The economic impacts of tourism-related private investment in Jamaica

Martín Cicowiez and Romina Ordoñez

Abstract

This study assesses the economy-wide impacts of private investment in the hotel industry in Jamaica. Specifically, the paper develops a tourism-extended social accounting matrix (SAM) and a dynamic computable general equilibrium (CGE) model tailored to the Jamaican economy. To analyse impacts in terms of poverty and inequality, the CGE model results are linked with a microsimulation model. The results demonstrate that private tourism investments leading to an expansion of foreign demand for tourism can have positive impacts on national economies in terms of gross domestic product (GDP), employment, household incomes and poverty reduction. However, the distribution of benefits is dependent on socioeconomic factors such as the distribution of factor endowments among households. At the sectoral level, sectors catering more directly to tourism experience the highest rates of growth, while more export-oriented sectors do not fare as well given the upward pressure on prices and the real exchange rate resulting from higher tourism spending.

Keywords

Tourism, investments, private sector, hotel industry, economic growth, poverty mitigation, equality, evaluation, mathematical models, Jamaica

JEL classification

L83, C68, I3, O1

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I. Introduction

Jamaica possesses diverse natural resources and a rich cultural heritage, which provide a range of attractions for tourists. In fact, tourism has been an important sector of Jamaica's economy since the 1950s (Taylor, 2003). International arrivals in Jamaica (excluding cruise passengers) grew from around 1.7 million visitors in 2006 to 2.2 million in 2016, an average annual growth rate of 2.7%.[1]

Tourism is a major source of foreign exchange for the economy and a potentially powerful means of reducing poverty. In fact, together with remittances, tourism is the largest source of foreign exchange: in 2016, earnings from tourism and remittances each represented about 15% of gross domestic product (GDP). The Statistical Institute of Jamaica (STATIN, 2017) estimates that the industry's share of total GDP in 2015 was 7.8%. The Bahamas, the Dominican Republic and Mexico recorded receipts from international tourism equivalent to 22%, 9% and 2% of GDP, respectively, showing how much the importance of the sector varies across economies in the Latin America and Caribbean region. In 2015, international tourism receipts accounted for 58% of exports in Jamaica, which ranked twelfth out of 195 countries on this measure. For comparison, the figures were 78%, 37% and 5% in the Bahamas, the Dominican Republic and Mexico, respectively (UNWTO, 2017).

Tourism also has the potential to advance the economic and social inclusion of women. For example, women account for approximately 59% of hotel and restaurant employees in Latin America and 55% in the Caribbean (UNWTO/UN-Women, 2011).

The tourism supply chain involves a wide range of social and economic sectors. The industry's contribution to growth, poverty reduction and long-term development depends upon complex and dynamic economic, social, environmental and institutional linkages, spillovers and externalities. The present study develops and applies a computational tool to assess the impact of tourism-related (private) investments. Specifically, it develops a tourism-extended social accounting matrix (SAM) and dynamic computable general equilibrium (CGE) and microsimulation models for Jamaica. It builds on previous work as published in Banerjee, Cicowiez and Gachot (2015) and Banerjee, Cicowiez and Cotta (2016) by focusing on private investments in the hotel industry and the sectoral composition of per capita tourist spending. In recent years, the CGE method has been used as a tool for coherent, forward-looking economy-wide analysis of tourism-related shocks from a medium- to long-run perspective (Dwyer, 2015; Blake, 2015). The present paper contributes to this literature by analysing the impact of a US$ 600 million private investment in the accommodation industry combined with an increase in the inflow and spending of foreign tourists in a relatively small island economy such as Jamaica.[2]

The results show that increased private investment in the hotel industry, combined with higher tourism spending, has a positive impact on GDP, employment, household incomes and poverty in Jamaica. With regard to inequality, the study does not find statistically significant changes in any of the scenarios considered. As for impacts on GDP growth at the sectoral level, the findings show service industries that cater directly to tourists, including hotels, restaurants and recreation activities, being strongly stimulated by the expansion in tourism investment. However, upward pressure on prices and the real exchange rate due to higher tourism spending leads to reduced competitiveness and a decrease in employment and value added in manufacturing and mining, two of Jamaica's most export-oriented sectors.

This paper is organized as follows. Section II provides an overview of the literature on tourism and growth. Section III provides a non-technical description of our CGE model for Jamaica and its current database. Section IV presents the model simulation scenarios and results. Lastly, section V offers concluding remarks. Annex A1 presents the results of a systematic sensitivity analysis with respect to selected elasticities, and annex A2 provides additional simulation results.

[1] In the same period, the number of cruise passengers arriving in Jamaica increased from around 1.3 million to 1.6 million.

[2] In 2017, this was equivalent to about 4% of GDP.

II. Literature review[3]

This section provides a concise review of recent literature that has assessed the impact of the tourism industry on growth and poverty using diverse methods. In recent years, tourism has been one of the fastest-growing economic sectors, generating 10% of global GDP and 30% of global exports in the service sectors (UNWTO, 2017). Tourism employs 1 in every 10 workers across the globe, equivalent to 330 million jobs in 2019 (WTTC, 2019). Pablo-Romero and Molina (2013) found a positive correlation between tourism and economic growth in 55 of 87 econometric studies reviewed that used time series, panel data and cross-sectional data. The relationship also holds good in the case of Latin America and the Caribbean, where Eugenio-Martín, Martín Morales and Scarpa (2004) confirmed this finding for 21 countries in the region between 1985 and 1998, with a particular focus on low- and middle-income countries. Furthermore, a study by Fayissa, Nsiah and Tadesse (2011) that used panel data for the period 1990–2005 found that a 10% increase in tourism expenditure in the Latin America and Caribbean region could increase per capita GDP by 0.4%. The overall relationship between tourism and economic growth in the region generally appears positive, though how benefits are distributed is more variable (Moreda and others, 2017).

The distribution of benefits depends on a variety of factors which may be destination- or activity-specific and conditioned by the country context, among other factors. For instance, Mitchell and Ashley (2010) review a range of empirical literature (CGE, input-output, regression analysis, qualitative analysis of microenterprises and livelihoods, and pro-poor value chain analysis) for destinations in Africa, Asia and Latin America and find evidence that 10% to 30% of tourism expenditure tends to accrue to the poor. In a recent study using a dynamic CGE model similar to ours, Njoya and Seetaram (2018) map the primary channels through which tourism can impact the poor, both positively and negatively. These include poor people's labour participation in the tourism value chain, the collection of taxes which can then be transferred to the poor, price channels (with currency appreciation as an example) and complex dynamic channels which can affect the socioeconomic environment of the destination and thus the setting in which the poor undertake their livelihood activities. In their application to Kenya, they find that where the economy of a destination is characterized by lower-skilled and labour-intensive sectors, there is a great probability that tourism development will increase the income of the poor. Interestingly, Jamaica's labour market is also dominated by (mostly unskilled) labour-intensive activities.

In the Latin American and Caribbean context, a number of country case studies have been undertaken to ascertain the dynamics between tourism development and poverty reduction (Moreda and others, 2017). In Costa Rica and Nicaragua, for example, evidence from time series econometrics suggests that a 1% increase in foreign tourism expenditure reduces poverty by 0.58% and 0.64%, respectively (Vanegas, Gartner and Senauer, 2015). For Panama, using a SAM multiplier model, Klytchnikova and Dorosh (2013) found that 20% of national income deriving from tourism expenditure reached the poor; this impact increased to 43% in destinations in the country that were particularly poor but tourism-oriented. In Haiti, using a regional CGE model, Banerjee, Cicowiez and Gachot (2015) found that a US$ 36 million public investment in tourism could reduce the number of people living in poverty by 1.6%. In Ecuador, analysis undertaken by Croes and Rivera (2017) using a SAM multiplier model found strong potential for tourism to reduce poverty and inequality (albeit this was a hypothetical simulation exercise). Lastly, where island States are concerned, Jiang and others (2011) found that for the 16 island States considered in their study, human development indicators and per capita GDP were positively correlated with tourism intensity, defined as the ratio of tourists to residents.

Interestingly, most applications of CGE modelling to the tourism sector assess the impact of changes in (i) tourism arrivals, (ii) per capita tourism expenditure and (iii) public investments in tourism-related infrastructure. Thus, our study is unique in using a CGE model to assess the economy-wide impact of an (exogenous) increase in private investment in the tourism sector.

[3] This section draws on Banerjee and others (2018).

III. Method and data

The tourism industry is not a single clearly defined sector. On the contrary, it is composed of many sectors such as hotels, restaurants, food and beverages, and transport. Similarly, investments in tourism also target diverse sectors, ranging from infrastructure development, the provision of basic public services such as water and sanitation and capacity-building in the services sector to measures to strengthen institutions in the interests of tourism sector governance. Thus, to assess the impact of any combination of policy interventions, private investments and external shocks affecting the tourism sector, a framework that includes all economic sectors and their interlinkages is essential (see, for example, Dwyer, 2015). In this study, a tourism-extended recursive dynamic CGE model for Jamaica was developed and implemented. CGE modelling offers a systematic method for predicting both the direction and approximate sizes of the impacts of policies, changes in private investment and external shocks on different agents.

1. The model

In a nutshell, our model integrates a fairly standard recursive dynamic CGE model (see, for example, Lofgren, Lee Harris and Robinson, 2002, and Robinson, 1989) with additional equations and variables that identify: (i) foreign tourism demand as the product of the number of foreign tourists and their spending per capita and (ii) the impact of private investments in the tourism sector. More precisely, our starting point for model development was our previous work as published in Banerjee, Cicowiez and Gachot (2015) and Banerjee, Cicowiez and Cotta (2016). In this particular application, however, we focus on private investments in tourism-related businesses such as hotels instead of public investments in tourism-related infrastructure. Thus, in contrast to other CGE models, the CGE that was developed for this particular application offers features relevant to the study of tourism investment, tourist arrivals and expenditure scenarios in a country's economy.

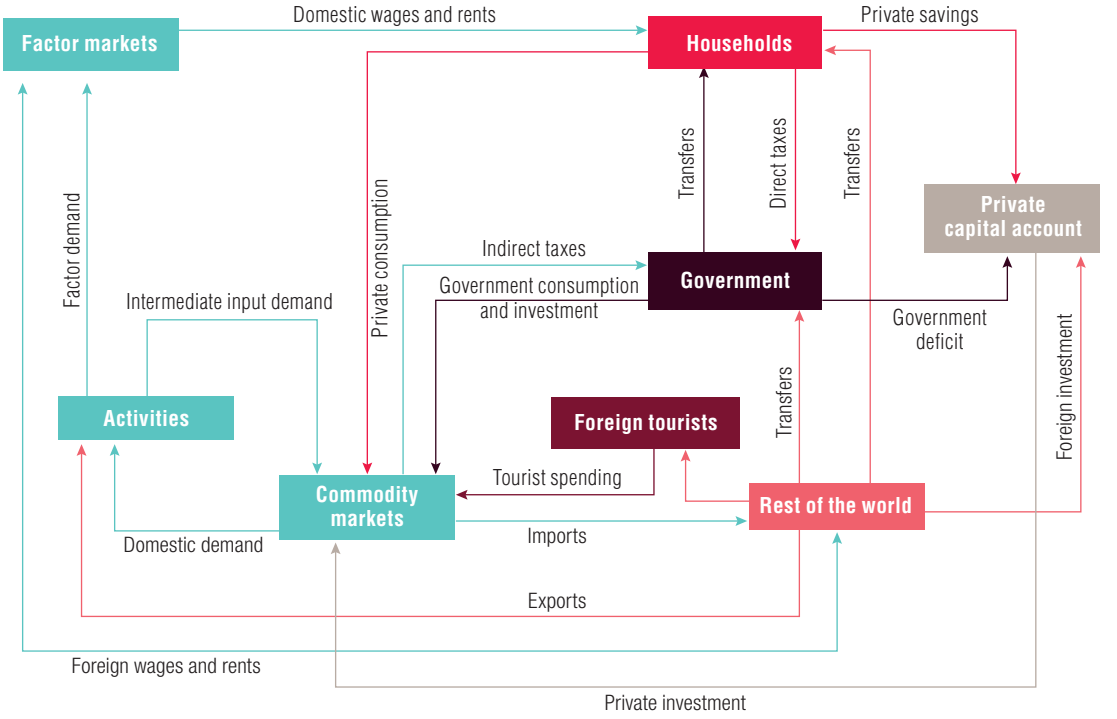
Figure 1 depicts, for each simulation period, the circular flow of income within the economy and between the economy and the rest of the world. The major building blocks of our CGE model may be divided into: (i) businesses (the entities that carry out production); (ii) commodities (business outputs or, exceptionally, imports in the absence of domestic production, linked to markets); (iii) factors (also linked to markets); and (iv) institutions (households, the government, the rest of the world and foreign tourists). In the Jamaica application (and database) of our CGE model, most of the blocks in figure 1 are disaggregated on the basis of the available data.

In any given year, our CGE model for Jamaica has the structure summarized in the above chart. Businesses produce and sell their output at home (to both residents and foreign tourists) or abroad (to Jamaica's trading partners), using their revenues to cover the costs of intermediate inputs, factors of production and taxes. Their decisions regarding factor employment, which determines output level, are driven by profit maximization. The shares of their output that are exported and sold domestically depend on relative selling prices in the domestic and export markets.

Figure 2 provides additional detail on the production technology of production activities. The level (or quantity) of any activity and the quantity of output (via yield coefficients) are a constant elasticity of substitution (CES) function of the quantities of factors employed (in this example, labour and capital). Intermediate input use is a Leontief function of activity levels.[4]

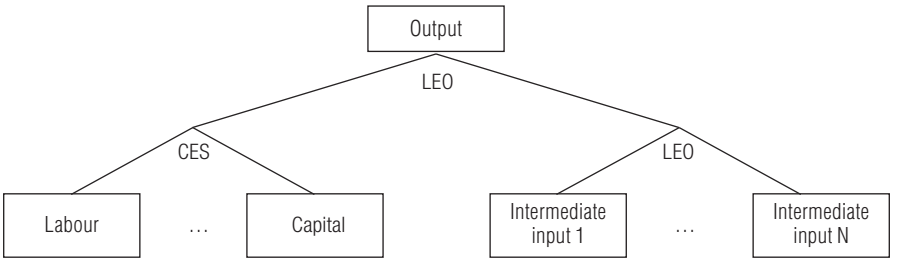
[4] CES, Leontief (or fixed coefficients) and constant elasticity of transformation (CET) functional forms are widely used in CGE modelling.

Figure 1
Circular income flow in the computable general equilibrium: within-period module



Source: Prepared by the authors.

Figure 2
Production function: factor and intermediate input demand



Source: Prepared by the authors.
Note: CES and LEO refer to constant elasticity of substitution and Leontief production functions, respectively. N commodities are used as intermediate inputs.

Returning to figure 1, our CGE model for Jamaica includes four types of institutions: households, the government, foreign tourists and the rest of the world. As shown, households receive income from factors, transfers from the government and transfers from the rest of the world. This income is used for direct taxes, savings and consumption. After deducting net financing of the government (which in the real world equals household lending to the government minus household interest revenue) and resources needed for changes in foreign reserves, household savings are used to finance private investment. Household consumption decisions change in response to income and price changes. By construction (and as required by household budget constraints), household consumption equals income net of direct taxes and savings.

The government obtains its receipts from taxes, transfers from abroad and net financing (borrowing net of interest payments) from households and the rest of the world. It uses these receipts for transfers

to households, consumption and investment (to provide the capital stocks required for government services).[5] To remain within its budget constraint, it either adjusts some part or parts of its spending to match available receipts or mobilizes additional receipts of one or more types in order to finance its spending plans.

Foreign wages and rents are the only non-trade payment to the rest of the world; they are typically an exogenous projection. The non-trade payments received from the rest of the world consist of tourism expenditures, net transfers to households, foreign borrowing and foreign investment, net of changes in foreign reserves. Total financing from the rest of the world (going to the government and to the non-government capital account) is positive (negative) if the model country has a deficit (surplus) in its non-borrowing payments. The balance of payments clears (inflows and outflows are equalized) via adjustments in the real exchange rate (the ratio between the international and domestic price levels), influencing export and import quantities and values.

In this application, international tourism receipts are modelled as the product of per capita tourism expenditures and the number of tourists arriving in Jamaica (see equation (1). The simulations in the next section model an increase in the number of foreign tourist arrivals combined with an increase in their per capita spending. Alternatively, foreign tourism demand can be modelled using a constant elasticity demand function (see equation (2)). In the latter case, the demand curve for the modelled country's tourism exports will be downward-sloping. In both cases, total tourism demand is disaggregated across domestically produced commodities in fixed proportions.[6] In equation (2), foreign tourists' demand is a function of local (tourism-related) prices relative to the exchange rate EXR_t.

$$QTRSMROW_{c,t} = qtrsmrowpc_{c,t} \cdot qtrsmrowpop_t \tag{1}$$

$$QTRSMROW_{c,t} = \overline{qtrsmrow_{c,t}} \left(\frac{PQ_{c,t}/EXR_t}{PQ_c^0/EXR^0} \right)^{\eta^{trsmrow}} \tag{2}$$

Where t is time, c is tourism-related commodities such as hotel and restaurant services, $QTRSMROW_{c,t}$ is the quantity of commodity c demanded by tourists from the rest of the world, $PQ_{c,t}$ is the price of commodity c in Jamaica, EXR_t is the exchange rate, $qtrsmrowpop_{c,t}$ is the quantity of commodity c demanded per foreign tourist, $qtrsmrowpop_t$ is the number of foreign tourists arriving in Jamaica and $\eta^{trsmrow}$ is the (constant) price elasticity of foreign tourism demand (< 0).

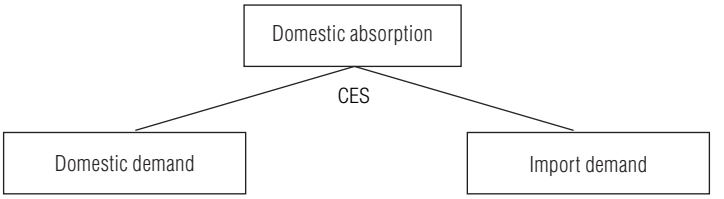
On the supply side, the modelling of alternative modes of tourism (e.g. all-inclusive beach resorts, boutique hotels and eco-lodges) is straightforward provided the required data are available. If they are, the model can incorporate different cost structures for the various modes of tourism on the supply side.

In commodity markets, flexible pricing ensures a balance between the demand for domestic output from domestic purchasers and the supply to the domestic market from domestic suppliers. The portion of domestic demand that is for imports pays exogenous world prices; following the common small-country assumption, prices in foreign currency are fixed. On the basis of relative prices, domestic purchasers decide on the split between domestic purchases and imports (see figure 3). Similarly, domestic suppliers (businesses) also consider relative prices when deciding on the allocation of their output between domestic sales and exports (see figure 4). For exports, we also assume that Jamaica has to deal with exogenous world prices.

[5] The government primary deficit is defined as spending on consumption, investment and domestic transfers minus taxes and transfers from abroad. This deficit is covered by domestic and foreign net financing.

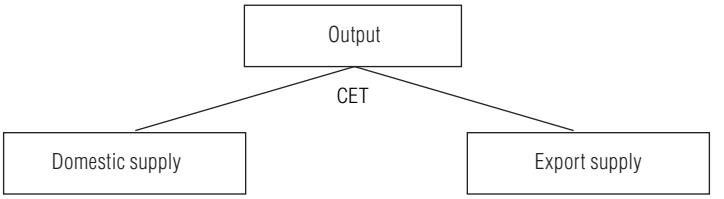
[6] In addition, the model allows one or more modes of tourism demand to be identified.

Figure 3
Allocation of domestic demand across alternative sources



Source: Prepared by the authors.
Note: CES refers to constant elasticity of substitution. The demand structure in the figure applies to each of the commodities identified in the social accounting matrix and the model.

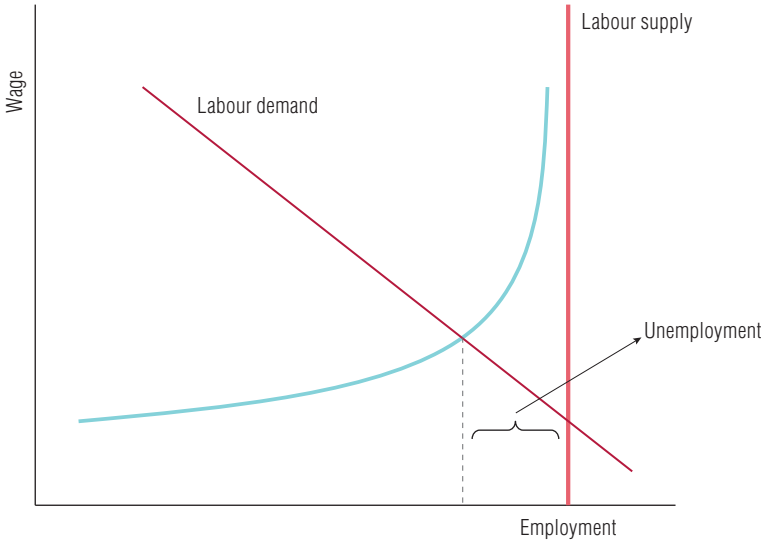
Figure 4
Allocation of output across alternative destinations



Source: Prepared by the authors.
Note: CET refers to the constant elasticity of transformation function. The supply structure in the figure applies to each of the commodities identified in the social accounting matrix and the model.

For non-labour factors, markets clear demand and supply via rent adjustments. Across all factors, the demand curves are downward-sloping, reflecting the responses of production activities to changes in wages. In labour markets, unemployment may be endogenous. If so, the model includes a wage curve that establishes a negative relationship between the real wage and the unemployment rate or, alternatively, a positive relationship between the real wage and the employment rate (see figure 5). For non-labour factors, full employment is assumed.

Figure 5
Labour market specification



Source: Prepared by the authors.

The above discussion refers to the functioning of the model economy in a single year. In our Jamaica CGE, growth over time is endogenous. The economy grows because of capital accumulation (determined by investment and depreciation), exogenous growth in the stocks of labour and other non-capital factors (e.g. agricultural land) and growth in total factor productivity (TFP). Apart from an exogenous component, the TFP of any production activity potentially depends on the level of capital stocks (typically stocks of government infrastructure).

2. Data

(a) The social accounting matrix

The basic accounting structure and much of the underlying data required to implement our Jamaica CGE model will be derived from a social accounting matrix (SAM).[7] A SAM is a comprehensive, economy-wide statistical representation of the modelled economy at a specific point in time. It is a square matrix with identical row and column accounts where each cell in the matrix shows a payment from its column account to its row account. It can be used for descriptive purposes and is the key data input for a CGE. Major accounts in a standard SAM are: (i) businesses that carry out production; (ii) commodities (goods and services) which are produced, imported or both and sold domestically, exported or both; (iii) factors used in production which include labour, capital, land and other natural resources; and (iv) institutions such as households, government, tourists and the rest of the country and world. Most features of the Jamaica SAM are familiar from social accounting matrices used in other models.[8] However, the Jamaica SAM has non-conventional features related to the explicit treatment of foreign tourism-related spending together with the corresponding inflow of foreign exchange.

In most cases, a SAM is built using supply and use tables (SUTs) as the starting point. However, in the case of Jamaica, given that the latest available SUTs are more than 10 years old (i.e. they refer to the year 2007), as many data as possible from the Statistical Institute of Jamaica (STATIN) and other government agencies were used as well, namely the 2015 national accounts for GDP by activity and GDP by expenditure, the 2015 tourism satellite account, the balance of payments, government receipts and spending and household surveys such as the four waves of the 2014 Labour Force Survey and the 2012 Survey of Living Conditions.[9]

The disaggregation of our Jamaica SAM matches that of the rest of the model database. As shown in table 1, it is disaggregated into 17 sectors (activities and commodities), including agriculture, mining, 3 manufacturing sectors and 12 service sectors, with each activity producing a single commodity for which it is the only domestic producer. The factors are split into labour, private capital and two types of natural resources, namely agricultural land and a natural resource used in extractive industries. Institutions are split into households, government, the rest of the world and domestic and foreign tourists. A set of auxiliary accounts covers the different tax instruments as well as trade and transport margins on domestic sales, imports and exports.

[7] Technically, the SAM is used to calibrate the CGE model. In other words, the SAM is used to compute reference (or initial) values for all behavioural parameters and exogenous variables in the CGE model.

[8] See Pyatt and Round (1985) and King (1981) for a more detailed introduction to SAM construction and interpretation.

[9] In a related study, we use the 2011 Population and Housing Census to regionalize the national SAM.

Table 1
Accounts in Jamaica's 2015 social accounting matrix

Category *(number)*	Item	Category *(number)*	Item
Sectors (17)	Agriculture, forestry and fishing	Factors (4)	Labour
	Mining		Capital
	Food, beverages and tobacco		Land
	Textiles and wearing apparel		Extractive resources
	Other manufacturing	Taxes (5)	Business taxes
	Electricity and water		Tariffs
	Construction		Commodity taxes
	Commerce		Income tax
	Hotels		Bauxite tax
	Restaurants	Institutions (4)	Households
	Transport		Government
	Communications		Rest of the world
	Financial services		Domestic tourism
	Real estate and business services		Foreign tourism
	Government services, education and health	Institutional capital accounts (3)	Households capital account
	Recreation		Government capital account
	Other services		Rest of the world capital account
Distribution margins (3)	Domestic margin	Investment (3)	Non-governmental investment
	Import margin		Governmental investment
	Export margin		Changes in inventories

Source: Prepared by the authors.

On the basis of the SAM data, table 2 summarizes the sectoral structure of the Jamaican economy, giving sectoral shares of value added, production, employment, exports and imports, as well as the split of domestic sectoral supply between exports and domestic sales and of domestic sectoral demand between imports and domestic output. For instance, while the hotel industry represents a substantial share of exports (around 26.9%), its shares of value added and production are much smaller (3.1% and 4.3%, respectively), while the share of its output that is consumed by foreign tourists (i.e. exported) is around 94.8%. The Jamaica SAM also identifies expenditure on accommodation and restaurants by residents of Jamaica who travel abroad, listed as "Hotels (imports)" and "Restaurants (imports)" in table 2. In 2015, for instance, "imports" of hotel and restaurant services represented 3.8% and 1.1% of total imports, respectively.[10]

Interestingly, while (primary) agriculture represents a significant share of employment (around 17.8%), its shares of value added, production and exports are much smaller (in the range of 2% to 7.6%). On the import side, the "other manufacturing" category (which includes, for example, machinery and equipment) represents a large share of total imports: about 59.5%. Furthermore, the share of domestic demand for "other manufacturing" products met by imports is 61.3%.

Table 3 shows the factor shares of total sectoral value added. For example, it shows that agriculture is relatively intensive in the use of labour and land, while mining is intensive in the use of capital and extractive natural resources. Interestingly, table 3 also shows, on the basis of information from the 2007 SUTs, that hotels and restaurants have similar factor intensities. It is often important to be aware of these aspects of sectoral structure when analysing simulation results. In the tourism industry, hotels and restaurants prove to be relatively labour-intensive.

[10] In 2015, total international tourism expenditures were equivalent to 6.2% of total imports.

Table 2
Sectoral structure of the Jamaican economy, 2015
(Percentages)

Sector	Value added	Output	Employment	Exports	Exports as a share of output	Imports	Share of demand met by imports
Agriculture, forestry and fishing	7.6	6.5	17.8	2.0	4.1	1.1	4.6
Mining	2.2	2.9	0.5	14.6	84.3	0.0	0.4
Food, beverages and tobacco	5.0	8.8	3.6	5.3	8.0	7.3	18.3
Textiles and wearing apparel	0.1	0.1	0.1	0.1	5.0	1.7	71.2
Other manufacturing	4.4	8.3	2.7	12.2	18.6	59.5	61.3
Electricity and water	3.4	4.5	0.8	0.4	1.4	0.1	0.4
Construction	7.7	7.7	7.3	0.0	0.0	0.1	0.3
Commerce	18.7	15.4	20.0	0.0	0.0	0.9	1.5
Hotels	3.1	4.3	3.2	26.9	94.8	0.0	0.0
Hotels (imports)	0.0	0.0	0.0	0.0	0.0	3.8	100.0
Restaurants	1.2	2.4	4.6	4.1	27.9	0.0	0.0
Restaurants (imports)	0.0	0.0	0.0	0.0	0.0	1.1	100.0
Transport	4.2	5.7	4.3	13.3	39.6	5.6	23.9
Communications	3.7	2.8	2.3	3.2	19.1	1.7	14.4
Financial services	8.6	7.2	2.3	2.1	5.0	3.4	10.6
Real estate and business services	10.9	8.2	6.5	2.5	5.3	11.9	27.5
Government services, education and health	15.0	10.5	14.0	0.0	0.0	0.1	0.2
Recreation	2.2	3.1	1.6	9.8	51.0	1.3	9.4
Other services	2.1	1.5	8.4	3.5	38.2	0.5	7.0
Total	100.0	100.0	100.0	100.0	16.1	100.0	23.4

Source: Prepared by the authors, on the basis of Jamaica's 2015 social accounting matrix (SAM) and employment data.

Table 3
Sectoral factor intensity
(Percentages)

Sector	Labour	Capital	Natural resources	Total
Agriculture, forestry and fishing	45.1	20.8	34.1	100.0
Mining	34.9	40.7	24.3	100.0
Food, beverages and tobacco	53.6	46.4	0.0	100.0
Textiles and wearing apparel	44.9	55.1	0.0	100.0
Other manufacturing	43.4	56.6	0.0	100.0
Electricity and water	32.4	67.6	0.0	100.0
Construction	72.2	27.8	0.0	100.0
Commerce	63.2	36.8	0.0	100.0
Hotels	66.2	33.8	0.0	100.0
Restaurants	66.8	33.2	0.0	100.0
Transport	71.8	28.2	0.0	100.0
Communications	28.5	71.5	0.0	100.0
Financial services	52.9	47.1	0.0	100.0
Real estate and business services	31.4	68.6	0.0	100.0
Government services, education and health	99.3	0.7	0.0	100.0
Recreation	65.4	34.6	0.0	100.0
Other services	66.0	34.0	0.0	100.0
Total	59.9	37.0	3.1	100.0

Source: Prepared by the authors, on the basis of Jamaica's 2015 social accounting matrix (SAM).

Table 4 shows the composition of demand for each commodity. For instance, most demand for construction services is driven by gross fixed capital formation, e.g. building or expanding a hotel. In turn, about 26% of the demand for restaurant services comes from foreign tourists visiting Jamaica.

Table 4
Demand structure
(Percentages)

Sector	Intermediate use	Distribution margins	Private consumption	Fixed investment	Change in inventories	Government consumption	Exports	International tourism	Total
Agriculture, forestry and fishing	42.4	0.0	53.4	0.3	0.0	0.0	3.9	0.0	100.0
Mining	16.3	0.0	0.0	0.0	-0.2	0.0	83.9	0.0	100.0
Food, beverages and tobacco	30.8	0.0	63.2	0.0	0.0	0.0	6.0	0.0	100.0
Textiles and wearing apparel	10.9	0.0	88.0	0.1	0.2	0.0	0.8	0.0	100.0
Other manufacturing	51.7	0.0	28.2	14.2	0.2	0.0	5.7	0.0	100.0
Electricity and water	59.0	0.0	39.7	0.0	0.0	0.0	1.4	0.0	100.0
Construction	25.5	0.0	0.0	74.5	0.0	0.0	0.0	0.0	100.0
Commerce	8.2	82.4	5.7	3.7	0.0	0.0	0.0	0.0	100.0
Hotels	5.6	0.0	0.2	0.0	0.0	0.0	0.0	94.3	100.0
Hotels (imports)	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
Restaurants	5.8	0.0	68.3	0.0	0.0	0.0	0.0	25.9	100.0
Restaurants (imports)	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
Transport	59.3	0.0	10.0	0.0	0.0	0.0	18.9	11.8	100.0
Communications	50.0	0.0	34.9	0.0	0.0	0.0	15.1	0.0	100.0
Financial services	52.5	0.0	43.3	0.0	0.0	0.0	4.2	0.0	100.0
Real estate and business services	59.7	0.0	35.9	0.6	0.0	0.0	3.8	0.0	100.0
Government services, education and health	4.7	0.0	21.4	0.0	0.0	73.9	0.0	0.0	100.0
Recreation	8.3	0.0	45.8	1.4	0.0	0.0	3.4	41.1	100.0
Other services	4.4	0.0	60.3	0.0	0.0	0.0	0.0	35.3	100.0
Total	35.4	8.8	31.0	8.0	0.1	5.3	5.9	5.6	100.0

Source: Prepared by the authors, on the basis of Jamaica's 2015 social accounting matrix (SAM).

(b) Non-SAM data

In addition to the SAM, our tourism-extended dynamic CGE model requires a set of elasticities (for production, consumption and trade, whether econometrically estimated or obtained from the literature) and estimates for sectoral employment levels and unemployment in the base year (2015). Furthermore, given that this is a dynamic model, we need to project the modelled economy on the assumption of a "business as usual" (BAU) scenario. This BAU scenario will then serve as a benchmark for comparing the non-base simulation scenarios, i.e. scenarios in which one or more shocks are introduced. For the BAU scenario, we require base year capital stocks, a baseline projection for population and labour force growth and a baseline projection for GDP growth.

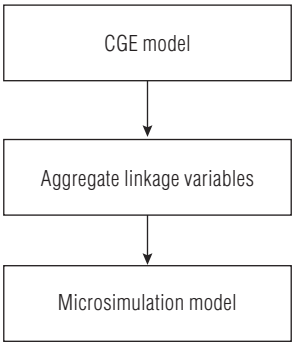
In this application, the chosen values for elasticities are as follows: (i) the elasticities of substitution between factors (labour, capital and natural resources) are in the 0.2 to 0.9 range, being lowest for natural resource activities such as agriculture (0.25) and mining (0.2) (Narayanan, Aguiar and McDougall, 2012); (ii) wage curve unemployment elasticity is 0.5 (Blanchflower and Oswald, 2005); and (iii) following Sadoulet and De Janvry (1995) and Annabi, Cockburn and Decaluwé (2006), trade-related elasticities are in the 2 to 2.15 range for substitution between imports and domestic purchases and transformation between exports and domestic sales, respectively. In addition, and given the uncertainty surrounding our elasticity values, in annex A2 we conduct a systematic sensitivity analysis of the values of our simulation results, finding that those presented here are robust.

(c) The microsimulation model and data

As discussed, CGE models are effective in capturing macro and meso[11] responses to shocks such as an increase in tourist arrivals. However, the standard configuration of a CGE model is not well suited to analysis of questions related to poverty and income inequality. This is due to the fact that most CGE models use a representative household formulation whereby all households in an economy are aggregated into one or a few households to represent household and consumer behaviour. The main limitation of the representative household formulation is that intra-household income distribution does not respond to shocks introduced into the model.

Consequently, in order to provide greater resolution with regard to household-level impacts, we generate results for poverty and inequality at the micro level by linking the CGE model with a microsimulation model. The two models interact in a sequential "top-down" fashion (i.e. without feedback): the CGE communicates with the microsimulation model by generating a vector of (real) wages,[12] aggregate employment variables such as labour demand by sector and the unemployment rate, and non-labour income such as government transfers and remittances. In figure 6, these are depicted as the aggregate linkage variables between the CGE model and the microsimulation model. The functioning of the labour market thus plays an important role in the microsimulation model. In turn, the CGE model determines the changes in employment by factor type and sector and changes in factor and product prices that are then used for the microsimulations.

Figure 6
The macro-micro approach



Source: Prepared by the authors.

To build the microsimulation model, the Jamaica Survey of Living Conditions (JSLC) for 2012, conducted by the Statistical Institute of Jamaica (STATIN), was used. These data cover 20,532 individuals in 6,579 households throughout Jamaica. The JSLC is the only available household survey in Jamaica that covers both income and spending. No attempt was made to reconcile the household survey data with the national accounts. Instead, the results from the CGE model were transmitted to the microsimulation model as percentage deviations from base values. To estimate poverty, we used the poverty line and the food poverty line for 2012; the national poverty rates were calculated as 19.8% and 7.5%, respectively.

[11] Meso is a word of Greek origin meaning middle, this being the level between macro and micro at which most SAMs and CGEs operate; i.e. there are no data at the level of individual micro units (households or firms), but the level of disaggregation is greater than is typical in macro analysis, with some 40 businesses and commodities typically being covered.

[12] The real wage is defined in terms of the CPI.

The microsimulation model follows the non-parametric method described in Vos and Sánchez (2010), but extended to incorporate changes in non-labour income.[13] First, the labour market structure is defined in terms of unemployment rates U among different segments of the working age population (divided by skill levels), the structure of employment as defined by sectors of activity S (the share of each industry in total employment) and (relative) remuneration $W1$, as well as overall remuneration $W2$. The labour market structure can thus be written as

$$\lambda = (U, S, W1, W2)$$

The effect of altering each of the four poverty and inequality parameters can then be analysed by simulating counterfactual individual earnings and family incomes. Briefly, the model selects at random (with multiple repetitions) from the corresponding groups the individuals who will change employment status (between employment and unemployment and between sectors) in response to the shock(s) being simulated and assigns wages to new workers according to parameters for the average groups. The new wage and employment values for each individual yield new household per capita incomes that are then used to determine the new poverty and income distribution results. Analytically, we can write

$$yl_i = f(\lambda, X_i)$$

where yl_i is individual labour income and X_i is individual characteristics, e.g. skill level. In each scenario, labour market conditions might change and in turn affect individual labour income, i.e.:

$$yl_i^* = f(\lambda^*, X_i)$$

where λe^* refers to the simulated labour market structure parameters.

The labour market variables and procedures that link the CGE model with the microsimulations are as follows. The "unemployment effect" is simulated by changing the employment status of the active population in the JSCL 2012 sample, in accordance with the results of the CGE model. For instance, if the CGE simulations show unemployment decreasing at the same time as employment increases for skilled workers in a given sector, the microsimulation model "hires" randomly from the unemployed skilled workers in the JSCL 2012 sample. However, the order in which workers are moved between labour market statuses is the same in all scenarios. For instance, if two scenarios require that 10 individuals be moved from unemployment to employment, the same 10 individuals are selected in both scenarios. As explained above, individual incomes for the newly employed are assigned on the basis of their characteristics (e.g. educational level) by looking at similar individuals who were employed to begin with. If the CGE simulations indicate a decrease in employment for a specific labour category and sector, the microsimulation program "fires" the equivalent percentage from that category and sector, and the counterfactual income for those newly unemployed is zero.

The "sectoral structure effect" is simulated by changing the sectoral composition of employment. For those individuals who move from one sector to another, we simulate a counterfactual labour income based on their characteristics and on their new sector of employment, again by looking at individuals who were employed in the destination sector to begin with.

To model changes in relative wages, the wage level for a given labour category (e.g. skilled workers in a given sector) is adjusted according to the changes yielded by the CGE simulations, but keeping the aggregate average wage for the economy constant. The impact of a change in the aggregate average wage for the economy is simulated by changing all labour incomes in all sectors by the same proportion on the basis of the changes yielded by the CGE simulations. Next, all the above steps are repeated several times and averaged.

[13] In turn, this approach is an extension of the earnings inequality method developed by Dos Reis and De Barros (1991).

Non-labour incomes, such as government transfers and remittances from abroad, are scaled up or down proportionally using changes yielded by the CGE model. The final step in the microsimulation model is to adjust the microdata so that the percentage change in household per capita income matches the change in the level of household per capita income for each representative household in the CGE simulations. This residual effect implicitly accounts for changes in all items not considered up to this point, such as natural resource and capital rents.

Lastly, it should be noted that our CGE model can only solve for relative prices and real variables in the economy. In other words, inflation cannot occur in our CGE model. Accordingly, a normalization rule has been applied to anchor the absolute price level. The consumer price index (CPI) has been chosen as the numéraire, so all changes in nominal prices and incomes in simulations are relative to the weighted unit price of households' initial consumption bundle (i.e. a fixed CPI).

IV. Simulations and results

1. Scenario design

This section presents the simulations and analyses the results. To illustrate the use of the Jamaica model and dataset we have developed, the following five scenarios were simulated and analysed:

(i) base: the baseline or reference scenario is the BAU scenario.

(ii) trsm10+: a US$ 200 million yearly increase in private investment in hotels during 2018–2020. An increase of US$ 200 million is equivalent to 1.4% of 2015 GDP and can pay for an additional 800 hotel rooms a year on top of the base growth in the number of rooms (assuming an average cost of US$ 250,000 per room in a four- or five-star hotel).[14] Given that the total number of rooms available in the country is approximately 25,000, the increase in the room supply is around 6.2% (assuming baseline growth of approximately 3% and 3.2% growth on top of the baseline created by the investment shock). This is slightly above the average 3% increase in room supply in the Caribbean during the last 15 years, but below the 8% increase in the supply of rooms in Jamaica in 2016 (Jamaica Tourist Board, n/d). Subsequently (2021–2030), private investment in hotels is around US$ 2.5 million higher than in the baseline because of additional maintenance costs (see figure 4.1a). In all years, the increase in private investment is financed with foreign resources. In practice, most large hotel investments in Jamaica are financed through foreign debt, foreign direct investment (FDI) or a mixture of the two. Overall, we assess an impact of US$ 600 million in tourism-related FDI over a three-year period. In addition, this scenario assumes that foreign tourism spending is 10% higher than in the base scenario every year during the period 2021–2030 (see figure 4.1b) (more specifically, the simulated increase is 5% in 2019, 7.5% in 2020 and 10% thereafter). This might result from a combination of (i) an increase in tourist arrivals and (ii) an increase in spending per tourist. For instance, in 2021 the number of foreign tourist arrivals could increase from 2.47 million in the baseline to 2.56 million (+3.5%), while per capita spending could increase from US$ 975 in the baseline to US$ 1,036 (+6.3%) at constant 2015 prices.[15]

[14] In the period 2013-2016, FDI in the tourism industry averaged US$ 213.6 million per year. Our non-base scenarios therefore assume that FDI in the tourism industry increases by about 94% relative to its recent trend (i.e. US$ 200 million above the baseline).

[15] In addition, we ran a simulation with the same increase in private investment in hotels but without the increase in foreign tourist arrivals, i.e. the number of foreign tourist arrivals and their per capita spending are assumed to be constant at their baseline values (the results are not shown, but are available from the authors on request). Interestingly, the long-run effects of this simulation are negative, since Jamaica overinvests in the accommodation sector. In other words, there is an increase in the number of hotel rooms not accompanied by an increase in the number of (foreign) tourists.

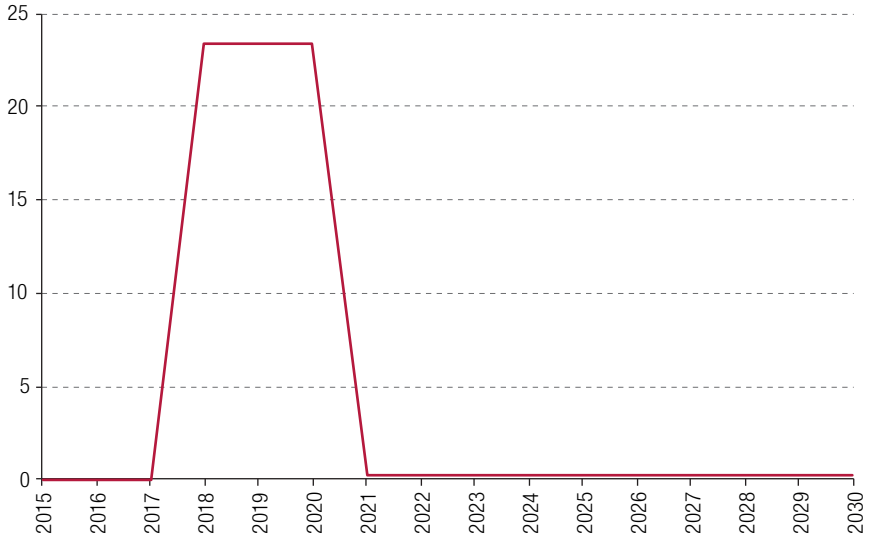
(iii) trsm20+: the same investment as in trsm10+, but the increase in foreign tourism spending is 20% higher every year during the period 2021–2030 than in the base scenario. In practice, such an increase in foreign tourism spending would require an increase in per capita spending, as it would be implausible for it to be attained only with an increase in foreign tourist arrivals.

(iv) trsm10-: the same investment as in trsm10+, but foreign tourism spending is 10% lower than in the base scenario during the period 2021–2030 (see figure 4.1b) (more specifically, the simulated decrease is 5% in 2019, 7.5% in 2020 and 10% thereafter). For instance, on the assumption that spending per tourist remained constant, in 2030 the number of tourists would be 2.85 million, as compared to 3.17 million in the base scenario. This scenario could reflect the impact of a natural disaster.

(v) trsm20-: the same investment as in trsm10+, but foreign tourism spending is 20% lower than in the base scenario. Again, this scenario could reflect the impact of a natural disaster.

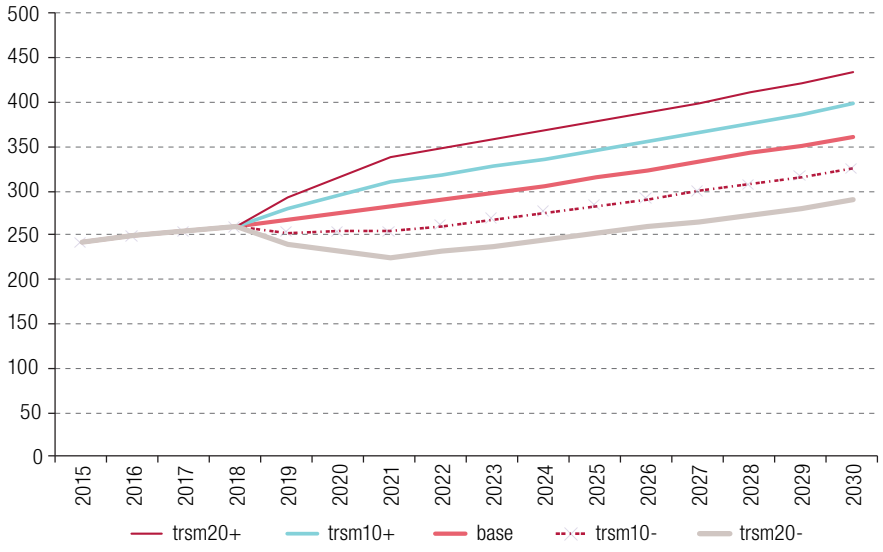
In reality, any tourism-related scenario would be likely to contain some of the elements present in this set of scenarios. In what follows, all simulations cover the period 2015–2030. The starting year, 2015, was selected in light of data availability (see above). The base simulation was designed to replicate trends since 2015 at the macro and sectoral levels. From 2018 onward, it is assumed that past trends will continue. In what follows, all shocks are introduced during the period 2018–2030; i.e. the base and non-base scenarios are the same up to and including 2017 (see figures 7 and 8).

Figure 7
Non-base scenarios: change in private investment in hotels relative to the base scenario, 2015–2030
(Billions of Jamaican dollars at 2015 prices)



Source: Prepared by the authors.

Figure 8
Non-base scenarios; foreign tourism spending
(Billions of Jamaican dollars at 2015 prices)



Source: Prepared by the authors.
Note: base: business as usual scenario; trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario.

2. Results and analysis

(a) Base scenario

For the period from the base year (2015) up to 2017, we draw on available information and estimates to generate a plausible picture of Jamaica's economic development that is the same for all simulations, including observed growth rates for real GDP at factor cost for the year 2016. Drawing on projections from the International Monetary Fund's *World Economic Outlook, April 2017: Gaining Momentum?* (IMF, 2017), we impose an average growth rate of 2.6% for the period 2017–2030. In addition, we assume that government services, transfers from government to households and net domestic and foreign government financing are all kept fixed as shares of GDP at their base year values. Taxes are fixed at their base year rates, which means that revenues will grow at the same pace as the overall economy.

For foreign tourism receipts, the baseline scenario, drawing on recent data, assumes (a) constant real per capita spending and (b) an exogenous growth rate for tourist arrivals equal to the GDP growth rate (for the period 1995–2016, the simple correlation between real GDP and foreign tourist arrivals is 0.75, i.e. is positive and statistically significant).

At the macro level, our CGE model for Jamaica, like any other CGE model, requires the specification of equilibrating mechanisms ("closures") for three macroeconomic balances: government, savings-investment and the balance of payments. For the base scenario, the following closures are used: (i) government: its accounts are balanced via adjustments in the direct tax rate; (ii) savings-investment: household savings adjust to generate exogenous GDP shares for domestically financed private investment while government investment is financed within the government budget; and (iii) balance of payments:

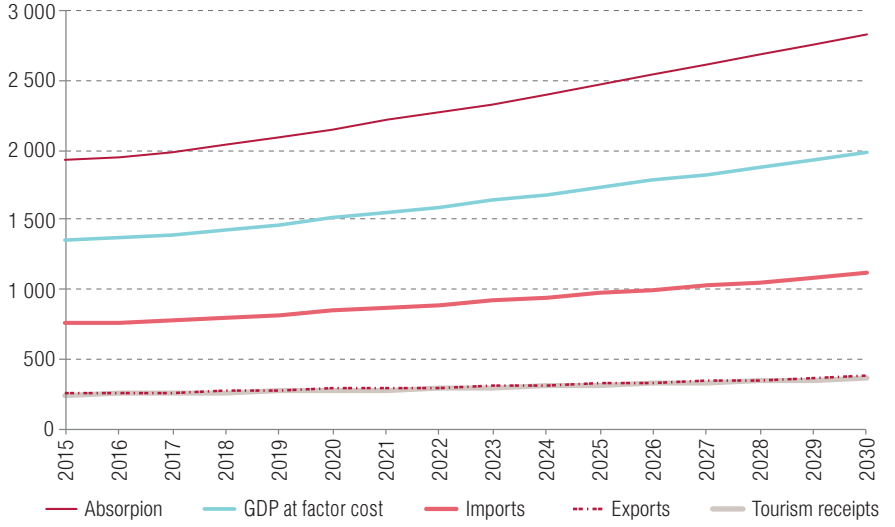
the real exchange rate equilibrates this balance by influencing export and import quantities and values, while the non-trade-related payments of the balance of payments (transfers and non-government net foreign financing) are non-clearing and remain fixed as shares of GDP.

In the non-base scenarios, the treatment of the balance of payments is the same as for the base scenario: the real exchange rate adjusts to equalize inflows and outflows of foreign exchange. For the balance between savings and (private) investment, instead of a fixed GDP share being imposed for private investment, this becomes the clearing variable, adjusting to make use of available financing in the context of exogenous household saving rates. For the government balance, the treatment is the same as for the base scenario (with a flexible direct tax rate).[16]

For each simulation, our CGE model provides the evolution over time of a wide range of indicators, including (i) macro outcomes: GDP (split into private and government consumption and investment, exports and imports); the composition of the government budget, the balance of payments and the savings-investment balance; total factor productivity; and domestic and foreign debt stocks; (ii) the sectoral structure of production, incomes, exports and imports; and trade flows disaggregated by trading partner; and (iii) the labour market: wages, unemployment and employment by sector.

Figures 9 to 11 show key macroeconomic results for the base scenario.[17] In this, the economy evolves in accordance with recent trends, with most macro aggregates growing at 2.7% to 2.8% per year during 2018–2030. The exchange rate appreciates slightly over time. GDP growth is sufficient to bring about a relatively rapid expansion of employment, and the unemployment rate falls from 13.5% in 2015 to 8.8% in 2030, while real wage growth averages 1.7% per year.

Figure 9
Base scenario: selected macroeconomic indicators
(Billions of Jamaican dollars at 2015 prices)

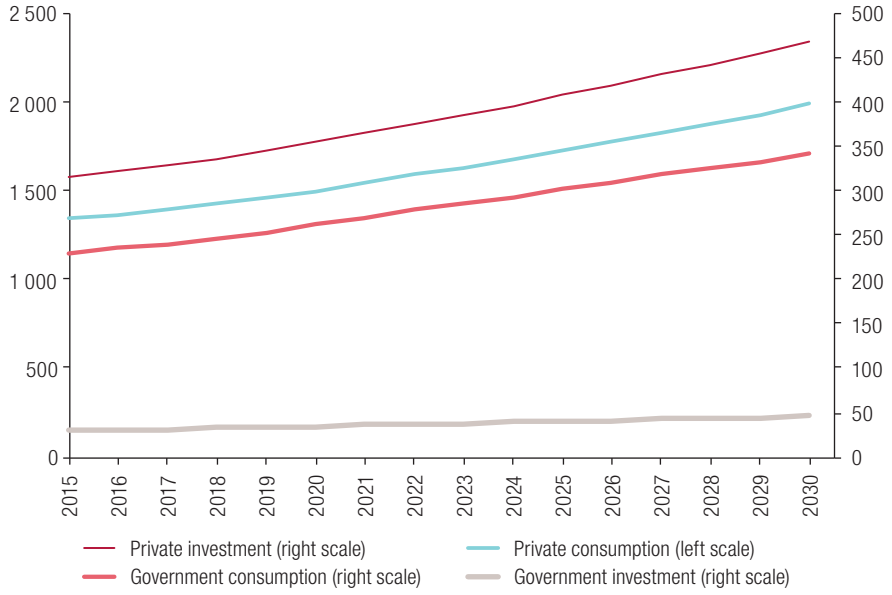


Source: Prepared by the authors, on the basis of simulation results.

[16] It is important to note that, for the non-base simulations, parameters related to the savings-investment and government balances are adjusted so that the introduction of changes in the treatment of these balances without any other changes have no impact on the results, and thus the base results are replicated exactly. However, when other changes are introduced (such as a change in tourist arrivals), then the exact treatment of, for example, the savings-investment balance has an impact on the results. More concretely, the base scenario generates a path for household saving rates that is consistent with the shares of private investment to GDP that are imposed. For all non-base scenarios, the path of household saving rates from the base is imposed while the private investment share of GDP is now endogenous. If this were the only change introduced in a non-base scenario, then the results would be the same as for the base. However, if another shock is introduced, then the response will be different when private investment is savings-driven as opposed to being an exogenously determined share of GDP (the base assumption).

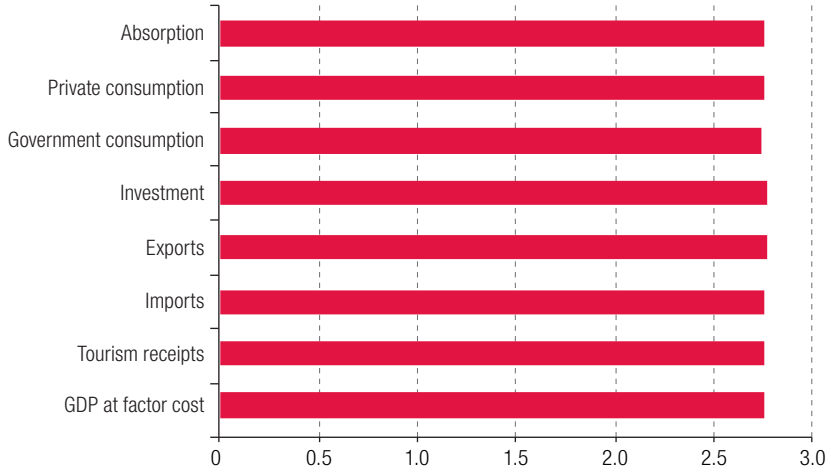
[17] Tables A2.1 to A2.5 in annex A2 show additional results for the base and non-base scenarios, covering macro and sectoral indicators as well as the government budget and the balance of payments.

Figure 10
Base scenario: domestic final demand
(Billions of Jamaican dollars at 2015 prices)



Source: Prepared by the authors, on the basis of simulation results.

Figure 11
Base scenario: real annual macroeconomic growth, 2018–2030
(Percentages)

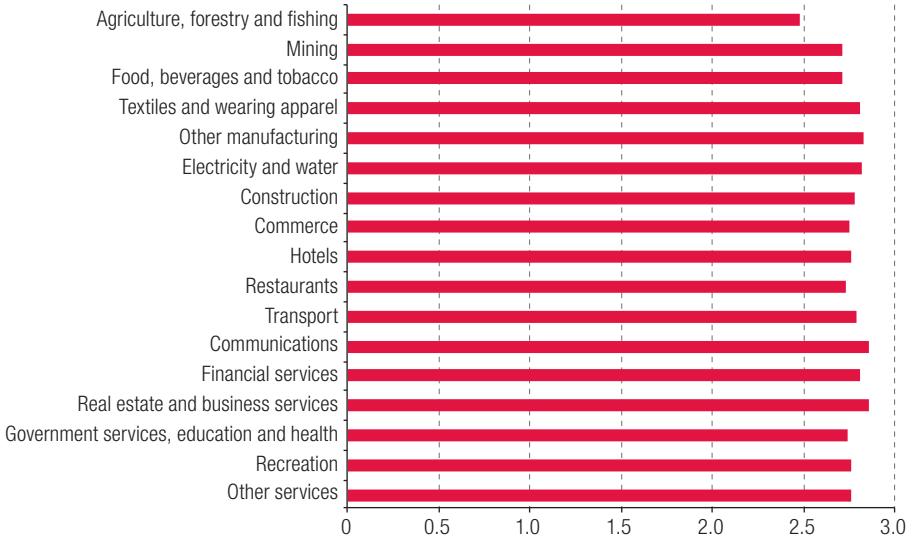


Source: Prepared by the authors, on the basis of simulation results.

In terms of sectoral structure (see figure 12), growth for agriculture is relatively low owing to slow growth in the supply of land (which is assumed to increase by 0.1% annually) and low income elasticities of demand. The sectoral structure of value added and exports shifts in favour of manufacturing and services, which enjoy more favourable supply and demand conditions. Among services, hotel

and restaurant growth is strongly influenced by foreign tourist arrivals. Consequently, the growth rate of tourism-related industries closely follows the GDP growth rate (see above). Per capita household consumption grows at a rate of 2.6% per year, leading to a significant decrease in the poverty rate, from 20.8% in 2015 to 9.1% in 2030 (see figure 13).

Figure 12
Base scenario: real annual sectoral growth, 2018–2030
(Percentages)



Source: Prepared by the authors, on the basis of simulation results.

Figure 13
Base scenario: real per capita household consumption and headcount poverty

A. Real per capita household consumption
(Jamaican dollars at 2015 prices)

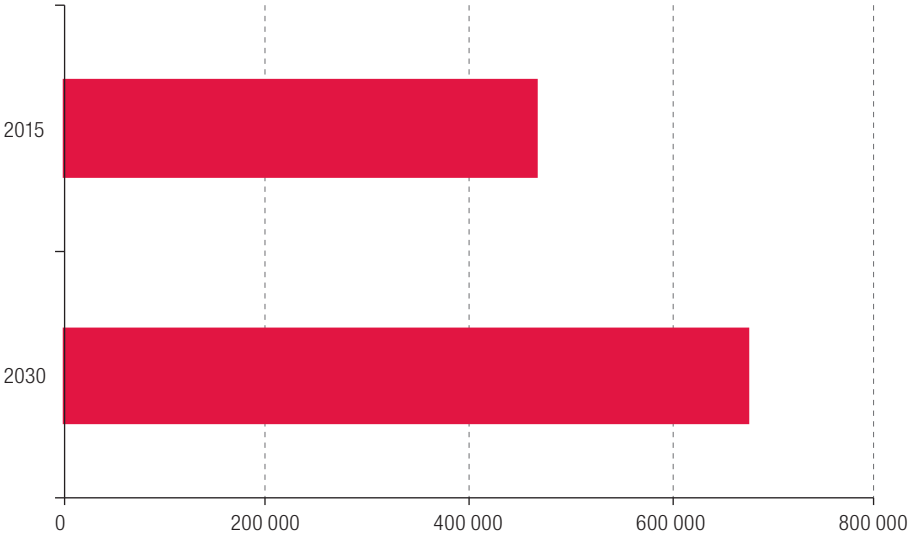
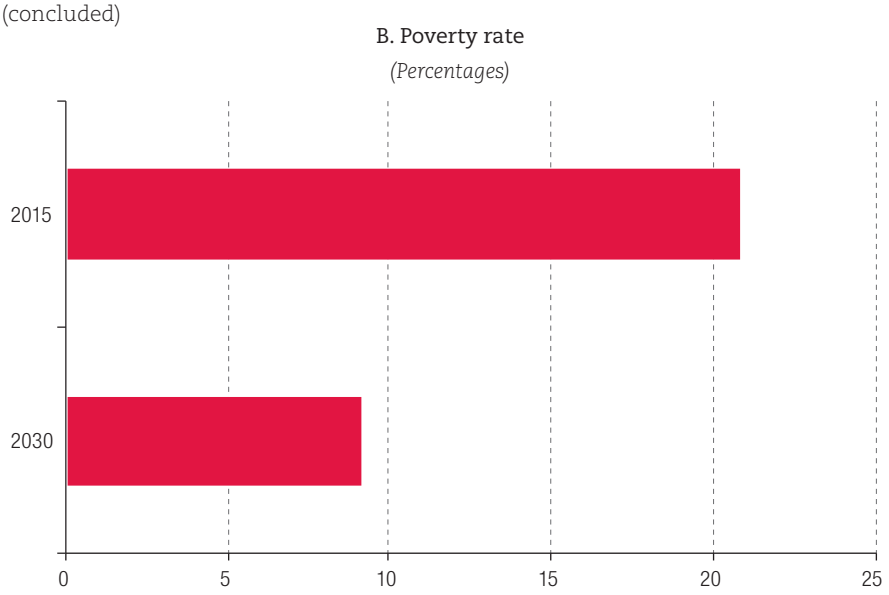


Figure 13 (concluded)

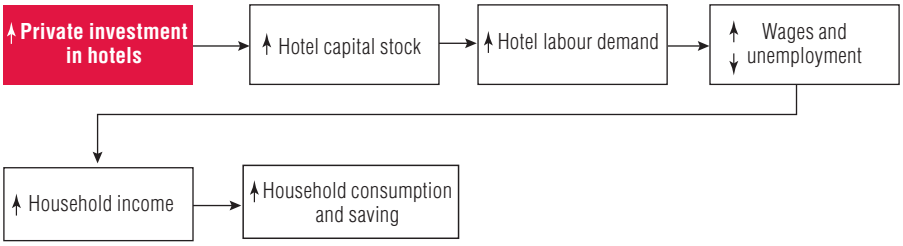


Source: Prepared by the authors, on the basis of simulation results.

(b) Non-base scenarios

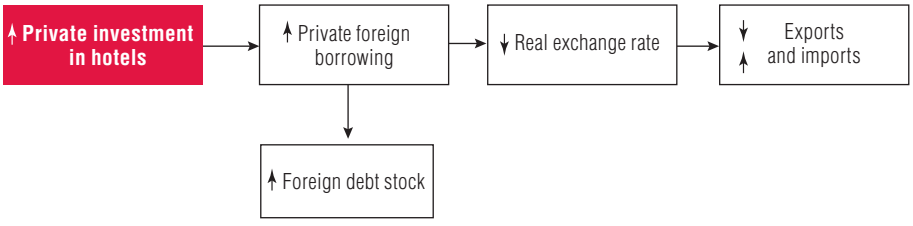
Figures 14 and 15 summarize the main transmission channels for the increase in private investment in hotels financed from abroad. Naturally, an increase in hotel investment will have a positive impact on the supply of accommodation services, i.e. the number or quality of hotel rooms, or both, will increase. In addition, when financing for additional investment comes from foreign borrowing, the inflow of foreign resources will lead to slower export growth and faster import growth, both induced by appreciation of the real exchange rate.

Figure 14
Main transmission channels for private investment in hotels



Source: Prepared by the authors.

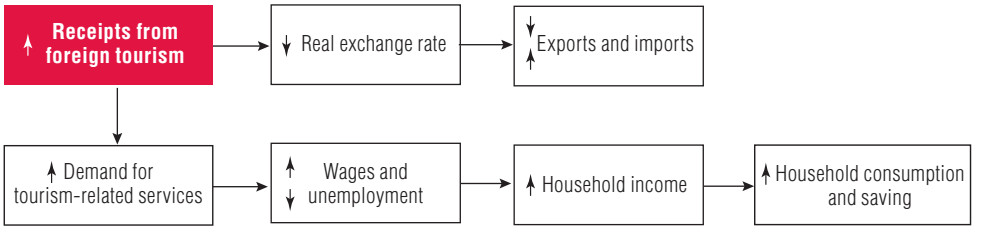
Figure 15
Main transmission channels for foreign financing of private investment in hotels



Source: Prepared by the authors.

Figure 16 summarizes the main transmission channels for the increase in receipts from foreign tourism. Overall, a rise in foreign tourism demand results in higher household income growth because these inflows of foreign exchange increase total resources in the economy. However, as shown in the figure, the increase in "tourism exports" also generates a real exchange-rate appreciation that hurts tradable sectors.

Figure 16
Main transmission channels for increased tourism receipts



Source: Prepared by the authors.

(c) Macro results

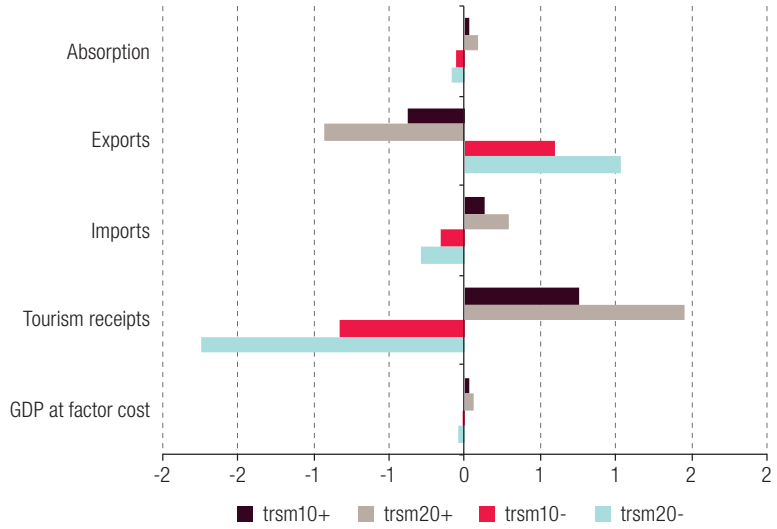
The main results for the non-base scenarios are presented in figures 17 to 21, and additional information can be found in tables A2.1 to A2.5 in annex A2. As shown in figures 17 and 18, increased private investment in hotels financed with foreign resources has a positive impact on the level of activity (see the results in table A2.1 for the trsm10+ and trsm20+ simulations in 2018). On the other hand, the inflow of foreign resources leads to slower export growth and faster import growth, both induced by real exchange-rate appreciation.[18] In turn, the expansion of tourism demand tends to increase domestic absorption more rapidly than GDP, likewise causing deterioration in the (non-tourism) trade balance (again, see scenarios trsm10+ and trsm20+). In other words, the increase in foreign tourism receipts also generates a real exchange-rate appreciation that hurts tradable sectors, while slower export growth here is also a function of increasing domestic demand and prices in Jamaica due to the investment. Thus, where there are constraints in the supply of factors (labour, capital, land and natural resources), an increase in domestic prices relative to world prices results in a reallocation of resources to domestic production in order to cater to more rapid growth in domestic demand, which includes demand from tourists visiting Jamaica.

Figure A2.1 in annex A2 provides information on the time path for deviations from the base for private consumption and investment in our set of scenarios. It shows that the short- and long-run effects of the four scenarios are similar. In the short run, however, the increase in private investment financed with foreign resources has a positive impact during the period 2018–2020. As explained, this is the period in which the accommodation sector expands. Overall, scenarios with decreased foreign tourist arrivals and spending show results of the opposite sign.

In the past, numerous authors have used input-output analysis to estimate income multipliers related to tourism expansion. Estimates generally range between 0.37 and 1.98 (Dwyer and Forsyth, 1998). However, income multipliers greater than 1 are suspect since the typical input-output approach assumes no constraints on capacity. In contrast to input-output analysis, which always produces a gain to the economy, CGE modelling acknowledges that price increases due to resource constraints may limit the increase in economic activity caused by growth in foreign tourism spending. In fact, as our results show, they may even lead to contractions in economic activity in some sectors. Consequently, our estimate of the income multiplier for 2030 and the trsm20+ scenario is 0.38, at the low end of the above spectrum. This is mainly because of capacity constraints.

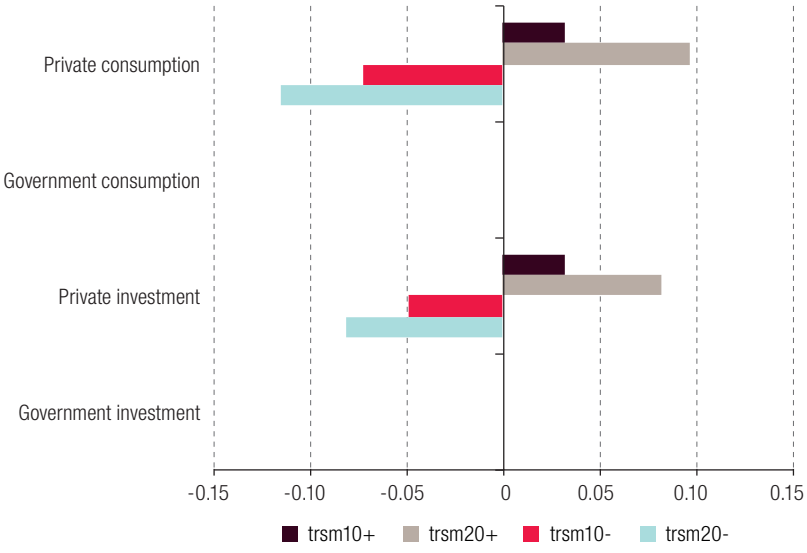
[18] Note that "exports" do not include tourism-related spending by foreigners. The latter certainly qualifies as tourism exports, but the two are treated differently in the model and figure 17.

Figure 17
Macro growth by simulation: deviation of average annual growth from the base scenario
(Percentage points)



Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario.

Figure 18
Consumption and investment growth by simulation:
deviation of average annual growth from the base scenario
(Percentage points)

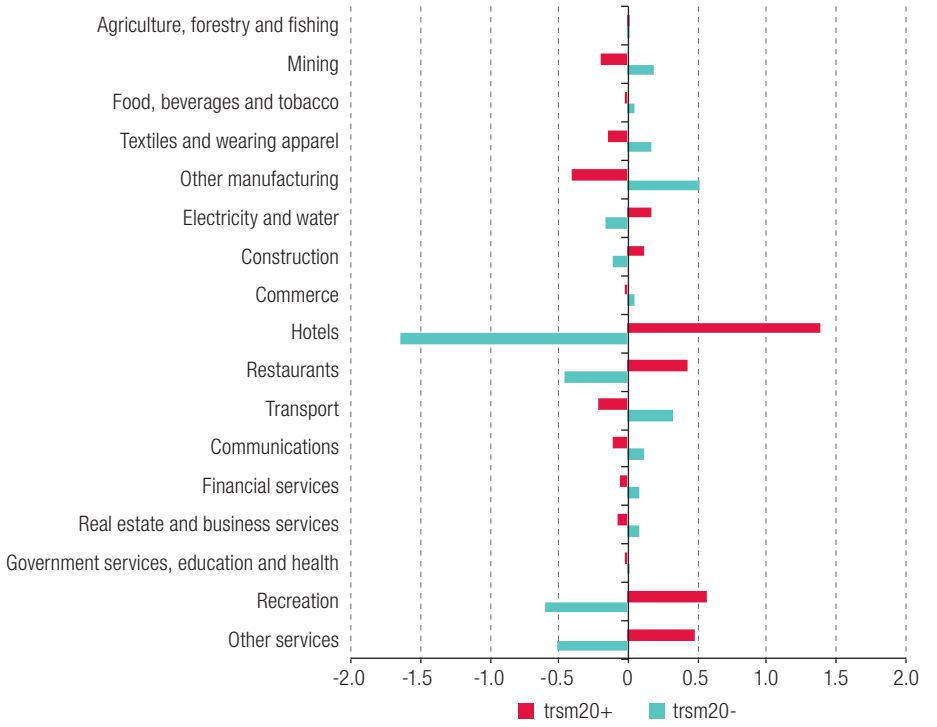


Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario.

(d) Sectoral results

Unsurprisingly, at the sectoral level, service industries catering directly to tourists, including hotels and restaurants, are strongly stimulated by growth in foreign tourist spending (simulations trsm10+ and trsm20+). In 2022, scenario trsm20+ shows employment in hotels and restaurants as being 6.6% and 6.3% higher than in the base scenario, respectively (see table A2.2). On the other hand, the upward pressure on prices and the real exchange rate leads to reduced competitiveness for the other (non-tourism) export sectors. Specifically, figure 19 and table A2.2 show a decrease in employment and value added in manufacturing and mining, two of the most export-oriented sectors (see table 2). In turn, scenarios trsm10- and trsm20- show that a 10% and 20% decrease in foreign tourist spending combined with an increase in FDI in the accommodation industry would lead to a large reduction in the number of workers employed in the hotel sector (again, see table A2.2). Our simulations show that the key mechanisms determining the size of the economic impacts from increased tourism demand include: factor supply constraints, exchange rate appreciation and current government economic policy (see Dwyer and others, 2000). In the period 2018–2020, the increase in private investment in hotels leads to a quite large expansion of the construction industry. Afterwards, higher incomes and saving mean that construction output is still above the baseline.

Figure 19
Sectoral GDP growth by simulation: deviation of average annual growth from the base scenario
(Percentage points)



Source: Prepared by the authors, on the basis of simulation results.
Note: For simplicity, only the results for the trsm20+ and trsm20- non-base scenarios are shown. trsm20+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm20+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario.

(e) Distributive results

With regard to poverty, our results show, for example, the poverty headcount ratio in Jamaica falling by about 0.3 percentage points and 0.11 percentage points relative to the base scenario by 2022 and 2030, respectively, in the trsm20+ scenario (see figure 20). The main drivers of this result are a decrease in unemployment, a higher average wage and an increase in non-labour income for households linked to the tourism industry. Interestingly, in the medium to long run the negative impact of real exchange-rate appreciation reduces the gains brought about by the increase in foreign tourism spending. Where inequality is concerned, we do not find statistically significant changes.

Figure 20
Headcount poverty by simulation in 2022 and 2030: deviation from the base scenario
(Percentage points)

Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario.

V. Concluding remarks

In this paper, a consistent quantitative framework has been developed for the assessment of private investments in the hotel industry and their impacts on a nation's economy and household welfare. The tourism sector's contribution to growth, poverty reduction and long-term development depends upon complex and dynamic economic, social, environmental and institutional linkages, spillovers and externalities. The results demonstrate that tourism and investment in this have positive impacts on national economies, though the distribution of benefits is dependent on socioeconomic factors such as the distribution of factor endowments among households. The sectoral distribution of benefits is also conditioned by these factors and by the initial conditions at the destination, such as the sectoral structure of the economy. There are invariably winners and losers when a new investment (or policy) is implemented.

In the present study, we applied this framework to simulate the impacts of US$ 600 million worth of private investment in tourism in Jamaica. To summarize, our results showed this investment combined with an expansion of foreign tourism demand to result in a positive impact on GDP, employment, household incomes and poverty. On the other hand, the expansion of foreign tourism demand leads to domestic absorption increasing more rapidly than GDP, which results in a deterioration of the merchandise trade balance. At the sectoral level, sectors catering more directly to tourism are found to experience the highest rates of growth, with sectors further removed from the tourism value chain growing more slowly. For instance, service industries such as hotels and restaurants are strongly stimulated by the expansion of tourism, with their value added increasing by 19% and 5.5%, respectively, when tourist demand increases by 20%. On the other hand, real exchange-rate appreciation leads to a loss of competitiveness in other (non-tourism) export sectors such as manufacturing and mining.

In addition, the results show that a 20% increase in tourism spending together with more private investment in the hotel industry could reduce poverty in the country by 0.3 percentage points by 2022 relative to the BAU scenario. This result is equivalent to a 2.3% average annual decrease in poverty relative to the BAU scenario between 2018–2030, and is mainly driven by a decrease in unemployment and a higher average wage. This could represent approximately 120,000 Jamaicans, or about 4% of today's population, being lifted out of poverty during the 13-year time frame. With regard to inequality, the study does not find statistically significant changes in any of the scenarios.

Overall, the findings show that investments in hotel infrastructure can bring major development impacts to local economies in developing countries. As global demand for tourism continues to grow and the supply of tourism services adjusts to changing preferences, it will be important to reach a greater understanding of the economy-wide impacts of different types of tourism investment, e.g. all-inclusive versus limited-service hotels. Multilateral development banks and impact investors working with the private sector have a key role to play in promoting tourism investments that drive broader development impacts.

Bibliography

Annabi, N., J. Cockburn and B. Decaluwé (2006), "Functional forms and parametrization of CGE models", *MPIA Working Paper*, No. 2006-04, Poverty and Economic Policy (PEP) Research Network.

Banerjee, O., M. Cicowiez and J. Cotta (2016), "Economics of tourism investment in data scarce countries", *Annals of Tourism Research*, vol. 60, September.

Banerjee, O., M. Cicowiez and S. Gachot (2015), "A quantitative framework for assessing public investment in tourism: an application to Haiti", *Tourism Management*, vol. 51, Elsevier, December.

Banerjee, O. and others (2018), "Boosting tourism's contribution to growth and development: analysis of the evidence", *Review of Development Economics*, vol. 22, No. 3, May.

Blake, A. (2015), "Computable general equilibrium model, tourism", *Encyclopedia of Tourism*, J. Jafari and H. Xiao (eds.), Springer, Cham.

Blanchflower, D. G. and A. J. Oswald (2005), "The wage curve reloaded", *NBER Working Paper*, No. 11338, Cambridge, National Bureau of Economic Research (NBER).

Croes, R. and M. A. Rivera (2017), "Tourism's potential to benefit the poor: a social accounting matrix model applied to Ecuador", *Tourism Economics*, vol. 23, No. 1, February.

Dos Reis, J. G. A. and R. P. de Barros (1991), "Wage inequality and the distribution of education: a study of the evolution of regional differences in inequality in metropolitan Brazil", *Journal of Development Economics*, vol. 36, No. 1, July.

Dwyer, L. (2015), "Computable general equilibrium modelling: an important tool for tourism policy analysis", *Tourism and Hospitality Management*, vol. 21, No. 2, December.

Dwyer, L. and P. Forsyth (1998), "Estimating the employment impacts of tourism to a nation", *Tourism Recreation Research*, vol. 23, No. 2.

Dwyer, L. and others (2000), "Economic impacts of inbound tourism under different assumptions regarding the macroeconomy", *Current Issues in Tourism*, vol. 3, No. 4.

Eugenio-Martín, J. L., N. Martín Morales and R. Scarpa (2004), "Tourism and economic growth in Latin American countries: a panel data approach", *FEEM Working Paper*, No. 26, Milan, Fondazione Eni Enrico Mattei (FEEM).
Fayissa, B., C. Nsiah and B. Tadesse (2011), "Research note: tourism and economic growth in Latin American countries: further empirical evidence", *Tourism Economics*, vol. 17, No. 6, December.
Harrison, G. W. and H. D. Vinod (1992), "The sensitivity analysis of applied general equilibrium models: completely randomized factorial sampling designs", *The Review of Economics and Statistics*, vol. 74, No. 2, May.
IMF (International Monetary Fund) (2017), *World Economic Outlook, April 2017: Gaining Momentum?*, Washington, D.C.
Jamaica Tourist Board (n/d), *Annual Travel Statistics 2016*, Kingston.
Jiang, M. and others (2011), "Some evidence for tourism alleviating poverty", *Annals of Tourism Research*, vol. 38, No. 3, July.
King, B. (1981), "What is a SAM? A layman's guide to social accounting matrices", *Staff Working Paper*, No. 463, Washington, D.C., World Bank.
Klytchnikova, I. and P. Dorosh (2013), "Tourism sector in Panama: regional economic impacts and the potential to benefit the poor", *Natural Resources Forum*, vol. 37, No. 2, June.
Lofgren, H., R. Lee Harris and S. Robinson (2002), "A standard computable general equilibrium (CGE) model in GAMS", *Microcomputers in Policy Research*, No. 5, International Food Policy Research Institute (IFPRI).
Mitchell, J. and C. Ashley (2010), *Tourism and Poverty Reduction: Pathways to Prosperity*, London, Earthscan.
Moreda, A. and others (2017), *Tourism Sector Framework Document*, Washington, D.C., Inter-American Development Bank (IDB).
Narayanan, B., A. Aguiar and R. McDougall (eds.) (2012), *Global Trade, Assistance, and Production: the GTAP 8 Data Base*, Center for Global Trade Analysis, Purdue University.
Njoya, E. T. and N. Seetaram (2018), "Tourism contribution to poverty alleviation in Kenya: a dynamic computable general equilibrium analysis", *Journal of Travel Research*, vol. 57, No. 4, April.
Pablo-Romero, M. del P. and J. A. Molina (2013), "Tourism and economic growth: a review of empirical literature", *Tourism Management Perspectives*, vol. 8, Elsevier, October.
Pyatt, G. and J. I. Round (eds.) (1985), *Social Accounting Matrices: A Basis for Planning*, Washington, D.C., World Bank.
Robinson, S. (1989), "Multisectoral models", *Handbook of Development Economics*, vol. 2, H. Chenery and T. N. Srinivasan (eds.), Amsterdam, North Holland.
Sadoulet, E. and A. de Janvry (1995), *Quantitative Development Policy Analysis*, Baltimore, The Johns Hopkins University Press.
STATIN (Statistical Institute of Jamaica) (2017), "Annual GDP" [online] https://statinja.gov.jm/NationalAccounting/Annual/NewAnnualGDP.aspx.
Taylor, F. F. (2003), *To Hell with Paradise: A History of the Jamaican Tourist Industry*, University of Pittsburgh Press.
UNWTO (World Tourism Organization) (2017), *Yearbook of Tourism Statistics, Data 2011–2015, 2017 Edition,* Madrid.
UNWTO/UN-Women (World Tourism Organization/United Nations Entity for Gender Equality and the Empowerment of Women) (2011), *Global Report on Women in Tourism 2010: Preliminary Findings*, Madrid/New York.
Vanegas, M., W. Gartner and B. Senauer (2015), "Tourism and poverty reduction: an economic sector analysis for Costa Rica and Nicaragua", *Tourism Economics*, vol. 21, No. 1, February.
Vos, R. and M. V. Sánchez (2010), "A non-parametric microsimulation approach to assess changes in inequality and poverty", *International Journal of Microsimulation*, vol. 3, No. 1, June.
WTTC (World Travel and Tourism Council) (2019), *Travel & Tourism Economic Impact 2019: World*, London.

Annex A1

Sensitivity analysis

The results from our Jamaica CGE model are a function of (i) the model structure (including functional forms used to model production and consumption decisions and macroeconomic closures), (ii) the database used for model calibration (including the SAM) and (iii) the values assigned to the model elasticities or, more generally, to the model's free parameters. In other words, the elasticities used in this study implicitly carry an estimation error, as they do in any similar model. To better understand the implications of this, we performed a systematic sensitivity analysis of the results with respect to the value assigned to the model elasticities. If the conclusions of the analysis are robust to changes in the set of elasticities used for model calibration, we will have greater confidence in the results presented above.

In the systematic sensitivity analysis, it is assumed that each of the model elasticities is uniformly distributed around the central value used to obtain the results. The range of variation allowed for each elasticity is +/-75%, i.e. a fairly wide range of variation for each model elasticity is incorporated. Our method is a variant of the one originally proposed by Harrison and Vinod (1992). Briefly, the model is solved iteratively with different sets of elasticities. The resulting distribution of results is used to build confidence intervals for selected model results. The steps for the systematic sensitivity analysis are as follows:

(i) The distribution (i.e. the lower and upper bound) is computed for each model parameter to be modified: elasticities of substitution between the primary factors of production, trade-related elasticities, expenditure elasticities and unemployment elasticities for the wage curves.

(ii) The model is solved repeatedly, each time with a different set of elasticities, following a Monte Carlo type procedure. First, the value for all model elasticities is randomly selected. Second, the model is calibrated using the selected elasticities. Third, the same base and non-base scenarios as previously described are calculated.

These three steps are repeated 1,000 times, employing sampling with replacement for the value assigned to the elasticities.

Table A1.1 shows the percentage change in private consumption estimated (i) with the central elasticities and (ii) as the average of the 1,000 observations generated by the sensitivity analysis. For the second case, the upper and lower bounds under the normality assumption were also computed. All runs from the Monte Carlo experiment receive the same weight. As can be seen, the results reported in the main text are significant and the estimates presented in table A2.1 are within the confidence intervals reported in table A1.1. For example, it is almost completely certain that the investment and tourism shock simulated in scenario trsm20+ would have a positive effect on private consumption. In addition, mean-comparison tests show that the increase in private consumption is significantly higher the larger the increase in foreign tourist arrivals.

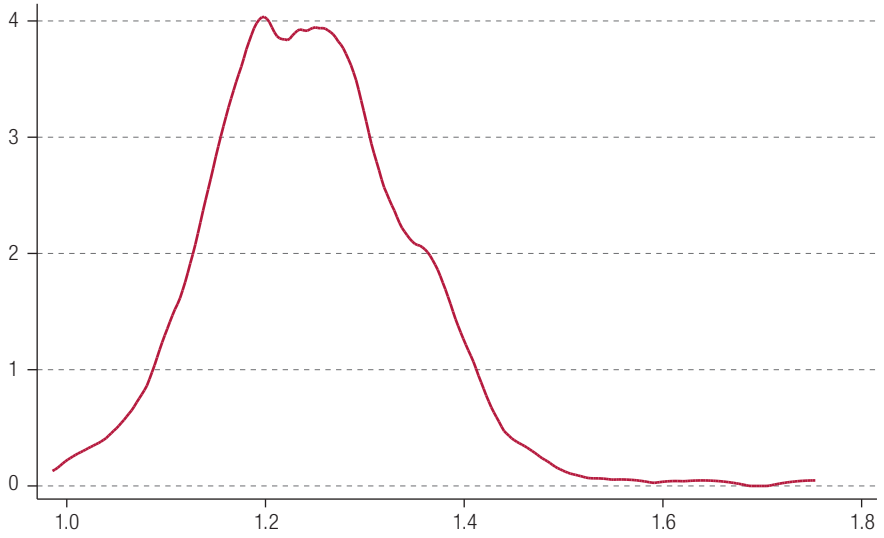
Figure A1.1 shows non-parametric estimates of the density function for the percentage change in private consumption in the trsm20+ scenario with respect to the base scenario. Again, the sign of the results (positive) does not change when model elasticities are allowed to differ by +/-75% from their "central" values.

Table A1.1
Systematic sensitivity analysis: 95% confidence interval for real private consumption under the normality assumption, deviation from the base scenario by 2030
(Percentages)

Item	trsm10+	trsm20+	trsm10-	trsm20-
Mean	0.387	1.246	-0.965	-1.494
Standard deviation	0.118	0.102	0.174	0.191
Lower bound	0.155	1.047	-1.306	-1.868
Upper bound	0.619	1.445	-0.623	-1.121
Central elasticities	0.401	1.231	-0.923	-1.447

Source: Authors' calculations.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario.

Figure A1.1
Sensitivity analysis, real private consumption under scenario trsm20+,[a] deviation from the base scenario by 2030
(Percentages)



Source: Authors' calculations.
[a] Scenario with a US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario.

Annex A2

Additional simulation results

Tables A2.1 to A2.5 show key macroeconomic and sectoral results for the non-base scenarios in 2022 (the first year after the simulated tourism-related investment is completed) and 2030.

Table A2.1
Real macro indicators and deviations from the baselines in the different scenarios

Item	Baseline (2015)	trsm10+		trsm20+		trsm10-		trsm20-	
		2022	2030	2022	2030	2022	2030	2022	2030
Absorption	1 923 274	0.2	0.3	0.8	1.0	-0.8	-0.7	-1.2	-1.2
Private consumption	1 346 283	0.2	0.4	0.9	1.2	-1.0	-0.9	-1.5	-1.4
Investment	345 265	0.3	0.4	0.9	0.9	-0.6	-0.6	-1.0	-0.9
Private investment	314 516	0.3	0.4	0.9	1.0	-0.7	-0.6	-1.1	-1.0
Exports	255 040	-3.5	-4.7	-9.6	-11.1	8.5	7.8	14.4	13.9
Imports	752 995	1.3	1.6	3.4	3.8	-2.2	-2.1	-3.7	-3.6
Foreign tourism	241 875	10.0	10.0	20.0	20.0	-10.0	-10.0	-20.0	-20.0
GDP at market prices	1 667 194	0.5	0.4	0.8	0.7	-0.1	-0.2	-0.5	-0.6
Net indirect taxes	319 582	1.0	1.0	2.1	2.1	-1.0	-1.0	-1.9	-1.9
GDP at factor cost	1 347 612	0.4	0.3	0.6	0.4	0.1	0.0	-0.1	-0.2
Real exchange rate (index)	1	-0.9	-1.3	-3.0	-3.5	3.0	2.5	4.7	4.3
Wages (index)	1	0.6	1.1	2.1	2.8	-1.9	-1.9	-3.0	-3.2
Return on capital (index)	1	0.3	0.0	0.4	-0.2	0.3	0.6	0.4	0.9
Unemployment rate (%)	13.5	-0.2	-0.2	-0.5	-0.5	0.5	0.3	0.8	0.6

Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario. Except where otherwise indicated, the 2015 column shows levels in millions of Jamaican dollars, while the simulation columns show percentage deviations from the base in the same year. For unemployment, the 2015 column shows the actual rate, while the simulation columns show percentage point deviations from that baseline the same year.

Table A2.2
Sectoral employment in the different scenarios

Sector	Baseline 2015	trsm10+		trsm20+		trsm10-		trsm20-	
		2022	2030	2022	2030	2022	2030	2022	2030
Agriculture, forestry and fishing	202 600	0.08	0.00	-0.09	-0.11	0.46	0.25	0.65	0.38
Mining	5 815	-1.16	-1.74	-2.95	-4.21	1.94	2.48	3.29	4.30
Food, beverages and tobacco	25 527	-0.01	-0.40	-0.77	-1.29	1.49	1.31	2.22	2.13
Textiles and wearing apparel	11 366	-0.70	-1.02	-2.12	-2.43	2.11	1.77	3.49	3.14
Other manufacturing	36 271	-2.10	-2.96	-6.23	-7.02	6.24	5.30	10.43	9.47
Electricity and water	8 723	1.78	0.99	3.43	1.58	-1.45	-0.33	-3.04	-1.05
Construction	82 789	0.60	0.60	1.38	1.29	-0.85	-0.68	-1.52	-1.27
Commerce	227 915	-0.19	-0.50	-0.70	-1.32	0.97	1.25	1.60	2.16
Hotels	36 480	-6.86	1.95	6.57	16.76	-31.38	-25.05	-42.45	-37.22
Restaurants	52 000	3.02	2.92	6.27	5.94	-3.34	-3.03	-6.46	-5.97
Transport	59 957	-0.29	-1.24	-2.74	-3.77	4.41	3.66	6.66	6.03
Communications	14 962	-1.20	-1.95	-3.74	-4.77	3.51	3.33	5.71	5.80
Financial services	26 469	-0.22	-0.68	-1.29	-1.93	1.77	1.65	2.70	2.73
Real estate and business services	74 393	-0.52	-1.14	-2.30	-3.14	2.66	2.44	4.08	4.05
Government services, education and health	159 964	0.01	-0.01	0.00	-0.04	0.03	0.05	0.04	0.07
Recreation	17 810	4.66	4.24	8.92	8.16	-4.01	-3.86	-8.41	-8.02
Other services	95 734	3.71	3.47	7.29	6.77	-3.52	-3.30	-7.16	-6.75
Total	1 138 775	0.18	0.20	0.59	0.52	-0.56	-0.38	-0.90	-0.65

Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario. The 2015 column shows the number of workers in each sector, while the simulation columns show percentage deviations from that baseline the same year.

Table A2.3
Sectoral real value added in the different scenarios

Sector	Baseline 2015	trsm10+		trsm20+		trsm10-		trsm20-	
		2022	2030	2022	2030	2022	2030	2022	2030
Agriculture, forestry and fishing	101 764	0.05	0.03	-0.04	0.02	0.25	0.09	0.35	0.13
Mining	29 359	-0.68	-1.07	-1.51	-2.56	0.72	1.37	1.31	2.38
Food, beverages and tobacco	67 014	0.00	-0.10	-0.33	-0.33	0.68	0.37	1.01	0.62
Textiles and wearing apparel	1 129	-0.54	-0.77	-1.58	-1.76	1.53	1.20	2.54	2.18
Other manufacturing	59 118	-1.43	-2.15	-4.22	-5.09	4.07	3.75	6.78	6.69
Electricity and water	45 242	0.81	0.96	1.61	2.04	-0.72	-1.07	-1.46	-2.02
Construction	103 898	0.62	0.64	1.35	1.38	-0.73	-0.70	-1.36	-1.32
Commerce	252 541	0.03	-0.09	-0.15	-0.24	0.50	0.36	0.76	0.64
Hotels	41 899	9.51	9.50	18.99	18.98	-9.45	-9.46	-18.93	-18.94
Restaurants	15 858	2.59	2.69	5.38	5.53	-2.88	-2.89	-5.57	-5.63
Transport	56 866	-0.25	-0.87	-1.92	-2.63	2.93	2.53	4.44	4.17
Communications	50 166	-0.37	-0.67	-0.98	-1.45	0.74	0.78	1.24	1.44
Financial services	116 150	-0.09	-0.28	-0.61	-0.75	0.86	0.62	1.30	1.04
Real estate and business services	147 320	-0.19	-0.37	-0.75	-0.95	0.80	0.63	1.22	1.06
Government services, education and health	202 138	0.01	-0.01	0.01	-0.04	0.03	0.04	0.03	0.06
Recreation	29 133	3.84	3.80	7.34	7.41	-3.35	-3.59	-7.02	-7.36
Other services	28 016	3.09	3.14	6.06	6.21	-2.96	-3.11	-6.02	-6.26
Total	1 347 612	0.43	0.30	0.59	0.45	0.11	-0.01	-0.06	-0.17

Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario. The 2015 column shows value added in millions of Jamaican dollars that year, while the simulation columns show percentage deviations from that baseline.

Table A2.4
Sectoral exports in the different scenarios

Sector	Baseline 2015	trsm10+		trsm20+		trsm10-		trsm20-	
		2022	2030	2022	2030	2022	2030	2022	2030
Agriculture, forestry and fishing	10 037	-6.18	-7.93	-16.38	-18.26	14.26	12.88	24.41	23.25
Mining	72 475	-0.71	-1.11	-1.52	-2.65	0.60	1.35	1.14	2.35
Food, beverages and tobacco	26 257	-5.25	-6.81	-14.55	-15.81	13.19	11.01	22.29	19.77
Textiles and wearing apparel	273	-6.49	-8.76	-18.28	-20.23	17.60	14.71	29.77	26.57
Other manufacturing	60 562	-4.96	-7.06	-14.12	-16.49	13.32	12.09	22.38	21.74
Electricity and water	1 831	-4.36	-4.05	-11.70	-9.36	10.02	5.90	17.05	10.56
Commerce	12	-4.11	-5.62	-12.21	-13.30	11.75	9.39	19.48	16.68
Transport	40 839	-4.16	-5.79	-11.95	-13.87	11.21	10.30	18.77	18.26
Communications	15 661	-2.81	-3.80	-7.14	-8.53	5.03	4.79	8.60	8.71
Financial services	10 607	-4.52	-5.95	-12.55	-13.85	11.28	9.53	19.02	17.06
Real estate and business services	12 642	-4.24	-5.24	-10.86	-11.90	8.57	7.48	14.76	13.55
Government services, education and health	89	-4.85	-6.88	-13.95	-16.36	13.42	12.25	22.53	21.80
Recreation	3 755	-1.54	-2.75	-7.48	-8.30	8.73	6.57	13.02	10.31
Total	255 040	-3.47	-4.75	-9.60	-11.14	8.53	7.77	14.40	13.88

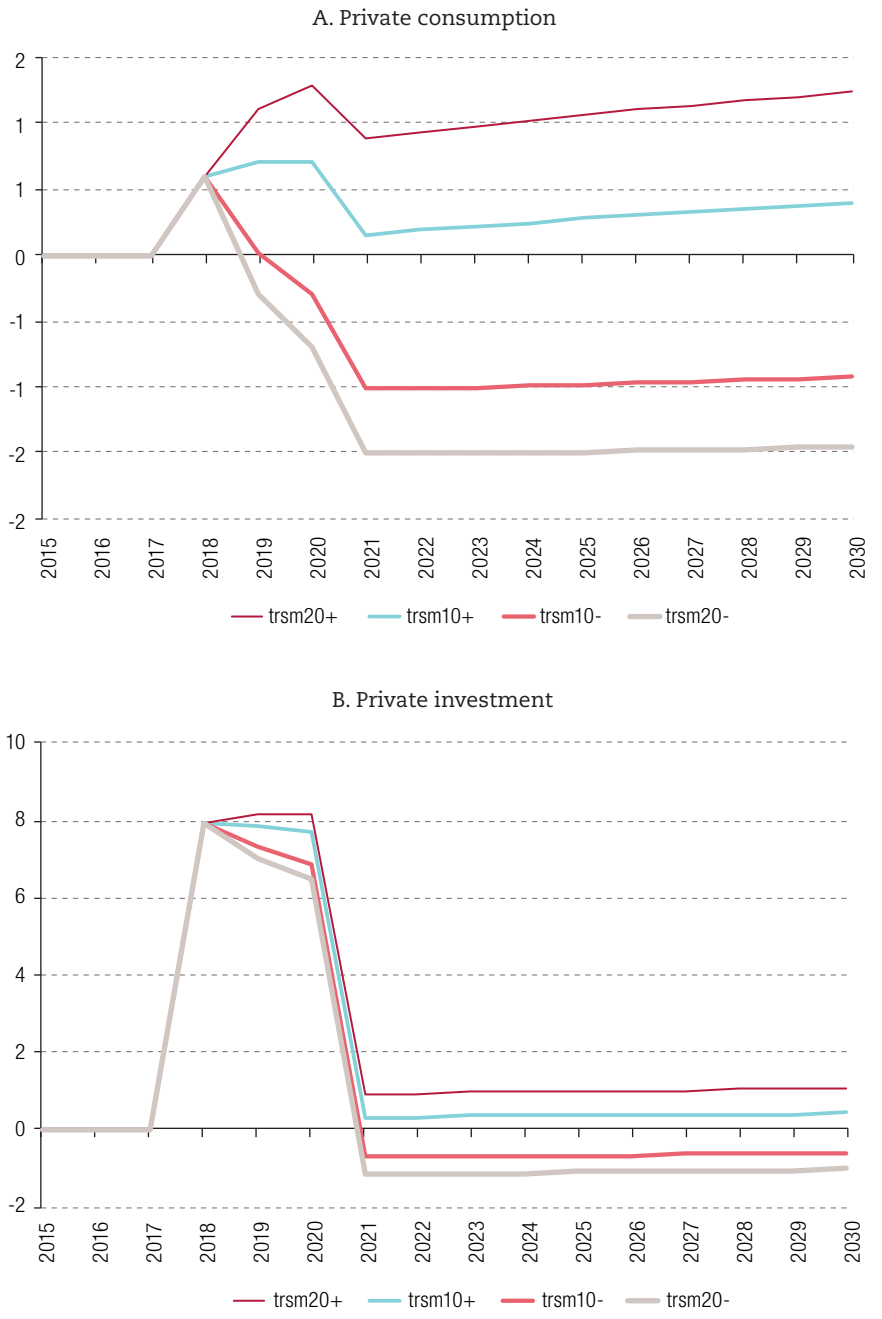
Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario. The 2015 column shows exports in millions of Jamaican dollars that year, while the simulation columns show percentage deviations from that baseline.

Table A2.5
Sectoral imports in the different scenarios

Sector	Baseline 2015	trsm10+		trsm20+		trsm10-		trsm20-	
		2022	2030	2022	2030	2022	2030	2022	2030
Agriculture, forestry and fishing	8 556	2.50	3.12	6.68	7.57	-4.49	-4.28	-7.45	-7.39
Mining	58	-0.40	-0.75	-1.45	-1.85	1.74	1.55	2.81	2.73
Food, beverages and tobacco	55 340	2.35	2.88	6.23	6.87	-4.33	-3.95	-7.23	-6.90
Textiles and wearing apparel	12 464	0.99	1.30	2.83	3.25	-2.21	-2.04	-3.61	-3.48
Other manufacturing	447 858	0.56	0.67	1.44	1.61	-0.90	-0.87	-1.50	-1.49
Electricity and water	522	3.61	3.67	9.28	8.53	-5.90	-4.52	-9.94	-8.03
Construction	639	2.52	3.38	7.33	8.46	-5.41	-4.92	-8.71	-8.34
Commerce	7 053	2.17	2.80	6.48	7.02	-4.70	-3.87	-7.46	-6.53
Hotels (imports)	28 574	1.07	1.53	3.45	4.00	-2.89	-2.55	-4.56	-4.24
Restaurants (imports)	8 556	1.07	1.53	3.45	4.00	-2.89	-2.55	-4.56	-4.24
Transport	41 872	3.78	4.19	8.82	9.42	-5.04	-4.89	-8.94	-8.89
Communications	12 669	1.68	2.06	4.30	4.85	-2.72	-2.56	-4.58	-4.49
Financial services	25 542	2.55	3.16	6.96	7.64	-4.78	-4.25	-7.87	-7.35
Real estate and business services	89 248	2.23	2.58	5.55	6.00	-3.47	-3.19	-5.95	-5.66
Government services, education and health	706	2.54	3.61	7.82	9.29	-6.07	-5.57	-9.63	-9.31
Recreation	9 923	7.00	7.67	16.66	17.32	-9.64	-8.92	-16.90	-16.15
Other services	3 415	6.48	7.23	15.88	16.64	-9.39	-8.61	-16.17	-15.37
Total	752 995	1.34	1.59	3.44	3.77	-2.21	-2.06	-3.73	-3.60

Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario. The 2015 column shows exports in millions of Jamaican dollars that year, while the simulation columns show percentage deviations from that baseline.

Figure A2.1
Real private consumption and investment in the different scenarios: deviations from the base scenario
(Percentages)



Source: Prepared by the authors, on the basis of simulation results.
Note: trsm10+: US$ 200 million yearly increase in private investment in hotels during 2018–2020 and foreign tourism spending 10% higher every year during the period 2021–2030 than in the base scenario; trsm20+: same investment as trsm10+, but foreign tourism spending 20% higher every year during the period 2021–2030 than in the base scenario; trsm10-: same investment as trsm10+, but foreign tourism spending 10% lower every year during the period 2021–2030 than in the base scenario; trsm20-: same investment as trsm10+, but foreign tourism spending 20% lower every year during the period 2021–2030 than in the base scenario.