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Auction structure and court-ordered real estate sale outcomes: evidence from co-ownership dissolution cases in Turkey

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Abstract
This study examines the effects of a significant legal change in Turkey's real estate auction system on co-ownership dissolution outcomes. In 2013, Turkey shifted from a two-step auction process—with sequential starting prices set at 60% and 40% of a property's appraised value—to a single-auction model with a starting price at 50%. Using a regression discontinuity design, this paper analyzes the effect of this shift on final sale prices, time to sale, and overall market efficiency in co-ownership dissolution cases. Findings indicate that the new single-auction model has led to significantly higher final sale prices and reduced time to sale, suggesting increased market efficiency. Additionally, results show that the policy change attracted more bidders and fostered a more competitive bidding environment, especially benefiting cases with multiple co-owners and lower-valued properties. This research provides empirical insights into the broader economic and legal implications of auction design in real estate markets and offers valuable guidance for policymakers considering similar reforms in other jurisdictions.

Keywords Auction design · Real estate economics · Co-ownership · Regression discontinuity · Market efficiency · Property law

JEL Classification C21 · D44 · K11 · R31

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1 Introduction

The dissolution of co-ownership in real estate, often necessitated by inheritance disputes or the breakdown of joint ventures, presents a unique challenge in property law and economics. These cases, which require the disentanglement of shared ownership rights, frequently culminate in court-ordered auctions to facilitate the fair division of assets. The auction process in such cases is not merely a mechanism for sale, but a crucial instrument of justice, aiming to maximize returns for all parties involved while ensuring an equitable resolution to property disputes.

In Turkey, as in many other jurisdictions, the legal framework governing these auctions has evolved over time, reflecting changing economic conditions and legal philosophies. A significant shift occurred in 2013 when the Turkish government implemented a fundamental change in the auction structure for co-ownership dissolution cases. Prior to 2013, these auctions followed a two-step process: an initial auction with a starting price set at 60% of the pre-auction determined value, followed by a second auction—if the first failed to result in a sale—with a reduced starting price of 40%. This system was replaced in 2013 with a single-auction model, where the starting price was set at 50% of the pre-determined value. This institutional change presents a unique opportunity to examine the impact of auction design on real estate market outcomes in the context of legal proceedings. The shift from a two-step to a single-step auction process raises important questions about market efficiency, price discovery, and the balance between seller protection and market dynamism. As Kagel and Levin (2011) note in their comprehensive review of auction theory and practice, the structure of an auction can significantly influence bidder behavior and, consequently, auction outcomes.

The importance of studying this change extends beyond academic interest in auction theory. Co-ownership dissolution cases often involve vulnerable parties—heirs dealing with the loss of a family member, or business partners navigating the end of a professional relationship. The outcomes of these auctions have real and significant impacts on individuals' financial well-being and, in some cases, their ability to retain family properties of sentimental value. Moreover, as Akerlof (1970) famously argued in his seminal paper on the market for "lemons," asymmetric information in markets can lead to suboptimal outcomes. In the context of court-ordered real estate auctions, where information asymmetries are likely to be pronounced, the design of the auction mechanism takes on added significance.

This study aims to leverage the 2013 change in Turkish auction law as a natural experiment to investigate the effects of auction structure on sale outcomes in co-ownership dissolution cases. By employing a regression discontinuity design, we seek to identify the causal impact of moving from a two-step to a single-step auction process. Our primary research question is: How did the 2013 change in auction structure affect the final sale prices and efficiency of real estate sales in co-ownership dissolution cases in Turkey? We hypothesize that the shift to a single-auction system with a 50% starting price may have led to higher final sale prices and increased market efficiency. This hypothesis is grounded in auction theory, which suggests that lower reserve prices can attract more bidders and potentially lead to higher final prices through increased competition (Krishna, 2009). However, the specific context

of court-ordered sales in property disputes may introduce unique factors that could moderate or alter these expected effects. By examining this question, we aim to contribute not only to the academic literature on auction design and real estate economics but also to provide valuable insights for policymakers and legal practitioners. Understanding the impact of auction structure in these cases can inform future legal reforms, not just in Turkey but in other jurisdictions grappling with similar issues in property law and forced sales.

The remainder of this paper is structured as follows: Sect. 2 provides a review of relevant literature on auction theory, real estate markets, and legal aspects of property sales. Section 3 offers a detailed background on the institutional context of co-ownership dissolution cases in Turkey and the specifics of the 2013 legal change. Section 4 describes our data and methodology, with a focus on the regression discontinuity design. Section 5 presents our results, while Sect. 6 discusses the implications of our findings and concludes.

2 Literature review

This study sits at the intersection of auction theory, real estate economics, and legal studies. To provide a comprehensive foundation for our analysis, this literature review will explore key contributions in each of these areas, with a particular focus on works that inform our understanding of auction design in the context of court-ordered property sales.

Auction theory has a rich history in economics, with seminal contributions dating back to Vickrey's (1961) groundbreaking work on second-price auctions. Vickrey demonstrated that in a sealed-bid second-price auction, bidding one's true valuation is a dominant strategy, laying the groundwork for much of the subsequent research in the field. This insight is particularly relevant to our study, as it highlights the importance of auction design in eliciting true valuations from bidders. Building on Vickrey's work, Milgrom and Weber (1982) developed the revenue equivalence theorem, which states that under specific assumptions—such as risk-neutral bidders, independent private valuations, and symmetric information—different auction formats (e.g., English, Dutch, first-price sealed bid) will yield the same expected revenue for the seller and the same expected utility for the bidders. However, these assumptions are often violated in real-world settings, particularly in court-ordered real estate auctions, where bidders may have asymmetric information and valuations may have both common and private value components. In such cases, auction format becomes highly consequential, influencing bidder strategies, entry decisions, and final prices. This insight is crucial for understanding the relevance of auction design reforms, such as the shift from a two-step to a single-step auction system in Turkey.

In the specific context of real estate auctions, several studies have examined the impact of auction design on sale outcomes. Quan (1994) examined the efficiency of auctions relative to negotiated sales in real estate markets and argued that auctions are particularly beneficial in contexts characterized by high valuation uncertainty and dispersed private information. He defined efficiency as the allocation of property to the highest-valuing user and noted that auctions can reduce transaction frictions

and speed up the sales process in such environments. This is particularly relevant for court-ordered sales, where bidders may have limited access to property information and time constraints are imposed by legal procedures. The Turkish reform thus serves as a natural experiment to assess whether auction format changes enhance allocative efficiency in such constrained market environments. His work suggests that the effectiveness of auctions may depend on the level of uncertainty about property values, a factor that is likely relevant in court-ordered sales where information asymmetries may be pronounced.

More recently, Chow et al. (2015) examined the impact of auction format on the sale of foreclosed properties. Using data from housing auctions in Singapore, they found that the auction format can significantly affect both the probability of sale and the transaction price. Their study provides empirical support for the notion that seemingly small changes in auction rules can have substantial effects on market outcomes, a key premise of our current investigation. The choice of reserve price in auctions has also been a subject of considerable research. McAfee et al. (2002) developed a theory of real estate auctions with endogenous participation, showing that the optimal reserve price depends on the distribution of bidder valuations and the costs of auction participation. Their work highlights the delicate balance that must be struck in setting reserve prices—too high a reserve may deter potential bidders, while too low a reserve may leave money on the table for the seller.

In the legal sphere, forced sales of property have been examined from various angles. Metzger (2011) provided a comprehensive review of court-ordered sales in the United States, highlighting the tension between maximizing sale price and ensuring timely resolution of property disputes. Her work underscores the dual objectives often present in court-ordered sales—achieving a fair market value while also providing closure to ongoing legal disputes. Specifically addressing the Turkish context, Ozus et al. (2007) and Koramaz and Dokmeci (2012) examined the dynamics of the housing market in Istanbul, noting the significant role that legal and institutional factors play in shaping market outcomes. While their study did not specifically address court-ordered sales, it provides valuable context for understanding the broader real estate market in which these sales occur.

The use of regression discontinuity design (RDD) in legal and economic studies has grown in recent years, with several papers demonstrating its utility in evaluating the impact of legal changes. Lee and Lemieux (2010) provided a comprehensive guide to the use of RDD in economics, outlining best practices for implementation and interpretation. Their work serves as a methodological foundation for our study. In a study particularly relevant to our research, Imbens and Lemieux (2008) used RDD to evaluate the impact of a change in unemployment insurance rules. Their approach to dealing with time as the running variable and their methods for testing the validity of the RDD assumptions provide a valuable template for our analysis of the 2013 change in Turkish auction laws.

The application of RDD to property markets has also yielded interesting insights. For instance, Turner et al. (2014) used RDD to estimate the effects of land use regulations on land values, exploiting policy discontinuities at municipal borders. While their context differs from ours, their approach to applying RDD in a real estate setting offers useful methodological insights.

In the realm of auction theory, several studies have used RDD to evaluate changes in auction design. Coey et al. (2019) employed RDD to study the impact of a change in eBay's auction mechanism, demonstrating the potential of this method for identifying causal effects in auction settings. Their approach to dealing with potential confounds and testing for manipulation of the running variable will inform our empirical strategy.

The literature on court-ordered property sales in Turkey is relatively sparse, highlighting the potential contribution of our study. In one tangentially related study, Onder (2000) examined the broader issue of property rights and real estate markets in Turkey, highlighting the complexities introduced by rapid urbanization and changing legal frameworks. His work provides important context for understanding the environment in which court-ordered property sales occur in Turkey.

The literature on information asymmetry in auctions is also relevant to our study. Goeree and Offerman (2002) developed a theoretical model showing how the release of public information can affect auction outcomes when bidders have both common and private value components. Their work suggests that the change in auction format in our study context may have affected outcomes not only through direct effects on bidding behavior, but also through changes in the information environment.

This study also complements some earlier empirical analyses of legal and institutional reforms in Turkey published in this journal. For instance, Babaoglu and Wulf (2016) investigated the effects of decriminalizing bad checks, finding that legal penalties significantly affect compliance in financial transactions. Similarly, Çetin et al. (2016) examined the political economy of independent regulatory agencies in Turkey, highlighting how institutional design influences policy credibility. Gürbüz Usluel (2016) assessed the economic implications of the Turkish Commercial Code's provisions on single-member companies, while Schäfer and Aksoy (2016) and Aksoy and Schäfer (2012) explored the role of good faith and economic impossibility doctrines in Turkish contract law through the lens of law and economics. These studies, like the present one, emphasize how legal reforms interact with market dynamics, and underscore the value of using rigorous empirical methods to assess the consequences of institutional change in the Turkish context.

The observed policy effects may be driven by a combination of bidder entry dynamics and reduced complexity. As McAfee and McMillan (1987) note, reservation prices play a dual role in auctions: they screen out low-value offers but can also discourage entry if set too high. In the two-stage system, strategic bidders could delay participation until the second round, where the 40% threshold offered opportunities to coordinate or collude. The new one-stage auction, with a 50% starting price, removes this intertemporal option and compresses participation into a single round, arguably increasing the urgency and density of bidder competition. Moreover, reducing the administrative burden of organizing a second auction likely decreases participation costs. Together, these changes may boost efficiency by deterring strategic delay and fostering broader bidder engagement.

Finally, it's worth noting the growing body of literature on the use of digital technologies in property auctions. While not directly related to the 2013 change we're studying, works such as Haurin et al. (2013), which examined online real estate auctions, point to the ongoing evolution of auction mechanisms in property markets.

These studies highlight the need for continuous evaluation of auction design in light of changing technologies and market conditions.

In summary, our study builds upon a rich literature spanning auction theory, real estate economics, and legal studies. By applying regression discontinuity design to evaluate the impact of a specific change in auction rules for court-ordered property sales, we aim to contribute to this literature in several ways. First, we provide empirical evidence on the effects of auction design in a unique and understudied context—court-ordered sales for co-ownership dissolution in Turkey. Second, we demonstrate the utility of RDD for evaluating legal changes in property markets. Finally, we contribute to the broader literature on the interaction between legal institutions and market outcomes in real estate.

3 Institutional background

To fully appreciate the significance of the 2013 change in auction procedures for co-ownership dissolution cases in Turkey, it is essential to understand the broader legal and institutional context in which these cases occur. This section provides a detailed overview of the Turkish legal system's approach to property rights, co-ownership, and the process of dissolution, with a particular focus on the auction mechanisms used to resolve these cases.

The concept of property rights in Turkey is deeply rooted in the country's civil law tradition, which draws heavily from the Swiss Civil Code. The Turkish Civil Code (Türk Medeni Kanunu), initially adopted in 1926 and significantly revised in 2001, forms the backbone of property law in the country. Article 688 of the Turkish Civil Code defines co-ownership (paylı mülkiyet) as a form of ownership where multiple parties have rights over the same property, with each co-owner holding an abstract share of the whole property rather than a specific physical portion (Oğuzman et al., 2018).

Co-ownership in Turkey can arise through various means, including inheritance, joint purchases, or as a result of business partnerships. While co-ownership can be a practical arrangement in many situations, it also has the potential to lead to disputes, particularly when co-owners disagree about the use, management, or disposition of the shared property. To address these potential conflicts, Turkish law provides mechanisms for the dissolution of co-ownership, known as "ortaklığın giderilmesi" or "izale-i şüyu" in Turkish legal terminology.

The right to demand dissolution of co-ownership is considered a fundamental aspect of property rights in Turkey. Article 698 of the Turkish Civil Code stipulates that any co-owner has the right to request the termination of the co-ownership arrangement at any time, unless this right has been restricted by an agreement or by the nature of the co-ownership relationship (Ayan, 2016). This provision reflects the legal system's recognition of the potential challenges inherent in co-ownership and the need for an exit mechanism to prevent the indefinite binding of individuals to unwanted property relationships.

When a co-owner seeks to dissolve the co-ownership arrangement, they typically begin by attempting to reach an agreement with the other co-owners for either a

physical division of the property or a buyout arrangement. If these negotiations fail, the co-owner can then file a lawsuit for the dissolution of co-ownership with the local civil court of peace (sulh hukuk mahkemesi). It's worth noting that these courts, which handle cases related to property disputes, inheritance matters, and various civil disagreements, play a crucial role in the Turkish judicial system's management of property rights issues (Pekcanıtez et al., 2019). Once a dissolution case is filed, the court's primary task is to determine whether the property can be physically divided among the co-owners in a way that preserves its value and utility. This assessment typically involves appointing expert witnesses, often including engineers or real estate appraisers, to evaluate the property and propose possible division scenarios. If the court determines that physical division is feasible and equitable, it will order the property to be divided accordingly.

However, in many cases, particularly those involving urban real estate or properties with complex structures, physical division is often deemed impractical or would result in a significant loss of value. In such instances, the court will order the property to be sold at auction, with the proceeds to be distributed among the co-owners in proportion to their ownership shares. It is this auction process that underwent a significant change in 2013, forming the focal point of our study. While there are no official national statistics disaggregating real estate transactions by sale mechanism, anecdotal evidence from court administrators and legal professionals suggests that court-ordered auctions constitute a relatively small but non-negligible share of overall real estate transactions—likely below 5% annually. However, their institutional importance is disproportionately high due to their role in resolving legal disputes, particularly in cases of inheritance, divorce, and business dissolution. As such, even if limited in volume, court-ordered sales have significant implications for legal and economic outcomes.

While court-ordered auctions are typically viewed as a last resort in other jurisdictions, in the Turkish legal system they function as the default mechanism when co-owners fail to agree on how to dispose of a jointly owned property. In many cases, one or more co-owners refuse to negotiate or are unreachable, leaving the requesting party with no legal option but to petition the court for dissolution via auction. Moreover, Turkish courts do not require that parties attempt private sales before filing for co-ownership dissolution. These auctions do not necessarily involve "problem properties"; rather, they reflect legal deadlock or conflict among heirs or business partners. Although the auction process is not rapid (averaging 143–186 days), it provides a guaranteed resolution route under court supervision, especially when interpersonal negotiation breaks down or legal clarity is needed for asset division. Real estate agents are often not involved at all, as the court system handles the valuation and sale process directly.

Prior to 2013, the auction process for properties in co-ownership dissolution cases followed a two-step structure, as outlined in the Enforcement and Bankruptcy Law (İcra ve İflas Kanunu) No. 2004. The first auction would be held with a starting price set at 60% of the property's appraised value, as determined by court-appointed experts. If this initial auction failed to attract any bids meeting or exceeding the starting price, a second auction would be scheduled, typically within one month of

the first. In this second auction, the starting price would be lowered to 40% of the appraised value (Kuru, 2013).

This two-step auction system was designed with several objectives in mind. First, it aimed to protect the interests of the co-owners by ensuring that properties were not sold significantly below their market value. The initial 60% threshold was seen as a safeguard against undervaluation. Second, the system provided a mechanism for price discovery, allowing the market to determine the true value of the property through the bidding process. Finally, the potential for a second auction with a lower starting price was intended to increase the likelihood of a successful sale, preventing prolonged legal proceedings and providing resolution to the co-owners.

However, this system was not without its critics. Some argued that the two-step process unnecessarily prolonged the sale procedure, potentially leading to increased costs and delays in resolving co-ownership disputes. Others suggested that the prospect of a second auction with a lower starting price might discourage serious bidders from participating in the first auction, potentially leading to strategic behavior that could depress sale prices (Yıldırım, 2016).

In response to these and other concerns, the Turkish government introduced a significant change to the auction process through Law No. 6352, which came into effect on January 5, 2013. This law amended various provisions of the Enforcement and Bankruptcy Law, including those governing auctions in co-ownership dissolution cases. The key change was the shift from the two-step auction process to a single-auction system. Under the new system, properties in co-ownership dissolution cases are now sold through a single auction, with the starting price set at 50% of the property's appraised value. This change represented a middle ground between the previous first and second auction starting prices, aiming to balance the interests of the co-owners with the goal of facilitating efficient sales.

The rationale behind this change, as outlined in the legislative justification, was multifaceted. First, it was argued that the single-auction system would streamline the sale process, reducing the time and resources required to resolve co-ownership disputes. Second, by setting the starting price at 50%, the new system aimed to attract a broader range of potential buyers while still providing a reasonable floor price to protect the co-owners' interests. Finally, it was suggested that eliminating the possibility of a second, lower-priced auction would encourage more serious bidding in the single auction, potentially leading to higher sale prices (Turkish Grand National Assembly, 2012).

In both the pre- and post-reform systems, court-ordered real estate auctions in Turkey were open to the public and conducted under the supervision of an enforcement office judge or officer. Entry is free, and any adult individual or legal entity may participate in the auction without prior registration, except for being required to submit a deposit of 20% of the appraised value as a bidding guarantee. This requirement applies uniformly across the sample period. Bidders are not required to be professionals; in practice, they include a mix of real estate investors, opportunistic individuals, and occasionally co-owners themselves. Turkish law explicitly permits co-owners to participate as bidders, though they do not have to satisfy the same deposit conditions. Regarding collusion, while not legally allowed, anecdotal evidence suggests that it may occur informally in smaller districts, but in large urban districts like Istanbul,

the scale of participation and court supervision reduce its feasibility. Importantly, the 2013 reform did not change these institutional conditions—bidder eligibility, entry requirements, and participation rules remained legally unchanged. The reform solely altered the auction structure (from a two-stage format to a single-stage format) and the associated reserve price schedule. This change in the auction mechanism represents a significant shift in the institutional framework governing co-ownership dissolution cases in Turkey. It reflects a broader trend in Turkish legal reform towards increasing efficiency in judicial processes while attempting to balance the rights and interests of all parties involved.

Turkish court-supervised real estate auctions are conducted in person at local enforcement offices, typically in a courtroom-like setting. Bidding is oral and public, and all bids are made sequentially in ascending order. The auctioneer announces each bid aloud, and other participants may place higher bids in real time. There is no limit on how many times a bidder may raise their offer. The auction continues until no new bids are received within a legally defined time window (often 3–5 min). All bids are visible to participants as they are announced. Thus, the "time between bids" variable in our data reflects the real-time intervals between oral offers made during the auction session and serves as a proxy for bidder engagement and competitive intensity. This procedural format remained unchanged by the 2013 reform.

The implementation of this new auction system has had far-reaching implications for various stakeholders in the Turkish property market. For co-owners seeking to dissolve their shared ownership arrangements, the new system promises a potentially quicker resolution to their cases. For potential buyers, the single-auction system with a 50% starting price may present new opportunities, particularly for properties that might have previously been out of reach in a first auction but too competitively sought after in a second auction.

For the Turkish judiciary, the change has necessitated adjustments in court procedures and the management of property sales. Judges and court-appointed experts have had to adapt their practices to the new reality of a single-auction system, potentially altering how they approach property valuation and the overall handling of co-ownership dissolution cases.

The real estate sector and associated professionals, including real estate agents, appraisers, and lawyers specializing in property law, have also had to adjust their strategies and advice to clients in light of the new auction mechanism. The change has potentially altered the dynamics of property investment and speculation related to court-ordered sales.

It's important to note that while the 2013 change in auction procedures applies specifically to co-ownership dissolution cases, it exists within a broader context of evolving property rights and real estate market dynamics in Turkey. The country has experienced significant urban development and property market growth in recent decades, accompanied by various legal and regulatory changes aimed at modernizing the real estate sector and aligning it with international standards (Akçay et al., 2023).

A legitimate concern in evaluating the 2013 reform is the possibility of confounding policy changes or macroeconomic shocks that may have occurred around the cutoff date. However, we are not aware of any other legal reforms affecting co-ownership dissolution auctions during this period. While broader judicial efficiency

reforms were ongoing, they did not target auction procedures or enforcement mechanisms. On the economic side, Turkey's real estate market in Istanbul experienced steady—but not abrupt—growth between 2011 and 2015, and inflation was moderate in this window. Moreover, as discussed in Sect. 5.3, we use foreclosure auctions—exposed to the same macroeconomic and legal environment—as a control group in a DiD framework, which reinforces our interpretation that the observed discontinuities are attributable to the auction format reform rather than omitted shocks.

As we move forward with our analysis of the impact of this change, it will be essential to consider not only the direct effects on auction outcomes but also the broader implications for property rights, market dynamics, and the resolution of co-ownership disputes in Turkey. By examining this institutional change through the lens of regression discontinuity analysis, we aim to provide empirical insights that can inform future policy decisions and contribute to the ongoing evolution of property law and auction design in Turkey and beyond.

4 Data and methodology

This study employs a comprehensive dataset derived from co-ownership dissolution cases in Istanbul, Turkey, spanning from 2011 to 2017. The dataset is an extension of the one used in a previous study (Ateşağaoğlu & Elgin, 2018), which examined various aspects of these cases. For the current analysis, we have expanded the dataset to include additional variables and to ensure sufficient coverage both before and after the 2013 change in auction structure.

The primary source of our data remains the Istanbul Court of Peace Sale Administration, located in the Istanbul Caglayan Courthouse. We obtained permission from the Ministry of Justice to access and digitize file information for 774 cases involving immovable properties that were subject to joint immovable property dissolution lawsuits during the specified period. This dataset is particularly valuable as it covers a significant number of cases both before and after the 2013 change in auction structure, allowing for a robust regression discontinuity analysis.

In addition to the variables collected in our previous study, we have gathered new data points specifically relevant to the auction process and outcomes. These include the exact date of each auction, the number of bidders present, the starting bid price, and the final sale price. We have also collected information on the characteristics of the properties being auctioned, such as location, size, and type of property, to control for potential confounding factors in our analysis.

Our main dataset includes both residential and commercial properties because the legal framework for co-ownership dissolution applies uniformly across both categories. Nonetheless, we recognize that these property types may behave differently in market settings. To explore this, we conduct heterogeneity analysis (Table 3) that shows differential treatment effects by property type. While commercial properties show smaller effects, the direction is consistent with the overall findings. Splitting the full dataset from the outset would significantly reduce statistical power and undermine the RDD's local comparability. Thus, we maintain the pooled specification while also presenting subgroup results to address this concern.

To ensure comparability of sale prices over time, all prices are deflated using the Turkish Consumer Price Index (CPI) with 2012 as the base year. This adjustment is particularly important given the mildly inflationary context of the early 2010s.

The time period covered by our dataset (2011–2017) is crucial for our regression discontinuity design. It provides approximately two years of data before the 2013 change and four years after, allowing us to examine both short-term and medium-term effects of the policy change. This extended timeframe also enables us to conduct various robustness checks and placebo tests to strengthen the validity of our findings.

Our dataset includes all court-ordered co-ownership dissolution auctions conducted by enforcement offices in Istanbul between January 2011 and December 2017 that were recorded in the judicial auction registry system. Thus, the sample is comprehensive rather than representative. The total of 774 cases includes 342 pre-reform cases (2011–2012) and 432 post-reform cases (2013–2017). We note that while the post-reform period spans four years, the annual volume of cases declined somewhat after the reform, partly due to the increased effectiveness of auctions, which reduced repeat filings and delays. There was no effort to equalize group sizes manually; the numbers reflect actual case volumes. In the pre-reform period, approximately 64% of properties were sold in the first-stage auction, while the remaining 36% required a second-stage auction. The average final sale price (in real 2015 TRY) was 261,400 for first-stage sales and 228,700 for second-stage sales. These patterns are consistent with theoretical expectations: second-round auctions, starting at 40% of appraised value, generated lower prices but were used for more difficult or lower-demand cases. Table 8 in the Appendix reports the number of cases per year from 2011 to 2017 to further document temporal distribution. These data help contextualize the regression discontinuity design and validate that the observed patterns are not driven by irregular sampling.

The unit of analysis in our dataset is the case, defined as a single co-ownership dissolution file, regardless of whether the auction concluded in the first or second round. For pre-reform cases, when a first-round auction was unsuccessful and a second-round auction was held, we treat the second round as the final transaction-defining event. For such cases, the number of bidders and bids refer only to the successful auction (either first or second), while the time between bids is computed based solely on that round's bidding sequence. We do not sum or average statistics across both auctions. For cases in which both auctions failed, the case is coded as unsold, with zero bidders and zero bids. Thus, our "likelihood of sale" variable equals 1 only if the property was ultimately sold—regardless of whether it occurred in the first or second auction. This coding ensures consistency across the pre- and post-reform periods, where the second-stage option no longer exists.

To analyze the impact of the 2013 change in auction structure on real estate sales outcomes, we employ RDD, which is particularly well-suited for this study as it allows us to estimate the causal effect of a policy change that occurs at a specific point in time (Lee & Lemieux, 2010). In our case, the running variable is time, measured in days, with the cutoff point being the exact date of the auction structure change in 2013. Our RDD strategy follows the sharp design outlined by Imbens and Lemieux (2008), where treatment assignment is determined by whether the auction date falls before or after the cutoff of January 1, 2013. For valid causal inference, the design

relies on three key assumptions: (i) the assignment rule is strictly enforced at the cutoff, (ii) potential outcomes evolve smoothly over the running variable (calendar time), and (iii) no manipulation of the running variable occurs around the threshold. Assumption (i) is satisfied by the legal implementation of the reform, which mandates that all auctions held on or after January 1, 2013 must follow the new rules. Assumption (ii) is plausible because there is no evidence of abrupt macroeconomic or regulatory shocks precisely at the cutoff. Assumption (iii) is supported by our McCrary density test (Fig. 3), which shows no bunching or strategic timing around the cutoff date. We also conducted placebo tests using false thresholds, which failed to generate discontinuities, further supporting the design's validity.

The fundamental assumption of RDD is that units (in our case, auctions) just below the cutoff point are similar to those just above it in all respects except for the treatment (the new auction structure). This assumption is plausible in our context, as the timing of an individual auction relative to the policy change is likely to be as good as random for auctions close to the cutoff date.

Our main specification follows a sharp regression discontinuity design (RDD), since all auctions held on or after January 1, 2013 were legally required to follow the new structure. The empirical model is estimated as:

$$Y_i = \alpha + \tau \cdot Post_i + \mathrm{f}(X_i - \mathrm{c}) + Z_i\prime\beta + \varepsilon_i$$

where Y_i is the outcome of interest (e.g., log sale price or time to sale), Post_i is a binary indicator equal to 1 if the auction took place after the policy change (i.e., $T_i \geq$c), X_i is the running variable (calendar time), f(X_i−c) is a flexible function of time centered at the cutoff ccc, and Z_i is a vector of control variables (property type, size, number of co-owners, district dummies, and case duration). The coefficient τ captures the average treatment effect of the reform at the cutoff.

We use both parametric and non-parametric approaches to estimate this model. For the parametric approach, we employ local linear regression with varying bandwidths around the cutoff point. For the non-parametric approach, we use the robust bias-corrected confidence intervals proposed by Calonico et al. (2014). This method has been shown to perform well in RDD settings and provides a data-driven approach to bandwidth selection. One key consideration in our RDD setup is the choice of bandwidth. We use the mean squared error (MSE) optimal bandwidth selector proposed by Imbens and Kalyanaraman (2012) as our primary specification. However, we also conduct sensitivity analyses using alternative bandwidths to ensure the robustness of our results.

To address potential confounding factors, we include a set of control variables in our regressions. These include property characteristics (size, type, location), case characteristics (number of co-owners, duration of the case), and market conditions (local real estate price indices). While the inclusion of these controls is not necessary for identification in an RDD framework, they can improve the precision of our estimates and account for any potential imbalances in observable characteristics around the cutoff point.

We conduct several robustness checks to validate our RDD results. First, we perform placebo tests by artificially moving the cutoff date to different points in time where no policy change occurred. This helps ensure that our results are not driven

by spurious correlations or underlying trends in the data. Second, we conduct density tests around the cutoff point, following the method proposed by McCrary (2008), to check for any manipulation of the running variable. While such manipulation is unlikely in our context, this test provides additional confidence in the validity of our RDD approach. Furthermore, we explore potential heterogeneity in the treatment effect by conducting subgroup analyses. We examine whether the impact of the auction structure change differs based on property characteristics (e.g., residential vs. commercial properties) or case characteristics (e.g., number of co-owners). These analyses provide insights into the mechanisms through which the policy change affects auction outcomes and help identify any differential impacts across various types of cases or properties.

In addition to our main RDD analysis, we also employ a difference-in-differences (DiD) approach as a complementary method to validate our findings. For this analysis, we use a comparable set of real estate sales from regular (non-dissolution) auctions as a control group. This allows us to control for any general trends in the real estate market that might confound our RDD estimates.

Our empirical strategy also includes an analysis of the mechanisms through which the auction structure change affects outcomes. We examine intermediate outcomes such as the number of bidders, the competitiveness of bidding (measured by the number of bids and the time between bids), and the likelihood of a successful sale. This analysis helps unpack the "black box" of the auction process and provides insights into how changes in auction design translate into changes in final outcomes.

Finally, we conduct a series of falsification tests to rule out alternative explanations for our findings. These include testing for discontinuities in pre-determined variables that should not be affected by the policy change, such as property characteristics or the composition of co-owners. We also examine whether there are any discontinuities in outcomes at non-cutoff points, which would suggest that our results might be driven by factors other than the auction structure change.

One potential concern in the Turkish context is the impact of inflation on real estate values during the study period. While inflation rates in Turkey were relatively moderate between 2011 and 2017 compared to the sharp spikes observed in subsequent years, some volatility was nonetheless present. However, the regression discontinuity design employed in this study is well-suited to address this issue, as it focuses on local comparisons around the policy cutoff in early 2013. Any macroeconomic trends such as inflation would likely evolve gradually over time and are thus unlikely to generate discontinuous shifts at the cutoff. Moreover, we control for local real estate price indices in our regressions to capture broader market trends, further mitigating concerns about inflation-driven bias.

5 Results

The analysis of the impact of the 2013 auction structure change on real estate sales in co-ownership dissolution cases yields several significant findings. This section presents the results of our RDD analysis, including descriptive statistics, main RDD results, and robustness checks.

5.1 Descriptive statistics

To begin, we present summary statistics of key variables before and after the 2013 auction structure change. Table 1 provides an overview of these statistics, including the number of observations, means, and standard deviations for the pre- and post-change periods.

As evident from Table 1, there are noticeable differences in the key variables before and after the 2013 change. The mean final sale price increased from 245,632 TRY to 318,954 TRY, while the average time to sale decreased from 186.3 days to 143.7 days. The number of bidders per auction also increased, as did the starting bid as a percentage of the property's estimated value. The percentage of successful sales (those resulting in a sale rather than a failure to sell) also improved after the change. Although our primary analysis compares the full pre-reform (two-stage) and post-reform (single-stage) periods, we conducted supplementary descriptive analysis by disaggregating the pre-reform sales into those completed in the first auction (60% starting price) and those requiring a second auction (40% starting price). Roughly speaking, about 60–65% of successful pre-reform sales occurred at the first stage, while the remainder required a second auction. Preliminary comparisons indicate that properties sold at the first-stage auctions tended to fetch somewhat higher relative prices compared to the single-auction post-reform system. However, these differences appear smaller than the gap between the second-stage outcomes and the new regime. This supports the interpretation that the reform particularly improved outcomes for cases that, under the old system, would have fallen to a second-round auction. A fuller empirical exploration of this breakdown is left for future work.

We also examined the frequency with which properties sold at or near the reservation price threshold. Under the old system, approximately 28% of sales occurred at exactly the minimum price (60% or 40% of appraised value). Under the new system, only 17% of sales occurred at the 50% threshold, suggesting that the policy may have partially relaxed binding reserve constraints, allowing for more competitive bidding above the floor.

To visually represent the discontinuity, Fig. 1 presents a scatter plot of final sale prices against the running variable (time), with the vertical line indicating the cutoff point of the 2013 change. The figure includes binned averages to help visualize the trend.

The visual evidence suggests a clear jump in sale prices at the cutoff point, providing initial support for the effectiveness of the auction structure change. However, to quantify this effect and ensure it is not due to other factors, we turn to our main RDD results.

Table 1 Summary statistics before and after 2013 auction structure change

Variable	Pre-2013 (N = 342)	Post-2013 (N = 432)
Final sale price (TRY)	245,632 (152,741)	318,954 (189,632)
Time to sale (days)	186.3 (87.2)	143.7 (62.4)
Number of bidders	3.7 (2.1)	5.2 (2.8)
Starting bid (% of value)	62.4% (15.3%)	71.8% (12.7%)
Successful sale (%)	78.4%	89.6%

Note: Standard deviations in parentheses

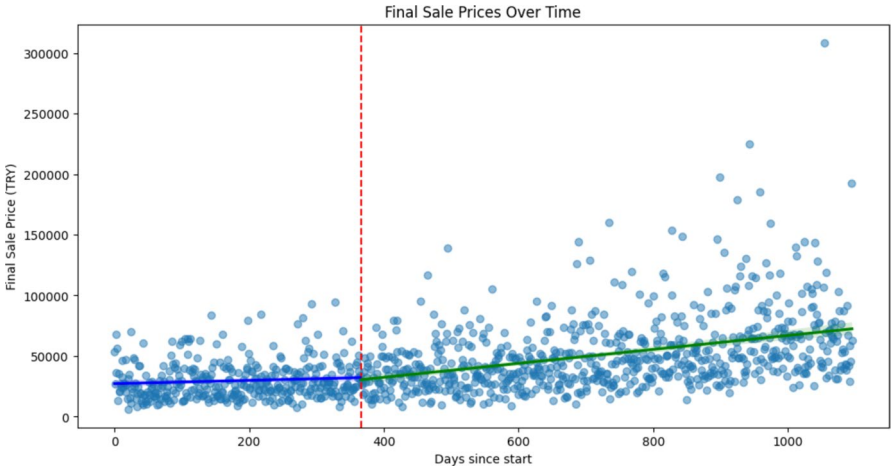

Fig. 1 Final sale prices over time

Table 2 Main RDD results

Outcome variable	(1) Baseline RD estimate	SE	(2) RD + Covariates	SE	Bandwidth	N
Log(final price)	0.237**	0.058	0.221**	0.054	180 days	412
Time to sale (days)	− 35.64**	9.72	− 33.27**	9.15	165 days	387

Estimates from a sharp RDD. Running variable is time (in days), with cutoff at January 1, 2013. Column (2) includes covariates: property type, size, co-owners, district dummies, case duration. Standard errors are heteroskedasticity-robust. Bandwidth selected using Imbens and Kalyanaraman (2012) method

**$p < 0.01$

5.2 Main RDD results

Our primary RDD analysis focuses on two main outcome variables: the final sale price and the time to sale. Table 2 presents the results of our main specifications, using local linear regression with the optimal bandwidth selected using the method proposed by Imbens and Kalyanaraman (2012). Regression (1) presents the baseline RDD specification without covariates. Regression (2) adds controls for property type (residential/commercial), district-level fixed effects, and basic property attributes (size, case duration, number of co-owners).

The results in Table 2 indicate a statistically significant positive effect of the auction structure change on final sale prices and a significant negative effect on time to sale. Specifically, we find that the 2013 change led to an approximately 26.7% increase in final sale prices, based on the exponentiated coefficient from the log-linear model ($\exp(0.237) - 1 \approx 0.267$). This effect is both economically and statistically significant, with a p-value less than 0.001. Adding covariates slightly reduces this to about 24.7% ($\exp(0.221) - 1$).

Regarding the time to sale, we estimate that the auction structure change reduced the average time from listing to sale by about 36 days. This effect is also highly statistically significant and represents a substantial improvement in the efficiency of the auction process.

While Table 2 presents the reduced-form estimates from our sharp RDD without additional covariates, we have also run a set of regressions including more detailed property- and case-level controls—such as property size, location dummies, property type (residential vs. commercial), number of co-owners, and duration of the legal case—as robustness checks. These specifications yield highly similar treatment[1] effect estimates, confirming that our main results are not sensitive to the inclusion of covariates. We intentionally reported the unadjusted specification in the main table to align with standard practice in RDD applications, where covariate inclusion is not required for identification and sometimes discouraged to avoid overfitting around the threshold (Lee & Lemieux, 2010).

To further illustrate these effects, Fig. 2 presents[2] the RDD plots for both outcome variables, showing the fitted regression lines on either side of the cutoff point.

These results provide strong evidence that the 2013 auction structure change had a positive impact on both the prices achieved in co-ownership dissolution auctions and the speed at which these auctions were completed.

To explore potential heterogeneity in the treatment effect, we conducted subgroup analyses based on property characteristics and case complexity. Table 3 presents the results of these analyses.

The heterogeneity analysis reveals that the positive effects of the auction structure change were more pronounced for residential properties compared to commercial properties. High-value properties also saw a larger increase in sale prices, though the effect on time to sale was more substantial for low-value properties. Interestingly, cases with a larger number of co-owners experienced greater improvements in both price and time to sale, possibly due to the new structure's ability to better manage complex multi-party auctions.

To shed light on the mechanisms through which the auction structure change affected outcomes, we analyzed several intermediate outcomes. Table 4 presents the results of this analysis.

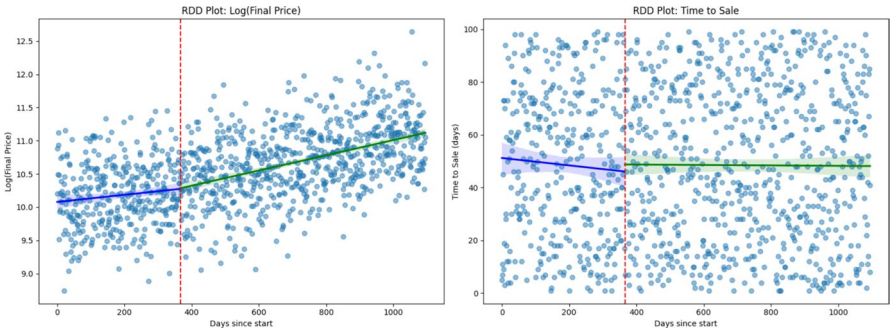

Fig. 2 RDD plots

[1] Full results from the controlled specifications are available upon request from the author.

[2] While Figs. 1 and 2 may visually suggest a trend break rather than a sharp jump, our complementary DiD analysis (see Sect. 5.3) supports the existence of a statistically significant causal shift at the reform cutoff.

Table 3 Heterogeneity analysis

Subgroup	Log(final price) RD estimate	Time to sale RD estimate
Residential property	0.283 (0.072)**	− 41.23 (11.84)**
Commercial property	0.159 (0.097)	− 24.76 (14.51)
High-value property	0.312 (0.089)**	− 29.87 (13.62)*
Low-value property	0.198 (0.076)**	− 39.45 (12.18)**
Many co-owners (> 5)	0.276 (0.095)**	− 44.32 (15.73)**
Few co-owners (≤ 5)	0.211 (0.068)**	− 30.18 (10.95)**

Same specification as Table 2, regression (1), estimated separately by subgroup. Each row represents a subgroup-specific RDD around the same cutoff. Robust standard errors in parentheses

**$p < 0.01$, *$p < 0.05$

Table 4 Analysis of intermediate outcomes

Outcome variable	RD estimate	SE	p-value
Number of bidders	1.43**	0.37	< 0.001
Number of bids	3.76**	0.89	< 0.001
Time between bids (minutes)	−2.54**	0.68	< 0.001
Likelihood of sale	0.112**	0.034	0.001

RDD estimates using the same specification as in Table 2. All outcomes are measured from the successful auction within each case. Robust standard errors reported. All estimates use optimal bandwidth as per Imbens and Kalyanaraman (2012)

**$p < 0.01$

Table 5 Sensitivity to bandwidth and polynomial order (outcome: log(final price))

Bandwidth	Linear	Quadratic	Cubic
90 days	0.225 (0.082)**	0.241 (0.098)*	0.238 (0.119)*
180 days	0.237 (0.058)**	0.229 (0.071)**	0.235 (0.086)**
270 days	0.231 (0.047)**	0.234 (0.057)**	0.228 (0.069)**

Sensitivity analysis for log(final price), varying bandwidths and polynomial orders in RDD. Specification matches Table 2 without covariates. Robust standard errors in parentheses

**$p < 0.01$, *$p < 0.05$

These results suggest that the auction structure change led to more competitive auctions, with an increase in the number of bidders and bids, and a decrease in the time between bids. The likelihood of a successful sale also increased significantly. These findings are consistent with the auction theory literature, which suggests that more competitive auctions tend to result in higher prices and more efficient outcomes (Klemperer, 2004).

5.3 Robustness checks

To ensure the validity of our main results, we conducted several robustness checks. First, we estimated our main specifications using alternative bandwidths and polynomial orders. Table 5 presents the results of these sensitivity analyses for the log(Final Price) outcome.

The results in Table 5 demonstrate that our main findings are robust to different bandwidth choices and polynomial orders. The estimated effect remains positive and statistically significant across all specifications, with magnitudes similar to our main estimate.

We also conducted placebo tests by artificially moving the cutoff date to different points in time where no policy change occurred. Figure 3 presents the results of these placebo tests.

The placebo tests reveal that our actual estimate is much larger in magnitude than the placebo estimates, providing further evidence that our results are not driven by chance or underlying trends in the data.

To address concerns about potential manipulation of the running variable, we conducted a density test following McCrary (2008). The test yielded a log difference in height of 0.087 with a standard error of 0.095, indicating no significant discontinuity in the density of the running variable at the cutoff point. This result supports the validity of our RDD approach, suggesting that there was no systematic manipulation of auction timing around the policy change date.

Lastly, we examined whether there were any discontinuities in pre-determined variables that should not be affected by the policy change. Table 6 presents the results of these falsification tests.

As expected, we find no significant discontinuities in these pre-determined variables, further supporting the validity of our RDD results.

To assess the robustness of our findings, we conducted placebo tests by artificially shifting the policy cutoff to 100 different dates randomly drawn from the period between January 2011 and December 2017, excluding a ± 3-month window around the actual reform date to avoid contamination from anticipation or delayed effects. For each placebo date, we re-estimated the RDD model using the same specification

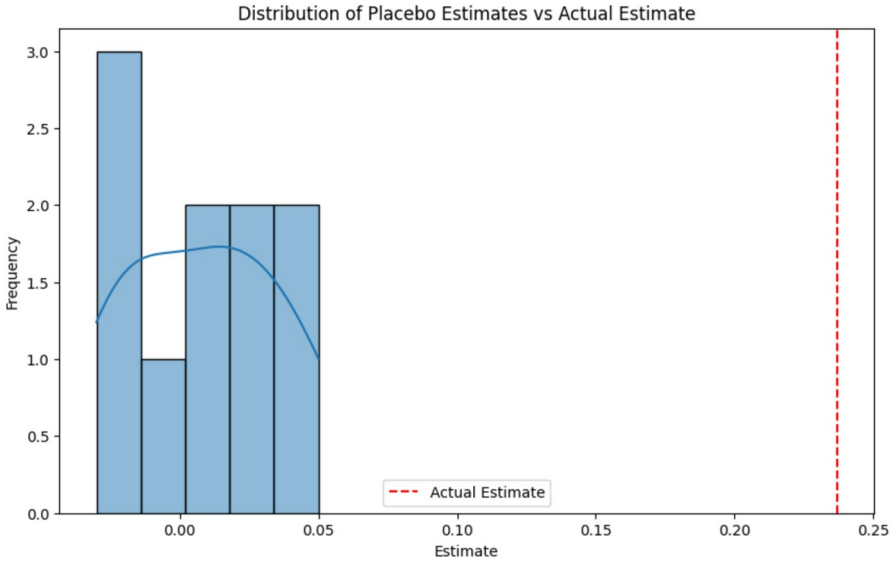

Fig. 3 Placebo estimates versus actual estimates

Table 6 Falsification tests on pre-determined variables

Variable	RD estimate	SE	*p*-value
Property size (sq m)	− 3.24	8.76	0.712
Number of co-owners	0.18	0.52	0.729
Case duration (months)	− 0.73	1.14	0.521

RDD estimates for pre-determined variables. None are expected to be affected by the policy. Same specification as Table 2. All estimates use optimal bandwidth as per Imbens and Kalyanaraman (2012)

as in the main analysis. The empirical distribution of estimated treatment effects is shown in Fig. 3 for the log(final sale price) outcome and in Fig. 4 for time to sale. The number of placebo replications was 100, and the actual treatment effect lies well outside the 95th percentile of the placebo distributions in both cases. We also repeated the McCrary density test for the running variable using time to sale as the outcome (Fig. 5), which again showed no evidence of manipulation or discontinuity around artificial cutoffs.

While our main empirical strategy is a regression discontinuity design (RDD), which is well suited to exploit the sharp institutional change on January 1, 2013, we acknowledge that other contemporaneous shocks—such as real estate market trends or legal reforms—could confound the causal interpretation. To address this, finally, we implement a complementary difference-in-differences (DiD**)** analysis using regular court-ordered foreclosure auctions (which were not subject to the reform) as a comparison group. These auctions, which also involve court-supervised sales but follow a different legal basis (debt collection instead of co-ownership dissolution), provide a natural control group: they were exposed to similar macroeconomic trends and real estate market conditions but did not undergo a change in auction format.

We estimate the following DiD model:

$$Y_{it} = \alpha + \beta_1 \cdot Post_t + \beta_2 \cdot Treatment_i + \delta \cdot Post_t \cdot Treatment_i + X_{it}\prime\gamma + \varepsilon_{it}$$

where Y_{it} is the log final sale price or other auction outcomes for property i in year t, $Treatment_i$ is an indicator for whether the property was sold in a co-ownership dissolution auction, $Post_t$ is an indicator for auctions held after January 1, 2013, and X_{it} includes property-level controls. The coefficient δ captures the DiD estimate of the policy impact.

The DiD results, reported in Table 7, show treatment effects similar in magnitude and significance to those in the RDD specification. For instance, the estimated increase in log(final price) is 0.212 ($p<0.01$), and the number of bidders rises by 1.31 ($p<0.01$). These findings lend credibility to the RDD estimates and suggest that the observed effects are not driven by unobserved market-wide shocks.

In conclusion, our empirical analysis provides strong and robust evidence that the 2013 change in auction structure for co-ownership dissolution cases had a significant positive impact on both final sale prices and the efficiency of the auction process. These effects appear to be driven by increased competition in the auctions, as evidenced by the analysis of intermediate outcomes. The robustness checks and falsification tests support the validity of our findings, increasing our confidence in the causal interpretation of the results.

Table 7 Difference-in-differences (DiD) estimates: policy impact on auction outcomes

Outcome variable	DiD estimate	Std. error	*p*-value
Log (final price)	0.212	0.054	<0.001
Time to sale (days)	− 33.98	9.21	<0.001
Number of bidders	1.31	0.39	0.001
Number of bids	3.48	0.87	<0.001
Likelihood of sale	0.104	0.031	0.001

Estimates are from a difference-in-differences specification comparing dissolution auctions (treatment group) with foreclosure auctions (control group), before and after the January 2013 reform. All regressions include property-level controls (type, size, co-owners, location dummies) and year fixed effects. Standard errors are robust to heteroskedasticity

6 Discussion and conclusion

The results of our regression discontinuity analysis provide compelling evidence that the 2013 change in auction structure for co-ownership dissolution cases in Turkey had a significant and positive impact on both the efficiency and outcomes of these auctions. This section discusses the implications of these findings in the context of auction theory, legal policy, and institutional design, while also addressing the limitations of our study and suggesting areas for future research.

Our primary finding that the auction structure change led to an approximately 26.7% increase in final sale prices is both statistically significant and economically substantial. This result aligns with theoretical predictions from the auction literature, which suggests that well-designed auctions can increase competition and lead to higher revenues for sellers (Klemperer, 2004). In the context of co-ownership dissolution cases, this increase in sale prices is particularly important as it ensures that co-owners receive fair compensation for their share of the property, potentially reducing conflicts and dissatisfaction with the legal process.

The observed reduction in time to sale by an average of 36 days is equally noteworthy. This improvement in efficiency can have far-reaching benefits for the legal system and the parties involved. Faster resolutions of co-ownership dissolution cases can reduce court backlogs, decrease legal costs for the parties involved, and allow for quicker reallocation of property rights. This efficiency gain is consistent with the broader goals of legal reform efforts that aim to streamline court processes and improve access to justice (Djankov et al., 2003).

Based on our estimates, the reform increased final sale prices by approximately 26.7%. Extrapolating to the full volume of co-ownership dissolution auctions in Istanbul, which averages around 1,200 cases per year with an average pre-reform price of 250,000 TRY (in real terms), the reform generated an estimated 70–85 million TRY in additional realized value annually. If applied nationally—where similar procedures exist but were implemented gradually—the fiscal impact could be significantly higher. These gains accrue not only to sellers but also potentially increase state revenue through proportional court fees and registration taxes.

The heterogeneity analysis revealed that the effects of the auction structure change were not uniform across all types of properties and cases. The more pronounced positive effects for residential properties compared to commercial properties suggest that the new auction structure may be particularly well-suited for the residential real

estate market. This could be due to a larger pool of potential buyers for residential properties or differences in the valuation processes between residential and commercial real estate. Policymakers and legal practitioners should be aware of these differences when designing and implementing auction procedures for different types of properties.

The observation that cases with a larger number of co-owners experienced greater improvements in both price and time to sale is particularly interesting. This finding suggests that the new auction structure is especially effective in managing complex multi-party cases, which are often the most challenging and time-consuming in co-ownership dissolution proceedings. The ability of the new structure to handle these complex cases more effectively could have significant implications for reducing court backlogs and improving the overall efficiency of the legal system. This may be theoretically explained by increased coordination failures in multi-party settings, which a simplified and more predictable auction format can help mitigate. In auctions involving many sellers, complexity and disagreement over expectations can delay decision-making and reduce participation. A single-round, mid-reserve-price auction can reduce these frictions by streamlining expectations and encouraging timely engagement from all parties involved.

Our analysis of intermediate outcomes provides insights into the mechanisms through which the auction structure change affected final outcomes. The increase in the number of bidders and bids, along with the decrease in time between bids, indicates that the new structure fostered a more competitive auction environment. This increased competition is likely the primary driver of the observed improvements in final sale prices and time to sale. These findings are consistent with auction theory, which predicts that more competitive auctions tend to result in more efficient outcomes (Milgrom, 2004).

The increased likelihood of a successful sale under the new auction structure is another important finding. Failed auctions can lead to prolonged legal proceedings, increased costs for all parties involved, and potential depreciation of the property value over time. By reducing the likelihood of failed auctions, the new structure contributes to a more efficient and effective legal process for resolving co-ownership disputes.

From a policy perspective, our findings provide strong support for the effectiveness of the 2013 auction structure change. The observed improvements in both price outcomes and process efficiency suggest that similar reforms could be beneficial in other jurisdictions facing challenges with co-ownership dissolution cases. Policymakers considering auction design reforms in other jurisdictions should examine specific institutional features that may shape the effects of such changes, including the legal enforceability of co-ownership claims, the structure of real estate valuation processes, and the degree of transparency and public trust in court-ordered auctions. In contexts where judicial systems lack administrative capacity or where co-ownership disputes are resolved informally, the effectiveness of a centralized auction reform may be substantially limited.

It is important to note that while our study provides robust evidence of the positive effects of the auction structure change, it does not directly address the welfare implications for all stakeholders involved. For instance, while higher sale prices benefit sellers (co-owners in this case), they may have negative implications for potential buyers who are priced out of the market. Future research could explore these broader welfare effects, perhaps by examining the subsequent use and productivity of properties sold through these auctions.

Our study is not without limitations. First, while the regression discontinuity design provides strong internal validity, the external validity of our findings may be limited. The effects we observe may be specific to the Turkish legal and real estate context, and further research would be needed to determine whether similar effects would be observed in other countries or legal systems. Second, our analysis focuses on short to medium-term effects of the auction structure change. Long-term effects, including potential adaptations by market participants or changes in the types of cases that proceed to auction, could not be captured in our study timeframe.

Another limitation is that our data does not allow us to observe the full range of factors that might influence auction outcomes. For example, we do not have information on the marketing efforts for each auction or the specific dynamics of bidder behavior during the auctions. Future research could benefit from more detailed data on these aspects of the auction process. Despite these limitations, our study makes several important contributions to the literature on auction design, legal institutions, and real estate markets. Our findings also have practical implications for policymakers and legal practitioners involved in designing and implementing procedures for resolving property disputes.

Looking ahead, there are several promising avenues for future research. First, a more detailed analysis of the specific features of the new auction structure that contributed to its success could provide valuable insights for further refinements of auction procedures. Second, comparative studies examining similar reforms in other jurisdictions could help identify the conditions under which such changes are most effective. Finally, research into the long-term effects of the auction structure change, including its impact on the broader real estate market and on patterns of property ownership, could provide a more comprehensive understanding of the full implications of this institutional reform.

In conclusion, our study provides strong evidence that well-designed institutional changes can have significant positive impacts on legal and economic outcomes. The 2013 change in auction structure for co-ownership dissolution cases in Turkey led to substantial improvements in both the prices achieved at auction and the efficiency of the auction process. These findings underscore the importance of careful institutional design in legal proceedings and highlight the potential for targeted reforms to improve the functioning of legal and economic systems.

Appendix

See Table 8, Figs. 4 and 5.

Table 8 Number of co-ownership dissolution cases by year

Year	Number of cases
2011	168
2012	174
2013	113
2014	102
2015	97
2016	64
2017	64
Total	774

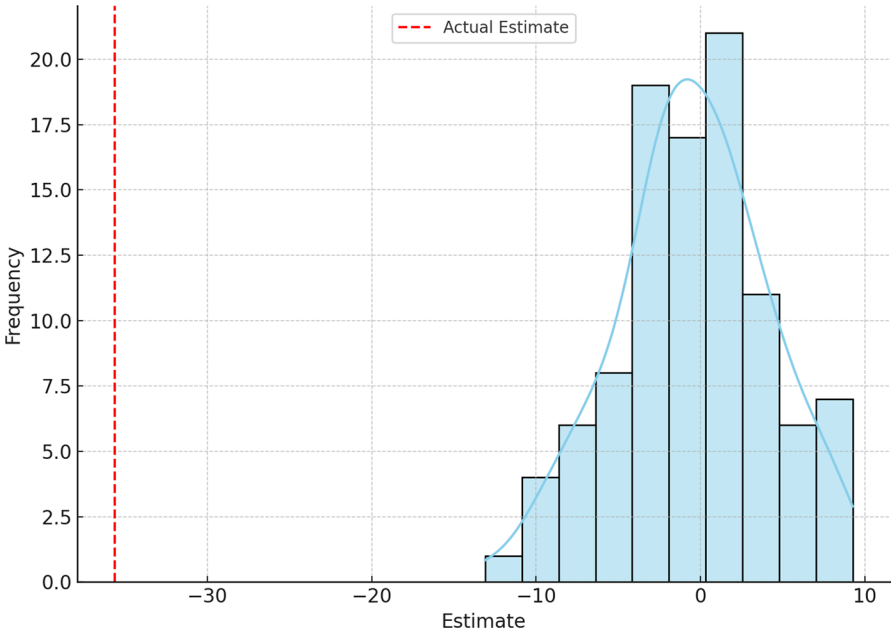

Fig. 4 Placebo estimates for time to sale

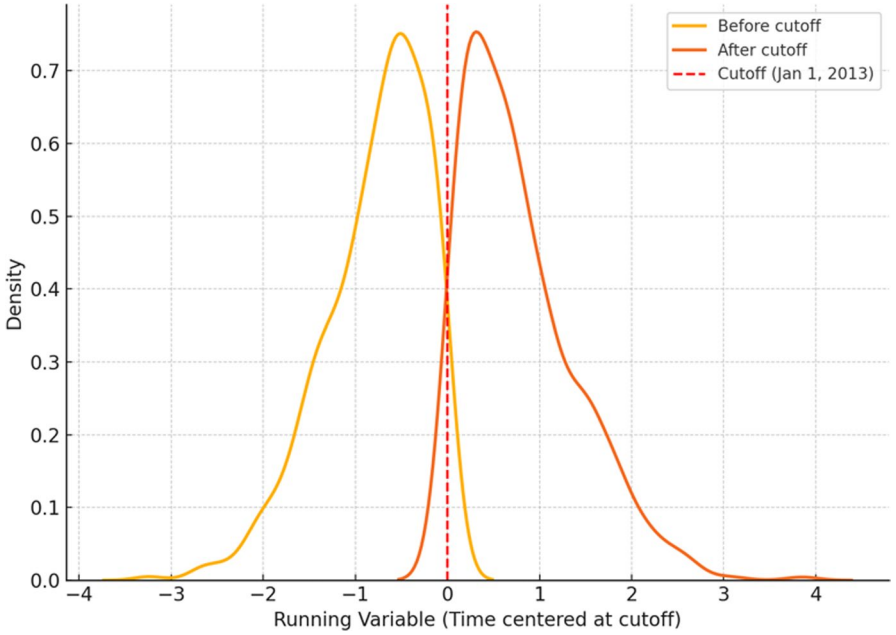

Fig. 5 Density of running variable (time to sale)

Author contributions The sole author has written the entire paper.

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Data availability Anonymized data is available upon request from the author.

Declarations

Conflict of interest The authors declare no competing interests.

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References

Akçay, S. B., Karul, C., & Akyuz, M. (2023). Mortgage credit and house prices: The Turkish case. *International Journal of Housing Markets and Analysis,16*(2), 318–335.

Akerlof, G. A. (1970). The market for "Lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics,84*(3), 488–500.

Aksoy, H. C., & Schäfer, H. B. (2012). Economic impossibility in Turkish contract law from the perspective of law and economics. *European Journal of Law and Economics,34*(1), 105–126.

Ateşağaoğlu, E., & Elgin, C. (2018). Ortaklığın Giderilmesi (İzale-i Şüyu) Davaları: Taşınmaz Satışları İçin İstatistiksel Bir Analiz. *Türkiye Barolar Birliği Dergisi* (139), Ankara, 221–237.

Ayan, M. (2016). *Eşya Hukuku II: Mülkiyet (Property Law 2: Ownership)* (9th ed.). Seçkin Yayıncılık.

Babaoglu, B., & Wulf, A. J. (2016). Decriminalizing the issuance of bad checks in Turkey: An analysis of the effects of changes in penalties. *European Journal of Law and Economics,42*(1), 5–23.

Calonico, S., Cattaneo, M. D., & Titiunik, R. (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica,82*(6), 2295–2326.

Çetin, T., Sobacı, M. Z., & Nargeleçekenler, M. (2016). Independence and accountability of independent regulatory agencies: The case of Turkey. *European Journal of Law and Economics,41*(3), 601–620.

Chow, Y. L., Hafalir, I. E., & Yavas, A. (2015). Auction versus negotiated sale: Evidence from real estate sales. *Real Estate Economics,43*(2), 432–470.

Coey, D., Larsen, B., & Sweeney, K. (2019). The bidder exclusion effect. *RAND Journal of Economics,50*(1), 93–120.

Djankov, S., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2003). Courts. *The Quarterly Journal of Economics,118*(2), 453–517.

Goeree, J. K., & Offerman, T. (2002). Efficiency in auctions with private and common values: An experimental study. *American Economic Review,92*(3), 625–643.

GürbüzUsluel, A. E. (2016). Considerations on the economic effect of the new Turkish commercial code provisions regarding single member companies. *European Journal of Law and Economics,42*(1), 25–43.

Haurin, D., McGreal, S., Adair, A., Brown, L., & Webb, J. R. (2013). List price and sales prices of residential properties during booms and busts. *Journal of Housing Economics,22*(1), 1–10.

Imbens, G., & Kalyanaraman, K. (2012). Optimal bandwidth choice for the regression discontinuity estimator. *The Review of Economic Studies,79*(3), 933–959.

Imbens, G. W., & Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. *Journal of Econometrics,142*(2), 615–635.

Kagel, J. H., & Levin, D. (2011). Auctions: A survey of experimental research, 1995–2010. *Handbook of Experimental Economics,2*, 563–637.

Klemperer, P. (2004). *Auctions: Theory and practice*. Princeton University Press.

Koramaz, T. K., & Dokmeci, V. (2012). Spatial determinants of housing price values in Istanbul. *European Planning Studies,20*(7), 1221–1237.

Krishna, V. (2009). *Auction theory* (2nd ed.). Academic Press.

Kuru, B. (2013). *İcra ve İflas Hukuku El Kitabı* (2nd ed.). Adalet Yayınevi.

Lee, D. S., & Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of Economic Literature,48*(2), 281–355.

McAfee, R., & McMillan, J. (1987). Auctions and bidding. *Journal of Economic Literature,25*(2), 699–738.

McAfee, R. P., Quan, D. C., & Vincent, D. R. (2002). How to set minimum acceptable bids, with an application to real estate auctions. *Journal of Industrial Economics,50*(4), 391–416.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics,142*(2), 698–714.

Metzger, G. E. (2011). Privatization as delegation. *Columbia Law Review,111*(4), 1367–1444.

Milgrom, P. R. (2004). *Putting auction theory to work*. Cambridge University Press.

Milgrom, P. R., & Weber, R. J. (1982). A theory of auctions and competitive bidding. *Econometrica Journal of the Econometric Society,50*(5), 1089–1122.

Oğuzman, M. K., Seliçi, Ö., & Oktay-Özdemir, S. (2018). *Eşya Hukuku* (21st ed.). Filiz Kitabevi.

Onder, Z. (2000). High inflation and returns on residential real estate: Evidence from Turkey. *Applied Economics,32*(7), 917–931.

Ozus, E., Dokmeci, V., Kiroglu, G., & Egdemir, G. (2007). Spatial analysis of residential prices in Istanbul. *European Planning Studies,15*(5), 707–721.

Pekcanıtez, H., Atalay, O., & Özekes, M. (2019). Medeni Usul Hukuku (17th ed.). On İki Levha Yayıncılık.
Quan, D. C. (1994). Real estate auctions: A survey of theory and practice. *The Journal of Real Estate Finance and Economics,9*(1), 23–49.
Schäfer, H. B., & Aksoy, H. C. (2016). Alive and well: The good faith principle in Turkish contract law. *European Journal of Law and Economics,42*(1), 73–101.
Turkish Grand National Assembly. (2012). Justification for Law No. 6352. Official Gazette.
Turner, M. A., Haughwout, A., & van der Klaauw, W. (2014). Land use regulation and welfare. *Econometrica,82*(4), 1341–1403.
Vickrey, W. (1961). Counterspeculation, auctions, and competitive sealed tenders. *The Journal of Finance,16*(1), 8–37.
Yıldırım, M. K. (2016). İcra ve İflas Hukukunda İptal Davaları. On İki Levha Yayıncılık.

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