



Measuring the extensive margin of a hidden market: evidence from Spain

Riccardo Ciacci & Alessandro Corvasce

To cite this article: Riccardo Ciacci & Alessandro Corvasce (2026) Measuring the extensive margin of a hidden market: evidence from Spain, *Regional Studies, Regional Science*, 13:1, 2633072, DOI: [10.1080/21681376.2026.2633072](https://doi.org/10.1080/21681376.2026.2633072)

To link to this article: <https://doi.org/10.1080/21681376.2026.2633072>



© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 10 Mar 2026.



[Submit your article to this journal](#)



[View related articles](#)



[View Crossmark data](#)

Measuring the extensive margin of a hidden market: evidence from Spain

Riccardo Ciacci ^a and Alessandro Corvasce ^b

^aDepartment of Economics and Institute for Research in Technology, Universidad Pontificia Comillas, Madrid, Spain; ^bUniversità degli Studi di Milano, Milan, Italy

ABSTRACT

This article introduces a longitudinal, venue-level dataset documenting the spatial and temporal evolution of a specific segment of an informal market in Spain between 2011 and 2023. Using publicly available Google data, we construct a panel of establishments classified within nightlife and adult entertainment categories, commonly referred to in Spanish as *clubes de alterne*. The primary contribution is methodological: we propose a transparent and replicable framework to track the commercial infrastructure of partially regulated markets that are opaque to standard measurement. The dataset captures the extensive margin of supply the presence and persistence of physical venues and should be interpreted as a conservative, observable lower bound. We document pronounced spatial concentration and heterogeneity across provinces, with establishments clustering in major urban and coastal tourist areas. This dataset provides a new empirical tool to study the interaction between informal markets, regulation and local economic dynamics.

ARTICLE HISTORY

Received 26 September 2025
Accepted 7 February 2026

KEYWORDS

Informal markets; regulatory gap; sex work

JEL

I18; J16; J46; J47

1. Background and summary

Measuring economic activities that operate in regulatory gaps or informal settings is a persistent challenge in applied social sciences. These ‘hidden markets’, which lie outside standardised monitoring frameworks, complicate empirical research and policy analysis. Spain’s service sector provides a clear example, where some entertainment venues operate under fragmented and decentralised regulation.

A paradigmatic case is the market for the sale of sex. Ministerio de Igualdad (2024) estimate that in 2023 between 152,735 and 184,234 women were in a situation in which they could sell sex to earn a living. Yet evidence on where prostitution takes place and how it evolves over time remains limited, making panel data on its spatial and temporal patterns crucial for empirical research.

This article builds, to the best of our knowledge, the first panel dataset on establishments where the sale of sex occurs in a given country, providing summary evidence on the size and structure of this segment in Spain. The methodology is straightforward and replicable, and the data are designed to support empirical analyses of the supply side of prostitution and local regulatory environments.

Existing research has relied mainly on police and crime records or data from online marketplaces, reflecting the difficulty of measuring both supply and demand for sexual services (see, among others, Arunachalam & Shah, 2008; Bisschop et al., 2017; Ciacci, 2023, 2024; Cunningham et al., 2023; Cunningham & Kendall, 2010; Cunningham & Shah, 2018, 2021). Evidence from Spanish online platforms shows that the ‘platformisation’ of prostitution does not dismantle institutional structures but reconfigures them through new digital intermediaries that reproduce gender, class and ethnic inequalities (Rodríguez-Casañ & Ariño, 2025).

We address these data limitations by proposing a measurement approach that offers a consistent and easily updateable framework. Our measure complements existing sources by providing a novel proxy for sex work based on establishment-level information. Data from Google Business can be combined with crime statistics or online platform data (Cunningham & Shah, 2021), while review volumes from Google

CONTACT Riccardo Ciacci  rciacci@comillas.edu

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/21681376.2026.2633072>

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

Reviews may proxy client engagement, a strategy common in related fields (Meneses Falcón, 2023; Rodriguez-Casañ & Ariño, 2025).

We focus on a clearly identifiable and consistently observable segment of the market. Spain is an informative case because consensual sex work is neither explicitly legal nor illegal, and governance relies on fragmented criminal provisions and local ordinances. This institutional setting creates a gap between *de jure* rules and *de facto* enforcement, particularly for indoor prostitution. Similar regulatory configurations exist across Europe, including Italy and the United Kingdom (United Nations Office on Drugs and Crime, 2010, 2011).

Our contribution is to document the spatial and temporal evolution of a specific segment of indoor prostitution, *clubes de alterne*, from 2011 to 2023. The dataset captures only the visible, venue-based component of prostitution and should be interpreted as a conservative lower bound. While it does not observe prostitution in private venues or online, clubs can be monitored consistently across provinces and over time. Existing sources rely largely on online advertisements (Ariño et al., 2022; Ministerio de Igualdad, 2024; Rodriguez-Casañ & Ariño, 2025). Our objective is not to estimate prevalence or worker conditions, but to provide a transparent and replicable measure of the markets physical infrastructure to support research on urban economics, employment geography and regulatory design.

The article is organised as follows. Section 2 details the data-collection strategy and verification procedure used to identify *clubes de alterne*. Section 3 presents the resulting dataset and documents its main spatial and temporal patterns across Spanish provinces. Section 4 provides consistency checks, comparing our measure with external indicators of prostitution. Section 5 concludes.

2. Methods

This article uses Google Reviews data to construct a panel dataset on the location, opening year and closure year (when applicable) of these establishments. *Clubes de alterne*, literally ‘alternation clubs’, are venues where customers alternate between consuming drinks at the bar and using rooms provided by the establishment together with its personnel.

Relying on Google Reviews may introduce measurement bias, as establishments can operate without published reviews, particularly given the clients preference for anonymity. Importantly, Google Reviews allow pseudonymous or effectively anonymous submissions, so anonymity per se does not mechanically prevent reviews from being posted. The main implication is therefore under-detection of establishments with no digital footprint, rather than systematic bias in observed reviews. There is no evidence that provinces differ in their clients propensity to post pseudonymous reviews or in establishments likelihood of maintaining a minimal online presence, implying that any resulting measurement error is approximately uniform across provinces and does not compromise relative spatial comparisons. While this study focuses on the number of establishments (the extensive margin), it does not capture labour supply (the intensive margin), as data limitations prevent reliably inferring workforce size from physical attributes. Our measure therefore reflects the sectors commercial footprint rather than its total economic scale or employment, and may undercount establishments by excluding less formal or unlisted venues.

All establishments listed as ‘clubes de alterne’ on Google Reviews were recorded for each Spanish province. For each venue, Google Reviews was used to verify current operational status and to collect the years of the first and last published reviews, which proxy opening and closure years, respectively.

Across Spain, we identified 461 establishments, 90 of which had no reviews and were therefore excluded. The final dataset includes 371 establishments observed between 2011 and 2024, with 2011 corresponding to the earliest observed review. Data collection took place between December 2023 and February 2024, and the dataset is current as of February 2024.

For each establishment, six variables were collected: the establishment name; ZIP code; years of the first and last review; an indicator for current operation; the establishments self-description; and the Google Maps classification.

2.1. Technical validation

The search for establishments began with Google queries using the keywords *clubes de alterne* combined with the name of each Spanish province, followed by a Google Maps search using the same query. Each

result was examined individually to determine whether it corresponded to a *club de alterne*. Although the keyword search yields mostly relevant results, some venues are unrelated to sex work, requiring a manual verification process to ensure accuracy, at the potential cost of underreporting less visible establishments.

Verification relied on three sequential filters:

- (1) Business name: Venues with names explicitly indicating their nature were preliminarily classified.
- (2) Visual inspection: For ambiguous cases, photos on Google Maps were examined for characteristic features.
- (3) Review analysis: Customer reviews were analysed for explicit references, with external sources consulted when necessary.

This procedure minimises false positives and ensures that only venues with a high probability of being *clubes de alterne* are included. The resulting dataset prioritises measurement precision over completeness and should therefore be interpreted as a conservative lower bound of the total number of such venues in Spain, while providing a validated basis for analysing the observable commercial footprint of the sector.

2.2. Further evidence on the categories of establishments

Using the categorisation assigned by Google Maps, we examine how establishments in our dataset present themselves on the platform. This information is summarised in Table A1 in the online supplemental data. The largest share corresponds to ‘Nightclubs’ (51.11%), followed by ‘Adult entertainment clubs’ (14.60%) and ‘Hostess bars’ (11.95%). Together, these three categories account for more than three-quarters of all venues, indicating a strong overlap between nightlife-related businesses and the establishments in our dataset.

Although our Google search keyword was ‘club de alterne’, these venues are not legally required to register under a standardised category reflecting their primary activity. Instead, they often select generic labels linked to complementary services such as drinks, rooms or nightlife entertainment. A legal requirement to adopt a standardised category would improve market transparency, reduce classification ambiguity and facilitate more consistent empirical analysis.

We further conduct a descriptive comparison with Google search activity to assess whether online interest aligns with the geographic distribution of establishments. Google Trends provides a normalised index of search intensity (0–100) at the level of Spain’s autonomous communities. Although these data do not match our provincial unit of analysis, they offer an external benchmark. We aggregate provincial counts to the regional level and retrieve Google Trends data for the term ‘puticlub’. As the index reflects relative and long-run search intensity, it should be interpreted descriptively. The correlation between the 2023 regional stock of establishments and the Google Trends index is positive ($\rho = 0.37$, $p = 0.12$), suggesting that regions with more establishments tend to display higher search interest. Given the coarse spatial resolution and normalised nature of the index, this exercise is used solely as background evidence.

3. Data records and descriptives

The dataset has been deposited in the Inter-university Consortium for Political and Social Research (ICPSR) repository under the accession number *openicpsr-217261* and is publicly accessible online. Following the procedures described in this article, the dataset may be updated.

3.1. Provincial-level evidence

Table A2 in the online supplemental data and [Figure 1](#) provide an overview of the provincial distribution of *clubes de alterne* in Spain. Panel (a) shows cumulative Google Reviews as a proxy for online activity; panel (b) reports per-capita values, indicating that concentration is not mechanically driven by population; panel (c) displays the number of establishments per province in 2023. Review counts offer a pragmatic proxy for revealed client engagement in informal markets where direct measures are unavailable.¹ The distribution is highly heterogeneous, with several provinces well above the national median.

Table 1. *Clubes* per 10,000 women by province.

Province	Mean	Max	Variance	Std. Dev.
A Corua	0.0817	0.2041	0.0068	0.0827
Alava	0.0894	0.2360	0.0080	0.0893
Albacete	0.1150	0.3603	0.0138	0.1176
Alicante	0.0816	0.1686	0.0043	0.0657
Almeria	0.0842	0.1882	0.0057	0.0758
Asturias	0.1785	0.9306	0.0624	0.2499
Avila	0.1000	0.2533	0.0132	0.1150
Badajoz	0.0289	0.3756	0.0109	0.1042
Balears	0.0761	0.2670	0.0060	0.0776
Barcelona	0.0720	0.5341	0.0202	0.1419
Bizkaia	0.1013	0.4080	0.0136	0.1165
Burgos	0.0615	0.1692	0.0043	0.0659
Caceres	0.0455	0.1532	0.0039	0.0627
Cadiz	0.1056	0.5002	0.0183	0.1352
Cantabria	0.1740	0.4594	0.0214	0.1461
Castellon	0.0286	0.0686	0.0009	0.0305
Ceuta	0.0000	0.0000	0.0000	0.0000
Ciudad Real	0.0624	0.1615	0.0054	0.0732
Cordoba	0.0765	0.2414	0.0049	0.0703
Cuenca	0.1390	0.4090	0.0233	0.1526
Gipuzkoa	0.1419	0.2974	0.0115	0.1073
Girona	0.0927	0.6081	0.0260	0.1612
Granada	0.0825	0.2142	0.0063	0.0796
Guadalajara	0.0599	0.0801	0.0012	0.0342
Huelva	0.0103	0.0377	0.0003	0.0166
Huesca	0.1091	0.1832	0.0054	0.0734
Jaen	0.1267	0.3332	0.0124	0.1113
La Rioja	0.2263	0.8887	0.0704	0.2653
Las Palmas	0.0409	0.1600	0.0024	0.0487
Leon	0.1205	0.2174	0.0066	0.0815
Lerida	0.1219	0.2317	0.0084	0.0918
Lugo	0.0732	0.2394	0.0090	0.0949
Madrid	0.0187	0.0399	0.0003	0.0175
Malaga	0.0527	0.1049	0.0019	0.0434
Melilla	0.1485	0.4767	0.0322	0.1793
Murcia	0.0086	0.0584	0.0003	0.0162
Navarra	0.1156	0.4422	0.0154	0.1242
Ourense	0.2558	1.0035	0.0943	0.3071
Palencia	0.1091	0.3765	0.0222	0.1490
Pontevedra	0.1040	0.2661	0.0118	0.1087
Salamanca	0.0778	0.3045	0.0088	0.0936
Santa Cruz de Tenerife	0.0860	0.4145	0.0128	0.1133
Segovia	0.0417	0.1310	0.0039	0.0621
Sevilla	0.1532	1.4083	0.1441	0.3796
Soria	0.1057	0.2295	0.0138	0.1173
Tarragona	0.1324	0.9021	0.0546	0.2337
Teruel	0.1083	0.3029	0.0199	0.1411
Toledo	0.2212	1.4995	0.1597	0.3996
Valencia	0.0605	0.3518	0.0085	0.0924
Valladolid	0.1020	0.2633	0.0103	0.1015
Zamora	0.0871	0.1193	0.0025	0.0498
Zaragoza	0.1132	0.2777	0.0116	0.1078

Note: Clubs per 10,000 women. Provincial-level statistics computed over the panel period.

We then analyse spatial dispersion across provinces. The first panel of Figure A1 in the online supplemental data maps provinces by the number of cities hosting at least one establishment, showing a strong concentration in a limited number of urban areas. In some provinces establishments are almost entirely centralised in the provincial capital, while in others secondary cities – often coastal and tourism-oriented – host a substantial share, as in Málaga or Alicante.

The second panel of Figure A1 shows that 48.6% of establishments are located in provincial capitals, with an even higher share in regional capitals. These patterns suggest that large urban centres act as focal points due to population density, accessibility and local institutional conditions, underscoring the relevance of intra-provincial heterogeneity.

Our findings should be interpreted within the broader landscape of prostitution in Spain. While this study focuses on *clubes de alterne*, it likely captures only a segment of the market. Ministerio de Igualdad (2024) estimate that about 150,000 women were in situations of prostitution in Spain in 2023 based on

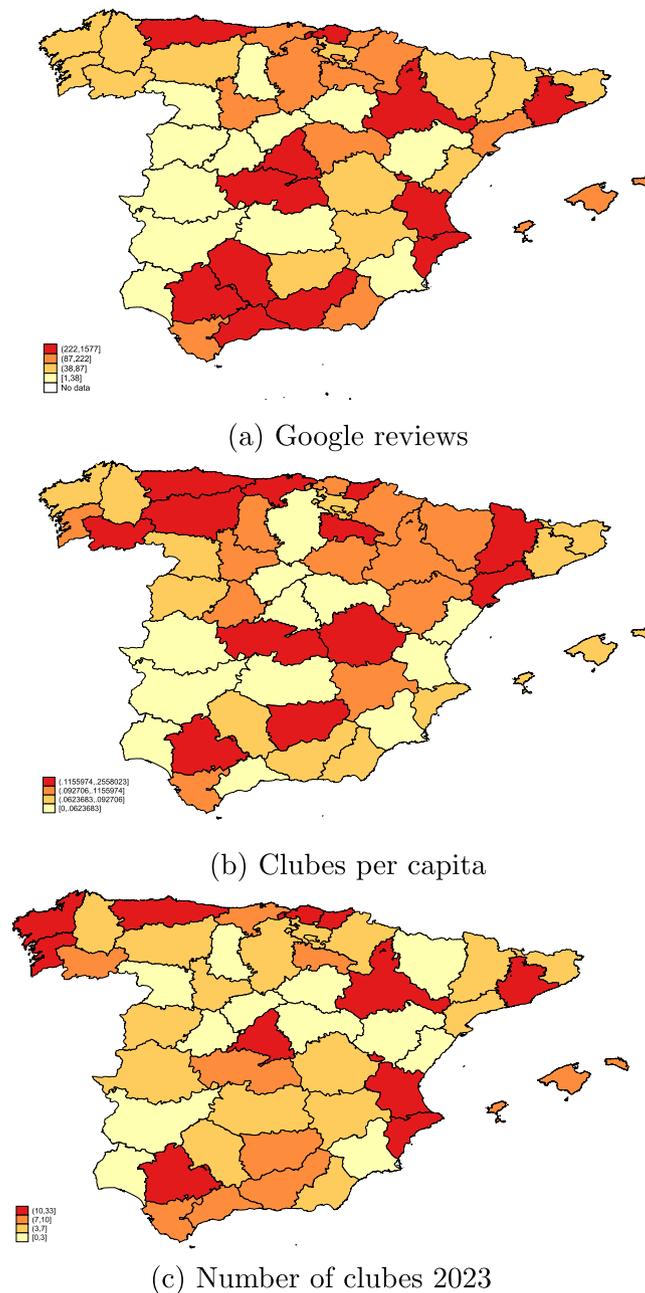


Figure 1. Clubes de alterne in Spain.

Notes: Provincial-level data. (a) Cumulative Google Reviews, 2011–2023. (b) Average establishments per 10,000 women. (c) Active establishments in 2023

online advertisements. This discrepancy highlights the difficulty of mapping hidden populations and suggests that a substantial share of activity occurs outside the channels captured here. Moreover, municipal regulations targeting outdoor prostitution may displace supply indoors, implying that our measure can reflect regulatory stringency as well as market size.

At the national level, prostitution operates within a partial and fragmented legal framework. While there is no law regulating the sale of sexual services per se, several provisions apply. These include Ley Orgánica 4/2015, whose Article 36.11 sanctions acts considered ‘contra la libertad e indemnidad sexual’ in public spaces, and Articles 177 bis, 187 and 188.4 of the Penal Code, which criminalise trafficking, exploitation and third-party profit. These legal instruments do not regulate consensual prostitution directly but constitute the background for enforcement practices. Local governments have increasingly intervened through municipal ordinances targeting outdoor sex work. As documented by Campmaj (2018), Spanish

municipalities have adopted two main approaches: general ‘civility’ or ‘public order’ ordinances sanctioning the offering or negotiation of sexual services in public spaces (e.g., Barcelona 2005; Bilbao 2010; Lleida 2009); and ordinances explicitly aimed at prostitution, such as those adopted in Sevilla (2011, revised 2017) and La Jonquera (2014). Most regulations impose fines on both sex workers and clients, often with higher penalties near schools or residential areas. This local regulatory environment is highly heterogeneous across provinces and provides an essential context for interpreting the spatial patterns we document. In areas with stricter outdoor regulation, the presence of establishments such as *clubes de alterne* may partly reflect regulatory substitution, whereby activities shift from the street to indoor venues. Future research may benefit from combining multiple data sources to better disentangle market size from regulatory effects.

4. External consistency checks

To assess the external validity of our measure, we compare the provincial distribution of *clubes de alterne* with administrative indicators of prostitution and sexual-exploitation dynamics. These exercises are descriptive and do not aim to establish causal relationships, but rather to evaluate whether the spatial patterns captured by our dataset align with established external sources. We begin by correlating our establishment counts with provincial data reported in Ministerio de Igualdad (2024). The Macroestudio provides information on both the observed number of women in prostitution and an estimated figure that adjusts for the hidden component of the market. Panel (a) of Figure 2 presents cross-sectional correlations for

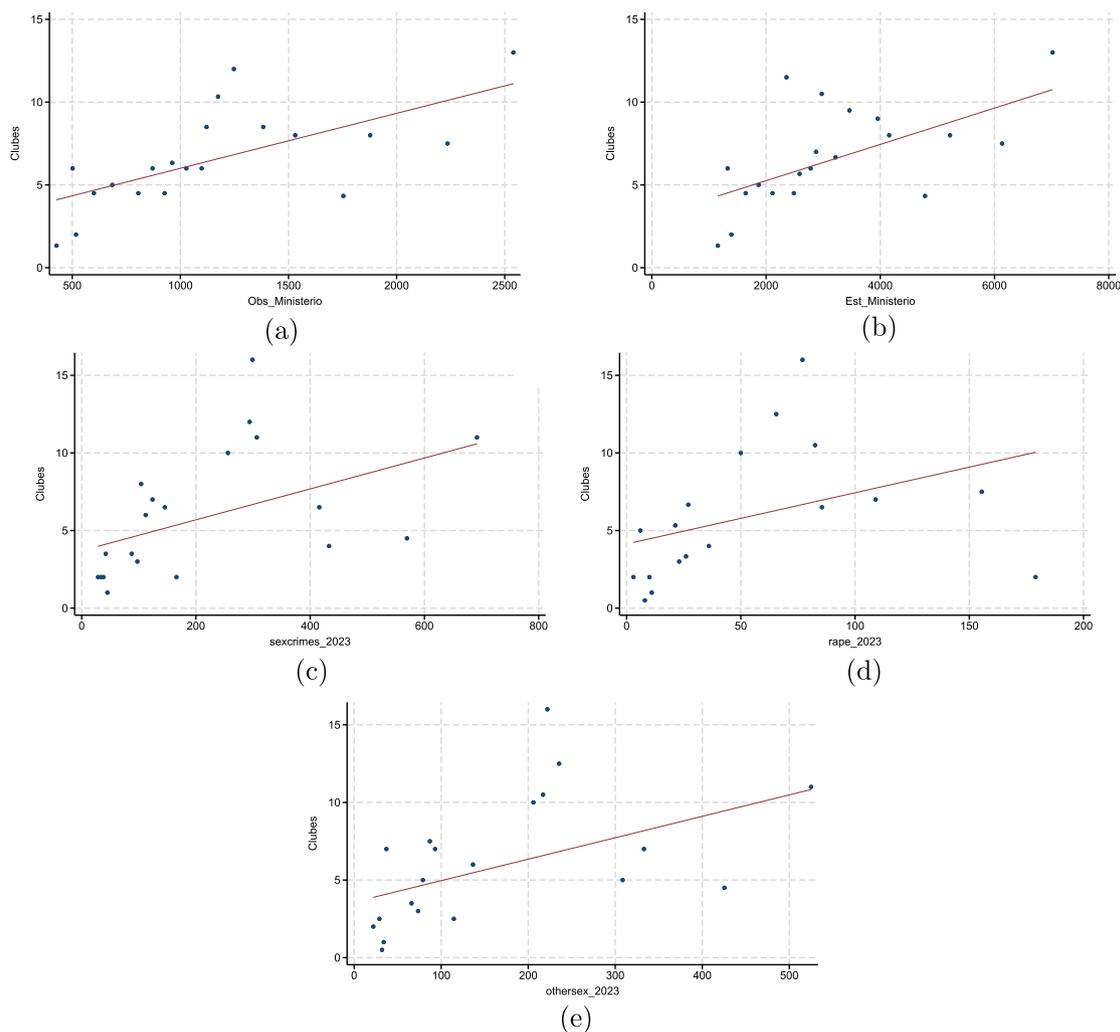


Figure 2. Correlations with external indicators.

Note: Provincial-level correlations between *clubes* and external measure of prostitution from the Ministerio de Igualdad (2024) (a–b) and sex crime data from Spanish Ministry of Interior (c–e). Lines show linear fits; descriptive and not causal.

2023 between the number of establishments and the observed number of women in prostitution, revealing a clear positive association. Similar results emerge when using the estimated number of sex workers (panel b). This comparison is informative because the Macroestudio relies on a distinct data-generating process based on large-scale scraping of online advertisements, and thus offers an independent benchmark for the extensive margin captured by our dataset.

We then turn to crime data from the Spanish Ministry of Interior, which provide an additional external proxy for prostitution-related activity. These data report officially recorded incidents under three categories: sexual offenses, rape and other sexual offenses, harmonised annually at the provincial level. Although these categories do not directly measure prostitution, prior research (Cho, 2015; Ciacci & Sviatschi, 2022) documents systematic links between prostitution and sex-crime incidence, either because they respond to similar socio-economic conditions or because some forms of sexual exploitation are statistically captured within these categories. Panels (c–e) of Figure 2 correlate provincial establishment counts with the three crime categories, yielding positive and meaningful associations. The aim is not to imply causality, but to show that provinces hosting a denser physical infrastructure of prostitution also tend to display higher levels of related indicators identified in the literature.

Taken together, these exercises validate the geographical distribution of our dataset rather than its absolute level. Given the under-coverage inherent in using public digital footprints, our measure should be interpreted as an observable lower bound of the indoor prostitution market. The relevant question is whether it captures relative intensity across provinces. The consistent positive associations across all external benchmarks support this view and provide evidence of convergent validity, reinforcing the interpretation of our dataset as a reliable proxy for the spatial distribution of club-based indoor prostitution.

5. Conclusion

This study shows how digital traces can be systematically leveraged to map the commercial footprint of economic activities operating in regulatory and informational gaps. By constructing the first longitudinal panel dataset of establishments commonly referred to as *clubes de alterne* (2011–2023), we provide a replicable methodology for tracking a segment of the service economy that is largely hidden from official monitoring. Our measure captures the extensive margin of visible, venue-based supply and should be interpreted as a conservative lower bound of this market's observable commercial infrastructure. It does not capture the intensive margin (e.g., workforce size) or less visible indoor or online provision. The spatial persistence documented here indicates that, despite maintaining an online presence, this sector remains partially obscured in official statistics due to non-standardised business classifications. This gap between *de facto* activity and *de jure* categorisation is a defining feature of informal and weakly regulated markets.

Beyond a descriptive account of a specific venue type, our dataset provides an empirical foundation for analysing broader questions in the economics of hidden markets. The framework can be applied to similar regulatory environments where systematic measurement is lacking and may inform both academic research and policy discussions. Future work may combine this establishment-level information with other sources, such as municipal ordinances, labour market statistics, urban indicators or crime data, to build a more comprehensive picture of the sector. By shifting the focus from estimating market size to documenting market structure within regulatory gaps, this study contributes to the applied social science literature on informal economies and institutional opacity.

Note

1. We use 'demand' to denote revealed engagement, not willingness-to-pay.

Acknowledgements

We are grateful to two anonymous referees and the responsible editor and to the participants of the Milan PhD Economic Workshop 2025 for thoughtful comments and suggestions. The research assistance of Carmen Larena Ibáñez through her undergraduate thesis is appreciated. All errors are our own.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The dataset has been deposited in the Inter-university Consortium for Political and Social Research (ICPSR) repository under the accession number openicpsr-217261 and is publicly accessible online. The version used in this paper corresponds to the first release of the project, titled Clubes de alterne in Spain, with <https://doi.org/10.3886/E217261V1>.

ORCID

Riccardo Ciacci  <https://orcid.org/0000-0001-8592-4197>

Alessandro Corvasce  <https://orcid.org/0009-0008-6102-5523>

References

- Ariño, A., Llopis Goig, R., Rodríguez Casañ, R., & Escribá Crespo, M. L. (2022). *La prostitución en la Comunitat Valenciana: una mirada sociológica*.
- Arunachalam, R., & Shah, M. (2008). Prostitutes and brides? *The American Economic Review*, 98(2), 516–522. doi:10.1257/aer.98.2.516
- Bisschop, P., Kastoryano, S., & van der Klaauw, B. (2017). Street prostitution zones and crime. *American Economic Journal: Economic Policy*, 9(4), 28–63. doi:10.1257/pol.20150299
- Campmaj, M. B. (2018). Las ordenanzas municipales: entre la regulacin y la sancin de la prostitucin en espaa. *Revista Crítica Penal y Poder*, 15, 90–109.
- Cho, S.-Y. (2015). The relationship between sex crimes and prostitution in South Korea. *Asian Journal of Criminology*, 9(1), 1–21.
- Ciacci, R. (2023). On the economic determinants of prostitution: marriage compensation and unilateral divorce in U.S. states. *Review of Economics of the Household*, 21(3), 941–1017. doi:10.1007/s11150-022-09643-5
- Ciacci, R. (2024). The dark side of a windfall: unintended consequences of lottery wins. Working paper.
- Ciacci, R., & Sviatschi, M. (2022). The effect of adult entertainment establishments on sex crime: Evidence from New York City. *The Economic Journal*, 132(641), 147–198. doi:10.1093/ej/ueab042
- Cunningham, S., DeAngelo, G., & Tripp, J. (2023). Did Craigslist's erotic services reduce female homicide and rape?. *Journal of Human Resources*, 59(1), 280–315.
- Cunningham, S., & Kendall, T. D. (2010). Risk behaviours among internet-facilitated sex workers: evidence from two new datasets. *Sexually transmitted infections*, 86(Suppl 3), iii100–iii105. doi:10.1136/sti.2010.044875
- Cunningham, S., & Shah, M. (2018). Decriminalizing indoor prostitution: Implications for sexual violence and public health. *The Review of Economic Studies*, 85(3), 1683–1715. doi:10.1093/restud/rdx065
- Cunningham, S., & Shah, M. (2021). *Handbook of Labor, Human Resources and Population Economics*. Springer.
- Meneses Falcón, M. C. (2023). *Viviendo en el burdel*. Diario de una investigadora.
- Ministerio de Igualdad. (2024). *Macroestudio. Trata, explotación sexual y prostitución de mujeres: una aproximación cuantitativa* (Technical report). Ministerio de Igualdad, Centro de Publicaciones, Spanish Government.
- Rodríguez-Casañ, R., & Ariño, A. (2025). Prostitution in the digital age: Analyzing data from Spanish online platforms.
- United Nations Office on Drugs and Crime. (2010). *The globalization of crime: A transnational organized crime threat assessment*. United Nations Publications.
- United Nations Office on Drugs and Crime. (2011). *Trata de personas hacia Europa con fines de explotación sexual*. United Nations Publications.