

The Real Consequences of LTV Limits on Housing Choices

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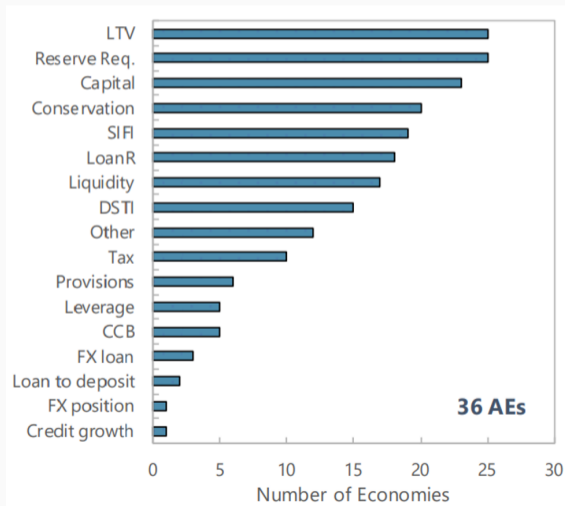
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Motivation

- Since the GFC, MPPs has become very common for its role in mitigating the risks associated with a housing boom.
- Most of the literature examines the effect on the banking system and suffers from identification challenges.
- There is limited existing research on the effect of LTV limits on housing and credit choices of affected borrowers (De Araujo et al. (2016), Kelly et al. (2017), Van Bekkum et al. (2019)).
- This paper uses rich data from Israel to asses the effect of LTV limits on housing choices - in terms of Price, Size and Location.

International Experience in Implementing MPPs

- Alam et al.(2019) find that LTV limit is the most popular MPPs tool among AEs:



Key Empirical Evidence on MPPs

- **The effect on Lenders:**

- Effective in reducing the risk in the financial system but suffer from "leakages": Acharya et al. (2019), DeFusco et al. (2019), Kuttner and Shim (2013), Aiyar et al., (2014).

- **The effect on borrowers:**

- Cross-country evidence shows lower default rates (Alam et al., 2019, Cerutti et al., 2017) but suffer from identification challenges.

- **The effect on housing prices:**

- Mixed evidence, small effect: Igan and Kang (2011), Han et al (2017).

I use rich loan-level data to assess the economic consequences of LTV limits on consumers in the credit and housing markets (not only housing prices).

This Paper

Objectives:

- Empirically assess the economic consequences of LTV limits on:
 - Distribution of borrowers characteristics.
 - Credit choices (loan amount, interest rate and default rates).
 - Housing choices (housing prices, size, and location).
 - Welfare implications: differential effect on different borrower type (e.g. Investors v FTHB).

Settings:

- Exploits two types of LTV limits implemented in Israel: soft and strict.
- Uses a unique loan-level setup, including data on borrowers and property characteristics.
- Uses DID matching approaches.

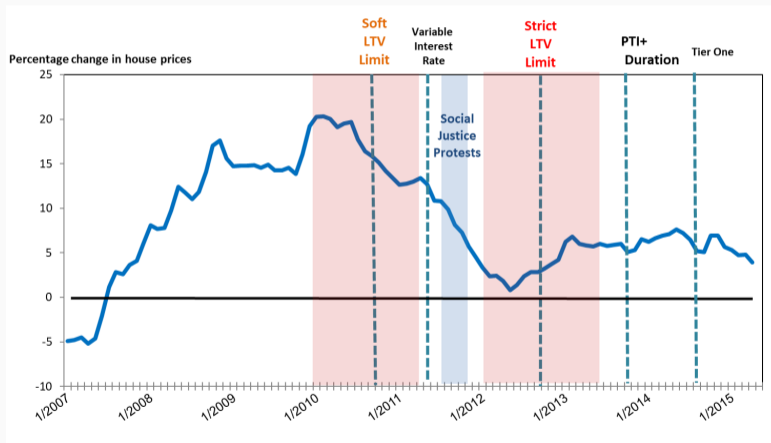
Results

- No segment of the population is being crowded out of the market.
- LTV limits affect:
 1. Mortgage contract terms: increase interest rate, reduce loan amount.
 2. Borrowers buy cheaper and lower quality assets.
 3. Population dispersion: borrowers moved farther from high demand areas to lower socio-economic neighbourhoods.
 4. Older households and investors are influenced more by the LTV limits.
- Strict LTV limit had a stronger effect on the borrowers.

Background

The Housing Market in Israel and MPPs

The Rate of Change in Housing Prices in Israel, 01/2007-12/2015:



The Regulatory Change - Soft LTV Limit

- In October 2010, the Supervisor of Banks in Israel required banks (the only mortgage providers) to increase capital provision for mortgages with LTV greater than 60%.
- This guideline did not apply to housing loans originally amounting to less than NIS 800,000 (\$200,000).

The Regulatory Change - Strict LTV Limit

- In October 2012, the Bank of Israel required banks (the only mortgage providers) to limit the LTV ratio to:
 1. 75 percent for First-Time Home Buyers.
 2. 70 percent for Upgraders (who need to sell their first home within 18 months).
 3. 50 percent for Investors (own two homes or more).

Data

Data - Soft Limit

1. Loan-level data from the Bank of Israel - mortgage contracts and borrower characteristics (90K obs. from Jan. 2010 to May 2011).
 2. Housing unit characteristics from the Israel Tax Authority - (Merged: 27k obs).
- 1+2 - Detailed information on the mortgage (interest rate, LTV, etc.), the borrower (age, income), and the housing unit (size, location etc.).

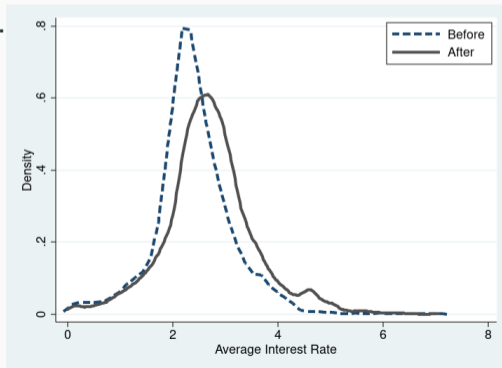
Data - Strict Limit

1. Loan-level data from the Bank of Israel - mortgage contracts and borrower characteristics (104K obs. from Jan. 2012 to August 2013).
2. Housing unit characteristics from the Israel Tax Authority - (Merged: 34k obs).

Stylized Facts - Did the LTV Limits were Effective?

Soft LTV - Mortgages Became More Expensive

- The LTV limit required banks to set aside more capital against risky loans.
- Increased the average interest rate for the risky borrowers ($LTV > 60\%$).



Soft LTV - Interest Rate Went Up

- Comparison of 2 similar borrowers above and below the 60% limit.
- Before the regulation - no difference between the 2 borrowers (0.01-0.03 percentage points).
- After the regulation, the interest rate paid by the borrower with $LTV > 60\%$ is 0.21-0.36 percentage points higher than the same borrower below the LTV limit.

Soft LTV - Interest Rate Went Up

	61% VS 59%				61-65% VS 55-59%			
	Average Rate	Average Rate	Spread	Spread	Average Rate	Average Rate	Spread	Spread
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ATT	.358*** (.078)	.251*** (.081)	0.213* (.110)	0.258** (.129)	.312*** (.065)	.297*** (.063)	0.251*** (.086)	0.259*** (.079)
Total income	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Average age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duration	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	349	349	349	349	1,937	1,937	1,937	1,937

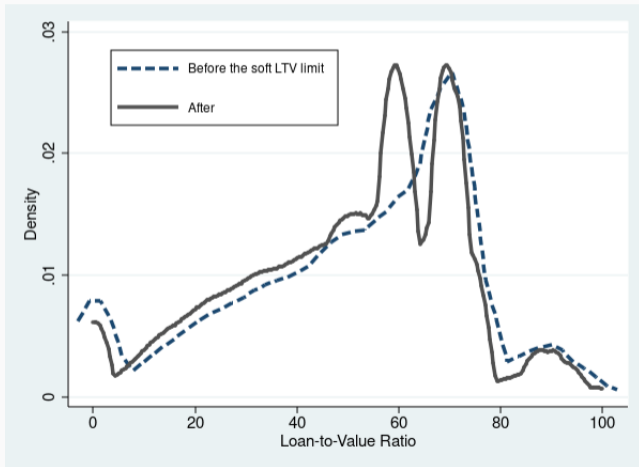
Note: Heteroskedasticity-consistent standard errors are in parentheses. ***, **, * - significance at 1, 5, and 10 percent levels, respectively. Spread - the interest rate over the PRIME. ATT is the Abadie-Imbens bias corrected average treated effect. Treated- who borrow above 60% LTV threshold. Borrowers were matched by income, age, bank and duration of the loan.

Soft LTV - Interest Rate Went Up

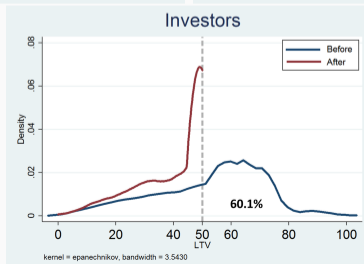
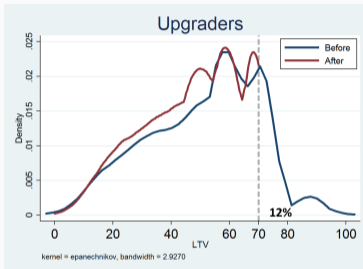
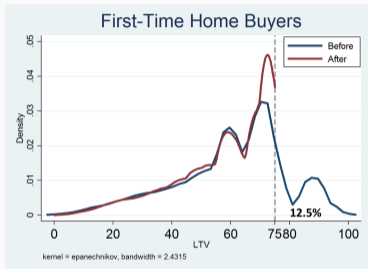
- Soft LTV limit increases the yearly interest rate payments, on average, by 2,700-3,250 NIS (4% of average household gross yearly income).
- Thus, although the policy is statutorily imposed on lenders, it appears as if a large portion of the economic burden ends up being born by borrowers in the form of higher interest rate (DeFusco et al., 2019).

LTV Limit Was Effective - LTV Went Down

- Incentivize risky borrowers ($LTV > 60\%$) to reduce leverage:



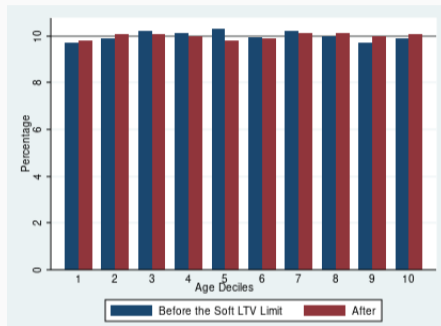
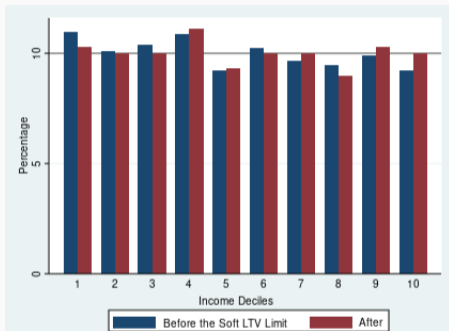
Strict LTV limit - Changes in the LTV Distribution, by Buyer Types



Research Questions

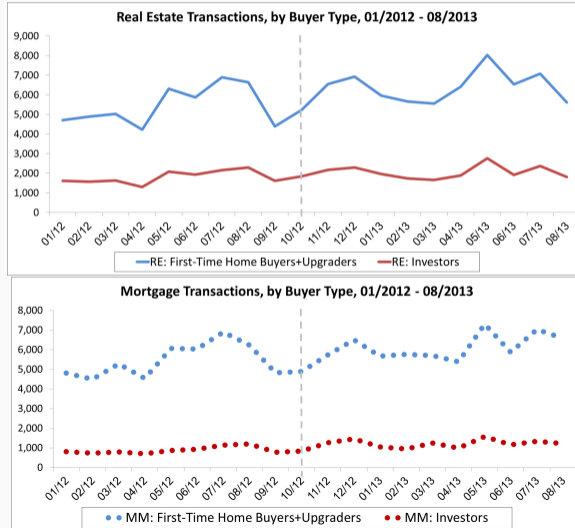
- Did the LTV limits changed the distribution of borrowers?
- Did the LTV limits affected the characteristics of their housing units:
 1. Housing prices.
 2. The type of assets (size, location).
 3. Social aspects of LTV limits.

Soft LTV limit - Test for Credit Rationing



- No significant change in the distribution of the borrowers' characteristics.

Strict LTV limit - Borrowers' Activity in the Housing and Credit Markets



Identification Approach

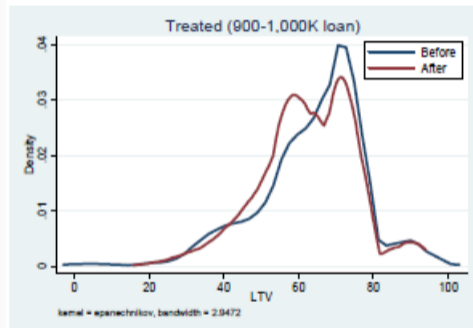
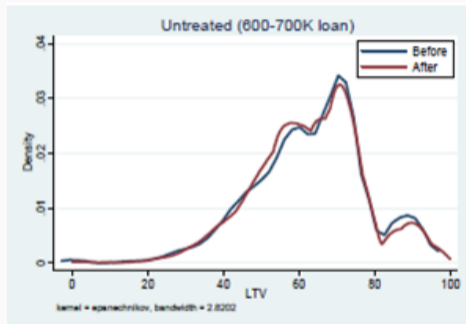
Identifying Affected Borrowers

- Effect of the policy on the subset of borrowers constrained by the policy: Average Treatment Effect on Treated (ATT).
- Households are not making housing decisions twice in 18 months -the challenge is to find and compare households with similar characteristics before and after the limit.
- Treated borrowers: those that before the policy borrowed above the limit.
- This paper uses DID Matching approach in order to asses the effect of LTV limits.

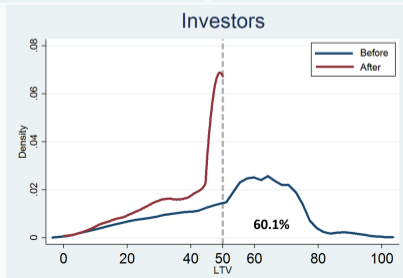
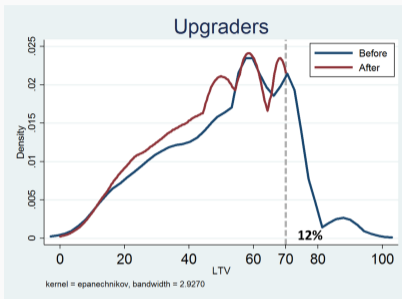
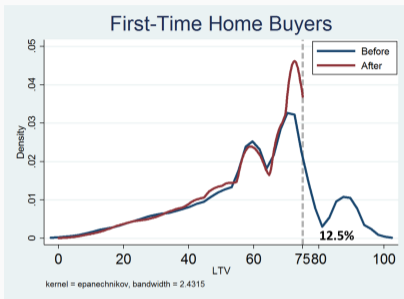
Identification Approach - Soft LTV Limit

- According to the October 2010 LTV limit, the banks were required to increase the capital provision for loans with LTV higher than 60% exceeding NIS 800K.
- Examined two groups:
 1. Untreated group - borrowed between NIS 600K and 700K.
 2. Treated group - borrowed between NIS 900K and 1,000K.
- Then, matching between these two groups by observable characteristics (age and income).
- Outcome variables: home prices, size, number of rooms, distance from Tel Aviv, and quality of neighborhoods.

Change in the LTV Distribution



Identification Approach - Strict LTV Limit



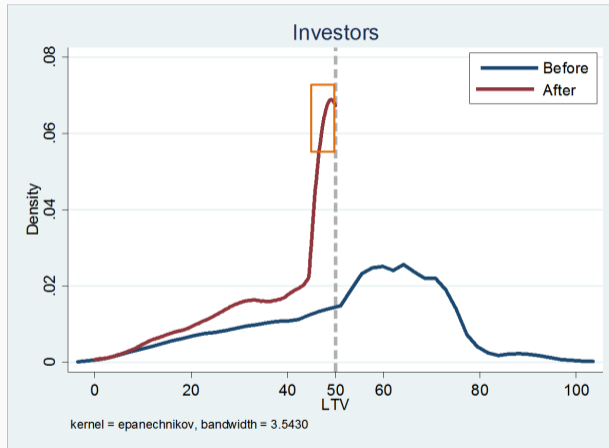
Identification Approach - Strict LTV Limit

- This study focuses on the effect on subset of borrowers constrained by the limit.
- However, treatment status observed only before the policy. After- no longer possible to distinguish between affected and non-affected borrowers.
- Abadie (2005): "Determine the treatment status from some individual characteristics observed in both periods".
- Individual characteristics: Age&Income (De Araujo et al., 2016).
- Other borrower characteristics have been tested.

Predicted LTV Distribution

- DID Matching approach: Examine households that are (slightly) below the cutoff after the policy.
 - Match the closest household from the period before based on observed characteristics.
 - Then, the leverage choices of the matched borrowers, their actual choices before and after the policy, can be examined.
1. Control group - households that chose the same LTV ratio before the policy, slightly below the cutoff.
 2. Treatment group - households that chose before the limitation to be above the LTV cutoff.

Predicted LTV Distribution



Results

Soft LTV Limit - Diff-in-Diff Matching

Dep. Variable:	Real Home Prices (NIS)	Size (sq.m.)	Rooms	Distance from Tel Aviv (KM)	Neighborhoods Ranking
ATT	-67,789*** (36,135)	0.41 (2.7)	-0.03 (0.05)	4.3*** (1.7)	-2.2*** (0.8)
ATT (%)	-6.7%	-1.1%	-0.9%	8.7%	-12.3%

Is there a sub-group that is more affected by the limit?

- Matching by type of buyer

Average		Real Home Prices (NIS)	Size (sq.m.)	Rooms	Distance from Tel Aviv (KM)	Quality of Neighborhoods
First-Time Home Buyer	ATT	-60,179*** [9,984]	-2.28* [1.23]	-0.04* [0.02]	1.85*** [1.1]	-0.6** [0.3]
	ATT (%)	-8%***	-3%*	-1%*	4%***	6%**
Upgraders	ATT	-93,021*** [12,165]	-1.43* [1.1]	-0.02 [0.02]	3.9*** [1.1]	-1.1*** [0.3]
	ATT (%)	-8%***	-1%*	0%	9%***	11%***
Investors	ATT	-122,680*** [22,940]	-0.13*** [0.04]	-0.08* [0.04]	5.57*** [1.9]	-1.5*** [0.41]
	ATT (%)	-12%***	0%***	-2%*	9%***	15%***

- Investors were affected more by the LTV limit - more flexible (Igan and Kang, 2011).

Strict LTV limit - Diff-in-Diff Matching

	FTHB	Upgraders	Investors
	70-75 VS 75-80	65-70 VS 70-75	45-50 VS 50-55
Real home prices (NIS)	-78,504*** (15,252)	-48,760** (16,901)	-182,722*** (27,522)
Size (SM)	-8.05*** (2.19)	-3.1* (2.42)	-14.9*** (3.01)
Distance from TA	7.1*** (1.61)	3.3** (1.57)	12.0*** (2.97)
Neighborhoods quality	-1.2*** (0.39)	-0.4 (0.43)	-2.0*** (0.57)
Interest Rate (p.p.)	0.41*** (0.13)	0.15 (0.14)	0.62*** (0.22)
Maturity (years)	1.8*** (0.45)	0.5 (0.42)	1.5*** (0.59)
Default (p.p.)	-0.2*** (0.06)	-0.15*** (0.05)	0.06 (0.07)

Strict LTV limit - DID Matching - Percentage Change

	FTHB	Upgraders	Investors
	70-75 VS 75-80	65-70 VS 70-75	45-50 VS 50-55
Real home prices (NIS)	-0.10***	-0.05**	-0.22***
Size (SM)	-0.09***	-0.03**	-0.14***
Distance from TA	0.14***	0.06**	0.24***
Neighborhoods quality	-0.12***	-0.04	-0.18***
Interest Rate (p.p.)	0.41***	0.15	0.62***
Maturity (years)	0.07***	0.02	0.09***
Default (p.p.)	-0.2***	-0.15***	0.06

Results

Strict LTV limit - Elasticity response

- Different buyer types are limited by different LTV cutoffs. The elasticity response is calculated for each borrower type:

$$\eta = \frac{\Delta Y}{\Delta LTV} \times \frac{\overline{LTV}}{\overline{Y}} \quad (1)$$

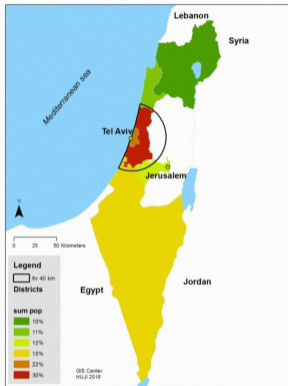
- Even when controlling for the different LTV cutoffs, investors were affected more, contrary to the criticism.
- These results are promising: if investors have the highest impact on housing prices during a housing boom (Kuttner and Shim, 2016), MPPs will not stop them from entering the housing market, but it will affect their housing choices.

Strict LTV limit - Elasticity response

	First-Time Home Buyers	Upgraders	Investors
Home prices	0.61*** (0.15)	0.49*** (0.13)	0.68*** (0.17)
Size	0.73*** (0.23)	0.51*** (0.18)	0.85*** (0.25)
Distance from Tel Aviv	0.72*** (0.27)	0.62*** (0.26)	0.82*** (0.33)
Socioeconomic level of neighborhood	0.62*** (0.17)	0.36* (0.23)	0.67*** (0.22)
Interest Rate	0.53*** (0.1)	0.51*** (0.2)	0.75*** (0.2)
Maturity	0.33*** (0.05)	0.17** (0.09)	0.23*** (0.05)
Default	0.93*** (0.2)	0.88*** (0.3)	0.63* (0.4)

The Magnitude of the Results

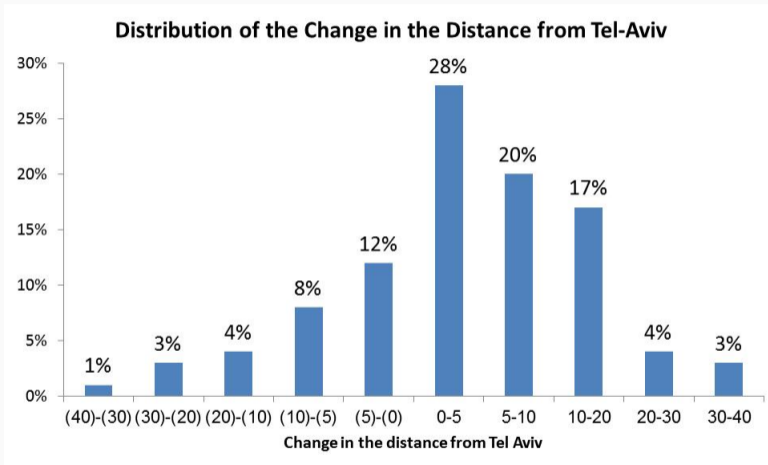
The Magnitude Within Israel



- 55% of the Israeli population lives in the center (radius of 40 KM from TLV).
- Within few months the treatment group moved 4-7 KM farther from TLV, to a significantly lower graded neighborhood on average.

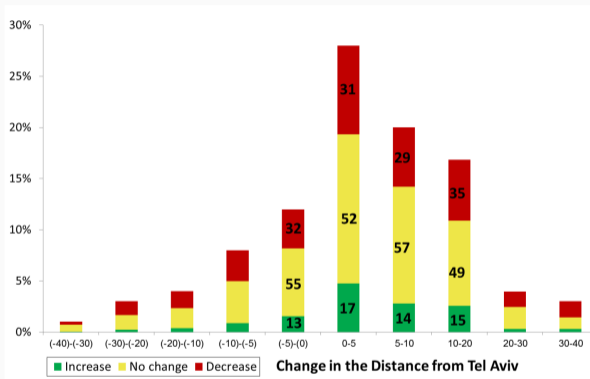
Results • Increase commuting costs.

Where Did They Move to?



- 70% of the borrowers moved farther from the center.

To What Kind of Neighborhood Did They Move?



- For each sub-group of distance from Tel-Aviv - significant decrease in the quality of neighborhoods.

Conclusions

- LTV limits affect consumer behavior in the credit and housing markets:
 1. Mortgage contract terms (interest rate, loan amount).
 2. Borrowers buy cheaper assets, and move farther from high demand areas to lower (socio-economic) graded neighborhoods.
 3. Investors are influenced more by the LTV limits.
- Important lesson - those **macro**prudential policies, who focus on the banking system, have **micro** effects in terms of credit and housing choices of affected borrowers.

Thank you!

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