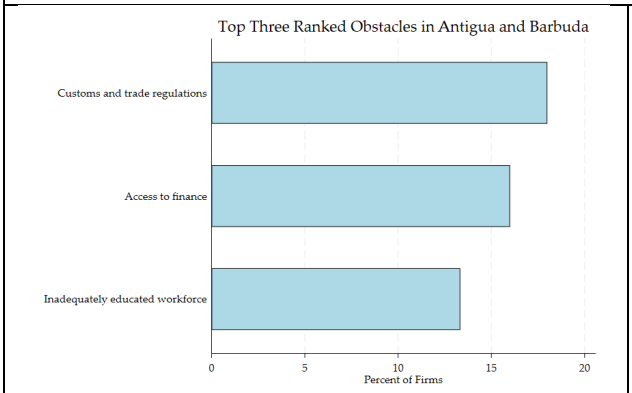


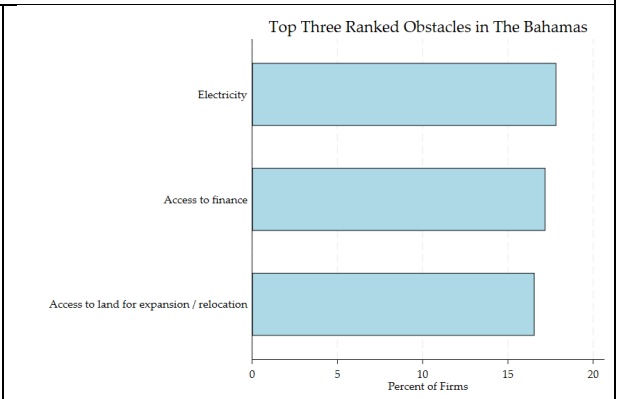


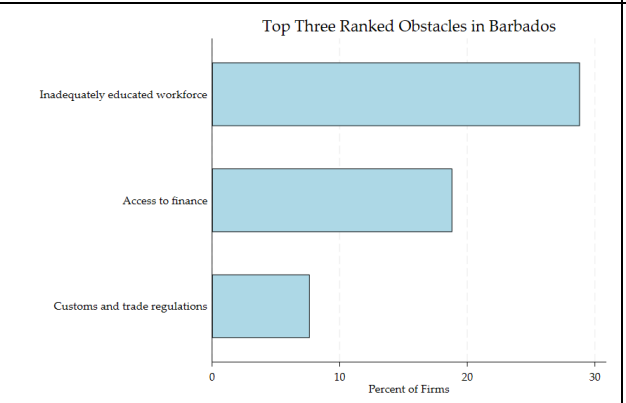


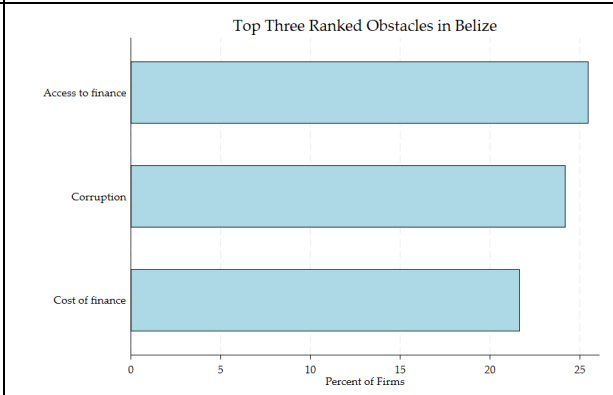
Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Values reflect the percent of firms who answered "major" or "very severe" to each obstacle.

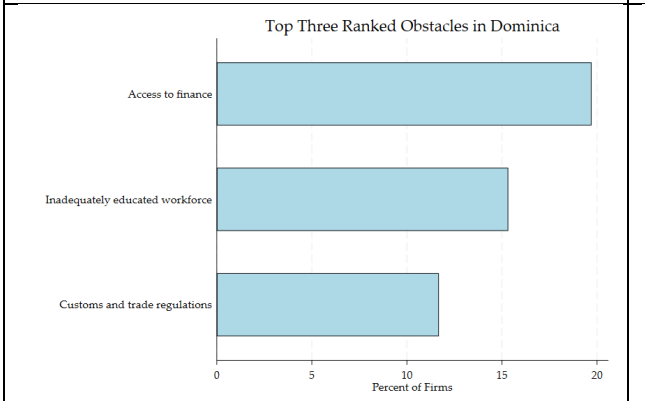
Figure A5

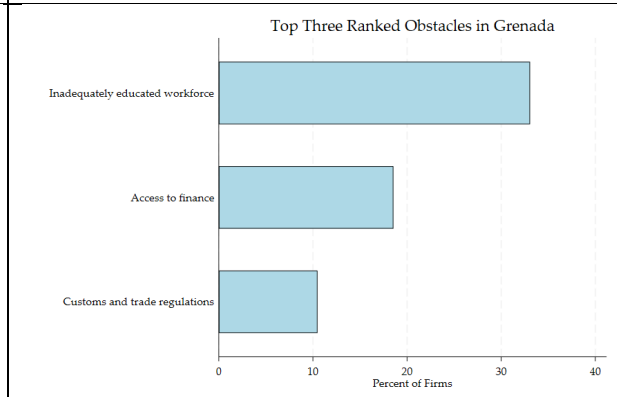

Top Three Ranked Obstacles in Antigua and Barbuda
Customs and trade regulations
Access to finance
Inadequately educated workforce
0
5
10
15
20
Percent of Firms

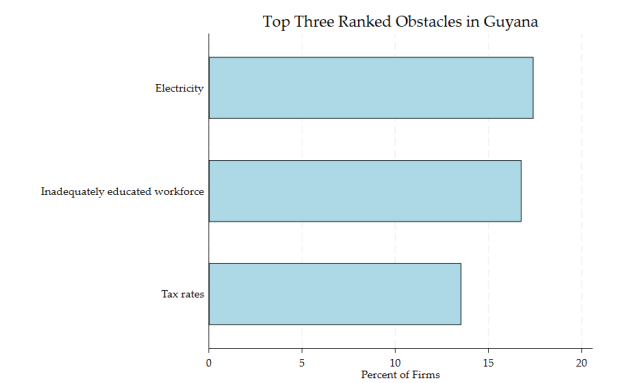

Top Three Ranked Obstacles in The Bahamas
Electricity
Access to finance
Access to land for expansion / relocation
0
5
10
15
20
Percent of Firms

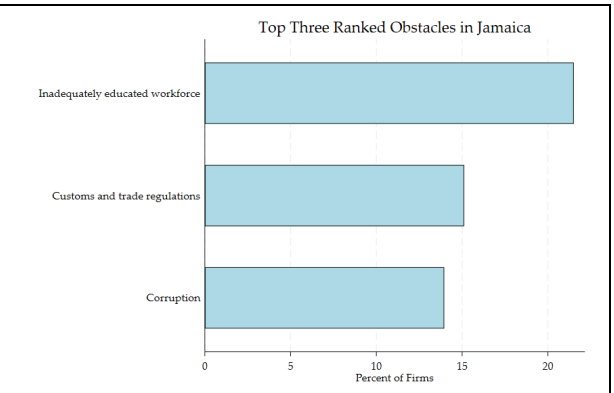

Top Three Ranked Obstacles in Barbados
Inadequately educated workforce
Access to finance
Customs and trade regulations
0
10
20
30
Percent of Firms

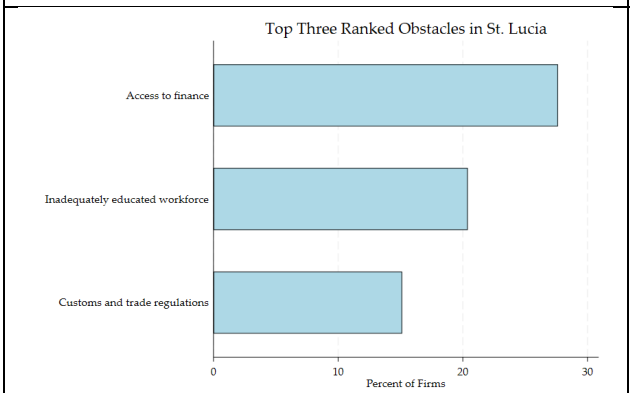

Top Three Ranked Obstacles in Belize
Access to finance
Corruption
Cost of finance
0
5
10
15
20
25
Percent of Firms

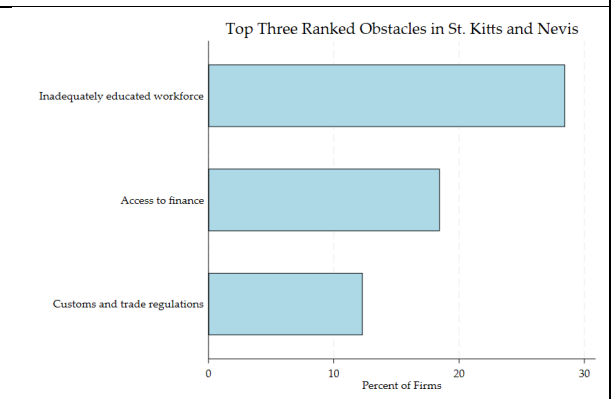

Top Three Ranked Obstacles in Dominica
Access to finance
Inadequately educated workforce
Customs and trade regulations
0
5
10
15
20
Percent of Firms

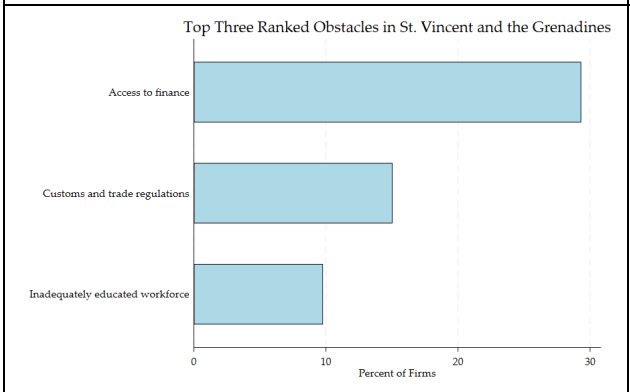

Top Three Ranked Obstacles in Grenada
Inadequately educated workforce
Access to finance
Customs and trade regulations
0
10
20
30
40
Percent of Firms

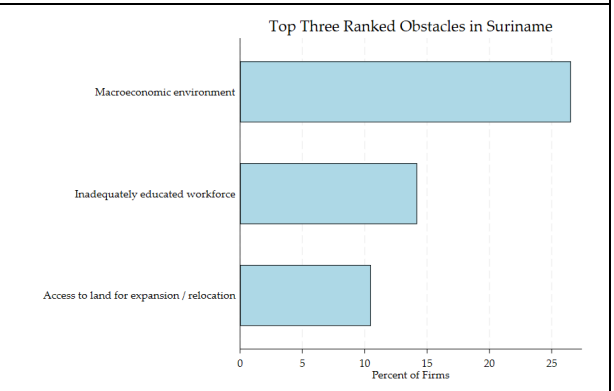


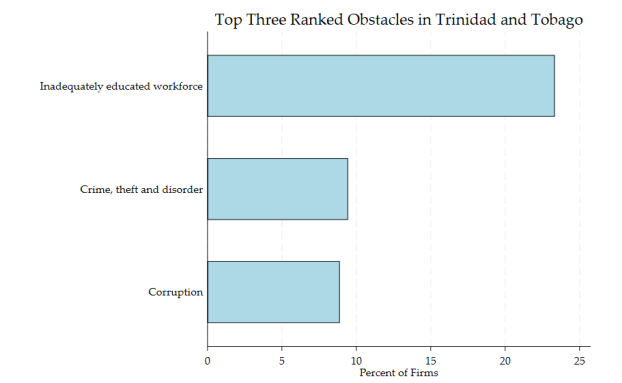






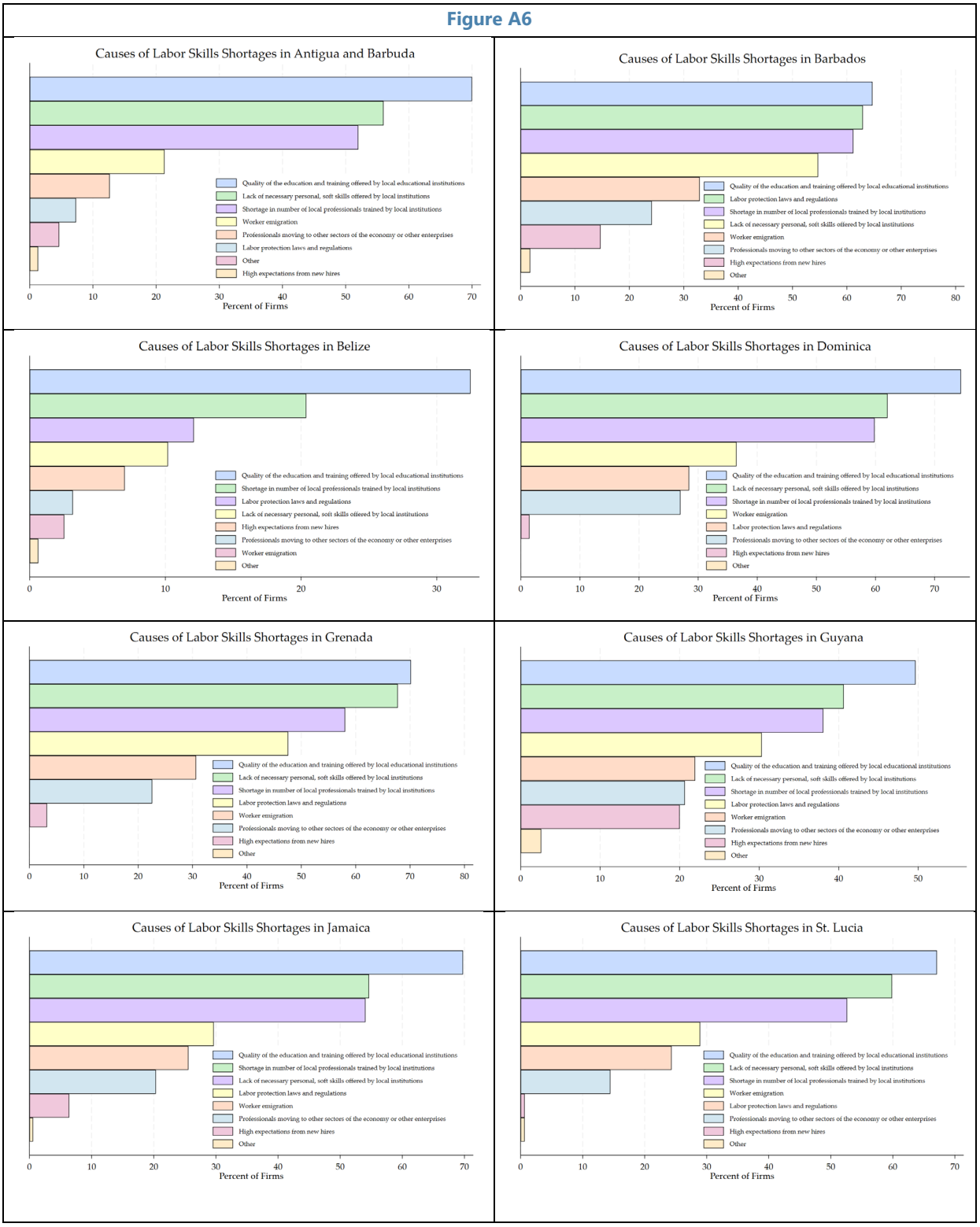


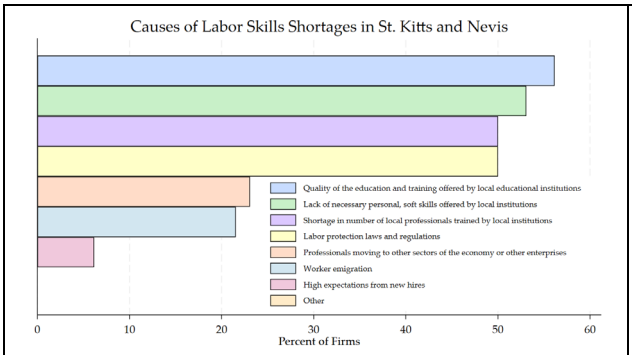


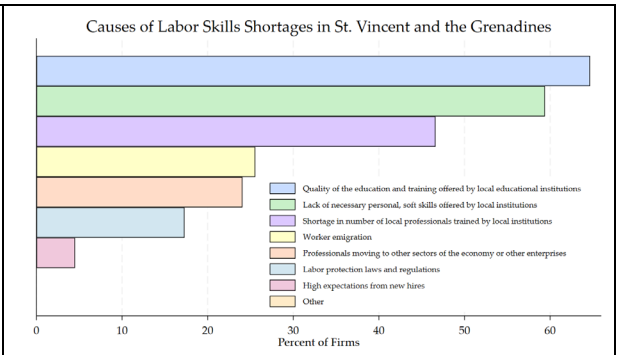


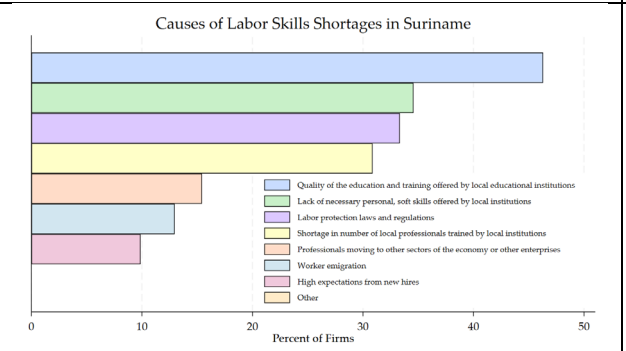
Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Values reflect the distribution of firms who chose one of 18 obstacles as their "most serious".

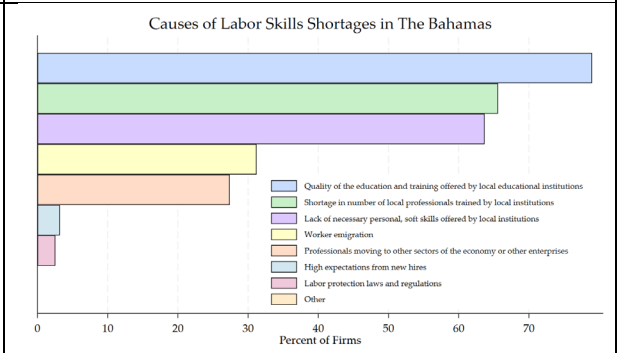
Figure A6

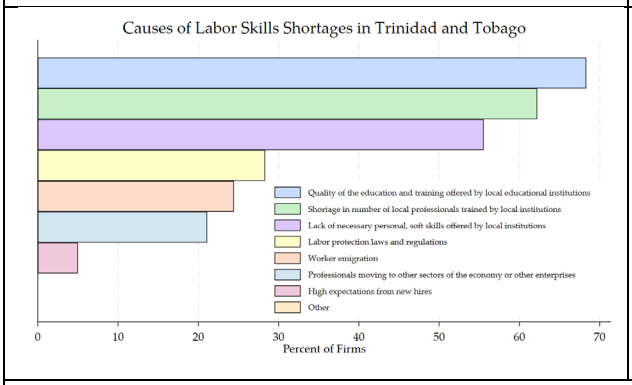

Causes of Labor Skills Shortages in Antigua and Barbuda
Quality of the education and training offered by local educational institutions
Lack of necessary personal, soft skills offered by local institutions
Shortage in number of local professionals trained by local institutions
Worker emigration
Professionals moving to other sectors of the economy or other enterprises
Labor protection laws and regulations
Other
High expectations from new hires
0 10 20 30 40 50 60 70
Percent of Firms
Causes of Labor Skills Shortages in Barbados
Quality of the education and training offered by local educational institutions
Labor protection laws and regulations
Shortage in number of local professionals trained by local institutions
Lack of necessary personal, soft skills offered by local institutions
Worker emigration
Professionals moving to other sectors of the economy or other enterprises
High expectations from new hires
Other
0 10 20 30 40 50 60 70 80
Percent of Firms
Causes of Labor Skills Shortages in Belize
Quality of the education and training offered by local educational institutions
Shortage in number of local professionals trained by local institutions
Labor protection laws and regulations
Lack of necessary personal, soft skills offered by local institutions
High expectations from new hires
Professionals moving to other sectors of the economy or other enterprises
Worker emigration
Other
0 10 20 30
Percent of Firms
Causes of Labor Skills Shortages in Dominica
Quality of the education and training offered by local educational institutions
Lack of necessary personal, soft skills offered by local institutions
Shortage in number of local professionals trained by local institutions
Worker emigration
Labor protection laws and regulations
Professionals moving to other sectors of the economy or other enterprises
High expectations from new hires
Other
0 10 20 30 40 50 60 70
Percent of Firms
Causes of Labor Skills Shortages in Grenada
Quality of the education and training offered by local educational institutions
Lack of necessary personal, soft skills offered by local institutions
Shortage in number of local professionals trained by local institutions
Labor protection laws and regulations
Worker emigration
Professionals moving to other sectors of the economy or other enterprises
High expectations from new hires
Other
0 10 20 30 40 50 60 70 80
Percent of Firms
Causes of Labor Skills Shortages in Guyana
Quality of the education and training offered by local educational institutions
Lack of necessary personal, soft skills offered by local institutions
Shortage in number of local professionals trained by local institutions
Labor protection laws and regulations
Worker emigration
Professionals moving to other sectors of the economy or other enterprises
High expectations from new hires
Other
0 10 20 30 40 50
Percent of Firms
Causes of Labor Skills Shortages in Jamaica
Quality of the education and training offered by local educational institutions
Shortage in number of local professionals trained by local institutions
Lack of necessary personal, soft skills offered by local institutions
Labor protection laws and regulations
Worker emigration
Professionals moving to other sectors of the economy or other enterprises
High expectations from new hires
Other
0 10 20 30 40 50 60 70
Percent of Firms
Causes of Labor Skills Shortages in St. Lucia
Quality of the education and training offered by local educational institutions
Lack of necessary personal, soft skills offered by local institutions
Shortage in number of local professionals trained by local institutions
Worker emigration
Labor protection laws and regulations
Professionals moving to other sectors of the economy or other enterprises
High expectations from new hires
Other
0 10 20 30 40 50 60 70
Percent of Firms











Source: Authors' calculations from the Innovation, Firm Performance and Gender (IFPG) survey.
Note: Values reflect the percent of firms who answered "very important" or "critical" to each factor.

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