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ORIGINAL ARTICLE

The digital divide and the growth of the hospitality industry: The case of Italian inner areas

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Abstract

We investigate the role of internet access in spurring tourism supply, a strategic driver of economic development, especially in the most 'peripheral' areas, characterized by a lack of technological infrastructure and other barriers that limit internet access and business opportunities. In a difference-in-differences setting, we exploit the recent Italian strategy for ultra-broadband policy—aimed at boosting the diffusion of ultra-broadband in Italy since 2015—as an exogenous source of variation in internet access to estimate the effect on tourism supply. In doing so, we employ detailed data on broadband coverage and tourist accommodation at the municipality level from 2012 to 2019. Our results show that the ultra-broadband availability increased the tourism supply in four-star hotels and bed and breakfasts, suggesting that policy interventions aimed at reducing the digital divide between centers and peripheries can boost local economic development and help the process of de-peripheralization of marginal areas.

KEYWORDS
demarginalization, digital divide, inner areas, internet, tourism

JEL CLASSIFICATION
H54, L20, 038, R10, Z32

1 | INTRODUCTION

Broadband and ultra-broadband networks are crucial for developing the information society and economic growth. As evidence of this, among the objectives of the European Digital Agenda, the European Commission is fostering services and applications based on broadband infrastructure to achieve universal coverage with minimum ultra-broadband (UBB, at least 30 Mb/s in download) and 50% of the population with 100 Mb/s ultra-broadband subscriptions (Italian Ministry of Economic Development, 2015). Internet and information and communication technologies (ICTs) are substantially changing the nature of our world, and the structure and organization of the tourism sector are no exceptions (Minghetti & Buhalis, 2009). ICTs influence residents' attitudes toward tourism as a driver of regional development (De Lucia et al., 2021). They are also supposed to nurture entrepreneurial opportunities, giving small firms a chance to enter the market and limiting the competitive advantages of the larger ones (Kotnik & Stritar, 2015). Recently the World Economic Forum (WEF, 2022) restated this idea. Indeed, the mechanism through which ICT affects the tourism supply includes three main elements: (1) it is crucial for businesses to access and advertise to new markets, (2) it improves efficiency, and (3) it gains insights into consumer needs.

However, the geographic digital divide between the core and peripheries constitutes a relevant issue regarding tourists and tourist destinations (Minghetti & Buhalis, 2009). Peripheral areas often face significant difficulties in terms of availability from the main tourist-generating regions, not only physically due to the lack of infrastructure but also electronically (Buhalis, 2000; Hohl & Tisdell, 1995; Nash & Martin, 2003). According to the United Nations Conference on Trade and Development (UNCTAD), the spreading of ICTs represents a considerable potential to enhance sustainable global and tourism development, particularly in less-developed areas (United Nations Conference on Trade and Development, UNCTAD, 2004). Nonetheless, disparities still exist in access, skills, use of ICTs, and services. This unequal availability and use of ICTs can lead to digital and social exclusions, both for consumers and firms, as many authors have pointed out (Alam & Imran, 2014; Klecun, 2008; Selwyn, 2004). The implications of digital exclusion for tourism organizations and destinations in low- and medium-digital-access regions, and the impacts on their competitiveness are issues that remain largely unexplored. One important implication is the inability to participate in the emerging network market and take advantage of emerging opportunities (Minghetti & Buhalis, 2009). According to the WEF (2022), proper care must be paid to develop ICT infrastructure in rural, natural, and secondary destinations. This will be a strategic point for the tourism sector and the attractiveness of peripheral destinations, which could in this way increase their capacity to absorb more visitors in the next years. As stated by Kühn (2015) '*peripheries do not have to remain peripheries forever*' (p. 369). The process of de-peripheralization in marginal tourism destinations goes through digitalization and access to ICT devices and, specifically, to an internet connection increasingly faster. This is because it is necessary to understand the needs of tourists, which during the last years have changed their preferences. A recent analysis demonstrated a strong correlation between the development of ICT infrastructure and digital services and natural tourism online searches in economies with rich natural resources (WEF, 2022).

According to the International Telecommunication Union (ITU, 2005), in an ideal world, a digital opportunity would mean that the whole population can easily access ICTs at reasonable prices, all homes are provided with ICT devices, all citizens own mobile devices and ICT devices, and everyone uses broadband. The opportunity to access ultra-broadband is seen as essential for future growth because of its potential to increase innovation and productivity. By and large, from an economic perspective, the lack of innovation due to low-qualified work, is a specific characteristic of the peripheralization process (Kühn, 2015). For this reason, the process of de-peripheralization is strictly linked to innovation. As for other sectors and society, broadband internet has become a crucial factor in tourism development (Minghetti & Buhalis, 2009). As remarked by Pencarelli (2020), a tourist destination becomes accessible the more internet technology is available throughout it since it allows to use wi-fi networks and get information to anyone, anywhere, and when needed.

The Italian territorial context is complex and unbalanced despite its strong tourist attractiveness. On the one hand, there are large cities,[1] which account for only 16% of the population, and on the other hand, there are small towns,[2] where 50% of the population live. Moreover, the orographic structure of Italy and its peripheral areas makes interventions by telecommunication operators difficult and expensive. In this respect, it is not a case that the Italian Ministry of Economic Development (MISE) has labeled the areas characterized by the highest digital divide as 'market failure areas' (MISE, 2015).

In this work, we investigate the effect of UBB Internet connection[3] on tourism supply at the municipality level. In particular, in a difference-in-differences (DiD) setting, we estimate the effect of the introduction of the ultra-broadband internet connection on the number of tourist accommodations and related beds in both all the Italian municipalities and in areas where the digital divide is more likely to exist. Our analysis, therefore, allows us to study how broadband coverage affects the hospitality tourism industry. In doing so, we leverage exogenous variation in the UBB coverage induced by the Italian strategy for ultra-broadband, a policy started in 2015 to reduce the digital gap existing in accessing the UBB network. We find that the increase in UBB significantly expands the tourist supply for four-star hotels and bed and breakfasts, with these results being confirmed when focusing on 'inner areas' as defined within the Italian National Strategy for Inner Areas (henceforth SNAI).[4] Considering that UBB data at our disposal measure the availability and not the adoption, findings may support the literature on the incentives of ultra-broadband infrastructure investments.

The paper is organized as follows. Section 2 provides an overview of the relevant literature on the relationships between ICTs and firms. The ultra-broadband policy is described in Section 3. Section 4 shows the data and the descriptive statistics of the variables used. Section 5 introduces a description of the methodology. Section 6 discusses the econometric results of the study, while Section 7 outlines its conclusions and the related policy implications.

2 | LITERATURE REVIEW

According to the Organization for Economic Cooperation and Development (OECD, 2001), the digital divide is '*the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access ICTs and to their use of the Internet for a wide variety of activities*' (p. 4). This definition is very vast and the literature on this topic is growing. Therefore, in this section, we provide a framework of the literature on ICTs, broadband, and the digital divide useful to identify the gap we aim to fill. In detail, Section 2.1 introduces the relationship between ICTs and broadband with firms, while Section 2.2 discusses the core–periphery dichotomy in accessing these technological tools. Finally, in Section 2.3 we introduce the relationship between broadband and tourism.

2.1 | ICTs and broadband relation with firms

The literature has long demonstrated that ICTs innovations lead to higher firm productivity. Bartelsman et al. (2019), by analyzing 117,000 firms across 10 European countries during 2002–2010, show that firm productivity is significantly related to broadband-connected employees more than to product innovation, even if the intensity of the association is different when comparing manufacturing and service firms. On the other hand, Colombo et al. (2013)

[1]Municipalities with more than 250,000 inhabitants.
[2]Municipalities with less than 25,000 inhabitants.
[3]Availability (or coverage) is intended as the existence of infrastructure and not as the consumers' willingness to pay for the service subscription.
[4]This national policy, introduced in 2014, identifies service provision centers as municipalities (A) or group of neighboring municipalities (B) which provide (i) a full range of options for secondary education, (ii) at least one emergency care hospital, and (iii) one railway station. All remaining municipalities are grouped into four classes according to travel time distance: outlying areas within 20 min (C); intermediate areas between 20 and 40 min (D), peripheral areas (between 40 and 75 min), and ultra-peripheral areas at over 75 min distance (E). Into the definition of 'Inner areas' are included municipalities in the classes D, E, and F.

examine the impact of the adoption of broadband internet technology on the productivity of 799 Italian small and medium enterprises (SMEs) from 1998 to 2004. The findings indicate that the impact of basic broadband applications is not significant and even negative. In contrast, adopting selected advanced broadband applications is beneficial, given other factors to consider. Productivity and broadband provisions are also the focus of the work of Mack and Faggian (2013), which examines the variability in broadband impacts related to the quality of human capital stock in US counties. In this case, broadband positively impacts productivity only in locales with high levels of human capital and highly skilled occupations.

Another productivity-boosting factor the literature has considered is fast internet access (OECD, 2003). The speed of internet access differs substantially across countries, regions, and even within cities. In this respect, Grimes et al. (2012) analyze a large New Zealand micro-survey of firms to evaluate the impact of different types of internet access on firm productivity. The authors use a propensity score matching method to control for factors that determine firms' internet access choices, analyzing the productivity impacts that emerge when a firm adopts different internet connectivity speeds. Their results show that broadband adoption enhances productivity, while there are no significant differences across broadband types.

Among the economic development strategies, entrepreneurship is popular, and it has been demonstrated that broadband positively impacts it. One of the first studies analyzing the relationship between broadband and infrastructure on a regional aggregation level is the paper by Audretsch et al. (2015). They test the hypothesis that start-up activity is boosted by infrastructure, finding that start-up activity in Germany is positively associated with infrastructure in general and particular types of infrastructure such as broadband. This has a more significant impact on promoting start-up activity concerning highways and railroads. Besides, investments in broadband are more beneficial to start-up activity in some industries, such as software, than in others, such as manufacturing. Another relevant work by Gallardo and Scammahorn (2011) examines innovative/noninnovative entrepreneurs and non-farm proprietors through three sets of predictor variables in three southern US states. The main finding is that noninnovative entrepreneurs are more sensitive to broadband access, among other variables.

Overall, as Kotnik and Stritar (2015) suggest, ICTs can promote new entrepreneurial chances through the creation of new firms and innovation activities of already functioning firms. Moreover, ICTs use can impact the reduction of transaction costs for many firm activities, leading to lower entry costs and the disadvantages that new and small firms face compared with larger and already established firms, which benefit from economies of scale. Much of the existing contributions focus on broadband impacts on firms, without distinction in different sectors. Specifically, none of the previous analyses investigate the tourism sector and the impacts broadband may have on tourism firms, which is the focus of this paper.

2.2 | Core–periphery dichotomy in accessing ICTs and internet

Another relevant element that must be accounted for when dealing with broadband access is the peripherality. According to DeStefano et al. (2022), most papers base their analysis on urban areas. Perrin (2017) and Levitz and Bauerlein (2017) state that peripheral areas are lagging behind urban areas in terms of broadband deployment and use.[5] In this regard, Canzian et al. (2015) analyzes the impact of advanced broadband accessibility on firm performance across rural municipalities in the Province of Trento (Italy). Through a DiD approach, they investigate a local policy intervention of next-generation broadband technology, showing that this type of broadband availability causes a significant increase in annual sales turnover of about 40% and an increase in value added of nearly 25% over 2 years, but with no significant impact on the number of employees.

Similarly, Briglauer et al. (2019) evaluate the impact of a European state aid program for broadband deployment applied to rural areas in the German state of Bavaria in 2010–2011. Their results indicate that aided municipalities

[5]See for instance Majid Gilani and Faccia (2022) for a full review of governmental policy analysis on broadband for the remote–rural Scotland case.

benefitted from 16.8% to 23.2% higher broadband coverage than nonaided municipalities. This increase led to a growth of, on average, seven employed individuals living in the respective aid-receiving municipalities, not affecting the number of employed or self-employed individuals or wages. Broadband coverage through state aid prevents rural areas from depopulation but does not help reduce the economic divide by creating new jobs. Dijkstra et al. (2013), for the case of Europe, already stated that the improvement of access to services, including broadband, might have favored the growth of small centers and rural regions. Indeed, these become more appealing for both residents and firms. The availability of broadband is found to cause an increase in the employment rate in the USA between 1999 and 2007, with a larger impact on more remote areas (Atasoy, 2013). Following these ideas, de Vos et al. (2020) studied the effect of broadband on small cities in Sweden from 2007 to 2015. To do this, they distinguish the effects in urban cores, urban regions, and rural regions. Their results indicate that broadband improves labor accessibility outside large cities, and employment rates increase in these areas. However, it is relevant to notice that the distance between the center and periphery plays a role in this process. Notably, in this paper, the effect is larger for nonurban areas near large cities.

As for rural development, Kim and Orazem (2016) analyze broadband and new firm location decisions in rural areas, observing through a DiD estimate that broadband availability has a positive and significant effect on the location decisions of new rural firms. This result is larger for more populated rural areas and those close to metropolitan areas due to the effect of agglomeration economies.

Recently, with an instrumental variable approach, Conroy and Low (2022) found evidence that broadband access is crucial for establishment births in rural America, particularly for nonemployer women-led businesses. The case of the UK is used to understand whether broadband has a different effect on firm performance in urban and rural contexts. For the first time, DeStefano et al. (2022) empirically investigate the causal effect on both sides of the digital divide. The results demonstrate that the size firm is affected by broadband more in urban areas than rural ones. But interestingly, for both firms, a concentration of effects exists in knowledge-intensive sectors.

2.3 | Relation between broadband and tourism

Minghetti and Buhalis (2009) propose a theoretical investigation of those elements leading to the unequal access and use of ICTs for tourists, destinations, and businesses. By adapting models on the digital divide elaborated in other disciplines to tourism, they show that these elements impact the ability of markets and destinations to connect globally. Digital divide literature is rich and constantly growing, but the effects of the core–periphery structure in accessing ICTs in the tourism sector remain largely overlooked. This lack of knowledge becomes more salient if peripheral areas are considered, where the digital divide is much larger, with only a tiny part of the population accessing the internet (Minghetti & Buhalis, 2009). In these areas, communities have encountered difficulties in keeping up with communication technologies (Malecki, 2003; Strover, 2003; Velaga et al., 2012). Since rural areas are characterized mainly by lower population density and greater distances from main infrastructures, there is very little market stimulus to invest in ICTs (Malecki, 2003). While urban areas can count on high-speed internet infrastructure so that they can be defined as digital 'hot spots,' rural areas tend to have low-tech internet access, with lower speeds (Skerratt, 2010; Skerratt et al., 2012).

On the other hand, it is crucial to notice that a new type of tourism is emerging, which pursues territorial authenticity, local lifestyle, and cultural heritage typical of rural and peripheral areas (Salvatore, 2015; Salvatore et al., 2018; UNWTO, 2023). For instance, Italian inner areas based their development strategies on tourism enhancement. However, a specific analysis of pilot projects showed that areas could develop these strategies in many cases because they are rich in natural and cultural resources. Still, in other cases, tourism cannot be the solution to deperipheralization (Brandano & Mastrangioli, 2020).

Using the Web, tourists can enjoy the unique and authentic characteristics of peripheral areas by using platforms, information sharing, and smartphone apps, devoted explicitly to accommodation booking. For these reasons,

broadband availability becomes fundamental since sharing economy practices provide alternatives to the standard paradigm of hospitality that are often missing in peripheral and marginal areas (Battino & Lampreu, 2019).

This review of the literature helps in the identification of a gap that this work aims to fill. As already mentioned in the Introduction, Italy is an excellent example of a territory with many towns and villages that can offer the opportunity to seek authenticity and experiential tourism, considering its cultural, historical, and natural assets. More remote areas, identified by the National Strategy for Inner Areas (SNAI henceforth),[6] can be attractive for a new segment of tourists, but the digital divide can represent a key asset in connecting demand and supply. The present work contributes to the existing literature in many ways. First, it sheds light on the relationship between broadband and an important service sector, the tourism sector, which is strategic for many countries. Second, it highlights the difference in the effects of high-speed internet access when considering different geographical areas such as 'central areas' as opposed to 'inner areas.'

3 | INSTITUTIONAL SETTING

A large digital divide characterizes Italy compared with other EU countries. About a decade ago, the reasons of such divide could be identified in the absence of cable television (together with Greece), a relatively higher population age that limits the demand for connectivity, and a very low propensity to use internet regularly and for e-commerce (MISE, 2015). All these factors have made infrastructure investments in Italy less attractive for private operators, which by and large have tended to target their investments toward areas characterized by the highest market potential and economies of density to guarantee an adequate return on investment. This has resulted in an underprovision of digital services in the less favorable areas, and has justified public intervention in reducing the large infrastructural gap. To this aim, in 2015, the Italian government approved the Italian strategy for the ultra-broadband to create an ultra-broadband network throughout the Italian territory in line with the objectives of the European Digital Agenda. The goal of the UBB strategy has been to increase the coverage of hi-speed connectivity (at least 100 Mbps) up to 85% of the Italian population by 2020[7] through the building of a publicly owned network available to all operators. The plan represents the national reference framework for public initiatives in these areas, considered essential to remedy social and geographical inequalities due to the absence of private initiatives. The intended result is a better social and territorial cohesion, allowing greater access to the means of communication through the ultra-broadband network.

4 | DATA

Our outcome variable is tourist accommodation as a proxy for tourist supply. Tourist accommodations are classified in hotels and other accommodation establishments (extra-hotels). While hotels are internationally ranked as five-, four-, three-, two-, one-star, and tourist hotel residences, extra-hotel establishments are divided into camping/tourist villages, holiday dwellings (rented),[8] farmhouses, youth hostels, holiday houses, mountain refugees, bed and breakfast and other tourist accommodations. We observe the number of establishments and beds for each category from 2012 to 2019.[9]

[6]Italian government experience launched in 2012 within the new 2014–2020 programming period of regional policies and promoted by the Department for Economic Development and Cohesion.

[7]For the remaining 15% of the population, the goal has been to ensure a download speed of at least 30 Mbps.

[8]This kind of accommodation includes rooms, vacation houses and apartments, rooming houses, accommodation businesses in catering establishments, furnished housing units for tourist use, and residences. Such collective facilities are distinguished by being managed by a single commercial administration and leased for tourist use. It does not include private holiday houses rented, which data are collected by Istat, but not published.

[9]The Italian tourist supply may be wider, given that not all the accommodations are regularly registered. This possible limitation may depend on the presence of structures escaping legal obligations, especially for tax purposes, and on the presence of heterogeneous regional regulations with respect to accommodation facilities (Bank of Italy, 2018). However, our data represent the best coverage of tourist supply available at the municipality level.

Appendix Table A1 explains all these outcome variables relevant to the analysis. Figure 1 shows the total yearly trends of hotels and extra-hotel establishments for the analysis period in centers (a) and inner areas (b). While standard hotels (black line) follow a decreasing trend, extra-hotel establishments (gray line) show an opposite, growing trend. According to the Bank of Italy (2018), these tendencies are the result of a change in the composition of the type of accommodation facilities offered, after some variations in tourist preferences and the progressive success of online platforms, which facilitate the matching between demand and supply, especially for smaller operators that are typically less tied to traditional business models (Figure 2).

The reason of these trends lies in the recomposition of the quality of the tourist supply, which is trying to intercept the demand of the medium–high range of tourists since the needs of lower-budget travelers can easily be satisfied by other accommodation establishments (e.g., bed and breakfast and holiday dwellings [rented]). Indeed, holiday dwellings (rented), youth hostels, bed and breakfasts, and other tourist accommodations register the highest increase. This pattern clearly emerges from Table 1 and Table 2, which show the growth change between 2012 and 2019 for different hotel and extra-hotel accommodation categories.

Data on UBB coverage are provided by MISE and elaborated by ISTAT.[10] They consist of percentages of buildings reached by the UBB at 30 Mb/s over the total number of buildings in each municipality.[11] However, these data are only available for 2015 and 2016; therefore, we only account for the reduced form of the model by considering the mean value between the 2015 and 2016 ultra-broadband coverage rate to identify municipalities that have benefitted from the policy. Hence, our baseline treatment variable is represented by a dummy variable equal to one when the coverage rate reached by the UBB is greater than or equal to 25%. It is also worth noticing that this data provides information only on the percentage of households reached by BUL relative to the total, for each municipality–year cell. Therefore, we do not have information on whether, once an individual is reached by the network, they actually enter into a contract to utilize that line. Sometimes these upgrades occur automatically, while other times they require customer–provider interaction. Therefore, our results should be interpreted as an intention-to-treatment effect rather than an average treatment effect.

We merge tourism and UBB data with the list of SNAI municipalities, which distinguishes municipalities into 'centers' and 'inner areas.' Inner areas are defined as small centers far from services of general interests. The strategy has provided a classification system of the Italian municipalities based on the travel time spent to reach the centers providing essential services, which are: an exhaustive range of secondary schools, at least one first-level DEA (Emergency and Reception Department) hospital, and at least one 'silver-type' railway station. More specifically:

- 'belt' areas, if at a travel distance up to 20 min. They belong to the macro-class of 'centers';
- 'intermediate' areas, from 20 to 40 min away;
- 'peripheral' areas, from 40 to 75 min away;
- 'ultra-peripheral' areas, over 75 min away.

Intermediate, peripheral, and ultra-peripheral municipalities are considered 'inner areas' (Lucatelli, 2016) and represent about 50% of our sample of municipalities. We calculate a dummy variable equal to one when a municipality belongs to this specific class, for which we test a possible differential effect of UBB. Figure 3 shows the geographical distribution of UBB coverage across the municipalities included in the sample, where we can identify a higher UBB coverage in Southern Italy, where most of the digital divide exists. In 2016, about 12% of municipalities had a UBB coverage larger than 50% and less than 10% had a coverage larger than 70%. Only about 3% of municipalities had a total (>95%) UBB coverage. This implies a large heterogeneity in the geographical pattern especially during the early phase of the policy, with such difference being reduced by the increasing coverage of UBB over time.

[10]Specifically, from http://amisuradicomune.istat.it/aMisuraDiComune/.

[11]By definition, ultra-broadband means an effective connection speed in download of at least 30 Mb/s.

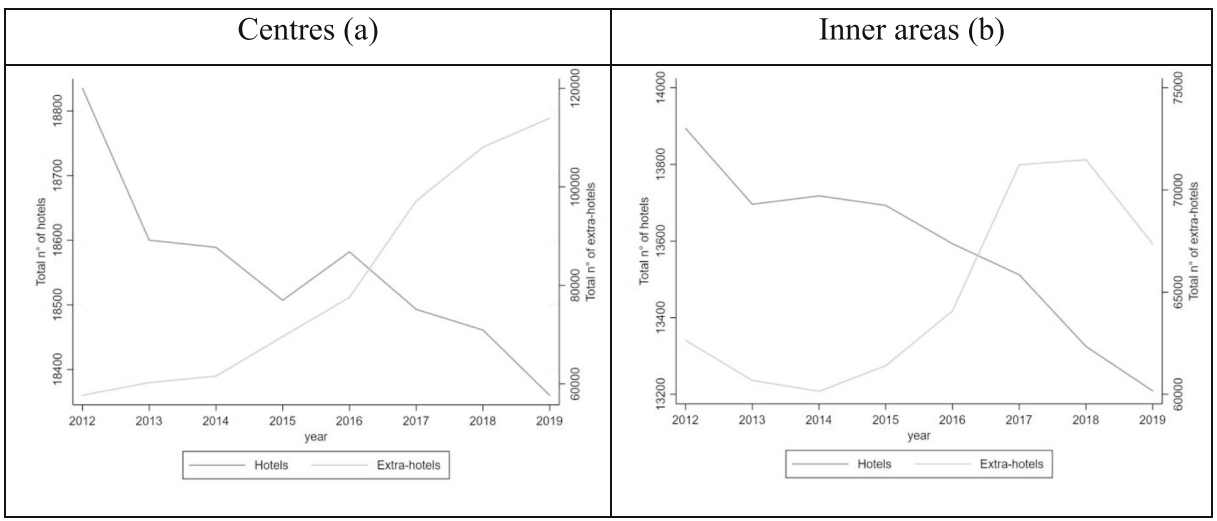

FIGURE 1 Trend of hotel and extra-hotel accommodations (2012–2019) in centers (a) and inner areas (b). Source: own elaboration based on Istat data.

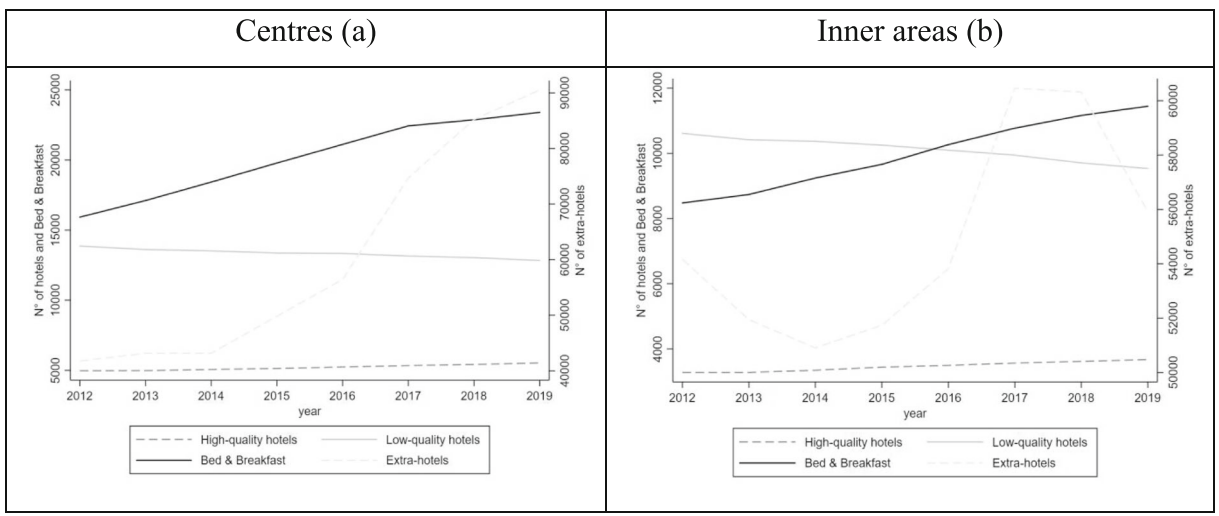

FIGURE 2 Trend of high- and low-quality hotels, bed and breakfasts, and other extra-hotel accommodations (2012–2019) in centers (a) and inner areas (b). Source: own elaboration based on Istat data.

TABLE 1 Percentage change of hotel accommodations between 2012 and 2019.

Hotel accommodations	Percentage change 2012–2019
Five-star hotels	41.08
Four-star hotels	13.11
Three-star hotels	−1.43
Two-star hotels	−16.70
One-star hotels	−24.99
Tourist hotel residences	4.48
Total (any type of hotel accommodation)	−3.54

Source: Own elaboration based on Istat data.

TABLE 2 Percentage change of extra-hotel accommodations between 2012 and 2019.

Extra-hotel accommodations	Percentage change 2012–2019
Camping/tourist villages	−2.60
Holiday dwellings (rented)	48.43
Farmhouses	16.44
Youth hostels	37.14
Holiday houses	6.20
Mountain refugees	10.77
Other tourist accommodation	1647.54
Bed and breakfast	42.77
Total (non-hotel accommodations)	50.65

Source: Own elaboration based on Istat data.

5 | EMPIRICAL STRATEGY

To analyze the impact of the UBB on the tourism supply, we exploit the longitudinal nature of our dataset and the discontinuity due to the policy implementation since 2015 in a DiD setting.

We estimate the following model:

$$Y^s_{it} = \beta_0 + \beta_1 Post_t + \beta_2 UBB_i + \delta(UBB_i \times Post_t) + \mu_i + \varepsilon_{it} \quad (1)$$

where Y is the outcome of interest, namely, (i) the number of tourist accommodations and (ii) the number of beds in tourist accommodations, respectively, in the municipality i and year t. For each outcome, we estimate separately the effect in each accommodation category s, dividing by hotels and extra-hotel accommodations. *Post* is a dummy variable that takes the value 1 for years ≥ 2015, *UBB* is a treatment dummy variable that takes the value 1 when at least 25% of the total buildings in the municipality benefits from a UBB coverage. In the model, we also control for municipality fixed effects μ_i. Finally, ε is an idiosyncratic error term, while δ is our parameter of interest, which provides the effect of UBB on the tourist supply outcomes described above. We cluster the standard errors at the municipality (treatment) level in all estimates to avoid serial correlation issues (Bertrand et al., 2004).

The DiD model assumes that in absence of the policy, treated and control municipalities would exhibit parallel trends. When this assumption fails, the DiD method results in a biased estimate, confounding changes unrelated to

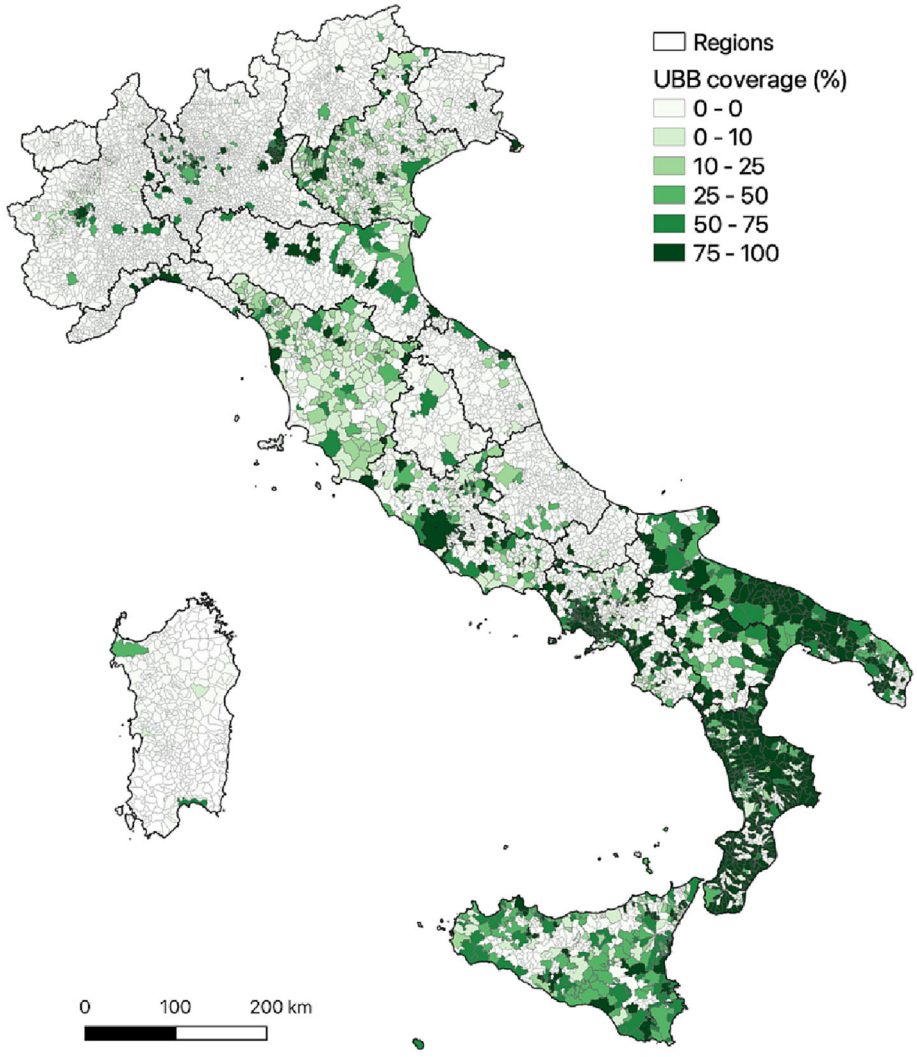

FIGURE 3 Ultra-broadband (UBB) geographical distribution in 2016. Source: own elaboration based on Mise data.

the policy with the true effects of it. While this assumption cannot be inherently tested, Figure 4 shows that, before the policy takes place (2012–2014), trends in tourist accommodations in municipalities with UBB are parallel to the ones in municipalities without UBB. The same pattern can be found in the case of total tourist beds, displayed in Figure 5. All together these figures are reassuring of the fact that the policy actually produced an exogenous discontinuity, and that our DiD estimates can be interpreted as causal.

6 | RESULTS

In this section, we present the results of the DiD models presented in Section 5. To begin with, we consider separately hotels and extra-hotels, both in terms of accommodations and beds, in all municipalities. Then we narrow down our sample to account for heterogeneous effects for the municipalities classified as 'inner areas.'

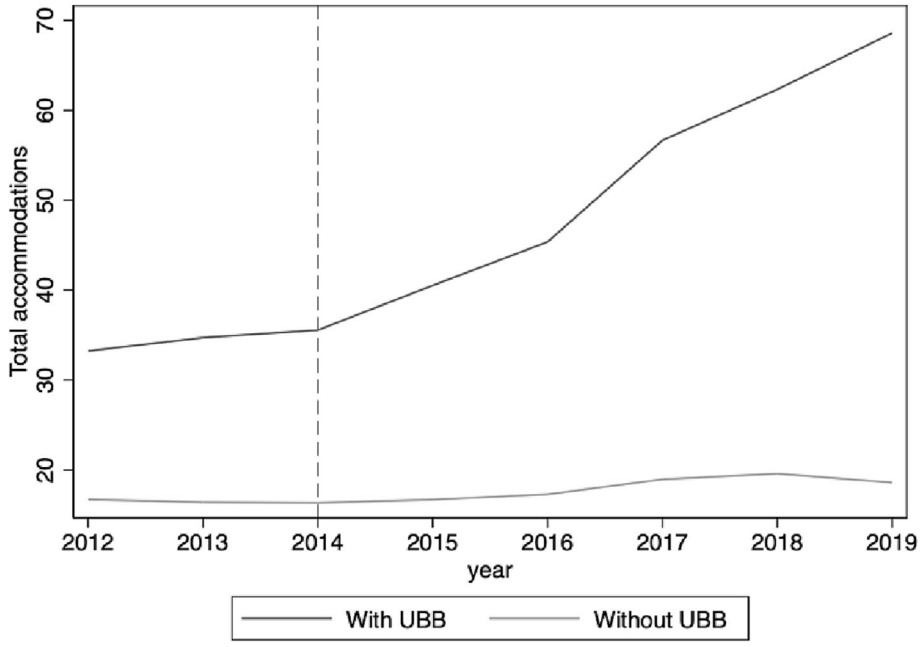

FIGURE 4 Trends for total tourist accommodations in ultra-broadband (UBB) and non-UBB municipalities. Source: own elaboration based on Istat and Mise data.

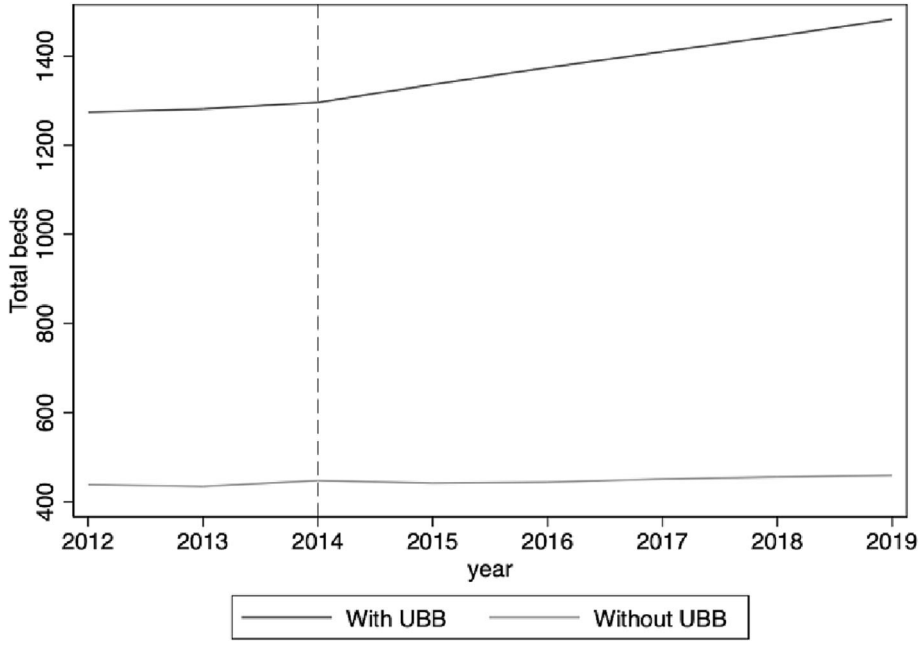

FIGURE 5 Trends for total tourist beds in UBB and non-UBB municipalities. Source: own elaboration based on Istat and Mise data.

Column 1 of Table 3 reports estimates of the effect of UBB on the total number of hotel accommodations, for which we find a positive but not significant UBB coefficient. Columns 2–7 provide a breakdown of the effect across different categories of hotel-type facilities. In this case, we find a positive and significant effect in the case of four-star hotels (+0.15 facilities, significant at 1%), and to a much lesser extent in the case of five-star hotels (+0.027 facilities, significant at 10%). By comparing these effects with the mean of our outcomes, an average change is found of +21% for four-star hotels and of +54% for five-star hotels.

When we estimate the effects by looking at the number of beds we find the same pattern. The results, reported in Table 4, point to more significant coefficients. Noteworthy, we find a weakly significant (at 10%) effect of about 19 additional beds due to UBB implementation also when considering all together any hotel category (column 1), while for four-star hotel beds, we observe an increase of 19.8 beds (column 3). As well as an increase is observed for tourist hotel residences (+4.15 beds). Conversely, we find a negative but weakly significant effect for two-star hotels (−2.3 beds). By comparing these effects with the mean of our outcomes, an average change is found of +21% for beds in four-star hotels and +17% for beds in tourism hotel residences.

Table 5 reports estimates on extra-hotel accommodations. By and large, the effect of UBB is positive on any extra-hotel category. In column 1, the total number of facilities increases by 18 units (significant at 10%). The largest effect is observed for holiday dwellings (rented), which increase by 10.1 units (significant at 5%), followed by an increase of 2.5 units (significant at 1%) in the case of bed and breakfast facilities. We also find a small but weakly significant growth for youth hostels and holiday houses (+0.04 and 0.14 additional units, respectively). A negative and weakly significant effect is found for mountain refugees. By comparing these effects with the mean of our outcomes, an average change is found of +92% for holiday dwelling (rented) and +65% for bed and breakfasts.

TABLE 3 DiD estimates on the effect of UBB on hotel accommodations.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Five-star	Four-star	Three-star	Two-star	One-star	Tourist hotel residences
UBB ≥25%	0.206	0.027*	0.150***	0.074	−0.032	−0.041	0.028
	(0.128)	(0.011)	(0.046)	(0.054)	(0.020)	(0.022)	(0.015)
Average change (%)	0.05	0.54	0.21	0.04	−0.04	−0.11	0.08
Obs.	61,952	61,952	61,952	61,952	61,952	61,952	61,952

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
*$p < 0.05$.**$p < 0.01$.***$p < 0.0$.

TABLE 4 DiD estimates on the effect of UBB on hotel beds.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Five-star	Four-star	Three-star	Two-star	One-star	Tourist hotel residences
UBB ≥25%	19.245*	3.504	19.857***	−4.802	−2.386**	−1.077	4.150*
	(8.402)	(1.805)	(5.677)	(3.062)	(0.881)	(0.560)	(2.111)
Average change (%)	0.07	0.40	0.21	−0.04	−0.1	−0.12	0.17
Obs.	61,952	61,952	61,952	61,952	61,952	61,952	61,952

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
*$p < 0.05$.**$p < 0.01$.***$p < 0.001$.

TABLE 5 DiD estimates on the effect of UBB on extra-hotel accommodations.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Camping	Holiday dwellings (rented)	Farmhouses	Youth hostels	Holiday houses	Mountain refugees	Other tourist accommodation	Bed and breakfasts
UBB ≥25%	17.993*	−0.018	10.112**	0.005	0.045**	0.136*	−0.009*	5.198	2.524***
	(8.019)	(0.010)	(3.729)	(0.044)	(0.017)	(0.069)	(0.004)	(4.913)	(0.526)
Average change (%)	0.96	−0.06	0.92	0.002	0.64	0.45	−0.07	7.12	0.65
Obs.	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
*$p < 0.05$.**$p < 0.01$.***$p < 0.001$.

TABLE 6 DiD estimates on the effect of UBB on extra-hotel beds.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Camping	Holiday dwellings (rented)	Farmhouses	Youth hostels	Holiday houses	Mountain Refugees	Other tourist accommodation	B&B
UBB ≥25%	94.379*	−4.294	56.238**	0.722	3.333*	3.694	−0.506**	20.829	14.362***
	(42.415)	(6.794)	(18.637)	(0.741)	(1.490)	(2.367)	(0.164)	(18.551)	(2.610)
Average change (%)	0.28	−0.03	0.67	0.02	0.81	0.22	−0.12	3.53	0.71
Obs	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
*$p < 0.05$.**$p < 0.01$.***$p < 0.001$.

Finally, as in the case of hotel accommodations, also in the case of extra-hotel facilities, the pattern of the effects is very similar to the one observed for the number of beds, reported in Table 6. For the overall number of extra-hotel beds (column 1), we estimate an additional 94 beds (significant at 10%), while for holiday dwellings (rented) (column 3), the increase is about 56 beds (significant at 5%). Fully significant and positive growth in terms of beds is confirmed also for bed and breakfasts, with an increase of 14 beds, while for youth hostels (column 5) we estimate an additional 3.3 (significant at 10%). A negative and weakly significant effect is found for beds in mountain refugees. By comparing these effects with the mean of our outcomes, an average change is found of +67% for beds in holiday dwelling (rented) and +71% in bed and breakfasts.

6.1 | Heterogeneous effects in inner areas

In this section, we consider the effect of UBB in the Italian inner areas. We limit this analysis to the tourist supply proxied by the number of hotel and extra-hotel accommodations; the results on the number of beds are included in the Appendix.

Table 7 reports the estimates for hotel accommodations. In column 1 we detect a weakly significant increase in the overall number of hotels. When disaggregating by hotel category, we find a positive effect of UBB only in the case of four-star hotels, for which we find 0.045 additional facilities (significant at 5%). No effect is found for the other hotel categories. Overall, these results are similar to those obtained when considering the full sample of municipalities, with four-star hotels playing the lion's share in the UBB-induced tourist supply. It is important to note that no significant effects are found when beds are considered (Table A2). This means that the presence of the UBB in inner areas affects the number of accommodations (+9% with respect to the average), but not their dimension.

In Table 8 we report estimates of the effect of UBB on extra-hotel accommodations. In this case, we find a slightly different pattern of results. First, we do not observe any significant change in the total supply of extra-hotel facilities (column 1), though we observe a modest negative change in the number of campings, farmhouses, and mountain refugees (significant only at 10%). However, a relevant exception is constituted by bed and breakfast facilities, which increase by about 0.67 units (+27% with respect to the average); this result is significant at 1% and is consistent with the strong effects we find for this category in our full-sample estimates presented in Tables 5 and 6. Ultimately, this set of results is in line with the recent literature showing how inner areas are earning much attention from a touristic perspective; they are experiencing the so-called 'transition of tourism' (Salvatore et al., 2018) where tourists are heading toward nontraditional destinations. Hence, the new tourists' needs and preferences can easily match with the bed and breakfast kind of accommodation offering an internet connection. Similar results are found in the case of beds in extra-hotel accommodations (Table A3). In this specific case, the dimension of these small and more flexible facilities is affected by the UBB (+34% with respect to the average).

TABLE 7 DiD estimates on the effect of UBB on hotel accommodations in inner areas.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Five-star	Four-star	Three-star	Two-star	One-star	Tourist hotel residences
UBB ≥25%	0.088*	0.002	0.045**	0.025	0.010	0.001	0.005
	(0.037)	(0.004)	(0.018)	(0.026)	(0.018)	(0.011)	(0.014)
Average change (%)	0.03	0.05	0.09	0.02	0.01	0.003	0.01
Obs.	31,349	31,349	31,349	31,349	31,349	31,349	31,349

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
*$p < 0.05$.**$p < 0.01$.***$p < 0.001$.

TABLE 8 DiD estimates on the effect of UBB on extra-hotel accommodations in inner areas.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Camping	Holiday dwellings (rented)	Farmhouses	Youth hostels	Holiday houses	Mountain refugees	Other tourist accommodation	Bed and breakfasts
UBB ≥25%	0.190	−0.029*	−0.484	−0.102*	0.004	0.060	−0.016**	0.081	0.676***
	(0.601)	(0.013)	(0.538)	(0.047)	(0.005)	(0.075)	(0.006)	(0.090)	(0.144)
Average change (%)	0.01	−0.08	−0.05	−0.04	0.07	0.29	−0.08	0.35	0.27
Obs.	31,349	31,349	31,349	31,349	31,349	31,349	31,349	31,349	31,349

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
*p < 0.0.,**p < 0.01.***p < 0.001.

7 | CONCLUSIONS AND COMMENTS

The EU 2020 Strategy has highlighted how the so-called smart growth—an economy based on knowledge and innovation—represents a paramount objective for development (European Commission, 2010). Although broadband infrastructure deployment and the consequent shrinkage of the digital divide between urban and peripheral areas do not represent the only enhancement driver in this regard, they still represent a precondition and a fundamental factor for development (Perpiña Castillo et al., 2021). Nevertheless, operators have encountered difficulties in justifying investments in broadband internet connection in peripheral areas. In fact, due to their low population density, this type of investment can be considered less profitable, compared with urban areas, and this paves the way for public intervention (MISE, 2015). Indeed, achieving the Digital Agenda's goal of universal 30 Mb/s coverage represents a significant challenge in the EU's rural regions (European Commission, 2020). In this respect, empirical evidence on the economic impacts of broadband and ultra-broadband represents a fundamental incentive for developing broadband-related public policies (Lehr et al., 2006).

Our paper provides an impact evaluation of public broadband provision, analyzing whether and to what extent the UBB policy—started in 2015—has affected the Italian tourism supply by considering the hotel and extra-hotel categories at the municipality level during the timespan 2012–2019. Moreover, we estimate the effects of the UBB policy, emphasizing the urban-peripheral dichotomy in terms of the digital divide. A specific focus on inner areas, which are earning much attention from a tourist perspective, is also pivotal in the analysis. As remarked in the literature review, these territories are lagging behind urban areas with regard to the accessibility to the Internet, but an increase in their attractiveness can lead to a speedup in broadband infrastructure deployment. In a DiD setting, we evaluate two different scenarios: the total number of municipalities and only the ones classified as 'inner areas' according to the classification operated by the SNAI. The results show that the public provision of UBB increases the tourism supply in the case of four-star hotels—for the hotels' category—and of bed and breakfast—for the other accommodation establishments. These results are in line with the recomposition of the quality of the tourist supply. In particular, inner areas may intercept the demand of the emerging types of tourists, who are mostly seeking the territorial authenticity, the local lifestyle, and the cultural heritage, typical of rural and peripheral destinations, which can be satisfied for instance by bed and breakfasts, even more so if well internet connected. Using the Web, on the one hand, tourist accommodations can better advertise their tourist package, attracting clients. On the other hand, tourists can stay connected during their vacation. To make this possible, UBB infrastructure is needed. Our findings can further support policies aiming at converting challenges into opportunities—more investments in the UBB infrastructure especially in peripheral areas—in the context of the digital transition and technological innovation for the tourism sector.

The main limitation of the present paper is that it does not analyze the effect of UBB on tourism demand. Indeed, as one could expect, the presence of broadband can affect both the demand and the supply side of the tourism market. Unfortunately, for the Italian case, data on tourist arrivals and overnight stays at the municipal level are not available. A further development of this work could go in these two directions: (1) to analyze some regions as case studies to understand whether the availability of UBB has a significant effect on tourism demand in inner areas, and (2) when data will be available, complete the analysis with a granular analysis on the total number of Italian municipalities.

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APPENDIX A

TABLE A1 Variables description and data sources.

Variables	Period	Source
Five-star hotels	2012–2019	Istat
Beds of five-star hotels	2012–2019	Istat
Four-star hotels	2012–2019	Istat
Beds of four-star hotels	2012–2019	Istat
Three-star hotels	2012–2019	Istat
Beds of three-star hotels	2012–2019	Istat
Two-star hotels	2012–2019	Istat
Beds of two-star hotels	2012–2019	Istat
One-star hotels	2012–2019	Istat
Beds of one-star hotels	2012–2019	Istat
Tourist hotel residences	2012–2019	Istat
Beds of tourist hotel residences	2012–2019	Istat
Total hotels	2012–2019	Istat
Beds of total hotels	2012–2019	Istat
Camping/tourist villages	2012–2019	Istat
Beds of camping/tourist villages	2012–2019	Istat
Holiday dwellings (rented)	2012–2019	Istat
Beds of holiday dwellings (rented)	2012–2019	Istat
Farmhouses	2012–2019	Istat
Beds of farmhouses	2012–2019	Istat
Youth hostels	2012–2019	Istat
Beds of youth hostels	2012–2019	Istat
Holiday houses	2012–2019	Istat
Beds of holiday houses	2012–2019	Istat
Mountain refugees	2012–2019	Istat
Beds of mountain refugees	2012–2019	Istat
Other tourist accommodation	2012–2019	Istat
Beds of other tourist accommodation	2012–2019	Istat
Bed and breakfasts	2012–2019	Istat
Beds of bed and breakfasts	2012–2019	Istat
Total of other kind of tourist accommodation establishments	2012–2019	Istat
Beds of total of other kind of tourist accommodation establishments	2012–2019	Istat

Source: Own elaboration based on ISTAT data.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.

TABLE A2 DiD estimates on the effect of UBB on hotels beds in inner areas.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	**Five-star**	**Four-star**	**Three-star**	**Two-star**	**One-star**	**Tourist hotel residences beds**
UBB ≥25%	4.495	1.034	4.149	−4.047	−0.461	0.163	3.657
	(5.001)	(1.626)	(3.455)	(3.029)	(0.865)	(0.258)	(2.910)
Average change (%)	0.02	0.19	0.07	−0.04	−0.02	0.02	0.15
Obs.	31,349	31,349	31,349	31,349	31,349	31,349	31,349

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
$^{*}p < 0.05.^{**}p < 0.01.^{***}p < 0.001$.

TABLE A3 DiD estimates on the effect of UBB on extra-hotels beds in inner areas.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Camping	Holiday dwellings (rented)	Farmhouses	Youth hostels	Holiday houses	Mountain refugees	Other tourist accommodation	Bed and breakfasts
UBB ≥25%	−12.975	−17.112*	−0.331	−0.683	0.237	0.158	−0.944**	0.824	4.875***
	(7.758)	(7.159)	(3.322)	(0.938)	(0.264)	(0.676)	(0.310)	(0.513)	(0.937)
Average change (%)	−0.04	−0.11	−0.004	−0.02	0.09	0.01	−0.14	0.26	0.34
Obs.	31,349	31,349	31,349	31,349	31,349	31,349	31,349	31,349	31,349

Note: Standard errors, in parentheses, are clustered on municipalities.
Abbreviations: DiD, difference-in-differences; UBB, ultra-broadband.
*$p < 0.05$.**$p < 0.01$.***$p < 0.001$.

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Resumen. Se investigó el papel del acceso a Internet en el impulso de la oferta turística, como motor estratégico del desarrollo económico, especialmente en las zonas más 'periféricas', caracterizadas por la falta de infraestructuras tecnológicas y otras barreras que limitan el acceso a Internet y las oportunidades de negocio. En un escenario de diferencias en diferencias, se aprovechó la reciente estrategia italiana para la política de banda ancha ultrarrápida, destinada a impulsar la difusión de la banda ancha ultrarrápida en Italia desde 2015, como una fuente exógena de variación en el acceso a Internet para estimar el efecto sobre la oferta turística. Para ello, se emplearon datos detallados sobre la cobertura de banda ancha y los alojamientos turísticos a nivel de municipio entre 2012 y 2019. Los resultados muestran que la disponibilidad de banda ancha ultrarrápida aumentó la oferta turística en hoteles de cuatro estrellas y casas de huéspedes, lo que sugiere que las intervenciones políticas dirigidas a reducir la brecha digital entre centros y periferias pueden impulsar el desarrollo económico local y contribuir al proceso de desperiferización de las zonas marginales.

抄録: 本稿では、インターネットアクセスとビジネスチャンスを制限する技術インフラの欠如やその他の障壁に特徴づけられる、最も「周辺の」地域において特に、経済発展の戦略的推進力である観光供給を促進する上でのインターネットアクセスの役割を検討する。差分の差分法での設定では、インターネットアクセスの変動の外因性ソースとして、2015年以降のイタリアにおけるウルトラ・ブロードバンドの普及を促進することを目的とした政策戦略を活用して、観光供給への影響を推定する。推定では、2012~2019年までの市町村レベルでのブロードバンド普及率や観光宿泊施設の詳細なデータを採用した。結果から、ウルトラ・ブロードバンドの利用可能性が4つ星ホテルやベッド・アンド・ブレックファストの観光供給を増加させたことが示され、中心部と周辺部のデジタル格差を削減することを目的とした政策介入は、地域の経済発展を促進し、周辺地域の脱周辺化プロセスの支援が可能であることが示唆される。