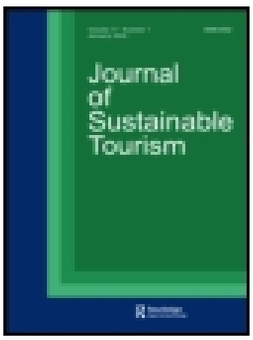

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Financing the sustainable management of Rwanda's protected areas

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ABSTRACT

Rwanda's Nyungwe National Park is a biodiversity hotspot with the most endemic species in the ecoregion and the highest number of threatened species internationally. Nyungwe supplies critical ecosystem services to the Rwandan population including water provisioning and tourism services. Tourism in the Park has strong potential for financing enhanced visitor experiences and the sustainable management of the Park. This paper explores quantitatively the economic impacts of adjustment in Park visitation fees and tourism demand as a source of revenues to improve Park tourism opportunities and ongoing operations and maintenance. The methods developed in this paper are novel in integrating the results of stated preference techniques with a regional computable general equilibrium modelling approach to capture multisectoral, direct, indirect and induced impacts. Such methods have strong potential for assessing revenue generation alternatives in other contexts where park managers are faced with the need to generate additional revenue for sustainable park management while facing diminishing budget allocations. Results of this analysis demonstrate that adjustment of Park fees has a relatively small impact on the regional economy and well-being when compared with a strategy aimed at generating increased tourism demand through investment in improving the visitor experience at Nyungwe National Park.

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Financing protected areas; economy-wide regional model; park fees; tourism demand; stated preference; Rwanda

Introduction

Nyungwe National Park forms part of the largest remnant of intact lower montane forest in Africa and is an important conservation area within the Albertine Rift Valley biodiversity hotspot. It is part of an eco-regional natural forest ecosystem known for the most diverse endemic vertebrae in the African continent, the most endemic species in the ecoregion, and the second highest number of threatened species internationally (Fischer & Killmann, 2008; Plumptre et al., 2007). The Park is home to threatened and near-threatened primates, including chimpanzees and owl-faced monkeys (Dowsett, 1990). Nyungwe National Park is also home to over 300 bird species, including 16 endemic species, and 75 mammal species. Once a national reserve, Nyungwe's status was elevated to that of a National Park in 2004 to protect the area's ecosystems and biological diversity, as well as its role as Rwanda's

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primary water catchment area. Logging, agricultural intensification and mining were significant threats to the area prior to the establishment of the Park (Birnie, Davies, Rice, & Mcluckie, 2015).

Nyungwe provides a range of critical ecosystem services to society and the economy. In terms of water provisioning ecosystem services, Nyungwe generates 70% of Rwanda's rainfall input to the country's principal river systems, including the Nyabarongo and Akagera river systems of the southern Nile Basin to the east, and the Lake Kivu and Congo River systems to the west. The densely forested slopes in this area are responsible for regulating ecosystem services that reduce the potential for flooding, mitigate erosion and contribute to the fertility of the economically important agricultural areas on the lower slopes. The Park contributes to climate regulation both through its role in carbon sequestration and in regulating regional rainfall patterns. Finally, its abundant plant diversity supports pollination ecosystem services that drive agricultural productivity in the region (Masozera, Alavalapati, Jacobson, & Shrestha, 2006).

In terms of cultural and aesthetic ecosystem services, tourism in Nyungwe makes important contributions to the regional economy. Since designation as a National Park, visitation has increased steadily from 2386 in 2005–2013, 644 in 2016, representing 15% of total Park visitation in Rwanda. Nyungwe has also experienced higher average annual growth in visitation than Rwanda's three other National Parks, Volcanoes, Akagera and Gishwati – Mukura National Parks (Figure 1). Overall visitation is still lower; however, relative to those of Volcanoes and Akagera National Parks which received over 32,000 and 41,000 visitors in 2016, respectively (RDB, 2016).

There are substantial opportunities for increasing the Park's contribution to Rwanda's economy, and to do so in a sustainable way. In 2015, Park revenue was US$317,992, accounting for only 2.1%

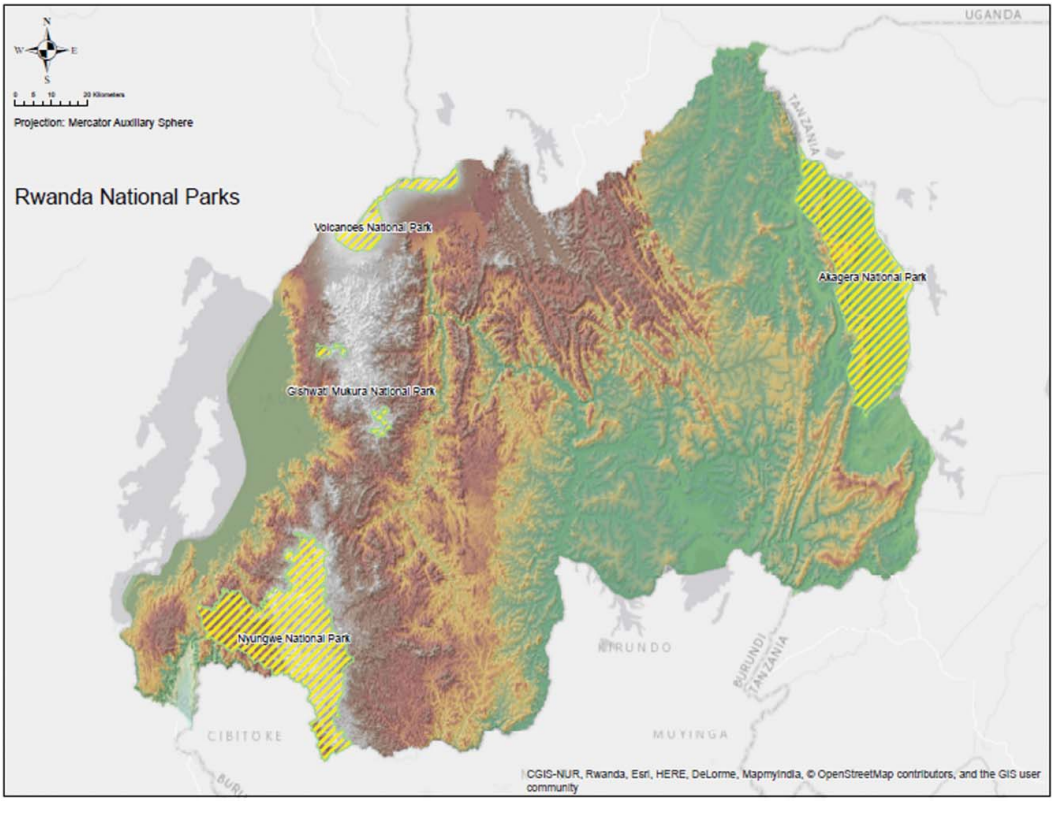

Figure 1. Rwanda's National Parks.
Source: Authors' own elaboration based on Rwanda Ministry of Agriculture and Animal Resources, Centre for Geographic Information Systems of National University of Rwanda data.

of Rwanda's total tourism revenue. Projected tourism revenue, however, is expected to increase by 61% by 2025 (WTTC, 2016), and Nyungwe is well poised to capture a greater share of this growth. Certainly, its natural features are like none other in the region with the oldest continuous rainforests in the world and the best preserved montane rainforest in East Africa. The recent introduction of two new lodges and the addition of a popular new attraction, the canopy walk, have strengthened demand and are indicative of the positive impacts new tourism opportunities can have on bolstering tourism demand.

Despite the positive outlook for Nyungwe National Park visitation, as a developing country, the resources the Rwandan Government can allocate towards sustainable management of the Park are limited given competing priorities for scarce public resources. To address this challenge, Rwanda's Development Board carried out a comprehensive strategic review of its protected area management functions which led to consideration of Public–Private Partnership arrangements between the Rwandan Development Board and the private sector. Such arrangements have proven to be successful in the management of Rwanda's Akagera National Park (Birnie et al., 2015).

Following this strategic review, the Rwandan Development Board commissioned the preparation of a 10-year business plan, produced by Conservation Capital, which assessed the status of Nyungwe's conservation context and determined conservation priorities for the Park (Birnie et al., 2015). The plan identified conservation management actions, potential revenue generation models, as well as appropriate governance structures. The plan outlines the investments that would be required to finance the improvements in Park recreational opportunities, conservation and management, considering first a five-year developmental phase followed by a consolidation phase that would continue into the foreseeable future. The first phase would involve developing a management framework and implementing new management operations, completing the requisite capital expenditures to support these operations, and developing the structures for the commercial revenue flow system that would be expected to mature during the second consolidation phase. The total cost of the plan over the 10-year period is approximately US$16.1 million, with recurring annual operations and maintenance costs of US$776,124 (Birnie et al., 2015).

Nyungwe National Park fees serve the dual role of a marketing and a revenue generation tool to finance Park operations and management. The marketing function of the fees projects an image of quality and exclusivity, as international visitors have shown strong preferences for a quality experience related to Rwanda's National Parks. The revenue generation function is critical for Park operations and maintenance; in the case of Volcanoes National Park, visitor fees generate 75% of total Park revenues. The shortfall between revenues and costs is greater in the case of Nyungwe National Park, and is usually supplemented with donor financing (Moore & Baca, 2012).

With the investments proposed under the business plan, securing additional revenues for Park management is a high priority issue on the Rwandan Development Board's agenda. Demonstrating the potential economic contribution, Nyungwe can make to regional development can stimulate private sector investment and substantiate a business case for investing in the Park. As in the case of Akagera National Park, there is significant scope for public–private partnerships and new revenue generation models through the development and leasing of concession spaces and educational centres. Demonstrating the regional socio-economic development impact of such investment can also help make a compelling case for development grant financing (Birnie et al., 2015).

This paper contributes to the current debate in Rwanda on how to increase tourism revenues to sustain the management of national parks, especially Nyungwe National Park. We develop a first regional computable general equilibrium (RCGE) model of Rwanda's South and West Provinces to evaluate the potential economic impacts from adjusting the Park fee structure and from increased tourism demand expected to arise from investment in enhancing the visitor experience in Nyungwe.

Protected areas can raise revenue for their management directly by introducing new paid services or through park entrance and activity fees. Several studies, in various contexts, have studied whether and how much tourists would be willing to pay for park access and activities (Kaffashi, Yacob, Clark, Radam, & Mamat, 2015; McDowel & Moore, 2014). Park fees on their own, however, are often

insufficient to cover all management and operational costs of a park and thus it becomes important to consider the park's role in the development of a tourist destination. A broader perspective thus becomes important to understand the economic spillovers that protected areas generate both for local populations and businesses. Increased regional economic activity generates additional tax revenue that could be allocated to park management.

This paper sheds light precisely on not only the direct economic benefits generated by the park through fees, but also the regional economic impacts through a regional, economy-wide assessment. This perspective improves our understanding Nyungwe's contribution to the development of the region through the indirect and induced benefits it generates. The RCGE approach applied here can be applied to other contexts to assess the contribution of protected areas to regional economic development and can generate evidence on economic returns on investment in protected areas as the central element in the development tourist destinations.

This paper is organized as follows. The second section reviews the importance of fee structures for the sustainable management of protected areas and provides a review of a recent study assessing consumer surplus for visiting Nyungwe National Park. The third section presents the methodology and provides an overview of the RCGE model. The fourth section describes the scenarios implemented in the RCGE and presents the results. The paper closes with a discussion of how the evidence generated here can support investment in Nyungwe National Park as a means of stimulating regional economic development and concluded by outlining the broader implications of the study.

Financing protected area management through park access and activity fees

Sustainable management of a national park for nature-based tourism requires a delicate balance between competing economic and environmental objectives. The value of the tourist visit depends to large measure on the quality of the visitor experience which is closely related to environmental quality. Analysis of visitor preferences at Nyungwe National Park in particular has revealed strong visitor preferences for quality. Policies to increase park visitation necessarily must consider the carrying capacity of the ecosystems and how protected area visitation is distributed over time. The use of park entrance and activity fees are market mechanisms that park managers have to achieve this balance (Birnie et al., 2015).

A well-designed fee structure serves to regulate access, reduce congestion, and reduce disturbance to the wildlife and other natural features that are the key assets of protected areas (Cessford, 2000). Regulating access is especially important for enhancing wildlife safety and maintaining ecosystem services and the biodiversity that underpin them (Karanth & DeFries, 2011; Whitelaw, King, & Tolkach, 2014). Given that protected areas are often critical habitats for endangered or near-endangered species, regulating access is key to maintaining these habitats in suitable condition. In developing countries, where public funds are limited and new areas are being conferred protected area status, development of such mechanisms is of critical importance for the sustainable management of these areas (Becken & Job, 2014; Chen & Jim, 2012; Karanth & DeFries, 2011; Mitchell, Wooliscroft, & Higham, 2013). Park activity and entrance fees are often important sources of revenue for park operations and maintenance as public budget allocations to protected areas are commonly insufficient (Manning, 1999; Walpole, Goodwin, & Ward, 2001; Whitelaw et al., 2014). Furthermore, park fees can help compensate for the opportunity cost of protected areas (Buckley, 2003).

The current fee structure at Nyungwe National Park has been shown to create confusion and generate visitor dissatisfaction. Since the Park was formally established, the number of activities has increased and the menu of options expanded. Currently, fees are a function of activity, activity duration and visitor residency status, among other variables. The fee structure also has caused issues for Park tour operators, particularly when there are unannounced changes in fees. This can affect client relations as well as generate unnecessary risk and uncertainty in operator financial planning (Moore & Baca, 2012).

Determining the correct pricing structure for protected areas is a complex task requiring consideration of revenue requirements for management and equitable park access to all segments of society. Understanding potential visitor responses to changing park fee structures before implementing changes is critical (Fix & Vaske, 2007; Kim & Crompton, 2002; More & Stevens, 2000). Contingent valuation is a stated preference approach (Champ, Boyle, & Brown, 2003) that can be used to determine how visitors would respond to changes in fee structures. Estimates of tourist willingness to pay (WTP) can be used to estimate fee structures that ensure adequate revenues are captured while maintaining visitation rates at a desirable level.

Rwanda is moving in the direction of packaging destinations. So far, tour operators have developed a package that includes visitation to all of Rwanda's national parks and some other key attractions in the country. Since designation of Nyungwe as a National Park, various policy and investment measures have been undertaken to both protect the Park and expand tourism opportunities. These measures include the establishment of a formal transboundary collaboration between the National Institute for the Environment and Conservation of Nature in Burundi and the Rwanda Tourism Board in 2008, and the construction of the canopy walkway in 2010. Owing to these changes, visitation numbers have increased substantially in recent years (Lal et al., 2017).

In this study, we use estimates generated by Lal et al. (2017) through a contingent valuation exercise to estimate visitor WTP for improved visitor experiences at Nyungwe National Park. Lal et al. (2017) surveyed 304 international tourists between February and July 2015. This period includes part of the peak tourism season which facilitated access to respondents. In addition to eliciting respondent Park use habits and standard demographic information, respondents were asked which activities they participated in and the maximum amount they would be willing to pay to engage in these activities.

Next, respondents were advised that there was a proposal to improve the quality of the visit to Nyungwe National Park where the proposed improvements included improving Park protection to increase the population of birds and primate species, thus increasing the probability of spotting wildlife during a visit. Additional improvements would enhance the beauty of the areas surrounding waterfalls and the nature walks, as well as increasing the number of rest areas and better trail systems. Respondents were asked to select from a list of options which indicated the entry and activity fee that they would be willing to pay to have access to these improvements. For visitor residents of Rwanda, the mean WTP was US$6.15 for activities and US$4.66 for the entrance fee. For tourist non-residents, the mean WTP was estimated as a 29% increase over the current fee structure. For the entrance fee, the WTP was estimated at US$14.35. Table 1 shows the current and proposed fee structure estimated in Lal et al. (2017). The proposed fee structure along with the estimated WTP for a Park entrance fee represent potential new direct revenues that would result from adjusting the Park fees. These direct benefits can contribute to financing the sustainability of current and future Park operations and maintenance following an investment in Park improvements.

The Park improvements considered follow the valuation scenarios described in Lal et al. (2017) and the investments considered in the business plan for the Park which are detailed in Birnie et al.

Table 1. Current and proposed activity fees in USD.

Activity	Current fee	New fee
Guided Nature Walk of Trails	$40	$52
Guided Birding Walk	$50	$65
Canopy Walkway Guided Hike	$60	$77
Tropical Waterfall Guided Hike	$50	$65
Congo Nile Trail Guided Hike	$100	$129
Chimpanzee Tracking with Guides	$90	$116
Other Primates Tracking with Guide	$60	$77
Camping/Tent/Night Stay	$30	$39

Source: Lal et al. (2017).

(2015). The business plan assessed Nyungwe's natural values and determined priority lines of action for conservation management. These lines of action included strengthening research, evaluation and monitoring functions, maintaining the wilderness character of Nyungwe, increasing the natural character of the buffer zones, restoring degraded habitats, and strengthening policy and advocacy for the Park.

Threats were also identified in the plan, most of which were directly related to the livelihood needs of local populations surrounding the Park. These threats included fire, invasive species, agricultural expansion, wood-gathering, mining, poaching and infrastructure development. To combat these threats, priority lines of action included strengthening the community engagement programme, improving law enforcement and building stronger relationships with government authorities. To capitalize on the opportunities presented by Nyungwe National Park and allay the perceived threats, the business plan proposed management actions that may be classified as Field Operations and Central Project Management actions. For each line of action, objectives, strategies and required resources were delineated. For Field Operations, major lines of action are (i) law enforcement; (ii) habitat and wildlife management; (iii) community engagement; (iv) transport and logistics; (v) research; and (vi) monitoring and evaluation.

Under Central Project Management activities, major lines of action are (i) finance management; (ii) general administration, compliance and human resources management; (iii) commercial management; (iv) revenue collection; (v) risk management; (vi) stakeholder management; (vii) donor management; and (viii) policy development. The investment costs used in this paper follow directly from the business plan and are estimated at US$16.1 million for the first 10 years, followed by recurring annual operations and maintenance costs of US$776,124 (Birnie et al., 2015).

Methods

The tourism industry is not an isolated sector. Indeed, it is comprised of and has important linkages with many sectors, ranging from the hotel and restaurant sector where it is dominant, to food and beverages and transport, where its influence is also strong. Similarly, investments in diverse sectors contribute to the development of tourism, from infrastructure development, the provision of basic public services such as water and sanitation, and capacity building in the services sector, to institutional strengthening in terms of tourism-sector governance.

Thus, to assess the economic impact of the many types of policy interventions, investments and external shocks that might affect the tourism sector, a framework that considers all economic sectors and their inter-linkages is essential (Banerjee et al., 2015; Dwyer, 2015). A computable general equilibrium (CGE) model provides a systematic method for estimating both the direction and approximate magnitudes of impacts of policies and external shocks on different economic agents and institutions. Banerjee, Cicowiez, and Cotta (2016) and Cicowiez, Banerjee, and Morris (2017) provide a comprehensive review of CGE analysis applied to public investment in tourism destinations. What follows is an overview of the regional, tourism-extended, dynamic RCGE model for Rwanda's South and West Provinces developed to evaluate the direct, indirect and induced impacts of investing in improving the visitor experience in Nyungwe, a restructuring of the Park's fee system and increased tourism demand. The RCGE model was developed for Rwanda's South and West Provinces since Nyungwe National Park straddles both of these provinces.

A dynamic computable general equilibrium model for Rwanda's south and west provinces

The RCGE model developed here combines a relatively standard recursive dynamic CGE model (Lofgren, Harris, Robinson, Thomas, & El-Said, 2002; Robinson, Yunez-Naude, Hinojosa-Ojeda, Lewis, & Devarajan, 1999) with a tourism-specific extension. The tourism extension follows (Banerjee et al., 2016; Banerjee, Cicowiez, & Gachot, 2015) and contains additional equations and variables where one can define (i) the domestic and foreign tourism demand; (ii) different modalities of tourism

supply and demand; and (iii) the impact of public capital investment in infrastructure on sectoral productivity.

Given the regional character of the model developed here, it is customized to account for (i) trade between the modelled region and the rest of the country and the rest of the world, and (ii) local and central government operations in the modelled region (i.e. tax collection and current and capital spending). In summary, compared to other RCGE models, the one developed here provides a combination of policy-relevant features for the study of tourism investment or policy counterfactual scenarios in a regional economy.

The major building blocks of the RCGE model for Rwanda's South and West Provinces can be categorized as activities (producers of commodities), markets for commodities (goods and services), markets for factors (labour, land and capital stock), and five institutions: households, government, the rest of the country, the rest of the world and foreign tourists. Foreign tourism is a source of income and foreign exchange earnings for the modelled region. In applications of the RCGE, the blocks depicted are disaggregated; the disaggregation used in the current application is shown in Table 2.

Activities represent economic sectors in the South and West Provinces that produce and sell their output at home (within the South and West Provinces) or outside of the South and West Provinces, to the rest of Rwanda and/or the rest of the world. Activity revenues are used to finance costs of production and provide returns to investors. Firm decisions to pursue specific activities with certain levels of factor use are driven by their profit maximization objective. The shares of output that are exported and sold domestically depend on the relative prices of the output in world, national and domestic markets. For any exported commodity, exporters face either (i) export prices (here referred to free-on-board prices) that are exogenously determined, in which case export demand is infinitely price-elastic; or (ii) price-sensitive export demands defined by constant-elasticity functions with the free-on-board export prices linked to domestic conditions such as costs of production and the real exchange rate.

Households earn incomes from factors of production and transfers. This income is used for consumption and savings and to pay direct taxes. Household consumption decisions change in response to income and price changes. By design and as a constraint imposed by the household budget, the value of household consumption is equal to its income net of direct taxes and savings.

Table 2. Accounts in the South West Regional SAM.

Category	Sector	Category	Sector
Primary	Food crops	Services continued	Real estate
*(6)	Export crops		Technological services
	Livestock		Support services
	Forestry		Government
	Fisheries		Education
	Mining		Health
Manufacturing	Processed food	Factors	Other services
*(8)	Beverages and tobacco prod	*(6)	Labour
	Textiles		Capital
	Wood products		Land
	Chemicals, rubber and plastic		Livestock
	Non-metallic mineral prod		Natural resources
	Machinery and equipment	Taxes	Commodity taxes
	Other manufactures	*(3)	Import taxes
Services	Electricity		Direct taxes
*(15)	Water	Institutions	Households
	Construction	*(4)	Government
	Repairs		Rest of Country
	Trade		Rest of World
	Transportation	Savings and investment	Tourism
	Hotel and restaurant	*(4)	Savings
	Telecommunications		Non-government investment
	Financial		Government investment

Source: Authors' own elaboration based on the Social Accounting Matrix for the South and West Provinces of Rwanda (2011).

The government receives revenue from taxes and transfers from abroad, and uses these for consumption, to transfer to households, and for investment, drawing on the loanable funds market for supplementary funding. To remain within its budget constraint, the government adjusts its spending according to available receipts or mobilizes additional receipts to finance its spending plans.

The rest of the country institution represents income flows from the South and West Provinces to and from the rest of the country to the South and West Provinces.

The rest of the world account represents income flows to Rwanda and from Rwanda and are those that appear in the balance of payments. This account sends foreign currency to the Provinces in the form of transfers to its government and households. The Provinces use these inflows to finance their imports. It is assumed that the balance of payments clears meaning that inflows and outflows are equalized through adjustments in the local real exchange rate (the ratio between the international and domestic price levels), influencing export and import quantities and values in foreign currency.

The private capital account for the South and West Provinces provides investment financing from savings by households, the government, the rest of the world and the rest of Rwanda.

Tourism demand from the rest of the world and the rest of Rwanda can be modelled as an exogenous volume or using constant elasticity of demand functions. In the latter case, the South and West Provinces face downward-sloping demand curves for their tourism exports. In both cases, the total tourism demand is disaggregated across locally produced commodities using fixed coefficients. Equations (1) and (2) show the demand functions used to model tourism export demand from the rest of the world and the rest of Rwanda, respectively.

These relationships in the model are described by the following equations:

$$QTROW_{c,i} = \overline{qtrow}_{c,i}\left(\frac{PQ_c \,/\, EXR}{PQ_c^0 \,/\, EXR^0}\right)^{\eta_{rowt,i}} \tag{1}$$

$$QTROC_{c,i} = \overline{qtroc}_{c,i}\left(\frac{PQ_c \,/\, CPI}{PQ_c^0 \,/\, CPI^0}\right)^{\eta_{roct,i}} \tag{2}$$

where c is the tourism-related *commodities* such as hotels and restaurants; i is the tourism demand *modalities* such as tourist and business visitors; $QTROW_{c,i}$ is the Rest of the *World* (RoW) tourism type i demand quantity of commodity c; $QTROC_{c,i}$ is the Rest of *Country* (RoC) tourism type i demand quantity of commodity c; PQ_c is the composite commodity price for c; *CPI* is the consumer price index; *EXR* is the exchange rate; $\overline{qtroc}_{c,i}$ is the baseline RoC tourism type i demand quantity of commodity c; $\overline{qtroc}_{c,i}$ is the baseline RoW tourism type i demand quantity of commodity c; $\eta_{roct,i}$ is the constant price elasticity of RoC tourism demand (<0); $\eta_{row,i}$ is the constant price elasticity of RoW tourism demand (<0).

As shown, constant elasticity of demand functions is used to model tourism export demand from the rest of the world and the rest of the country. In addition, within domestic and foreign tourism demand, the model allows for the identification of one or more tourism demand modalities (i.e. see index i in Equations (1) and (2)).[1] In Equation (1), foreign tourist demand is a function of local tourism-related prices relative to the exchange rate. In Equation (2), national tourist demand is a function of local tourism-related prices relative to the consumer price index. Note that although tourists from the rest of Rwanda do not need to change currencies, a real exchange rate exists between any specific region of Rwanda that is being modelled and the rest of the country. This regional exchange rate is defined as the ratio between regionally tradable and non-tradable commodities such as housing.

In domestic commodity markets, flexible prices ensure balance between demand and supply. Import prices in most cases would be exogenous, but the assumptions of the model can be adjusted for cases where their prices are endogenous; for example, where a large increase in imports from a specific region of the country could push up prices. The share of imports in the national market is

determined by their international prices relative to domestic prices. In factor markets, demand curves are downward-sloping reflecting the responses of production activities to changes in factor prices.

In the case of labour, unemployment is endogenous. For each labour type, the model assumes an inverse relationship between the real wage and the unemployment rate (Blanchflower & Oswald, 2004, 1994). The model allows for different assumptions about labour mobility in response to wage differentials between Rwanda and the rest of the world, and between one region and another within Rwanda. For non-labour factors, the supply curves are vertical in any single year: that is, their quantities are fixed, but prices adjust according to the level of demand.

In this RCGE, national income growth over time is largely endogenous and the economy grows as capacity expands which is determined by net fixed capital formation, labour force growth and improvements in total factor productivity which have both endogenous and exogenous components. The endogenous determinants of total factor productivity include the levels of government capital stock and economic openness. The accumulation of private and government capital is financed by local and external investment. Increased private capital is allocated across sectors according to their relative profitability. Once installed, capital becomes sector-specific and can only be adjusted through exogenously determined depreciation and the attraction of new investments.

The basic accounting structure and much of the underlying data required to implement the RCGE model are based on a Social Accounting Matrix (SAM) developed in this study for Rwanda's South and West Provinces. A SAM is a comprehensive, economy-wide statistical representation of the 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 core database input for a CGE. Major accounts in a standard SAM match the main building blocks of the CGE as described above: activities, commodities, factors used in production and institutions such as households, government and the rest of the country/world. Table 2 shows the main accounts in the SAM, while Table 3 provides a snapshot of the economy of Rwanda's South and West Provinces.

Gross regional product (GRP) for the South and West is equal to US$2.6 billion which is equivalent to approximately 41% of national gross domestic product (GDP). Imports into the two provinces are slightly greater than exports at US$982 million and US$753 million, respectively. Regional tourism demand, much of which can be attributed to Nyungwe National Park, is US$115 million.

With the hotel and restaurant sectors closely related to tourism, they are responsible for 2.4% of value added and 2.3% of employment in the South and West Provinces of Rwanda. The strongest value-added sectors are the agriculture sector (42% of value added), followed by other services (18.9%), commerce and trade (13.4%), and construction (6.9%); employment shares are similar to value added shares. Exports to the rest of the country are highest for manufacturing, hotel and restaurants, and agriculture (24.6%, 22.1% and 19.6%, respectively). Imports from the rest of the country are outweighed by manufacturing exports with an 83.4% import share.

Table 3. Macro indicators for South and West Provinces; millions of 2011 USD.

Macro-indicators; millions of 2011 (USD)	
Item	USD
Demand	
Private consumption	1806
Government consumption	419
Fixed investment	492
Exports	753
Tourism demand	115
Total demand	3584
Supply	

Source: Authors' own calculations based on the SAM for the South and West Provinces of Rwanda (2011).

Scenario design and results

This section describes the scenarios to assess the regional economic impacts of changes in the Park fee structure and investments in improving the visitor experience at Nyungwe National Park. Results are reported for each scenario individually while the discussion section discusses the broader implications of the scenarios considered herein.

Scenario design

The following six scenarios were implemented in the RCGE for Rwanda's South and West Provinces.

BASELINE: The first scenario, "BASELINE" is the baseline scenario which projects the economy of the South and West Provinces of Rwanda from 2011 to 2040. All other scenarios are compared to the baseline scenario. Here it is assumed that past trends will continue from 2011 to 2040. In fact, in the absence of better projections, it is assumed that the economy of Rwanda's South and West Provinces is on a balanced growth path, which means that real or volume variables, including tourism demand, grow at the same rate, while relative prices do not change. In the baseline, the most recent estimate of government revenues from the Park was US$317,992 in 2015.

The primary *y*-axis of Figure 2 shows the number of visitors to Nyungwe National Park. In 2010, non-resident and resident visitors to the Park were 4930 and 839 visitors, respectively. With the short time series of observations for visitor numbers, a conservative approach is taken to projecting growth in Park visitation by imposing a linear trend line on the data. In this scenario, no assumptions are made about an increase in the number of tourists because of any investments or improvements made in the Park. By 2040, the number of Park visitors reaches 16,581 and 5231 for non-resident and resident visitors, respectively. The projection of the number of non-resident visitors and the product of the sum of the activity fee increase and the entrance fee represent the increase in government revenue derived from the change in fees (secondary *y*-axis).

INVEST: The second scenario, "INVEST" simulates the government investment in improving Park tourism opportunities and management. This scenario simulates the investment programme outlined

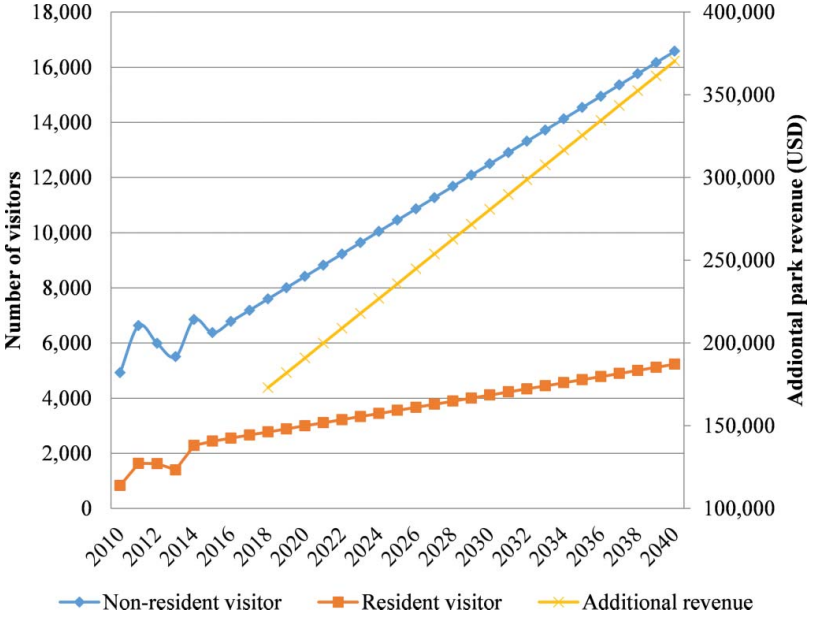

Figure 2. Visitors to Nyungwe National Park and additional park revenue with new fee structure; (2011 USD).
Source: Authors' own elaboration. Data source: Lal et al. (2017) and RDB (2015).

in the business plan through an increase in government expenditure and investment of US $2,015,035 per year from 2018 to 2022, and US$776,124 annually thereafter. To implement this scenario, it is assumed that that the government increases its recurrent spending in services related to Park operations (i.e. the commodity "Government" in Table 2). This implies that the government provision of services such as education and health is kept fixed at its base year levels. In turn, the increase in government capital expenditure refers to expenditure on infrastructure, such as roads and trails to improve Park access. The investment is financed through foreign borrowing.

ACTFEE: The third scenario, "ACTFEE", simulates the increase in the activity fee for non-resident visitors to the Park. This is equivalent to US$90,281 in 2018 and, driven by the business-as-usual growth rate in visitors, grows to US$189,780 by 2040. Since the estimated WTP for activities was linked to Park improvements, this scenario also includes the investment described in the INVEST scenario. The Rwandan Government, as the Park manager, is the recipient of the activity fee. The activity fee contributes to financing the investment and ongoing operations and maintenance of the Park.

ENTFEE: The fourth scenario, "ENTFEE", simulates the establishment of an entrance fee to the Park for non-resident visitors. In 2018, this is equal to US$82,804 and, driven by the business-as-usual growth rate in visitors, reaches US$180,684 by 2040. Since the estimated WTP for entrance to the Park was linked to Park improvements, this scenario also includes the investment described in the INVEST scenario. The Rwandan Government, as the Park manager, is the recipient of the entrance fee. The entrance fee contributes to financing the investment and recurrent expenditure in the Park.

DEMAND: The fifth scenario, "DEMAND", simulates a 10% increase in tourism demand resulting from improvements in Park tourism opportunities. The increase begins gradually in 2018 and reaches 10% in 2022. This scenario also includes the INVEST scenario which is reasoned to be largely responsible for this increase in demand. Although this increase is above baseline demand, it is still conservative given tourism demand projections made elsewhere (Lal et al., 2017; Moore & Baca, 2012).

COMBI: The sixth scenario, "COMBI", simulates the INVEST, ACTFEE, ENTFEE and DEMAND scenarios simultaneously. As depicted in Figure 2, the new fee structure generates an additional US$173,085 in direct government revenues in 2018 and reaches US$370,464 by 2040.

At the macro level, the RCGE model requires the specification of the equilibrating mechanism for three macroeconomic balances. For the non-base scenarios, these are:

(i) The impact on the government fiscal balance is cleared through changes in income tax rates on households. This assumption ensures that the simulations are budget neutral; in other words, in the absence of changes, domestic and foreign financing are kept fixed at their base values.
(ii) Private investment in the South and West Provinces follows an exogenously imposed path; given this path, adjustments in savings from the rest of Rwanda clear the savings–investment balance.
(iii) The real exchange rate adjusts to equilibrate inflows and outflows of foreign exchange, by influencing export and import quantities. As such, the simulations are neutral in terms of changes in regional net foreign assets. The non-trade-related payments of the (local) balance of payments (transfers and foreign investment) are non-clearing, following exogenously imposed paths.

In addition, given the regional character of the model, a mechanism is required to clear the current account of the balance of payments between the South and West Provinces and the rest of Rwanda. Specifically, it is assumed that the regional real exchange rate is flexible with respect to the rest of Rwanda, with equilibrium achieved through changes in the price of local non-tradable

commodities. In other words, prices for non-tradable commodities are region-specific, while for tradable commodities, the local price is a weighted average of the price of three different varieties: local commodities, commodities from the rest of Rwanda and commodities from the rest of the world.

Scenario results

Imposing a new activity fee structure and the entrance fee affects the economy in a number of ways. The increased fees are transferred to the Government account which increases government savings which in turn enables greater levels of government investment. At the same time, the Park fee payments cause a small appreciation of the exchange rate which reduces exports from the South and West Provinces, and an increase in imports.

In the INVEST scenario, the new Government investment is transmitted through the economy through three main mechanisms. First, the investment in tourism infrastructure generates increased government demand for goods and services. This represents the purchase of goods and services that are required to improve the tourism opportunities within Nyungwe National Park. Construction services, for example, are a key economic sector stimulated by the investment. This increased demand for goods and services produces increased demand for factors of production including labour which pushes wages up, unemployment down and results in greater household income, consumption and well-being.

Second, the government investment generates new tourism infrastructure and creates new capital stock. This increase in capital stock positively impacts tourism factor productivity which directly drives faster economic growth and boosts GRP. Third, the investment is financed through foreign borrowing which increases the stock of foreign debt. The large influx of investment capital leads to a regional exchange rate appreciation rendering exports less competitive and imports more appealing as was the case with the activity and entrance fee transmission mechanism.

The increase in foreign tourism demand has its own transmission mechanisms through which it impacts the economy. With increased tourist arrivals and/or expenditure, there is an increase in demand for tourism-related goods and services which includes hotels, restaurants and transportation among other goods and services. This increased demand is transmitted through the economy by increasing the output from these and related sectors and at the same time, increasing demand for factors of production including labour. This increased demand results in higher wages, reduced unemployment and greater household consumption, savings and well-being. At the same time, the increase in tourism demand contributes to an appreciation of the regional exchange rate which renders exports less competitive and imports more competitive.

Figure 3 shows the value of key macroeconomic indicators as the difference from baseline values in the year 2040. In the baseline by 2040, GRP would grow to US$10.7 billion. Clearly, it is the DEMAND scenario that would generate the greatest impact with a GRP impact of US$9.5 million. The investment itself is second in terms of its impact, and would increase regional product by US$1.28 million (INVEST scenario). The activity fee and the entrance fee would increase GRP by US$1.30 million, though the investment makes the larger contribution in this scenario. The GRP impact of ENTFEE would be similar to that of ACTFEE (US$1.30 million).

Figure 3 shows that in the COMBI scenario, imports from both the rest of Rwanda and the rest of the world would increase by US$6.88 million and US$56.52 million, respectively. Exports in the COMBI scenario would also tend to fall from both the rest of Rwanda and the rest of the world, by US $9.69 million and US$28.51 million, respectively. The appreciation of the real regional exchange rate would make exports less competitive and imports more appealing across scenarios. Absorption would increase by US$32.77 and GRP by US$9.57 million.

In terms of value added, it tends to increase across most sectors with the exceptions of the agriculture, forestry and fisheries, mining, and manufacturing sectors. These sectors are the most export-oriented and thus would be the most heavily impacted by the real exchange rate appreciation. The

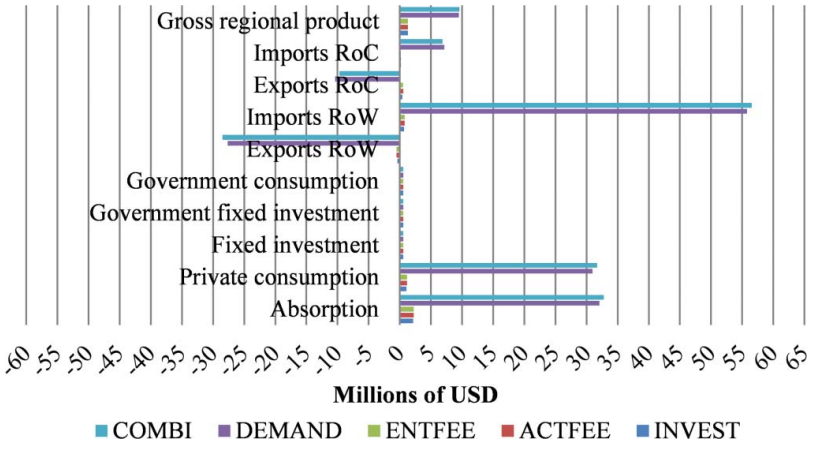

Figure 3. Macro-indicators, difference from baseline by 2040; millions of USD (2011).
Source: Authors' own elaboration based on modelling results.

hotel and restaurant sector would grow the most, by US$167.4 million in the COMBI sector, followed by other services (US$70 million) and trade and commerce (US$50.1 million).

Singling out the investment impact on the regional economy, the other services sector, construction and trade and commerce, would be stimulated the most through the Government investment (US$8.8 million, US$5.8 million and US$5.3 million, respectively). This is because both the construction and trade/commerce sectors are the mainstays of the public sector's capital stock. Increased consumption of government services on the other hand is a function of increased Government purchasing.

In this analysis, equivalent variation is used as the measure of change in household welfare (Banerjee, Cicowiez, & Moreda, 2017). Equivalent variation is the change in household income at current prices that a change in prices would have on household welfare if income were held constant. In other words, where an intervention does not occur, equivalent variation is the amount of income an individual would have to be offered to make them just as well-off as if the intervention had taken place. Impacts on equivalent variation are shown in Figure 4. It is the COMBI scenario, followed closely by the DEMAND scenario, that would result in the greatest positive welfare impact. By the end of the period, welfare would increase by US$31.7 million in COMBI and US$31 million, US$1.17 million, US$1.18 million and US$1.05 million in DEMAND, ENTFEE, ACTFEE and INVEST, respectively.

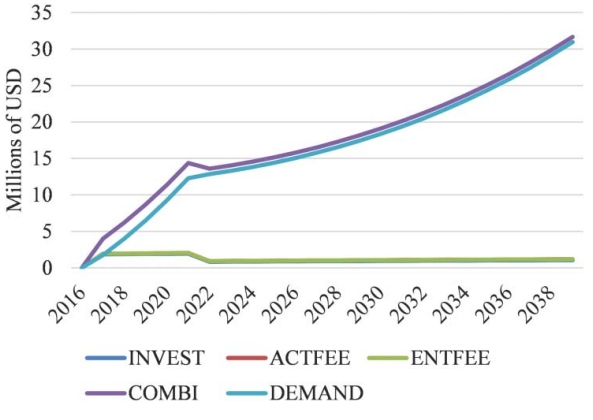

Figure 4. Welfare impacts expressed as equivalent variation; millions of USD (2011).
Source: Authors' own elaboration based on modelling results.

The net present value of each scenario, an indicator often required by multilateral development banks in assessing the economic viability of loans (which is similar to the scenarios explored here where the government investment was financed through foreign financing), was calculated using a discount rate of 12%. The net present value for the INVEST, ACTFEE, ENTFEE, DEMAND and COMBI scenarios would be equal to US$10.61 million, US$11.33 million, US$11.29 million, US$92.69 million and US$103.59 million, respectively.

Discussion

The results of this study show that overall, increases in activity fees and imposing an entrance fee for Nyungwe National Park have a relatively small impact when compared to the regional economic impact of investment in the Park visitor experience and increased tourism demand. The investment in Park improvements alone would generate an increase of US$1.28 million in GRP, while the increased fees, together with the investment impact, would increase regional product by US$1.30 million. The increase in tourism demand would drive the overall regional economic impact, raising regional product by US$9.5 million. Fee adjustments, investment and increased tourism demand taken together would lift regional product by US$9.57 million while the overall increase in household well-being would be US$31.7 million.

Analysing the transmission mechanisms through which the interventions affect regional economic development, the reasons for the small impact arising from the fee adjustment are evident. Imposing an entrance fee and adjusting the Park activity fee structure would result in an increase in the direct transfer of resources from foreign tourists to the Rwandan Government, as the manager of Nyungwe National Park. While these additional resources may be made available for Park management, they would not permeate the regional economy in any significant way in producing second-round economic impacts and spillovers.

Where the investment in enhancing Park tourism opportunities is concerned, in undertaking the investment, the government would increase its expenditure on goods and services. This increased government consumption would stimulate greater output and demand for factors of production including labour which would push up regional wages, reduce unemployment, and increase household income, consumption and well-being. These indirect effects are largely absent when Park fees alone are adjusted.

In the case of a conservative increase in tourism demand, the positive impacts would be amplified. The increase in tourism demand would generate an increase in the production of a broader set of goods and services consumed by tourists than those demanded by the government in the investment scenario alone. Greater demand for goods and services from more sectors would stimulate a greater number of backward and forward linkages characteristic of tourism-related sectors. With greater direct, indirect and induced benefits, household welfare would also improve markedly with heightened tourism demand.

This analysis highlights that if the Government of Rwanda's objective is to increase revenues from Nyungwe National Park to offset Park operations and maintenance, an emphasis on Park fees may be misguided, particularly since visitation rates are relatively low. This study shows that efforts to improve tourism opportunities to enhance demand would be a much more effective strategy. Though the results presented in Lal et al. (2017) show that there is a willingness to pay higher fees for Park access and activities, in terms of overall economic impact and revenue generation, adjusting fees would have a small marginal effect as shown here.

Nonetheless, there are other reasons for adjusting Park visitation fees which include projecting quality and exclusivity, as well as to regulate use for considerations related to ecological and managerial carrying capacity. The former is unlikely to be limiting factor currently in the case of Nyungwe National Park, since tourism access to the Park is only permitted on one quarter of the Park's extent. It is worth noting that an interesting experiment with visitation fees is underway in Rwanda's Volcanoes National Park. In May of 2017, Rwanda's Development Board doubled its Mountain Gorilla viewing permit fees from US$750 to US$1500 per visitor. It will be interesting to analyse the impact of this change on the number of visitors to both the Park and the region, as well as the government revenue

implications of the change. Certainly, Volcanoes National Park is a special case where 75% of Park revenues are generated through visitation fees.

Conclusions

In this paper, an RCGE for the South and West Provinces of Rwanda was developed to evaluate the regional economic impacts of an adjustment to the Nyungwe National Park fee structure, an investment in improving the visitor experience in the Park, and the impact of increased tourism demand. The RCGE approach is powerful in enabling focus on a target region and capturing the multisectoral nature of the tourism sector and its forward and backward linkages with the rest of the economy. Once developed for a region, the RCGE model can serve as a laboratory for examining the *ex-ante* impacts of a range of tourism policy interventions and public investments. The methods developed here can be applied to other contexts to explore park revenue generation mechanisms where park managers are increasingly faced with the need to generate revenue for park management while facing diminishing budget allocations.

Changes in tourism demand are critical determinants of the regional economic impacts of protected areas. Estimating how tourism demand responds to improved visitor experiences and opportunities is a challenging area for further research. Flexible approaches to estimating tourism demand responses to public investments are critical tools for informing public investment decisions. Stated preference methods such as contingent valuation and choice modelling are promising techniques for estimating demand, though as survey-based methods, they are costly and time consuming to implement. Focus groups and engaging with tour operators and other local service providers can help inform expectations of tourism demand. Revised estimates of tourism demand, if generated, would help refine the results presented here.

Targeting tourism demand can be an effective strategy for financing protected areas as well as contributing to regional economic development. The flow-on regional economic impacts and spillovers arising from greater tourism demand can have a significant impact on the regional economy, wages, employment and household well-being. This increase in regional economic output would generate additional tax revenues which could be used for investment in the park and its operations and maintenance. For such a strategy to be effective, however, would require that a share of the increased tax revenue from greater tourism demand be allocated to the protected area. While this would require more complex political manoeuvring and involve more institutions and stakeholders than would simple adjustments to park fee structures, the overall economic impact of increased tourism demand would compensate for potential increased transaction costs, generating a win–win outcome for protected areas as well as regional governments.

The approach developed here can generate evidence on the potential regional economic impacts of public investment in tourism. This information can be of critical importance to substantiate a business case for both public and private investment, particularly when full-cost recovery of public investments is increasingly common. Furthermore, demonstrating the economic welfare impacts to households in proximity of the protected area – households which are often key protagonists in protected area advocacy and de facto management – can help leverage public investment by catalysing financing from both development and environmentally oriented international institutions.

Note

1. For example, index *i* in Equation (1) can refer to tourists from different countries.

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