



MACROECONOMICS,
TRADE AND
INVESTMENT



EQUITABLE GROWTH, FINANCE & INSTITUTIONS NOTES

Gender and Property Taxes in São Paulo

May 2023

Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized



TABLE OF CONTENTS

ACKNOWLEDGEMENTS	4
EXECUTIVE SUMMARY	5
1. INSTITUTIONAL CONTEXT	8
1.1 Property taxes in Brazil	8
1.2 The geography of São Paulo	9
2. DATA AND DESCRIPTIVES	11
2.1 Main data sources	11
2.2 Definition of key variables	12
2.3 Preliminary descriptive statistics	14
3. MAIN FINDINGS	16
3.1 Overall property ownership	16
3.2 Wealth ownership	19
3.3 Implications for property tax distribution	24
4. POLICY IMPLICATIONS AND CONCLUSION	26
REFERENCES	29
APPENDICES	31
A.1 Determining the sex of property owners	32
A.2 Calculation of property taxes in São Paulo	34
A.3 Credit markets for property acquisition in Brazil	36



ACKNOWLEDGEMENTS

This note was prepared by Thiago Scot (DIME, World Bank), Tatiana Flores (DIME, World Bank), Davi Moura (PUC-Rio), Javier Feinmann (UC Berkeley), and Roberto Hsu Rocha (UC Berkeley). We would like to express our gratitude to The World Bank Global Tax Program (GTP) and DEC Research Support Budget (RSB) for their generous support. We also extend our thanks to Ceren Ozer (Senior Economist and Program Manager of the GTP, World Bank) for her valuable advice. Our peer reviewers, Hitomi Komatsu (MTI, World Bank) and Caio Piza (DIME, World Bank), provided us with insightful comments and suggestions, which we greatly appreciate. We would also like to thank Juan Santini (DIME, World Bank) for his feedback and Miguel Jacob for his generous help in accessing the data.



EXECUTIVE SUMMARY

As income inequality increased in the developed world in the last decades and the labor share in total income declined, academic and policy discussions on capital and wealth taxation have garnered substantial attention (Saez, Zucman, and Piketty 2022; Piketty and Saez 2012; Zucman 2019). The most common form of wealth taxation, going back centuries, is immovable property and land taxes (Dray, Landais, and Stantcheva 2022). Despite their antiquity and positive features,¹ property taxes are often the target of severe political opposition and are overall underutilized (Cabral and Hoxby 2012).

Taxes on property collect particularly little revenue in low- and middle-income countries—on average 0.3 to 0.6 percent of GDP, while OECD countries collect 2 to 3 percent (Ali, Fjeldstad, and Katera 2017), suggesting significant increases are possible. Despite the challenges to compiling accurate, comprehensive, and up-to-date cadasters, local governments across the developing world have invested significant resources in generating systems to capture and update property registries (Sepulveda and Martinez-Vazquez 2012; Okunogbe 2021).²

Since property taxation is intrinsically linked to property ownership and valuation, understanding ownership patterns across societal groups is key to understanding these taxes' distributional effects. Several studies in low- and middle-income countries have shown that women face significant barriers to owning property, including cultural norms, legal restrictions, and lack of access to credit (Gaddis, Lahoti, and Swaminathan 2022; Komatsu et al. 2021b). Although they are fading, gender-based legal distinctions in inheritance and asset ownership are a reality: nearly 40 percent of all countries still have some level of restriction on women's property rights (World Bank 2022).

This knowledge note provides new evidence on property ownership and taxation patterns across genders in São Paulo (Brazil), the largest city in the Americas, with 12 million inhabitants. We exploit microdata on all commercial and residential properties to document the share of total property and property wealth owned by women, the geographic distribution of female-owned properties, and the implications of this data for property taxes in the city.

1 Property taxes are potentially much less distorting than income taxes and are often directly connected with provision of local public goods and a stable tax base.

2 Knebelmann (2022) discusses how new digital tools like satellite imagery and geolocated cadasters can improve property detection, registration, and billing processes and, overall, change how local governments enforce property taxation.

We start by documenting large gaps in property ownership in the city: women own 30 percent of properties. Properties solely owned by men represent half of all properties, a 20 percentage point (p.p.) higher share than those solely owned by women. Joint ownership by both genders represents less than 10 percent of all properties, and the remaining properties are owned by private and public firms. These gaps in ownership are even higher (26 p.p.) for commercial as compared to residential properties.

Gender disparities are even higher in property wealth ownership. Not only do women own fewer properties overall, but the gap is particularly large for high-value properties: among the top 1 percent of highest-value properties, female ownership is approximately 20 percent. That implies the property wealth gap—the difference in *property wealth* owned by men and women—is even larger: women own 18 percent of total property wealth compared to 38 percent owned by men. These patterns are replicated geographically, but they are larger in the city’s wealthiest areas. When looking at the property level, we observe that properties solely owned by women are 9 percent less valuable than those solely owned by men. Property characteristics like size, type, and year of construction almost fully explain this gap.

We then analyze the implications for property taxation. Since property taxation in São Paulo is increasing in property value, women also pay proportionally less taxes. Despite a flat headline rate of 1 percent, the effective tax rate paid by properties in São Paulo increases in assessed value due to a complex schedule of exemptions and surcharges. We document that women are more likely to solely own fully exempt properties (one-third of their properties are exempt versus 27 percent for men) and less likely to own properties paying more than 1 percent in effective rate. Properties solely owned by women pay 14 percent of all property tax revenue, while those solely owned by men pay 32 percent—the vast majority of the remaining taxes are all paid by properties owned by private firms.

Our study contributes new evidence on the ownership of properties and on property wealth across genders for the largest city in the Americas. Coelho et al. (2022) note the scarcity of “data on the distribution of wealth by gender in developing countries.” Gaddis, Lahoti, and Swaminathan (2022) use Demographic and Health Survey (DHS) data from 41 low- and middle-income countries to document patterns of property ownership across genders. In almost all countries, men are 20 to 50 p.p. more likely to own housing than women. Exceptions are documented by Kotikula and Raza (2021) among poor urban dwellers in Bangladesh and by Holden and Tilahun (2020) among farmers in Tigray, Ethiopia, where the gender gap in housing ownership is practically null. The richness of our data also represents an improvement on previous efforts to measure property tax liabilities across genders. Komatsu et al. (2021a) note large discrepancies in tax liabilities for Ethiopian households when comparing self-reported measures with imputed values using land area and tax schedules, stating that this “highlights the importance of updated administrative tax data and land registries to complement survey data.”

We are also able to provide detailed evidence of gender disparities in ownership in a setting with no *de jure* restrictions on female ownership. According to the World Bank (2022), Brazil provides ample legal protection for women regarding property ownership: men and women have equal ownership and administrative rights over property in a relationship, sons and daughters have equal inheritance rights, and surviving spouses have equal rights regardless of gender. Nonetheless, these protections were only introduced with the new 2002 Civil Code. Before that, the law of the land was the 1916 Civil Code, which stated, “The husband is the head of the household, a function he exercises with the collaboration of the wife,” and which made husbands responsible for “managing joint assets.” Despite these crucial legal changes, the fact that laws explicitly limited the role of women in owning and managing properties within a couple suggests that norms might still assign different roles to husbands and wives within households. In the concluding section, we discuss in more detail the implications of our findings in light of previous research on *de jure* versus *de facto* ownership rights.

Some caveats about our findings should be noted. First, our property value and property wealth ownership measures are based on assessed value, not on the market value of properties. Previous studies have not only documented that assessments are often lower than market value, but they have also found them to be regressive (Berry 2021). Potentially more worrying for our findings, Avenancio-León and Howard (2022) show that the gap between assessed and market value in the United States is particularly large for minority groups. The main mechanism behind this gap is that assessments fail to capitalize on local amenities that increase property market prices—since cities are vastly segregated in the United States, this leads to higher gaps in areas where white owners live. While we recognize that the levels of property value we measure likely underestimate true property value, we argue that differences across the owners’ gender are unlikely to be meaningful, since homeowners do not segregate across space based on gender. Second, our data only allows us to make statements about property tax liabilities, not about property tax payments. Important questions related to the levels of compliance across genders, including nonpayment and late payments, will require additional data. Finally, we use administrative data from the municipality’s property cadaster, meaning that our data does not cover informal settlements and unregistered properties. Carvalho Junior (2017) discusses estimates of property cadaster coverage in Brazil and puts coverage in São Paulo at the 66 to 75 percent range. Our results, in that sense, should be interpreted as being representative of these formally registered properties.

The rest of this report is organized as follows. Section 2 provides institutional context and setup for the property tax in Brazil. Section 3 details data sources and main data descriptive statistics. Section 4 analyzes property ownership patterns and wealth ownership, discussing some of these patterns’ implications for property tax distribution.



Institutional context

1.1 Property taxes in Brazil

Property taxes in Brazil (IPTU, from the Portuguese acronym for “urban property and land tax”) are assessed and collected by municipalities, the lowest administrative level in the country.^{3,4} Tax rates vary between cities, but mostly fall between 1 and 3 percent of assessed property valuation, payable every year. In the municipality of São Paulo, the headline tax rate for residential properties is 1 percent of the assessed value, while the rate for other properties (mainly commercial or unused land) is 1.5 percent. As we discuss further below, several adjustments introduce “progressivity” to the flat rate, such that higher-value properties face higher rates. Often, property taxes need not be

paid at once but are divided into as many as ten installments over the year.

Brazilian municipalities rely heavily on transfers from the federal government to provide a wide range of services, including health and education. In Figure 1a we document that, for the vast majority of municipalities in the country, revenue from property taxes is very small in relative terms: IPTU revenue is less than 5 percent of total revenue in 90 percent of municipalities. Although no single factor explains the mixed revenue performance of IPTU across municipalities or its overall low performance as a revenue source, São Paulo

3 See Carvalho Junior (2017) for a thorough discussion of history, main features, and debates about property taxation in Brazil.

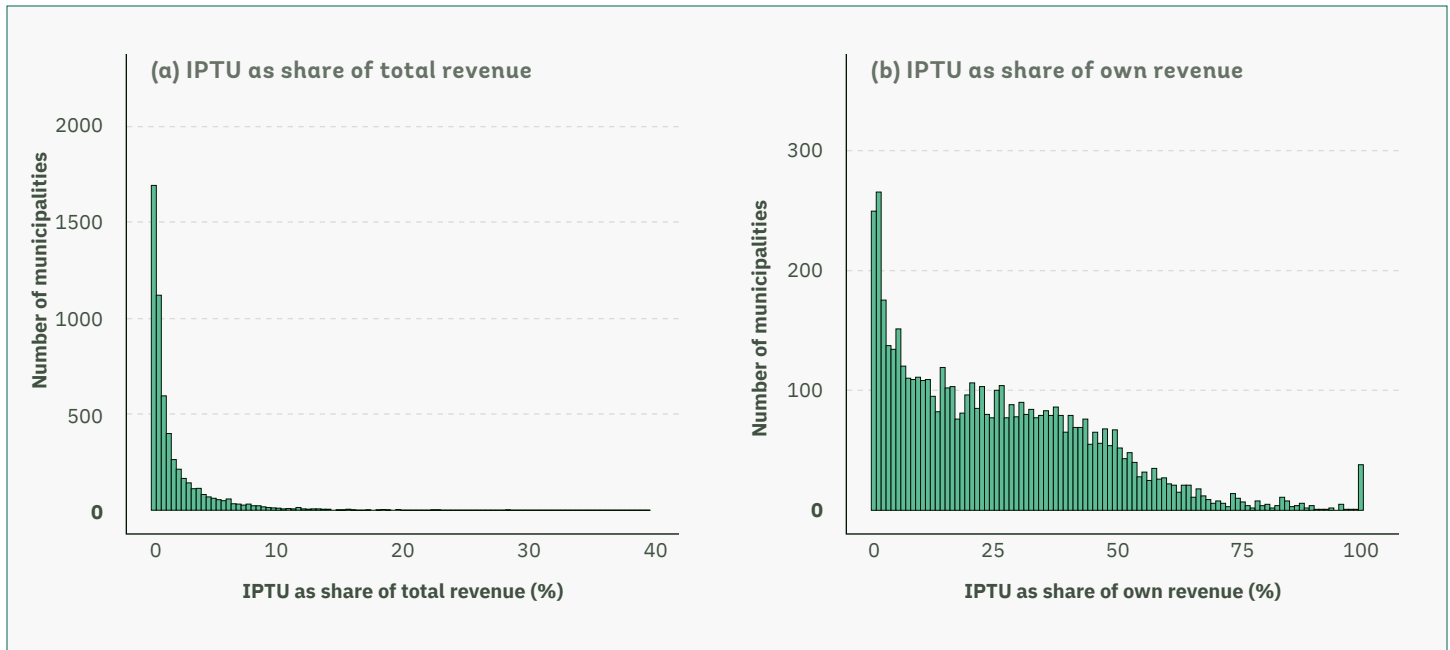
4 We use the term “property taxes” to refer to recurrent, yearly tax liability based on property values. Property transaction taxes, also called stamp duties, also exist in Brazil in the form of ITBI (Tax on Immovable Property Transactions), another municipal tax.

stands out: in 2019, property taxes represented 18 percent of the municipality’s total revenues. When excluding transfers from the central government and focusing on local tax revenue, as described in

Figure 1b, property taxes become more relevant: the median municipality collects 25 percent of its own taxes from IPTU, while São Paulo collects over 35 percent.⁵



Figure 1: Share of local property taxes in revenue



Source: Matos dos Santos, Souto Valente Motta, and Estorani de Faria (2020).

Note: These figures present histograms of the share of local property taxes in total revenue (panel a) and own-revenue (panel b) across Brazilian municipalities in 2019.

1.2 The geography of São Paulo

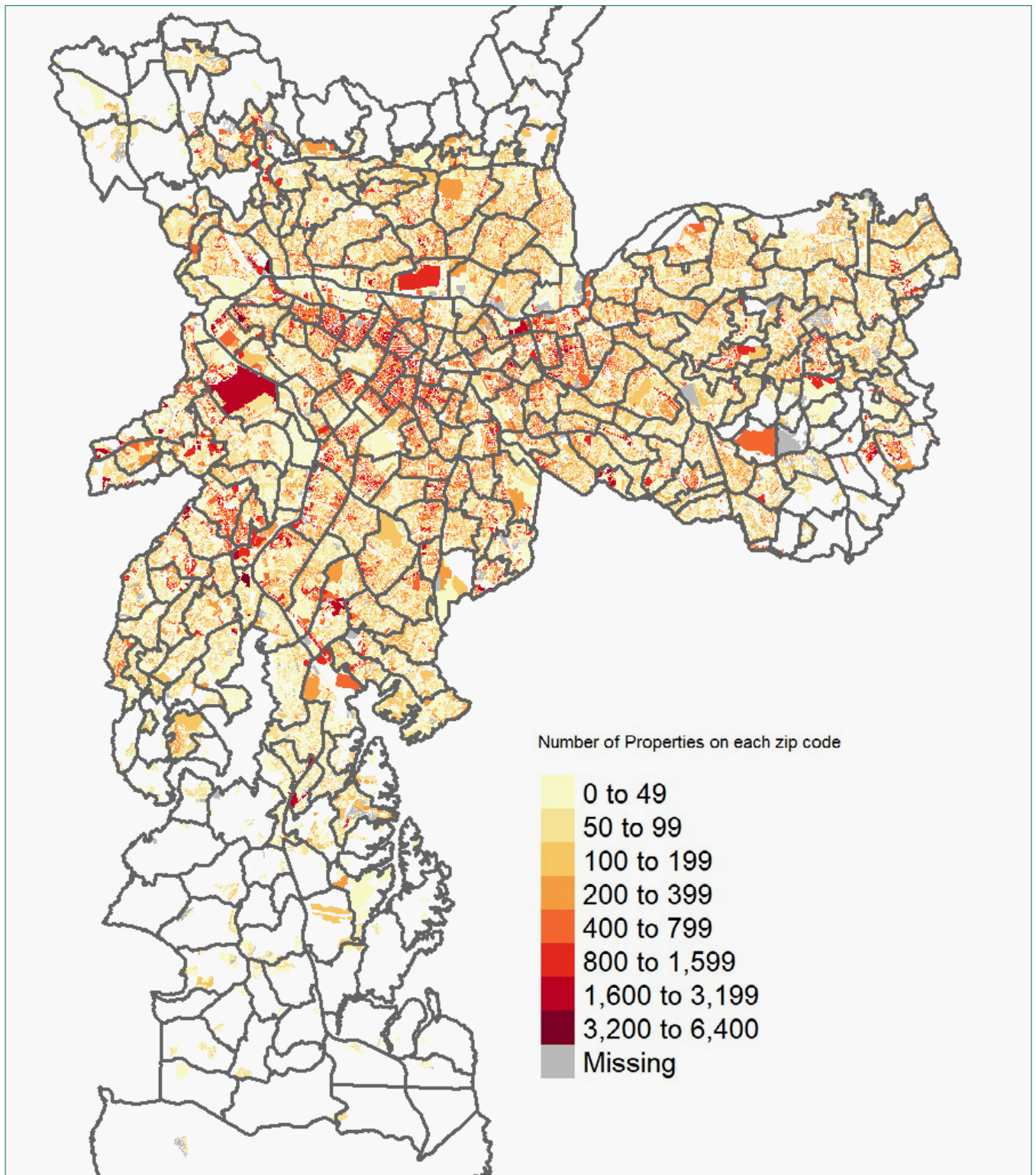
São Paulo, the most populated municipality in Brazil, has a population estimated at over 12 million in 2021 and forms the center of a broader metropolitan region with approximately 20 million inhabitants. The map of São Paulo in Figure 2 provides some insight into the city’s geography by plotting the property density in each of its more than 40,000 zip codes. The vast southern and extreme northern areas show little density and are nonurban, environmentally protected areas. At the

municipality’s core lies the densely occupied central district, dominated by commercial properties and surrounded by higher-income residential areas, particularly to its southwest. Lower-income households are more often found in an outer ring of regions farther from the central district, in particular in the vast eastern regions, which are home to 4.5 million people or close to 40 percent of the city’s population.

⁵ The most important own-revenue for most municipalities is the tax on services (ISS, imposto sobre serviços), a turnover tax on commercial service provision.



Figure 2: Number of properties by zip code



Source: Original calculations for publication.

Note: This map presents the number of properties (residential and nonresidential) in each zip code of São Paulo for 2018. Larger regions delimited by thick lines are fiscal zones, the administrative boundaries related to property valuation assessment.



Data and descriptives

2.1 Main data sources

The main data source for this study is administrative data on the universe of property assessments in the municipality of São Paulo, Brazil, between 2008 and 2018. This is an administrative cadaster, updated yearly, containing information such as property type (commercial or residential), address, zip code, year of construction, and a unique identifier that remains constant over time, thus allowing us to track properties even when they change ownership. The annual update to the database covers all key information used to calculate the property's assessed value (*valor venal* in Portuguese), which is the base for property taxes. We discuss in more detail below how the tax base is calculated, but the information available includes both property characteristics, such as land and built areas and

whether the property is single residency or multiunit, and valuation assessments, such as assessed price per square meter.

We complement this dataset with two other data sources. First, the municipality of São Paulo provides a shapefile of the city that links each property identifier to a geolocated area, allowing us to map all the properties in the database and construct aggregates at levels such as zip code and fiscal zones, the city administrative boundaries linked to area valuation. Second, we match properties to their owners using the property identifier. Ownership data contains the name and national identifiers of owners (CPF),⁶ which allows us to match them to other administrative databases.

⁶ The Individual Taxpayer Registration (CPF) is the registry maintained by the Federal Revenue of Brazil, where any natural person must register once, regardless of age or nationality.

2.2 Definition of key variables

This section discusses in-depth how we construct the key variables used throughout the study, starting with how we assign sex to property owners and followed by details on the calculation of property valuation and tax liabilities.

Our dataset includes the full names of property owners, which enables us to extract each of their first names. We then match the owners to a database generated from the 2010 Brazilian Census, which contains more than 100,000 first names and, for each name, determine the frequency with which the individuals self-declare their sex as male and female.⁷ First names in Brazil are mostly gendered, with over 90 percent of unique first names exclusively used by a single sex. We then use a simple classifier, assigning an owner as being female if more than 50 percent of the registered individuals with the same first name are registered in the Census as female.⁸ We recognize that this method will sometimes misclassify individuals whose names are not clearly gendered and that it does not distinguish individuals whose self-identified gender does not conform to names mostly used by a different sex.

We then compute the assessed value for each property, which is the sum of three key quantities: the value of the constructed area, the value of the occupied area, and the value of “excess land.” The value of the constructed area is simply calculated as the assessed value per square meter multiplied by the total constructed area, with adjustments for depreciation depending on building age.⁹ The calculation of the value of the occupied area and excess land is more complex, involving not

only the value of total area but also other factors related to the type of terrain, whether the unit is in a multiapartment building, and the property perimeter.¹⁰ We then assign to each property an assessed value equal to the sum of these three components. It is worth mentioning that the excess land value only applies when large fractions of the total property area are undeveloped; the precise thresholds vary by region of the city, but overall we estimate that only 8 percent of total properties have positive excess area value.

Once we obtain each of the three valuation components, we can calculate the total tax liability. We follow the nomenclature used by the municipality and define the total property liability of property i of type $t = \{\text{Residential, Commercial}\}$ as

$$T_{i,t} = \tau_{P,t} * (\text{ValueBuilding}_i + \text{ValueOccupied}_i) + \tau_L * \text{ValueLand}_i + \text{Adjustments}_i$$

where $T_{i,t}$ is the total tax liability of property i of type t ; $\tau_{P,t}$ is the tax rate applied to the sum of the constructed and occupied area for a property of type t ; and τ_L is the tax rate applied to unoccupied land. In the period we study, the tax on constructed and occupied area $\tau_{P,t}$ was 1 percent for residential properties and 1.5 percent for commercial properties, and the tax on unoccupied land was 1.5 percent.

Despite the headline flat taxes on property values, in practice the final tax liability depends on a complex schedule of exemptions and surcharges, which we summarize in the expression above with the term Adjustments_i . The main form of exemption is based on assessed value. For 2018, any residential property

⁷ This data is publicly available at <https://github.com/turicas/genero-nomes>.

⁸ We provide more detail on this procedure in Appendix A1.

⁹ Assessed values per square meter are defined by the city government and are usually updated yearly according to inflation. A more detailed discussion on the method used to define value per square meter is beyond the scope of this note. See Carvalho Junior and De Cesare (2022) for examples.

¹⁰ We provide more details on these calculations in Appendix A2, including the detailed tax form received by taxpayers, as shown in Figure A2.



with an assessed value below R\$160,000 was fully exempt from property taxes, and properties with values between R\$160,000 and R\$320,000 faced a decreasing exemption. An additional exemption adjustment can also increase or decrease tax liabilities between -0.03% and +0.05% of assessed value. Finally, a municipal law capped the year-over-year increase in tax liability at 10 percent in the period

we study. All of these adjustments are not directly available in the public datasets, so we construct them based on detailed rules to recover the actual liabilities for each property. The main implication of all these adjustments, as we document below, is that in practice effective tax rates are increasing in assessed property value, despite a flat headline rate.¹¹

11 We note that other, more idiosyncratic exemptions exist. Over time, exemptions were provided for Second World War veterans, low-income elderly individuals, individuals suffering from cancer, parents of foster children, etc. Unfortunately, we do not observe this information in the data and thus are not able to incorporate these exemptions in our analysis.

2.3 Preliminary descriptive statistics

We provide preliminary descriptive statistics of our sample in Table 1. We observe approximately three million properties every year and slightly over two million unique property owners. The mean assessed value of all properties was \approx R\$340,000 in 2018,¹² but with wide dispersion: Figure 3 presents a histogram of 2018 assessed values, documenting

that the median property value was R\$160,000 and that three-quarters of properties were valued at less than R\$300,000. Note, however, that the distribution includes a long right tail of properties valued above R\$1 million. The mean tax liability was close to 1 percent of the mean assessed value at R\$3,900.



Table 1: Descriptive statistics

	2012	2014	2015	2017	2018
Property characteristics					
Share residential	0.84	0.85	0.85	0.85	0.85
Mean assessed value (R\$2018)	243,190.19	237,029.56	337,759.33	350,788.89	345,898.11
Mean tax liability (R\$2018)	2,706.85	2,728.48	2,671.52	3,068.20	3,936.76
Share of exempt properties	0.31	0.28	0.31	0.27	0.27
Property ownership					
Share owned by women only	0.27	0.28	0.28	0.29	0.29
Share owned by men only	0.51	0.50	0.50	0.49	0.49
Share owned jointly by women and men	0.09	0.09	0.09	0.09	0.09
Share owned by private firms	0.10	0.11	0.11	0.11	0.11
Share owned by public firms	0.02	0.02	0.02	0.02	0.02
Number of properties	3,085,491	3,186,315	3,235,448	3,383,561	3,414,208
Number of zip codes	41,132	41,319	41,399	41,689	42,143
Number of owners	2,160,459	2,253,353	2,285,747	2,385,551	2,420,329

Source: Original calculations for publication.

Note: This table presents the descriptive statistics for 2012, 2014, 2015, 2017, and 2018. The share of residential properties is the share of all properties the municipality considers to be of the type *Residência/Residencial*. *Mean assessed value* is the sample mean of the computed assessed value for all properties each year, following the municipality's method of calculating the property value. We take 2018 values using INPC. *Mean tax liability* is calculated from the mean assessed value, taking into account exemptions and discounts for each different property. *Number of owners* for each year is the number of unique owners. We consider owners to be unique owners if their names and the four digits of their CPF differ from those of all other owners.

¹² Approximately USD150,000 in 2018 PPP exchange rate (USD 1 = BRL 2.23).

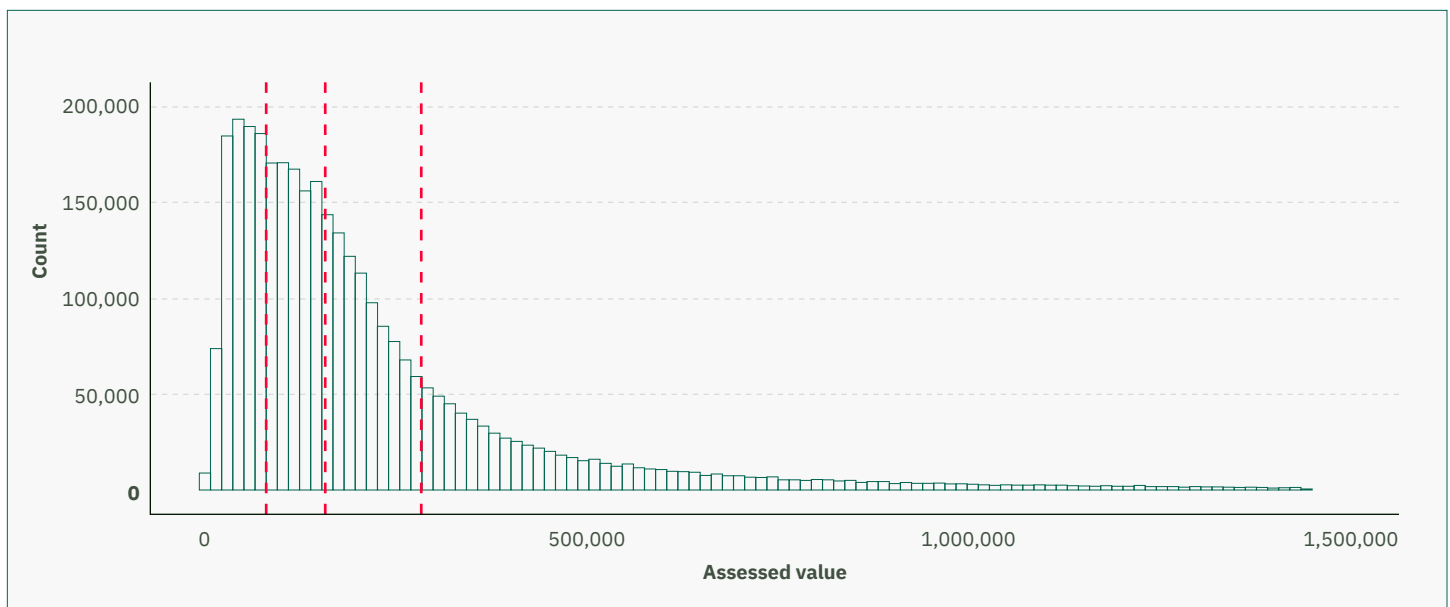
One key component in the calculation of tax liabilities is the exemptions: we estimate that each year due almost one-third of all properties were exempt from paying property taxes due to their low assessed value.¹³

In Table 1 we also provide some preliminary statistics on the characteristics of owners. Around 10 percent of all properties are owned by firms; as we discuss below in more detail, private firms own a larger share of commercial properties, and public firms own some residential properties. The

remaining non-firm-owned properties are classified as being owned solely by men, solely by women, or jointly by men and women. We first document the prevalence of single-gendered property ownership over mixed-gender joint ownership, the latter representing 10 percent of properties across the years. The pattern of ownership by gender is quite stable: half of the properties are owned exclusively by men; 27 to 30 percent of properties are owned exclusively by women.



Figure 3: Histogram of assessed values in 2018



Source: Original calculations for publication.

Note: This figure presents the histogram of the computed 2018 assessed values for all properties. The vertical red lines show the 25th, 50th and 75th percentiles. We trim the distribution at the 97.5th percentile, equivalent to R\$1.4 million valuation, for visualization purposes.

13 This magnitude is consistent with estimates from Carvalho Junior (2017) for large municipalities in Brazil. Smaller municipalities often exempt less than 10% of all properties.

3.

Main findings

This section presents the key findings regarding gender-related aspects of property/wealth ownership in the city of São Paulo and the relationship of gender to property taxes. For the remainder of the paper, we focus on data for 2018, the most recent year available in our panel.

3.1 Overall property ownership

Women own fewer properties than men, across different types of properties and throughout the city. In Table 2, we document key differences in property ownership by gender. First, women solely own 30 percent of all properties in the city versus 50 percent owned exclusively by men. Approximately 9 percent of properties are jointly owned by two or more individuals from both sexes, while the remaining properties are owned by firms. As documented in Table 1, residential properties represent approximately 85 percent of all properties. Gender gaps are even larger for the smaller share of commercial properties: while men solely own over

40 percent of commercial properties, women solely own 16 percent; private firms own almost a third of all of this type of property.

This pattern is replicated throughout the city as documented in Figure 4. Across most zones, women own between 20 percent and 40 percent of all properties, with a slightly higher ownership share in the central, wealthier part of the city. But overall the gender gap in property ownership is rather similar across the geography of the city and similar in magnitude in both central and peripheral areas and for areas with very different income and wealth levels.



In Table 2 we also document that the average value of properties owned solely by women and solely by men are very different. Male-owned properties are valued at R\$270,000 on average, 20 percent higher than the average value of female-owned

properties, which are valued at R\$223,000. In the following section, we assess in more detail these gaps in properties' assessed value, since they have implications for the differences in ownership of property wealth across genders.



Table 2: Summary statistics on owners 2018

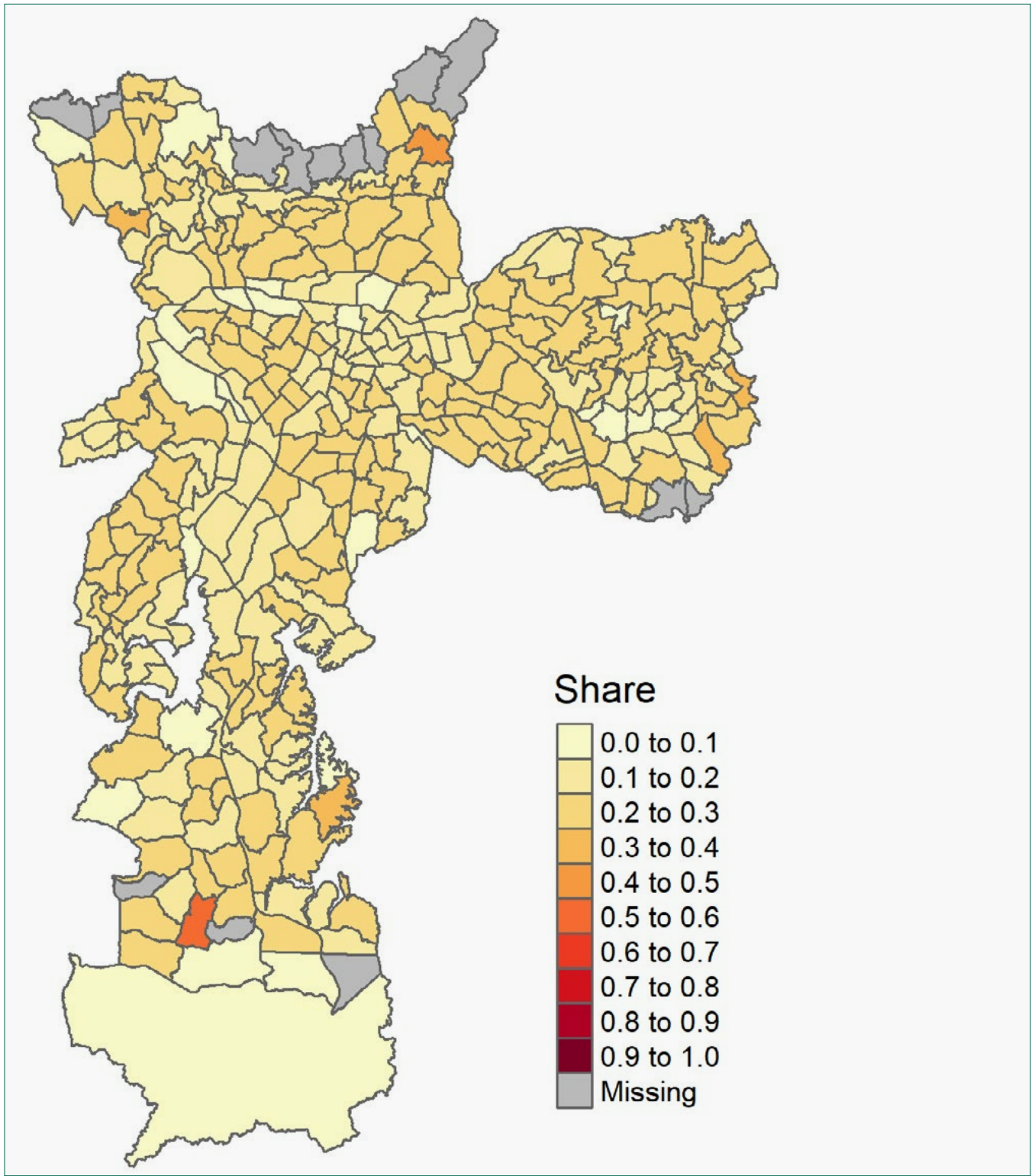
	All	Men	Women	Mixed Men/Women	Private Firm	Public Firm
Number of properties	3,414,208	1,668,753	997,855	308,631	393,857	45,112
Share of all properties (%)	100.00	48.88	29.23	9.04	11.54	1.32
Share of residential properties (%)	100.00	50.02	31.44	9.13	7.96	1.46
Share of commercial properties (%)	100.00	42.50	16.89	8.56	31.49	0.56
Mean value of all properties (R\$)	345,898.11	270,139.06	223,848.55	322,429.09	1,012,848.28	185,656.74
Mean value of residential properties (R\$)	240,357.42	238,936.00	205,450.22	289,521.31	355,983.64	103,132.56
Mean value of commercial properties (R\$)	934,168.80	474,831.74	414,756.28	518,026.35	1,937,876.93	1,377,638.15

Source: Original calculations for publication.

Note: This table presents the *Number of properties*, corresponding to the number of properties owned by each group; *Share of all properties* is the corresponding shares of ownership. *Share of residential properties (%)* and *Share of commercial properties (%)* are the share of the ownership for each group of the total number of residential/commercial properties. *Mean value of all properties (R\$)* is the mean assessed property value per group in Brazilian reais. Likewise, *Mean value of residential properties (R\$)* and *Mean value of commercial properties (R\$)* represent the mean value for residential and commercial properties in Brazilian reais. Designations of *Women* or *Men* are considered when only one gender owns the property. If a property is split between men and women, it is considered *Mixed property*. We group public and private firms following the same algorithm.



Figure 4: Share of female owned properties—all properties



Source: Original calculations for publication.

Note: This map plots the share of all properties owned solely by women in each fiscal zone of São Paulo in 2018.

3.2 Wealth ownership

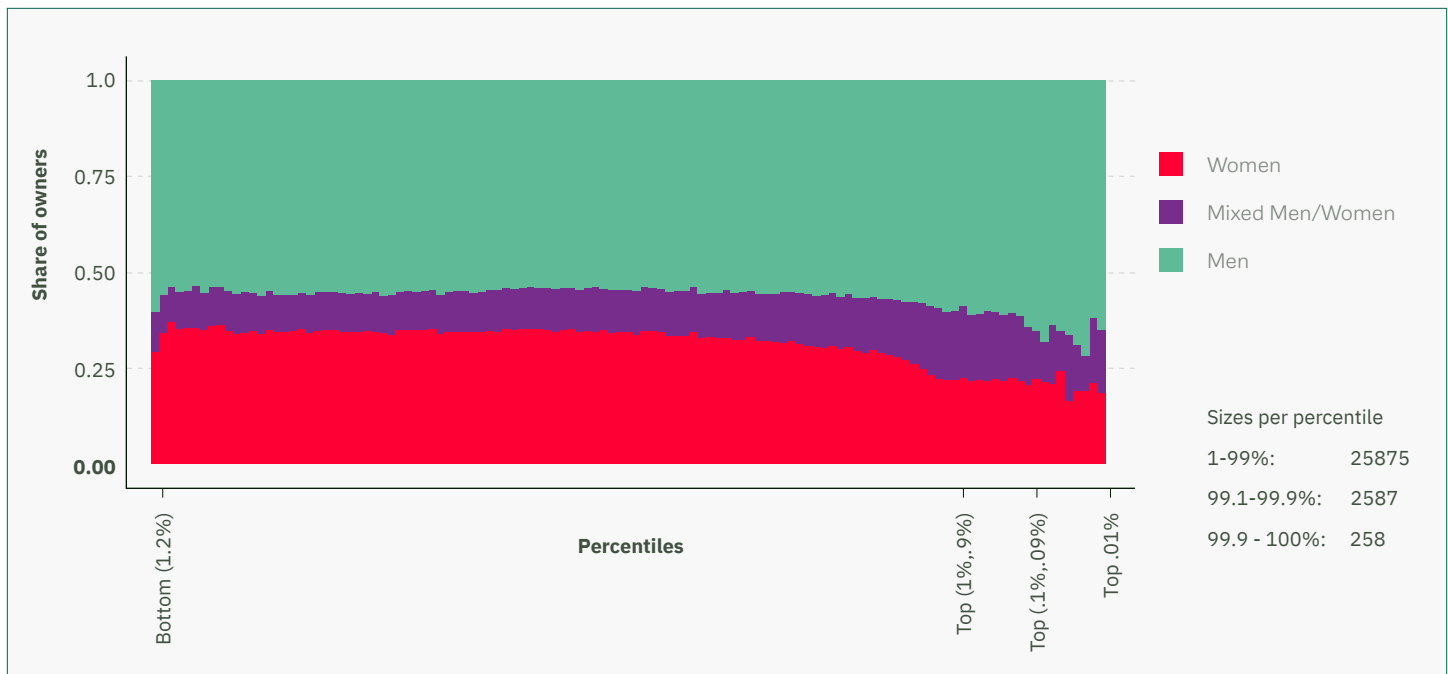
The gender gap in property ownership is larger for high-value properties, implying a larger gap for property wealth ownership. In the previous section we documented the overall levels of property ownership by women. But the documented gaps might be very different depending on the assessed value of properties—our best proxy for property wealth. We use the valuation of properties to understand how this gender gap behaves across the distribution of property values.

We summarize these findings in Figure 5. We first order properties by their assessed value and separate them into 118 quantiles: 99 quantiles for properties in the bottom 99 percent of valuation;

9 quantiles for the top 1 percent; and 10 quantiles for the top 0.1 percent. We then exclude properties owned by firms and compute the share solely owned by women, by men, and women and men jointly. Our key takeaway is that, for most of the distribution, the share of properties solely owned by women is rather stable at approximately 30 to 35 percent, as we previously documented. This share starts to decrease for properties in the top 20 percent, such that for the 1 percent of highest-value properties (those with an assessed value above R\$2.5 million), female ownership is approximately 10 to 15 percentage points (p.p.) lower, at about 20 percent.



Figure 5: Top G percentiles—no firm-owned property

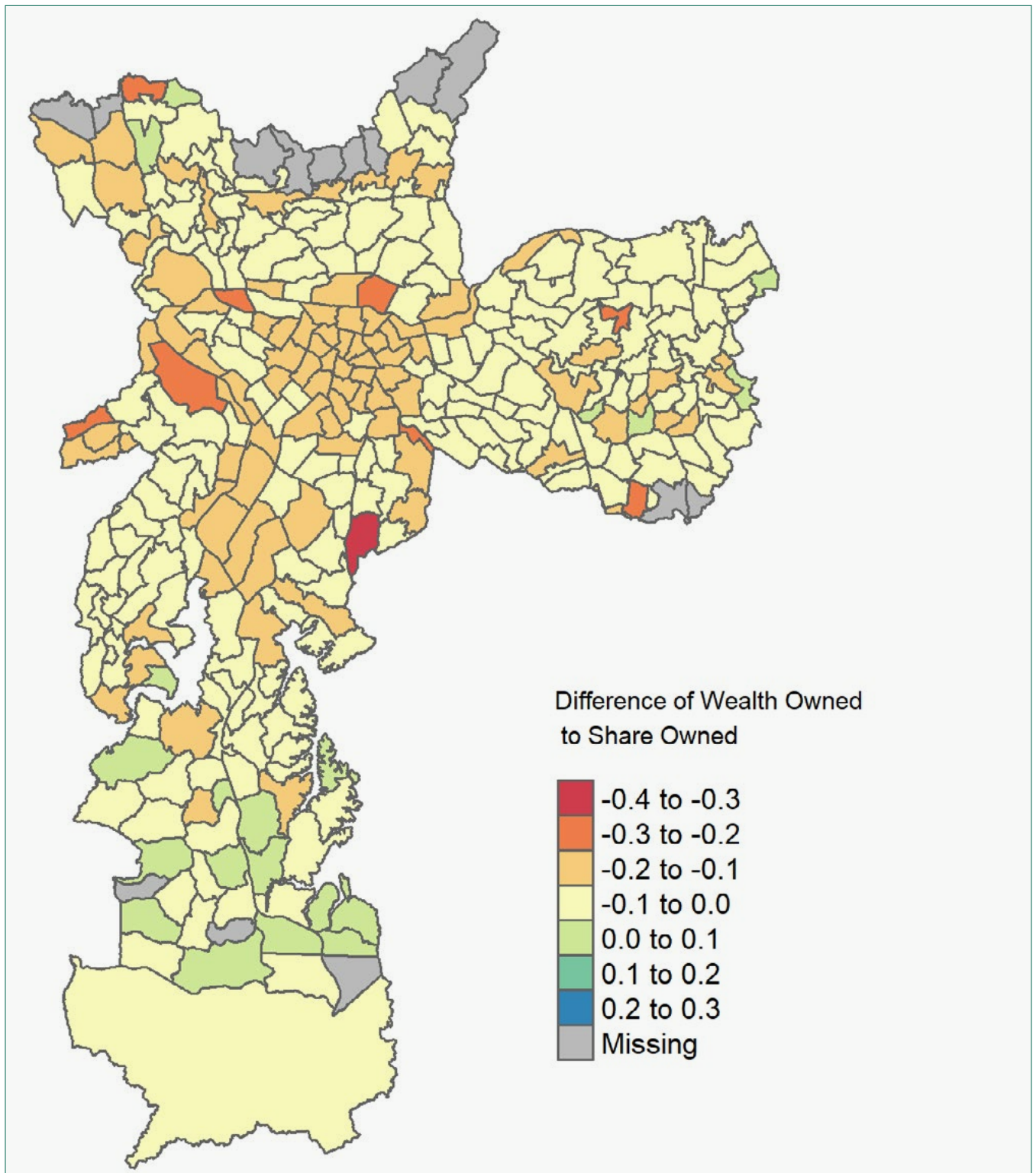


Source: Original calculations for publication.

Note: This figure presents the share of ownership for the different percentiles. We show 99 columns for the bottom 99 percentiles, 9 columns for the bottom tenth-of-percentiles of the top percentile, and 10 for the 10 one-hundredth-of-percentiles of the top tenth-of-percentile. This only shows properties not owned by firms (public or private). Designations of *Women* or *Men* are considered only when one gender owns the property. If property ownership is split between men and women, it is considered mixed. We group public and private firms following the same algorithm.



Figure 6: Difference of share of wealth/ share of ownership—women



Source: Original calculations for publication.

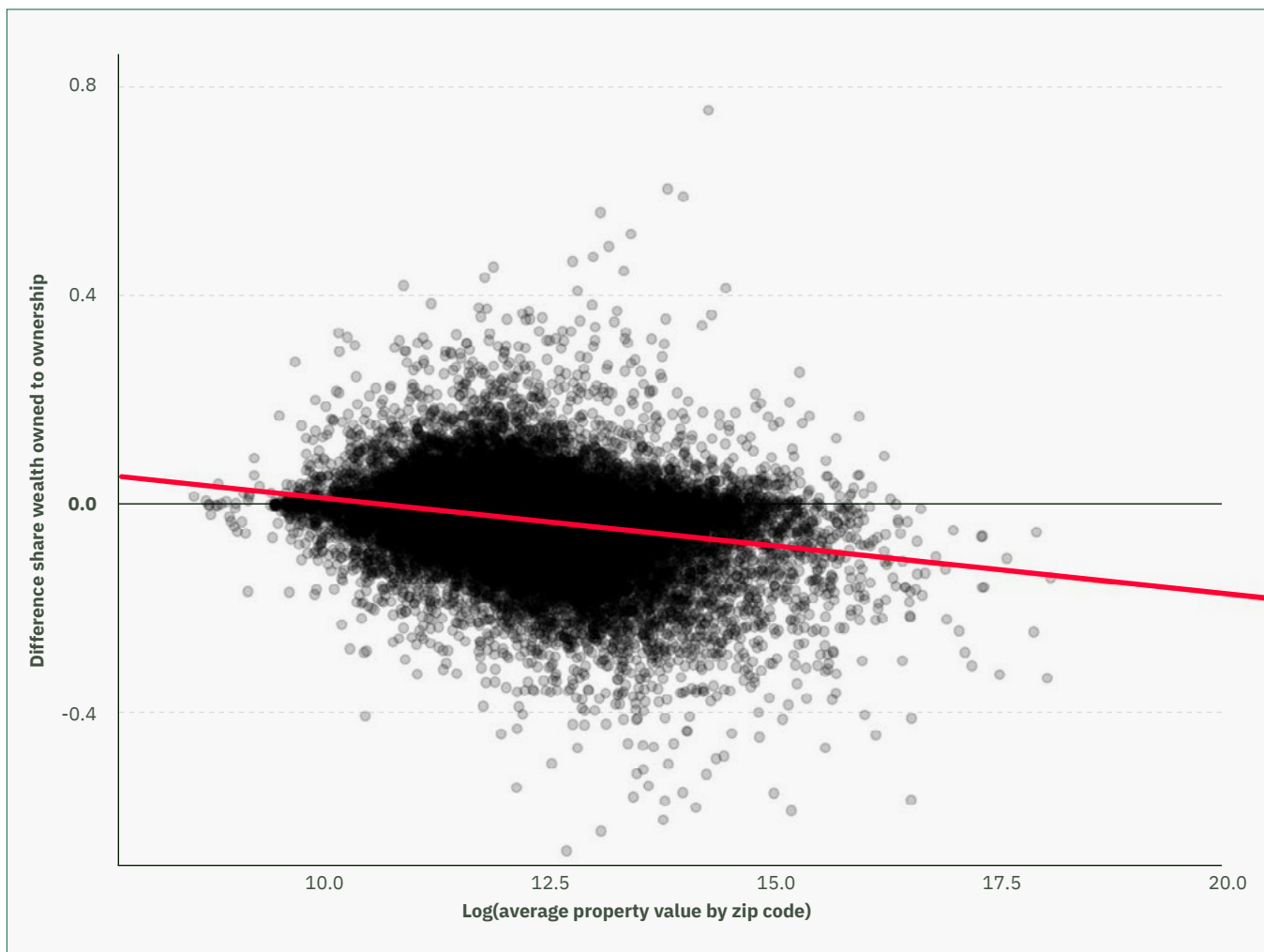
Note: This figure presents the difference between the share of wealth on properties owned by women and the share of property ownership by women in each fiscal zone. Properties are considered owned by women when only women own the property. If ownership is split between genders, we consider the property to have mixed ownership.

This decrease in sole female ownership at the top is driven both by an increase in properties owned by males only, which increase from 55 percent overall to 60 percent at the top 1 percent, but also by an increase in properties owned jointly by male and female owners, which increases from 10 percent to 15 to 20 percent at the top.¹⁴

These patterns are replicated throughout the city, but gaps are larger in areas with higher-valued properties. We previously documented that the share of properties owned by women is quite stable across the geography of São Paulo. When we consider not only the share of properties, but the share of property wealth, the result is somewhat



Figure 7: Difference of share of wealth/ share of ownership—women



Source: Original calculations for publication.

Note: This figure presents a scatter plot of the difference between the share of total wealth on properties and the share of ownership, by women, by zip code and the mean assessed value of all properties. The linear fit is a simple regression of the difference of wealth owned and the share of ownership on the average wealth at the zip-code level, controlling for the log number of properties on each zip code. We use the mean value of log of the number of properties to plot the intercept in the figure.

¹⁴ In Figure A4 we reproduce these results across percentiles of property assessed value and include the participation of firms as well, both for all firms and separately for residential properties only.

different. In Figure 6 we plot, for each fiscal zone in the city, the difference between the share of property wealth owned by women and the share of the number of properties owned. If the average valuation of women- and men-owned properties were the same, this indicator would be zero across the city. What we observe instead is particularly large gaps in the central district and adjoining areas, where the share of property wealth owned by women is often 10 to 30 p.p. lower than the share of property units owned by them. In more distant areas, where property valuations are lower, we often observe smaller gaps and even positive gaps in some zones, where women own a larger share of property wealth than they own property units, that is, women in these zones own properties that are more valuable than men on average. We formalize that suggestive evidence in Figure 7, where we plot, for each zip code, the difference between the share of property wealth and the share of property units women own and the average of all property value in each zip code. What we see is a negative correlation, with a semi-elasticity of -0.02 —when moving between two zip codes with 1 percent different average property values, we expect to see a 2 percentage point higher gap in female wealth ownership in the zip code with more expensive properties.

Property characteristics fully explain the gender gap in property values. While we document that women own property that is, on average, less valuable than property owned by men and that these gaps vary across the city, we have so far not discussed what mechanisms explain that

fact. Racial differences in market and assessed property value in the United States, for example, are explained both by property characteristics and by location factors that drive property value (Avenancio-León and Howard 2022). In Table 3 we explore whether the gender gaps we observe are fully explained by property traits like size and type of use or by geography as well; since we only observe assessed values, these differences would be driven by differences in assessed value per square meter in different areas of the city. We start by quantifying the average gap in column (1): properties owned solely by women are 9 percent less valuable than those exclusively owned by men. Once we control for a series of property characteristics in column (2), this gap almost fully disappears: the point estimate on the gap is actually positive but only by $+0.5$ percent, an order of magnitude smaller in absolute values than the raw gap. These property characteristics directly enter the value assessment, but they are unrelated to the city's assessment of which areas are more or less valuable, which is incorporated in assessed square-meter values. In column (3) we re-estimate the model by adding zip code fixed-effects, which absorbs almost all variation in terms of valuation of space. This changes our coefficient to -1 percent, but again the magnitude is very small compared to the overall gap. As we discussed above, this is consistent with the idea that the gender gap in property value is not explained by gender segregation across space but by men and women owning properties that differ across observable dimensions, such as size, age, and use.



Table 3: Regression table: Determinants of gender gaps in property value and tax liability

Dependent variables:	Log (Winsorized property value)			Winsorized tax due		
	OLS			Poisson		
Model:	(1) OLS	(2) OLS	(3) OLS	(4) Poisson	(5) Poisson	(6) Poisson
Variables						
Women	-0.0904*** (0.0012)	0.0051*** (0.0006)	-0.0102*** (0.0003)	-0.2056*** (0.0026)	-0.0367*** (0.0036)	-0.0484*** (0.0015)
Residential	-0.3030*** (0.0023)	0.0747*** (0.0038)	-0.0167*** (0.0024)	-1.080*** (0.0029)	-0.0092 (0.0203)	-0.2948*** (0.0061)
Fixed effects						
Zip code			Yes			Yes
Property traits		Yes	Yes		Yes	Yes
Fit statistics						
Observations	2,666,608	2,666,608	2,666,608	2,666,608	2,592,268	2,586,867
R ²	0.01323	0.73234	0.91943	0.06664	0.05790	0.63620
Pseudo R ²	0.00488	0.48280	0.92259	0.09237	0.63235	0.84033
BIC	7,244,352.3	3,767,391.5	1,179,502.3	1.04 × 10 ¹⁰	-2,147,483,648.8	1,773,962,517.8

Heteroskedasticity-robust standard-errors in parentheses
 Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

Source: Original calculations for publication.

Note: Control for property traits include year of construction and type of use fixed effects, as well as controls for the log of build and land areas. Sample is restricted to properties owned exclusively by men or women. Property value and tax liability values are winsorized at the 1st and 99th percentiles.

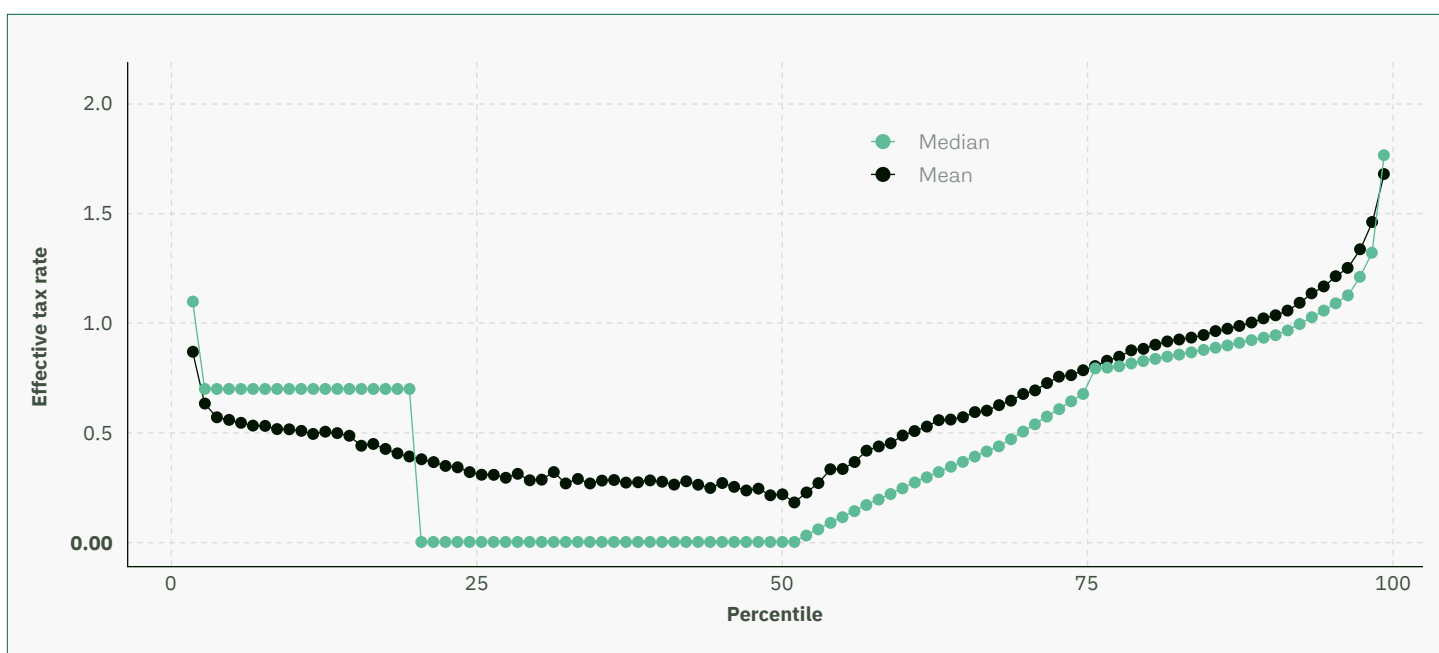
3.3 Implications for property tax distribution

Despite the headline 1 percent flat rate, the effective property tax rate in São Paulo increases with assessed value due to exemptions and other adjustments. In Figure 8 we plot the average and median effective tax rate, defined as the tax liability divided by assessed value, across the percentiles of assessed value distribution. If tax liability was simply calculated as 1 percent of assessed value, both lines should be flat at 1 percent, since all properties would face the same effective rate. In reality, the complex rules of exemptions, discounts, and surcharges create a tax schedule that leads

to high-value properties facing higher effective rates. In 2018, the exemption level for residential properties was close to the median of the property distribution, so the median property below that level is paying a zero effective rate.¹⁵ Starting from the median, the effective rate increases linearly toward 1 percent as discounts are phased out and then keeps increasing, particularly rapidly at the top as property prices rise fast—the top 1 percent highest-value properties face an effective rate of 1.8 percent due to surcharges for properties above R\$1.2 million.¹⁶



Figure 8: Effective tax rate per percentile



Source: Original calculations for publication.

Note: This figure presents the mean and median effective rate, i.e., the tax liability divided by the computed value of the property, for all properties and for each percentile of property value. Lower percentiles can be formed of parking spaces, which are never exempt; also, because each owner can only have one property exempt, the municipality chooses the property with the highest discount, therefore some lower percentiles' values can have higher effective tax rates than properties in the higher percentiles.

15 The high level of effective rates at the bottom 10 percent of the distribution is mainly explained by properties used as parking spots: these have low value but are never exempt. Exemptions also apply only to an owner's first and most valuable property, so some low-value properties are not exempt due to multiple property ownership.

16 In Figure A3, we present the average assessed value for properties in each percentile. While the median property is assessed at R\$160,000, as previously discussed, the average value at the top 1 percent is R\$10 million.

Women face lower effective rates than men since they own less valuable properties.

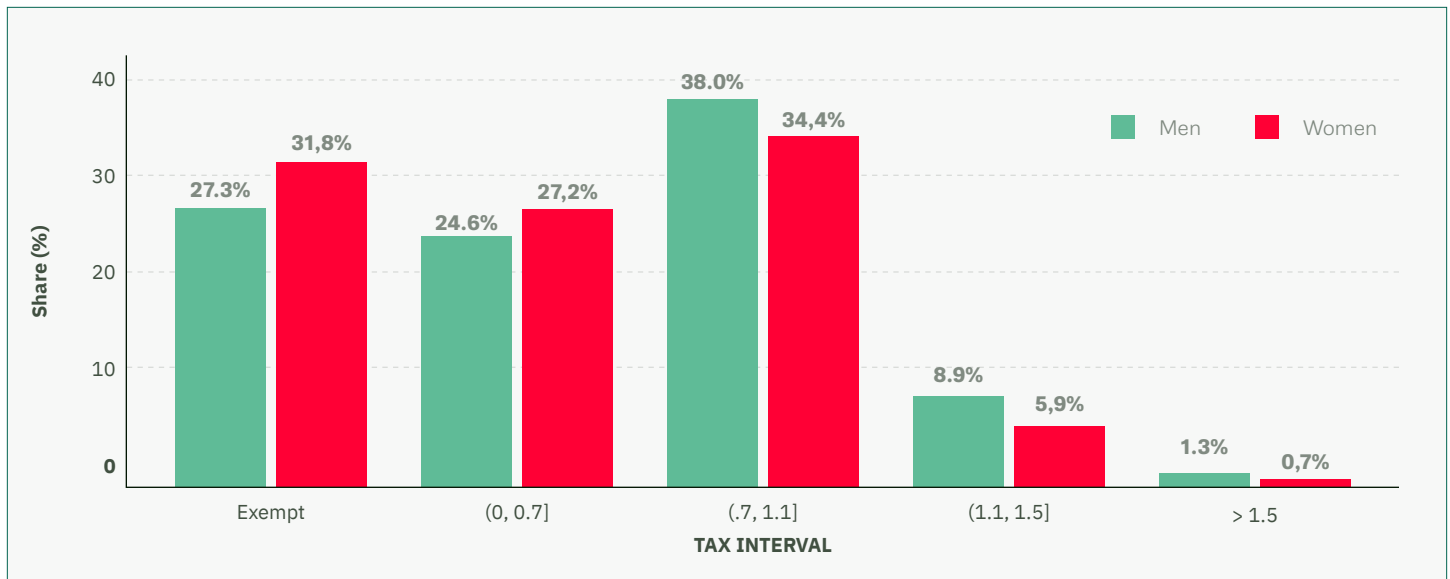
Taken together, the facts that women own less valuable properties and that effective rates increase with assessed value would imply that men pay higher property taxes in São Paulo than women. In Figure 9 below we quantify that difference, assigning taxpayers to bins of effective rates related to the marginal rates present in the tax schedule. First, we note that 32 percent of properties owned solely by women are exempt from property taxes, versus 27 percent for those solely owned by men. Women are also 2 percentage points more likely to pay effective rates between 0 and 0.7 percent, which is the first bracket of low but positive rates. For higher rates, properties solely owned by men are systematically overrepresented: men are 3.6 percentage points (10.2 percent versus 6.6 percent) more likely to own

properties that pay over 1.1 percent in effective rates and thus face surcharges compared to the flat 1 percent rate.

Mirroring our exercise for gender disparities in property valuation, in Table 3 we also present regressions of tax liability on indicators of the gender of the owner and other controls. In column (4) we show the overall gap is 20 percent, and that is reduced by 3 to 5 percent once we include property and area controls.¹⁷ These differences in tax liabilities across genders are important in aggregate: the aggregate liability for properties owned solely by women represent 14 percent of total taxes, while those owned by men face more than double the total amount or 32 percent of total property taxes.



Figure 9: Share of effective tax rate by gender



Source: Original calculations for publication.

Note: This figure presents the share of properties, by gender, on each bin of effective tax rate, i.e., the tax liability divided by the property value. The sample is restricted to properties owned exclusively by men or women.

¹⁷ Since, with exemptions, a large share of properties face zero tax liability, we estimate a zero-inflated Poisson regression.



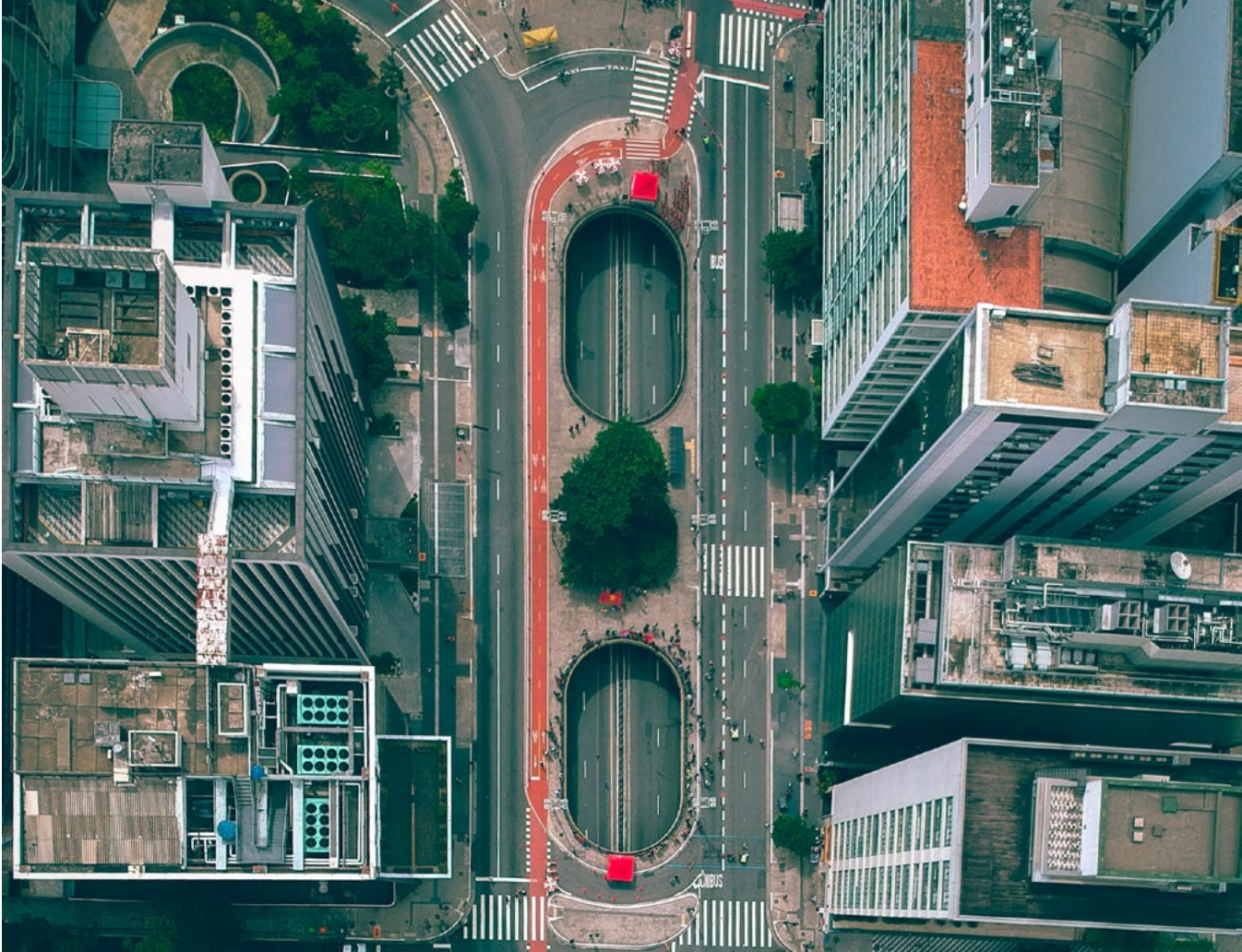
Policy implications and conclusion

In this report we use microdata on property cadasters in São Paulo, Brazil, to document gender gaps in property ownership, wealth, and tax liabilities. Our findings of large gaps in a setting with no *de jure* restrictions on female property ownership invites several other questions. We briefly introduce here three important ones.

First, what are the causes of these gender gaps in property ownership and wealth? While there have been no legal restrictions on female property ownership since 2002, current levels of ownership may still be partly explained by the legacy of those restrictive laws. Furthermore, gender-based norms may change more slowly than legal provisions, and current norms about who should be registered

as the property owner within a couple of different sex might still disfavor women. Gaps in property ownership might also be the result of biases in other settings, such as in labor markets (where women are paid less for the same job or face barriers to entry into certain professions) or in the process of obtaining mortgage loans.¹⁸ Deere and Leon (2003) study gender gaps in land ownership across Latin America using survey data and discuss as important drivers of these gaps the role of gender norms within families and communities and biases in state programs and the acquisition market. We see these as important avenues for further research to understand the determinants of gaps in ownership of urban properties.

18 We summarize the main features of Brazil mortgage loan markets in Appendix A3, including that approximately half of all purchases are made with subsidized credits from federal programs.



Second, what are the consequences of these gender gaps in property ownership and wealth? One important dimension to note in the Brazilian setting is that, unless couples explicitly choose otherwise, the law establishes that all property acquired during a legally recognized relationship belongs to both individuals, regardless of who is the owner on paper.¹⁹ While we are unable to assert whether each property is owned by individuals who are married, it is reasonable to assume that a substantial share of the gap we observe is due to men being the registered property owners within a heterosexual couple. By law, if the property was acquired during the relationship, most of the women in these cases are also legal owners.

Nonetheless, we should not assume this implies they have the same rights as the registered owner in practice. Doss and Meinen-Dick (2020) discuss the importance of robustness of property rights, meaning “the extent to which they are enforceable when under threat.” Delays in court procedures, for example, can make the enforcement of conjugal rights very costly. Furthermore, prior knowledge of these rights might also be absent: Bernardino (2021) documents in interviews with survivors of gender-based violence that often women do not know they have property rights even if they are not listed as owners and that they are “likely to lose their rightful share of property upon separation and inheritance, while their attempts to claim and

19 Article 1.658 of the Civil Code describes the “Partial community property regime” as the default unless couples choose a different regime, with the two main alternatives being a full separation of all assets between spouses and the full joint-ownership between spouses. See, for example, <https://swisscam.com.br/en/publicacao/doing-business-in-brazil/23-aspectos-sobre-o-direito-de-familia-brasileiro/>.

exercise property rights can trigger or aggravate gender violence.” These findings suggest that even though marriage laws assure property rights for spouses, direct property ownership in cadasters provides important assurance of those rights.

A significant body of literature has shown that ownership of assets plays a critical role in women’s bargaining power, productivity, and safety (World Bank 2012; Beegle, Frankenberg, and Thomas 2001; Alvarado et al. 2021). Studies focusing on granting women land ownership in rural areas have demonstrated positive effects on investment and child outcomes (D. Ali et al. 2015), while in urban areas, insecure land and housing rights, particularly in slums, pose greater challenges for women, who tend to outnumber men living in these vulnerable conditions. Studies suggest that women living in slums are disproportionately affected by multiple deprivations, including worse educational outcomes compared to their non-slum-dwelling counterparts and to men living in the same conditions (Azcona et al. 2020). Despite suggestive evidence of the disproportionate effects of asset ownership on women in the cities, data and conclusive evidence on the mechanisms and size of these effects are still lacking.

Finally, given the diagnosis of existing gender gaps in property ownership and previous evidence on its implications, an important question is what policies can be enacted to encourage increased female property ownership. This topic has received

attention from policy makers in Brazil: since 2009, the flagship housing program for low-income families encouraged registration in the name of the female spouse (Law 11.9777/2009).²⁰ A similar law, giving priority to women as formal owners in housing programs, also exists in the State of São Paulo.²¹ Similar policies to encourage property ownership by women exist elsewhere, but their effectiveness is unclear. Awasthi et al. (2023) document that several cities in India provide discounts on stamp duties and recurring property taxes when women are registered as owners. In interviews with stakeholders, the perception is that stamp duties encourage women to be registered as owners but do little to change the actual management of properties, while discounts to recurring property taxes are ineffective. D. A. Ali et al. (2016) show that in informal settlements in Tanzania, small subsidies substantially increase the probability that households will register female members as owners. Nonetheless, the authors recognize that the impact on welfare outcomes for these women is conditional on future enforcement of the legal rights involved. Clear understanding of the mechanisms and magnitudes of the impact of such policies to encourage female ownership will be an important step toward closing these gender gaps.

20 UN Habitat (2013) documents that in the 2009–2010 period, 80 percent of contracts were signed by female-headed households. The law also established that, in the case of divorce, formal ownership of the house would belong to women, but that specific rule has been successfully challenged in court several times as unconstitutional.

21 Originally Law 16.792/2018, incorporated into the broader Law 17.431/2021.

References

- Ali, Daniel, Klaus W. Deininger, Markus Goldstein, and Eliana La Ferrara. 2015. "Empowering Women through Land Tenure Regularization: Evidence from the Impact Evaluation of the National Program in Rwanda." Development Research Group Case Study, World Bank, Washington, DC. <http://documents.worldbank.org/curated/en/241921467986301910/Empowering-women-through-land-tenure-regularization-evidence-from-the-impact-evaluation-of-the-national-program-in-Rwanda>.
- Ali, Daniel Ayalew, Matthew Collin, Klaus Deininger, Stefan Dercon, Justin Sandefur, and Andrew Zeitlin. 2016. "Small Price Incentives Increase Women's Access to Land Titles in Tanzania" [in en]. *Journal of Development Economics* 123 (November): 107–22. <https://www.sciencedirect.com/science/article/pii/S030438781630044X>.
- Ali, Merima, Odd-Helge Fjeldstad, and Lucas Katera. 2017. "Property Taxation in Developing Countries" [in en]. CMI Brief 1. <https://www.cmi.no/publications/6167-property-taxation-in-developing-countries>.
- Alvarado, Gina, Boaz Anglade, Zachary B. Catanzarite, Jackeline Contreras, Cheryl R. Doss, J. Y. Suchitra, Abena D. Oduro, Hema Swaminathan, Jennifer Twyman, and Pilar Useche. 2021. *¿Casa propia? La autonomía económica de las mujeres en Ecuador* [in spa]. Edited by Carmen Diana Deere. Serie Savia. Quito: Ediciones Abya Yala\$Editorial FLACSO. ISBN: 978-9978-67-577-9 978-9942-09-756-9.
- Avenancio-León, Carlos F., and Troup Howard. 2022. "The Assessment Gap: Racial Inequalities in Property Taxation." *Quarterly Journal of Economics* 137, no. 3 (August): 1383–434.
- Awasthi, Rajul, Katie Pyle, Namita Aggarwal, and Parvina Rakhimova. 2023. "Gender-Based Discounts on Taxes Related to Property: Role in Encouraging Female Ownership—A Case Study of Indian States and Cities" [in en]. Policy Research Working Papers, World Bank, Washington, DC. January 2023. <http://elibrary.worldbank.org/doi/book/10.1596/1813-9450-10287>.
- Azcona, Ginette, A. Bhatt, S. Duerto Valero, and T. Priya. 2020. "Harsh Realities: Marginalized Women in Cities of the Developing World." UN Habitat Spotlight on SDG11, UN Women, New York. <https://data.unwomen.org/publications/spotlight-sdg11-harsh-realities-marginalized-women-cities-developing-world>.
- Beegle, Kathleen, Elizabeth Frankenberg, and Duncan Thomas. 2001. "Bargaining Power Within Couples and Use of Prenatal and Delivery Care in Indonesia" [in en]. *Studies in Family Planning* 32 (2): 130–46. <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1728-4465.2001.00130.x>.
- Bernardino, Raquel Ludermir. 2021. "Housing for Survival: Insecurity of Tenure, Property Loss and Domestic Violence Against Women in Recife." Master's thesis, Universidade Federal de Pernambuco, Recife, Brazil.
- Berry, Christopher R. 2021. "Reassessing the Property Tax" [in en]. SSRN Scholarly Paper, Rochester, NY. March 2021. <https://papers.ssrn.com/abstract=3800536>.
- Cabral, Marika, and Caroline Hoxby. 2012. "The Hated Property Tax: Salience, Tax Rates, and Tax Revolts." NER Working Paper, National Bureau of Economic Research, Cambridge, MA. November 2012. <https://www.nber.org/papers/w18514>.
- Carvalho Junior, Bruno Pedro Humberto. 2017. "Property Tax Performance and Potential in Brazil." PhD diss., University of Pretoria, South Africa.
- Carvalho Junior, P. H. B., and C. De Cesare. 2022. "Who Pays the Property Tax? Evidence from Brazil" [in en]. *Land Use Policy* 120 (September): 106235.
- Coelho, Maria Delgado, Aieshwarya Davis, Alexander D. Klemm, and Carolina Osorio Buitron. 2022. "Gendered Taxes: The Interaction of Tax Policy with Gender Equality." IMF Working Papers, International Monetary Fund, Washington, DC.

- Deere, Carmen Diana, and Magdalena Leon. 2003. "The Gender Asset Gap: Land in Latin America" [in en]. *World Development* 31, no. 6 (June): 925–947. <https://linkinghub.elsevier.com/retrieve/pii/S0305750X03000469>.
- Doss, Cheryl, and Ruth Meinzen-Dick. 2020. "Land Tenure Security for Women: A Conceptual Framework" [in en]. *Land Use Policy* 99 (December): 105080. <https://www.sciencedirect.com/science/article/pii/S0264837719310853>.
- Dray, Sacha, Camille Landais, and Stefanie Stantcheva. 2022. "Wealth and Property Taxation in the United States" [in en]. Working Paper 31080, National Bureau of Economic Research, Cambridge, MA. March 2023. DOI 10.3386/w31080.
- Fioravante, Dea, and Bernardo Alves Furtado. 2018. "Crédito Imobiliário" [in pt-BR]. In *Financiamento do desenvolvimento no Brasil*, edited by João Alberto De Negri, Bruno César Pino Oliveira de Araújo, and Ricardo Bacelette. Instituto de Pesquisa Econômica Aplicada (IPEA). <https://repositorio.ipea.gov.br/handle/11058/8820>.
- Gaddis, Isis, Rahul Lahoti, and Hema Swaminathan. 2022. "Women's Legal Rights and Gender Gaps in Property Ownership in Developing Countries." Wiley Online Library, *Population and Development Review* 48 (2): 331–77.
- Holden, Stein T., and Mesfin Tilahun. 2020. "Farm Size and Gender Distribution of Land: Evidence from Ethiopian Land Registry Data" [in en]. *World Development* 130 (June): 104926. <https://linkinghub.elsevier.com/retrieve/pii/S0305750X20300528>.
- Knebelmann, Justine. 2022. "Digitalisation of Property Taxation in Developing Countries" [in en]. *ODI Report*. London: ODI.
- Komatsu, Hitomi, Alemayehu A. Ambel, Gayatri Koolwal, and Manex Bule Yonis. 2021a. "Gender and Tax Incidence of Rural Land Use Fee and Agricultural Income Tax in Ethiopia" [in en]. Policy Research Working Papers, World Bank, Washington, DC. June 2021. <http://elibrary.worldbank.org/doi/book/10.1596/1813-9450-9715>.
- Komatsu, Hitomi, Alemayehu A. Ambel, Gayatri Koolwal, and Manex Bule Yonis. 2021b. "Gender Implications of Rural Land Use Fee and Agricultural Income Tax in Ethiopia" [in en]. Brief, World Bank, Washington, DC. June 2021. <https://openknowledge.worldbank.org/handle/10986/36029>.
- Kotikula, Aphichoke, and Wameq Azfar Raza. 2021. "Housing Ownership Gender Differences in Dhaka, Bangladesh" [in en]. *Land Use Policy: Land Governance and Tenure Security at Scale* 110 (November): 104983. <https://www.sciencedirect.com/science/article/pii/S0264837719307720>.
- Matos dos Santos, Claudio Hamilton, Ana Carolina Souto Valente Motta, and Monise Estorani de Faria. 2020. "Estimativas anuais da arrecadação tributária e das receitas totais dos municípios brasileiros entre 2003 e 2019." *Carta de Conjuntura* 48–3o Trimestre. <https://www.ipea.gov.br/cartadeconjuntura/index.php/2020/07/estimativas-anuais-da-arrecadacao-tributaria-e-das-receitas-totais-dos-municipios-brasileiros-entre-2003-e-2019/>.
- Okunogbe, Oyebola. 2021. "Becoming Legible to the State: The Role of Detection and Enforcement Capacity in Tax Compliance" [in en]. Policy Research Working Papers, World Bank, Washington, DC. November 2021. <https://doi.org/10.1596/1813-9450-9852>.
- Piketty, Thomas, and Emmanuel Saez. 2012. *A Theory of Optimal Capital Taxation*. Working Paper, National Bureau of Economic Research, Cambridge, MA. April 2021. <https://www.nber.org/papers/w17989>.
- Saez, Emmanuel, Gabriel Zucman, and Thomas Piketty. 2022. "Rethinking Capital and Wealth Taxation." Draft. https://eml.berkeley.edu/~saez/PikettySaezZucman2022RKT_v5.pdf.
- Sepulveda, Cristian F., and Jorge Martinez-Vazquez. 2012. "Explaining Property Tax Collections in Developing Countries: The Case of Latin America." ECON Publications, Dept. of Economics, ScholarWorks @ Georgia State University, Georgia State University, Atlanta, GA.
- UN Habitat. 2013. "Scaling-Up Affordable Housing Supply in Brazil: The 'My House, My Life' Programme." UN Habitat, Nairobi, Kenya. <https://unhabitat.org/sites/default/files/download-manager-files/Scaling-up%20Affordable%20Housing%20Supply%20in%20Brazil.pdf>.
- World Bank. 2012. *World Development Report 2012: Gender Equality and Development*. Washington, DC: World Bank.
- World Bank. 2022. *Women, Business and the Law 2022*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/36945>.
- Zucman, Gabriel. 2019. "Global Wealth Inequality." *Annual Review of Economics* 11 (1): 109–38. <https://doi.org/10.1146/annurev-economics-080218-025852>.



APPENDICES

A.1 Determining the sex of property owners

In this section we describe our method of determining the sex of each property owner in our database. Our first step is to extract the first word of the owners' names, which is the (first) given name in Brazil. In Table A1 we list ten of the most common owners' names: five we assign as female (Maria, Ana, Marcia, Vera, and Sandra) and five we assign as male (Jose, Antonio, Joao, Luiz, and Carlos). For example, of approximately four million unique owners, we observe that almost 200,000 (6 percent of total owners) are named Maria and over 160,000 (5 percent) are named Jose.

> > > **Table A1: Most common names by gender**

Name	Obs.	Share	Ratio appearing female	Assigned gender
MARIA	186,003	0.057	0.997	F
ANA	32,345	0.010	0.997	F
MARCIA	14,078	0.004	0.997	F
VERA	12,147	0.004	0.998	F
SANDRA	11,558	0.004	0.998	F
JOSE	166,783	0.051	0.004	M
ANTONIO	91,492	0.028	0.003	M
JOAO	61,307	0.019	0.004	M
LUIZ	48,877	0.015	0.004	M
CARLOS	43,669	0.013	0.004	M

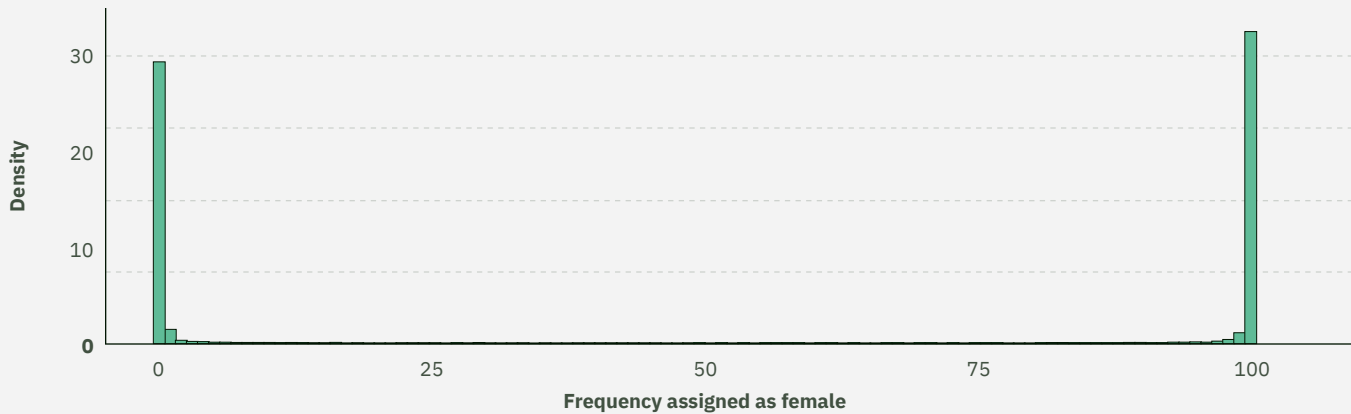
Source: Original calculations for publication.

In a second step, we match each of the names to a database containing all first names encountered in the 2010 Brazilian Census. For each name, the database includes information on the share of individuals with that first name that declare their sex as male or female. This allows us to compute the share of individuals with a given first name identified as female. In column (4), we present these shares for each name. For each of the top five female names, over 99.5 percent of individuals with that name identify as female. Conversely, for first names like Jose, Antonio, and Joao, less than 0.5 percent of individuals identify as females.

Our last step is then a rule-based decision to assign sex to first names (and therefore to owners with that first name): if over 50 percent of individuals on the Census with that name identify as female, we assign their sex as female; otherwise, we assign their sex as male. All sex-based statistics presented in this report derive from this process. We recognize this is not a perfect process, but we argue the sex-assignment errors that certainly exist in our data (male owners we identify as female and vice versa) are likely to be small and to have little effect on aggregate statistics.

Figure A1 presents a histogram, across all first names in our property-ownership database, of the share of individuals in the Census identifying as female. The distribution is highly bimodal: similar to the most common names we list above, for over 80 percent of first names, 99 percent or more of individuals are identified as one sex. Not only are the vast majority of names overwhelmingly used only by one sex, but that is particularly true for popular names: first names for which 99 percent or more individuals identify as one sex represent 93 percent of all individuals in our database.

> > > **Figure A1: Density of frequency of name assigned as female**



Source: Original calculations for publication.

Note: This figure presents a histogram of the share of individuals identified as female in the 2010 Census, across all first names of property owners in São Paulo in 2018. It documents that for over 40 percent of first names, the share of females is above 99 percent, while for another 40 percent the share of females is below 1 percent; that is, these first names are overwhelmingly associated with individuals from one sex.

While the vast majority of owners have first names that are clearly gendered, and therefore unlikely to be misclassified, a small share of owners have names that in the Census data belong to individuals declaring themselves male or female in similar proportion. In Table A2 we exemplify some of these names, presenting the most popular first names for which the ratio of female individuals in the Census is between 45 and 55 percent—meaning if these names are classified as female, our guess at the correct gender will be as close possible to random. The key finding from that table, consistent with previous results, is that these nongendered names are quite uncommon. The two most popular among them are “Darcy,” which we classify as male because 49.3 percent of Census respondents with that name are female, and Juraci, which we classify as female because 54 percent of respondents are female. Taken together, individuals with these top 10 names represent slightly more than 3,500 property owners in our sample, or only 0.1 percent of the total number of owners. Taken together with the previous evidence presented, we argue that this suggests our results are unlikely to be biased by our inability to perfectly assign sex to every owner in the database.

> > > **Table A2: Nongendered names**

Name	Obs.	Share	Ratio appearing female	Assigned gender
JURACI	845	0.0003	0.546	F
YOUNG	218	0.0001	0.503	F
EDIR	150	0.0000	0.504	F
EDY	120	0.0000	0.544	F
TSAI	118	0.0000	0.507	F
DARCY	1,249	0.0004	0.493	M
LIN	407	0.0001	0.471	M
ELY	286	0.0001	0.481	M
LAIR	188	0.0001	0.455	M
DIOMAR	132	0.0000	0.460	M

Source: Original calculations for publication.

A.2 Calculation of property taxes in São Paulo

Figure A2 shows the prefiled tax form presented yearly to property owners in São Paulo, containing the main fields used to calculate tax liabilities. The overall property tax is composed of two parts: a property tax on construction and one on land. The tax base for the former is the sum of assessed value of a constructed area and the assessed value of land incorporated by the building (which varies according to areas of the city and also takes into account factors like the perimeter of the area, the type of terrain, and whether the property provides single-family or multifamily housing). The tax base for land is “excess area,” a measure unconstructed area.

The sum of these two components determines whether a property is eligible for an exemption or discount. For example, in 2018, residential properties with a value below R\$160,000.00 were exempt from the IPTU, while those with a value between the exemption threshold and R\$320,000.00 received a linear discount. Similarly, nonresidential properties were exempt if their value was less than R\$90,000.00, and they received a similar discount, measured by the difference between their value and R\$180,000.00. Finally, the land tax is only calculated if the total area exceeds the constructed space and the land site incorporated by the building; the land tax is measured by the following formula $\text{Min}(\eta_{\text{SZU}} \cdot \text{Occupied area}, \text{Total Area})$, which is not subject to exemptions or discounts.

After taking into account any exemptions and discounts, the IPTU tax rate is applied progressively based on the values of the properties within each threshold. For residential properties, the base tax rate is 1 percent, while for nonresidential properties, it is 1.5 percent. The discounts and increases are then applied accordingly to determine the final tax amount. Table A3 shows the specific discounts and increases for each threshold.

It is important to note that the final value of the IPTU tax also depends on the tax levied the previous year. For instance, in 2018, limits were placed on the increase of nominal tax values. Residential properties were not permitted to increase their nominal tax value by more than 10 percent, while nonresidential properties had a limit of 15 percent.



Table A3: Tax discounts/increases by property value in 2018

Valor Venal	Residential	Nonresidential	(-)
≤R\$150,000.00	-0.3 p.p.	-0.4 p.p.	0
R\$150,000.00 < Val ≤ R\$300,000.00	-0.1 p.p.	-0.2 p.p.	300
R\$300,000.00 < Val ≤ R\$600,000.00	0.1 p.p.	0 p.p.	900
R\$600,000.00 < Val ≤ R\$1,200,000.00	0.3 p.p.	0.2 p.p.	2,100
≥ R\$ 1,200,000.00	0.5 p.p.	0.4 p.p.	4,500

Source: Secretaria Municipal da Fazenda São Paulo

> > > Figure A2: Tax form for property tax in São Paulo



**CIDADE DE
SÃO PAULO**
FAZENDA

Entenda cada campo da cartela do IPTU

Passa o mouse sobre o campo ou clique no **+** para mais informações.

IPTU2023 **+**

IMPOSTO PREDIAL E
TERRITORIAL URBANO

**Notificação de
Lançamento** **+**

CADASTRO DO IMÓVEL **+**

DATA BASE **+**

EXERCÍCIO

NL **+**

CONTRIBUINTE(S) **+**

LOCAL DO IMÓVEL

MENSAGENS

VENCIMENTOS

USO **+**

COB

CIII

SZU **+**

TT/EF **+**

TESTADA **+**

ÁREA OCUPADA **+**

ACC **+**

ÁREAS (M2)

CONSTRUÍDA **+**

TERRENO INCORPORADO **+**

EXCESSO DE ÁREA **+**

VALOR M2 (R\$)

CONSTRUÇÃO **+**

TERRENO **+**

TERRENO **+**

FATORES

OBSOLESCÊNCIA **+**

PROFUNDIDADE **+**

TIPO TERRENO **+**

CONDOMÍNIO **+**

PROFUNDIDADE **+**

TIPO TERRENO **+**

CONDOMÍNIO **+**

FRAÇÃO IDEAL **+**

BASE DE CÁLCULO (R\$)

CONSTRUÇÃO **+**

TERRENO INCORPORADO **+**

EXCESSO DE ÁREA **+**

FATOR

ESPECIAL **+**

ESPECIAL **+**

ESPECIAL **+**

BASE DE CÁLCULO (R\$)
(COM DESCONTO)

(A)+(B) (R\$) - DESCONTO **+**

(C) (R\$) **+**

ALÍQUOTA

PREDIAL **+**

TERRITORIAL **+**

DESCONTO / ACRÉSCIMO

PREDIAL R\$ **+**

TERRITORIAL R\$ **+**

IMPOSTOS CALCULADOS

PREDIAL R\$

TERRITORIAL R\$

FATOR ESPECIAL

PREDIAL **+**

TERRITORIAL **+**

IMPOSTOS CORRIGIDOS

PREDIAL R\$

TERRITORIAL R\$

DEDUÇÕES

PREDIAL R\$ **+**

TERRITORIAL R\$ **+**

IMPOSTO A PAGAR

PREDIAL R\$ **+**

TERRITORIAL R\$ **+**

**CIDADE DE
SÃO PAULO**
FAZENDA

TOTAL DO IPTU (D) + (E) **-** CRÉDITO DA NOTA FISCAL ELETRÔNICA **+** =

TOTAL A PAGAR (R\$)

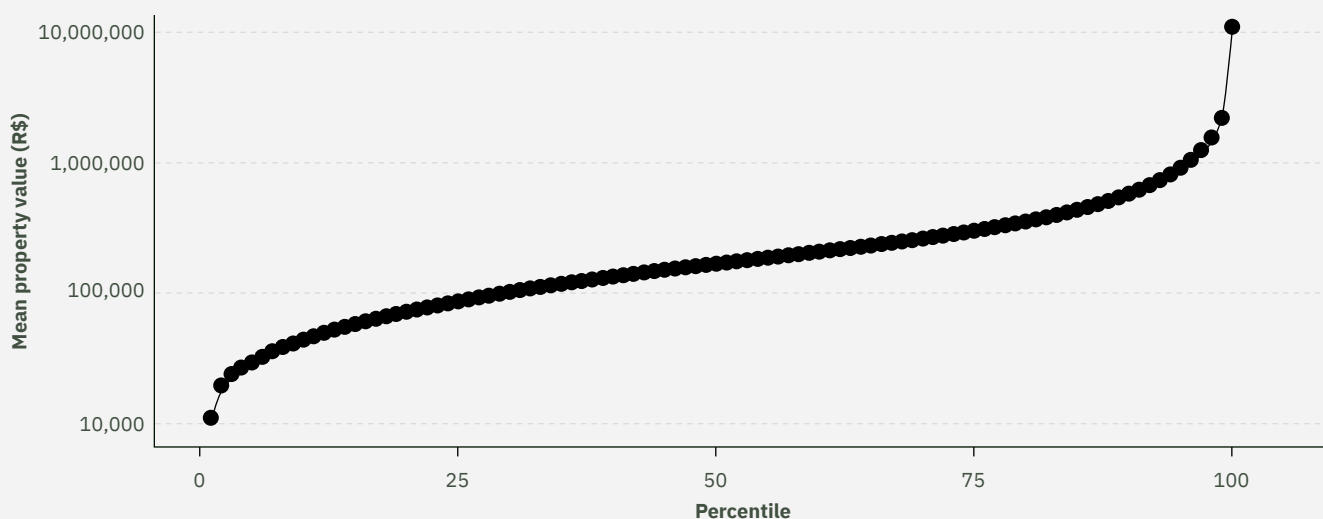
A.3 Credit markets for property acquisition in Brazil

Mortgage lending in Brazil is dominated by government-regulated programs with concessional terms. According to data from the Central Bank, “regulated” credit represents approximately 90 percent of total mortgage credit flow every year. The main program under that umbrella is the Housing Financial System (SFH), originally created in 1964. This program offers credit at reduced interest rates exclusively for residential purchases and is funded in large part by mandatory contributions from formal workers (FGTS) (Fioravante and Alves Furtado 2018). SFH loans are capped at 80 percent of the property’s assessed value and cannot be used to purchase properties above R\$1.5 million. The second source of mortgage financing is the Real Estate Financing System (SFI), where interest rates are market-based and loans can be used for either commercial or residential properties; SFI places no cap on property value.

Mortgage-financed transactions represent approximately half of all property transactions in São Paulo. Unlike mortgage operations, which are closely tracked by the Central Bank, data on the universe of property transactions is scarcer, making it more difficult to estimate precisely the share of cash-only versus mortgage-financed transactions. The Regional Board of Realtors of the state of São Paulo publishes monthly surveys on the nature of property transactions and estimates that approximately 50 percent are financed.* That magnitude is consistent with microdata from the property transaction tax (ITBI) available for the municipality of São Paulo between 2019 and 2022: 40 percent of the properties paying ITBI during this the period were financed by the SFH system. Considering that we do not observe in that data the smaller share of properties not financed by SFI, and that properties in some SFH programs are exempt from ITBI and therefore missing from our data, the share of actual residential transactions with a mortgage is likely closer to 50 percent.

A.4 Additional Figures and Tables

> > > **Figure A3: Mean property value per percentile**

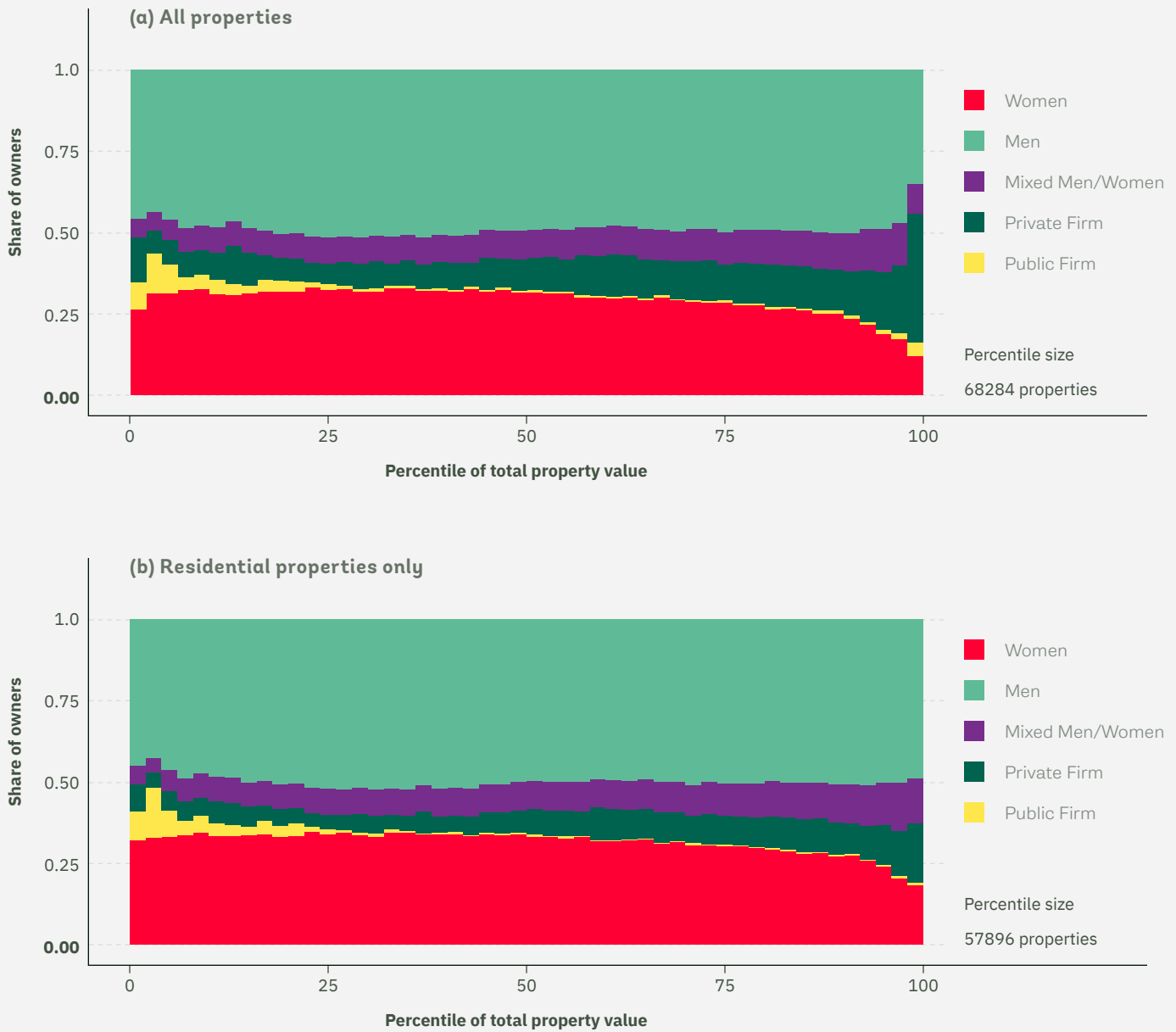


Source: Original calculations for publication.

Note: This figure presents the mean assessed property value for all properties and for each percentile of property value. The Y-axis is presented in logarithmic scale.

* Reports are available at <https://www.crecisp.gov.br/comunicacao/pesquisasmercado>.

> > > **Figure A4: Share of ownership per percentile of property value**



Source: Original calculations for publication.

Note: This figure presents the share of ownership per percentile of all properties in panel (a) and of residential properties in panel (b). Designations of Women or Men are considered only when one gender owns the property. If a property is split between men and women, ownership is considered mixed.

