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# Digital Platforms and the Demand for International Tourism Services

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## Abstract

Tourism is an important source of foreign exchange and employment across developing economies. A scant literature has explored the relationship between tourism and the advent of the internet. This paper contributes to the tourism-trade literature and studies the empirical relationship between international tourism and the adoption of digital technologies that facilitate search about tourism opportunities across countries. It links foreign visits with the spread of the use of the internet in sending countries and the level of development of business-to-consumer digital tools in host countries. The paper estimates a well-specified gravity model of tourist arrivals between country pairs with panel data. The results indicate that frictions affecting bilateral tourism flows have been attenuated by the advent of digital tools. The absolute value of the effects of bilateral geographic distance, language differences, and border-contiguity seem to be reduced by the use of the internet by potential tourists and the business sector in host countries. The results are robust to alternative proxies for internet use for tourism search proxied by data from Google trends. The paper also presents simulations of the potential impacts of advances in the adoption of digital tools over time, linking the adoption process to mechanisms of technology adoption that are commonplace in the literature.


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# Digital Platforms and the Demand for International Tourism Services

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## 1. Introduction

Over the last three decades, international trade in services has outpaced the growth in merchandise trade. As a share of world GDP, services trade increase from 7.7% of GDP in 1990 to 12.9% in 2017. Over the same period, merchandise trade in goods also expanded, albeit more slowly, from 30.9% to 44.1%, so that the ratio of services to merchandise trade grew from 25.0% to 29.3%.[2] Today, there is rising evidence that the emergence of a digital economy that facilitates a shift from trading in “atoms and molecules” to trading in “bits and bytes”, paraphrasing Quah (1996), has given further impetus to the possibility of exchanging services between countries.

In this paper we explore the way in which digital technologies affect world trade in services, by looking specifically at the case of international tourism. Within services, tourism stands out as having a sizable share of internationally traded services. Worldwide, in 2017, travel services stood at 25.6% of all imported services, having grown steadily since the onset of the Great Recession. While the latter figure is blurred by the relative performance of other internationally traded services — in particular, by the performance of financial services trade before and after 2008 — traveler flows attest to the rapid growth of tourism services and reached 1,341 million visitors in 2017.

The advent of digital tools has had a noticeable impact on tourism. A growing number of travelers plan their trips relying on online travel agencies (OTAs), digitally user-generated content (UGC) and other digital tools. It is estimated that, in 2014, 59% of trips by EU residents traveling internationally relied on digital tools to book accommodations, and 67% for air transportation.[3] In the United Kingdom, the share of travelers using online accommodation services grew from 42% in 2007 to 52% in 2017.[4] Digital travel sales are expected to grow from US$471 billion to US$818 billion by 2020.[5] The flip side of the use of digital tools to plan trips and purchase travel services can be seen in the sharp decline in the number of physical travel agencies. For example, in the United States, the number of travel agencies declined from 25,975 establishments in 2000 to 14,797 in 2016, with a concomitant fall in employment from 183,143 to 108,984.[6]

[2] All figures are from the World Development Indicators, World Bank Group.
[3] Source: European Commission, *Statistics on ICT use in tourism*. Online publication.
[4] Source: Statista.
[5] Idem.
[6] Source: 2000 and 2016 *County Business Patterns*, US Census Bureau.

Naturally, the rapid and widespread adoption of digital platforms in the tourism industry leads us to ask (i) what their impact on the demand for tourism services is and (ii) how countries can tap into the opportunities that the new technologies present, as well as cope with some of the accompanying challenges. While there is a growing literature looking at the "material economy" implications of the digital economy, there are relatively few studies focusing specifically on international trade and specifically on trade in services and tourism. Freund and Weinhold (2004) provide an early look at how the Internet shaped international merchandise trade and find that, on average, the Internet led to a 1 percentage point increase in export growth from 1997 to 1999. More recently, Lendle et al (2016) look at eBay international trade transactions and conclude that the digital platform reduces the impact of distance on bilateral trade flow by 65 percent, on average. The authors posit that the reduction in search costs is the main reason behind their finding, with seller-rating information having an additional impact. With regards to services trade, Freund and Weinhold (2002) provide the earliest look at the topic, focusing on how the Internet influenced US bilateral services trade with 31 different countries across 14 industries. They find that as Internet penetration in a partner country increases by 10 percent, service exports growth increases by 1.1 percentage points and import growth by 1.1 percentage points. Eichengreen et al (2016) focus on the foreign exchange market and find that greater connectivity via undersea cables dampens the impact of spatial frictions, by up to 80 percent, between local markets and major financial centers and increases offshore trading by 21 percent.

Related to the present paper, Hoonsawat (2016) explores the question of the extent to which the Internet has promoted tourism flows and, as in the present paper, applies a gravity equation model to bilateral tourism flows. The author motivates his analysis by modeling how the Internet helps mitigate a traveler's lack of information about a given destination, thus increasing her demand for tourism services. Empirically, the author uses internet penetration rates as the variable of interest and finds that they have a significant positive impact on tourism flows, particularly as internet usage increases in the origin country.

As we explain below, the motivation, proxies for digital platform use, and econometric specification we choose differ from those in Hoonsawat's paper. Indeed, we also adapt the rich literature on the use of gravity models in the international (goods) trade literature to the case in point, but we offer a more comprehensive discussion on how digital technologies impact the different cost elements of the tourism market, parsing through the channels through which digital technologies affect the demand and supply of international tourism services. Our econometric approach also uses population-wide internet use in origin countries, but we focus on business-to-consumer internet use as the relevant variable of interest in the destination country. Furthermore, as an alternative and to check for robustness, we construct a novel proxy of digital tourism platform adoption, based on *Google Trends* data, to get a more direct look at the use of digital tools for tourism purposes.

Before describing our model, data and econometric results in more detail, the next section provides further information on the evolution of tourism trends, its relevance for development outcomes, and the increasing use of digital tools in travel and tourism activities. We pay particular attention to countries in the Middle East and North Africa (MENA) and in Sub-Saharan Africa (SSA), as the countries in the two regions have only recently been catching up with the rest of the world in terms of the use of digital tools, with a presumption that there is untapped potential to leverage the new technologies and help create more jobs.

## 2. International tourism and the digital economy

### 2.1 Tourism matters for development

Tourism represents over 10% of global GDP, it is the second-fastest growing industry in attracting FDI, and it is the second-largest job creator, supporting 292 million jobs by the end of 2016 (International Finance Corporation, 2017). There is a strong correlation between tourist arrivals and employment and GDP in the travel and tourism industry: a 10-percent increase in arrivals translates into a 6.3 percent increase in jobs in the industry, and a 10 percent increase in travel-and-tourism GDP (Figure 1).

There is evidence of a causal impact as well. Arezki et al (2009) estimate growth equations that incorporate measures of tourism specialization. The authors use information from UNESCO's World Heritage List to construct an instrumental variable for tourism and apply it to a cross-section of countries for the period 1980–2002. They find that tourism specialization is positively correlated with economic growth, with a one standard-deviation increase in the share of tourism in exports leading to a 0.5 percentage point in additional annual GDP growth. Similarly, Sequeira and Nunes (2008) use panel data methods and find that tourism has a positive impact on economic growth. More recently, Faber and Gaubert (2019), using microdata for Mexico, find that tourism results in "large and significant" economic gains — employment, GDP — in tourist destinations relative to other regions. Their identification is based on measures of tourism attractiveness that result from local natural and cultural characteristics. In their simplest estimation results, the authors find that a 10 percent increase in tourism revenues leads a 2.5 percent increase in relative employment and a 2 percent increase in population. They also find sizable general equilibrium and long-term effects, with positive spillovers from tourism into the rest of the economy, particularly manufacturing production.

**Figure 1: International Tourist Arrivals and Employment and GDP in the Tourism Industry, 2017**

**Fig. 1(a)**

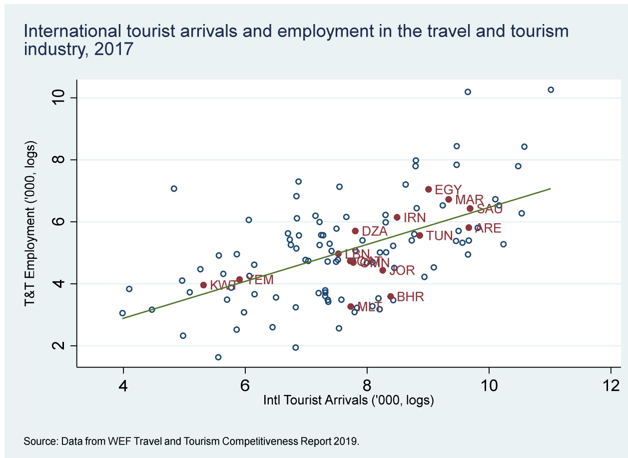
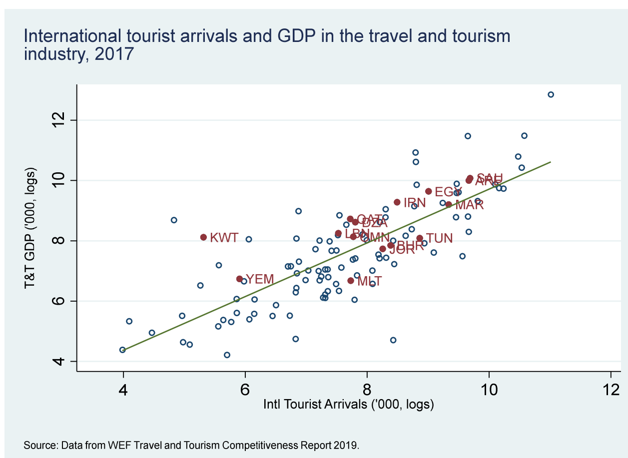



**Fig. 1(b)**




## 2.2 International trade in tourism services is on the rise

From 1995 to 2017, worldwide tourist arrivals grew 4.4% p.a., from 524 million to 1,341 million visitors. Growth over that period was steady and resilient, with small falls during periods of crisis and recovery following soon after. Indeed, the number of international arrivals grew at an even faster pace of 5.0% p.a.

over 2010-2017. International tourism expenditures as a share of total imports, as well as receipts as a fraction of total exports, fell during the period leading to the global financial crisis, but have both recovered over the past decade, each at around 6.5 percent in 2017; see Figure 2 (a).

**Figure 2: Tourism trends, 1995-2017**

**Fig. 2(a): World**

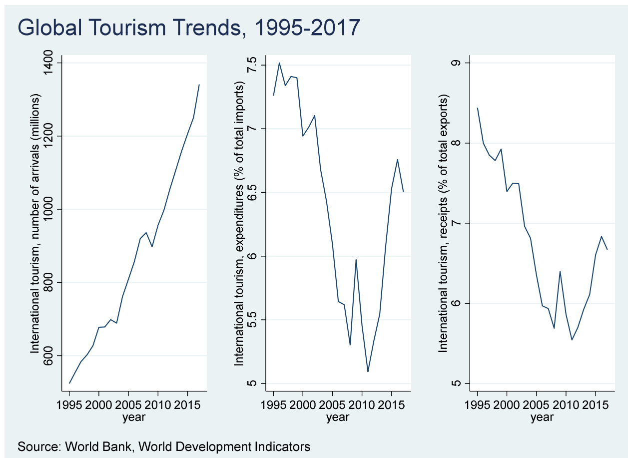
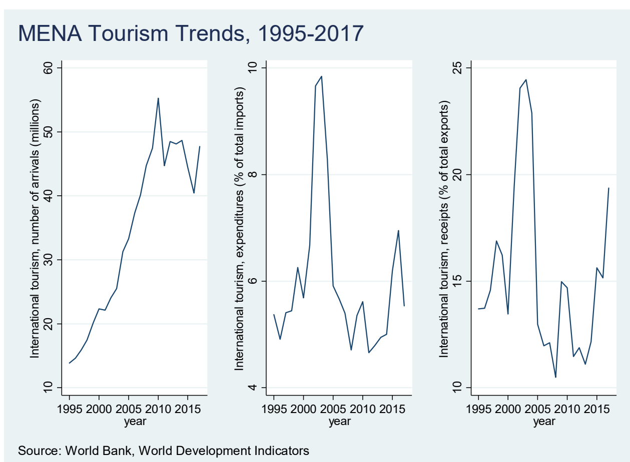



**Fig. 2(b): MENA** (excl. high income)




Growth in the MENA region has been spotty, however. Excluding high-income countries, tourist arrivals to the MENA region outpaced growth in other regions from 1995 to 2010, increasing at a rate of 5.5% p.a. However, since 2010, arrivals have fallen by 2.1% year by year, reaching 47.7 million in 2017 (Fig. 2(b) and Table 1). The region as a whole, including high-income countries, fared slightly better, as arrivals have remained slightly below 90 million.

| Table 1: International Tourist Arrivals, 1995-2017 | | | | | |
|---|---|---|---|---|---|
| | Tourist Arrivals (Millions) | | | | |
| Region | 1995 | 2000 | 2005 | 2010 | 2017 |
| East Asia & Pacific (excl hi income) | 43.57 | 62.85 | 91.04 | 119.85 | 172.30 |
| Europe & Central Asia (excl hi income) | 32.28 | 50.36 | 80.95 | 105.42 | 144.45 |
| Latin America & Carib (excl hi income) | 32.66 | 39.76 | 46.37 | 51.35 | 83.30 |
| Latin America & Caribbean | 47.00 | 55.65 | 64.12 | 72.04 | 112.44 |
| Middle East & North Afr (excl hi income) | 13.83 | 22.30 | 33.28 | 55.26 | 47.74 |
| Middle East & North Africa | 24.18 | 37.37 | 53.99 | 87.83 | 89.19 |
| South Asia | 3.81 | 4.83 | 6.37 | 9.23 | 22.85 |
| Sub-Saharan Africa | 12.96 | 17.58 | 23.58 | 31.46 | 42.36 |
| World | 523.91 | 677.39 | 808.77 | 956.37 | 1341.46 |

**Source**: World Bank, World Development Indicators.

### 2.3 Digital tools are increasingly used in tourism planning

Digital platforms in the travel and tourism industry are increasingly used, both by travelers and by businesses engaged in the industry. Digital platforms and online travel agents are major players. For instance, Booking.com comprises 29 million accommodation listings in 154,000 destinations worldwide and operates in 190 countries. Similarly, TripAdvisor reports 8.4 accommodation listings in 156,000 destinations spread across 49 markets, with 490 unique monthly visitors that provide more than 250 reviews and opinions per minute.[7] Figure 3 shows that, in developing countries, tourism service providers' use of digital platforms is growing, both across traditional (e.g., hotels) and non-traditional (e.g., "bed and breakfast") establishments.

At the same time, foreign travelers are increasingly relying on digital platforms to plan their travel plans. Figure 4 illustrates the use and potential of digital planning tools looking at the case of Jordan. The figure shows a growing number of "page views" in TripAdvisor of accommodations, attractions (e.g., museums, tours), and eateries in the country. It further helps gauge interest in Jordan vis-à-vis other competitor destinations and helps benchmark the quality of services in Jordan against other countries in the region. The data collected through such platforms shed light on how tourist services provided in Jordan compare to those offer by its peers in the region.

[7] Data provided to WBG staff by Booking.com and TripAdvisor.

**Figure 3: Growth in accommodation listings on Booking.com in Jordan and Nepal (2017 Q1 -2019 Q1)**


**Source**: Figures based on WBG's Digital Destination Monitor pilot project.

**Figure 4: Use of Digital Planning Tools by Travelers Interested in Jordan**

**Fig. 4 (a)**

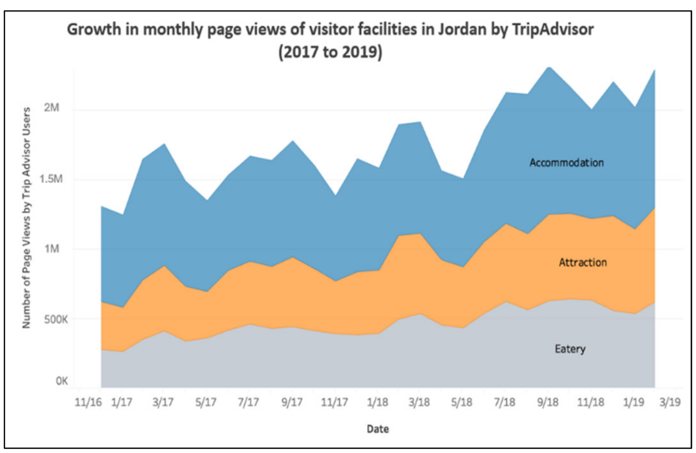


**Fig. 4 (b)**

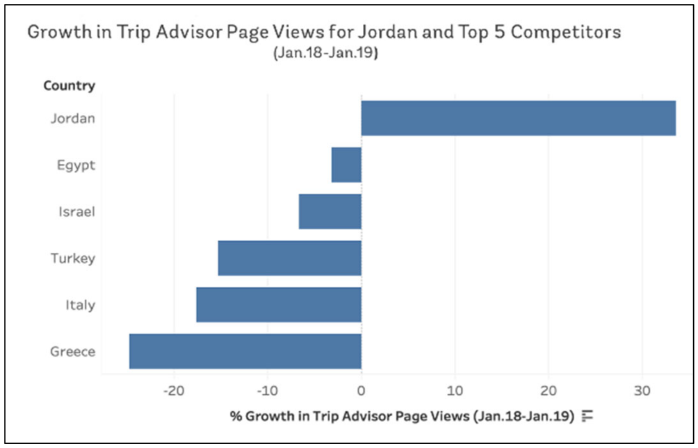
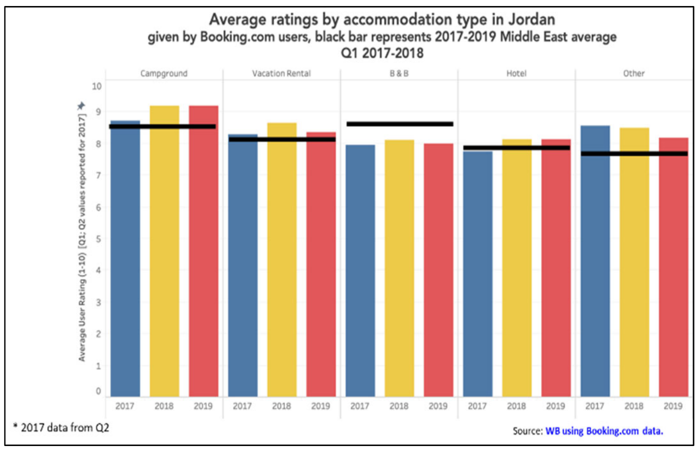



**Fig. 4 (c)**




<u>Note</u>: Figures based on WBG's *Digital Destination Monitor* pilot project.

## 2.4 Digital platforms and the cost of travel decisions

Digital platforms would be expected to increase the demand for tourism services through their impact on the pecuniary and non-pecuniary cost of travel: the price of airfare and accommodations, expanding the choice of alternative destinations, the time spent making travel plans, or even reducing uncertainty about the quality of a future trip, among others.

Goldfarb and Tucker (2019) analyze how digital technologies affect economic activity in the broad, not only in the tourism sector, distinguishing between five different types of costs that such technologies help reduce: (i) search costs; (ii) replication costs; (iii) transportation costs; (iv) tracking costs; and (v) verification costs. In this typology, replication and transportation costs do not have an impact —or, at least, not a direct impact— on the demand for tourism services, as they comprise the exchange of digital goods and information. Replication costs refer to the ability to provide a digital good to additional consumers at zero marginal cost; similarly, the cost of transporting digital goods drops to zero as information is digitized. On the other hand, the impact that digital technologies have in reducing the other three types of costs —search, tracking, and verification— affects the market for tourism services directly. For the most part, cost reductions in those three areas would translate into lower prices for tourism services, but as we will see, that is not always the case.

The analysis of search costs has been a more traditional part of the economics literature. Ease in the ability to find and compare alternative products and services increases market competition and exerts downward pressure on prices. The increased reliance on online travel agents and booking websites has resulted in reductions in the price of airfare (Orlov, 2011). Lower airfare costs would make traveling to more distant destinations more affordable, which appears to be borne by the empirical analysis of the following sections.

Lower search costs would also help find niche items. This leads to a so-called “long tail” phenomenon (Anderson, 2004), whereby digital markets allow consumers to access an ever-greater variety of products —e.g., digital book sellers being able to offer a much larger number of book titles than brick-and-mortar bookstores. Brynjolfsson et al (2003) argue that efficiency gains from access to a greater variety of products can be much larger than gains from increased competition. In the case of tourism, digital platforms make off-the-beaten-path destinations easier to find, catering to the particular tastes of travelers. Thus, reliance on word-of-mouth information becomes less critical in making traveling decisions.

In addition, within a given destination, digital tools also allow finding a greater variety of accommodations —for example, peer-to-peer lodgings such as those found through Airbnb— experiences and amenities. Zervas et al (2017) analyze the impact of Airbnb in the hotel industry after the digital company arrived in the US state of Texas. In the city of Austin, where Airbnb’s presence was largest, they find a causal impact on hotel revenue, with declines of around 8%-10%, with a greater effect on lower-priced and non-business hotels. The declines come primarily through “less aggressive hotel room pricing, an impact that benefits all consumers, not just participants in the sharing economy.” Farronato and Fradkin (2018) reach similar conclusions and find welfare gains from Airbnb, “concentrated in locations (New York) and times (New Year’s Eve) when hotels are capacity constrained.” They note that Airbnb hosts respond to market conditions and expand their supply of accommodations as hotels fill up, helping keep hotel prices in check.

The ability of digital platforms to identify users, their tastes and demand patterns, reduce what Goldfarb and Tucker (2019) call *tracking costs*. That may have the benefit of offering consumers products and services closer to their needs, but it also opens the possibility of making price discrimination easier. Nonetheless, low online tracking costs appears not to have resulted in the latter, but rather to provide consumers with more appropriate and relevant products — with associated profitable advertising opportunities (Goldfarb and Tucker, 2019). In the case of tourism, this would reinforce the impact of reduced search costs in offering a greater variety of destination and other tourist services options to travelers, reducing the relevance of traditional information sources.

Goldfarb and Tucker (2019) point to the novelty of introducing verification costs as part of the conceptual analysis of the digital economy. Information asymmetries are larger in digital transactions (Lieber and Syversson, 2012). Digital platforms allow users to rate the quality of a given good or service, attest to the veracity of the information provided by the seller, provide feedback to the seller or comments that help other consumers make decisions. Such information helps *verify* whether or not a given seller is to be trusted and hence build trust on the reliability of the service or good being bought —as well as on the reliability of the digital platform itself. The World Bank (2018a) argues that so-called *user-generated content* (UGC) is fast becoming the main source of tourism information, disrupting traditional travel planning resources. The report looks at the case of Jordan, a country that struggles with perception issues due to regional instability. Jordan relies heavily on UGC for much of its marketing and leverages UGC to illustrate that the country is a safe and interesting tourism destination. As Goldfarb and Tucker (2019: 4) put it, "the rise of online reputation systems has facilitated trust and created new markets." Nevertheless, Fradkin et al (2018), looking at the case of Airbnb, conclude that a process of self-selection into submitting reviews, with people with positive experiences being more likely to provide them, results in inefficiencies in reputation systems, leading them to conclude that "reviews are typically informative but that negative experiences are underreported."

## 3. Empirical framework

This section lays out our empirical approach to test the channels through which digital platforms affect the demand for tourism services, as outlined in the previous section. It also describes the data used in the empirical exercise.

### 3.1 An extension of the gravity model to trade in tourism services

In this section we extend the gravity equation applied to goods trade in Anderson and Van Wincoop (2003) to trade in tourism services.[8] With CES preferences over a basket of tourist destinations, demand $T_{od}$ for tourist services by the origin country *o* from destination country *d* is given by the following expression:

(1) $$T_{od} = \frac{Y_o Y_d}{Y_w}\left(\frac{\tau_{od}}{P_d \Pi_o}\right)^{\epsilon}.$$

In equation (1), $Y_o$ and $Y_d$ represent countries with *o* and *d* income levels; $Y_w$ represents world income; $P_d$ and $\Pi_o$ represent what Anderson and Van Wincoop (2003) call *multilateral resistance* terms, which capture factors in the rest of the world that affect bilateral demand for tourism services between countries *o* and *d*; $\epsilon$ is the demand elasticity with respect to the cost of tourism services.

The term $\tau_{od}$ is the overall bilateral cost of tourism services faced by visitors from the origin country *o* to destination *d.* As reflected in expression (2), such cost is proxied by geographic distance between the destination and origin countries ($D_{od}$), the bilateral real exchange rate ($RXR_{od}$), whether the two countries share a common border ($CB = 1$), speak a common language ($CL = 1$), have ever been in a colonial relationship ($CR = 1$), or are members of a free trade agreement ($FTA = 1$). In expression (2), the different parameters $\alpha_x$ represent the elasticity of the cost of tourism services $\tau_{od}$ with respect to a continuous variable x, or when the latter is a binary variable instead, the overall percent increase in $\tau_{od}$ for a change in x.

(2) $$\tau_{od} = D_{od}^{\alpha_D} RXR_{od}^{\alpha_{rxr}} e^{CB\alpha_{CB}} e^{CL\alpha_{CL}} e^{CR\alpha_{CR}} e^{FTA\alpha_{FTA}}.$$

Distance can be naturally interpreted to affect the cost of travel services through the cost of transportation services: other things equal, the farther away the destination, the higher the cost of transportation, and thus the lesser the demand for tourism services from that destination. Sharing a common border would mitigate travel costs given the implied proximity but also through more travel modes being available. In addition, closer proximity could facilitate getting information about a given destination, thus dispelling any apprehension that a would-be traveler may have about visiting that location, as discussed by Hoonsawat (2016).

[8] Previous applications of the gravity equation to tourism include Culiuc (2014).

Sharing a common language would presumably mitigate the cost of travel as well, both pecuniary and non-pecuniary costs. Finding information about a particular destination might be easier and less time-consuming for travelers who speak the local language. A common language would also reduce the potential apprehension of visiting a foreign country. A similar argument may be made with regards to countries that share a colonial relationship, as visitors may feel greater cultural affinity to the destination country. In addition, colonial ties, past or present, may also induce travel between the two countries because of existing cross-border family bonds. It is important to note that countries speaking a common language or sharing a colonial relationship have deeper commercial ties —such countries trade more goods with one another, a constant result of all gravity studies— which should result in increased business travel. Since our dependent variable is the number of visitors, our empirical results may capture other reasons for traveling, in addition to tourism.

The discussion in section 2 suggests that the increased use of digital platforms would affect the cost elements behind the term $\tau_{od}$. The reduction in search cost for air travel would make the distance and the common border terms less binding. Similarly, digital planning tools would help mitigate language barriers —digital platforms offer services in several languages— and reduce the cost of finding suitable accommodations as well as other travelers' opinions about a given destination. Digital tools could also help bridge cultural gaps between a given origin-destination pair —making the colonial relationship less of an advantage when visiting a country.

### 3.2 Data

Bilateral tourism flows come from the United Nations World Tourism Organization (UNWTO, 2019) and cover the period 1995 to 2017, the last year for which such data are available. It should be emphasized that, contrary to trade data, reported tourism data vary considerably across countries. For the purpose of this paper, we focused on arrivals of non-resident tourists or visitors at national borders as our proxy for the demand of tourist services. To the best of our knowledge, no data exist on bilateral tourism services trade expressed as monetary receipts or expenditures. For some countries, the UNWTO reports, in addition or in place of arrivals at the border, overnight stays of non-resident tourists at hotels or similar accommodations.[9] Thus, compared to standard trade databases used in estimating trade gravity equations, the bilateral tourism database used in this paper does not offer a comprehensive account of

[9] For more details, see UNWTO (2018a).

all pairwise flows taking place across the world, nor does it provide details on "zero" tourism bilateral flows. Therefore, we are unable to apply recent approaches in the trade gravity equation literature to correct selection bias problems. [10]

The next challenge is to come up with indicators about the adoption of digital tourism platforms with variation across countries and over time. We use two alternative sets of proxies for the use of digital planning tools. First, we use information on the percent of the population with Internet access in the origin country, as an approximation to the extent to which would-be travelers can use digital tools for travel planning. In addition, from the perspective of the destination country, we use an indicator of the extent to which businesses use the internet to reach costumers, in the economy as a whole and not limited to the tourism industry. This measure consists of an index from 1 to 7 in response to the survey question "In your country, to what extent do businesses use the internet for selling their goods and services to consumers?", with 1 being "not at all" and 7 "to a great extent". The data come from the World Economic Forum's *Travel and Tourism Competitiveness Reports* for 2015, 2017, and 2019, with information dated two years prior to each report. As a result, in the first case, the econometric exercise uses only data for the years 2013, 2015 and 2017.

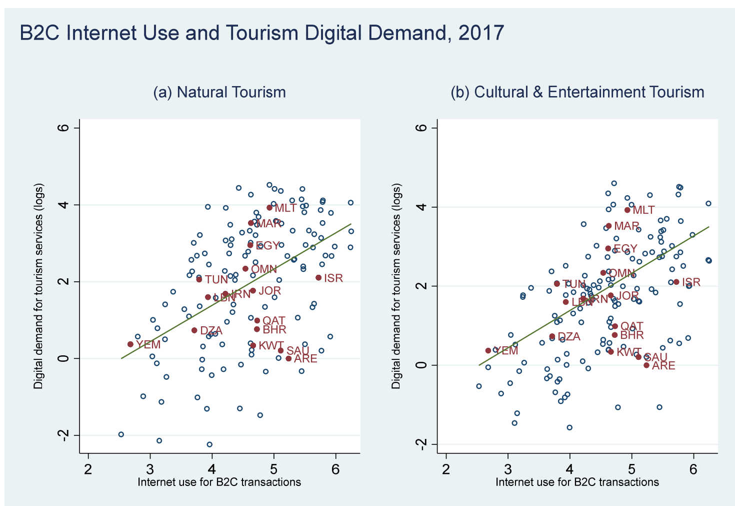
Figure 5 shows that there is a strong correlation between the extent of business-to-consumer (B2C) internet use and "digital demand" for tourism services. The latter come from WEF (2019) and consist of two indicators (0-100) that measure total online search volume of either nature-related or cultural "brandtags". Nature tourism brandtags include terms such as "beaches", "diving", "hiking", "protected areas"; whereas examples of cultural and entertainment brandtags include "historical sites", "museums", "religious tourism", "local gastronomy", and "nightlife". More than 3.8 million destination-specific keywords correlated to tourist activities and attractions were analyzed across nine languages to build each indicator. Figure 5 shows that greater B2C internet use in the destination country is correlated with greater online search for tourism-related terms in that destination.

In the second approach, we use *Google Trends* search data. Choi and Varian (2012) and Varian (2014) advocate for the use of *Google Trends* data to forecast values of economic variables, with illustrations of applications that include travel destination planning. In this paper, we focus on internet queries on Google for the names of five of the most common online tourism platforms: "TripAdvisor", "Booking.com", "Travelocity", "Expedia", and "Orbitz". We downloaded search terms from 2004 to the present, with

[10] That is, Poisson Maximum Likelihood estimation methods, as proposed by Santos Silva and Tenreyro (2010).

monthly periodicity, and disaggregation according to the country or territory from which the search query is performed. For each country, *Google Trends* normalizes the search for any given term with respect to the month with the highest volume of searches of such term in that country, setting that month equal to 100. We then use this information to measure, for every year, the average of the *Google Trends* indicator, allowing us to track the increase over time in the prevalence of those queries. As Figure 6(a) illustrates, there is a noticeable variation across countries and secular increases over the period of interest on the five platforms. In the econometric exercise below, we define countries as "high" adopters of tourism digital platforms when the constructed Google Search Index exceeds 50%.[11]

**Figure 5: Internet use for business-to-consumer transactions and digital demand for tourism services, 2017**




Source: Data from WEF Travel and Tourism Competitiveness Report 2019.

In addition to covering a longer time period, an advantage of the second proxy is that it is more directly related to the usage of digital platforms. Nevertheless, in contrast to our first approach, we are unable to distinguish between people using platforms to plan a trip in the origin country — demand for tourism services — and businesses in the destination country offering travel services — the supply side — although Figure 6(b) shows that there is a strong correlation between B2C Internet use and the proxy for digital

[11] Table A.1 presents the mean Google Trends index by world region; Table A.2 further presents the index for MENA countries.

platform use constructed from *Google Trends* data. Using the two proxies (separately) helps us check on the robustness of the two approaches.

**Figure 6: Google Trends Digital Platform Use Proxy**

**Fig. 6(a)**

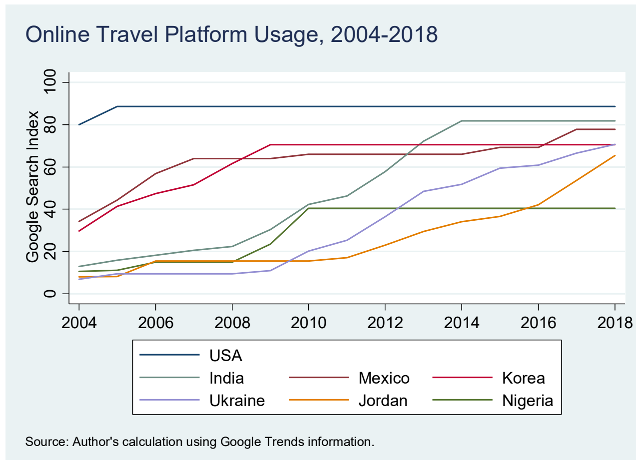
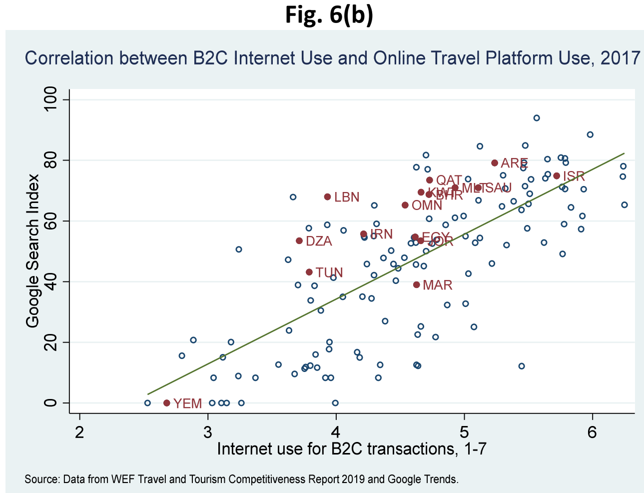



**Fig. 6(b)**




Last, we complement our data set with several sources that provided the required control variables. Standard gravity model variables came from the U.S. International Trade Commission's Dynamic Gravity Dataset.[12] The World Bank's World Development Indicators and the World Economic Forum (2018) were used to supplement the USITC data set and in exploring some of the determinants of the demand for tourism services.

[12] See Gurevich and Herman (2018).

### 3.3 Econometric estimation

Plugging expression (2) into the demand equation (1), taking logs, and noting that country *i*'s income can be expressed as the product of income per capita and total population ($POP_i$), $Y_i = Y_i/POP_i \times POP_i$, the baseline estimating equation (3) becomes:

$$(3) \qquad \ln T_{od} = \ln Y_o/POP_o + \ln Y_d/POP_d + \ln POP_o + \ln POP_d - \ln Y_w + \beta_D \ln D_{od} + \beta_{rxr} \ln RXR_{od} + \beta_{FTA} FTA + \beta_{CB} CB + \beta_{CL} CL + \beta_{CR} CR - \epsilon \ln P_d - \epsilon \ln \Pi_o .$$

Equation (3) is our baseline estimation equation. It omits time subscripts, which are needed given the panel data information at hand (see below). In estimating (3), we use origin and destination fixed effects, as well as year fixed effects. As it is common in the trade literature, as proxies for the multilateral resistance terms, we construct measures of "remoteness" for each of the two countries; that is, we measure the average distance to all other countries, other than the partner country under consideration. Thus, the remoteness measures vary by country pair and over time as well.[13]

## 4. Estimation results

Table 2 presents OLS estimates of the baseline equation (3). Columns (1) and (2) use our full sample, while columns (3) and (4) use a subset of the data that comprise a balanced panel of country-pairs and years for which all data are available. The latter is the preferred specification as it helps control for country entry or exits in the data set from influencing our estimates. All regressions use origin-country, destination-country, and year dummies. Also, for purposes of comparison to other studies, columns (1) and (2) use GDP and population as different regressors, and the other two columns use per capita GDP and population instead. The latter allows distinguishing country size and average income more cleanly. Column (4) reflects our preferred specification.

The estimates in Table 2 are all highly significant and of the expected sign and explain about 80% of the variance of the dependent variable. With reference to column (4), the coefficient (equal to 0.859) on per capita GDP of the origin country indicates an income elasticity of the demand for tourism services below one, which is somewhat surprising but in line with the findings by Culiuc (2014). As one would expect, larger origin countries demand more tourism services, with a 1-percent increase in population translating

[13] Following Head and Mayer (2015) and Yotov et al (2016), we also considered using destination-year and origin-year fixed effects to control for multilateral resistance. However, the computational demands are substantial, given the very large corresponding number of dummy variables.

into a 0.559% increase in tourist arrivals. In contrast, a 1-percent real exchange rate appreciation in the destination country reduces tourist arrivals by 0.129%. Also of note, the farther away the origin country is *from the rest of the world*, as measured by the remoteness variable, the more tourism services it demands from a given destination. The destination country remoteness, however, is not statistically significant, as it is not immediately obvious why marginal changes in its distance to the rest of the world should affect tourists from the origin country from arriving.

### 4.1 Estimation results: Variation over time

In order to shed light on the influence of digital platforms on the demand for tourism services, we first extend the baseline equation by including interaction terms of the distance, common language, colonial relationship, and common border variables, with the year dummies. As we discussed before, in the context of the gravity equation applied to trade in tourism services, the adoption of digital platforms would affect the cost of traveling in ways that would be captured by the four interaction variables. Interaction with year dummies would help us see whether the weight of those variables has changed in recent years. While there are multiple reasons why that might have happened, one would suspect that the rapid adoption of digital platforms during the period of analysis would be behind any observed changes.

Table 3 presents the interaction terms' coefficient estimates; coefficient estimates on other regressors — those in the baseline specification— are not reported but are in line with those found earlier. There is strong evidence indicating that sharing a common language or a colonial relationship becomes a less important driver of the demand for tourism services during the present decade. Coefficients on those variables are negative, statistically significant, and appear to be increasing (in absolute terms) over the decade. In contrast, sharing a common border is not significantly different from zero. The same is true of the distance-year interaction, although it should be noted that the coefficient is positive, albeit insignificant, suggesting that the negative effect of distance on the tourist flows might be mitigated over time.

### 4.2 Estimation results: Internet use

The behavior of the estimated interaction coefficients in Table 3 is in line with the hypothesis that, as the use of digital platforms has risen in recent years, the costs of planning a trip and traveling have fallen. To tackle this hypothesis more directly, we first look at Internet use as a proxy of digital platform adoption.

To that effect, we now interact the relevant gravity equation variables with a dummy indicating population-wide internet use in the origin country, and business-to-consumer (B2C) internet use in the destination country. We then estimate a version of equation (3) augmented with the interacted terms, both each by itself, as well as different combinations of them.

The estimation results appear in Table 4, in which, for the sake of clarity, once again we do not report the gravity equation control variables. In Table 4(a) we present estimates in which each of the gravity variables of interest — bilateral distance, common border, common language, and colonial relationship — is interacted with the *product* of origin-country internet use and destination B2C internet use. Each of the interacted terms is first introduced by itself in columns (2) to (5), and then all of them are entered together in column (6). The gravity baseline results in Column (1), covering the years 2013, 2015, and 2017, are in line with the results in Table 2, which cover the 2004-2017 period. Except for the colonial relationship-interacted term, all the estimated coefficients are significant and have the hypothesized sign. A wider use of digital platforms in either of the two or in both countries, proxied by internet use, mitigates the negative impact of distance, increasing the demand for faraway destinations relative to the baseline. Moreover, sharing a border and speaking the same language become less important determinants of the demand for tourism services when internet use is widespread. The colonial relationship interaction is *positive* and significant when it is entered by itself (column 5), but it is not significantly different from zero when all other variables are introduced (column 6).

Table 4(b) presents coefficient estimates of an alternative specification in which the gravity variables are interacted with the internet use measures for the origin and destination countries separately — i.e., not as the product of the two measures. Panel B presents coefficient estimates for the interactions with internet use in the origin country, while Panel C presents estimates for interaction with business internet use in the destination country. Once again, we find that greater internet use in both the origin and destination countries offsets the negative impact of distance on tourism flows and reduces the role of sharing a common border or speaking the same language in facilitating bilateral travel. Once again, however, the colonial relationship interaction does not have the expected sign and remains significant in the case of the origin country even in the fuller specification in column (11).

### 4.3 Estimation results: Google Trends data

As a robustness check, we now turn to the use of our proxy constructed with Google Trends data. We can now explore a longer time horizon, spanning the 2004 to 2017 period, with a measure that is more directly related to the actual use of digital platforms, but that nevertheless does not capture whether interest in Google searches is motivated by travel planning (demand side) or by catering to potential tourists in the destination country (supply side).

Keeping these caveats in mind, the results in Table 5 confirm the previous evidence regarding the role of digital platforms. As shown in Panel A, when the use of digital platforms is widespread in the origin country, tourist flows are less sensitive to sharing a common language or a common border and are less affected by distance to the destination country. Coefficient estimates on the three variables are highly significant across all specifications; in contrast, the coefficient on the colonial relationship is statistically insignificant across four out of five specifications.

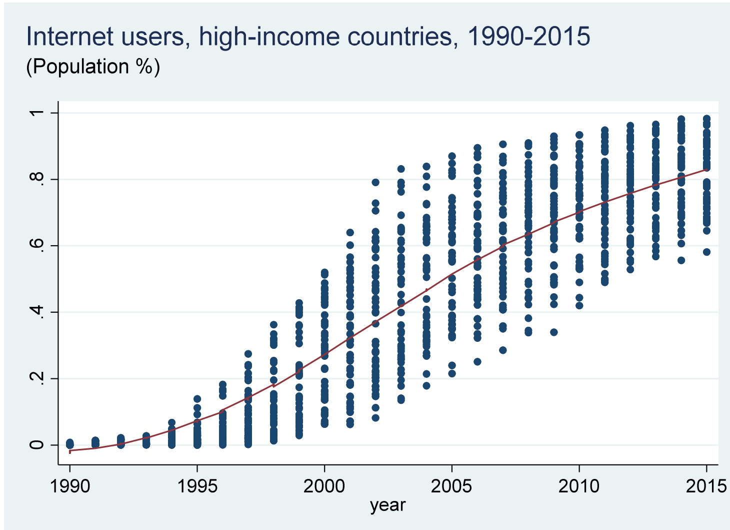
Panel B focuses on the use of digital platforms in destination countries. Again, among more avid users of digital platforms, the impact of sharing a common border or a common language appears to be more subdued across specifications, although in the regression in column (16) the coefficients are not significant or only marginally so. Oddly, the coefficient on the colonial relationship dummy is positive, although only marginally significant. The coefficient on distance is negative and highly significant, suggesting once again that destinations that have adopted digital technologies would attract more visitors from countries that are in closer proximity.

## 5. Discussion

In order to interpret the above results, in this section we discuss how the demand for tourist services would increase as the use of digital platforms continues to rise. To that effect, we focus on the results estimates in Column (11), Table 4(b), Panel C, which focuses on the uses of the internet for business-to-consumer transactions (B2C). Moreover, the forecasting exercise requires making informed assumptions about the path that B2C internet use would follow in the coming years. To that end, we look at the rate at which internet use has increased in developed countries, measured as a percentage of the population. That is, we assume that: (i) B2C adoption will increase at the same rate as the internet overall; and (ii) that the same rate of B2C adoption applies in all countries.

We follow the literature on technology adoption (see Grilliches, 1957; Comin and Mastiery, 2013) and assume that internet use has evolved as described by a logistic function, which is consistent with the S-shaped pattern presented in Figure 7.

**Figure 7**




Source: Author's calculation using WDI data

Using WDI data for 1990-2015, we estimate two variants of the logistic function. First, we constrain the estimation to have minimum and maximum values equal to 0 and 1. This specification assumes that eventually 100% of the population uses the Internet. Alternatively, we estimate the function without constraining its maximum value, allowing internet adoption to fall below 100%. The estimates under each case are as follows:

Case 1 - Full adoption: $Internet\ use = 1/\left(1 + e^{-0.213491 \times (t - 16.14261)}\right)$

Case 2 - Unconstrained function: $Internet\ use = .7954979/\left(1 + e^{-.3314878 \times (t - 13.5291)}\right)$

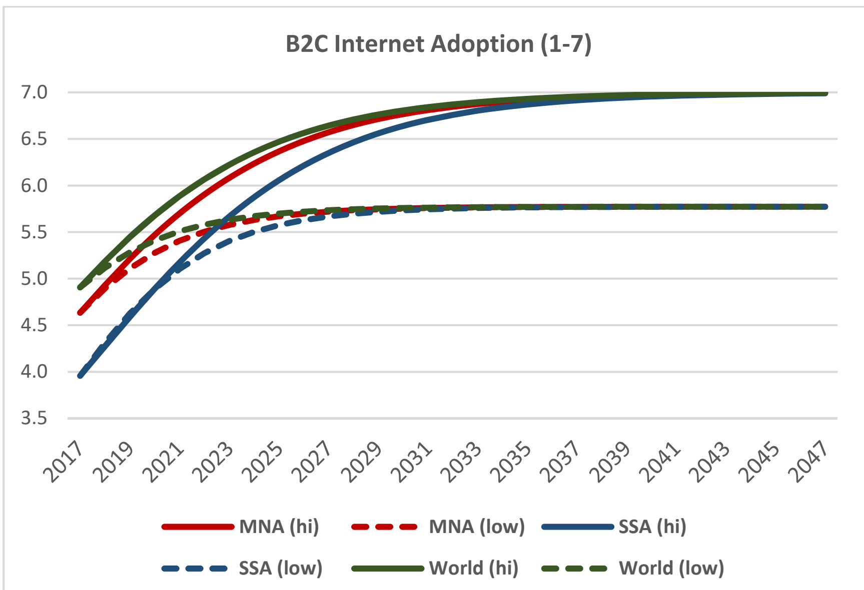
In both cases, $t = 0$, in 1990. The speed of internet adoption is 0.21 and 0.33 in each case, respectively. Case 2 shows that internet use will converge to approximately 80%. Although this is consistent with the data for the average high-income country, as depicted in Figure 7, the latter figure also shows that, in several countries, internet adoption was already approaching 100% in 2015. In what follows, we use the two cases to illustrate a high- and a low-adoption scenario, with corresponding implications for our projections on future tourism demand.

With the logistic function parameters in hand, we applied them to the data on B2C Internet use. As the original data from WEF are expressed in the form of an index taking values 1 to 7, we first transform the index to take the values 0 to 1. We then forecast the rate of B2C internet adoption taking the year 2017, the last for which data are available, as our starting point. Note that as B2C has already been in use, $t$ in the data does not start at zero. Thus, we compute the value of $t$ which is consistent with the observed

B2C level in the year 2017, distinguishing by region, as well as the corresponding *t* through 2047. Applying these to the two cases under consideration, we obtain the forecast for B2C Internet use for the period 2018-2047. We transform such forecast estimates back to 1-to-7 values, to maintain consistency with the original WEF data.

As Figure 8 shows, B2C adoption converges gradually to the maximum value of 7 in Case 1, as expected. Although MENA and SSA countries[14] lag the rest of the world in the extent to which B2C is adopted, they eventually converge to the maximum level. Indeed, for the average MENA country, B2C exceeds 6 by the year 2023 and 6.9 by 2035. In Case 2, in which adoption never reaches its full potential, B2C internet usage converges to 5.8.

**Figure 8**




Source: Author's calculation.

In turn, we use the above B2C forecasts to project how the average number of travelers per country of origin —that is, not the total number of visitors— will increase as the use of digital platforms grows in the

[14] As stated in the introduction, we pay particular attention to MENA and SSA countries, as the two regions have only recently been catching up with the rest of the world in terms of the use of digital tools.

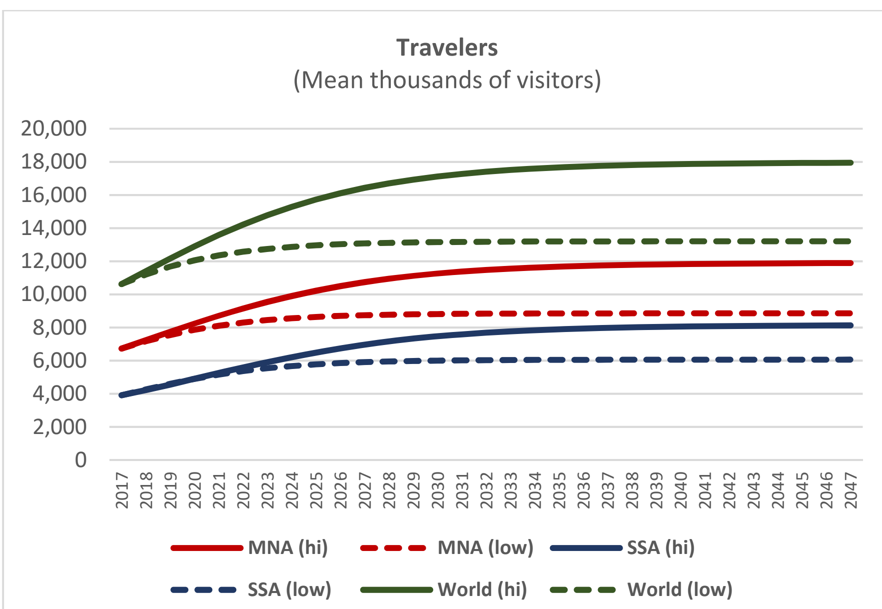
region, holding everything else constant. Using the estimates in Table 4(b), Panel C, column (11). The increase in the log number of travelers is given by the expression:

$$(4) \qquad \Delta \ln T_{t+1} = (\beta_D \ln Dist + \beta_{CB} CB + \beta_{CL} CL + \beta_{CR} CR) \times \Delta B2C_{t+1}.$$

Note that distance (*Dist*), common border (*CB*), common language (*CL*), and colonial relationship (*CR*) are all time-invariant variables. In computing expression (4), we use the mean values of those variables in the year 2017 for all observations occurring in the estimated regression of reference.

Figure 9 presents our projections of the number of travelers (in levels) expected to arrive in each region through the year 2047. To put the projections in perspective, in 2017 the typical MENA country received, on average, 6,732 visitors per country of origin. Holding all else constant, in Case 1, the adoption of B2C would result in an increase of 60% in that number by 2027 and 75% by 2037. For SSA, starting from average arrivals of 3,914 travelers in 2017, the projected increases are 78% and 104% in 2027 and 2037, respectively. The increase in the number of visitors is much more modest but still considerable. By 2027, average arrivals from a given country increase by 30% in MENA and 51.1% in SSA. Nevertheless, such increases rapidly reach a plateau and 10 years later the corresponding figures stand at 32% and 55%, respectively.

**Figure 9**




Source: Author's calculation.

## 6. Final remarks

The econometric evidence presented in this paper provides support to the notion that the adoption of digital platforms in the tourism industry has facilitated international travel. By reducing search costs and providing travelers with more information about a given destination, digital platforms reduce the monetary and non-monetary costs of traveling (e.g., the time spent planning for a trip or the psychological reticence to travel to an unknown country) and thus boost trade in international tourism services. A gravity equation model, adapted from the trade literature to the case of tourism, provides a conceptual framework to analyze how the digital economy affects the cost of traveling. A novel data set of bilateral tourism flows and the adoption of digital platforms in tourism allows us to estimate the gravity equation.

The results suggest that as the adoption of digital tools increases, less traditional destinations may overcome the lack of information and interest from foreign travelers, and abate traveling costs, thereby attracting more visitors. As the paper shows, there is a positive correlation between tourist arrivals and the size of the travel and tourism industry in the destination country, both in terms of employment and GDP. Therefore, the adoption of digital tools, by inducing a greater demand for tourism services, helps create jobs. Countries that have lagged the rest of the world in the adoption of digital technologies, such as those in the Middle East and North Africa and Sub-Saharan Africa, could spur economic activity in the travel and tourism industry by leveraging such technologies.

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**Table 2: Baseline regression**
(Dependent variable: Tourist arrivals, 2004-2017, logs)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Full sample | Full sample | Balanced panel | Balanced panel |
| | | | | |
| GDP: Origin country (logs) | 0.747*** | | 0.859*** | |
| | (0.0396) | | (0.0481) | |
| GDP: Destination country (logs) | 0.577*** | | 0.782*** | |
| | (0.0350) | | (0.0406) | |
| Per capita GDP: Origin country (logs) | | 0.747*** | | 0.859*** |
| | | (0.0396) | | (0.0481) |
| Per capita GDP: Destination country (logs) | | 0.577*** | | 0.782*** |
| | | (0.0350) | | (0.0406) |
| Population: Origin country (logs) | -0.363*** | 0.384*** | -0.300*** | 0.559*** |
| | (0.0728) | (0.0654) | (0.0889) | (0.0804) |
| Population: Destination country (logs) | -0.759*** | -0.182** | -0.784*** | -0.00151 |
| | (0.0776) | (0.0731) | (0.0986) | (0.0916) |
| Bilateral distance (logs) | -1.338*** | -1.338*** | -1.279*** | -1.279*** |
| | (0.00589) | (0.00589) | (0.00758) | (0.00758) |
| Common border dummy | 1.328*** | 1.328*** | 1.318*** | 1.318*** |
| | (0.0240) | (0.0240) | (0.0275) | (0.0275) |
| Common Language dummy | 0.726*** | 0.726*** | 0.688*** | 0.688*** |
| | (0.00945) | (0.00945) | (0.0112) | (0.0112) |
| Common Free Trade Agreement dummy | 0.589*** | 0.589*** | 0.468*** | 0.468*** |
| | (0.0104) | (0.0104) | (0.0123) | (0.0123) |
| Colonial relationship dummy | 1.285*** | 1.285*** | 1.177*** | 1.177*** |
| | (0.0304) | (0.0304) | (0.0296) | (0.0296) |
| Bilateral real exchange rate (logs) | -0.138*** | -0.138*** | -0.129*** | -0.129*** |
| | (0.0151) | (0.0151) | (0.0193) | (0.0193) |
| Remoteness: Destination country (logs) | -0.253** | -0.253** | 0.0679 | 0.0679 |
| | (0.101) | (0.101) | (0.119) | (0.119) |
| Remoteness: Origin country (logs) | 0.382*** | 0.382*** | 0.745*** | 0.745*** |
| | (0.0811) | (0.0811) | (0.0824) | (0.0824) |
| Constant | -2.740 | -2.740 | -16.74*** | -16.74*** |
| | (1.810) | (1.810) | (2.088) | (2.088) |
| | | | | |
| Observations | 124,012 | 124,012 | 76,006 | 76,006 |
| R-squared | 0.799 | 0.799 | 0.814 | 0.814 |
| Country and year dummies included but not reported | | | | |
| Robust standard errors in parentheses | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | |

**Table 3: Year Interaction Coefficients**

(Dependent variable: Tourist arrivals, 2004-2017, logs)

| | (1) | (2) | (3) | (4) | | | (5) |
|---|---|---|---|---|---|---|---|
| INTERACTED REGRESSOR: | Common Border | Common Language | Colonial Relationship | Common Border | Common Language | Colonial Relationship | Distance (log) |
| Year = 2005 | -0.00769 | -0.0170 | -0.0182 | -0.00136 | -0.0165 | -0.00990 | 0.00938 |
| | (0.128) | (0.0411) | (0.145) | (0.128) | (0.0414) | (0.146) | (0.0219) |
| Year = 2006 | -0.0534 | -0.0333 | -0.0228 | -0.0420 | -0.0296 | -0.00955 | 0.0221 |
| | (0.128) | (0.0408) | (0.142) | (0.128) | (0.0411) | (0.144) | (0.0218) |
| Year = 2007 | -0.0961 | -0.0426 | -0.0631 | -0.0831 | -0.0346 | -0.0492 | 0.0350 |
| | (0.128) | (0.0407) | (0.142) | (0.128) | (0.0410) | (0.143) | (0.0217) |
| Year = 2008 | -0.0728 | -0.0512 | -0.126 | -0.0567 | -0.0435 | -0.107 | 0.0451** |
| | (0.128) | (0.0405) | (0.138) | (0.129) | (0.0408) | (0.140) | (0.0216) |
| Year = 2009 | -0.0217 | -0.0661 | -0.179 | 0.000691 | -0.0615 | -0.148 | 0.0300 |
| | (0.128) | (0.0403) | (0.144) | (0.128) | (0.0406) | (0.145) | (0.0214) |
| Year = 2010 | -0.0385 | -0.0877** | -0.214 | -0.00862 | -0.0816** | -0.173 | 0.0341 |
| | (0.127) | (0.0401) | (0.138) | (0.128) | (0.0404) | (0.140) | (0.0214) |
| Year = 2011 | -0.0211 | -0.0888** | -0.230* | 0.00960 | -0.0836** | -0.186 | 0.0255 |
| | (0.129) | (0.0404) | (0.137) | (0.129) | (0.0407) | (0.139) | (0.0215) |
| Year = 2012 | -0.0159 | -0.110*** | -0.296** | 0.0222 | -0.105** | -0.241* | 0.0169 |
| | (0.128) | (0.0404) | (0.140) | (0.129) | (0.0406) | (0.141) | (0.0215) |
| Year = 2013 | -0.0245 | -0.119*** | -0.317** | 0.0162 | -0.112*** | -0.258* | 0.0121 |
| | (0.128) | (0.0404) | (0.139) | (0.129) | (0.0407) | (0.140) | (0.0216) |
| Year = 2014 | -0.0416 | -0.121*** | -0.312** | -0.000304 | -0.113*** | -0.252* | 0.0188 |
| | (0.127) | (0.0406) | (0.141) | (0.128) | (0.0409) | (0.143) | (0.0216) |
| Year = 2015 | -0.0814 | -0.126*** | -0.331** | -0.0399 | -0.114*** | -0.272* | 0.0194 |
| | (0.128) | (0.0407) | (0.143) | (0.129) | (0.0410) | (0.145) | (0.0217) |
| Year = 2016 | -0.0877 | -0.129*** | -0.347** | -0.0459 | -0.116*** | -0.288** | 0.0235 |
| | (0.127) | (0.0411) | (0.143) | (0.128) | (0.0414) | (0.145) | (0.0218) |
| Year = 2017 | -0.111 | -0.170*** | -0.401*** | -0.0552 | -0.156*** | -0.322** | 0.0230 |
| | (0.129) | (0.0414) | (0.147) | (0.130) | (0.0417) | (0.148) | (0.0220) |
| Observations | 76,006 | 76,006 | 76,006 | 76,006 | | | 76,006 |
| R-squared | 0.814 | 0.814 | 0.814 | 0.814 | | | 0.814 |

Other regressors included but not reported: Per capita GDP, Population, Real exchange rate, Remoteness, Contiguity, Common language, Colonial relationship, Country and Year dummies.

Sample: Balanced panel

Robust standard errors in parentheses

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

**Table 4(a): Digital Adoption – Internet Use**

(Dependent variable: Tourist arrivals, 2013, 2015, 2017, logs)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Bilateral distance (logs) | -1.289*** | -1.449*** | -1.269*** | -1.263*** | -1.289*** | -1.393*** |
| | (0.0173) | (0.0184) | (0.0173) | (0.0177) | (0.0173) | (0.0188) |
| Common border dummy | 1.239*** | 1.195*** | 2.851*** | 1.241*** | 1.237*** | 2.457*** |
| | (0.0623) | (0.0606) | (0.121) | (0.0617) | (0.0623) | (0.123) |
| Common Language dummy | 0.674*** | 0.690*** | 0.727*** | 0.981*** | 0.675*** | 1.084*** |
| | (0.0239) | (0.0237) | (0.0237) | (0.0493) | (0.0239) | (0.0493) |
| Colonial relationship dummy | 1.181*** | 1.145*** | 1.148*** | 1.247*** | 0.750*** | 1.064*** |
| | (0.0534) | (0.0520) | (0.0533) | (0.0554) | (0.170) | (0.171) |
| ***PANEL A:*** *Interaction with (B2C Internet Use in Destination Country) x (Individual Internet Use in Origin Country)* | | | | | | |
| x Distance (logs) | | 0.0608*** | | | | 0.0566*** |
| | | (0.00283) | | | | (0.00291) |
| x Common border | | | -0.0841*** | | | -0.0656*** |
| | | | (0.00520) | | | (0.00521) |
| x Common Language | | | | -0.0121*** | | -0.0140*** |
| | | | | (0.00156) | | (0.00155) |
| x Colonial relationship | | | | | 0.0126*** | 0.00393 |
| | | | | | (0.00452) | (0.00461) |
| Observations | 17,922 | 17,922 | 17,922 | 17,922 | 17,922 | 17,922 |
| R-squared | 0.830 | 0.835 | 0.835 | 0.831 | 0.830 | 0.839 |

Regressors included but not reported: Per capita GDP, Population, Real exchange rate, Remoteness, Country & Year dummies.
Sample: Balanced panel.
Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

**Table 4(b): Digital Adoption – Internet Use**

(Dependent variable: Tourist arrivals, 2013, 2015, 2017, logs)

| | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|
| Bilateral distance (logs) | -1.694*** | -1.277*** | -1.263*** | -1.288*** | -1.591*** |
| | (0.0328) | (0.0169) | (0.0174) | (0.0173) | (0.0329) |
| Common border dummy | 1.208*** | 5.806*** | 1.283*** | 1.238*** | 4.971*** |
| | (0.0608) | (0.337) | (0.0607) | (0.0623) | (0.341) |
| Common Language dummy | 0.681*** | 0.735*** | 2.010*** | 0.675*** | 1.631*** |
| | (0.0237) | (0.0237) | (0.122) | (0.0239) | (0.121) |
| Colonial relationship dummy | 1.131*** | 1.151*** | 1.292*** | 0.382 | 0.655 |
| | (0.0529) | (0.0536) | (0.0549) | (0.439) | (0.456) |
| | | | | | |
| ***PANEL B:*** *Interaction with Individual Internet Use in Origin Country* | | | | | |
| x Distance (logs) | 0.303*** | | | | 0.258*** |
| | (0.0217) | | | | (0.0218) |
| x Common border | | -2.129*** | | | -1.531*** |
| | | (0.272) | | | (0.273) |
| x Common Language | | | -0.882*** | | -0.707*** |
| | | | (0.0763) | | (0.0763) |
| x Colonial relationship | | | | 0.599** | 0.643** |
| | | | | (0.293) | (0.295) |
| | | | | | |
| ***PANEL C:*** *Interaction with B2C Internet Use in Destination Country* | | | | | |
| x Distance (logs) | 0.0441*** | | | | 0.0346*** |
| | (0.00519) | | | | (0.00515) |
| x Common border | | -0.696*** | | | -0.593*** |
| | | (0.0859) | | | (0.0859) |
| x Common Language | | | -0.162*** | | -0.0948*** |
| | | | (0.0221) | | (0.0220) |
| x Colonial relationship | | | | 0.0657 | 0.00877 |
| | | | | (0.0591) | (0.0617) |
| | | | | | |
| Observations | 17,922 | 17,922 | 17,922 | 17,922 | 17,922 |
| R-squared | 0.834 | 0.837 | 0.833 | 0.830 | 0.840 |

Regressors included but not reported: Per capita GDP, Population, Real exchange rate, Remoteness, Country & Year dummies.

Sample: Balanced panel.

Robust standard errors in parentheses.

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

## Table 5: Digital Adoption – *Google Trends* Proxy

(Dependent variable: Tourist arrivals, 2004-2017, logs)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bilateral distance (logs) | -1.278*** | -1.277*** | -1.277*** | -1.277*** | -1.277*** | -1.276*** | -1.277*** | -1.276*** | -1.277*** | -1.276*** | -1.277*** | -1.276*** | -1.280*** | -1.277*** | -1.279*** | -1.280*** |
| | (0.00757) | (0.00758) | (0.00758) | (0.00756) | (0.00758) | (0.00758) | (0.00758) | (0.00758) | (0.00756) | (0.00758) | (0.00758) | (0.00756) | (0.00758) | (0.00758) | (0.00758) | (0.00756) |
| Common border dummy | 1.414*** | 1.316*** | 1.318*** | 1.400*** | 1.388*** | 1.317*** | 1.318*** | 1.379*** | 1.433*** | 1.315*** | 1.318*** | 1.414*** | 1.318*** | 1.319*** | 1.318*** | 1.408*** |
| | (0.0298) | (0.0275) | (0.0275) | (0.0299) | (0.0294) | (0.0275) | (0.0275) | (0.0295) | (0.0304) | (0.0275) | (0.0275) | (0.0304) | (0.0275) | (0.0275) | (0.0275) | (0.0304) |
| Common Language dummy | 0.691*** | 0.730*** | 0.688*** | 0.723*** | 0.690*** | 0.716*** | 0.688*** | 0.712*** | 0.692*** | 0.748*** | 0.688*** | 0.738*** | 0.688*** | 0.688*** | 0.688*** | 0.751*** |
| | (0.0112) | (0.0124) | (0.0112) | (0.0124) | (0.0112) | (0.0122) | (0.0112) | (0.0122) | (0.0112) | (0.0130) | (0.0112) | (0.0130) | (0.0112) | (0.0112) | (0.0112) | (0.0133) |
| Colonial relationship dummy | 1.171*** | 1.201*** | 1.152*** | 1.125*** | 1.175*** | 1.177*** | 1.150*** | 1.136*** | 1.171*** | 1.199*** | 1.129*** | 1.099*** | 1.174*** | 1.177*** | 1.175*** | 1.111*** |
| | (0.0296) | (0.0298) | (0.0460) | (0.0462) | (0.0295) | (0.0296) | (0.0364) | (0.0364) | (0.0295) | (0.0298) | (0.0486) | (0.0487) | (0.0295) | (0.0296) | (0.0296) | (0.0489) |
| ***PANEL A:*** *Interaction with high digital platform adoption - Origin country:* | | | | | | | | | | | | | | | | |
| x Common border | -0.575*** | | | -0.509*** | | | | | -0.493*** | | | -0.431*** | | | | -0.434*** |
| | (0.0649) | | | (0.0656) | | | | | (0.0742) | | | (0.0749) | | | | (0.0747) |
| x Common Language | | -0.146*** | | -0.110*** | | | | | | -0.133*** | | -0.102*** | | | | -0.189*** |
| | | (0.0157) | | (0.0158) | | | | | | (0.0159) | | (0.0160) | | | | (0.0175) |
| x Colonial relationship | | | 0.0400 | 0.106* | | | | | | | 0.0355 | 0.0916 | | | | 0.0882 |
| | | | (0.0553) | (0.0564) | | | | | | | (0.0559) | (0.0571) | | | | (0.0571) |
| x Distance (logs) | | | | | | | | | | | | | 0.00997*** | | 0.00993*** | 0.0191*** |
| | | | | | | | | | | | | | (0.00154) | | (0.00154) | (0.00168) |
| ***PANEL B:*** *Interaction with high digital platform adoption - Destination country:* | | | | | | | | | | | | | | | | |
| x Common border | | | | | -0.391*** | | | -0.349*** | -0.187** | | | -0.158** | | | | -0.139* |
| | | | | | (0.0694) | | | (0.0699) | (0.0778) | | | (0.0784) | | | | (0.0782) |
| x Common Language | | | | | | -0.0935*** | | -0.0702*** | | -0.0706*** | | -0.0552*** | | | | -0.0168 |
| | | | | | | (0.0158) | | (0.0157) | | (0.0160) | | (0.0159) | | | | (0.0176) |
| x Colonial relationship | | | | | | | 0.0783 | 0.120** | | | 0.0761 | 0.102* | | | | 0.105* |
| | | | | | | | (0.0552) | (0.0559) | | | (0.0556) | (0.0564) | | | | (0.0564) |
| x Distance (logs) | | | | | | | | | | | | | | -0.00596*** | -0.00589*** | -0.00497*** |
| | | | | | | | | | | | | | | (0.00155) | (0.00155) | (0.00170) |
| Constant | -17.31*** | -18.18*** | -17.03*** | -18.16*** | -17.41*** | -17.66*** | -17.05*** | -17.87*** | -17.45*** | -18.55*** | -17.05*** | -18.60*** | -18.05*** | -16.51*** | -17.53*** | -20.54*** |
| | (2.081) | (2.094) | (2.088) | (2.087) | (2.085) | (2.098) | (2.088) | (2.093) | (2.080) | (2.101) | (2.088) | (2.093) | (2.092) | (2.101) | (2.105) | (2.120) |
| Observations | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 | 75,880 |
| R-squared | 0.815 | 0.814 | 0.814 | 0.815 | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.814 | 0.814 | 0.815 | 0.814 | 0.814 | 0.814 | 0.815 |

Other regressors included but not reported: Per capita GDP, Population, Real exchange rate, Remoteness, Country and Year dummies.
Sample: Balanced panel.
Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

**Table A.1: Adoption of digital travel tools**
(Google Trends Index)

| REGION | 2004 | 2010 | 2014 | 2018 |
|---|---|---|---|---|
| | YEAR | | | |
| East Asia & Pacific | 8.4 | 23.3 | 34.9 | 40.9 |
| Europe & Central Asia | 6.1 | 20.0 | 40.1 | 55.4 |
| Latin America & Caribbean | 14.3 | 24.1 | 34.7 | 43.8 |
| Middle East & North Africa | 8.6 | 21.8 | 44.6 | 55.0 |
| North America | 55.9 | 79.5 | 79.9 | 79.9 |
| South Asia | 11.6 | 28.1 | 38.9 | 46.3 |
| Sub-Saharan Africa | 3.2 | 11.3 | 15.6 | 17.1 |
| Total | 8.6 | 20.7 | 33.8 | 42.3 |

**Note**: Author's calculation using Google Trends search data of the terms "TripAdvisor", "Booking.com", "Travelocity", "Expedia", and "Orbitz", over the period 2004-2018.

**Table A.2: Use of Digital Travel Sites in MENA**
(Index 0 - 100)

| COUNTRY | YEAR 2004 | 2010 | 2014 | 2018 |
|---|---|---|---|---|
| Algeria | 1.1 | 7.7 | 35.5 | 58.3 |
| Bahrain | 7.5 | 27.3 | 59.1 | 68.8 |
| Djibouti | 8.3 | 12.1 | 12.1 | 12.1 |
| Egypt | 12.8 | 12.8 | 36.0 | 58.6 |
| Iran | 9.6 | 20.8 | 38.3 | 55.8 |
| Iraq | 3.3 | 38.0 | 38.0 | 38.0 |
| Israel | 7.6 | 12.3 | 59.7 | 74.9 |
| Jordan | 8.0 | 15.4 | 34.0 | 65.5 |
| Kuwait | 6.8 | 28.3 | 69.5 | 69.5 |
| Lebanon | 22.3 | 38.6 | 63.3 | 71.9 |
| Libya | 3.6 | 10.8 | 39.2 | 39.2 |
| Malta | 6.9 | 26.8 | 67.0 | 71.0 |
| Morocco | 2.8 | 8.1 | 21.7 | 50.2 |
| Oman | 6.0 | 23.9 | 63.7 | 68.8 |
| Qatar | 12.4 | 36.4 | 73.5 | 73.5 |
| Saudi Arabia | 2.9 | 18.6 | 60.8 | 71.0 |
| Syrian Arab Republic | 15.0 | 17.8 | 17.8 | 17.8 |
| Tunisia | 3.5 | 4.7 | 18.3 | 50.8 |
| United Arab Emirates | 6.3 | 37.9 | 70.3 | 79.2 |
| West Bank and Gaza | 34.8 | 59.3 | 59.3 | 59.3 |
| Yemen | 0.0 | 0.0 | 0.0 | 0.0 |
| Total | 8.6 | 21.8 | 44.6 | 55.0 |

**Note**: Author's calculation using Google Trends search data of the terms "TripAdvisor", "Booking.com", "Travelocity", "Expedia", and "Orbitz", over the period 2004-2018.