

# Sharing my place: the local labor market impact of the P2P technology shock

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## Abstract

The emergence of new digital business models, often called peer-to-peer (P2P) marketplaces, is transforming the hospitality industry. While its implications go beyond the industry, our knowledge of its aggregate impact is limited. This paper examines the effects of the P2P irruption on the local labor markets in Spain between 2016 and 2020. We exploit exogenous regulatory changes in short-term rentals (STRs) across different municipalities and periods to investigate the employment outcomes and job reallocation patterns in response to the P2P technology shock. Our findings reveal a strong and positive effect of P2P activity on local employment. A 10% increase in P2P overnights leads to an increase in local employment by 8.2 workers and a reduction in unemployment by 7.6 workers. This effect is pronounced across various sectors, including services, construction, and industry, while agriculture experiences an increase in unemployment. Our analysis indicates that the employment gain from P2P STRs varies across municipalities, with smaller non-touristy areas demonstrating the most substantial employment gains. In contrast, areas with intense competition from hotels experience a diminished effect.

**Keywords:** employment, local labor markets, tourism, technology adoption, regulation.

**JEL Codes:** D5, E2, L5, L8, O3.

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# 1 Introduction

During the last decades, the world has witnessed the rapid diffusion of digital technologies that underpin modern ways of exchange. It is the case with peer-to-peer (P2P) marketplaces. Among them, P2P rental markets have been particularly successful. The reason, in a nutshell, is that they better address, relative to traditional rental markets, the problem of under-utilization of durable goods: they decrease the bring-to-market costs of small and nonprofessional owners, allowing them to compete with incumbents and monetize unused capacity, while more non-owners gain access to more varieties of the durable good (Filippas et al., 2020). As a result, P2P activity has exploded in the last decades, revolutionizing rental markets with phenomenal consequences and sparking intense academic debate.

The previous literature has shown that P2P marketplaces have disrupted the traditional accommodation industry (e.g. see Farronato and Fradkin, 2022; Li and Srinivasan, 2019; Schaefer and Tran, 2020; Zervas et al., 2017), heated housing markets (e.g. see Barron et al., 2021; Chen et al., 2022; Garcia-López et al., 2020; Hoffman and Heisler, 2020; Koster et al., 2021; Shabrina et al., 2022), stimulated retail and residential investment in neighborhoods (Xu and Xu, 2021; Bekkerman et al., 2022) and also the development of local consumption amenities such as restaurants (Alyakoob and Rahman, 2022; Basuroy et al., 2020; Hidalgo et al., 2022). However, its effect on local activity and, specifically, on local employment remains unclear. This paper examines local labor market adjustments to the proliferation of P2P short-term rentals (STRs). We thus broaden the focus from the response of directly affected industries, such as hotels and restaurants, to the whole labor market.

To comprehend the growth of P2P activity in the accommodation industry at an aggregate level, it is necessary to analyze the process of creative destruction, whereby new ideas and firms replace obsolete ones, resulting in increased competition within the industry. This has clear implications for resource allocation and aggregate productivity (Aghion et al., 2015). In addition to the supply-side transformation, there are various direct and indirect effects on the demand side. To be more precise, on the supply side, it may create employment in P2P accommodations at the expense of hotel employment (displacement effect): we expect this net direct supply impact to reduce employment because hotels typically offer more services than P2P accommodations. Indirectly, to the extent

that traditional and P2P accommodations have different input requirements and proportions of locally sourced inputs, it changes employment in local suppliers.<sup>1</sup> Furthermore, because all the above affects residents' incomes, their consumption may react in a Keynesian fashion. This indirect demand impact is theoretically ambiguous: it depends, for example, on the propensities to consume of the groups that lose (hoteliers, renters, etc.) and gain income (hosts, landlords, etc.). A final indirect channel could operate via the displacement of long-term renters for tourists, with ambiguous local employment consequences. To the extent that long-term residents are displaced, and the remaining renters reduce consumption due to higher rents, local employment falls; given that tourists display higher labor-intensive consumption than residents and landlords spend additional rents, local employment increases (market expansion effect). This last channel can be particularly relevant for small municipalities where the P2P technology can attract more tourists who may not have considered visiting otherwise. In sum, the net impact of P2P expansion on local employment is uncertain.

To analyze the impact of P2P activity on local employment, we focus on the irruption of two major P2P platforms (Airbnb and HomeAway) in Spanish municipalities from 2016 to 2020. We build a monthly-municipality panel dataset with P2P supply and demand and local employment and unemployment. To identify the causal impact of P2P on the local labor market, we use an instrumental variable approach, exploiting the exogenous regulatory changes affecting P2P short-term regulation across municipalities. P2P short-term regulations were independent of local employment but reduced the P2P accommodation supply. We take advantage of the heterogeneity of these local regulations and their different timing, allowing us to estimate the causal impact of the P2P technology shock in the accommodation industry on the labor market.

We show that the penetration of P2P platforms strongly impacted local labor market outcomes. We find that a 10% increase in local P2P overnights raises local employment by 8.2 workers and reduces unemployment by 7.6 workers. For an average municipality, the local employment elasticity to P2P overnight stays is 0.036%. Contrary to conventional belief, additional jobs are mainly permanent jobs. The reduction of local unemployment attributed to P2P activity is not exclusive to the service sector. It also reduces unemployment in the construction and industry sector, while it increases in agriculture, suggestive evidence of a reallocation effect.

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<sup>1</sup>Further complicating the analysis, economies of scale and agglomeration economies could also operate.

The positive effect of P2P activity varies with municipality size, being higher in small municipalities. We argue that in small towns, where the hotel industry is less present, P2P can attract tourists that may not have considered visiting otherwise (market expansion). Additionally, P2P activity may reduce the seasonality of the tourism sector, promoting year-round local employment. In large municipalities, where tourism is less seasonal, such effect is not as relevant. The job creation effects are nuanced the higher the hotel room capacity. This finding manifests the substitution (displacement) effect that new technology infringes on the incumbents.

Spain is a particularly suitable case to study this topic. According to the UNWTO, Spain ranks second as an international tourist destination, attracting 84 million annual visitors, just below France (90 million) and above the United States (79 million). But Spain’s accommodation capacity is higher than in France: it counts with nearly one million rooms, eminently hotelier, and with the largest penetration of P2P STRs in the European Union (EU), concentrating one out of five overnights commercialized by platforms in the EU (Eurostat, 2021). Furthermore, tourism industries employ 2.5 million workers, compared with the 1.3 and 5.8 million workers in France and the USA, respectively.<sup>2</sup> The recent irruption of P2P in Spain has been extraordinary. In only three years (from the summer of 2016 to the summer of 2019), the share of P2P beds over the total bed supply increased from 28% to 47%. During that time, the fraction of municipalities where P2P beds represent more than half of the accommodation supply almost doubled (from 25% to 48%).

The rest of the paper is structured as follows. In the next section, we relate it to the literature. In section 3, we describe the dataset and review the P2P STRs boom in Spain. Section 4 explains the identification strategy for the causal inference. Section 5 contains our main results. Section 6 includes robustness checks and Section 7 estimates of the heterogeneous-effects model. Section 8 discusses the results of a counterfactual exercise and Section 9 concludes.

## 2 Literature Review and Contribution

Our paper contributes to two lines of research: the study of the rise of P2P rental markets and of the local employment effects of aggregate shocks. Regarding the first research line, Filippas et al. (2020) model how a technological innovation creates a P2P rental market, allowing owners of durable goods

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<sup>2</sup>Data are referred for the year 2019 and are extracted from <https://www.unwto.org/tourism-data/unwto-tourism-dashboard>.

to sell unused capacity to non-owners. To this end, they examine the short-run equilibrium, in which ownership and renting decisions are fixed, and the long-run equilibrium, which allows for changes in ownership. Their main conclusions are that sharing-economy markets always expand consumption and surplus, and that P2P rental markets will emerge for goods with sufficiently low bring-to-market costs relative to the purchase price. This is the case with home-sharing platforms. [Einav et al. \(2016\)](#) propose a model where P2P platforms reduce entry barriers to small or flexible suppliers. A corollary is that new individual providers enter the market, which competes with incumbents and drives prices down. To understand the competitive mechanism in the rental market, [Farronato and Fradkin \(2022\)](#) corroborate the idea that the new supply is highly elastic, specially in markets where demand is volatile. By studying the case of Airbnb in the accommodation industry, they find that welfare gains are concentrated when hotel capacity is constrained. Natural experiments are rarely used as a strategy to estimate the causal effects of P2P technology shock on incumbents' outcomes. For instance, [Zervas et al. \(2017\)](#) use a Difference-in-Differences technique taking Airbnb adoption in Texas as exogenous.<sup>3</sup> We contribute to this literature with a novel source of plausibly exogenous variation in the peer supply generated by the combination of spatial and time-varying STR regulations. This is an important departure from existing empirical work, as the spread of P2P rental platforms is likely to be endogenous to several local outcomes.

Secondly, our paper connects with the literature examining the employment effects of aggregate disturbances across local economies, prominently trade and technological shocks. [Autor et al. \(2013\)](#) study the effects of Chinese import competition on US local labor markets. [Dauth et al. \(2014\)](#) perform a similar analysis including trade with China and Eastern Europe and a separate analysis for exports on German local labor markets. In both cases, authors find job losses in regions specialized in import-competing industries and, for German local labor markets, [Dauth et al. \(2014\)](#) also find that regions specialized in export-oriented industries had stronger employment gains and lower unemployment. [Acemoglu et al. \(2016\)](#) study the effect of rising import competition with China on employment through input-output linkages with other industries at the national level. They find that indirect effects through national product demand spillovers and other general equilibrium effects account for half of the overall employment losses attributed to Chinese import competition. There is a closely related literature dealing with technology shocks that extends

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<sup>3</sup>They perform some robustness checks discarding reverse causality instead.

the same methodology used by [Autor et al. \(2013\)](#) and [Dauth et al. \(2014\)](#) to study the labor market effects of adopting robots in industrial processes. [Acemoglu and Restrepo \(2020\)](#) study the effects of robots on US local industry employment and find that commuting zones more exposed to robots exhibit lower employment and wages. [Dauth et al. \(2021\)](#) conduct a similar study for the German case using administrative microdata and find lower coefficients than for the US and some heterogeneous local effects. We contribute to this literature by analyzing product demand spillovers driven by a technology shock in one industry and by providing the first evidence of how the labor market adjusts in the short run along several dimensions. We can compute the net impact of local reallocation and the Keynesian demand effects on the non-tradable sector (e.g., services and construction) and on local tradable sectors (e.g., agriculture and industry) leveraging monthly-level data and direct measures of the exposure of the local labor market to the aggregate technology shock. Moreover, we also explore how the labor market adjusts by quantity and by quality using the information on the newly created labor contracts.

### 3 Data

To measure local labor markets' exposure to P2P STRs, we use data from AirDNA, a company that continuously scraps Airbnb and Homeaway over the whole Spanish territory since May 2016. We thus account for almost all P2P STRs in Spain because the market share of these two companies represented 92.5% of the combined market share of four major platforms in 2019 ([Eurostat, 2021](#)). Each listing has information on the host identifier, the type of listing, characteristics such as the number of beds, bathrooms, and amenities, posted dates, posted prices, the exact location of the listing, booked dates, prices, and the revenue produced by the owner. For each month, we define the listing supply as the number of active properties available for at least one night in that month. To proxy for demand for P2P STRs, we generate different measures based on effectively booked listings (i.e., residences), beds, or overnight stays (bed places times tourists) at each municipality. To quantify the impact of the P2P technology shock on the local labor market, we use labor market outcomes at the municipal level, all of them provided by the Spanish Social Security Ministry. In particular, we construct a monthly panel with the number of affiliated workers (employment) and registered unemployed workers by sector of activity (agriculture, construction, industry, and ser-

vices),<sup>4</sup> and the number of contracts signed in a month by sector and type of contract (permanent, temporary and temporary-converted to permanent). Our dataset is composed of 7,989 municipalities for the period May 2016 to December 2019, amounting to 268,298 municipality-month observations. We complement the data by adding a yearly panel with information on hotel lodging capacity in each municipality, obtained from regional statistical institutes, the tourism division of the regional government, and regional registers of hotel establishments.

### 3.1 Descriptive statistics

The left-hand panel of Table 1 reports the descriptive statistics. During the sample period (May 2016 to December 2019), the monthly average number of P2P beds demanded and supplied in an average municipality was 145 and 299, respectively, while the average supply of hotel beds was 332. The average P2P overnight stays were 1,856. The right-hand panel of Table 1 reports the descriptive statistics of the sample of touristy municipalities<sup>5</sup>. This subsample restricts to larger municipalities (average total employment is 83,615 versus 2,824). They also have more hotel capacity (the number of hotel beds is 27 times larger, 9,180 versus 332). The relative differences in the P2P bed supply and demand are very similar in magnitude to those of hotels, 26 and 23 larger in the touristy municipalities, respectively.

Averages of the sample hide substantial heterogeneity among municipalities. Table B-1 reports the mean and standard deviation of the main variables of interest for different subsets of municipalities: those with less than and more than 6,000 inhabitants, in Columns 1 and 2; from 6,000 to 50,000 inhabitants and more than 50,000, in Columns 3 and 4; and the sub-sample excluding non-touristy municipalities (Column 5). Non-touristy municipalities are places that do not report any P2P activity in the sample period. As we will explain later, we run our baseline estimation separately for each of these subsets of municipalities to examine how the employment impact of P2P varies by municipality size.

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<sup>4</sup>Our measure of unemployment restricts to unemployed workers enrolled in the unemployment office as unemployed (registered unemployment). That is, we exclude workers that, while they are also non-employed, do not register in the unemployment office. Hence, our measure of unemployment is a lower bound of the actual numbers, which should also include those that are not registered but actively searching for a job.

<sup>5</sup>Tourist spots are defined by the Spanish National Statistics Institute (INE). The INE does not utilize a particular criterion to delineate a tourist spot. However, the institute obtains data on municipalities that are recognized as key tourist destinations in Spain through the hotel occupancy survey. Typically, a municipality is classified as a tourist spot if it attracts a substantial number of visitors, presents a wide variety of tourist offerings, and exhibits distinguishing attributes such as natural splendor and safety.

**Table 1:** Descriptive statistics

	Entire sample			Tourist points		
	Mean	Std. dev	Max	Mean	Std. dev	Max
P2P Beds Demand	145.1	1,229.4	71,681	3,728.2	7,816.9	71,681
P2P Beds Supply	299.1	2,242.9	11,9587	7,062.4	13,620.2	119,541
P2P Overnights	1,856.2	18,969.3	1,297,452	52,139.0	124,051.7	1,297,092
Hotel Beds	332.3	3,635.9	198,153	9,180.0	14,308.8	89,514
Employment	2,823.9	30,924.8	2,068,367	83,614.8	2,172,73.5	2,068,367
Unemployed	516.9	3422.2	201,605	12,359.2	21,688.0	201,605
Contracts	278.0	2547.0	193,454	7,720.8	17,477.5	193,454
<i>Contracts</i>						
Permanent	17.0	286.5	28,122	543.4	2,092.9	28,122
Temporary	251.2	2,183.7	15,7187	6,900.8	14,821.6	157,187
Temporary to Permanent	9.7	98.8	8,654	276.6	686.7	8,654
Agriculture	35.1	262.4	15,727	407.3	1,335.7	15,727
Industry	26.8	138.8	5,123	459.3	760.9	5,123
Construction	15.6	126.7	9,532	375.4	857.0	9,532
Services	200.5	2,281.2	180,865	6,478.8	15,950.0	180,865
<i>Unemployment</i>						
Agriculture	22.4	92.4	2,692	302.1	385.5	1,884
Industry	45.2	245.0	11,024	852.7	1,450.9	11,024
Construction	46.7	293.6	19,364	1,046.0	1,817.0	19,364
Services	357.3	2,581.4	15,8701	9,002.0	16,702.6	158,701
N <sup>o</sup> of municipalities		7,989			106	
Observations		268,298			4,645	

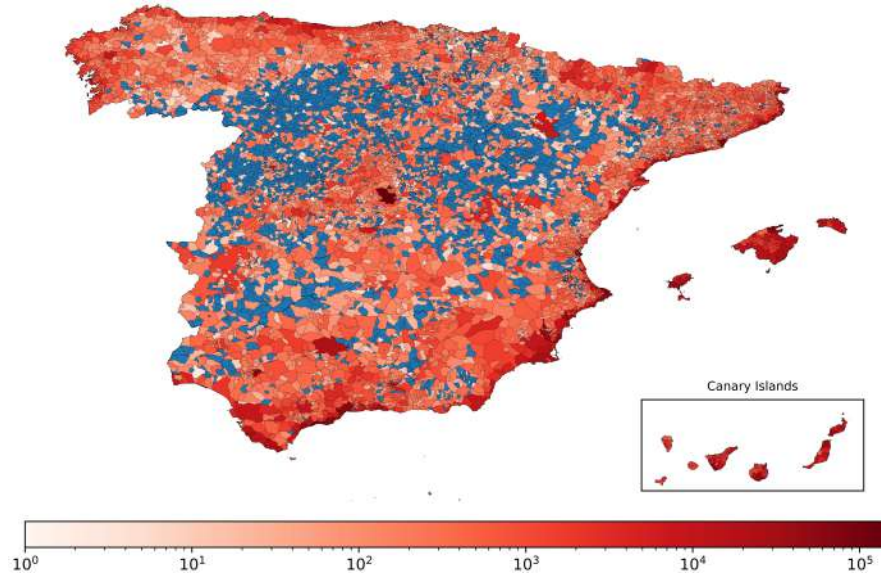
Source: AirDNA and Spanish Social Security Ministry.

Figure 1 illustrates the recent expansion of the P2P supply across the Spanish territory. It displays the change in the average number of available beds supplied by Airbnb and HomeAway from the summer of 2016 to the summer of 2019. Across the Spanish territory, the average increase was 296.1 beds. However, there is substantial heterogeneity across municipalities, with the coastal areas and large cities (Madrid, Córdoba, or Seville) absorbing most of the increase.

We next examine the importance of P2P supply relative to the traditional accommodation supply. Figure 2 displays the fraction of P2P beds over total bed supply across Spanish municipalities in two moments: the summer of 2016 (left-hand side) and the summer of 2019 (right-hand side). In only three years, the average fraction increased from 0.28 to 0.47 and the share of municipalities where that fraction is above 0.5 went from 25% to 48%.

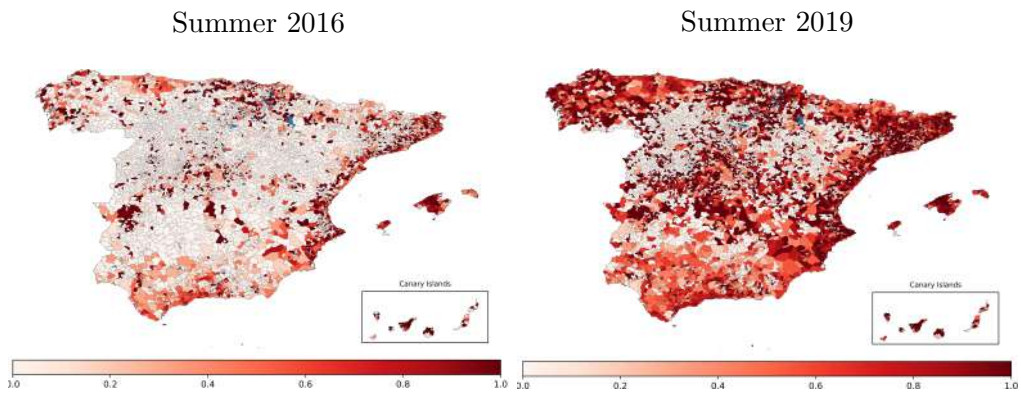


**Figure 1:** Change in the P2P supply of beds, 2016-2019 (summer)



Notes: Change in the average number of P2P beds supplied in the summer of 2016 to the summer of 2019. Own elaboration based on data from AirDNA

**Figure 2:** Share of P2P beds over Total Bed Supply



Notes: fraction of P2P supplied beds over total bed supply. Own elaboration based on data from AirDNA and business registers.

## 4 Empirical strategy

### 4.1 Impact of P2P tourism in local employment

We identify the causal effect of P2P rentals on local employment by exploiting the timing of the STR regulations, which vary across municipalities. The empirical strategy exploits these differences with an instrumental variable (IV) design. To capture the causal impact of the P2P technology shock on local employment, we estimate the following regression:

$$L_{it} = peer_{it}\beta + x_{it}\delta_i + \epsilon_{it}, \quad (1)$$

where the dependent variable  $L_{it}$  is a labor market outcome (employment, unemployment, or new employment contracts) at municipality  $i$  in month  $t$ . We use two sets of labor market outcomes: stock variables (employment and unemployment) and a flow variable (contracts), measured at an extraordinary level of territorial breakdown (municipality). Variable  $peer_{it}$  denotes a measure of the peer-to-peer STR activity in the municipality.

The vector  $x_{it}$  contains a set of exogenous regressors, including municipal-specific slopes. With this term, we account simultaneously for municipal-specific intercepts allowing us to control for unobserved heterogeneity across local municipalities such as size, market access, and amenities; time-specific shocks that might characterize seasonal patterns of employment and other macroeconomic shocks common to all local units; and municipal-specific time trends that characterize idiosyncratic labor market trends across municipalities.<sup>6</sup> By controlling for idiosyncratic time trends, we account for labor market dynamics that are unobserved and which might respond to other tourism-related developments. All of this is important because, in Spain, employment dynamics differ, both in booms and busts, between rural areas, urban hinterlands, and urban cities, and between service-oriented and diversified economies and the rest (Holl, 2018). Our model adheres to the principle of parsimony by maintaining simplicity, and we examine whether estimated parameters differ when accounting for other time-varying factors such as changes in population size or tourist capacity of the municipality. The model specification allows us to use panel data estimation techniques.

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<sup>6</sup>Seasonality is high in the Spanish economy, mainly because of seasonal tourism demand. To account for it, we add month dummies and assume that seasonal patterns are constant to the different cross-sectional units. In a second step, not reported, we relax this assumption by introducing a more demanding specification with month-year dummies. Results hardly change.

The coefficient of interest,  $\beta$ , captures the correlation between the labor market outcomes and the penetration of P2P platforms. We identify the coefficient from the within-municipality correlation between P2P exposure and the labor market outcome. It is worth highlighting that to deliver consistent estimates of  $\beta$ , the local variation of the P2P activity over time must be orthogonal to unobserved factors contained in the error term in equation (1). That is, consistency requires  $Cov(peer_{it}, \epsilon_{it}) = 0$ . However, this condition may not hold despite including time-fixed effects, idiosyncratic fixed effects, and specific time trends in the regression. First, P2P activity might respond to the labor market situation instead of being its driver. That might be the case when individual owners had more incentives to advertise their property on a P2P platform to mitigate the loss of labor income. If that is the case, labor market shocks would be negatively correlated with peer supply; hence, OLS estimates of  $\beta$  in equation (1) are downward biased in magnitude. Simultaneously, there might be positively correlated shocks, such as wealthier and most dynamic locations attracting more P2P visitors, which produce an upward bias. The resulting net effect will depend on the relative magnitude of those underlying correlations. Second, it is likely that time-municipal-specific omitted factors drive both the labor market and the P2P activity, affecting  $peer_{it}$  and  $L_{it}$ .

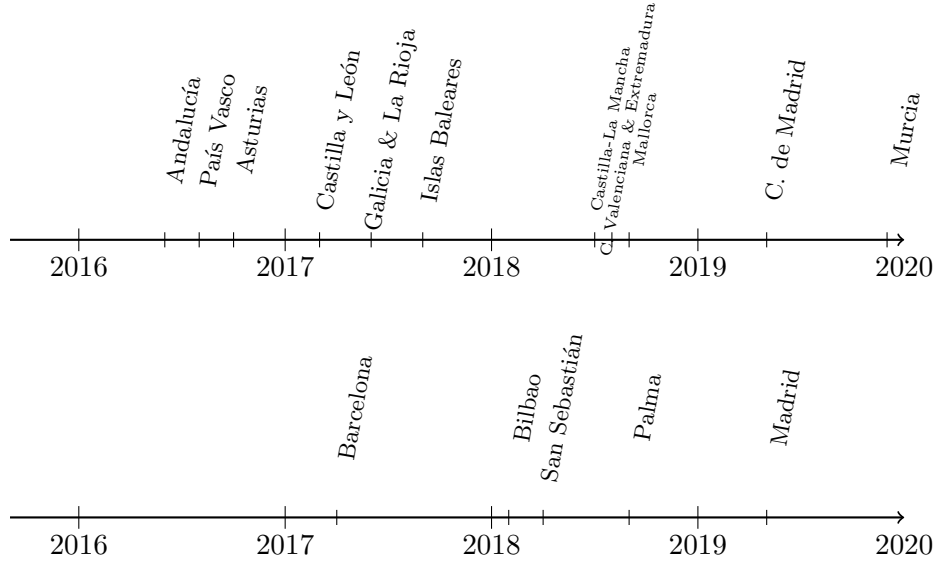
## 4.2 Short-term rental regulations and P2P activity in Spain

To tackle these endogeneity concerns, we implement an IV strategy exploiting the cross-sectional variation in the timing of the policies adopted by local authorities to regulate STR. We assume that local regulations affect the penetration of P2P platforms. The estimating equation of the first stage is the following:

$$peer_{it} = \gamma \mathbf{1}[t \geq \tau]_{it} + x_{it} \alpha_i + \epsilon_{it} \quad (2)$$

where the endogenous variable  $peer_{it}$  is regressed over our instrument, the policy indicator  $\mathbf{1}[t \geq \tau]_{it}$ . The policy indicator  $\mathbf{1}[t \geq \tau]_{it}$  takes a value of one when the policy is in place at the municipality  $i$  or remains zero otherwise. We take advantage of a policy change at the national level that triggered a cascade of regulatory changes at regional and municipal levels. According to the Spanish Constitution, sectoral tourism regulations are the competence of regional governments (i.e. Autonomous Communities), whereas the Spanish central government regulates urban rentals. In

**Figure 3:** Timing of regulation across regions (top) and cities (bottom).



June 2013, the Spanish government amended the Urban Leasing Law (e.g., *Ley de Arrendamientos Urbanos*), which left tourist STRs, popularly known as vacation rentals, to be regulated by regional authorities. Since 2013 and coinciding with the emergence of platforms in the STR market, most regional governments have updated STR regulations to align them with the stricter standards of other regions. On a lower administrative level, several tourist cities such as Madrid, Barcelona, and Palma developed their own rules to limit tourist STR. Thus, the indicator for a municipality shifts from zero to 1 when its Autonomous Community or council enacts a tourist STR regulation.<sup>7</sup> Figure 3 shows the chronology of the regulatory changes implemented during the sample period in the Spanish municipalities according to the Autonomous Community to which they belong or to particular city councils' regulations.

The regulatory development at the regional level established that dwellers had an obligation to notify the public office of the start of their STR activity in advance, requiring compliance with some minimum criteria (i.e., declaration of responsibility before starting the activity, without implying that starting was subject to prior administrative control). In the general case, regions

<sup>7</sup>When there are updated regulations, we only code the latest change, as stringency has increased over time. We discard using stringency or continuous measures due to the difficulty of quantitatively measuring the intensity of the regulatory measures. We also abstract from legal enforcement differences across jurisdictions. That is, our instrument captures changes before and after the regulations were in place, disregarding the intensity or the enforcement of those regulations.

established requisites to operate as a short-term rental housing activity for tourist use, such as proving that the facility was considered habitable by showing the official certificate (i.e., *cédula de habitabilidad*), that the zoning does not prohibit the tourist use (i.e., urban planning) and that the statutes of the Community of owners did not prohibit it (i.e., horizontal property regime). Since 2013, the generalized regulation of the Autonomous Communities has not prevented some city or town councils from imposing additional rules, either through the use of the municipal ordinance, such as creating inspection regimes that undermine the free entry guaranteed by the declarations responsible for starting the activity, or through the use of various urban planning instruments such as zoning, the obligation to maintain a minimum distance between tourist homes, or limiting its implementation to compliance with urban parameters. The political decentralization of STR produced substantial variation among regulation schemes, with stringency levels ranging from setting minimum regulation requisites, as in most places, to severe limitations of STR. The Balearic and Canary Islands, and tourist cities such as Madrid, Barcelona, and Palma are examples of tight regulations. The Appendix provides detailed descriptions and motivations of the regulatory schemes of each region and city.

The power and the validity of this instrument depend on its relevance for predicting the P2P activity in the municipality (i.e., it depends on the correlation between  $\mathbf{1}[t \geq \tau]_{it}$  and  $peer_{it}$ ) and on the assumption about the exclusion restriction (i.e.,  $Cov(\mathbf{1}[t \geq \tau]_{it}, \epsilon_{it} | x_{it}) = 0$ ). In words, the exclusion restriction implies that the instrument does not directly affect the local labor market, and it does only through its impact on the P2P activity. If regulations were a policy response to the local labor market’s outlook, that would violate the exclusion restriction. To defend our instrument from this critique, we examined the preambles of the several norms enacted in the Autonomous Communities (upper tier). We found no evidence that the regulations intended to affect growth or economic dynamism in the region. Instead, in the general case, regulations claim their main goal is to protect users and consumers by setting minimum quality standards and the obligation to notify the beginning of the rental activity (see the description of the regulations in the Supplementary Appendix A. At the city level (lower tier), most city councils restricted STRs to make housing more affordable, limiting gentrification or avoiding problems of coexistence between residents and tourists in urban areas.<sup>8</sup> In any case, the upper-tier and lower-tier regulations were motivated by reasons

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<sup>8</sup>Nor can we rule out that in those places with a hotel accommodation industry, the limitations also intended to

other than shocks to local labor markets. Even if regulators act motivated by reasons indirectly related to local labor market dynamics, it is worth mentioning that regional governments set rules for all municipalities within the jurisdiction and therefore set the same STR regulations in labor markets affected by different dynamics. Furthermore, the decentralized political process of setting up distinct STR regulations across regions confronts a labor market regulation highly centralized at the country level. This confrontation makes it very unlikely that other policy changes that affect the Spanish local labor markets might have been undertaken simultaneously with the STR regulations. With all these arguments, we are confident that the instrument satisfies the exclusion restriction.

Table 2 reports the estimated coefficient  $\gamma$  of the first-stage equation of our preferred measure of P2P activity penetration. In Table B-2 from the Supplementary Appendix B we also report the first-stage of alternative P2P penetration measures. They capture the average change in the P2P activity of the municipality that is associated with a change in its policy indicator. The estimated coefficients are negative and highly significant, suggesting that policy changes strongly reduce P2P activity. The dichotomous measure of policy change facilitates the interpretation of the coefficient, as it captures both the degree of compliance and the stringency of regulations that may differ across municipalities. According to our preferred specification, Column 2 of Table 2 show that the average regulatory change dropped overnight stays by 16%, while demand for beds and listing supply drop by 12% and 8.3% respectively (see Table B-2 from the appendix). The reported Kleibergen-Paap rank Wald  $F$  statistics of the first stage indicate that the instrument is relevant (well above the Stock-Yogo critical values), discarding a weak instrument bias.

## 5 Results

This section reports the results of three analyses. First, we describe the IV results of the labor market response across municipalities. Second, we focus on the industry reallocation effects of the P2P technology shock. Third, we extend the analysis to investigate the quality of the new jobs created.

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protect the incumbents from the new competition from the platforms.

**Table 2:** First-stage

	Log P2P Overnights		
	(1)	(2)	(3)
Policy	-0.235*** (0.0132)	-0.158*** (0.0104)	-0.158*** (0.0104)
Municipality FE	Yes	Yes	Yes
Year & Month FE	Yes	Yes	Yes
Municipality trends	No	Yes	Yes
Municipality controls	No	No	Yes
Observations	268,174	268,174	268,174
Municipalities	7,989	7,989	7,989

Notes: Employment-month level analysis. Column 1 include month, year and municipality fixed effects. Column 2 add municipality specific linear time trends. Column 3 add the log of inhabitants and the log of 1 plus the number of hotel beds, both at the municipal level. Municipality-clustered standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .

## 5.1 Labor market impact of P2P activity

Table 3 displays the results of the baseline estimation. We chose a level-log model specification after testing different Ramsey RESET specification tests. Columns 1 to 4 report the estimated coefficients obtained by OLS and IV regressions for employment and unemployment as dependent variables. Based on our preferred instrumental variable (IV) parsimonious regression model (columns 2 and 5), our findings demonstrate that P2P overnights have a significant and positive impact on local employment. Specifically, we observe that an average municipality experiences a 8.2 increase in local employment for every 10% rise in P2P overnights (Column 2). To contextualize the magnitude of this effect, we present the implied elasticity of each coefficient in the bottom panel of Table 3. Accordingly, a 1% increase in P2P overnights leads to a 0.036% increase in employment for an average municipality. These results align with the unemployment figures, which indicate that a 10% increase in P2P overnights decreases local unemployment by 7.63 workers and implies a -0.18 elasticity (Column 5). In sum, our analysis highlights that P2P STRs have a positive net employment outcome, with a substantial effect on reducing unemployment.

The OLS coefficient is downward biased, indicating a negative correlation of P2P activity with local employment dynamics. A plausible explanation is that some hosts post their houses on P2P

**Table 3:** Impact of P2P stays on employment and unemployment

	Employment			Unemployment		
	(1)	(2)	(3)	(4)	(5)	(6)
A. IV estimates						
Log P2P Overnights	169.3 (104.0)	81.96*** (30.41)	81.85*** (30.41)	-81.35*** (24.81)	-76.32*** (19.86)	-76.31*** (19.87)
B. OLS estimates						
Log P2P Overnights	44.77*** (3.684)	32.02*** (4.283)	32.02*** (4.283)	-18.19*** (0.991)	-9.226*** (0.738)	-9.227*** (0.739)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year & Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality trends	No	Yes	Yes	No	Yes	Yes
Municipality controls	No	No	Yes	No	No	Yes
Observations	268,174	268,174	268,174	268,249	268,249	268,249
Municipalities	7,989	7,989	7,989	7,995	7,995	7,995
First-stage F-statistic	317.74	233.27	233.21	317.90	233.85	233.78
IV Implied Elasticity	0.075	0.036	0.036	-0.194	-0.182	-0.182

Notes: Employment-month level analysis. Columns 1 and 4 include month, year, and municipality fixed effects. Columns 2 and 5 add municipality specific linear time trends. Columns 3 and 6 add the log of inhabitants and the log of 1 plus the number of hotel beds, both at the municipal level. Municipality-clustered standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .

platforms to mitigate a negative employment shock. Such correlation underscores the relevance of our IV strategy. In contrast, most studies on the economic impacts of P2P STRs ignored problems such as reverse causation. For example, [Fang et al. \(2016\)](#) find that a unit increase in Airbnb listings in the counties of Idaho State from 2009 to 2013 raises employment in its tourist industry by 0.5% minus 0.004% times the number of listings squared. Thus, they obtain a positive but decreasing marginal effect of Airbnb listings. Against this parabolic relationship, [Dogru et al. \(2020\)](#) find that on average, for every 100 Airbnb listings supplied, 1.5 employments in hospitality, tourism, and leisure industries are created in twelve major metropolitan statistical areas in the United States. These effects vary across industries: lower in hotels, bars, and restaurants while higher in Arts, Entertainment, and Leisure. Surprisingly, the employment effects are higher for hotels than for bars and restaurants. Unfortunately, endogeneity issues like those detected in this work may have biased these results.



## 5.2 Industry effects

As explained in Section 1, the P2P technology shock produces several within and between industry effects. First, by directly expanding the accommodation sector since the irruption of the P2P technology drives down transaction costs. Second, indirectly, as peer hosts and new consumers interact with other sectors, redirecting forward and backward linkages with other industries, through input-output connections and Keynesian-type multipliers of consumption and investment (Keynesian demand effect). The overall impact may suggest unequal sectoral growth, also known as structural change. In this section, we provide insight into labor market outcomes in different sectors, including agriculture, industry, construction, and services.

Table 4 presents instrumental variable estimates of the local labor market impact of P2P activity on each sector of activity. Unfortunately, at the municipal level there is no information on employment by sector; hence, we use unemployment as the dependent variable.<sup>9</sup> We find that an increase in P2P overnights significantly reduces local unemployment in the industry, construction and service sector, but increases agricultural unemployment. In absolute terms, P2P overnights favor the unemployed from the service sector the most. In relative terms (elasticities), construction and industry workers benefit the most. The unfavorable impact on agriculture is the lowest in absolute and relative terms.

These results indicate that the service sector is capturing most of the positive employment effects of P2P accommodation services. The result is not surprising because the service industry is the largest and most connected to the tourism sector. Also, services are often locally consumed and provided. The effects on construction employment are relatively high because P2P STRs make residential assets more profitable and expand construction, which, as before, are often locally provided. Last, P2P also promotes local industrial employment, which reveals large indirect effects of P2P STRs, even if industrial goods are typically tradable. Concerning agricultural employment, although we expected it to benefit from indirect Keynesian demand and I-O linkages, the reallocation effect dominates. Agriculture seems to lose attractiveness for owners of agricultural facilities, because of the emerging opportunity costs in the face of the profitability of agro-tourism and tourism-related activities; and for agricultural workers, which find better opportunities in

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<sup>9</sup>Unemployed workers are assigned to the sector where they worked before unemployment.

**Table 4:** Unemployment impact of P2P by sector of activity

	Unemployment			
	(1) Agriculture	(2) Industry	(3) Construction	(4) Services
Log P2P Overnights	3.185*** (0.772)	-7.976*** (2.296)	-16.94*** (3.827)	-53.96*** (15.61)
Observations	268,249	268,249	268,249	268,249
Municipalities	7,995	7,995	7,995	7,995
IV F-statistic	233.85	233.85	233.85	233.85
Average unemployment	19.8	37.3	37.9	287.0
Implied elasticity	0.161	-0.214	-0.446	-0.188

Notes: unemployment-month level analysis. Regressions include month, year, municipality fixed effects, and municipality specific linear time trends. Municipality-clustered standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .

sectors with higher wages and better working conditions.

These intuitive results are consistent with those in [Faber and Gaubert \(2019\)](#), which finds that tourism promotes total local employment, not least because of sizable positive multiplier effects on manufacturing production. They contrast with the surprising conclusions of [González and Surovtseva \(2020\)](#), who argue that higher tourist inflows increase tourism-related employment, but decrease total employment because it destroys jobs in construction and manufacturing.

### 5.3 Effects on job quality

Researchers and stakeholders examined the impact of P2P platforms on the nature of employment and the employment relationship. Some highlight workers' contentment with the business model, for example with Uber ([Hall and Krueger, 2018](#)), but such conclusions appear arguable ([Berg and Johnston, 2019](#)). Critics contend P2P platforms expand to previously informal, non-market spheres, reorganize activities that traditionally relied on the employment relationship into self-employment and replace full-time permanent positions with contingent employment ([Drahokoupil and Fabo, 2016](#)).

We approach these issues by examining whether P2P accommodation platforms favor temporary or permanent contracts. [Table 5](#) reports the IV regressions when the dependent variables are new permanent contracts (Column 1), new temporary contracts (Column 3), and temporary converted to

permanent contracts (Column 2). We find that the net positive impact of P2P on local employment comes from an increase in the conversion rate of temporary to permanent contracts (Column 2). In particular, we find that a 10% increase in P2P overnights increases the number of temporary contracts converted to permanent ones in 0.5 units, which implies an elasticity of 0.6%. The estimated positive effect on the number of new permanent contracts is only significant at the 90% confidence level. We find a negative impact on the number of new temporary jobs. These findings suggest that the local jobs created by P2P technology are predominately stable. The negative effect on new temporary jobs implies a reduction of local labor market turnover. One potential channel explaining the results is that P2P STR expands demand in the low season, which could be relevant for most touristic areas, where employment is very elastic to within-year variations in tourism flows.

**Table 5:** Impact of P2P stays on new contracts, by type of contract

	(1)	(2)	(3)
	Permanent	Temporary to Permanent	Temporary
Log P2P Overnights	14.71* (7.801)	4.953*** (1.624)	-41.39** (20.77)
Observations	268,249	268,249	268,249
Municipalities	7,995	7,995	7,995
IV F-statistic	233.85	233.85	233.85
Average Contracts	13.4	7.7	204.5
Implied elasticity	1.100	0.641	-0.202

Notes: Contracts-month level analysis. Regressions include month, year, municipality fixed effects, and municipality specific linear time trends. Municipality-clustered standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .

## 6 Robustness Checks

We evaluate how robust are the main results by performing a battery of checks. First, we check whether our main results hold under alternative measures of P2P activity. Second, we show that our results carry under different functional forms. Third, we address two main concerns of our identification strategy: the role of capital provinces and self-regulated cities. We provide more

detail on those concerns below.

## 6.1 Alternative measures of P2P activity

In our baseline model, we used the number of overnight stays booked through P2P platforms as our variable of interest. Our first robustness check takes two different metrics of the penetration of P2P accommodations in municipalities: the number of booked beds and of supplied properties, which are (inferior) proxies often used in the literature. In Panels A and B of Table 6, we report the estimated coefficients of beds booked and listings supplied on employment and unemployment. In all specifications, we find that the estimated coefficients are significant and carry the same sign as in the baseline estimation. A 10% increase in the number of P2P booked beds (listing supply) produces an increase in local employment of 11.1 (16) workers and a reduction in local unemployment of 10.3 (14.6) individuals. These coefficients are larger than in the baseline estimation because beds are often booked for more than one night, and a listing typically offers more than one bed.

**Table 6:** Robustness checks

Alternative measure	Employment		Unemployment	
	Coefficient	Implied elasticity	Coefficient	Implied elasticity
A. Beds	111.2*** (41.29)	0.049	-103.5*** (26.96)	-0.247
B. Listings	156.6*** (58.35)	0.069	-145.9*** (38.33)	-0.349
Alternative specification				
C. Log-log	0.046*** (0.014)	–	-0.150*** (0.028)	–
D. Level-level	0.0222*** (0.006)	–	-0.023*** (0.005)	–
E. Log-log with weights	0.027*** (0.010)	–	-0.093*** (0.034)	–
Robustness to identification				
F. Excluding capital of province	92.76*** (21.57)	0.072	-60.07*** (7.28)	-0.207
G. Imputing upper-tier regulation	102.1*** (25.29)	0.045	-85.53*** (19.01)	-0.204

Notes: Employment-month level analysis. Regressions include month, year, municipality fixed effects, and municipality-specific linear time trends. Municipality-clustered standard errors are in parentheses. All specifications are IV regressions. In Panel F we remove provincial capital cities from the sample. In Panel G we impute the regional (upper-tier) regulations to self-regulated cities (Palma, Barcelona, Valencia, Madrid, San Sebastián and Bilbao). Panel E uses observations (7,945 municipalities). The rest of the estimations use the baseline sample. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .

## 6.2 Functional form

In our main specification, we measure the P2P activity variable,  $peer_{it}$ , as the log of one plus the number of overnight stays booked through P2P platforms.<sup>10</sup> Our choice of functional form is justified by a Ramsey RESET test over a broad set of competing models. This functional form is convenient because it captures the non-linear effect of peer business on employment. For example, when peer activity is close to zero, the transformation  $\log(1 + peer_{it})$  turns out approximately linear; when it is large, the transformation is approximately concave. Nonetheless, we compare our baseline functional form with the log-log specification, which delivers straight elasticities, and the level-level specification, which indicates marginal effects. Results are displayed in Panels C and D of Table 6. While the log-log drops a significant fraction of zeroes from the sample, the level-level regression is misspecified. The estimated coefficients not only maintain the same sign as in the baseline estimation, but they also show significant results. It is the case when the dependent variable is either employment or unemployment.

The estimated elasticities for employment and unemployment display similar magnitudes to those found in the baseline estimation, standing at 0.046 and 0.036, and -0.150 and -0.149, respectively.

Finally, we test whether our main results are representative at the national level. For that, we run a weighted log-log regression, where the weight is the average population size of the municipality in the sample period. We run the log-log specification based on the Ramsey RESET test using weights. As before, we find that the effect of P2P is positive and significant on employment and negative and significant on unemployment. However, the estimated elasticities are slightly smaller than in the unweighted regression. This outcome implies that the influence of P2P on employment is more pronounced in smaller municipalities, a point we will delve into further in Section 7.

## 6.3 Robustness of the identification assumption

**Excluding the capital of the province** Identifying the causal impact of P2P activity on local employment activity relies on the exclusion restriction of our instrument: the fact that the STR policies are not a policy response to the labor market outlook in the municipality. As explained in Section 5, a crucial argument supporting the assumption is that in most cases (except self-regulated

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<sup>10</sup>We also employ the same transformation when using other proxies for peer activity, as in Panel A in Table 6.

cities: Barcelona, Bilbao, Madrid, Palma, San Sebastián and Valencia), the political process of setting up STR regulations is set at the regional level, so that different municipalities (with very heterogeneous labor markets) face the same STR regulation. Nonetheless, it could be contended that regional regulations are spurred by the labor market dynamics of the regional capitals (i.e., the capitals of the provinces). As a result, we cannot confidently view STR regulations as entirely independent of the labor market dynamics of the most influential municipalities within the region, particularly in the capitals. To address this potential issue, we conduct a robustness check by excluding the capital of provinces from the analysis. Thus, we limit our focus to municipalities where the exclusion restriction is more plausible. By doing so, we warrant that our baseline results are more robust and not driven by the potential confounding effect of labor market dynamics in the provincial capital.

The results in Panel F in Table 6 rule out that we are incurring a potential endogeneity issue when using the provincial capitals. The estimated coefficient is larger than in the baseline model, standing at 92.8 (versus 81.9 in Table 3), which corresponds to a higher implied elasticity (0.07 versus 0.03). In sum, the findings here indicate that our results continue to hold even after excluding the primary labor markets within each province.

**Assigning regional regulation to self-regulated cities** Another potential challenge to our identification strategy relates to the exclusion restriction. In particular, the previous argument supporting the exclusion restriction (that STR regulations are set at the upper-tier level) does not hold for self-regulated cities. Even if the regulations claim to be motivated by reasons unrelated to the labor market (see Supplementary Appendix A for more details on regulation motivations), some may argue that this is not credible for self-regulated cities. In contrast to most municipalities, self-regulated cities possess the autonomy to independently regulate STR activity, granting them greater flexibility in managing their local tourism industry and using regulations to bolster local economic activity. To address this concern, we conduct a robustness check where we impute regional upper-tier regulations for self-regulated cities. While the number of observations remains the same as in the baseline analysis, we modify the first stage of the estimation. Panel G in Table 6 indicates that our results are robust to this policy variable modification, as the estimated impact of P2P activity is larger than in the baseline estimation (102.1).

## 7 Heterogeneous impacts

The results presented in Section 5 are average effects across Spanish municipalities, which could hide relevant local heterogeneity. In this section, we analyze whether local characteristics mediate the P2P accommodation impact on employment. This will help us to shed light on the sign and relative importance of the direct and indirect supply and demand effects on employment. We consider three local characteristics: population size, hotel capacity (i.e., hotel beds), and hotel size (i.e., the average number of beds per hotel). The first helps us examine the market expansion channel. Our conjecture is that the P2P technology allows smaller municipalities to attract tourists that otherwise will go to hotel-oriented destinations. Since tourists display higher labor-intensive consumption than residents, we expect a higher (relative) impact of P2P activity in smaller municipalities. The other two characteristics (hotel capacity and size) are proxies for the incumbent hotels' ability to compete with P2P accommodations. We hypothesize that larger hotels will have a greater capacity to compete in prices due to their higher markup. Therefore, investigating the impact of P2P on employment across municipalities with different hotel sizes can shed light on the substitution effects operating within and between industries. Throughout this section, we maintain the level-log linear specification used in the baseline estimation.

### 7.1 Market size effects

The first characteristic that may affect the impact of P2P on local employment is the municipality size. Smaller economies may benefit less from indirect supply linkages than larger ones because they rely more on input supplies from neighboring municipalities, which reduces their self-sufficiency. However, there are arguments indicating that the impact may be greater in smaller municipalities. For instance, in smaller areas, the hotel industry is less established. P2P accommodation could therefore attract tourists who may not have considered visiting otherwise, thus expanding the market. Additionally, since tourists typically engage in more labor-intensive consumption activities than locals, we expect a relatively stronger impact of P2P activity on employment in smaller municipalities. Second, large municipalities tend to have a more diverse range of industries, providing a wider variety of employment opportunities. As a result, the impact of P2P activity on local employment may be less significant, since P2P accommodation faces stiff competition in attracting

workers. Conversely, small municipalities, which often have fewer job opportunities, may find it easier to attract employees. Third, the impact of P2P technology on employment may depend on the seasonality of the local tourism industry. In smaller municipalities, where the tourism industry is highly seasonal, unemployment rates may spike during the off-season. The advent of P2P technology can help alleviate this problem by reducing seasonality and promoting local employment. However, this is typically not the case in large municipalities, where hotels are more prevalent and the tourism industry is generally less seasonal. As a result, local workers tend to be employed year-round, and the arrival of P2P accommodations may generate higher competition rather than creating new opportunities, ultimately reducing potential employment gains.

To test our hypothesis, we first split our estimation into two sub-samples based on municipality size. Specifically, we distinguished between municipalities with less than six thousand inhabitants and those with six thousand or more. Columns 2 and 3 in Table 7 present the estimated instrumental variable (IV) coefficients obtained when the dependent variable is total employment, while column 1 reports the coefficient for the entire sample. We found that P2P overnights have a positive and statistically significant impact on local employment in municipalities with less than 6,000 inhabitants. In these areas, a 10% increase in P2P overnights raises local employment by 0.9 workers, with an elasticity implied by the coefficient of 0.03.<sup>11</sup> Contrarily, the estimated effect is non-significant for municipalities with 6,000 or more inhabitants. We conduct additional sub-sample analyses by dividing municipalities into mid-size (6,000 to 50,000 inhabitants) and large (above 50,000). Columns 4 and 5 show that the coefficients are large and significant for mid-size municipalities, but not for larger ones. Our findings indicate that the substitution effect dominates in larger municipalities, resulting in a negligible net effect on local employment. Conversely, the market expansion effect is more prominent in smaller places.

## 7.2 Substitution effects

We postulate that tougher competition exerted by hotels mitigates the positive job-creation effect of P2P on local employment. We can think of the case of very tourist areas. There, the availability of new accommodation services (P2P STRs) presumably does not bring new visitors, as they would

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<sup>11</sup>We also conducted robustness checks by testing different population thresholds and found consistent results (e.g., 1,000 or 2,000 inhabitants).



**Table 7:** Heterogeneous impacts: Market size effects

	(1)	(2)	(3)	(4)	(5)
	All	<6,000	>6,000	6,000-50,000	>50,000
Log P2P Overnights	81.96*** (30.41)	8.911** (4.048)	268.0 (282.5)	233.2* (140.6)	384.0 (1179.1)
Observations	268,174	223,977	44,197	37,865	6,318
Municipalities	7,989	6,867	1,122	975	146
IV F-statistic	233.27	165.81	14.52	9.32	12.28
Average Employment	2,256	292	14,427	5,195	77,027
Implied elasticity	0.036	0.030	0.019	0.045	0.005

Notes: Employment-month level analysis. Regressions include month, year, municipality fixed effects, and municipality specific linear time trends. Municipality-clustered standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .

have come in any case (using the already established traditional accommodation industry). Instead, many travelers will shift from hotel accommodation to P2P STRs (substitution effect), leading to job losses in hotels and hotel suppliers. We use three proxies to measure the presence of incumbents: a dummy for tourist spot, the number of hotel beds, and the hotel’s average size.

Columns 1 and 2 report the estimated IV coefficient obtained from the baseline estimation (where the dependent variable is total employment) for two separate subsamples: touristy and non-touristy municipalities. Our analysis reveals that P2P overnights have a significant positive effect on local employment, particularly in non-touristy areas. This result is consistent with the previous section, where we find that the overall positive impact on local employment is stronger in smaller places. It is also accordant with our conjecture above: we expect fewer substitution effects in less touristy areas, and hence in areas with fewer hotels.

To better capture the substitution effect, we exploit the information on the number of hotel beds supplied in each municipality. The baseline estimation is now extended with an interaction term between our variable of interest (log P2P overnights) and the number of hotel beds.<sup>12</sup> We estimate it for the entire sample and separately for touristy and non-touristy places. Columns 3 to 5 report the IV estimates. We find that, for both the entire sample and the subsample of tourist municipalities, the interaction term of P2P overnights and hotel beds is statistically non-significant.

<sup>12</sup>To deal with the large number of zeros of this variable in the sample (i.e., municipalities where there are no hotels), we take the log of 1 plus the number of hotel beds. Accordingly, our estimation includes all municipalities, and we do not set missing places with no hotel beds.

In turn, in non-touristy places, we find a negative and non-significant coefficient of the interaction, whereas the coefficient on P2P is positive and significant. We interpret the positive coefficient linked to log overnights, along with the negative estimated coefficient for its interaction with hotel beds, as evidence that while an upsurge in P2P activity boosts local employment, this positive impact diminishes as the number of hotel beds in the municipality increases. In short, an increase in P2P activity yields a less significant positive effect on local employment in municipalities with greater hotel capacity. These two results are consistent with the direct and indirect substitution effects of the P2P shock and underscore the significant heterogeneity of local employment effects of P2P platforms.

**Table 8:** Heterogeneous impacts: Substitution effects

	Baseline		Hotel Beds			Hotel size		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Touristy	Non-Touristy	All	Touristy	Non-Touristy	All	Touristy	Non-Touristy
Log P2P Overnights	-352.8 (901.8)	87.05*** (21.14)	146.3 (242.7)	72689.8 (650833.2)	254.5*** (93.78)	464.9* (261.9)	-8105.7 (12792.6)	480.8*** (173.0)
P2P Overnights x Hotel Beds			-16.23 (54.61)	-7655.0 (67581.4)	-45.55** (20.24)			
P2P Overnights x Hotel Size						-94.32* (51.07)	1585.1 (2665.0)	-87.63** (35.78)
Observations	4,645	263,529	268,174	4,645	263,529	117,614	4,637	112,977
Municipalities	106	7,883	7,989	106	7,883	3,447	106	3,341
IV F-statistic	12.50	219.13	28.71	0.01	50.98	23.39	0.66	20.51

Notes: Employment-month level analysis. Regressions include month, year, municipality fixed effects, and municipality specific linear time trends. Municipality-clustered standard errors are in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .

Last, we repeat the three estimations but with the average hotel size instead of the number of hotel beds. As a part of the variable creation process, we limit the analysis to municipalities with at least one hotel when calculating the average hotel size. As a result, the number of observations decreases. Columns 6 to 8 report the estimated IV coefficient on log P2P overnight and its interaction term with our measure of hotel size. In contrast with the estimation of hotel beds, in this case, the interaction term is negative and significant for the entire sample. As anticipated, the sign indicates that the positive impact of P2P is less pronounced in areas with larger hotel

sizes. Similar to previous findings, the subset of non-tourist locations largely influences the overall effects. We view the average hotel size as a proxy of the incumbent hotels' ability to compete with P2P suppliers through prices. With more intense competition, P2P operations become less viable, which in turn hinders their potential to attract new visitors and results in a reduced positive effect on local employment.

## 8 Quantitative analysis

In this section, we employ our model to quantify the impact of the P2P shock on the evolution of local employment in Spain during 2016-2019. To accomplish this, we explore a hypothetical scenario in which the amount of P2P overnights in each municipality did not increase during the specified period. We examine how local employment in December 2019 under this scenario would compare to the actual observed value. We predict 2019 employment using a counterfactual scenario in which P2P overnights remain constant at their initial value in the summer of 2016, along with the associated IV coefficients reported in Column 2 of Table 3. The results are presented in Table 9. Our analysis reveals that, for the median municipality, employment in 2019 would be 15.5 lower if P2P activity remained constant during 2016-2019, which implies a relative drop of 3.2% compared to actual employment levels in 2019. Columns 2 to 5 provide further insight into the effects of P2P activity on local employment for different subsets of municipalities based on their size. We find that the relative drop in employment ranges from 2.1% to 8.2% for municipalities with less than and more than 6,000 inhabitants, respectively. Consistent with the estimated elasticities reported in Table 7, we observe that the largest effect is found in mid-size municipalities (6,000-50,000 inhabitants), where the median municipality employment would be 10% lower in the counterfactual scenario where P2P activity remained constant from 2016.

Last, Figure 4 illustrates the relative change in employment for each municipality in Spain in 2019, compared to the actual employment level, under the counterfactual scenario where P2P activity remained constant from 2016 to 2019. To predict the counterfactual employment level for each municipality, we use the coefficients associated with the size subgroup to which the municipality belongs. The resulting picture reveals a mixed impact of P2P activity on local employment across the different regions of Spain. The growth of P2P has had a positive effect in most areas, particularly

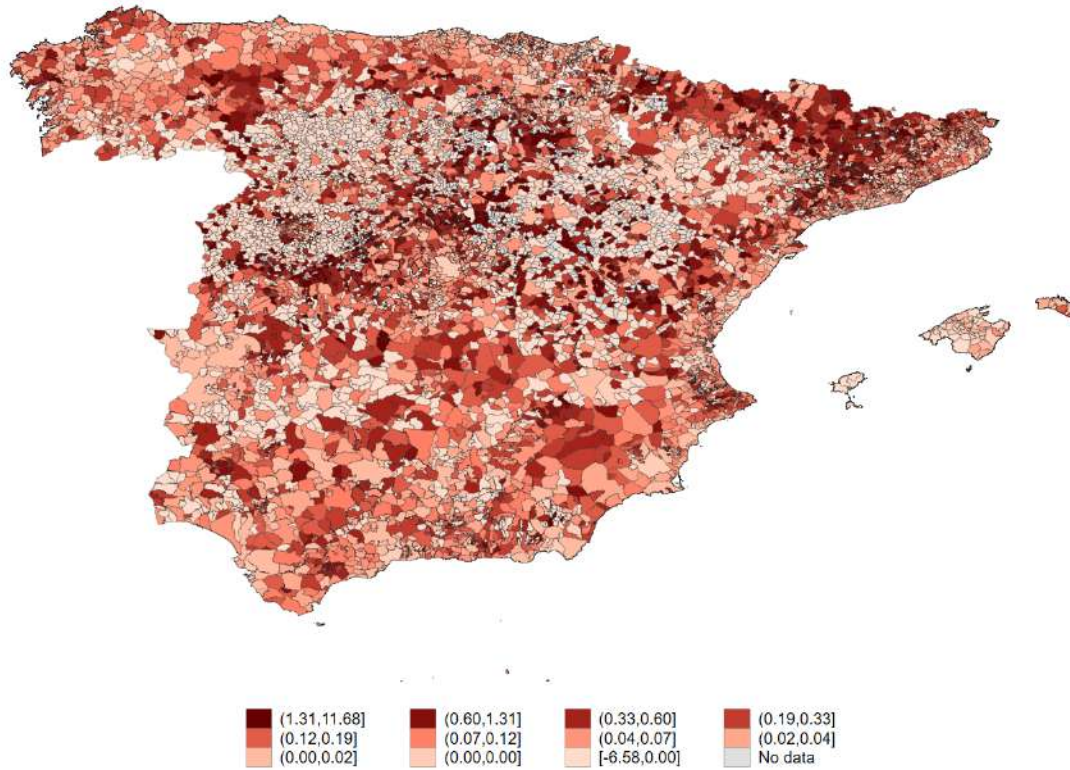
**Table 9:** Difference in 2019 employment predicted with observed and counterfactual P2P

	(1)	(2)	(3)	(4)	(5)
	All	<6,000	>6,000	6,000-50,000	>50,000
Median absolute difference	15.5	7.8	458.0	442.0	597.33
Median difference (% 2019 employment)	3.2%	2.1%	8.2%	10.1%	1.6%
Municipalities	7,989	6,867	1,122	975	146

Notes: The table reports the change in employment in 2019, compared to the actual employment level, under the counterfactual scenario where P2P activity remained constant from 2016 to 2019. The counterfactual scenario assumes P2P overnights are set to their initial value. Positive numbers imply more employment in the actual scenario than in the counterfactual where P2P remained constant during the mentioned period.

in the northern part of Spain (darker colors). However, some parts of the western interior of Spain and the Balearic Islands have experienced a lower level of employment growth due to the increase in P2P activity, as represented by the lighter color.

**Figure 4:** Difference (%) in 2019 employment predicted with the observed and the counterfactual P2P



Notes: The figure reports the change in employment in 2019, compared to the actual employment level, under the counterfactual scenario where P2P activity remained constant from 2016 to 2019. The counterfactual scenario assumes P2P overnights are set to their initial value. Positive numbers imply more employment in the actual scenario than in the counterfactual where P2P remained constant during the mentioned period. To predict the counterfactual employment level for each municipality, we use the coefficients associated with the size subgroup to which the municipality belongs.

## 9 Conclusion

The irruption of peer-to-peer platforms in the accommodation sector provokes changes within the industry and in the overall economy. Lower barriers to entry and lower transaction costs explain how rapidly the accommodation market expands worldwide. The political and social debate on the implications of Airbnb and other P2P platforms has been narrowly focused on the negative impacts on incumbents and external effects such as the tensions in the housing market. Simultaneously, the economic case for P2P accommodations has tended to rely on the consumer's welfare effects of the entry of new competitors in the accommodation markets.

In this research, we take a broader view of the implications of the irruption of P2P platforms

by analyzing the effects on the labor market. We take the case of Spain, a country that attracts millions of tourists per year and has a strong hospitality sector. Across a wide range of indicators, we find that the growing penetration of P2P platforms has a strong impact on local job creation. This effect tends to vary depending on the municipality size: lower in small municipalities, but large in municipalities with over one thousand inhabitants. The wide dispersion of P2P activity across the geography does not entail significant changes in the local employment level unless the market size is large enough, suggesting that spillover effects over neighboring municipalities might be important.

Our data allow us to compare the relative economic impact of an overnight stay booked through a platform and an overnight stay performed in the traditional hotel sector. Both impact positively on the overall employment level, but it is larger for the peer overnight stays. This suggests that the ability of the peer facilities vis-à-vis the hotel facilities to generate positive indirect supply impacts and positive direct and indirect demand effects in the local economy should be considered an important driver for local development.

The job creation effects are more nuanced the greater the hotel room capacity, and the greater the hotel's ability to compete with the new entrants across municipalities. These patterns manifest the role played by two forces in play, the substitution effect that new competitors infringe over the incumbents and the market expansion effect driven by newer tourists and homeowners participating in the local accommodation market. While the substitution effect drags resources from the hotel incumbents, the market expansion out-weights those losses by spurring peer-induced jobs. Consistent with this logic, our results indicate that job creation is lower when the competition effect is more likely.

An efficient local STR regulation should consider both direct and indirect costs and benefits. Limiting the scope of P2P platforms might reduce indirect costs in terms of lowering housing prices in touristy urban markets. However, stringent regulations also produce losses in terms of direct and indirect local jobs, in addition to the well-documented consumer welfare gains analyzed in the literature.

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# Appendices

## A Regulatory framework

### Andalucía

**Regulation:** Decree 28/2016, of February 2, on housing for tourist purposes and modification of Decree 194/2010, of April 20, on tourist apartment establishments in Andalusia.

**Time of implementation:** 05/2016

**Description:** Regulation of housing for tourism purposes. It imposes conditions and registration.

**Motivation:** Public safety, the protection of users of tourist services and the protection of the environment and urban environment.

### Aragón

**Regulation:** Decree 80/2015, of May 5, of the Government of Aragon, which approves the Regulation of housing for tourist use in Aragon.

**Time of implementation:** 08/2015

**Description:** Regulation of housing for tourist use. It imposes conditions and registration.

**Motivation:** Incorporate a new category of tourist establishment called housing for tourist use to the sectoral regulation.

### Asturias

**Regulation:** Decree 48/2016 of August 10, on vacation homes and homes for tourist use.

**Time of implementation:** 09/2016

**Description:** Regulation of homes for tourist and vacation use. It imposes conditions and registration.

**Motivation:** Legally equate these rentals with holiday accommodation.

### Baleares

**Regulation:** Law 6/2017 of July 31, regarding the commercialization of tourist stays in homes.

**Time of implementation:** 08/2017

**Description:** Regulation of homes for tourist and vacation use. It imposes conditions and registration.

**Motivation:** Legally equate these rentals with holiday accommodation.

### Mallorca

**Regulation:** Zoning of the Consell de Mallorca, of July 28.

**Time of implementation:** 08/2018

**Description:** Provisional delimitation of the areas suitable for the commercialization of tourist stays in homes for residential use in Mallorca (excluding Palma)

**Motivation:** Containment of tourist activity, zoning and management.

### Palma

**Regulation:** Zoning of Palma City Council, of July 24.

**Time of implementation:** 08/2018

**Description:** Zonal delimitation and prohibition of tourist rental in multi-family homes.

**Motivation:** Protect access to housing for residents and improve their social coexistence with tourists.

### Canarias

**Regulation:** Decree 113/2015, of May 22, approving the Regulations for holiday homes in the Autonomous Community of the Canary Islands.

**Time of implementation:** 05/2015

**Description:** Regulation of vacation homes. It imposes conditions and registration, and de facto, administrative control of entry, later annulled by the courts. Exclusion of homes on tourist land

**Motivation:** Incorporate a new category of tourist establishment called vacation home to the sectoral regulation. Reduce the competition that tourist housing exerts on the rest of accommodation.

### Cantabria

**Regulation:** Decree 225/2019, of November 28, which regulates housing for tourist use in the Autonomous Community of Cantabria.

**Time of implementation:** 03/2020

**Description:** Regulation of housing for tourist use in the Autonomous Community of Cantabria.

**Motivation:** Guarantee the minimum conditions of public order, citizen security, public health and consumer protection.

### Castilla y León

**Regulation:** Decree 3/2017, of February 16, which regulates accommodation establishments in the housing modality for tourist use in the Community of Castilla y León.

**Time of implementation:** 02/2017

**Description:** Regulation of accommodation establishments in the housing modality for tourist use in the Community of Castilla y León.

**Motivation:** Expand the accommodation supply in the face of growing demand, promote the quality and excellence of tourism.

### Castilla Mancha

**Regulation:** Decree 36/2018, of May 29, which establishes the organization of tourist apartments and houses for tourist use in Castilla-La Mancha.

**Time of implementation:** 06/2018

**Description:** Regulation of tourist apartments and dwellings for tourist use in Castilla-La Mancha.

**Motivation:** Expand the accommodation supply in the face of growing demand, promote quality and protect the user of tourist services.

## Cataluña

**Regulation:** Law 16/2015, of July 21, on the simplification of the administrative activity of the Administration of the Generalitat and of the local governments of Catalonia and the promotion of economic activity.

**Time of implementation:** 08/2015

**Description:** Impose declaration of interest to start activity in STR. Sectoral regulation is established in Decree 159/2012, of November 20, and remains until Decree 75/2020, of August 4.

**Motivation:** Removal of barriers to economic activity.

## Barcelona

**Regulation:** Special Urban Plan for Tourist Accommodation (PEUAT), of March 6, 2017.

**Time of implementation:** 03/2017

**Description:** Special urban plan for the regulation of tourist accommodation establishments, youth hostels, collective residences for temporary accommodation and housing for tourist use in the city of Barcelona.

**Motivation:** Containment of tourist activity, zoning and additional regulation.

## Comunidad Valenciana

**Regulation:** Ley 15/2018, 7 de junLaw 15/2018, June 7, of the Generalitat, of tourism, leisure and hospitality of the Valencian Community.

**Time of implementation:** 07/2018

**Description:** Promotion and regulation of tourist activity in the Valencian Community.

**Motivation:** Enable a rational use of the territory, greater satisfaction of visitors, greater involvement of the local population and increased wealth.

## Valencia

**Regulation:** Ciutat Vella Special Protection Plan (PEP), dated February 26, 2020.

**Time of implementation:** 02/2020

**Description:** It imposes conditions, subject to urban parameters and zoning.

**Motivation:** Containment of tourist activity, zoning and additional regulation.

## Galicia

**Regulation:** Decree 12/2017, of January 26, which establishes the management of tourist apartments, tourist homes and homes for tourist use in the Autonomous Community of Galicia.

**Time of implementation:** 05/2017

**Description:** Regulation of tourist apartments, tourist housing and housing for tourist use in the Autonomous Community of Galicia.

**Motivation:** Incorporate new typologies of tourist establishments into sector regulations.

## **Extremadura**

**Regulation:** Law 6/2018, of July 12, amending Law 2/2011, of January 31, on the development and modernization of tourism in Extremadura.

**Time of implementation:** 07/2018

**Description:** Tourism planning. It imposes conditions and registration.

**Motivation:** Simplify procedures for starting activities, provide legal certainty and adapt regulations to nationwide regulations.

## **Comunidad de Madrid**

**Regulation:** Decree 29/2019, of April 9, of the Government Council, which modifies Decree 79/2014, of July 10, which regulates the Tourist Apartments and the Tourist Homes of the Community of Madrid.

**Time of implementation:** 04/2019

**Description:** Regulation of tourist apartments and housing for tourist use in the Community of Madrid. It adapts the regulations after judicial rulings and imposes new conditions.

**Motivation:** Adaptation to judicial pronouncements, promoting the quality of the tourist service, citizen safety and favoring a competitive environment.

## **Madrid**

**Regulation:** Special Plan for the Regulation of the use of Tertiary Services in the Accommodation class (PEH), of April 23, 2019.

**Time of implementation:** 04/2019

**Description:** Delimitation of the areas suitable for the use of tertiary services in the type of accommodation intended to provide temporary accommodation in the City of Madrid.

**Motivation:** Preserve residential use in the central areas of the city, through a new regulation of compatible and authorized uses, limiting to the maximum the expulsion of permanent residential use and its replacement by the use of tertiary services in the type of lodging intended to provide temporary accommodation.

## **Navarra**

**Regulation:** Foral Decree 230/2011, of October 26.

**Time of implementation:** 11/2011

**Description:** Regulation of tourist apartments in the Autonomous Community of Navarra. It imposes conditions and registration.

**Motivation:**

## **País Vasco**

**Regulation:** Law 13/2016, of July 28, on Tourism.

**Time of implementation:** 07/2016

**Description:** Tourism planning. It imposes conditions and registration.

**Motivation:** Update accommodation and tourist intermediation figures, preserve natural and environmental resources, protect the user and preserve the quality of service

## ***San Sebastián***

**Regulation:** Regulatory Ordinance of urban use of tourist housing and rental of rooms in habitual residence for tourist use, of August 30, 2017.

**Time of implementation:** 03/2018

**Description:** Defines the concept and requirements for the use of tourist housing. It imposes conditions of the property, assimilated to hotel use, limiting the use to entire buildings or to ground or first floors. Establish zoning. Partially annulled by the courts.

**Motivation:** The protection of the environment, the right to rest of the neighbors, the need to preserve the residential urban use of housing in the terms established in the urban planning, the interest in the economic and social revitalization of the city as a whole, the evasion of gentrification processes in certain areas, etc

## ***Bilbao***

**Regulation:** Detailed modification of the General Plan for Urban Planning of Bilbao, in relation to the regulation of the use of tourist accommodation, of January 25, 2018.

**Time of implementation:** 01/2018

**Description:** It imposes property conditions, limiting its location to the first floors of residential buildings, or to lower floors than those intended for housing if they have independent access, with eventual limitations to one dwelling for tourist use per building. Tourist homes are assimilated to equipment and not to residential use. Zoning is established.

**Motivation:** Adapt urban planning regulations regarding tourist use in all its categories. Correct the dysfunctions and coexistence problems of certain uses in the same building, correct the increase in prices and shortage of rental housing.

## **La Rioja**

**Regulation:** Decree 10/2017, of March 17, which approves the general regulation of tourism in La Rioja.

**Time of implementation:** 05/2017

**Description:** Regulation of housing for tourist use. It imposes conditions and registration.

**Motivation:** Incorporate a new category of dwellings for tourist use to the sectoral regulation.

## B Further tables and analysis

**Table B-1:** Descriptive statistics by municipality size

	(1)	(2)	(3)	(4)	(5)
	< 6,000	≥ 6,000	From 6,000 to 50,000	> 50,000	Excluding Non-touristy
P2P Beds Demand					
Mean	33.2	712.9	440.2	2,336.7	217.2
std. dev	128.0	2,951.7	1,359.7	6,819.8	1,499.0
Overnight P2P stays					
Mean	340.4	9,549.0	5,604.8	33,036.4	2,779.2
std. dev	1,756.0	45,820.9	20,100.3	107,487.8	23155.8
Hotel Beds					
Mean	55.7	1,736.0	1,118.3	5,414.3	493.9
std. dev	350.5	8,793.8	7,506.6	13,656.5	4,440.1
Employment					
Mean	289.6	15685.6	5312.4	77457.3	4178.4
std. dev	519.2	74,903.5	4,120.7	185,655.4	37,766.6
Unemployment					
Mean	59.2	2,839.3	1,191.5	12,652.3	763.5
std. dev	97.9	8,039.4	924.9	18,220.7	4,165.6
Contracts					
Mean	36.1	1,505.5	599.7	6,899.4	409.4
std. dev	95.4	6,128.3	661.8	14,987.9	3,108.1
Observations	224,134	44,164	3,7814	6,350	179,195
N <sup>o</sup> of municipalities	6,867	1,122	975	146	6,079

Source: AirDNA, business registers and Spanish Social Security Ministry.

**Table B-2:** First-stage for alternative measures of P2P activity

	Log P2P Beds Demand			Log P2P Listing Supply		
	(1)	(2)	(3)	(4)	(5)	(6)
Policy	-0.197*** (0.0104)	-0.117*** (0.00769)	-0.117*** (0.00769)	-0.149*** (0.00904)	-0.0828*** (0.00617)	-0.0827*** (0.00616)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year & Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality trends	No	Yes	Yes	No	Yes	Yes
Municipality controls	No	No	Yes	No	No	Yes
Observations	268,174	268,174	268,174	268,174	268,174	268,174
Municipalities	7,989	7,989	7,989	7,989	7,989	7,989

Notes: Employment-month level analysis. Columns 1 and 4 include month, year and municipality fixed effects. Columns 2 and 5 add municipality specific linear time trends. Columns 3 and 6 add the log of inhabitants and the log of 1 plus the number of hotel beds, both at the municipal level. Municipality-clustered standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$ .