Information Asymmetry and the Gains from Shopping: Evidence from the Israeli Mortgage Market

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Extended Abstract

This paper focuses on information frictions in the Israeli mortgage market. Two types of frictions are analyzed. The first is due to the cost of obtaining an additional price quote. The second emanates from the challenge of comparing competing price quotes. While the former is common to many mortgage markets, the latter stems from the unique characteristics of mortgages in Israel. Namely, a mortgage in Israel is a bundle of distinct sub-loans each of which has its own interest rate, hereinafter we will refer to such mortgages as "mortgage bundles".[2] Thus, a borrower decides how to allocate the principal loan amount between multiple loan types rather than choose a single mortgage product among multiple products. Market realities suggests that in most cases, shopping effort will result in price quotes for different mortgage bundles, making comparison hard for non-professionals.

We use a rich and unique dataset obtained from the three leading mortgage banks that consists of the universe of mortgages originated during the years 2015-2017 for the purpose of purchasing a house. These mortgages cover about 78% of the market. In addition, using administrative data from all mortgage banks, we observe for each borrower the number of banks provided her with a price quote prior to mortgage origination.

Our analysis proceeds in two steps. The first aims at estimating how shopping efforts impact interest rate. We use Oster (2019) for bounding the self-selection bias.[3] We also use quantile regression to study the heterogeneity in the effect of shopping. In the second step, following Woodward and Hall (2012),[4] we use the estimated interest rate distribution (estimated separately for each bank) to simulate a shopping procedure that enables borrowers to compare the same mortgage bundle across banks. We find that the average simulated interest rate savings are significantly greater than the estimated savings.

Our findings led Israel Competition Authority (ICA) to promote a mortgage market reform: banks would enable borrowers to obtain price quotes online for a mortgage bundle of their choice and for a small set of mortgage bundles determined by the regulator. These steps are believed to reduce search costs, enhance mortgage comparability and hence the ability of borrowers to make informed decisions. The Bank of Israel has adopted these recommendations and implementation is planned to take place in 2022.[5]

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[2] The most common mortgage bundle consists of three distinct loans: (1) fixed rate inflation-linked loan; (2) adjusted rate loan with the anchor being the Bank of Israel interest rate, and (3) adjusted rate loans with the anchor being 5-year government bonds.

[3] Oster, E. (2019). Unobservable Selection and Coefficient Stability: Theory and Evidence. *Journal of Business & Economic Statistics* 37(2), 187-204.

[4] Woodward, S., & Hall, R. (2012). Diagnosing Consumer Confusion and Sub-Optimal Shopping Effort: Theory and Mortgage-Market Evidence. *The American Economic Review*, 102(7), 3249-3276.

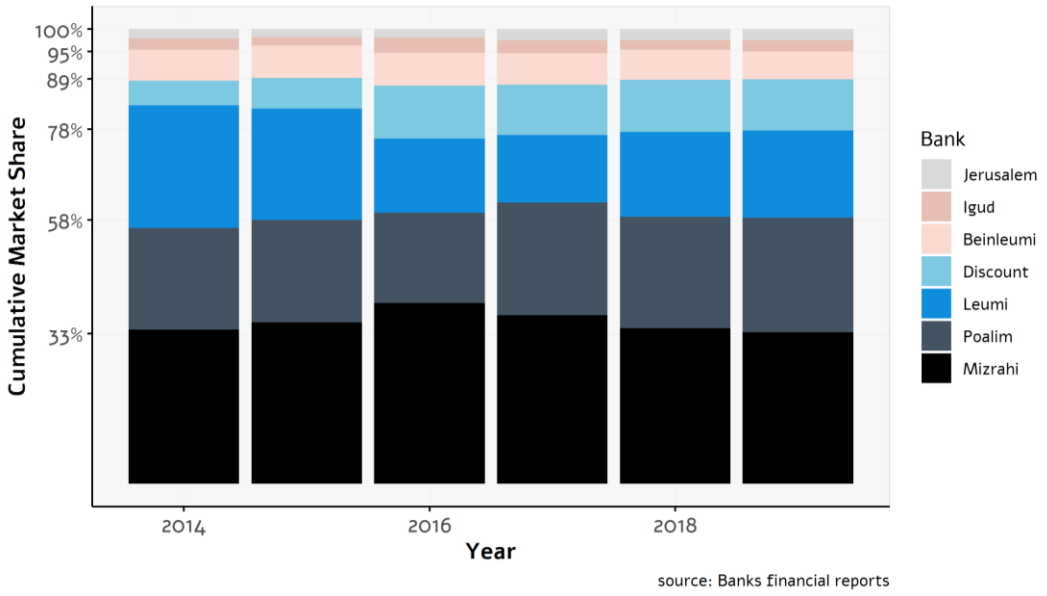
[5] Bank of Israel press release: Consumer reform to increase information transparency for bank customers and to enhance the competitive environment in the mortgage market, November 2021 - https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/14-11-21.aspx.

Market structure

The Israeli mortgage market is highly concentrated. Banks dominate the market, while non-banks are niche players. The largest five banking groups account for nearly 95% of the market and the largest three groups for about 78%. Figure 1 presents the yearly market shares of the different banking groups for the years 2014 to 2019. The mean HHI for this period is 2,378.

The banking market is characterized by high barriers to entry. No new banks entered the market for decades and non-bank lenders suffer from inferior access to capital and limited branch deployment.

Figure 1: **New mortgage loans market shares, 2014-2019**

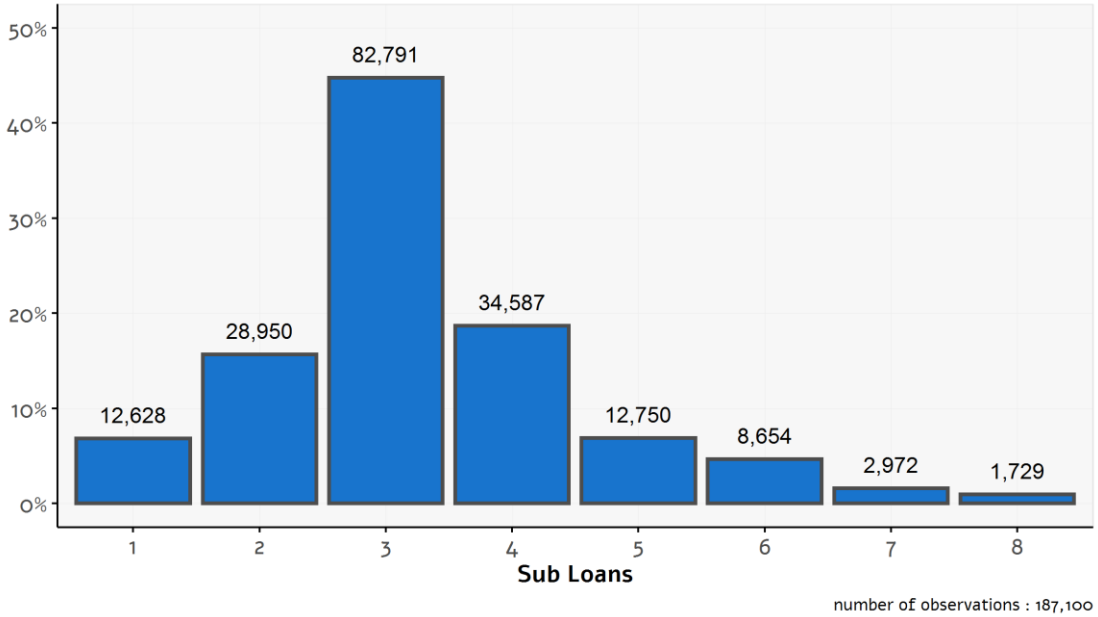


The mortgage market is extensively regulated. While generally speaking, regulation affects market dynamics, two aspects of regulation stand out in relation to the information frictions discussed here. The first is requiring banks to issue a price quote that is valid for a time period of 24 days.

The second is restrictions imposed on borrowers in relation to the share of adjustable rate loan out of total mortgage. Specifically, during the time of the research, regulation has restricted the aggregate share of all adjustable rate sub-loans not to exceed two-thirds of the mortgage. The aggregate share of adjustable rate sub loans with a fixed rate period of less than five years was further restricted not to exceed one third of the mortgage.

These restrictions led borrowers to assemble together several distinct sub-loans into a "mortgage bundle". Each sub-loan has its own interest rate and amortization period. Thus, a borrower has to decide how to allocate the principal loan amount between several types of loan instead of choosing one type of mortgage from multiple mortgage products. Figure 2 presents the distribution of the number of sub-loans in the sample. About 75% of mortgages consist of three or more sub-loans.

Figure 2: **Number of Sub-Loans Distribution**



Data

We use administrative data on the universe of mortgage loan originations by the three largest banks in years 2015-2017. Loan data include most of the information recorded by the bank, e.g.: asset value, type and location; borrowers' disposable income, neighborhood, marital status, number of dependent children, employment status and age; loan-to-value ratio, loan purpose, sub-loans type, sub-loans principal amount, interest rate and spread for each sub-loan.

In addition, we have detailed data on the shopping behavior of each borrower as reflected by the number of banks provided her with a price quote prior to mortgage origination.

Table 1: **Borrower and Transaction Characteristics by Loan Purpose**
House Purchase only
(Monetary Values in thousands NIS)

	First time buyers		**Buy to let**		**Other**	
Variable	average	median	average	median	Average	median
Asset value	1,493	1,320	1,894	1,530	1,925	1,740
Principal Loan amount	705	660	641	500	796	700
Disposable monthly income	15.7	14.0	24.5	19.5	18.3	16.2
Age	37	35	46	45	42	41
Number of dependent children	1.3	1.0	1.9	2.0	1.9	2.0

Mortgage Choice

Examining mortgage choice, reveals that it does not converge to form distinct products. The following summary statistics with regard to sub-loan choice and mortgage bundles choice help to establish this conclusion.

Table 2 presents the choice patterns of sub-loans in the data. As can be seen, adjustable rate mortgages (ARMs) with no fixed rate period are the most popular sub-loan type, most probably

due to their low interest rates. Regulation restrict these loans to account for more than a third of the mortgage (in monetary terms). The aggregate share of fixed rate mortgages (FRMs) which bound below by regulation to be no less than 33.3% reaches 42%.

Table 2: **Mortgage Choice – Sub-Loans Shares**

Type of sub-loan			Share of mortgages that include type of sub-loan	Count share of all sub-loans	Monetary share of all sub-loans	Median amortization period
Inflation-linked	ARM/FRM	Fixed rate period (for ARM loan)				
Non-linked	ARM	No fixed rate period[6]	89%	32%	28%	25
Non-linked	FRM	-	65%	24%	30%	19
Linked	ARM	5 years	46%	16%	15%	25
Linked	FRM	-	44%	18%	18%	20
Non-linked	ARM	5 years	26%	9%	9%	25
Foreign Currency indexed ARM			2%	1%	0%	30

The five most popular mortgage bundles are featured in Table 3. Notably, all of these bundles include the most popular sub loan.

Table 3: **Mortgage Choice – Most Popular Mortgage Bundles**

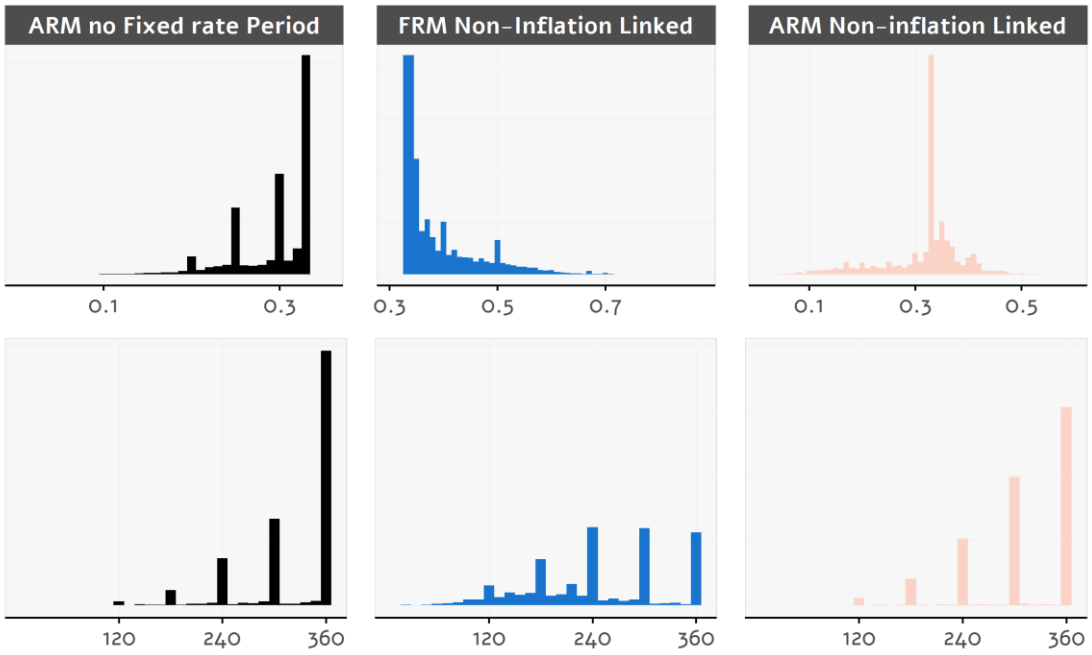
Number of Sub-Loans	ARM No Fixed Rate Period Non-Inflation Linked	ARM Inflation-Linked	ARM Non Inflation-Linked	FRM Inflation-Linked	FRM Non Inflation-Linked	Share of all Mortgages
3	✓		✓		✓	19.8%
3	✓	✓		✓		17.6%
3	✓		✓	✓		16.7%
2	✓			✓		13.9%
2	✓				✓	4.6%
Total						72.6%

To get a better understanding of the variability in the share of different sub-loans for a specific mortgage bundle, Figure 3 presents the distribution of share for each sub-loan in the second most common mortgage bundle and the corresponding distribution of mortgage amortization period.[7] The figure demonstrates that the regulated restrictions on the share of some of the sub-loans are binding.

[6] These sub-loans are index-tracker loans tied to the Bank of Israel interest rate.

[7] As shown in table 3, the second most common mortgage bundle consist of three sub-loans: (1) non-inflation linked ARM with no fixed rate period (Bank of Israel interest tracker loans); (2) non-inflation linked ARM with five years fixed rate period; and (3) non-inflation linked FRM.

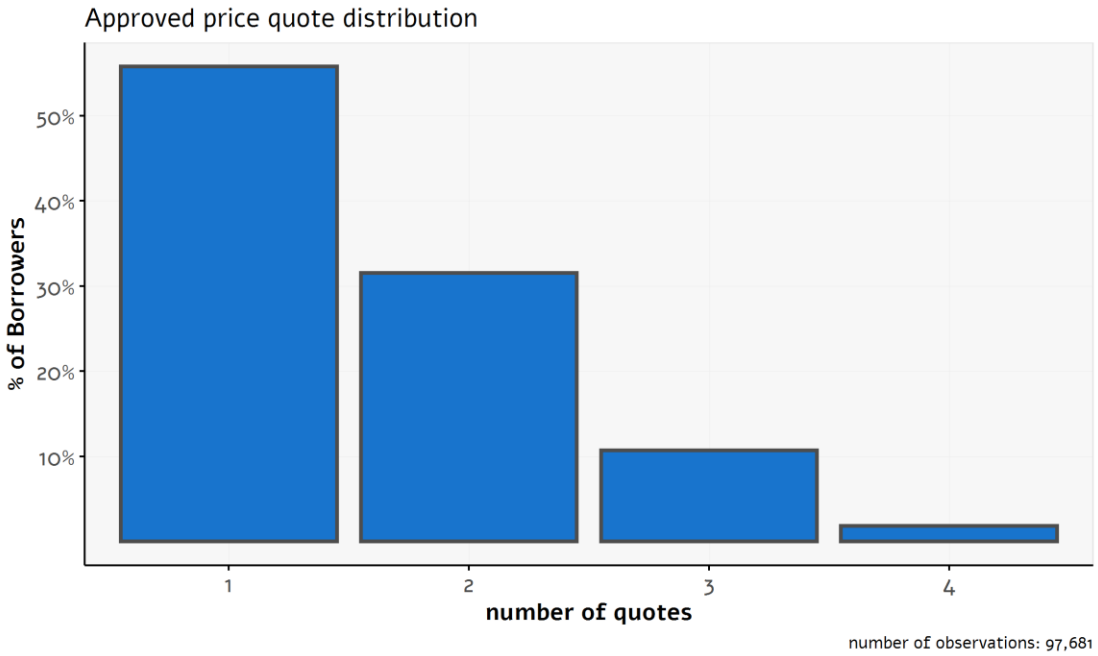
Figure 3: **Distribution of Sub-Loan Share (in monetary terms) and Sub-Loan Amortization Period for the Second Most Common Mortgage Bundle**



Shopping Behavior

Figure 4 demonstrates that 56% of mortgage borrowers considered only a single alternative. That is, they did not apply and received a price quote from another bank.

Figure 4: **Number of Price Quotes Distribution**



We present in Table 4 the results from a linear probability model that estimates the association between obtaining more than a single price quote and the characteristics of the borrower. The table reveals that young first home buyers are more inclined to shop between banks and so do borrowers with low LTV.

Table 4: **The Probability to Shop**

Variable	**Estimated Coefficient**
Principal loan amount (log)	0.134***
Disposable income (log)	0.109***
Asset value (log)	-0.066***
Age group	
Benchmark: 56+	
48 – 56	0.050***
43 – 48	0.082***
39 – 43	0.123***
35 – 39	0.177***
31 – 35	0.233***
18 – 31	0.189***
Loan purpose	
Benchmark: first time buyers	
Buy to let	-0.092***
Other	-0.053***
Loan to Value (LTV)	
Benchmark: less than 45%	
45% - 60%	-0.058***
60%-70%	-0.147***
Greater than 70%	-0.112***
observations	97,681
R^2	0.053

Price dispersion

We demonstrate the degree of mortgage price dispersion in Table 5. The table is based on a quantile regression in which the interest rate is used as the dependent variable and a full set of mortgage characteristics are used as explanatory variables. For each mortgage, we estimated the expected interest rate for the 10^{th}, 25^{th}, 75^{th} and 90^{th} quantiles. The table presents the average and median difference between the expected interest rate at the 75^{th} and 25^{th} quantiles as well as the 90^{th} and 10^{th} quantiles. The table reveals a significant price dispersion. While the average 75^{th} and 25^{th} quantiles expected interest rate differences is 35 basis points, the corresponding 90^{th} and 10^{th} quantiles difference is 70 basis points.

Table 5: **Price Dispersion**

	Mean	**Median**
Q-75-Q-25	35	32
Q-90-Q-10	70	64

The Gains from Shopping

Table 6 examines the effect of shopping, as reflected by the number of price quotes, on the interest rate. The table demonstrates that while the interest rate is negatively correlated with the number of price quotes, the marginal return for shopping decreases with the number of price quotes. We further account for selection into shopping by using Oster (2019) correction. The results remain qualitatively unchanged.

Table 6: **Estimated Gains from Shopping**

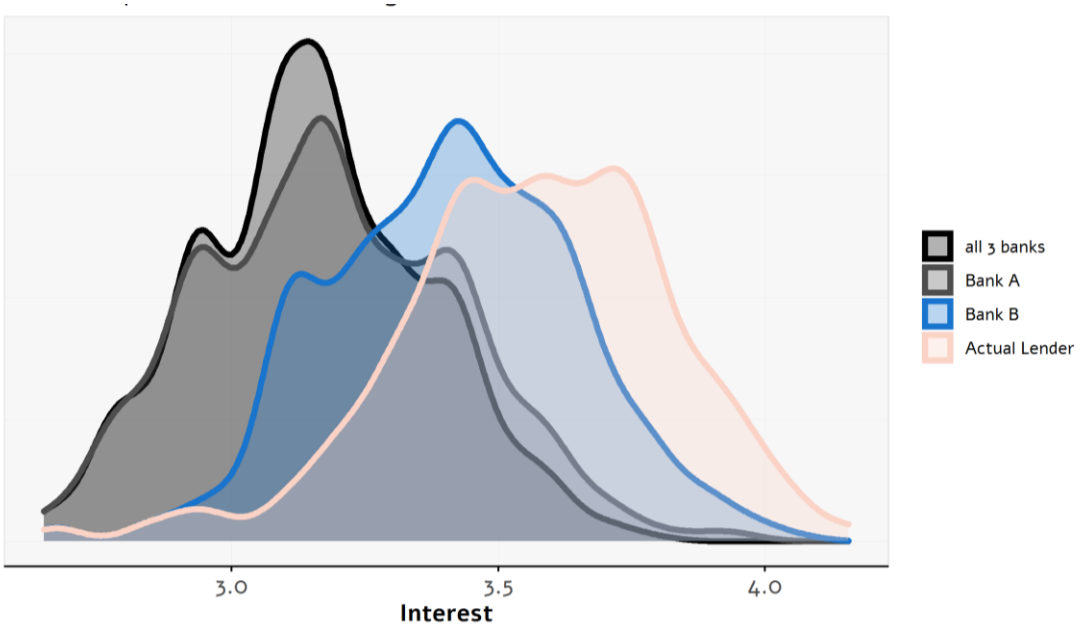
(Basis Points)

Number of Price Quotes	Home Bank Borrowers	All Borrowers
2	-6.8***	-7.7***
3	-8.1***	-9.8***
4	-11.0***	-13.4***
5	-15.7***	-19.8***
6	-	-14.7
Observations	39,012	77,507
Adjusted R^2	0.725	0.718

Simulated Shopping

The estimated effect of shopping featured above is a lower bound on the potential effect of shopping had borrowers were able to perfectly compare mortgages and obtain price quotes for identical mortgages. The reason for borrowers' limited ability to do so is that banks practice price obfuscation and limit borrowers' ability to compare prices. To further estimate the potential effect of shopping, we derive for each mortgage, the price quote it would have obtained in the other two banks. Simulation is useful here to account for possibility that price quotes would be drawn from different quantiles in the price distribution. Figure 5 exhibits, for one given loan, the distribution of estimated interest rates for each of the banks as well as for all banks combined as would be obtained if the borrower would be able to compare price quotes for the same mortgage across banks. We simulated estimated interest rates for all loans and estimated an average interest rate reduction of 19 basis points as a result of shopping in one additional bank and 27 basis points reduction as a result of shopping in two additional banks. Such an interest price reduction is sizable and accounts for approximately 20,000 NIS lower interest payments for the average mortgage.

Figure 5: **Simulated Interest Rate Distributions: An Example**



The finding of our study led the ICA to promote a mortgage market reform centered on the following features: banks would enable borrowers to obtain price quotes online for a mortgage

bundle of her choosing and for a small set of mortgage bundles determined by the regulator. These features are likely to reduce search costs, enhance mortgage comparability and hence the ability of borrowers to make informed decisions. The Bank of Israel has adopted these recommendations and implementation is planned to take place in 2022.