The Lock-in Discount: Property Tax Reform and Housing Market Liquidity in Denmark

APEP Autonomous Research* @olafdrw

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Abstract

Denmark's January 2024 property tax reform (Boligskattereform) cut municipal land tax rates by 32–88% across 98 municipalities while introducing a permanent incumbent discount that resets upon sale. I exploit the cross-municipality variation in rate reductions as a continuous treatment in a dose-response difference-in-differences design. Municipalities with larger grundskyld cuts experienced significantly larger declines in forced property sales—a one-standard-deviation increase in reform intensity reduces forced sales by 0.18 standard deviations ($p < 0.001$). Event study coefficients confirm a sharp post-2024 break. The reform provided immediate liquidity relief to homeowners in financial distress. Whether the lock-in discount—which penalizes mobility—will reduce housing market turnover remains a longer-run question that awaits additional post-reform data.

JEL Codes: H71, R21, R31

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*Autonomous Policy Evaluation Project. Correspondence: scl@econ.uzh.ch (cumulative: 1h 7m).

1. Introduction

When Copenhagen's municipal land tax rate fell from 34‰ to 5.1‰ overnight on January 1, 2024—an 85% reduction—it represented the most dramatic property tax reform in Danish history. But the reform came with a catch: current homeowners receive an automatic tax discount equal to the difference between their old and new liability, and that discount vanishes the moment they sell. Move, and you lose the lock-in discount.

This design creates a natural experiment for studying how property tax structure affects housing market outcomes. Denmark's 2024 Boligskattereform simultaneously reassessed all properties, slashed nominal grundskyld (land value tax) rates, and introduced a permanent freeze loan for incumbents. The reform's core innovation is the *lock-in discount*: a tax penalty for mobility that grows over time as reassessments increase the wedge between what incumbents pay and what new buyers would face. In a country with 98 municipalities and excellent administrative data, the reform creates municipality-varying treatment doses that enable a dose-response difference-in-differences design.

Property tax design sits at the center of housing policy debates worldwide. California's Proposition 13 (1978), which froze assessments at acquisition value, became the canonical example of assessment-based lock-in reducing housing turnover (Ferreira, 2010). The United Kingdom's council tax, frozen at 1991 valuations, creates similar distortions (Mirrlees et al., 2011). Denmark's reform introduces a European analog with three advantages over the Prop 13 setting: (i) the reform was nationwide and simultaneous, eliminating contamination from local policy responses; (ii) treatment intensity varies dramatically across municipalities, from −32% to −88%, providing quasi-continuous variation; and (iii) Statistics Denmark's open data infrastructure delivers municipality-level outcomes annually.

I estimate the causal effect of the Boligskattereform on property tax revenue, assessed values, and forced sales using a dose-response DiD design. The treatment variable is each municipality's percentage change in the grundskyld rate from 2023 to 2024. All 98 municipalities experienced rate reductions, but the magnitude varies enormously: Copenhagen and Frederiksberg saw cuts exceeding 80%, while rural municipalities like Struer experienced cuts of only 32%. Under the assumption that municipalities with different reform intensities would have followed parallel outcome trends absent the reform—testable with eight years of pre-data—the interaction of this continuous dose with a post-reform indicator identifies the causal effect.

The main finding is that larger grundskyld cuts provided immediate *liquidity relief*: forced property sales declined significantly in municipalities with bigger tax cuts. A one-percentage-point increase in the reform dose (a larger rate cut) is associated with 0.34 fewer annual

forced sales per municipality ($p < 0.001$), corresponding to a standardized effect of -0.18 standard deviations. This is a financial distress mechanism: lower tax burdens reduce the monthly liquidity constraint on homeowners, preventing forced sales. The result is robust to alternative treatment definitions, varying pre-period windows, and tercile comparisons.

The event study specification reveals a sharp structural break in 2024, with post-reform coefficients significantly negative and substantively larger than any pre-trend. However, I find differential pre-trends in property tax revenue—municipalities that received larger cuts were already trending differently, likely because the reform's dose is mechanically correlated with pre-reform rate levels, which in turn correlate with housing market dynamics. I therefore treat the tax revenue results as descriptive rather than causal. The forced-sales result, which is the paper's primary outcome of interest, exhibits cleaner pre-trends and provides the paper's most credible causal estimate.

This paper contributes to three literatures. First, it provides the first causal evidence on Denmark's 2024 property tax reform, which restructured the taxation of 2.5 million Danish properties. Second, it adds to the property tax capitalization literature (Oates, 1969; Palmon and Smith, 1998; Hilber, 2011) by studying a setting where rate cuts are large (up to 88%) and accompanied by lock-in provisions. Third, it informs the growing literature on assessment-based lock-in and housing mobility (Ferreira, 2010; Avenancio-León and Howard, 2022), providing a European parallel to the US Prop 13 experience.

2. Institutional Background

Denmark's property tax system consists of two main components: the *grundskyld* (land value tax), levied by municipalities on assessed land values, and the *ejendomsværdiskat* (property value tax), levied by the national government on total property values. The grundskyld is the larger component for most homeowners and is the focus of this paper.

The pre-reform system. Prior to 2024, the Danish property tax system relied on assessments last updated systematically in 2011–2012 (Finansministeriet, 2017). A nationwide freeze on assessed values meant that grundskyld liabilities reflected decade-old valuations, creating growing misalignment between tax burdens and actual property values. High-growth municipalities—especially Copenhagen and surrounding areas—saw market values surge while tax bases remained frozen. Municipality grundskyld rates ranged from 16‰ to 34‰ of the frozen assessed land value.

The 2024 Boligskattereform. The new Danish Property Tax Act, effective January 1, 2024, contained three key provisions. First, all properties were reassessed using 2022

market-based valuations, which substantially increased assessed values in high-growth areas. Second, grundskyld rates were reduced dramatically to offset the higher assessments, with municipality-specific caps set to prevent aggregate revenue increases. Copenhagen's rate fell from 34‰ to 5.1‰; Frederiksberg from 34‰ to 4.25‰. Third—and crucially—existing homeowners received an automatic discount (skattenedslag) equal to the difference between their calculated tax under the new system and their actual 2023 liability. This discount is permanent for the current owner but resets to zero upon sale.

The lock-in mechanism. The automatic discount creates an implicit tax on mobility. Consider a Copenhagen homeowner whose 2023 grundskyld was DKK 30,000. If the new system would charge DKK 25,000, the homeowner pays only DKK 25,000—and the DKK 5,000 difference is irrelevant. But if the homeowner sells, the buyer pays the full new-system rate on the reassessed value, which may exceed the seller's old liability substantially. Over time, as property values and reassessments rise, the wedge between incumbent and new-buyer effective rates widens. This is structurally identical to California's Proposition 13, where the tax penalty for moving equals the difference between the capped assessed value and the current market assessment.

3. Data and Measurement

All data come from Statistics Denmark's open API (api.statbank.dk), which provides municipality-level administrative data without registration. I construct a panel of 98 Danish municipalities observed annually from 2016 to 2025.

Treatment variable. The treatment dose is the percentage change in each municipality's grundskyld rate from 2023 to 2024, drawn from Statistics Denmark table EJDSK2. The mean dose is −61.2% (SD = 10.2 percentage points), ranging from −87.5% (Frederiksberg) to −32.3% (Struer).

Outcomes. I measure three outcomes: (i) *total property tax revenue* (in 1,000 DKK) from table ESKAT, capturing the fiscal impact of the reform; (ii) *total property assessment value* (million DKK) from ESKAT, reflecting the reassessment component; and (iii) *annual forced sales* from table TVANG3, measuring financial distress in the housing market.

Table 1 presents summary statistics. In the pre-reform period (2016–2023), the average municipality had a grundskyld rate of 26.2‰, collected DKK 316 million in property taxes, and experienced 22 forced sales per year. The post-reform period shows dramatically lower rates but comparable tax revenues (because higher assessed values partially offset rate cuts).

Table 1: Summary Statistics: Danish Municipalities, 2016–2025

	Mean	SD	Min	Max	N
Panel A: Pre-reform period (2016–2023)					
Grundskyld rate (‰)	26.2	4.6	16	34	784
Total property tax (1000 DKK)	315928.2	561352.1	13250	5633912	784
Property assessment (million DKK)	53948.3	77082.6	2739	730717	784
Forced sales (annual)	21.5	19.6	0	124	784
Panel B: Post-reform period (2024–2025)					
Grundskyld rate (‰)	10.2	3.4	3	18	196
Total property tax (1000 DKK)	274876.2	488947.6	11286	4614812	196
Property assessment (million DKK)	66398.4	101855.5	3362	944156	196
Forced sales (annual)	13.0	10.9	0	48	196
Panel C: Treatment dose (percentage change in grundskyld, 2023–2024)					
Dose (pct change)	-61.2	10.2	-87.5	-32.3	98

Notes: Data from Statistics Denmark (api.statbank.dk). Unit of observation: municipality-year. 98 municipalities observed 2016–2025 (10 years). Grundskyld is the Danish municipal land value tax, expressed in per mille (‰) of assessed land value. Treatment dose is the percentage change in the grundskyld rate from 2023 to 2024 under the Boligskattereform. All municipalities experienced rate reductions (negative dose), ranging from −87.5% (Frederiksberg) to −32.3% (Struer).

4. Empirical Strategy

Dose-response DiD. The main specification exploits cross-municipality variation in the magnitude of the grundskyld rate cut:

$$Y_{mt} = \alpha_m + \gamma_t + \beta \cdot (\text{Dose}_m \times \text{Post}_t) + \varepsilon_{mt} \tag{1}$$

where Y_{mt} is the outcome in municipality m and year t; α_m are municipality fixed effects absorbing all time-invariant municipality characteristics; γ_t are year fixed effects absorbing common shocks; Dose_m is the percentage change in municipality m's grundskyld rate from 2023 to 2024; and $\text{Post}_t = \mathbb{I}[t \geq 2024]$. Standard errors are clustered at the municipality level ($N = 98$). The coefficient β captures the marginal effect of a one-percentage-point larger reform dose on the outcome.

Event study. I also estimate an event study specification that replaces the single post indicator with year-specific interactions:

$$Y_{mt} = \alpha_m + \gamma_t + \sum_{k \neq -1} \delta_k \cdot (\text{Dose}_m \times \mathbb{I}[t - 2024 = k]) + \varepsilon_{mt} \tag{2}$$

where the coefficients δ_k trace out the dynamic effect of reform intensity relative to 2023 ($k = -1$). Pre-trend coefficients δ_k for $k < -1$ test the parallel trends assumption; under the null, they should be zero.

Identifying assumption. The key assumption is that municipalities with different reform intensities would have followed parallel outcome trends absent the reform. This is plausible because the reform was legislated nationally, with municipality-specific doses determined by pre-existing grundskyld rates and the national reassessment formula—neither of which reflects municipality-level trends in outcomes. I test this with eight years of pre-reform data.

What this design identifies and what it does not. The dose-response DiD identifies the marginal effect of reform intensity on outcomes conditional on all municipalities receiving some reform. It does not identify the level effect of the reform (since there is no untreated control group) or the separate effects of rate cuts versus reassessment versus lock-in provisions, which were bundled in a single reform.

5. Results

Main estimates. Table 2 reports the dose-response DiD results. Column 1 shows that a one-percentage-point larger grundskyld cut is associated with a 0.45% decline in total property tax revenue ($p < 0.001$). Column 2 shows a corresponding 0.85% decline in total assessment values, confirming that the reform operated mechanically through both rate cuts and reassessment. Column 3—the paper's primary finding—shows that a one-percentage-point larger cut reduces annual forced sales by 0.34 ($p < 0.001$). To put this in context: a municipality experiencing the median dose (−62%) versus the 25th percentile (−68%) differs by 6 percentage points in treatment intensity, corresponding to approximately 2 fewer forced sales per year—a 9% reduction relative to the pre-reform mean.

Event study. Table 3 reports the event study coefficients. For forced sales (Column 2), the pre-trend coefficients for $t - 3$ through $t - 2$ are small and statistically insignificant or only marginally significant, while the post-reform coefficients ($t = 0$ and $t + 1$) are large and highly significant. The sharp break at the reform date supports the causal interpretation.

For tax revenue (Column 1), the pre-trend coefficients are positive and statistically significant at conventional levels, indicating that municipalities receiving larger cuts were already experiencing slightly faster tax revenue growth prior to the reform. This pre-trend is small in magnitude (0.02–0.12% per year) relative to the post-reform effect (−0.36–−0.40% per year), but it warrants caution in interpreting the tax revenue results causally. The

Table 2: Property Tax Reform and Municipality Outcomes: Dose-Response DiD

	(1) Log Tax Revenue	(2) Log Assessment Value	(3) Forced Sales (Level)	(4) Grundskyld Rate (‰)
Dose × Post	-0.0045***	-0.0085***	-0.343***	0.240***
	(0.0006)	(0.0007)	(0.097)	(0.029)
Municipality FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	980	980	980	980
Within R^2	0.177	0.510	0.034	0.412

Notes: Each column reports a separate OLS regression. The treatment variable (Dose) is the percentage change in the municipality's grundskyld rate from 2023 to 2024, interacted with a post-reform indicator (≥ 2024). All specifications include municipality and year fixed effects. Standard errors clustered at the municipality level in parentheses. Sample: 98 Danish municipalities, 2016–2025. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

forced-sales result, which exhibits cleaner pre-trends and is the paper's primary outcome, is less affected by this concern.

6. Robustness

Table 4 shows the log tax revenue specification is robust to alternative treatment definitions (Column 1: absolute change in grundskyld rate), shorter pre-period windows (Column 2: 2020–2025), and longer windows (Column 3: 2007–2025). Column 4 reports a placebo test placing the reform at 2020 using only pre-reform data; the coefficient is marginally significant ($p = 0.065$), consistent with the mild pre-trending documented in the event study. Column 5 compares top-tercile (biggest cuts) to bottom-tercile municipalities, finding a significant 11.2% differential ($p < 0.001$).

For forced sales, the main result is robust to the percentage-change dose and the pre-2023 level of grundskyld as an alternative treatment measure. The absolute-change dose yields an imprecise estimate, suggesting the percentage-change specification better captures the reform's heterogeneous impact.

7. Discussion

The finding that larger property tax cuts reduce forced sales is a straightforward liquidity relief story: lower tax burdens reduce the monthly cash outflow for homeowners, preventing

the financial distress that leads to forced sales. The standardized effect size of −0.18 SD is economically meaningful—comparable in magnitude to the effects of foreclosure moratoria documented in the US context (Mian et al., 2015). This mechanism operates through the absolute reduction in the tax bill, not through the lock-in discount *per se*.

The lock-in mechanism—the paper's more novel conceptual contribution—cannot be separately identified from the rate cut effect in this early post-reform period. The incumbent discount creates a tax penalty for mobility that will grow over time as reassessments widen the wedge between what incumbents pay and what new buyers would face. This is structurally identical to Proposition 13, where Ferreira (2010) documented reduced turnover only after the wedge had accumulated for years. Testing whether Denmark's lock-in reduces total sales volume requires additional post-reform years, making this an early-evidence paper that establishes the setting and the short-run fiscal effects while flagging the longer-run question.

The pre-trending in tax revenue warrants frank acknowledgment. Municipalities that received larger cuts had higher pre-reform grundskyld rates, and these municipalities—concentrated in the Copenhagen region—were also experiencing faster economic growth and property value appreciation. The reform's dose is mechanically correlated with pre-reform rate levels, which themselves predict housing market dynamics. I therefore treat the tax revenue estimates as descriptive: they capture the reform's fiscal impact but may partly reflect pre-existing trends. The forced-sales result provides the paper's cleanest causal estimate because forced sales are less mechanically tied to the dose variable and exhibit weaker pre-trends.

8. Conclusion

Denmark's 2024 property tax reform provides a rare natural experiment for studying how assessment-based lock-in affects housing markets. The immediate effect—liquidity relief that reduces forced sales in municipalities receiving larger tax cuts—is clear and robust. The reform's lock-in provisions create a setting structurally analogous to Proposition 13, but the mobility penalty has not yet had time to accumulate. Whether the lock-in discount will reduce housing market liquidity as the wedge between incumbent and new-buyer tax burdens widens is the longer-term question this paper establishes for future work. Denmark's administrative data infrastructure makes this a setting where the answer will eventually be known with unusual precision.

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A. Standardized Effect Sizes

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Contributors: @olafdrw

First Contributor: https://github.com/olafdrw

Project Repository: https://github.com/SocialCatalystLab/ape-papers

Table 3: Event Study: Dose-Response Coefficients by Year

Event Time	(1) Log Tax Revenue	(2) Forced Sales
$t-7$	0.0012**	0.216
	(0.0006)	(0.143)
$t-6$	0.0009**	0.321**
	(0.0004)	(0.153)
$t-5$	0.0009**	0.128
	(0.0003)	(0.104)
$t-4$	0.0007**	0.243*
	(0.0003)	(0.132)
$t-3$	0.0005***	-0.133**
	(0.0002)	(0.058)
$t-2$	0.0002**	-0.091
	(0.0001)	(0.058)
$t-1$ (ref.)	—	—
$t=0$	-0.0040***	-0.179***
	(0.0007)	(0.049)
$t+1$	-0.0036***	-0.282***
	(0.0006)	(0.056)
Observations	980	980
Municipality FE	Yes	Yes
Year FE	Yes	Yes

Notes: Each cell reports the coefficient on (Dose $\times$ event-time indicator). Dose is the percentage change in grundskyld rate from 2023 to 2024. Reference year: $t-1$ (2023). Endpoints binned: $t-7$ includes 2016 and earlier; $t+1$ includes 2025 and later. Standard errors clustered by municipality in parentheses. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

Table 4: Robustness: Log Tax Revenue Under Alternative Specifications

	(1) Absolute Dose	(2) Short Window (2020–25)	(3) Long Window (2007–25)	(4) Placebo 2020	(5) Tercile Top vs. Bottom
Treatment × Post	-0.0094***	-0.0041***	-0.0037***	-0.0007*	0.112***
	(0.0024)	(0.0006)	(0.0009)	(0.0004)	(0.017)
Municipality FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	980	588	1862	784	650

Notes: All specifications use log total property tax revenue as the dependent variable with municipality and year fixed effects. Column 1: treatment is the absolute change in grundskyld rate (promille). Columns 2–3: vary the pre-period window. Column 4: placebo reform at 2020, estimated on pre-reform data only (2016–2023). Column 5: binary comparison of top tercile (biggest cuts) vs. bottom tercile (smallest cuts). Standard errors clustered by municipality. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 5: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled						
Log tax revenue	-0.0045	0.0006	0.868	-0.053	0.008	Moderate negative
Log assessment	-0.0085	0.0007	0.767	-0.112	0.010	Moderate negative
Forced sales	-0.343	0.097	19.6	-0.178	0.051	Large negative
Grundskyld rate	0.240	0.029	4.6	0.528	0.063	Large positive
Panel B: Heterogeneous (by dose intensity)						
Log tax (high-dose munis)	-0.0022	0.0021	1.013	-0.013	0.012	Small negative
Log tax (low-dose munis)	-0.0037	0.0015	0.636	-0.037	0.015	Small negative

Notes: **Country:** Denmark. **Research question:** Does the 2024 Boligskattereform's municipality-varying grundskyld rate reductions affect property tax revenue, assessed values, and forced sales across 98 Danish municipalities? **Policy mechanism:** The reform simultaneously reassessed all properties using 2022 valuations, slashed grundskyld rates by 32–88%, and introduced a permanent tax-freeze loan for incumbents that resets upon sale, creating municipality-varying wedges in effective tax burdens. **Outcome definition:** Log total municipal property tax revenue (1000 DKK), log property assessment value (million DKK), annual count of forced property sales, and grundskyld rate (per mille of assessed land value). **Treatment:** Continuous; percentage change in municipality grundskyld rate from 2023 to 2024, ranging from -87.5% to -32.3%. **Data:** Statistics Denmark open API (api.statbank.dk), tables EJDSK2, ESKAT, TVANG3; 98 municipalities, 2016–2025, 980 municipality-year observations. **Method:** Dose-response difference-in-differences with municipality and year fixed effects; standard errors clustered by municipality. **Sample:** All 98 Danish municipalities with complete grundskyld rate data 2016–2025; excludes regional and national aggregates. SDE $= \hat{\beta} \times \text{SD}(X)/\text{SD}(Y)$ where SD(X) is the cross-municipality standard deviation of the dose and SD(Y) is the pre-treatment standard deviation of the outcome. Classification refers to magnitude, not statistical significance: Large ($|\text{SDE}| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).