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Economic spillover from Natural Protected Areas to conventional tourist destinations

Derrama económica de las Áreas Naturales Protegidas en destinos turísticos convencionales

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Abstract

This paper examines the role of Natural Protected Areas (NPAs) as a source of economic spillovers for mass tourism destinations in Mexico. An econometric model was used to explain the number of booked rooms in tourism destinations as a function of proximity to NPAs, controlling for destination characteristics. A conservative estimate suggests that some rooms booked by foreign visitors can be explained by proximity to NPAs. Our results open public policy options, such as a compensating mechanism from conventional tourism to fund NPAs and show that they would be economically efficient and contribute to sustainability.

Keywords: *positive externalities, sustainable tourism, spillover benefits, Mexico.*

Resumen

En este artículo examinamos el papel de las Áreas Naturales Protegidas (ANPs) como fuente de derrama económica en México atrayendo turistas que no llegarían en ausencia de estas. Para ello, planteamos un modelo econométrico que explica el número de cuartos ocupados de destinos turísticos en función de la proximidad a ANPs, controlado por otras características del sitio. Un estimado conservador indica que 17.7% de los cuartos ocupados por turistas extranjeros estarían explicados por la proximidad a ANPs. Estos resultados plantean posibilidades como un mecanismo de compensación por parte del turismo convencional, propuesta económicamente eficiente y que contribuye al desarrollo sostenible.

Palabras clave: externalidades positivas, turismo sustentable, derrama económica, México.

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Introduction

This paper studies the potential spillovers Natural Protected Areas (NPAs) generate for conventional tourism in Mexico. Conventional tourism is defined as the flows of domestic and inbound tourism that arrive at a set of destinations in Mexico, which the Ministry of Tourism officially reports. This set includes world famous destinations such as Cancun and Puerto Vallarta, major cities, and several other destinations that receive both national and international tourists. NPAs are argued to generate positive spillovers in this kind of destination by attracting a share of tourists that would not go there unless the former were available.

The hypothesis is that a given tourist is more willing to visit a destination with nearby natural attractions simply because they have the possibility of visiting them (even if they opt not to). As discussed later, even though NPAs are severely underfunded, results show that they explain a large share of visitors to conventional destinations. These findings suggest that the compensation from conventional tourism for NPAs is economically efficient and contributes to sustainability. To test this hypothesis, an econometric model that takes the number of booked rooms in conventional destinations was used as a function of proximity to NPAs. Destination characteristics were controlled such as the availability of air transport, beach destinations, and marginalization levels.

NPAs importance, goals, and obstacles

The importance of NPAs for human development and welfare has been recognized at national and international levels. The Convention on Biological Diversity (CBD) highlights the fact that these areas are a source of poverty reduction, climate change mitigation, health protection, preservation of fishing assets, food security, clean water, protection against natural disasters, and cultural and spiritual development for human beings (Mulongoy and Babu Gidda, 2008; Secretariat of the Convention on Biological Diversity, 2008). Likewise, governments have increasingly recognized their importance. This is borne out by the commitment signed in 2010 by several governments to protect at least 17% of terrestrial areas and 10% of marine areas by 2020 at the Conference of the Parties (COP) 16 in Cancun (CBD and UNEP, 2011).

In this respect, the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the International Union for Conservation of Nature (IUCN) (UNEP and IUCN, 2016) indicate that the marine conservation goal has already been reached and that the terrestrial goal is only 2.7 percentage points above the current percentage, which corresponds to 3.1 million square kilometers. However, the main constraint on increasing natural protected areas is the lack of financing. There are insufficient resources to maintain and expand protected areas, particularly in developing countries (Emerton *et al.*, 2006). The evaluation of the financial resources required to accomplish the 2020 commitments by Sukhdev *et al.* (2012) shows that between 150 and 400 extra billion dollars are required annually (between 0.08 and 0.25% of world GDP).

The Mexican case

The establishment of NPAs in Mexico is due to social and environmental reasons recognizing their importance to social development. There are approximately 91 million hectares of Natural Protected Areas according to the National Commission for Natural Protected Areas in Mexico (Spanish acronym CONANP) (CONANP, 2019); of which 21 million correspond to terrestrial areas, equivalent to 10.69% of the total terrestrial area; and 70 million correspond to marine areas, representing 22% of the total area including territorial seas and the Exclusive Economic Zone. In 2016, four new marine NPAs were decreed, with an area of 65 million hectares, thereby achieving the Aichi Goal of protecting at least 10% of the water surface (CBD and UNEP, 2011).

NPAs are classified as follows: Flora and Fauna Protection Areas, Natural Resource Protection Areas, National Monuments, National Parks, Biosphere Reserves, and Sanctuaries. The most extensive type of NPAs is the Biosphere Reserve with 78 million hectares, followed by Flora and Fauna Protection Areas with approximately seven million hectares, and then Natural Resource Protection Areas with nearly five million hectares. Table 1 shows the area covered by each type of NPAs and its equivalence with the International Union for Conservation of Nature system of classification (Bezaury-Creel *et al.,* 2009).

Table 1
Equivalence of classification and NPAs covered in Mexico

Mexico's classification	*IUCN Classification*	*Land Surface (thousands of hectares)*	*Water surface (thousands of hectares)*	*TOTAL*
Flora and Fauna Protection Areas	Protected area with sustainable management of natural resources	6668.60	328.26	*6996.86*

Table 1 (*continuation*)

Mexico's classification	*IUCN Classification*	*Land Surface (thousands of hectares)*	*Water surface (thousands of hectares)*	*TOTAL*
Natural Resource Protection Areas	Protected area with sustainable natural resource management	4503.35	0.00	*4503.35*
National Monument	Natural Monument	16.27	0.00	*16.27*
National Park	National Park	627.29	15,546.30	*16,218.59*
Biosphere Reserve	Buffer zone: Protected area with sustainable management of natural resources or Core zone: Strict Nature Reserve	9514.26	53,438.49	*62,952.75*
Sanctuary	Strict Nature Reserve	4.63	145.56	*150.19*
TOTAL		21,379.40	69,458.61	*90,838.01*

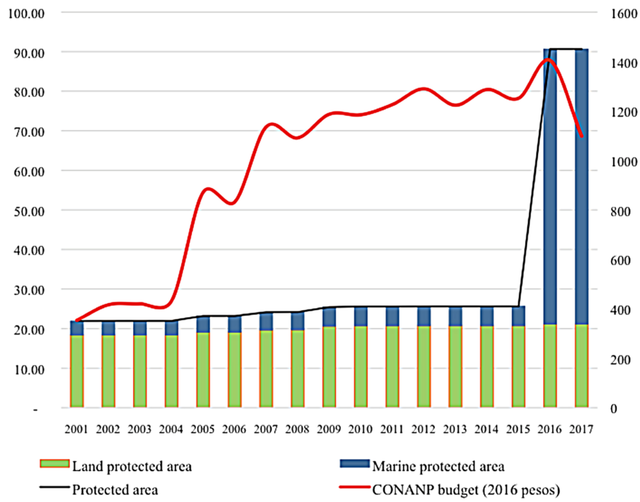
Source: CONANP (2019).

Despite having achieved the COP 16 goal, Mexico faces underfunding for the maintenance of Natural Protected Areas. Bezaury-Creel, *et al* (2011) estimated a 723 million peso (~36 million USD) gap in NPAs financing for 2012, when there were only 25 million hectares under this status. Given that CONANP had a nominal budget of $1,098 million pesos in 2017 (~55 million USD), less than in 2009 (SHCP, 2016), and that the size of protected areas increased from 26 million to 91 million hectares, the financial gap increased substantially. The situation subsequently further deteriorated: CONANP had a nominal budget in 2017 of $1,132 million pesos (~56 million USD) (SHCP, 2017), 843 million pesos (~ 43 million USD) in 2019 (SHCP, 2018), and 864 million pesos (~43 million USD) in 2020 (SHCP, 2019) (see graph 1).

Recreation service of NPAs and discrepancies

Among the many benefits of natural areas, recreation services are a primary source of economic resources and people's welfare. National and foreign tourists visit NPAs in Mexico, paying an admission fee, which serves to trigger economic activity in nearby areas. In 2007, NPAs in Mexico received approximately 14 million visitors, who generated nearly $8,345 million pesos (~417 million USD) of economic spillover (Bezaury-Creel, 2009).

Graph 1
Protected Areas and CONANP budget from 2001 to 2017
(million hectares/million 2016 pesos)



Source: CONANP (2016a), SHCP (2016), Bezaury-Creel (2009), and Bezaury-Creel *et al.* (2011).

This spillover was greater than the amount required to maintain the NPAs, but as long as this revenue is sent to the Finance Ministry and the budget for the maintenance of NPAs is assigned regardless of this revenue, underfunding will persist.

The economic value generated by these areas between 2009 and 2015 can be estimated using data from the annual CONANP budget. The annual increase in the number of visitors as well as the average expenditure per person was calculated for 2015, resulting in a total of 16,550,000 visitors,[1] multiplied by 596 pesos (~30 USD), which is the average expenditure per person, resulting in an estimated economic spillover of $9,867 million pesos (~493 million USD) in 2007 constant prices, equivalent to $12,604 million pesos (~630 million USD) in 2015.

[1] During 2009, the revenue generated by the admission fee for NPAs was 53 million pesos (~2.65 million USD) and 89 million pesos (~4.5 million USD) in 2015, representing an increase of 68%. The price of admission was increased from 40 pesos (2 USD) to 56 pesos (2.8 USD) per person in low charge capacity areas and from 20 pesos (1 USD) to 28.8 pesos (1.44 USD) in the remaining areas DOF (2006). Decreto por el que se reforman, adicionan y derogan diversas disposiciones de la Ley Federal de Derechos. 27 de diciembre de 2006. In C. d. l. Unión (Ed.), Ciudad de México: Diario Oficial de la Federación; CONANP (2014). Diseño de Brazaletes 2014. In: Comisión Nacional de Áreas Naturales Protegidas, representing an average increase of 42%. Therefore, the increase estimated in the number of visitors from 2009 to 2015 was 18%, equivalent to an increase in the number of visitors from 14 million in 2009 to 16.5 million in 2015. Average expenditure per person was obtained by dividing the 8,345 million pesos (~417 million USD) of revenue generated in 2009 by the 14 million visitors.

The discrepancy between the NPAs' income and their budget is not exclusive to Mexico as shown by Eagles and Hillel (2008), who reviewed the benefits that tourist natural parks offer all over the world compared with their budget, and concluded that tourism has the potential to make a major contribution to the conservation of natural spaces.

Additionally, Eagles and Hillel (2008) estimated that the financial needs of every natural area in the world represents less than 10% of the benefits these areas produce for tourist destinations, where they are the main attraction. Similar studies have been conducted by Driml and Common (1995) who report the case of Australia, Pabón-Zamora *et al.* (2008) who describe a similar phenomenon in protected areas in Peru, and Goodwin *et al.* (1998) who demonstrates that in natural parks in India, Indonesia, and Zimbabwe, there is no relation between the income parks generate for the tourism sector and their maintenance needs.

Value quantification

Two main approaches are used to quantify the economic value of the tourist services NPAs provide: (i) those that estimate the consumer surplus and (ii) those based on direct expenditure. The former seeks to estimate the actual economic value a visitor assigns to an NPAs while the latter attempts to estimate the total money flow NPAs visitors generate.

Among those designed to calculate consumer surplus, there are two main methodologies: contingent valuation and travel cost. Contingent valuation estimates consumer preferences using surveys. For instance, (Rivera-Planter and Muñoz-Piña, 2005) estimated the value of the recreational services of coral reefs in Marine Protected Areas in Mexico. The travel cost methodology estimates consumer surplus by aggregating all costs visitors incur when traveling to a Natural Protected Area. For example (Martínez-Cruz, 2005) uses this methodology to estimate the value of the recreational service offered by Desierto de los Leones, an NPA on the outskirts of Mexico City. The second approach, which estimates the direct expenditure of consumers, (Bezaury-Creel, 2009) follows this method.

The approach of this study is somewhat different to the previous methods. An econometric model that explains booked rooms in conventional tourism destinations[2] by their proximity to an NPAs with tourist potential for the period 2010-2018 is specified. An Ordinary Least Squares (OLS) model is stated using several controls related to the characteristics

[2] By conventional tourist destinations, a list of 115 destinations regularly monitored by the Tourism Ministry of Mexico to generate tourism statistics in Mexico is referred to. These destinations are not necessarily associated with sustainable management models.

of the sites, such as the availability of an airport, if it is a beach destination, population in a given radius, among others. In addition, the economic value of this effect is approximated. As far as we know, there are no similar studies to ours since the focus of previous studies is to estimate the economic spillover of nearby NPAs.

There are only a few studies with a similar objective to this one. Specifically, Yang and Wong (2012) find a large, significant effect of national parks on tourism flows in 341 mainland cities in China. Bo *et al.* (2016) confirm that cultural and natural attractions have a strong influence on domestic tourists in eastern China, while Naranpanawa *et al.* (2019) report that regional parks and state forests are significant drivers of tourism employment in Queensland, Australia.

Other studies give additional insights on the relationship between NPAs and conventional tourism. Whitelaw *et al.* (2014) regard tourism in NPAs as an ecosystemic service that must be adequately paid for by visitors, especially in NPAs where biodiversity levels are low and therefore the presence of human beings is less harmful. They propose financing schemes in which the use of ecosystemic services is divided among all its users to make them financially sustainable. Wall Reinius and Fredman (2007) study the features tourists evaluate when deciding which NPAs to visit and found that certain attributes, such as the type of area (natural park, biosphere reserve, etc.) and the type of activities available to tourists determine their decision whether to go there. Similarly, this research evaluates the variables affecting tourists' decision when choosing a conventional tourist destination and found that proximity to an NPAs is a positive attribute when making the decision even if tourists do not go there once they have arrived in the conventional site.

Munro-Strickland *et al.* (2010) propose a transdisciplinary framework to evaluate how local communities benefit from tourism in NPAs, which could be complemented by integrating the benefits touristic NPAs yield for nearby communities as well. They suggest that not only local communities may benefit from NPAs, but also nearby locations where conventional tourism is the main economic activity. Conversely, Nepal (1997) suggests that tourism in NPAs does not benefit local communities but rather traditional tourism companies that bring tourists from conventional destinations to these NPAs. This argument tallies with our results since evidence was found that conventional tourism benefits from the existence of nearby touristic NPAs. However, this does not imply that touristic companies are the only ones receiving positive externalities.

Finally, Weaver (2001) explores the relationship between ecotourism and conventional tourism in the opposite direction. He concludes that ecotourism could hardly exist on its own, since the number of tourists only visiting NPAs is minimal, and most tourists who visit this type of places come from conventional touristic places such as beach resorts and cruises meaning that one cannot exist without the other. From the results of our analysis, it is possible to hypothesize that this is a mutually beneficial relationship, since NPAs attract tourists to conventional touristic places, while conventional tourist destinations send tourists to NPAs.

1. Methodology

1.1. Hypothesis

The number of booked rooms in various conventional touristic destinations increases when there is a Natural Protected Area offering recreational services no more than two hours away.

1.2. Materials and methods

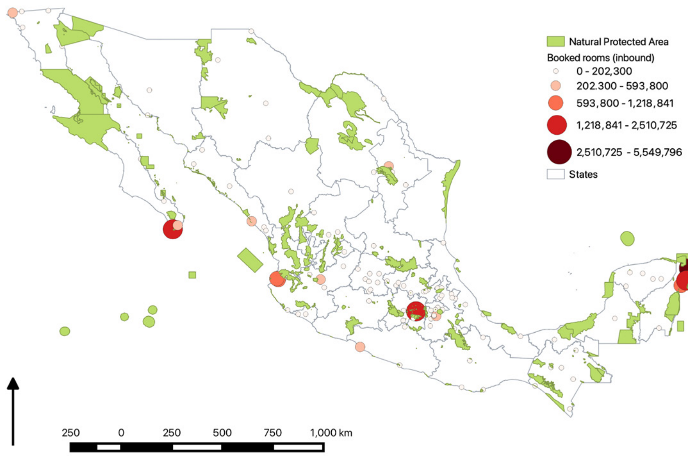
First, a database to specify an econometric model was created. The observation units of the model are tourist destinations in Mexico. To identify them, SECTUR (2016) DATATUR website was consulted, a source of tourism information from the Mexican government. Among other items, it reports data on hotel occupancy for over 100 tourist destinations in Mexico. This data was georeferenced on Google Maps, with each geographical coordinate corresponding to the label Google Maps assigns to each destination.

Second, the dependent variable was constructed for each destination by averaging the number of annual booked rooms from January 2010 to December 2018 according to DATATUR reports. Information on 115 places was collected, 16 of which reported zero rooms during period, so they were not included in the econometric analysis. In addition, it was distinguished between inbound and domestic tourists to determine whether they behave differently. Figures 1.A and 1.B show the 115 tourist destinations considered and their hotel occupancy.

Two variables of interest were then created to test the hypothesis. The first indicates whether there is an NPA near the destination while the second is an index to measure the touristic potential of NPAs.

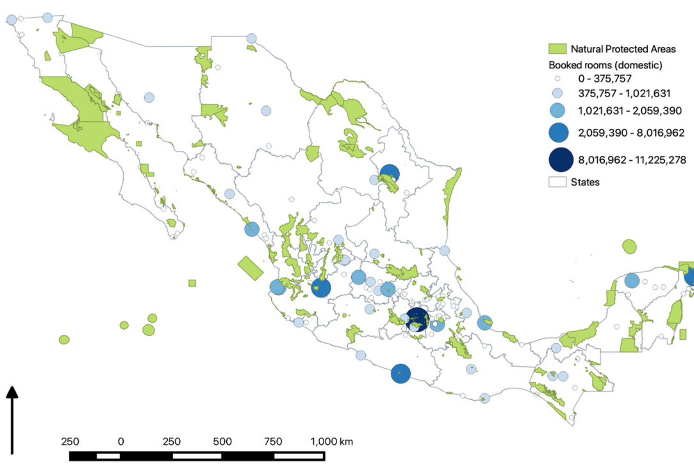
1. *NPAs*: Indicator of the existence of one or more NPAs less than a two-hour ride away.
2. *Tourism Index*: Aggregated index for each destination regarding the tourism potential of the nearby NPAs.

Figure 1.A
Natural Protected Areas and its annual average hotel occupancy (domestic)



Source: compiled by the authors using data from CONANP (2019), SECTUR (2019), and the software QGis 3.10 (2019).

Figure 1.B
Natural Protected Areas and their annual average hotel occupancy (inbound)



Source: compiled by the authors using data from CONANP (2019), SECTUR (2019), and the software QGis 3.10 (2019).

The first variable was generated through the geographical location of the centroid of each NPA in Mexico, using the most recent list, updated in January 2017, which includes 181 NPAs. A time-distance matrix was created using Google API (*Application Programming Interface*), specifically the *distance matrix* function. This matrix shows the time and distance required to move from the tourist destination to each NPA in Mexico. In the case of marine NPAs, the route cannot be identified because Google API only enables one to calculate land routes. The traffic conditions considered were the average ones reported in Google's records. After the matrix was processed, routes that took two hours or less were selected, considering that this is a reasonable time for a tourist to do a one-day trip to an NPA during their stay at a tourist destination.

The index variable measures the tourist potential of NPA and was developed by CONANP for 90 NPAs in Mexico. This index considers 18 criteria for each NPA grouped into four dimensions: biophysical environment, administrative management, cultural and socio-economic environment, and market context. An example of one of the criteria considered in the market dimension is the quality of transport infrastructure. CONANP rates each criterion in the index from one to four using pre-established parameters. For example, if there is no transport available to the NPAs, a one is assigned, if there is a transport network to tourist sites, a four is assigned. Each dimension is rated by the simple mean of their component criteria, and the general index is constructed by the simple mean of the four dimensions. Table 2 shows all the criteria and their respective measurement units.

Then, for each conventional destination, the indexes of every NPAs requiring a trip of less than two hours were added. For example, for Cancun, the method identifies Tulum (with a 2.17 tourism potential index) and Puerto Morelos Reef (with a 2.62 index). The aggregated assigned index for Cancun is 4.79, resulting from the sum of indexes of Tulum and Puerto Morelos reef. Finally, the aggregated index was standardized between 0 and 1. The destination with the lowest index (Acapulco) is 0 and the one with the highest index (Valladolid) is 1. Accordingly, the final index was calculated using the operation: $Index_i = (I_i — I_m) / (I_{max} — I_{min})$, where I refers to the sum of the indexes by CONANP of the NPAs near the tourist site. Graph 2 shows the indexes of the selected tourist sites.

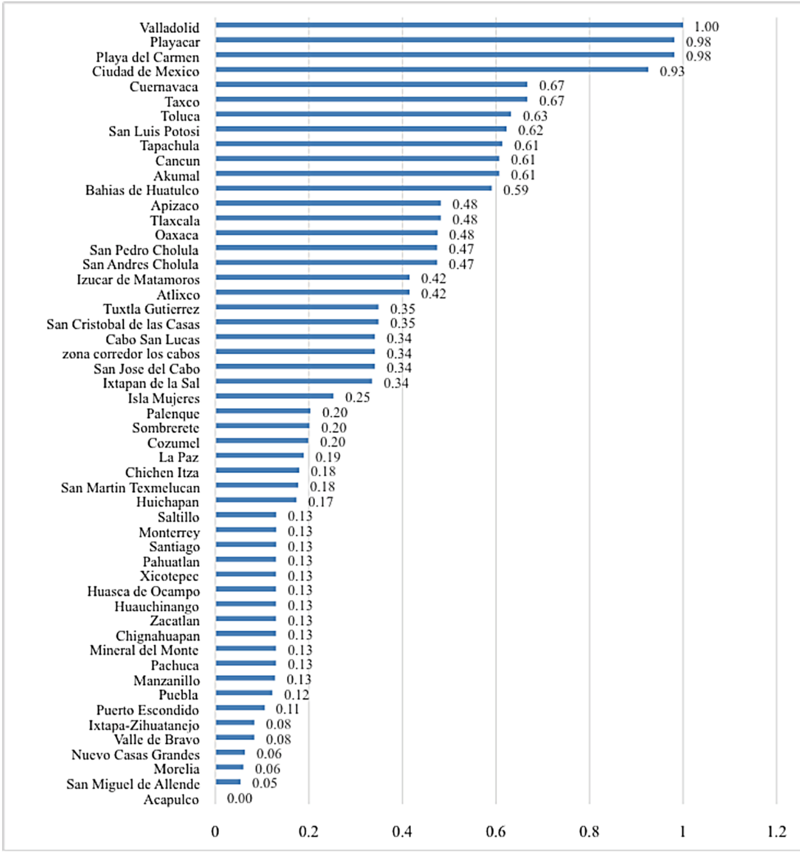
For example, Valladolid has a very high index because of its proximity to Ria Lagartos, Tulum, and Puerto Morelos Reef, three NPAs with high potential tourism indexes and the fact that Yucatan (the state where Valladolid is located) has favorable topographic characteristics that facilitate land transportation. Note that Playacar and Playa del Carmen rank second

Table 2
Criteria and measurement units for CONANP potential tourism index

	#	*Criteria*	*Measurement unit*
Biophysical	1	Ramsar site, UNESCO natural heritage, other	recognitions
	2	Charismatic megafauna	number of species
Management	3	Existence of planning tools (acceptable visitor load, management plan, etc.)	number of tools
	4	Budget sufficiency	levels: insufficient budget, …, budget sufficiency
	5	Inter-institutional tourist agreements	no agreements, …, successful agreements
	6	Level of land conflicts	several conflicts, …, no conflicts
Socio-economic conditions	7	Anthropogenic impacts on ecosystem services	lot of pressure, …, sustainable practices
	8	Employment	full employment, …, tourism is an employment option
	9	Safety	unsafe, …, safe
	10	Cultural attractions	no attractions, …, local income generating attractions
	11	Incorporation of rural economic activities into tourism	some, …, most of the activities are integrated
	12	Archaeological remains	Some, …, they attract tourists
Market	13	Transport infrastructure	no infrastructure, …, less than one hour from destination
	14	Visitation	no visits, …, constant flow of tourists all year round
	15	Communication services	no communication, …, communication services are key to local tourist companies
	16	Marketing	no marketing, …, market positioning
	17	Product diversification	no products, …, over six tourist products
	18	Accommodation	no accommodation options in a radius of less than 20 kms, …, 4-star hotels in a radius of less than 20 km

Source: (CONANP, 2016b).

Graph 2
Tourist destinations and their aggregate index



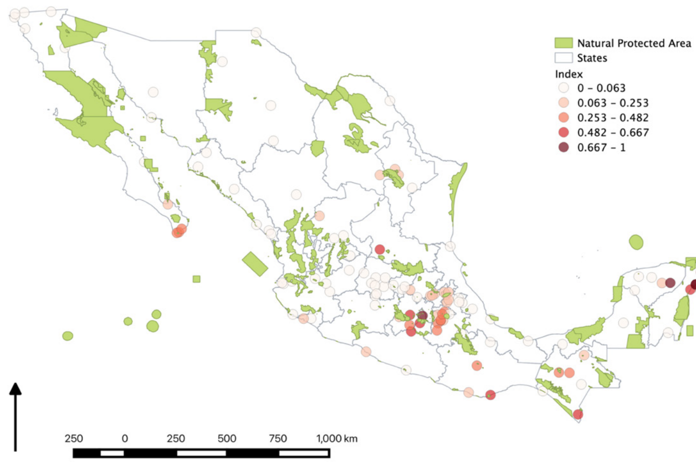
Source: compiled by the authors with (CONANP, 2016b) and (SECTUR, 2016) data.

and third in this aggregated index and that they are also located in the Yucatan Peninsula, confirming that this region presents favorable conditions for NPAs tourism. Figure 2 contains a graphic representation of each destination index.

The tourism potential index was only calculated for 90 NPAs. NPAs that are not rated were excluded as well as marine areas. As it is explained later, this causes an underestimate of the effect of the proximity of NPAs to conventional tourist destinations. This potential omission suggests that the effect trying to be proven may be even higher. A model only considering destinations with a positive index (meaning they have NPAs with tourism potential nearby) is presented in a subsequent section, which confirms the argument explained above.

Finally, the following variables were calculated to be included as controls:

Figure 2
Assigned index for tourist destinations



Source: compiled by the authors with CONANP (2016a), SECTUR (2016) data, and the software QGis 3.10 (2019).

1. *Population*. Number of inhabitants in a 30-km radius in every tourist destination according to the 2010 Population Census, by the National Institute of Geography and Statistics (INEGI, 2010).
2. *Beach*. Dummy variable identifying whether the destination is near the coast. This process was conducted manually assigning 1 to destinations that were near the coast and 0 to destinations that were not.
3. *Loc50k*. Indicates the number of cities with 50,000 inhabitants or more within a 100 km radius. Obtained through a buffer around the tourist destination with data from the 2010 Population Census.
4. *Airport*. Determines whether the destination has an airport. This was manually identified in the Tourist Atlas of Mexico.[3]
5. *Trend*. Refers to the positioning of the destination in people's minds. Using the website trends.google.com, the number of times the tourist site was searched in the past five years was tracked. Considering the fact that the results of this site are expressed in relative terms (the website reports the number of searches assigning the number *100* to the day when that word was most searched), the number of searches for each place was compared with the searches for the word

[3] SECTUR (2020)

"Mexico". For example, for Cancun, the result of the comparison is 32 and 28 for Mexico, so Cancun is "popular". Evidently, there are some destinations whose names are not necessarily linked to tourism (such as Ciudad Juarez, mainly related to insecurity issues). However, the results show that there is a positive correlation between the number of times the name of the place was searched and the number of booked rooms.

6. *Homicides*. The national homicide rate per 100 thousand inhabitants for the period of 2010-2015 with INEGI information. This variable seeks to offset the negative effect the name of the destination could have in the positioning of the place in people's minds.
7. *Marg*: Marginality index published by the National Population Commission (CONAPO) at the locality level (CONAPO, 2010).

1.3. Ordinary Least Square Model

Two models using the *Ordinary Least Square* methodology were estimated. The difference between them is the variable of interest used. For the first model (model 1) a dummy variable *(NPAs)* was included, which indicates whether there is an NPA within a two-hour ride, while for the second model (model 2), the variable of interest is the index we explained earlier. In both cases, the model was estimated by dividing the dependent variable (booked rooms) into national and foreign tourists to incorporate into the model the characteristics of each group that could affect their selection of a tourist destination such as budget or proximity to their home city. The two specifications were as follows:

Model 1:

$$\ln(booked\ rooms_{domestic})\ or\ \ln\ (bookedrooms_{inbound}) = \alpha_0 + \beta_1 NPA + \alpha_2 \ln(population) + \alpha_3\ beach + \alpha_4\ loc50k + \alpha_5\ airport + \alpha_6 \ln(trend) + \alpha_7 \ln(homicides) + marg + \epsilon$$

Model 2:

$$\ln(booked\ rooms_{domestic}) or\ \ln\ (bookedrooms_{inbound}) = \alpha_0 + \beta_2(Index) + \alpha_2 \ln(population) + \alpha_3\ beach + \alpha_4\ loc50k + \alpha_5\ airport + \alpha_6 \ln(trend) + \alpha_7 \ln(homicides) + marg + \epsilon$$

The coefficient of each variable is explained below:

1. *NPAs*: If the destination has one or more NPAs at a distance of 30 km or less, the number of rooms occupied increases by β_1 x 100 percent.

2. *Index:* For every extra unit of the index, the number of booked rooms increases by β_2 x 100 percent.
3. *Ln(population):* Each 1% increase in population increases the number of booked rooms by α_2 percent.
4. *Beach*: When the place is a beach destination, the number of booked rooms increases by α_3 x 100 percent.
5. *Loc50k*: For each city with 50,000 inhabitants near the destination, the number of booked rooms increases by α_4 x 100 percent.
6. *Airport*: When the destination has an international airport, the number of booked rooms increases by α_5 x 100 percent.
7. *Ln(trend)*: When the positioning of the destination increases by 1%, the number of booked rooms increases by α_6 x 100 percent. Note that this variable does not have an intuitive interpretation, because the units are relative, but is included in the regression for control purposes.
8. *Ln(homicides)*. For each 1% increase in the homicide rate, the number of booked rooms occupied is reduced by α_7 percent.

1.4. Instrumental Variables

In addition, a third model (model 3) was estimated. In this one, it was determined whether an increase in visitors to NPAs increases the number of visitors to conventional destinations. However, there is an endogeneity problem between these variables, because when visitors to conventional destinations increase, it is assumed that visitors to NPAs also increase. Accordingly, an instrumental variable model was specified, in which we proxied visitors to NPAs with the Tourism Potential Index described earlier. The specification of this model is as follows:

Model 3:

$$\begin{aligned}\ln(booked\ rooms_{domestic})\ or\ \ln(bookedrooms_{inbound}) \\ = \alpha_0 + \beta_3 \ln(visitors\_NPA) + \alpha_2 \ln(population) + \alpha_3\ beach + \alpha_4\ loc50k \\ + \alpha_5\ airport + \alpha_6 \ln(trend) + \alpha_7 \ln(homicides) + marg + \epsilon\end{aligned}$$

$$\ln(visitors\_NPA) = \alpha_0 + \gamma(Index) + u$$

2. Results

The variable of interest proved non-significant with the original model in both groups. In the case of national visitors, the population in the destination, the existence of an airport and the digital trend were significant and had the expected sign; these last two variables showed extremely high coefficients. Afterwards, the same regression was run only using data from tourist destinations with over 5000 hotel rooms available from 2010 to 2015, as shown in the second and fourth column of table 3. Model 3 showed the same behavior, since it presents no statistically significant results for national visitors, although it does so for foreign visitors, with a coefficient of 0.5 for the variable of interest, as shown in table 4.

The 83 destinations with over 5000 inbound tourists reflect the existence of a significant impact of the NPAs offering recreational services on the hotel occupation rate of nearby tourist sites, equivalent to a 55% increase. In this same model, the existence of a beach in the tourist destination is the control variable with the highest impact, increasing hotel occupation by 156%. However, in the case of national visitors, the existence of nearby NPAs shows no statistical effect on hotel occupancy.

The second model, excluding the destinations with an aggregated index of zero, offers a broader vision of the NPAs impact because not only does it consider the proximity of the NPAs to the tourist destination, but also the impact due to the accessibility of the area, the quality of services offered there, the cultural heritage, biodiversity, financial and environmental sustainability of the project, employment, and conflicts. In keeping with the first model, the variable of interest is only significant for the foreign visitors' group, while the variable with the highest coefficient is the online trend of the destination, increasing hotel occupancy by 328%, followed by *beach*, which increases hotel occupancy by 237 percent.

The relevant coefficient for our study is the one from the *Index* variable (rating the tourism potential of NPAs near destination) because the model seeks to calculate NPAs' impact on the traditional tourist industry. As mentioned before, the model only revealed the statistical significance of a causal relationship between these two variables in inbound tourism. This is an interesting finding that could be explained by several factors that are not reflected in the model itself, regarding the characteristics of both groups. For instance, domestic travelers may be less interested in NPAs near their destination since the investment in time and money tends to be lower than that of foreign visitors. Accordingly, international tourists may consider a wider array of benefits in the places they are visiting.

This coefficient for foreign tourists in the second model is 2.66, meaning that when the aggregated index increases in one unit, the number of rooms occupied by international visitors is 266% larger. As explained before, the index comprises 18 variables related to the tourism potential of each NPAs and each variable is rated between 1 and 4. This implies

Table 3
Results

Variable	*Model*					
	(1a_domestic)	*(1b_domestic) (visitors>5K)*	*(2_domestic) (Index>0)*	*(1a_inbound)*	*(1b_inbound) (visitors>5K)*	*(2_inbound) (Index>0)*
NPAs	*-0.25*	*-0.29*		*-0.043*	0.549 **	
	(0.19)	*(0.19)*		*(0.33)*	*(0.29)*	
Index			-.80			2.66 ***
			0.56			*(0.77)*
log(pop)	*0.35* ***	0.34 ***	0.11	0.17	-0.03	-0.26
	(0.08)	(0.08)	(0.18)	(0.14)	(0.11)	(0.25)
Beach	0.37	0.39	-0.38	1.39 ***	1.56 ***	2.37 ***
	(0.25)	(0.24)	(0.54)	(0.42)	(0.35)	(0.74)
localities	0.035	0.037 *	0.05 **	0.052	0.07 **	0.05
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
Airport	0.95 ***	0.91 ***	1.32 ***	1.96 ***	0.41	0.85
	(0.23)	(0.23)	(0.47)	(0.40)	(0.35)	(0.64)

Table 3 (*continuation*)

Variable	*Model*					
	(1a_domestic)	*(1b_domestic) (visitors>5K)*	*(2_domestic) (Index>0)*	*(1a_inbound)*	*(1b_inbound) (visitors>5K)*	*(2_inbound) (Index>0)*
log(trend)	1.32 **	1.35 ***	1.74 ***	1.45 **	1.51 **	3.28 ***
	(0.38)	(0.37)	(0.60)	(0.65)	(0.52)	(0.82)
log(homic)	-0.11	0.04	0.35 *	0.14	-0.005	-0.08
	(0.11	(0.11)	(0.19)	(0.18)	(0.16)	(0.27)
Marg	-0.23	-0.19	0.13	0.07	-0.19	-0.008
	(-0.18)	(0.18)	(0.25)	(0.31)	(0.26)	(0.35)
Cons	6.13 ***	6.55 ***	8.72 ***	5.68 ***	9.51 ***	11.15 ***
	(1.04)	(1.04)	(2.3)	(1.78)	(1.45)	(3.23)
R-squared	*0.6322*	*0.6256*	*0.6619*	*0.5280*	*0.5432*	*0.75*
R-squared adj.	*0.6028*	*0.5954*	*0.5959*	*0.4903*	*0.4938*	*0.70*
Observations	109	108	50	109	83	50

* $p < 0.1$, ** $p < 0.05$, ***$p<0.01$

Source: compiled by the authors, and the software Stata 15 (StataCorp LLC, 2017).

Table 4
Results

Variable	*(3_domestic)*	*(3 first stage_ domestic)*	*(3_inbound)*	*(3 first stage_ inbound)*
NPAs				
		4.6 ***		*4.6* ***
Index		*(1.08)*		*(1.08)*
	-0.17		0.50 ***	
log(vis_NPAs)	(0.12)		(0.14)	
	0.66 **	1.10 **	-0.88 ***	1.10 **
log(pop)	(0.28)	(0.45)	(0.33)	(0.45)
	0.39	1.78	0.18	1.78
beach	(0.64)	(1.06)	(0.75)	(1.07)
	-0.048	-0.89	0.01	-0.89
localities	(-0.06)	(-0.11)	(0.07)	(0.11)
	1.32 ***	-0.48	2.98 ***	-0.48
airport	(0.45)	(-0.85)	(0.53)	(-0.85)
	1.81 **	-0.63	3.32 ***	-0.63
log(trend)	(0.71)	(-1.29)	(0.83)	(-1.29)
	0.13	-0.37	0.20	-0.37
log(homic)	(0.23)	(-0.42)	(0.27)	(-0.42)
	1.05 **	1.51 ***	-0.34	1.51 ***
marg	(0.54)	(0.83)	(0.59)	(0.83)
	4.48	-3.29	13.49 ***	-3.29
cons	(2.98)	(-5.47)	(3.46)	(-5.47)
R-squared	*0.5363*	*0.5411*		0.5411
R-squared adj.				
Observations	37	37	37	37

* $p < 0.1$, ** $p < 0.05$, ***$p<0.01$

Source: compiled by the authors, and the software Stata 15 (StataCorp LLC, 2017).

that a one-unit increase in the degree of any of the variables represents a 25% divided by 18% increase in the global index, in other words, an increase of 0.013 units of the index. Multiplying this by the estimated coefficient of 2.66 results in a 3.5% increase in the number of occupied rooms. For example, if an NPA is declared as natural heritage by UNESCO, the number of rooms in the tourist destinations booked by foreigners near that NPA will increase by 3.5%, and the same would happen with any other of the characteristics contained in the index developed by CONANP. Likewise, the third model seeks to isolate the exogenous effects of the index variable and offers a cleaner estimate. It was found that the effect increases and that, following the same logical procedure, with a coefficient of 5, the impact increases to 6.5 percent.

Moreover, the effect of the proximity of NPAs to tourist sites on hotel occupation can be interpreted using the aggregated index. The average value of the index (the one that standardized between 0 and 1) in our database is 0.155. This is, an NPAs with potential tourism has an aggregated index of an average of 0.155. Multiplying the average value by the estimated coefficient (2.66), it was found that a conventional tourist destination with a potentially touristic NPA nearby, would have an average of 41.23% more foreign visitors that those that are close to NPAs with no tourism potential. Furthermore, considering there are some NPAs that were not rated by CONANP and that marine areas are not contemplated, the effect could be even higher. Using Model 3, the impact could increase to 77.5 percent.

Finally, looking for a conservative estimate of the effect of the proximity of NPAs to touristic places (in terms of the international tourism attraction), the confidence interval that is between 1.1 and 4.22 in the base model (all 50 observations) can be considered. This interval can be interpreted as the range of values where the actual coefficient of the effect can be found. That is to say that, in an extremely pessimist analysis, the coefficient would be 1.1, which means that an increase of one unit in the tourism potential index of an NPA increases the number of occupied rooms in nearby tourist destinations by 110%. Following the procedure established in the previous paragraph, in destinations with an NPA with average tourism potential, the number of rooms would be at least 1.4% higher than the rest. Also, the rooms occupied in the destinations with a touristic NPA would be 17.7% lower if these areas did not exist (this results from multiplying 1.1 by 0.155, in other words, the minimum value of the coefficient times the average value of the index variable.)

3. Approximation of the economic value of the contribution of a touristic NPA to nearby destinations

Considering the previous analysis and the average total expenditure of international tourists drawn from the International Travelers Survey, conducted by the National Institute of Geography and Statistics (SECTUR, 2013), (which increases to 851 USD per trip per person) it can be inferred that without the existence of touristic NPAs, expenditure would be 17.7% lower, in other words, 150 USD fewer pesos per person. Hence, given that in 2019 the Ministry of Tourism reported a total of 4,161,664 international tourists entering Mexico, this relationship suggests that without the existence of NPAs near traditional tourist destinations, 624,249,600 USD less would have entered the country in the tourist sector.

In addition, destinations with a higher influx of tourists such as Cancun and Playa del Carmen that are close to NPAs with a higher tourism potential index, may display a more intense effect.

4. Discussion

The main contribution of this paper is that it analyzes a specific type of economic positive externalities of touristic NPAs in Mexico by showing how they attract international visitors to conventional tourist destinations, thereby contributing to the economic and social development of nearby cities and towns through the traditional tourism industry. Even more important is the magnitude of this effect, which in a conservative scenario indicates that 1.4% of the rooms booked by foreigners in conventional tourist sites in Mexico can be explained by the proximity of an NPA.

This is especially important for tourist sites where foreign visitors account for most clients. This is the case of the states of Quintana Roo and Baja California Sur, where international visitors represented 83% and 76% respectively in 2018 (SECTUR, 2018). It is also the case of certain other destinations in the Mayan Riviera in the states of Yucatan and Campeche, and some beaches in Jalisco. At the national level, foreign tourists represent 30% of all the visitors engaging in tourism activities, which had a monetary value of 2.289 billion dollars in 2018 (SECTUR, 2018). It is also worth mentioning that some of the most popular tourist destinations in Mexico grew because of their natural attractions, which at the time led to the creation of large projects that eventually degraded the natural spaces that had been the original attraction.

That said, this paper could serve as the basis for future proposals to create hybrid financing schemes for NPAs in Mexico in places where international tourists are the main source of revenue for the city. Since hotels, restaurants, and other tourism companies benefit from the existence and the maintenance of these areas, their deterioration could decrease the international tourist inflow. Therefore, a win-win proposal could be designed to expand the NPAs budget, which would translate into better maintained natural attractions that could even increase hotel occupancy in these destinations.

As for the limitations of this paper, it would be necessary to run empirical testing of the results through a field study to examine the decision-making process of the various agents involved in the market. Specifically, it would be pertinent to determine whether the fact of having the option of going to an NPA (even if the tourist ends up not visiting it) acts as a key factor in the decision process of choosing between two tourist destinations. In other words, *ceteris paribus,* the aim would be to determine whether proximity to an NPA increases the likelihood of choosing one destination over another.

Conclusions

Maintenance and conservation of NPAs is relevant in economic terms at the local level because their deterioration would significantly affect local tourism. In other words, the economic spillover and revenue earned from tourist destinations could diminish if visitors are no longer attracted by NPAs. Specifically, our estimation indicates that the average total expenditure per international tourist in Mexico would be 150 USD less.

Due to the close relationship between tourism development and NPAs conservation, as mentioned before, it is essential for this sector to become financially involved with the efforts to ensure the necessary resources for the maintenance of NPAs in Mexico to guarantee sustainable development and tourism activities in the long run. A first step to achieve this would be to redefine admission fees since, according to Witt (2019), they are lower than the maximum price visitors are willing to pay. The unwillingness to increase them should be brought up at Congress and the pertinent studies performed, and public policy proposals submitted to generate tax incomes to fund the conservation of NPAs. The aim is for the Tourism Ministry and the National Commission of Natural Protected Areas to work together on projects that will yield mutual benefits, acknowledge their mutual importance, and support each other financially.

It is important to point out that beyond the efforts that could be made by different departments, it is necessary to continue working on financial mechanisms, particularly their implementation. For example, the admission fee is inefficient since there are large numbers of people who do not pay this for several reasons: lack of incentives to charge a fee on the part of local managers; administrative negligence; flaws in the printing procedure or even because the tickets have to be collected in offices in Mexico City. This said, certain administrative improvement measures could be taken regardless of the legal and political restructuring of Natural Protected Areas in Mexico.

Finally, any effective effort that contributes to the conservation of NPAs helps achieve the Sustainable Development Goals (SDG) agenda, to which Mexico is committed. It directly contributes to the 15th and 16th objectives, Life Below Water and Life on Land, respectively, and indirectly to several others, such as Climate Action (through carbon sinks), Decent Work and Economic Growth (through economic spillovers), and Responsible Consumption and Production (through tourism compensating for the contribution of natural ecosystems).

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