

When local business faded away: the uneven impact of Airbnb on the geography of economic activities

Applied Young Economist Webinar

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Motivation

- The economic landscape in urban areas is rapidly changing, prompted mainly by the decline in local businesses being displaced by new stores.
- Several phenomena contribute to this fact, such as gentrification, e-commerce and tourism. In this paper, we will focus on the last process: touristification
- Airbnb can be considered one of the main drives of this new touristification wave.



Airbnb and business transformation



- The switch from long-term rental contracts to short-term rental contracts provoke a displacement of residents by tourists whose consumption patterns differ from each other.
- The change in the local consumer pool has an uneven effect across activities, ultimately affecting local businesses and favoring tourist-oriented stores.
- Lastly, those effects are more intense in peripheral areas where most resident-oriented businesses are located.

The paper

- **Research question:** To study the unequal effect of Airbnb on the spatial organisation of economic activity in Madrid, Spain.
- **Methodology:** Linear probability model to study how short-term rentals affect unevenly business demographic metrics (births, deaths, transitions) depending on whether they are tourist or local-oriented stores.
- **Identification strategy:** We leverage the temporal dimension of our data and the uneven geographic distribution of short-term rentals, which allows us to isolate the impact of Airbnb from other time trends related to e-commerce or gentrification processes.

Preview of the results

- **Business creation:** Airbnb contributes to business formation mainly driven by tourist-oriented establishment creation.
 - Consumption amenities like restaurants and bars and, to a lesser extent, tourist-oriented retail shops like souvenirs or exchange currency stores.
- **Local businesses decline:** Conversely, local businesses are negatively affected by the short-term rental disruption.
 - Tradable and non-tradable businesses alike, such as drugstores, butgeries, and hairdressers.
- **Touristic business displacement:** Part of the increase in tourist-oriented establishments occurs at the expense of local businesses.

Contributions

1. Going beyond business formation analyses or short-term rentals externalities to identify displacement effects from Airbnb [Zervas, Proserpio, and Byers (2017), Garcia-López et al. (2020), and Hidalgo, Riccaboni, and Velázquez (2022)].
2. Put businesses at the heart of the analysis of touristification [Behrens et al. (2018)].
3. We propose a new methodology and classification to identify which businesses are at risk of falling because of Airbnb disruption in local areas

Methodology

Data

- **Data:**

- **Unit of analysis:** Business premises in the Madrid municipality;
- **Time frame:** October 2014 and October 2019.

- **Variables:**

- **Madrid City Council's census:** business premises-level data under a four-digit NACE-based classification, location, typology and activity status;
- **Short-term rentals:** user-faced web scrapped information from Airbnb (Inside Airbnb);
- **Sociodemographic information:** population and income information at the census tract level from *Municipal Register) and Ministry of Public Works and Transport)*

▶ Variable definition and source

▶ Descriptive statistics

Methodology

Data Step I:

Dependent variable: Establishments classification as tourist-oriented or resident-oriented with local consumption. Adapting existing classification to our context [Meltzer and Schuetz (2012), Meltzer and Capperis (2017), Allen et al. (2020), and Aparicio et al. (2021)].

Table 1: TOURIST-ORIENTED AND RESIDENT-ORIENTED ACTIVITIES CLASSIFICATION

Establishment type	Activity code	Activity description
Tourist-oriented		
Souvenirs	661002, 477807, 477808	Exchange currency, Expositions, Gift shop
Restaurant	561001, 561004	Restaurant, Bar restaurant
Bar	561005, 563002, 563005	Bar with kitchen, Bar without kitchen, Bar with performance
Ice-cream parlour	472902,472903, 472904	Ice-cream parlour (in-place elaboration), Ice-cream take-away
Coffee	561006, 561007	Coffee, Teahouse
Limiting-Service Eating places	472406, 472407	Take-away (in-place elaboration), Take-away
Ready-made meals	471101	Ready-meal store
Pastry shops	472402, 472403	Pastry, Pastry with baked goods
Clothing store	477101	Retail trade of clothing in specialized stores
Resident-oriented		
Clothing textile	464201,952004, 960101	Textile shop, Textile laundry, Tailor
Furnishing	475903, 433001	Furnishing
Retail food	471104, 472907, 472102, 472203, 472302	Convenience, Fruit, Butchery, Fishmonger, Candy
Retail non food	477801, 474201, 931008	Drugstore, Phone store,Gym
Beauty salon	960206, 960203,960201	Hairdresser, Beauty salon, Depilation
Car workshop	452002,472102, 855001	Car workshop, Driving School
Newsagent	476201, 821001	Newsagent, Print shop
Nursery	851001	Nursery school

Notes: Activity codes refer to the most disaggregated information about business service offerings. They come from the classification of activities used by the Madrid City Council.

Methodology

Data Step II:

Dependent variable: Once classified establishments according to their target population and based on their activity situation, we compute a set of business dynamics variables.

Variable	Definition	Source
Dependent variables:		
Birth	1 if an establishment opened during the period 2014-2019, 0 otherwise	Madrid Statistical Department
Birth, tourist	1 if a tourist-oriented establishment opened during the period 2014-2019, 0 otherwise	Madrid Statistical Department
Birth, resident	1 if a resident-oriented establishment opened during the period 2014-2019, 0 otherwise	Madrid Statistical Department
Death	1 if an establishment closed during the period 2014-2019, 0 otherwise	Madrid Statistical Department
Death, tourist	1 if a tourist-oriented establishment closed during the period 2014-2019, 0 otherwise	Madrid Statistical Department
Death, resident	1 if a resident-oriented establishment closed during the period 2014-2019, 0 otherwise	Madrid Statistical Department
Transition	1 if an establishment was open during the period 2014-2019 but changed activity, 0 otherwise	Madrid Statistical Department
Transition, tourist	1 if an establishment was open during the period 2014-2019 but changed activity towards tourist services, 0 otherwise	Madrid Statistical Department
Transition, resident	1 if an establishment was open during the period 2014-2019 but changed activity towards local services, 0 otherwise	Madrid Statistical Department
Transition, resident-tourist	1 if an establishment was a tourist business in 2019 conditional on being a local business in 2014, 0 otherwise	Madrid Statistical Department
Transition, tourist-resident	1 if an establishment was a resident-oriented business in 2019 conditional on being a tourist business in 2014, 0 otherwise	Madrid Statistical Department

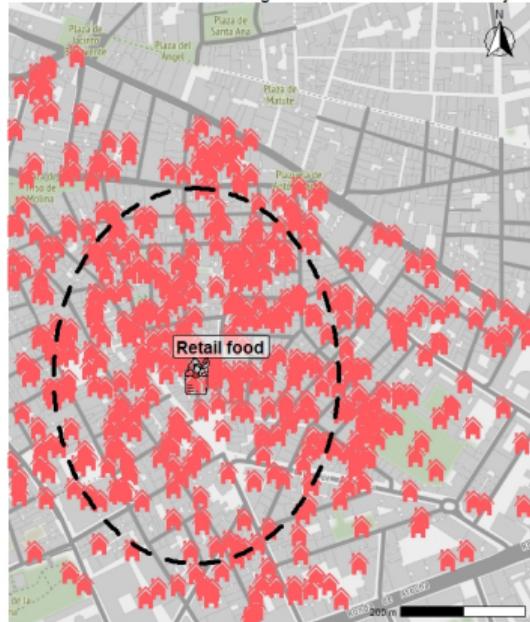
Methodology

Data Step III:

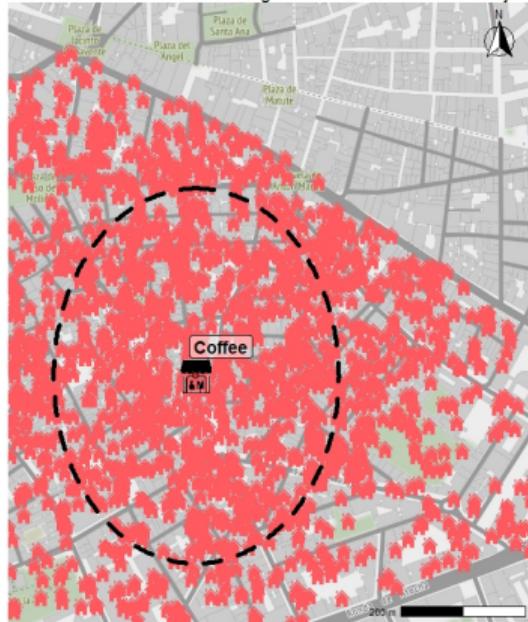
Variable of interest: 150-meter radius buffer around each business premises in 2014 and 2019.

Counting the number of Airbnb listings surrounding each business premises.

Buffer creation: Short-term rentals in Madrid, 2014
150-meter radius buffer around a given establishment in the Embajadores neighbourhood



Buffer creation: Short-term rentals in Madrid, 2019
150-meter radius buffer around a given establishment in the Embajadores neighbourhood



Methodology

Empirical strategy

Regression Specification

The main specification is as follows:

$$\Pr(Establishments\ dynamics_i^{2019-2014}) = \beta Airbnb_i + \rho X_c + \delta Z_i + \alpha_s + \gamma_n + \epsilon_i$$

- *Establishments dynamics*_{*i*}^{2019–2014} refers to the business dynamics outcome variables depending on the specification.
- β measures the effect of a change in the number of short-term rentals around a 150-meters radius buffer of business premises *i* on the probability that the establishment undergoes any change in business activity.
- IV using as an instrument the number of rental houses in 2011 as in Hidalgo, Riccaboni, and Velázquez (2022).

Results

Business demographics metrics

Table 2: LINEAR PROBABILITY MODEL FOR ESTABLISHMENTS BIRTH AND DEATH DYNAMICS OLS

Dependent Variable:	(1) Pr(Birth = 1)	(2) Pr(Birth, tourist = 1)	(3) Pr(Birth, resident = 1)	(4) Pr(Death = 1)	(5) Pr(Death, tourist = 1)	(6) Pr(Death, resident = 1)
Airbnb buffer	0.010*** (0.004)	0.015*** (0.006)	-0.012*** (0.004)	0.001 (0.001)	-0.004 (0.012)	0.015** (0.007)
Mean dependent variable	0.792	0.193	0.238	0.0233	0.195	0.262
Marginal percentage effect	1.120	7.756	5.036	4.298	2.052	05.730
R ²	0.17657	0.06799	0.03202	0.02464	0.13997	0.09923
Observations	7,732	6,123	6,123	74,227	1,868	1,868

Takeaways:

- Airbnb contributes positively to the rise of new businesses, whereas it does not seem to affect the probability of closure.
- Airbnb increases the probability that tourist-oriented are born and decrease it for resident-oriented.
- Airbnb decreases the probability of closing for touristic businesses and an increase in resident-oriented.

Results

Business displacement

Table 3: LINEAR PROBABILITY MODEL FOR ESTABLISHMENTS TRANSITIONS DYNAMICS (OLS)

Dependent Variable:	(7) Pr(Transition = 1)	(8) Pr(Transition, tourist = 1)	(9) Pr(Transition, resident = 1)	(10) Pr(Transition, resident-tourist = 1)	(11) Pr(Transition, tourist-resident = 1)
Airbnb buffer	0.003*** (0.0001)	0.010* (0.006)	-0.007** (0.004)	0.034*** (0.010)	-0.004 (0.004)
Mean dependent variable	0.109	0.244	0.219	0.217	0.197
Marginal effect	0.110	0.217	0.262	0.151	0.175
R ²	0.228	0.184	0.107	0.169	0.218
Observations	85,791	9,334	9,334	1,518	1,600

Takeaways:

- Airbnb increases the probability that a business premises transition towards a tourist-oriented activity
- Airbnb increases the probability that an establishment becomes tourist-oriented, conditional on being a local business in the past, we do not observe the opposite

Robustness checks

- **Short-term rental measurement:** Using the capacity of each listing and the number of reviews instead of its number of Airbnb listings to account for the size and demand of the short-term rental activity and varying the zoom distance (± 100 meters).
- **Traditional accommodations:** Remove all neighborhoods where a new hotel settle during the 2019-2014 period.
- **E-commerce confounder:** Remove tradable activities from our tourist and local-oriented business classification.
- **Gentrification confounder:** Falsification exercise where we replace tourist-oriented activities for those activities which have been related to gentrification based on [Behrens et al. \(2018\)](#) classification.
- **Sensitivity analysis:** Sensitivity tools developed by [Cinelli and Hazlett \(2020\)](#) to access the robustness of the results to the potential presence of one or more confounders.

Robustness checks

Table 4: ROBUSTNESS CHECKS

Dependent Variable:	Pr(Transition = 1)	Pr(Trans, tourist = 1)	Pr(Trans, resident = 1)	Pr(Trans, resident-tourist = 1)	Pr(Trans, tourist-resident = 1)
A. Airbnb buffer (Guests)	0.003*** (0.0001)	0.010** (0.005)	-0.005** (0.0003)	0.025*** (0.005)	-0.003 (0.004)
B. Airbnb buffer (Reviews)	0.002*** (0.0001)	0.008* (0.004)	-0.006* (0.003)	0.019* (0.010)	-0.007* (0.003)
C. Airbnb buffer (Radius 100m)	0.004*** (0.001)	0.019** (0.009)	-0.010 (0.007)	0.054*** (0.016)	-0.001 (0.007)
D. Airbnb buffer (Radius 200m)	0.001*** (0.0001)	0.007 (0.004)	-0.004** (0.003)	0.016** (0.006)	-0.004 (0.003)
E. Airbnb buffer (No hotel neighbourhoods)	0.003** (0.001)	0.018*** (0.003)	-0.004 (0.004)	0.022** (0.009)	-0.004 (0.004)
F. Airbnb buffer (Only non-tradables)	0.003*** (0.0001)	0.010* (0.006)	-0.004** (0.001)	0.033** (0.016)	0.009 (0.004)
G. Airbnb buffer (Broader trends)	0.003*** (0.0001)	0.009* (0.003)	-0.007** (0.001)	0.025** (0.008)	0.009 (0.015)
Dependent Variable:	Pr(Transition = 1)	Pr(Trans, gentrifiers = 1)	Pr(Trans, resident = 1)	Pr(Trans, resident-gentrifiers = 1)	Pr(Trans, gentrifiers-resident = 1)
H. Airbnb buffer	0.003*** (0.0001)	-0.001 (0.001)	-0.007** (0.004)	-0.004 (0.004)	-0.034 (0.036)

Conclusions

- Airbnb contributes to shaping the urban economic landscape in line with tourists' needs, partly at the expense of local businesses.
- The uneven effect on the spatial organisation of economic activity demands local authorities' intervention to regulate this activity in two ways:
 - The short-term rental levels that are considered globally desirable in the city and how they are distributed throughout the territory.
 - How Airbnb affects businesses differently depending on its consumer orientation.
 - Economic evidence in favor of food security areas and 15 minute-walkable city strategy.

Thank you!

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Appendix

Example Transition, resident-tourist

Figure 1: Resident-oriented establishments displaced by tourist-oriented

Tourist-oriented establishments in Madrid, 2014



Local-oriented establishments in Madrid, 2019



◀ Go Back

Appendix

Airbnb measurement: Capacity of the listing

Table 5: Variable definition and source

Variable	Definition	Source
Dependent variables:		
Birth	1 if an establishment open in 2019, 0 otherwise	Madrid Statistical department
Birth, tourist	1 if a tourist-oriented establishment open in 2019, 0 otherwise	Madrid Statistical department
Birth, resident	1 if a resident-oriented establishment open in 2019, 0 otherwise	Madrid Statistical department
Death	1 if an establishment close in 2019, 0 otherwise	Madrid Statistical department
Death, tourist	1 if a tourist-oriented establishment close in 2019, 0 otherwise	Madrid Statistical department
Death, resident	1 if a resident-oriented establishment close in 2019, 0 otherwise	Madrid Statistical department
Transition	1 if an establishment open in 2014 and 2019 but change activity, 0 otherwise	Madrid Statistical department
Transition, tourist	1 if an establishment open in 2014 and 2019 which change activity towards tourist services, 0 otherwise	Madrid Statistical department
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Transition, resident-tourist	1 if an establishment is a tourist business in 2019 conditional on being a local business in 2014, 0 otherwise	Madrid Statistical department
Transition, tourist-resident	1 if an establishment is a resident-oriented business in 2019 conditional on being a tourist business in 2014, 0 otherwise	Madrid Statistical department
Explanatory variables:		
Airbnb	Absolute change in the number of Airbnb listings within a 150-meter buffer around each establishment between 2014 and 2019	Inside Airbnb
Population	Number of inhabitants in a given census tract	Municipal Register
Average household income	Average household income in a given census tract	Ministry of Development
Distance	Euclidean distance in meters to the city centre from census tract centroid	Spanish National Geographic Institute

Appendix

Descriptive statistics

Table 6: DESCRIPTIVE STATISTICS

Dependent variables	△October 2019 - October 2014		
	Sum	Mean	Sd
Birth	6565	0.05	0.22
Birth, tourist	1184	0.008	0.09
Birth, resident	1459	0.010	0.1
Death	2236	0.016	0.12
Death, tourist	364	0.003	0.06
Death, resident	489	0.003	0.06
Transition	9762	0.074	0.262
Transition, tourist	2352	0.017	0.13
Transition, resident	2105	0.015	0.14
Transition, resident-tourist	284	0.002	0.04
Transition, tourist-resident	403	0.003	0.05
October 2014		October 2019	
Explanatory variables	Sum	Mean	Sd
Airbnb buffer	765908	5.796	15.086
Population	3130308	3243940	1319.691
Avg. Household Income	85488590	36040.72	14782.41

Appendix

Comparison group

Table 7: COMPARISON GROUPS

Variable	Reference category	Variable	Reference category
<i>Birth</i>	Closed establishments in 2014 and 2019 and those born in 2019 and closed in 2014.	<i>Birth tourist</i>	Birth establishments
<i>Death</i>	Open establishments in 2014 and 2019 and those closed in 2019 and open in 2014	<i>Death local</i>	
<i>Transition</i>	Open establishments in 2014 and 2019 and those which change storefront name and/or change main activity also	<i>Death tourist</i>	Death establishments
<i>Transition, resident-tourist</i>	Open establishments in 2014 and 2019, which change storefront name and activity whose previous activity was tourist	<i>Death local</i>	
<i>Transition, tourist-resident</i>	Open establishments in 2014 and 2019, which change storefront name and activity whose previous activity was local	<i>Transition tourist</i>	Transition establishments
		<i>Transition local</i>	

Appendix

Comparison group

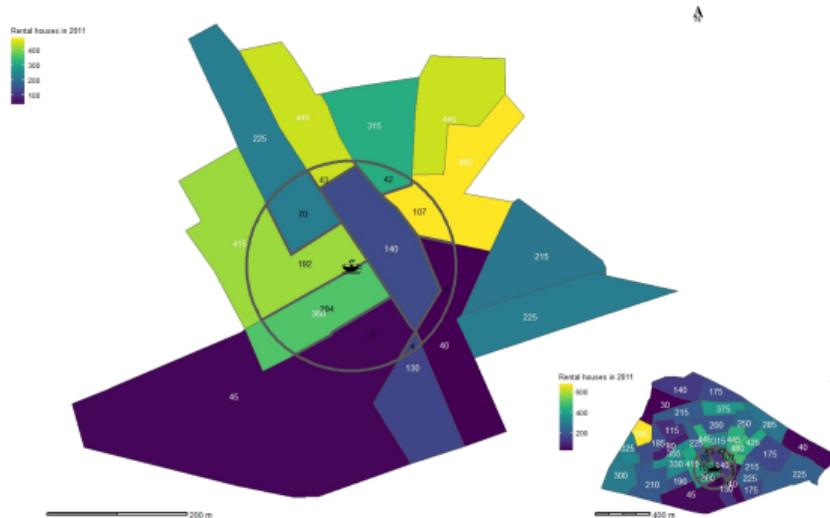


Figure 2: Instrumental variable construction

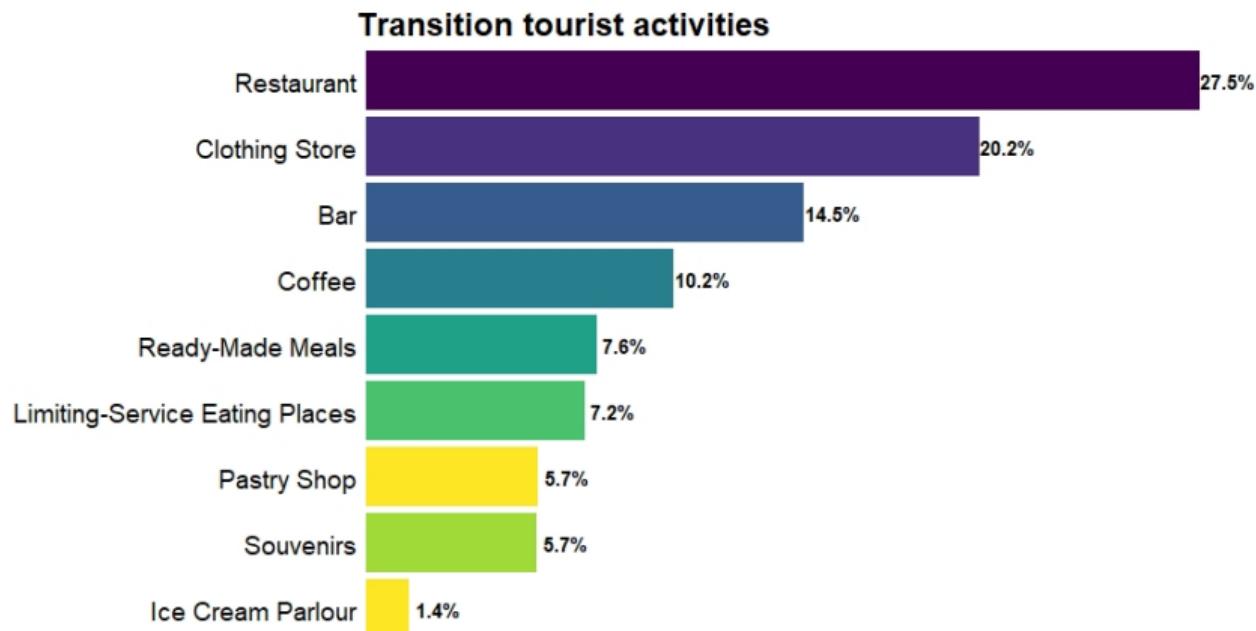
Notes: Rental houses imputation for a particular establishment in Embajadores neighbourhood. The imputed number of rental houses, represented by the black numbers, is calculated by multiplying the area of the census tract touched by the buffer by the actual number of rental houses in 2011 (white numbers).

◀ Empirical strategy

Appendix

Results

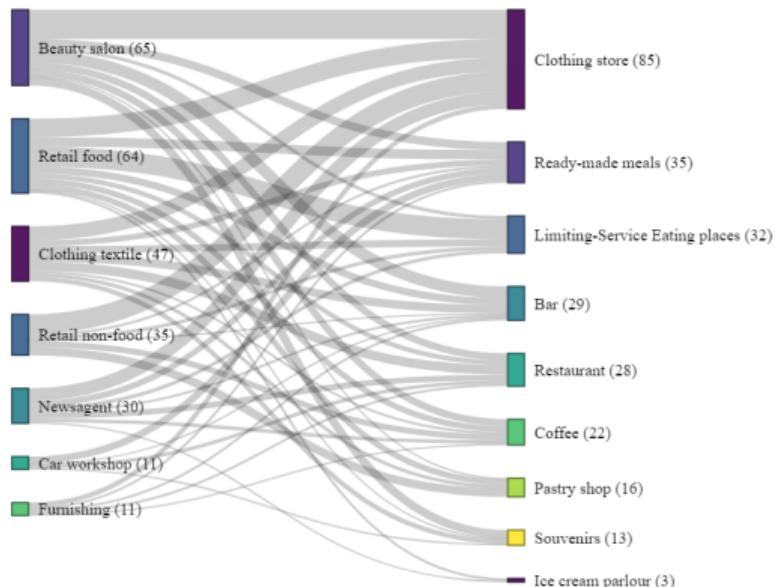
Figure 3: Tourist-oriented transitions



Appendix

Results

Figure 4: Resident-oriented establishments displaced by tourist-oriented



Appendix

Business demographic and displacement IV specification

Table 8: LINEAR PROBABILITY MODEL FOR ESTABLISHMENTS BIRTH AND DEATH DYNAMICS (IV)

Dependent Variable:	(1) Pr(Birth = 1)	(2) Pr(Birth, tourist = 1)	(3) Pr(Birth, resident = 1)	(4) Pr(Death = 1)	(5) Pr(Death, tourist = 1)	(6) Pr(Death, resident = 1)
Airbnb buffer	0.004*** (0.001)	0.004*** (0.001)	-0.0004 (0.001)	0.0007** (0.0003)	-0.004 (0.002)	0.006* (0.003)
Mean dependent variable	0.792	0.193	0.238	0.0233	0.195	0.262
Marginal percentage effect	1.120	7.756	5.036	4.298	2.052	05.730
Observations	7,732	6,123	6,123	74,227	1,868	1,868

Table 9: LINEAR PROBABILITY MODEL FOR ESTABLISHMENTS TRANSITIONS DYNAMICS (IV)

Dependent Variable:	(7) Pr(Transition = 1)	(8) Pr(Transition, tourist = 1)	(9) Pr(Transition, resident = 1)	(10) Pr(Transition, resident-tourist = 1)	(11) Pr(Transition, tourist-resident = 1)
Airbnb buffer	0.013** (0.006)	0.028 (0.019)	-0.010 (0.013)	0.138** (0.067)	-0.013 (0.024)
Mean dependent variable	0.109	0.244	0.219	0.217	0.197
Marginal effect	0.110	0.217	0.262	0.151	0.175
Observations	85,791	9,334	9,334	1,518	1,600

[◀ Go Back business displacement](#)

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Appendix

Sensitivity analysis

Table 10: SENSITIVITY ANALYSIS

Outcome: *Transition, tourist-resident*

Treatment:	Est.	S.E.	t-value	$R^2_{Y \sim D \mathbf{X}}$	$RV_{q=1}$	$RV_{q=1, \alpha=0.05}$
Airbnb buffer	0.002	0.001	2.739	0.6%	7.2%	2.1%
df = 1332	<i>Bound (1x income): $R^2_{Y \sim Z \mathbf{X}, D} = 0.6\%$, $R^2_{D \sim Z \mathbf{X}} = 4.4\%$</i>					

Notes: Y refers to our outcome variable, transition tourist-resident, D , our variable of interest, Airbnb buffer, X the set of controls and finally Z the unobserved confounder(s).