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Vertical and Horizontal Rental Inequalities in Early 20th-Century Madrid

1. Background and Objectives

European capitals at the turn of the twentieth century were undergoing rapid urban expansion, stratification, and technological change. In multi-storey housing, social status was often encoded vertically: wealthier households concentrated on lower floors, especially the first floor (often regarded as “piano nobile” in Italian or “Belle etage” in French) with larger apartments and luxurious construction, while poorer households climbed more steps (White, 1984). This hierarchical spatial configuration was even more prominent in Southern European cities (Leontidou, 1992). However, despite the prominence of this pattern in social history, quantitative evidence at fine spatial scales has remained scarce. We leverage newly digitized microdata from Madrid (ca. 1905) to:

1. map the horizontal distribution of rents across neighborhoods;
2. measure vertical gradients of rent and status within buildings;
3. assess how much of within-neighborhood inequality is attributable to vertical stratification; and
4. compare early twentieth-century patterns with neighborhood-level rental prices in 2001 and 2019 to evaluate persistence and change.

2. Data

Historical microdata (ca. 1905) from resident register (Padrón Municipal). Household-level entries include street address, dwelling floor, rental payment/value, and occupations (coded to derive social class via HISCO (Leeuwen et al., 2002)). Building-level identifiers allow clustering of units within addresses. The spatial frame is the neighborhood (*barrio*), enabling aggregation and spatial statistics.

Contemporary series (2001, 2019). Neighborhood-level rent per square meter provides two modern benchmarks. These observations allow a long-run comparison of central vs. peripheral zones and the emergence of a north–south gradient.

4. Methods

Our strategy combines spatial statistics and inequality decomposition:

- **Descriptive mapping.** We map mean rent and social-class composition by neighborhood and compute global Moran’s I and local indicators of spatial association (LISA) (Anselin, 1995) to detect hot/cold clusters.
- **Vertical rent gradient.** Within multi-storey buildings we estimate OLS models of (log) rent on floor (1–5+), controlling for neighborhood fixed effects; slopes quantify the price discount with height.
- **Status by floor.** Using HISCO-derived classes (lower/middle/upper), we compute the odds that a household occupies a first floor versus other floors by neighborhood; we summarize spatial heterogeneity in these odds and derive a simple dissimilarity index comparing observed first-floor composition to the neighborhood’s class mix.
- **Inequality decomposition.** We compute the Theil index within neighborhoods and decompose it into a vertical component (between floors) and a horizontal component (within floors), expressing the vertical share as a percentage of total within-neighborhood inequality.
- **Long-run comparison.** For 2001 and 2019 we map rents, cluster hot/cold spots, and compute inflation-adjusted differences and percent changes to evaluate whether early patterns persisted or realigned.

5. Preliminary Findings

- **Classic center–periphery divide (c. 1905).** Central neighborhoods display high mean rents and high internal inequality; peripheral neighborhoods are cheaper and more

homogeneous. A clear north–south contrast emerges among peripheral areas, with northern periphery relatively better-off than the southern counterpart.

- **Verticality is spatially patterned.** Central areas have taller building profiles and a higher prevalence of upper floors; peripheral neighborhoods, especially Pacífico and Plaza de Toros, show many single-storey dwellings and lower average building height.
- **First-floor premium and class sorting (Figure 1).** Upper-class households are consistently over-represented on first floors. Odds ratios exceed 1 in all neighborhoods, albeit with varying magnitudes; the poor are less likely to occupy first floors and the middle class shows heterogeneous patterns (more first-floor presence at the periphery than in the center).
- **Rent decreases with height (Figure 2).** OLS slopes are negative in almost all neighborhoods (exceptions at the periphery with many single-storey or low-rise units), implying 10–15% discounts between first and fifth floors in some areas, and as high as ~80% in central, high-status neighborhoods.
- **Vertical inequality matters (Figure 3 and 4).** In several central neighborhoods (e.g., Cervantes, Cañizares, Príncipe, Floridablanca), vertical differences account for roughly 40% of total within-neighborhood inequality; the share is notably smaller at the periphery.
- **2001–2019 continuity and divergence.** The center remains a persistent hot spot of high rents; the south lags behind. Real price growth is strongest along a north–northwest arc, while southern neighborhoods show modest increases relative to the city. Delicias—once peripheral—catches up substantially, approaching central levels by 2019, yet the broader north–south divide intensifies.

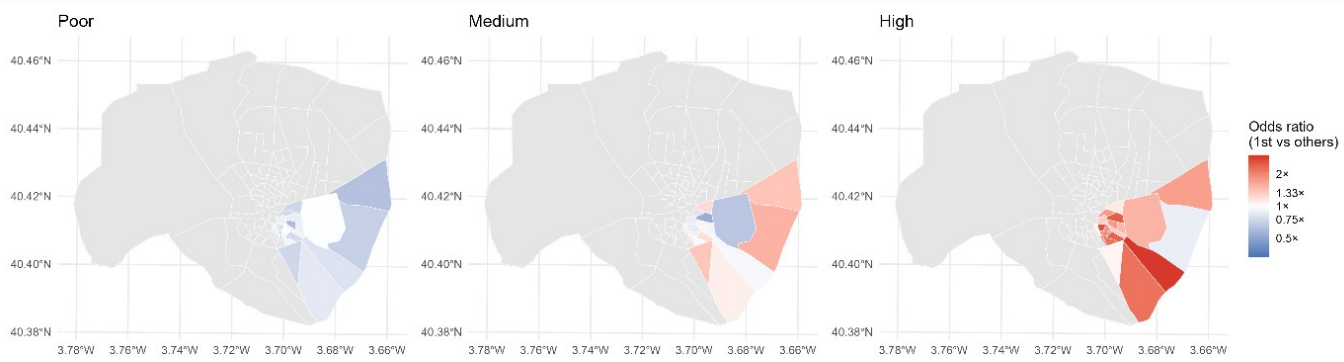

Figure 1: Odds ratio of first floor by barrio and social class

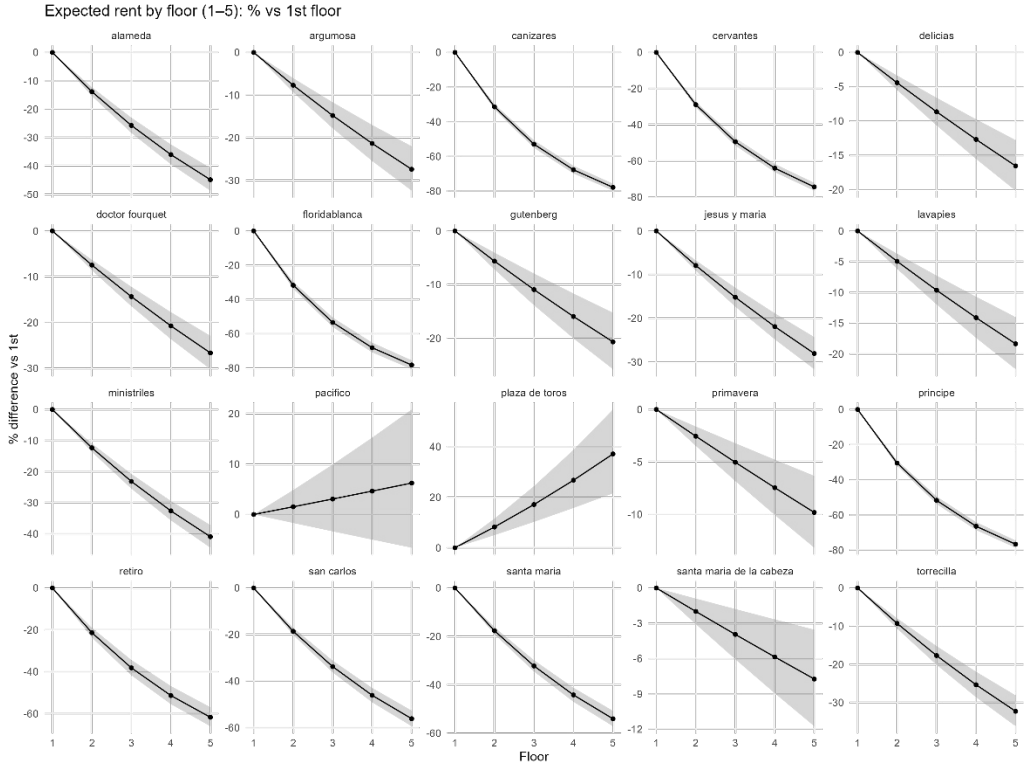

Figure 2: Rent slope by floor using 1st as baseline

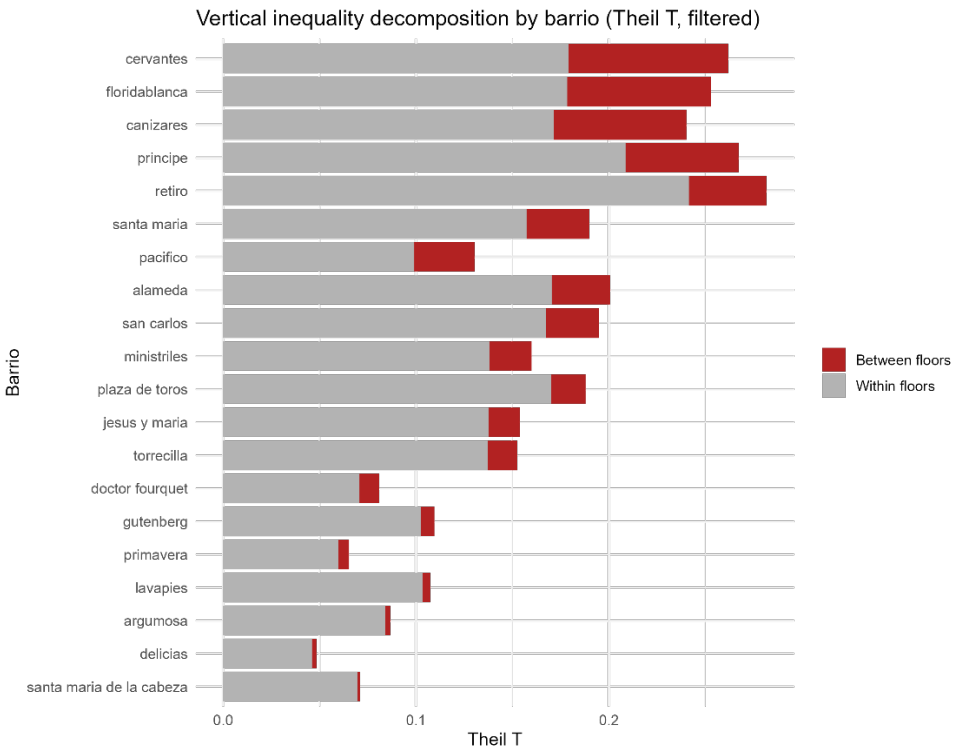

Figure 3: Inequality decomposition by barrio using a Theil index

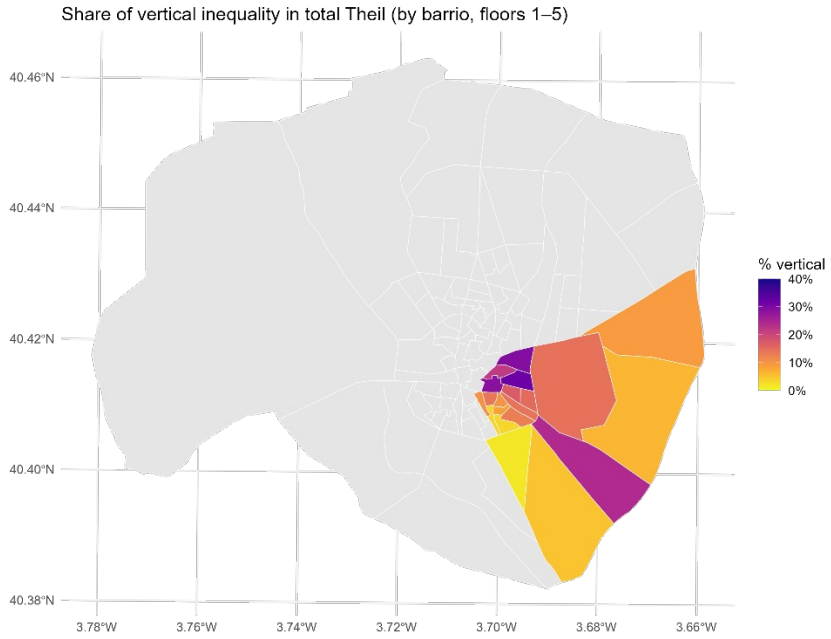

Figure 4: Geographical distribution of the share of total inequality associated with verticality

6. Contribution and Relevance

The paper contribution is threefold. First, it recovers a rarely observed dimension of historical inequality, vertical stratification, at household resolution and embeds it in urban space. Second, it provides a transparent cleaning and harmonization protocol for historical census sources, offering a template for other cities. Third, by bridging 1905 with 2001–2019, it documents both persistence (center–periphery and first-floor premium) and reconfiguration (emergent north–south contrast), informing contemporary discussions on housing affordability, densification, and segregation.

7. Status and Next Steps

We will finalize robustness checks (alternative outlier rules, neighborhood definitions, and floor coding), extend the inequality decomposition to incorporate household size or room counts when available, and prepare a full paper with sensitivity analyses and reproducible code.

8. References

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