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Urbanization and housing market dynamics in Türkiye's reclassified cities after the metropolitan reform: Quantile-based insights

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ABSTRACT

This paper examines how house price growth responds to urbanization, demographic and economic conditions, and housing market dynamics across regions differentially exposed to Türkiye's metropolitan reform under Law No. 6360 over the period 2013–2023. The reform reclassified affected provinces as fully urban, creating a structural break in official urbanization measures by eliminating variation in rural population shares. To address this discontinuity, we construct continuity-adjusted urban–rural population series based on pre-reform classifications. Using annual data, we estimate fixed-effects and Method of Moments Quantile Regression (MMQR) models to analyze both average effects and distributional heterogeneity in housing price growth. The results reveal a clear divergence in the relationship between urbanization and house price growth. In reform-exposed regions, urbanization is negatively associated with price growth, with stronger effects at higher quantiles. In contrast, the relationship is positive in non-exposed regions and statistically significant at the middle and upper quantiles. The findings suggest that these differences are linked to variations in housing market structure. While higher transaction intensity is associated with lower house price growth, resale activity amplifies the relationship between urbanization and housing prices. Overall, the study highlights the importance of measurement consistency in urbanization analysis and shows how administrative reclassification can obscure underlying housing market dynamics. The results further demonstrate that regional heterogeneity and market structure play a central role in shaping housing outcomes.

1. Introduction

Can a city's transformation be considered true urbanization if driven solely by administrative reclassification? Without accompanying dynamics such as population mobility, economic change, and infrastructure development, top-down reforms may fail to reflect the social and spatial realities of urban life. When statistical changes are not matched by functional shifts, important questions arise about the inclusiveness and sustainability of such transformations. As the OECD (2018) emphasizes, urban areas should be understood in terms of their functional characteristics such as commuting patterns, economic integration, and service provision rather than being confined to administrative boundaries. This perspective is particularly relevant in the case of Türkiye's metropolitan reform under Law No. 6360,[1] which restructured local government systems and eliminated the urban–rural distinction at the settlement level. By extending metropolitan status to provinces above a specified population threshold, the reform substantially altered official statistics and administrative jurisdictions without necessarily reflecting functional urban expansion. Although this issue is particularly relevant for rapidly urbanizing regions, empirical evidence on the consequences of such top-down reforms for urbanization patterns and socio-economic outcomes remains limited. This study addresses this gap by examining how administrative reclassification is associated with changes in urban statistics and housing market dynamics, which are closely linked to urbanization.

In Türkiye, Law No. 6360 reclassified 14 provinces[2] as metropolitan

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[1] Law No. 6360 (in Turkish) https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6360&MevzuatTur=1&MevzuatTertip=5 (28.05.2025).
[2] The list of provinces affected by Law No. 6360 is in Appendix Table A1.

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municipalities, abolishing[3] the urban-rural distinction in official statistics. Following the reform, the Turkish Statistical Institute (TURKSTAT, 2025) ceased publishing separate rural population figures for these provinces. This shift reflects an institutional redefinition rather than a substantive transformation in settlement structures. Moreover, the resulting discontinuity distorts conventional measures of urbanization, complicates analyses of spatial development, and obscures underlying socioeconomic conditions. For housing markets, where outcomes are closely tied to urban form, such distortions are particularly problematic and risk producing misleading conclusions. Reconstructing rural–urban classifications in line with pre-reform designations is therefore crucial for preserving data continuity and enabling a reliable assessment of the reform's spatial and economic consequences.

These challenges are further compounded by data constraints in empirical research on housing markets. House price indices in Türkiye are available only at the NUTS-2 regional level, where regions may include both provinces affected by the reform and those not affected. Since provinces subject to the reform are recorded as fully urban from 2013 onwards, conventional urbanization measures cannot be meaningfully applied, even within the same NUTS-2 unit. This creates a disconnect between administrative classifications and underlying spatial and economic characteristics, as the reform is based primarily on population thresholds rather than functional urbanization or economic development.

In this context, the central question of this study is how house prices vary across regions with different exposure to Law No. 6360 and how urbanization, demographic, labor market, macroeconomic, and housing market factors are associated with these differences. A complementary question is whether such differences reflect divergences across regions and, if so, which factors emerge as the main drivers based on the empirical analysis. To address these questions, we construct continuity-adjusted urban–rural population data and employ a panel framework to empirically analyze housing price dynamics across regions composed of reform-exposed and non-exposed provinces.

The empirical results reveal a clear divergence in how urbanization is associated with housing price growth across regions. Urbanization is negatively associated with housing price growth in regions that include reform-exposed provinces, whereas the relationship is positive in regions without such exposure. Further analysis indicates that differences in housing market dynamics help explain this pattern, as higher transaction intensity moderates price growth, whereas greater resale activity amplifies the relationship between urbanization and housing prices.

This study makes three main contributions. First, it addresses the measurement discontinuity introduced by Law No. 6360 by constructing continuity-adjusted urban–rural population series[4] for affected provinces, thereby providing a consistent basis for empirical analysis. Second, it generates new evidence on regional housing market dynamics by exploiting variation in reform exposure across NUTS-2 regions and employing fixed effects with Method of Moments Quantile Regression (MMQR) to capture both average effects and distributional heterogeneity. Third, it documents a divergence in the association between urbanization and house price growth across regions and shows that this divergence is linked to differences in housing market activity and composition.

While grounded in the Turkish case, the analysis has broader relevance for the literature on administrative restructuring and urban transformation. It highlights how top-down reclassification can reshape measured urbanization without necessarily reflecting functional changes, with important implications for interpreting urban statistics and evaluating policy outcomes in contexts where rural–urban boundaries are administratively redefined.

The remainder of the paper is organized as follows. Section 2 provides background on the institutional context. Section 3 reviews the relevant literature and outlines the hypotheses. Section 4 details the methodology, sample, and variable construction. Section 5 presents empirical findings. Section 6 discusses the measurement issues arising from the reform. Section 7 concludes.

2. Institutional background and metropolitan reform

Rather than establishing a new legal framework, Law No. 6360 amended the existing Metropolitan Municipality Law No. 5216 and redefined the administrative, spatial, and functional scope of metropolitan governance. Before the reform, multiple tiers of local government (i.e., metropolitan, district, and town municipalities, along with special provincial administrations and villages) jointly administered metropolitan municipalities. Within this structure, metropolitan and district municipalities primarily delivered services in urban areas, while special provincial administrations, district and town municipalities, and village administrations provided services in rural areas.

Law No. 6360 fundamentally transformed local government structures in provinces designated as metropolitan municipalities. The reform introduced a population threshold of 750,000, increased the number of metropolitan municipalities from 16 to 30, and extended metropolitan boundaries to coincide with provincial borders. It also aligned district municipal boundaries with administrative district borders, thereby expanding metropolitan jurisdiction to encompass entire provinces rather than only urban areas. Beyond territorial expansion, the reform also restructured institutional arrangements and service delivery. In metropolitan provinces, it abolished special provincial administrations, transferred responsibility for rural services to metropolitan and district municipalities, reclassified villages as neighborhoods, and incorporated town municipalities into district municipalities. These changes aimed to simplify administrative structures and promote more integrated service provision. To strengthen central–local coordination, the reform established Investment Monitoring and Coordination Directorates under provincial governors.

As a result, the reform did not produce a uniform local government system in Türkiye; instead, it created an asymmetric structure that differentiates between metropolitan and non-metropolitan provinces. In the 30 metropolitan provinces, local services are delivered by metropolitan and district municipalities, whereas in the remaining 51 provinces, special provincial administrations, municipalities, and villages continue to operate. By redefining administrative boundaries and reclassifying rural settlements as urban neighborhoods, the reform alters the statistical measurement of urbanization without necessarily capturing underlying functional change, an issue examined empirically in this study.

To better situate these institutional changes, it is useful to consider how metropolitan areas are conceptualized in literature. Metropolitan areas are increasingly defined in functional terms, reflecting a conceptual shift away from population size and administrative boundaries toward criteria such as labor mobility, economic integration, and spatial interaction. This perspective emphasizes socioeconomic linkages between core cities and surrounding areas (Fuguitt et al., 1988).

[3] This “abolishment” is not merely definitional but results in a discrete structural break in the data: while the rural population share in these provinces declined gradually, from a weighted average of 44% in 2007 to 41% in 2012, it is recorded as 0% from 2013 onwards, with the urban share correspondingly rising to 100% and remaining at that level. Time series of urban and rural population shares are provided in the Data section.

[4] Our reconstruction does not claim to capture the “true” spatial extent of urbanization, which may evolve independently of administrative designations. Rather, it provides a consistent and comparable measure that avoids distortions created by the abrupt elimination of the rural category after Law No. 6360. In this sense, the index is not designed to settle the conceptual question of whether administrative expansion constitutes genuine urbanization. Instead, it maintains continuity in the rural–urban distinction across the reform period, ensuring that observed changes reflect demographic dynamics rather than statistical breaks. This strategy makes the data suitable for panel-based analysis of housing markets and related economic outcomes.

Accordingly, metropolitan areas are commonly operationalized using indicators such as commuting patterns, economic linkages, institutional structures, innovation capacity, and spatial integration (Dümmler & Thierstein, 2002; Mao & Zhang, 2015; Merriman et al., 1995; Slack, 2017), treating them as integrated systems that connect dense urban cores with surrounding settlements.

Viewed through this functional perspective, Law No. 6360 defined metropolitan structures primarily according to provincial administrative boundaries, prioritizing jurisdictional criteria over functional dynamics. At the same time, the reform introduced a territorially integrated governance model by eliminating the distinction between rural and urban areas within metropolitan provinces. However, this institutional redefinition does not necessarily align with the underlying functional, economic, and spatial characteristics of settlements.

Against this background, the following section examines whether provinces subject to the reform differ systematically from others in their pre- and post-reform demographic and economic trajectories.

2.1. Pre- and post-reform patterns across provinces

To provide additional context on how provinces differed around the reform period, we examine the behavior of key demographic and economic indicators before and after the reform.[5] A key feature of the reform is that exposure was determined by a population threshold (750,000), rather than by economic or sectoral characteristics. This rule-based assignment provides an important benchmark for interpreting differences across provinces.

The comparison did not reveal a sharp distinction between the two groups. Prior to the reform, provinces were broadly similar in key indicators such as population growth, employment, and real GDP per capita growth. Differences were more evident in urbanization, with provinces not affected by the law exhibiting higher urban population shares; however, these differences remained modest and did not generate a pronounced separation between groups.

Sectoral composition provided some additional variation, though without a clear dividing line. Provinces subject to the reform exhibited a relatively higher share of industry, while agriculture remained more prominent in non-reform provinces, particularly in the pre-reform period. At the same time, both groups followed similar trajectories over time, with declining agricultural shares and rising industrial shares. For example, the agricultural share decreased from 18% to 14% in reform provinces and from 19% to 16% in non-reform provinces. This parallel evolution suggests that structural transformation reflected a broader economy-wide trend rather than a process specific to provinces affected by the reform.

The comparison across sub-periods did not yield a clear distinction between provinces based on the variables considered. While some differences emerged, most notably in urbanization and sectoral composition, the two groups remained comparable in key macroeconomic dimensions and exhibited similar directional changes over time. This pattern is consistent with the institutional design of the reform, as assignment depended on a population threshold rather than underlying economic characteristics.

3. Literature

Urbanization is generally defined as the increase in the urban population resulting from rural-to-urban migration and natural population growth, and it is a fundamental process shaping economic development (Long & Trung-Kien, 2024). It is closely linked to several areas of economic analysis, including growth and structural transformation (Sukanya & Tantia, 2023), development and living standards (Quigley, 2008), land use and real estate dynamics (Van Doorn et al., 2019).

While urban growth is typically driven by demographic and economic forces, administrative reclassifications can also influence measured urbanization by modifying official boundaries without corresponding changes in population distribution or spatial structure. Pugh (1995) conceptualizes urbanization as a process shaped not only by demographic and economic dynamics but also by institutional arrangements, governance structures, and spatial inequalities, highlighting its inherently multifaceted and policy-driven nature, particularly in developing countries.

Urban economic theory further clarifies the relationship between urban growth and housing outcomes. Classical and modern models show that housing prices, supply, and income respond to demographic and spatial pressures associated with urban expansion (Alonso, 1964; DiPasquale & Wheaton, 1994; Mankiw & Weil, 1989). Population growth and income are central drivers of this process. As cities expand, they require additional land to accommodate population increases, while higher income levels generate demand for larger and higher-quality housing. These dynamics drive changes in land use, construction activity, and housing prices, thereby linking urbanization closely to housing market behavior (Angel, 2023; Brueckner, 2000; Glaeser & Gyourko, 2005).

This study relates to two main strands of empirical literature. The first examines the economic implications of urbanization, particularly how changes in urban population dynamics are associated with housing market dynamics. The second addresses the methodological challenges of measuring urbanization in contexts where administrative reforms blur the distinction between rural and urban areas.

3.1. Urbanization and housing market

Urbanization is widely recognized as a major force shaping housing demand, as growing urban populations fueled by migration, demographic change, and spatial expansion place upward pressure on housing markets. A substantial body of international evidence suggests that urban population growth, particularly when combined with supply constraints, contributes to rising housing prices.

Research on rapidly urbanizing economies, especially China, highlights the importance of rural-to-urban migration in shaping housing demand and price dynamics. Studies such as Wu et al. (2016), Zheng et al. (2017), Gong and Yao (2022), and Wang et al. (2017) show that large-scale internal migration intensifies housing demand and contributes to price escalation, often exacerbated by spatial mismatches and institutional rigidities. Lin et al. (2018) further demonstrate that migration affects not only city size but also demographic composition, thereby intensifying demand pressures and contributing to localized supply shortages.

Evidence from advanced economies also supports this relationship. Brueckner and Kim (2001) and Saiz (2007) show that urban density and migration influence land values and housing prices through their interaction with supply constraints and urban form. Erol and Unal (2022) find that internal migration significantly increases housing prices in Australia, particularly in large metropolitan areas. Similarly, Unal et al. (2024) show that immigration raises rents and flat prices in Germany in the short term. More broadly, evidence from European and OECD countries confirms that population inflows and urban expansion exert upward pressure on housing prices (Churchill et al., 2020; Sanchis-Guarner, 2023).

Recent work also emphasizes heterogeneity in these effects. Bangura and Lee (2023) highlight the macroeconomic importance of urban demographic trends in emerging markets, while Long and Trung-Kien (2024) show that the impact of urbanization varies across the housing price distribution, with stronger effects in the middle quantiles.

In Türkiye, both historical and recent analyses highlight a strong link between urbanization and housing markets. Güzey (2016) examines

[5] Appendix Table A2 reports average values of key variables for provinces subject to the reform and those not subject to it over the full sample (2013–2023) and across pre- and post-reform periods.

Law No. 6306 as a housing-led urban renewal initiative, while Yeşilbağ (2020) situates recent housing dynamics within a broader trajectory of neoliberal urbanization. Tunc (2019) documents how policy shifts and changing demand patterns have reshaped the sector, and Coskun et al. (2017) link post-2003 urban regeneration policies to housing supply expansion and price growth. Duran and Özdoğan (2020) identify urbanization as a key determinant of regional housing demand, whereas Ahsan and Sadak (2021) find that its effects are not uniform, suggesting that the relationship depends on local market conditions.

3.2. Rural-urban reclassification and measurement challenges of urbanization

Administrative reclassification of rural areas as urban can distort demographic and spatial statistics by inflating measures of urbanization without reflecting underlying structural change. Such changes disrupt data continuity and complicate longitudinal analysis. Türkiye provides a clear example: Law No. 6360 abolished the rural–urban distinction within metropolitan areas by reclassifying villages as urban neighborhoods, raising concerns about the comparability and validity of official urbanization indicators.

Research on the administrative and statistical consequences of the reform remains limited. Some studies use satellite imagery and field observations to assess whether reclassified areas have been functionally integrated into urban systems (e.g., Dinç, 2022; Türkan, 2021), while others infer rural–urban distinctions by examining persistent socio-economic characteristics using Address-Based Population Registration System (ABPRS) data. Although these studies point to the statistical overstatement of urbanization, they typically rely on cross-sectional analyses at the city level (e.g., Kara & Belge, 2022;Şenol, 2019). This study builds on this literature but differs in several important respects. First, it extends the analysis beyond individual case studies to all metropolitan municipalities affected by the reform. Second, it constructs a longitudinal dataset covering 2013–2023, enabling consistent and comparable analysis across regions with different exposure to the reform.

Building on the literature and the institutional context of Law No. 6360, we test two hypotheses:

H1. The relationship between urbanization and house price growth differs across regions with varying exposure to the metropolitan reform.

H2. Housing market dynamics are systematically associated with house price growth and help explain differences across regions.

4. Methodology and data

This section outlines the econometric strategy and data used to analyze house price growth across regions with and without provinces affected by Law No. 6360 over the period 2013–2023.

4.1. Methodology

This part outlines the empirical strategy used to examine the relationship between urbanization and house price growth across regions with different exposure to the metropolitan reform under Law No. 6360. We begin by estimating baseline fixed effects (FE) models to capture average relationships across regions and then extend the analysis using the Method of Moments Quantile Regression (MMQR) approach to account for heterogeneity across the distribution of house price growth.

We adopt the MMQR approach developed by Machado and Silva (2019) to estimate long-run parameters. Unlike conventional methods, MMQR allows the effects of explanatory variables to vary across different points of the outcome distribution, providing a more comprehensive view of the underlying relationships. It is particularly suitable in the presence of non-normality, outliers, and unobserved heterogeneity, making it well suited for the empirical setting considered in this study.

MMQR specification is illustrated in Eq. (1)

$$Q_Y(\tau/X_{it}) = (\alpha_i + \delta_i q(\tau)) + X'_{it}\beta + Z'_{it}\gamma q(\tau) \quad (1)$$

where $Q_Y(\tau/X_{it})$ represents the conditional quantile regression function of the dependent variable Y at the τ quantile. α_i is the individual parameter, and $\delta_i q(\tau)$ shows the individual effects that vary across quantile levels. The term $X'_{it}\beta$ represents the conventional coefficient vector capturing the effects of the main explanatory variables on the dependent variable. The component $Z'_{it}\gamma q(\tau)$ denotes the quantile–specific effects of the additional explanatory variables.

4.2. Data

This section describes the data and variable construction used in the empirical analysis. We construct a balanced panel of annual observations for the period 2013–2023 at the NUTS-2 regional level. The sample includes regions that differ in their composition of provinces affected by Law No. 6360 and those not affected. Detailed information on the distribution of provinces across NUTS-2 regions and their reform status is provided in Appendix Table A1.

We measure housing prices using the Residential Property Price Index (RPPI) published by the Central Bank of the Republic of Türkiye (CBRT). The CBRT reports the RPPI at the NUTS-2 regional level rather than at the provincial level, producing a single index for regions such as TR32 (Aydın, Denizli, and Muğla). Because the dependent variable is defined at this aggregated level, we also aggregate explanatory variables—originally observed at the provincial level—to the NUTS-2 level.

We perform this aggregation using population weights, such that provinces with larger populations contribute proportionally more to regional values. This approach ensures consistency between dependent and independent variables while capturing the relative demographic and economic importance of provinces in shaping regional housing market dynamics.

Our main explanatory variable is the urbanization rate, defined as the share of the population residing in urban areas relative to the total population. In official statistics, post-2013 figures set this rate at 100% in provinces affected by the reform, reflecting the administrative elimination of the rural category rather than actual demographic change. To address this issue, we reconstruct[6] provincial-level urban population shares and subsequently aggregate them to the NUTS-2 level to align with the RPPI. We use annual population data from the Address-Based Population Registration System (ABPRS) of TURKSTAT for the period 2012–2023. Including 2012 provides a critical baseline, as TURKSTAT reported rural and urban populations separately prior to the enactment of Law No. 6360.

After the law took effect, TURKSTAT ceased publishing rural population figures, as all villages within the new metropolitan boundaries were administratively reclassified as neighborhoods. This change introduced a discontinuity that prevents consistent measurement of urbanization over time. To restore continuity, we reconstruct rural and urban populations based on each settlement's 2012 administrative status. Settlements classified as villages in 2012 are treated as rural throughout the 2012–2023 period, even if they were subsequently reclassified as neighborhoods. This reconstruction does not assume that villages remained demographically or spatially unchanged after 2012.

[6] Reconstruction of urban and rural population figures for the post-2013 period ensures continuity with pre-reform classifications. By anchoring settlement definitions to their 2012 administrative status, the resulting dataset preserves the rural–urban distinction and avoids artificial shifts in urbanization statistics. While this measure provides a consistent basis for empirical analysis, it does not constitute an official indicator but rather a continuity framework designed to mitigate distortions introduced by administrative reclassification.

Some settlements may have experienced population growth or functional urbanization. However, in the absence of official post-reform rural statistics, anchoring classifications to the 2012 baseline provides a consistent identification strategy. This approach minimizes distortions arising from administrative reclassification and ensures that observed changes in urbanization rates reflect underlying demographic dynamics rather than statistical artifacts.

We then calculate regional urbanization rates at the NUTS-2 level by dividing the reconstructed urban population by the total population. This procedure captures meaningful transformations in settlement patterns while preserving comparability across the reform period. To ensure consistency, we rely on the stability of administrative codes. For example, Akbayır in Şanlıurfa Province retained its administrative code (80312) before and after the reform despite a change in its official classification. Because the code remained unchanged, we anchor its status to its 2012 rural classification. We apply this procedure systematically across all settlements in the sample.

At this stage, we calculate urbanization rates at the provincial level. Housing prices, however, are reported only at the NUTS-2 level, creating a potential aggregation mismatch that could bias the analysis if left unaddressed. To resolve this, we aggregate provincial urbanization rates to the NUTS-2 level using population weights. Specifically, we weight each province's urbanization rate by its total population, sum these values across provinces within each region, and divide by the region's total population. This procedure yields a region-level urbanization measure that is consistent with the housing price data. The calculation of regional urbanization rate for a given NUTS-2 region is as follows:

$$urban\ rate_{r,t} = \frac{\sum_{i=1}^{n} \left(urban\ rate_{i,t} \times population_{i,t} \right)}{\sum_{i=1}^{n} \left(population_{i,t} \right)}$$

$urban\ rate_{r,t}$ represents the corresponding NUTS-2 level measure of urbanization rate obtained through aggregation at time t, i refers the provinces within the region r and n denotes the number of provinces. This method ensures consistency between the units of measurement for urbanization and housing price variables, thus preserving the validity of the empirical analysis.

As shown in Fig. 1, official statistics indicate a gradual increase in the urban population share and a corresponding decline in the rural share up to 2012, followed by a discrete break in 2013, when the rural share is recorded as zero and the urban share as 100% thereafter.

Fig. 2 displays the recalculated urban and rural population shares for the same provinces, adjusting for the artificial jump caused by Law No. 6360. The bold solid line indicates the continuity adjusted rural population share, while the dashed line represents the urban share. Unlike the official TURKSTAT data, which exhibits an artificial spike in urban population share after 2013 due to administrative reclassification, the corrected figures reflect actual demographic change and offer a more accurate representation of the urban–rural distribution over time.

We include a set of control variables capturing demographic, labor market, economic, and housing market conditions relevant to housing prices. We measure demographic dynamics by using population growth and migration, where migration is defined as the net migration rate (the difference between in-migrants and out-migrants divided by the total population and multiplied by 1000). We capture labor market conditions using the employment rate. We proxy income activity with real GDP per capita growth (deflated) and sectoral composition, measured by the share of real estate activities in total GDP. We use housing sales as a measure of housing market activity. Finally, we control for macroeconomic factors by including the growth rate of the real effective exchange rate and a dummy variable for the COVID-19 period.

For the demographic control variables, we use province-level migration data from TURKSTAT, including in-migration, out-migration, and net migration. Because these variables are reported as population counts rather than ratios, we aggregate them to the NUTS-2 level by summing provincial observations within each region. This approach reflects the additive nature of the data and differs from the population-weighted aggregation applied to ratio-based variables, such as labor market indicators, discussed below.

Regarding labor market conditions, we rely on core labor force indicators including, employment, labor force, and the population aged 15 +, to construct standard ratios. We define the employment rate as the ratio of employed individuals to the working-age population. Since TURKSTAT reports these indicators only at the NUTS-2 level, we approximate provincial-level values by allocating regional totals across provinces in proportion to their 15+ population. We then use these numbers to construct NUTS-2 level measures that are consistent with the aggregation of the dependent variable, rather than directly using the original TURKSTAT series. This approach ensures comparability between dependent and independent variables within a unified aggregation framework, although it relies on the assumption that labor market participation is proportionally distributed across provinces within each NUTS-2 region. For example, in NUTS-2 region TR21, Tekirdağ is the province affected by Law No. 6360, whereas Edirne and Kırklareli retain their original administrative status. To account for this heterogeneity, we use the population aged 15 and over to construct disaggregated proxies for labor market conditions at the provincial level. We then aggregate these estimates to the NUTS-2 level using population weights. In the case of TR21, this involves first deriving population-weighted proxies for Edirne and Kırklareli and then combining them with Tekirdağ to obtain a consistent regional measure. We apply this procedure uniformly across all NUTS-2 regions comprising multiple provinces, ensuring that the explanatory variables align with the level of

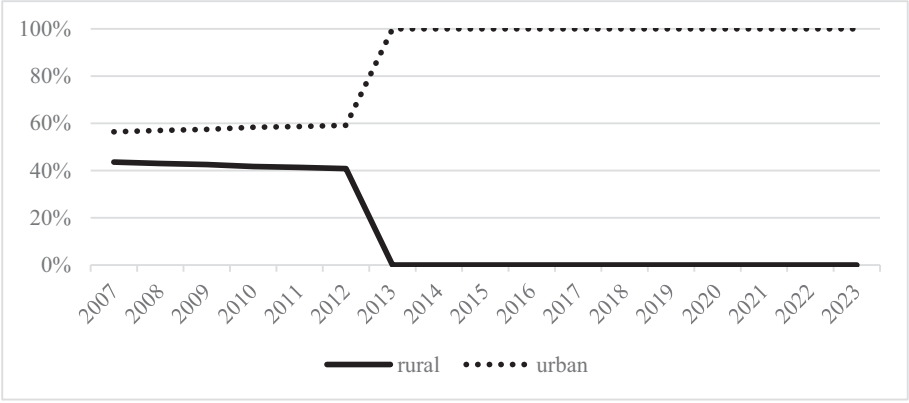

Fig. 1. Official data on urban and rural population shares before and after Law No. 6360.
Source: Turkish Statistical Institute (TURKSTAT, 2025). Address Based Population Registration System (ABPRS)

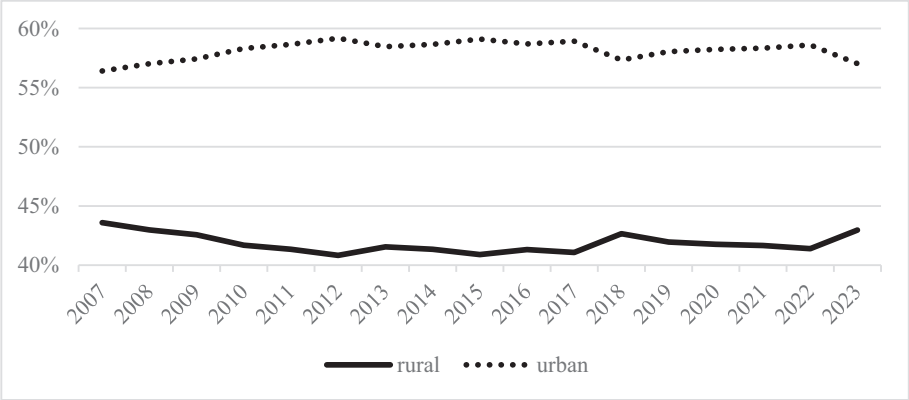

Fig. 2. Continuity adjusted data on urban and rural population shares.
Source: Authors' own calculations using TURKSTAT's ABPRS data, adjusted using pre-2013 administrative settlement classifications to correct for changes introduced by Law No. 6360.

aggregation of the dependent variable. The calculation is as follows:

$$X_{r,t} = \frac{\sum_{i=1}^{n} (pop15+_{i,t} \times X_{i,t})}{\sum_{i=1}^{n} (pop15+_{i,t})}$$

where $X_{i,t}$ denotes the provincial-level proxy for variable X (e.g., employment rate, labor force participation rate, GDP per capita) at time t, $pop15+_{i,t}$ is the 15+ population of province i and $X_{r,t}$ represents the corresponding NUTS-2 level measure obtained through aggregation. In other words, each province's contribution to the regional aggregate is weighted by its share of the 15+ population.

For the economic activity controls, we use TURKSTAT data on provincial GDP by kind of economic activity. We focus on real estate activities, measured as a share of provincial GDP. For provinces analyzed individually, we use these sectoral shares directly. For multi-province NUTS-2 regions, however, we construct consistent aggregates by weighting provincial sectoral shares by their GDP. For example, in TR21, Tekirdağ is the only province affected by Law No. 6360, so we use its sectoral shares directly. For Edirne and Kırklareli, which retain their original administrative status, we avoid simple averaging because the relative importance of economic activities depends on the size of provincial GDP. In 2010, although Edirne (5.93 billion TL) and Kırklareli (6.03 billion TL) had similar GDP levels, their industrial output differed substantially (0.65 billion TL in Edirne versus 2.03 billion TL in Kırklareli). A simple average would therefore misrepresent the regional structure. By weighting each province's sectoral share by its GDP, we ensure that the aggregated NUTS-2 measure accurately reflects the relative economic importance of each province.

Formally, for each sector S in NUTS-2 region r, we calculate:

$$S_{r,t} = \frac{\sum_{i=1}^{n} (GDP_{i,t} \times s_{i,t})}{\sum_{i=1}^{n} (GDP_{i,t})}$$

where $s_{i,t}$ denotes the share of sector S in province i at time t, $GDP_{i,t}$ is the provincial GDP and $S_{r,t}$ represents the aggregated sectoral share at the NUTS-2 level. This procedure ensures that regional sectoral shares reflect the relative economic weight of provinces within each NUTS-2 region.

We measure housing market activity using first-hand housing sales, which capture both demand for newly built units and the entry of new supply into the market. We include the real effective exchange rate to account for cost-related and external price pressures that may influence housing price dynamics. We also introduce a dummy variable for the COVID-19 period (2020–2021) to capture pandemic-related disruptions in housing markets. Appendix Table A3 presents the variables along with their definitions and sources.

4.2.1. *Weighted aggregation and reform exposure at the NUTS-2 level*

A key feature of the empirical design is the use of NUTS-2 regions as the unit of analysis. The dependent variable (i.e., house price growth) is observed only at the NUTS-2 level, while explanatory variables are constructed as weighted aggregates of province-level characteristics within each region, based on its original composition. Importantly, NUTS-2 regions may include both provinces affected by the reform and those not affected. For example, in region TR21, Tekirdağ is affected by the reform, whereas Edirne and Kırklareli are not. To examine differences by reform exposure, we partition the province-level components within each NUTS-2 region into affected and non-affected groups and construct separate weighted aggregates for each group.

This procedure yields two sets of region-level observations: (i) affected-weighted NUTS-2 measures, which reflect the contribution of provinces affected by the reform, and (ii) non-affected-weighted NUTS-2 measures, which reflect the contribution of provinces not affected. The same NUTS-2 region may therefore appear in both samples, but with different values for the explanatory variables, as these are constructed using group-specific weights. The dependent variable remains identical across the two samples, as it is observed only at the regional level. This approach does not redefine regional boundaries but instead reweights province-level characteristics within each region.

5. Empirical results

This section presents an empirical analysis of housing prices across provinces in Türkiye, classified by their exposure to the metropolitan reform, over the period 2013–2023. The analysis is conducted at the NUTS-2 level, where the dependent variable is observed, and explanatory variables are constructed as weighted aggregates of province-level characteristics. Accordingly, the estimates capture region-level associations rather than province-specific effects.

The empirical strategy proceeds in two steps. We first present fixed effects estimates that capture average relationships and then employ Method of Moments Quantile Regression (MMQR) to examine heterogeneity across the distribution of house price growth. This approach allows us to assess whether the determinants of house price growth differ between low-, median-, and high-growth regions. Regions are classified according to their exposure to the metropolitan reform under Law No. 6360. Since NUTS-2 regions may include both affected and unaffected provinces, this classification reflects differences in regional composition rather than a strict province-level separation. Table 1

Table 1
Fixed-effects estimates of house price growth by reform exposure.

	Affected by metropolitan reform				Not affected by metropolitan reform			
Variables	1	2	3	4	5	6	7	8
Urbanization	−0.98	−1.46	−0.82	−1.31	0.16	1.59**	1.79	2.22**
Migration	0.01	0.02**	0.01	0.02**	0.00	0.01**	0.00	0.01**
Population	−4.58	−14.54**	−7.91	−14.45**	0.72	−3.46	−1.83	−4.10*
Employment	0.19	0.00	−0.02	−0.07	0.04	−0.13	−0.19**	−0.23*
GDP per capita	−0.29	0.13	−0.02	0.19	−0.78**	−0.11	−0.36	0.00
Real Estate	−11.39**	−7.83***	−11.91***	−8.65***	−11.68***	−7.92***	−11.39***	−8.44***
Sales	−0.19**	−0.22***	−0.21**	−0.22***	−0.15	−0.21**	−0.17	−0.21**
Exchange Rate		0.81***		0.68***		0.83***		0.68***
Dummy			−0.16***	−0.08**			−0.18***	−0.10**

Notes: Dependent variable: annual percentage change in house prices (housing price growth at time *t*). All independent variables are measured at time *t–1*. Urbanization is defined as the share of population living in urban areas. Migration is measured as the rate of net migration (the difference between immigrants and emigrants divided by total population, multiplied by 1000). Population refers to the annual growth rate of total population. Employment is the ratio of employed people to the total working-age population. GDP per capita denotes the annual growth rate of real GDP per capita. Real Estate is the share of real estate activities in total provincial GDP. Sales represent housing sales in logarithmic form. Exchange Rate refers to the annual growth rate of the real effective exchange rate. Dummy is a binary variable capturing the COVID-19 period (2020–2021). All specifications are estimated using fixed effects with robust standard errors. Columns (1)–(4) report estimates for regions where provinces are affected by the metropolitan reform, while columns (5)–(8) report estimates for regions where provinces are not affected by the reform. Within each group, specifications are estimated sequentially: columns (1) and (5) present the baseline models; columns (2) and (6) additionally include the exchange rate; columns (3) and (7) include the COVID-19 dummy; and columns (4) and (8) include both the exchange rate and the COVID-19 dummy. Since NUTS-2 regions may include both affected and not affected provinces, explanatory variables are constructed as weighted aggregates reflecting the relative contribution of each group within regions. Coefficients represent the change in housing price growth (in percentage points) associated with a one-unit change in each explanatory variable (in percentage points where applicable). Significance levels are denoted as ***$p < 0.01$, **$p < 0.05$, and *$p < 0.10$.

reports the fixed-effects results, while Tables 2 and 3 present the corresponding quantile estimates. Finally, the measure of urbanization is based on administrative definitions anchored to the pre-reform period. As such, it captures the spatial distribution of the population across administratively defined urban areas rather than functional urban processes. The estimated relationships should therefore be interpreted as reflecting changes in the share of the population living in administratively defined urban areas, not as evidence of functional urbanization processes.

5.1. Fixed-effects results

Table 1 reports fixed-effects estimates for regions exposed to the metropolitan reform (Columns 1–4) and those not exposed (Columns 5–8). Several variables exhibit consistent patterns across specifications. Real estate activity is consistently negative and highly significant, suggesting that increased sectoral activity reflects supply expansions that moderate price pressures.[7] Housing sales also display a negative association, indicating that higher transaction intensity may ease market tightness.[8] In contrast, the exchange rate exhibits a positive and highly significant effect, while the COVID-19 period is associated with a decline in house price growth. Despite these common patterns, important differences emerge across region groups. Urbanization shows a clear divergence: it is negatively associated with house price growth in reform-exposed regions but positively associated in non-exposed regions, with statistical significance in the latter. Population growth is generally negatively related to house price growth, with stronger effects in reform-exposed regions. Migration is positively associated with house price growth, although its significance varies across specifications, while employment and GDP per capita growth display weaker and less consistent relationships. The results highlight the joint importance of demand- and supply-side dynamics, together with macroeconomic conditions, in explaining house price growth. At the same time, the effect of urbanization diverges systematically across region groups, indicating that its relationship with house price growth varies by reform exposure and may reflect underlying differences in regional institutional and market structures. These findings are robust to a range of sensitivity checks with alternative model specifications.[9] Appendix Table A4 presents the results.

5.2. Quantile regression

While the fixed-effects estimates capture average relationships, they may mask important variation across the distribution of house price growth. To address this, we employ Method of Moments Quantile Regression (MMQR), which allows the effects of explanatory variables to differ across quantiles. This approach enables us to assess whether the determinants of house price growth vary between lower- and higher-growth regions, thereby complementing the baseline results with distributional evidence.

5.2.1. Regions with provinces affected by the metropolitan reform

Table 2 reports the MMQR estimates for regions exposed to the metropolitan reform. The results broadly confirm the patterns identified in the fixed-effects estimates, while revealing important heterogeneity across the distribution of house price growth. Urbanization is negatively associated with house price growth across all quantiles, with the effect becoming stronger toward the upper end of the distribution, indicating a more pronounced relationship in high-growth regions. Migration shows

[7] Occupancy permit data support this interpretation. Housing completions follow a similar cycle across regions, rising to a peak around 2018 before declining thereafter—for example, from 136k to 170k and then to 89k in reform-affected regions, and from 50k to 72k and then to 48k in non-affected regions (TURKSTAT, 2025). This pattern suggests that periods of higher real estate activity coincide with supply expansions that moderate house price growth, while subsequent declines may contribute to tighter market conditions.

[8] First-hand housing sales follow a similar cyclical pattern across regions, increasing until 2017–2018 and declining thereafter. In reform-affected regions, sales rose from about 92k to 132k before falling to around 70k, while in non-affected regions they increased from roughly 27k to 37k and then declined to about 20k (TURKSTAT, 2025). As first-hand transactions reflect newly supplied housing, higher levels of activity likely expand supply and ease market tightness, thereby moderating house price growth.

[9] Diagnostic tests confirm that the fixed effects model is appropriate according to the Hausman test. Multicollinearity and heteroskedasticity are not concerns, while the Wooldridge test indicates the presence of first-order autocorrelation. Slope homogeneity is supported by the Pesaran–Yamagata test, whereas normality is rejected by the Doornik–Hansen test. Therefore, we employ robust standard errors to ensure reliable inference.

Table 2
Quantile regression estimates for reform-affected regions.

	Quantiles							
	1	2	3	4	5	6	7	8
Variables	Q_{20}	Q_{40}	Q_{60}	Q_{80}	Q_{20}	Q_{40}	Q_{60}	Q_{80}
Urbanization	−0.78	−1.23	−1.70	−2.14	−0.42	−0.96	−1.59*	−2.29*
Migration	0.02**	0.02***	0.02**	0.01	0.02**	0.02***	0.02**	0.01
Population	−16.69**	−15.28***	−13.80**	−12.41	−16.55**	−15.27***	−13.79**	−12.14
Employment	−0.18	−0.06	0.06	0.18	−0.25	−0.14	−0.01	0.13
GDP per capita	0.49	0.26	0.01	−0.22	0.51	0.31	0.08	−0.17
Real Estate	−7.78***	−7.81***	−7.84***	−7.87***	−8.54***	−8.61***	−8.68***	−8.76***
Sales	−0.17**	−0.20***	−0.23***	−0.26***	−0.19**	−0.21***	−0.23***	−0.26***
Exchange Rate	0.82***	0.82***	0.81***	0.80***	0.68***	0.68***	0.68***	0.68**
Dummy					−0.05	−0.07*	−0.08**	−0.10**

Notes: Dependent variable: annual percentage change in house prices (housing price growth at time *t*). All independent variables are measured at time *t–1*. Urbanization is defined as the share of population living in urban areas. Migration is measured as rate of net migration (the difference between immigrants and emigrants divided by total population, multiplied by 1000). Population refers to the annual growth rate of total population. Employment is the ratio of employed people to the total working-age population. GDP per capita denotes the annual growth rate of real GDP per capita. Real Estate is the share of real estate activities in total provincial GDP. Sales represent housing sales in logarithmic form. Exchange Rate refers to the annual growth rate of the real effective exchange rate. Dummy is a binary variable capturing the COVID-19 period (2020–2021). Estimates are obtained from MMQR across quantiles Q20, Q40, Q60, and Q80. Since NUTS-2 regions may include both affected and not affected provinces, the explanatory variables in this table are constructed as weighted aggregates that emphasize the relative contribution of provinces affected by the reform within each region. Columns (5)–(8) report the corresponding estimates for the same sample with the COVID-19 dummy included. Coefficients represent the change in housing price growth (in percentage points) associated with a one-unit change in each explanatory variable (in percentage points where applicable). As MMQR captures heterogeneous effects across the distribution, coefficient magnitudes and signs may vary by quantile, reflecting differences in the determinants of housing price growth between low-, median-, and high-growth regions. Significance levels are denoted as $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.10$.

Table 3
Quantile regression estimates for non-affected regions.

	Quantiles							
	1	2	3	4	5	6	7	8
Variables	Q_{20}	Q_{40}	Q_{60}	Q_{80}	Q_{20}	Q_{40}	Q_{60}	Q_{80}
Urbanization	1.86	1.68	1.41	1.31	2.44	2.23**	2.08**	2.02*
Migration	0.01	0.01**	0.01**	0.01	0.01	0.01**	0.01***	0.01**
Population	−3.86	−3.61	−3.20	−3.05	−3.71	−4.07	−4.34*	−4.44
Employment	−0.18	−0.15	−0.10	−0.08	−0.28	−0.23*	−0.20	−0.18
GDP per capita	0.17	−0.01	−0.30	−0.40	0.45	0.03	−0.29	−0.40
Real Estate	−7.00***	−7.59***	−8.53***	−8.87***	−7.44	−8.36***	−9.07***	−9.32***
Sales	−0.22**	−0.21***	−0.21***	−0.21**	−0.26***	−0.21***	−0.18***	−0.17***
Exchange Rate	0.92***	0.86***	0.77***	0.73***	0.80***	0.69***	0.60***	0.57***
Dummy					−0.06***	−0.10***	−0.12***	−0.13***

Notes: Dependent variable: annual percentage change in house prices (housing price growth at time *t*). All independent variables are measured at time *t–1*. Urbanization is defined as the share of population living in urban areas. Migration is measured as rate of net migration (the difference between immigrants and emigrants divided by total population, multiplied by 1000). Population refers to the annual growth rate of total population. Employment is the ratio of employed people to the total working-age population. GDP per capita denotes the annual growth rate of real GDP per capita. Real Estate is the share of real estate activities in total provincial GDP. Sales represent housing sales in logarithmic form. Exchange Rate refers to the annual growth rate of the real effective exchange rate. Dummy is a binary variable capturing the COVID-19 period (2020–2021). Estimates are obtained from MMQR across quantiles Q20, Q40, Q60, and Q80. Since NUTS-2 regions may include both affected and not affected provinces, the explanatory variables in this table are constructed as weighted aggregates that emphasize the relative contribution of provinces not affected by the reform within each region. Columns (5)–(8) report the corresponding estimates for the same sample with the COVID-19 dummy included. Coefficients represent the change in housing price growth (in percentage points) associated with a one-unit change in each explanatory variable (in percentage points where applicable). As MMQR captures heterogeneous effects across the distribution, coefficient magnitudes and signs may vary by quantile, reflecting differences in the determinants of housing price growth between low-, median-, and high-growth regions. Significance levels are denoted as $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.10$.

a positive association, particularly at lower and middle quantiles, while population growth is negatively related to house price growth in lower and middle parts of the distribution but becomes insignificant at higher quantiles. Real estate activity exhibits a consistently negative and stable effect, while housing sales are also negatively associated with house price growth, with stronger effects at higher quantiles. The exchange rate emerges as a strong and stable positive determinant across the distribution. Finally, the COVID-19 period is associated with a decline in house price growth, with effects that become more pronounced at higher quantiles. The results indicate that while several determinants operate consistently across the distribution, their relative importance varies between low- and high-growth regions.

5.2.2. Regions with provinces not affected by the metropolitan reform

Table 3 reports the MMQR estimates for regions not exposed to the metropolitan reform. The results reveal a combination of stable patterns and distributional heterogeneity, broadly consistent with the fixed-effects findings. In contrast to reform-exposed regions, urbanization is positively associated with house price growth across all quantiles, with stronger and statistically significant effects at the middle and upper parts of the distribution. Migration also shows a positive association, particularly at middle quantiles, while population growth remains generally negative but weak and less consistent across the distribution. Employment tends to be negatively associated with house price growth, whereas GDP per capita growth shows a positive but unstable relationship. Real estate activity exhibits a negative and statistically significant effect across most quantiles, with somewhat stronger effects at higher quantiles. Housing sales are also negatively associated with house price growth, although their dampening effect weakens toward the upper end of the distribution. The exchange rate remains a strong and positive

determinant, though its magnitude declines at higher quantiles. The COVID-19 period is associated with lower house price growth across all quantiles, with more pronounced effects in high-growth regions. Overall, the results confirm the presence of distributional heterogeneity and, most importantly, highlight a clear contrast with reform-exposed regions, where the effect of urbanization is negative rather than positive.

5.2.3. Comparative insights

The results reveal systematic differences in how key determinants relate to house price growth across reform-exposed and non-exposed regions. The most pronounced divergence concerns urbanization. In reform-exposed regions, urbanization is negatively associated with house price growth and becomes stronger toward higher quantiles, whereas in non-exposed regions the relationship is positive and more pronounced in the upper part of the distribution. By contrast, other variables display broadly consistent signs across region groups but differ in magnitude and distributional patterns. Migration is positively associated with house price growth in both groups, with limited variation across quantiles. Population growth is generally negative, with stronger and more consistent effects in reform-exposed regions. Real estate activity is negative and statistically significant in both groups, remaining stable in reform-affected provinces but strengthening toward higher points of the distribution in non-affected ones. Housing sales follow a similar pattern, with effects increasing in reform-affected provinces but weakening in non-affected provinces, particularly when the dummy is included. The exchange rate is positive and statistically significant in both groups; however, its effect is stable in reform-affected provinces and declines toward higher points of the distribution in non-affected provinces when controlling for the dummy variable. The findings indicate that while most determinants operate in similar directions across regions, their relative importance varies across the distribution. The urbanization measure capturing the share of population in administratively defined urban areas based on pre-reform classifications, stands out as the only variable exhibiting a clear divergence in sign, providing strong support for H1 that its association with house price growth differs systematically by reform exposure. Appendix Tables A5 and A6 show that the main findings remain broadly stable across alternative model specifications and different points of the conditional distribution.

5.2.4. Divergent role of urbanization across regions by reform exposure

Building on the comparative evidence, we focus on urbanization and examine whether its divergent association with house price growth can be explained by differences in housing market activity and structure. Baseline estimates indicate that urbanization is negatively associated with house price growth in reform-exposed regions and positively associated in non-exposed regions, although these effects are not always statistically significant. To provide formal support for this divergence, we estimate pooled specifications that incorporate detailed housing market controls. We exploit measures of transaction intensity and market composition derived from first-hand and second-hand housing sales, aggregated at the regional level. These variables capture both the scale of primary market activity and the dynamics of the resale segment (see Appendix B for descriptive evidence).

If the observed divergence reflects differences in housing market functioning, transaction-based measures should play a central role. First-hand sales intensity is expected to capture variations in effective supply, while second-hand sales reflect activity in the resale market. Moreover, if housing market dynamics condition the effect of urbanization, interaction terms between urbanization and market activity should be significant, indicating that the relationship between urbanization and house price growth depends on the level of market activity. Table 4 reports pooled fixed effects estimates across four specifications designed to examine the role of housing market dynamics. Model (1) presents the baseline specification. Model (2) refines the measure of market activity by using first-hand sales intensity, allowing for differences in regional market size. Model (3) incorporates the growth rate of second-hand sales to capture dynamics in the resale market. Model (4) further includes an interaction term between urbanization and second-hand sales growth, providing a direct test of whether the effect of urbanization depends on housing market activity. First-hand sales intensity enters with a negative and highly significant coefficient across specifications, indicating that higher transaction intensity is associated with lower house price growth. Similarly, second-hand sales growth is negative and significant, suggesting that increased resale activity also dampens price growth, consistent with a reallocation mechanism that expands effective supply. At the same time, the interaction between urbanization and second-hand sales growth is positive and statistically significant, indicating that the effect of urbanization depends on the level of activity in the resale market. While higher resale activity is associated with lower price growth on average, it strengthens the relationship between urbanization and house price growth. This suggests that in more active resale markets, the urbanization measure is more strongly associated with price dynamics — consistent with the idea that a larger urban population share, as defined by pre-reform administrative classifications, amplifies the sensitivity of prices to resale activity. Once these housing market dynamics are considered, the divergence identified in the baseline estimates becomes statistically supported. Urbanization is positively and significantly associated with house price growth in non-exposed regions, while the interaction with the reform indicator is negative and significant, implying a negative effect in reform-exposed regions.

The results confirm that the association between urbanization and house price growth differs across region groups. Once differences in housing market structure and dynamics are controlled for, this divergence can be explained by how urbanization interacts with housing market activity. In particular, the differing relationship between urbanization and house prices across regions affected by the reform and those not affected can be supported by this interaction. While both first-hand transaction intensity and second-hand sales growth are associated with lower house price growth, the resale segment plays an additional role by strengthening the relationship between urbanization and house

Table 4
Pooled fixed-effects estimates.

Variables	1	2	3	4
Urbanization	1.3*	1.23*	2.63***	2.69***
Urbanization × Affected	−2.61**	−2.38**	−2.97**	−2.75*
Migration	0.01***	0.01***	0.012***	0.012***
Population	−6.27**	−6.41**	−9.14***	−8.81***
Employment	−0.1	−0.08	0.73	0.66
GDP per capita	0.046	0.08	0.00	0.05
Real Estate	−9.42***	−9.06***	−7.55***	−7.45***
Sales	−0.22***			
Exchange Rate	0.65***	0.65***	0.78***	0.78***
Dummy	−0.09***	−0.1***	−0.04	−0.04
Intensity		−0.23***	−0.21***	−0.22***
Second-hand			−0.2***	−0.84***
Urbanization × Second-hand				0.97***

Notes. This table reports pooled fixed-effects regression results across four specifications. The dependent variable is house price growth. Model (1) presents the baseline specification, where housing market activity is measured using the level of first-hand sales. Model (2) replaces this variable with first-hand sales intensity, defined as the logarithm of first-hand transactions per 1000 inhabitants. Model (3) extends the specification by including the growth rate of second-hand sales, capturing dynamics in the resale market. Model (4) further incorporates an interaction term between urbanization and second-hand sales growth, allowing the association between urbanization and house price growth to vary with resale market activity. The coefficient on Urbanization (not affected regions) represents the association between urbanization and house price growth in regions not affected by the reform. The interaction term Urbanization × Affected captures how this association differs in regions affected by the reform. Robust standard errors are reported in parentheses. Significance levels are denoted as $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.10$.

prices.

In this sense, housing market dynamics both ease price pressures and influence how demand related to urbanization is reflected in prices. This combined role explains why the association between urbanization measure and housing outcomes differs across regions and underscores the importance of accounting for local housing market conditions. The results provide support for H2.

6. Discussion

The metropolitan reform can be interpreted as a top-down administrative reclassification of settlement structure. Implemented through population-based thresholds and jurisdictional boundary changes under Law No. 6360, the reform redefined rural and urban areas without directly accounting for economic structures, land-use patterns, or functional linkages such as commuting flows and market integration. Descriptive evidence indicates that key province-level characteristics are broadly similar across provinces affected by the reform and those not affected, suggesting that the observed differences do not primarily reflect large structural disparities.

In this context, the administrative designation of urban status may not correspond to the economic and spatial characteristics typically associated with functional urbanization. Areas that retain rural or semi-rural features are reclassified as urban, creating a disconnect between statistical definitions and observed settlement patterns. As a result, measured urbanization reflects institutional restructuring rather than changes in economic organization or spatial form. This reclassification has direct implications for measurement. Following the reform, official statistics reported by TURKSTAT classified the entire population of affected provinces as urban from 2013 onward, eliminating variation in rural population shares and introducing a structural break. Consequently, these statistics reflect institutional changes rather than demographic or spatial dynamics, limiting their usefulness for empirical analysis.

To address this issue, this study constructs continuity-adjusted urban–rural population series based on pre-reform administrative classifications. These series restore variation in population shares and provide a consistent basis for analysis. While they do not fully capture functional urbanization, they offer a more informative proxy for urban–rural population distribution in a context where such variation is essential.

Recent developments in official statistics point in a similar direction. TURKSTAT has begun publishing classifications based on the Degree of Urbanization (DEGURBA) framework developed by the European Statistical Office, which distinguishes between densely populated, intermediate-density, and thinly populated areas using population density thresholds. Although available only from 2022 onward, these data indicate that a substantial share of the population in provinces affected by the reform continues to reside in thinly and intermediate-density areas. For example, thinly populated areas accounted for approximately 27%, 26%, and 25% of the population in 2023, 2024, and 2025, respectively. Including intermediate-density areas increases this share to around 49%, 49%, and 48%.

These patterns suggest that the post-2013 classification of these provinces as fully urban does not accurately reflect the actual settlement structure. More broadly, they underscore the importance of carefully considering how urbanization is measured in empirical research. While the continuity-adjusted series do not capture functional urbanization, they provide a more reliable representation than official post-reform statistics. The introduction of DEGURBA-based measures by TURKSTAT also reflects growing recognition of the limitations of purely administrative classifications and the need for measures that better align with spatial and demographic realities.

7. Conclusion

This study examines how house price growth varies across regions with different exposure to Türkiye's metropolitan reform under Law No. 6360 over the period 2013–2023. Using continuity-adjusted urban–rural population data and combining fixed-effects and quantile regression approaches, the analysis identifies both average relationships and distributional heterogeneity in housing price dynamics.

The results reveal a clear divergence in the relationship between urbanization and house price growth across regions. Urbanization is negatively related to house price growth in reform-exposed regions and positively related in non-exposed regions, with effects varying across the distribution. This divergence appears to reflect differences in housing market dynamics: while higher transaction intensity corresponds to lower price growth, resale activity strengthens the relationship between urbanization and housing prices.

Other variables exhibit broadly consistent average effects, although their magnitude varies across the distribution. Population growth is negatively related to house price growth in both groups, with stronger effects in reform-exposed regions, whereas migration is positively linked to price growth throughout the distribution. Real estate activity and housing sales are negatively associated with price growth, with stronger effects in reform-exposed regions but weaker effects in non-exposed regions. The exchange rate is positively related to house price growth in both groups, although its effect remains relatively stable in reform-exposed regions while declining in non-exposed regions.

These findings align with the existing literature. The non-uniform impact of urbanization across regions supports prior findings that its effects depend on local conditions (Ahsan & Sadak, 2021). The observed heterogeneity across the distribution of house price growth is also consistent with recent evidence highlighting variation across housing market segments (Long & Trung-Kien, 2024). More broadly, the divergence in urbanization coefficient reinforces concerns that administrative definitions can influence measured urbanization and obscure underlying dynamics (Pugh, 1995). The positive relationship between migration and house price growth is consistent with evidence that population inflows increase housing demand (Erol & Unal, 2022; Wu et al., 2016; Zheng et al., 2017). Finally, the negative relationship between housing transaction intensity and price growth is consistent with demand–supply frameworks, where higher turnover may ease price pressures by improving the allocation of existing housing stock (Alonso, 1964; DiPasquale & Wheaton, 1994; Mankiw & Weil, 1989).

The findings underscore the importance of measurement and regional heterogeneity in assessing urbanization processes. Improving the availability of accurate and harmonized data would enhance the reliability of empirical analysis, while extending frameworks such as DEGURBA to earlier periods would strengthen temporal consistency. The results also suggest that administrative classifications alone may not capture functional urbanization patterns, highlighting the value of incorporating functional criteria in the designation of metropolitan areas.

Several limitations should be acknowledged. The analysis is constrained by the availability of the Residential Property Price Index (RPPI), which serves as a proxy for housing prices and is not reported prior to 2010. This limitation restricts the temporal scope of the study and prevents a direct comparison with the pre-reform period. A further limitation concerns the lack of disaggregated housing price data. While the RPPI is available at the NUTS-2 level, separate indices for new and existing dwellings are reported only at the national level. As a result, the analysis relies on aggregate regional price indices, which may mask differences in price dynamics across housing market segments. These constraints underscore the value of more detailed regional housing market statistics, which would allow for a more comprehensive assessment of housing market dynamics and urbanization processes. Finally, the urbanization measure is based on the share of the urban population and therefore reflects administrative classification rather than

functional urbanization.

Future research could build on the present analysis by examining the metropolitan reform using variables and datasets with sufficiently long pre-reform coverage, thereby allowing the application of causal or quasi-experimental approaches. In the current study, the limited availability of consistent pre-reform observations constrains the implementation of approaches such as difference-in-differences or related quasi-experimental methods. As richer longitudinal datasets with sufficient pre-reform coverage become available, future empirical work may be better positioned to evaluate reforms of this kind more directly. In this context, comparing official urbanization measures with continuity-adjusted series would be particularly informative, as reliance on administrative classifications may obscure underlying relationships.

CRediT authorship contribution statement

Gamze Çürüksulu Usta: Writing – original draft, Conceptualization. **Tunahan Hacıimamoğlu:** Visualization, Software, Methodology, Investigation, Formal analysis. **Ahmet Usta:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

There are no conflicts of interest related to this study. This submission is made on behalf of all co-authors.

Appendix

This section provides supplementary information supporting the empirical analysis. Appendix A presents institutional and data-related details, including the composition of NUTS-2 regions by reform exposure, descriptive evidence on key indicators across provinces before and after the reform and the definitions of variables used in the analysis. Moreover, it presents robustness checks. Appendix B reports additional descriptive evidence on housing market activity, illustrating differences in transaction intensity and sales composition across province groups.

Appendix A. Regional composition and data description

Table A1
Composition of NUTS-2 regions by reform exposure.

NUTS-2 region	Provinces affected by reform	Provinces not affected by reform
TR21	Tekirdağ	Edirne, Kırklareli
TR22	Balıkesir	Çanakkale
TR32	Aydın, Denizli, Muğla	
TR33	Manisa	Afyonkarahisar, Kütahya, Uşak
TR63	Hatay, Kahramanmaraş	Osmaniye
TR90	Ordu, Trabzon	Giresun, Rize, Artvin, Gümüşhane
TRB	Malatya, Van	Elazığ, Bingöl, Tunceli, Muş, Bitlis, Hakkari
TRC	Şanlıurfa, Mardin	Adıyaman, Kilis, Batman, Şırnak, Siirt

Notes. This table reports the provinces in the sample by NUTS-2 regions, distinguishing those reclassified as metropolitan municipalities under Law No. 6360 from those that retained their pre-reform administrative status. Provinces already classified as metropolitan municipalities before the reform (e.g., Gaziantep and Diyarbakır) under TRC are excluded.

Table A2
Pre- and post-reform patterns across provinces by reform exposure.

	Full: 2008–2023		Pre – reform: 2008–2012		Post – reform: 2013–2023	
Variables	1	0	1	0	1	0
Urbanization	0.59	0.64	0.58	0.60	0.59	0.65
Migration	−0.87	−2.70	−1.55	−5.46	−0.56	−1.48
Net migration	−1485	−1123	−1988	−1998	−1256	−725
Population	0.01	0.01	0.01	0.01	0.01	0.01
Employment	0.45	0.44	0.45	0.43	0.45	0.44
GDP per capita	0.03	0.04	0.03	0.04	0.04	0.03
Economic activity						
Agriculture	0.15	0.17	0.18	0.19	0.14	0.16
Industry	0.23	0.17	0.19	0.15	0.24	0.18
Real Estate	0.09	0.09	0.12	0.11	0.08	0.08
Services	0.21	0.17	0.20	0.16	0.22	0.17

Notes. This table reports average values of key variables for provinces subject to the reform (1) and those not subject to the reform (0). The full sample covers 2008–2023, while the pre-reform period is defined as 2008–2012 and the post-reform period as 2013–2023, based on the timing of the reform and the discontinuation of rural population statistics in official data. Values represent period averages across all provinces in each group. Variable definitions are provided in Appendix Table A3. In addition, net migration denotes the difference between in-migration and out-migration in levels. Negative values of migration indicators indicate net outflows. Economic activity variables (agriculture, industry, real estate, and services) are expressed as shares of total provincial GDP.

Table A3
Definitions of variables.

Variable	Definition
Housing Prices	Annual growth rate in Residential Property Price Index (RPPI)
Urbanization	Share of population living in urban areas, based on administrative classification
Migration	Rate of net migration, defined as the difference between in-migrants and out-migrants divided by total population, multiplied by 1,000
Population	Annual growth rate of total population
Employment	Ratio of employed people to the total working-age population
GDP per capita	Annual growth rate of real GDP per capita
Real Estate	Share of real estate activities in total provincial GDP
Sales	Total housing (first-hand) sales, expressed in logarithmic form
Exchange Rate	Annual growth rate of real effective exchange rate
Dummy	Binary variable equal to 1 for the COVID-19 period (2020–2021), and 0 otherwise.

Notes. All variables are obtained from Turkish Statistical Institute, while the Residential Property Price Index (RPPI) and the real effective exchange rate are sourced from the Central Bank of the Republic of Türkiye.

Table A4
Robustness checks: Fixed-effects estimates under alternative specifications.

Variables	Baseline	1	2	3	4	5
Urbanization	−1.31	−1.89*	−1.18	−1.08	−1.54*	−1.46
Migration	0.02**	0.04***	0.02**	0.02**	0.04***	0.04***
Population	−14.45**	−31.69***	−14.13**	−15.92**	−34.31***	−33.28***
Employment	−0.07	−0.30**		−0.09	−0.32***	
Labor Force			−0.12			−0.08
GDP per capita	0.19	0.55	0.20	0.31	0.73*	0.75*
Real Estate	−8.65***		−8.71***	−8.38***		
Industry		2.70***			2.28***	2.09***
Sales	−0.22***	−0.40***	−0.23***			
Intensity				−0.03***	−0.05***	−0.06***
Exchange Rate	0.68***	0.83***	0.67***	0.63***	0.83***	0.83***
Dummy	−0.08**	−0.12**	−0.08*	−0.10*	−0.13*	−0.12*

Notes. The table reports fixed-effects estimation results from robustness checks. The baseline specification corresponds to the main model presented in the manuscript, while Columns (1)–(5) report alternative specifications in which selected variables are replaced or redefined. Labor Force refers to the growth rate of the labor force. Industry denotes the share of industry in province-level GDP. Intensity measures sales transaction intensity. All other variables are defined as in the main analysis. Standard errors are robust, and significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table A5
Robustness checks: Quantile regression estimates under an alternative specification.

	Quantiles							
	1	2	3	4	5	6	7	8
Variables	Q_{20}	Q_{40}	Q_{60}	Q_{80}	Q_{20}	Q_{40}	Q_{60}	Q_{80}
Urbanization	−0.42	−0.96	−1.59*	−2.29*	−1.25	−1.39	−1.53	−1.69
Migration	0.02**	0.02***	0.02**	0.01	0.03***	0.04***	0.04***	0.04***
Population	−16.55**	−15.27***	−13.79**	−12.14	−31.33***	−32.62***	−33.89***	−35.41***
Employment	−0.25	−0.14	−0.01	0.13				
Labor Force					0.25	0.03	−0.19	−0.45
GDP per capita	0.51	0.31	0.08	−0.17	0.56	0.68	0.81*	0.96
Real Estate	−8.54***	−8.61***	−8.68***	−8.76***				
Industry					1.69**	1.95***	2.21***	2.52***
Sales	−0.19**	−0.21***	−0.23***	−0.26***				
Intensity					−0.04**	−0.05***	−0.06***	−0.07***
Exchange Rate	0.68***	0.68***	0.68***	0.68**	0.96***	0.88***	0.79***	0.69**
Dummy	−0.05	−0.07*	−0.08**	−0.10**	−0.06	−0.10***	−0.14**	−0.18***

Notes. The table reports quantile regression estimates at the 20th, 40th, 60th, and 80th percentiles (Q20, Q40, Q60, and Q80, respectively). Columns 1 to 4 present the baseline regression results reported in the main manuscript (Table 2, Columns 5–8), while the remaining columns report alternative specifications in which selected variables are replaced with comparable proxies. Specifically, Employment is replaced by Labor Force (growth rate), Real Estate is replaced by Industry (share of industry in province-level GDP), and Sales is replaced by Intensity (sales transaction intensity). This exercise is conducted only for regions affected by the reform; results for non-affected regions can be provided upon request. All other variables are defined as in the main analysis. Standard errors are robust, and significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table A6
Robustness check: Quantile regression estimates under alternative distribution.

	Quantiles								
	1	2	3	4	5	6	7	8	9
Variables	Q_{20}	Q_{40}	Q_{60}	Q_{80}	Q_5	Q_{25}	Q_{50}	Q_{75}	Q_{95}
Urbanization	−0.42	−0.96	−1.59*	−2.29*	0.43	−0.61	−1.35	−2.11*	−3.17
Migration	0.02**	0.02***	0.02**	0.01	0.02	0.02**	0.02***	0.02*	0.01
Population	−16.55**	−15.27***	−13.79**	−12.14	−18.55	−16.11**	−14.37***	−12.57*	−10.06
Employment	−0.25	−0.14	−0.01	0.13	−0.42	−0.21	−0.06	0.10	0.31
GDP per capita	0.51	0.31	0.08	−0.17	0.82	0.44	0.17	−0.11	−0.49
Real Estate	−8.54***	−8.61***	−8.68***	−8.76***	−8.45***	−8.57***	−8.65***	−8.74***	−8.86***
Sales	−0.19**	−0.21***	−0.23***	−0.26***	−0.16	−0.20***	−0.23***	−0.25***	−0.29**
Exchange Rate	0.68***	0.68***	0.68***	0.68**	0.68**	0.68***	0.68***	0.68***	0.68**
Dummy	−0.05	−0.07*	−0.08**	−0.10**	−0.03	−0.06	−0.08**	−0.10**	−0.13*

Notes. The table reports quantile regression estimates across different points of the conditional distribution of the dependent variable. Columns 1 to 4 present estimates at the 20th, 40th, 60th, and 80th percentiles (Q20, Q40, Q60, and Q80, respectively), corresponding to the baseline regression results reported in the main manuscript (Table 2, Columns 5–8). Columns 5 to 9 report estimates at the 5th, 25th, 50th, 75th, and 95th percentiles (Q5, Q25, Q50, Q75, and Q95, respectively), thereby extending the analysis to alternative distributional points. This exercise is conducted only for regions affected by the reform; results for non-affected regions can be provided upon request. All other variables are defined as in the main analysis. Standard errors are robust, and significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Appendix B. Supplementary evidence on housing market activity

Fig. B1 presents the relative transaction intensity of provinces affected by the reform compared to those not affected, disaggregated by first-hand, second-hand, and total transactions over the period 2013–2023. Values greater than one indicate higher transaction intensity in provinces affected by the reform relative to non-affected provinces. The figure shows that transaction activity in provinces affected by the reform consistently exceeds that of non-affected provinces across all categories. This difference is most pronounced for second-hand transactions, which remain persistently higher and peak around 2020–2021 before declining. By contrast, the relative intensity of first-hand transactions is more volatile, rising until 2016 and then declining, suggesting a narrowing gap between the two groups in newly built housing activity over time. Total transaction intensity remains relatively stable but consistently above unity, indicating that overall housing market activity is systematically higher in provinces affected by the reform. However, the decline observed after 2021 suggests a convergence between the two groups in the later period. The figure highlights persistent differences in housing market activity across province groups, with the gap largely driven by stronger second-hand transaction activity in provinces affected by the reform.

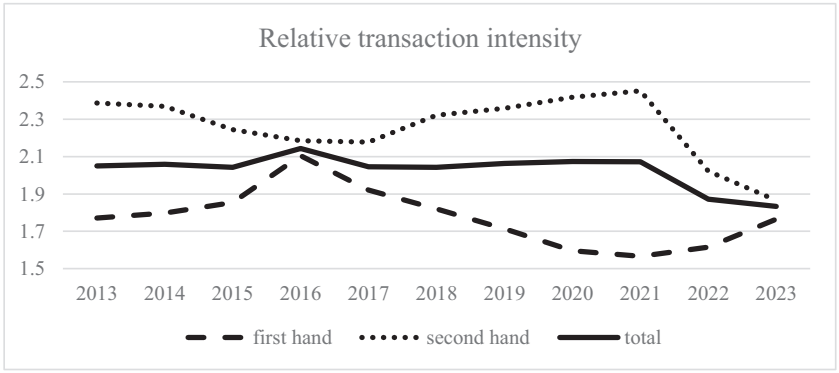

Fig. B1. Ratio of housing transaction intensity by province groups.
Source: General Directorate of Land Registry and Cadastre (GDLRC) and authors' calculation.

Fig. B2 reports the shares of first- and second-hand housing sales for provinces affected by the reform and those not affected. The reported shares correspond to the average of province-level first- and second-hand housing sales shares within each group of provinces. The figure reveals notable differences in both the level and evolution of housing market activity across the two groups. In provinces affected by the reform, second-hand transactions dominate throughout the entire sample period and exhibit a pronounced upward trend after 2018, increasing from roughly half of total transactions to nearly 70% by 2023. This shift is particularly striking, as it reflects a strong and persistent reliance on the resale market, accompanied by a sharp decline in the share of first-hand sales over the same period. In contrast, provinces not affected by the reform display a more balanced composition between first- and second-hand transactions in the earlier years, with first-hand sales accounting for a relatively larger share until around 2018. The transition toward second-hand dominance occurs more gradually, becoming evident only after 2019, and although the share of second-hand transactions increases steadily thereafter, the shift is less abrupt compared to reform-affected provinces. These patterns highlight two striking features. First, the resale segment plays a structurally more prominent role in provinces affected by the reform, both in terms of its initial dominance and its rapid expansion over time. Second, the timing and speed of the shift toward second-hand transactions differ markedly across groups, with reform-affected provinces experiencing an earlier and sharper transition. These differences point to distinct housing market dynamics across regions, particularly in terms of market composition and the relative importance of turnover in the resale segment.

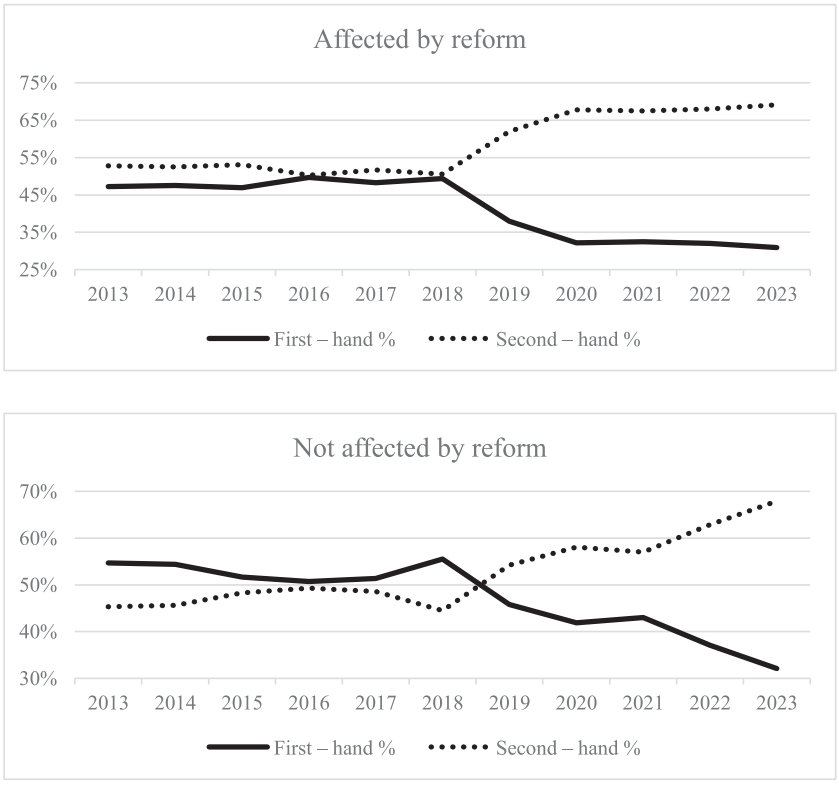

Fig. B2. Shares of first- and second-hand house sales by province groups.
Source: General Directorate of Land Registry and Cadastre (GDLRC) and authors' calculation.

Data availability

Data will be made available on request.

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