

Housing segregation in the Mumbai Metropolitan Region - a spatial model for caste-based discrimination

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1. Introduction

Mumbai, India's financial and commercial capital, is both its wealthiest city and its most diverse. The current capital of Maharashtra and the former headquarters of the Bombay Presidency during British rule - which at its peak extended as far as present-day Sindh in Pakistan - the city has long been home to large minority communities, but was always dominated by Maharashtrians and Gujaratis, who comprised a bulk of the natives of the region. Post-independence, however, the city was (and continues to be) shaped by waves of immigration from across the state and the country, exponentially growing its population and consequently its urbanized area to accommodate these new residents. Large swathes of land to the north of the city, previously independent towns or villages, were annexed by administration, with sprawl oriented around the three major railway lines emanating from the historic city. Mumbai is no stranger to expansion - indeed, the city owes its mere existence to land reclamation by the British - but its scale and scope in the past few decades has been unprecedented. In 1951, the city covered 231.5 km^2 and housed 2.3 million people. By 2011, the city's metropolitan region (henceforth shortened as MMR) spanned $6,328 \text{ km}^2$ with 23.5 million people, with the city proper housing 12.2 million over a mere 603 km^2 . Today, Maharashtrians and Gujaratis only make up 42% and 19% of the city's population respectively, the rest being natives of other states.

These rapid changes in demography have brought with them a significant rise in ethnic, religious, and caste tension.

and combined with rising real estate prices, manifest in

At the same time, real estate prices tend to decrease as one moves outward from the original island city

Daily commutes of three hours or more are common

The state was the center of the caste movement

The existence of widespread discrimination in Mumbai’s housing market has been well-established in the literature [], despite recent laws that have attempted to curb the practice. However, little analysis has been conducted on segregation in the wider metropolitan region, outside the boundaries of the city proper.

Further, analysis conducted in other cities tend to utilize

This project aims to explore to what extent

(see Bharathi, Malghan, and Rahman 2023)

2. Data

The data used in this study comes from The Socioeconomic High-resolution Rural-Urban Geographic Platform for India Project (abbrev. SHRUG). SHRUG is an open access repository that aims to link hundreds of Indian datasets comprising socio-economic surveys, censuses, and environmental studies with common geographic identifiers. Owing to the nation’s size and diversity, Indian record-keeping is notoriously inconsistent, with formats, naming conventions, and even languages often differing within the same state; SHRUG circumvents this issue through its standardization process. SHRUG also obtains a level of geographic granularity that cannot be found in any single government dataset - by splitting the nation into 576,153 uniform areal units termed “shrids” and reaggregating all variables to these, it provides a largely consistent framework by which to analyse different regions at a deeper level than states, districts and sub-districts. It is for this reason that the project utilizes **2011 Population Census Data** (credited to Registrar General and Census Commissioner 2011; Asher et al. 2021) over more recent data like the National Family Health Survey from 2019-21 - cleaning the latter to a level acceptable for analysis would have been a months-long project, as it is not currently available in SHRUG. It would also not yield the granularity desired of areal data for spatial modelling.

The 2011 Population Census data co

Key variables of interest were the SC/ST population in each shrid and

2.1 Data Cleaning

As SHRUG stores district/sub-district data separately from shrid-level data, with no linking variables between the two, finding the specific shrids that comprised the MMR outside of the city proper proved a challenge. This was compounded by the fact that the MMR is defined by the Municipal Corporation and Councils that comprise it, the exact boundaries for which occasionally span multiple state-level districts or include very small portions of specific sub-districts. To rectify this problem as much as possible, I found the spatial intersection between most relevant districts and all shrids

As a result, some areas of the MMR may be missing from the analy

the area of analysis may not perfectly correspond to every area of the MMR s

Note that all of the city proper is a single shrld - the authors of SHRUG mention this as a problem in their documentation and

2.2 Exploration

Table 1: Caste demography of the MMR vs. India

	Region	SC Population (% of total)	ST Population (% of total)	Combined SC/ST Population (% of total)
1	MMR	6.76	3.13	9.89
2	MMR (excluding city proper)	7.12	5.56	12.68
3	India	16.60	8.60	25.20

Table 1 shows

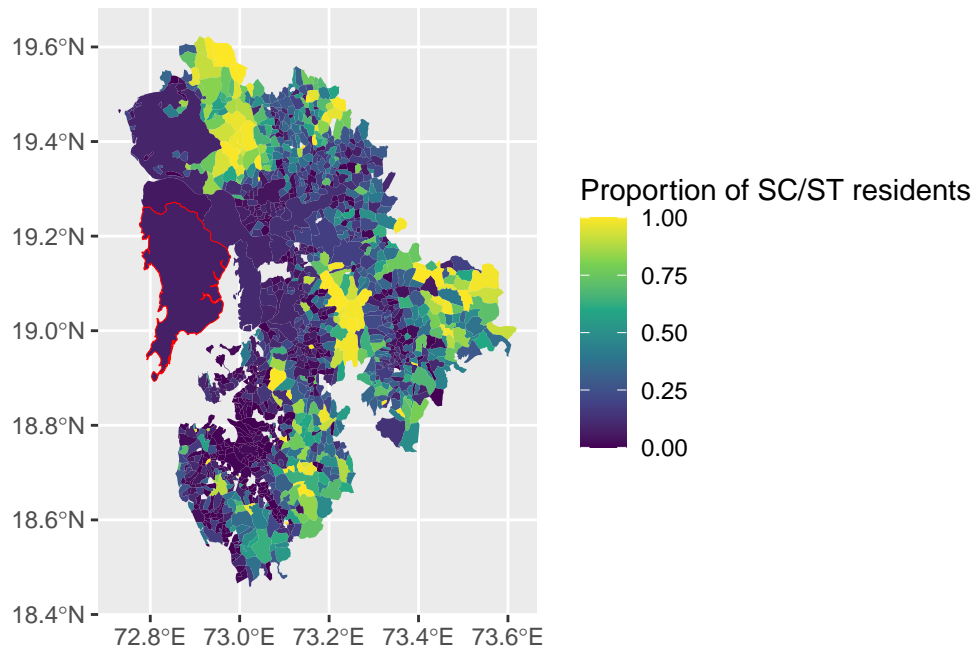


Figure 1 displays a choropleth-map of all regions of the MMR (including Mumbai City/Suburban districts). As before, note that all of the city proper is a single, large shrld,

outlined in red on the map. We observe a pattern of increasing SC/ST percentages as we move further from the city proper,

This indicates

Geary's C	P-value
0.543	0

3. Methodology

3.1 Primary Outcome

The primary outcome of this study is the global spatial dissimilarity index, first formalized in (Feitosa et al. 2007). This index was chosen for its prior use in the Indian context (see Haque et al. 2021, which explores spatial segregation in Kolkata and Bengaluru) as well as its ability to mitigate the so-called “checkerboard problem” (Reardon and O’Sullivan 2004), of central importance in a city like Mumbai

Significance will be tested using a pseudo-significance “p-value” measure, computed on random permutation tests of dissimilarity across different spatial arrangements of the region (using the procedure described in Feitosa et al. 2007, 309–10).

4. Results

5. Discussion and Evaluation

Appendix

<https://www.freepressjournal.in/analysis/mumbai-naama-politicians-and-law-do-not-have-answers-to-mumbais-housing-discrimination>

https://link.springer.com/chapter/10.1007/978-3-030-64569-4_8#:~:text=The%20city%20is%20pervaded%20b

References

- Asher, Sam, Tobias Lunt, Ryu Matsuura, and Paul Novosad. 2021. “Development Research at High Geographic Resolution: An Analysis of Night-Lights, Firms, and Poverty in India Using the Shrug Open Data Platform.” *The World Bank Economic Review* 35 (4).
- Bharathi, Naveen, Deepak Malghan, and Andaleeb Rahman. 2023. “Ethnic Diversity and Economic Development with Spatial Segregation.” *Economics Letters* 222: 110951. <https://doi.org/https://doi.org/10.1016/j.econlet.2022.110951>.

- Feitosa, Flávia, Gilberto Câmara, Antonio Monteiro, Thomas Koschitzki, and Marcelino Silva. 2007. “Global and Local Spatial Indices of Urban Segregation.” *International Journal of Geographical Information Science* 21 (March): 299–323. <https://doi.org/10.1080/13658810600911903>.
- Haque, Ismail, Dipendra Nath Das, Priyank Pravin Patel, and Md Hasnine. 2021. “Towards an Enhanced Understanding of Caste-Based Residential Segregation in Indian Cities: Reflections from Kolkata and Bengaluru.” *Spatial Demography* 9 (2): 187–211. <https://doi.org/10.1007/s40980-021-00085-8>.
- Reardon, Sean F., and David O’Sullivan. 2004. “Measures of Spatial Segregation.” *Sociological Methodology* 34: 121–62. <http://www.jstor.org/stable/3649372>.
- Registrar General, Office of the, and India Census Commissioner. 2011. “Census of India.”