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Consumer loan rate dispersion and the role of competition: Evidence from Turkish banking industry

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ABSTRACT

This paper investigates the degree of dispersion in the loan pricing of commercial banks and its association with competitive conditions in the banking industry of a large emerging economy. To quantify the lending rate variability in consumer loans, we utilize a new indexation mechanism exploiting a detailed bank-level dataset for the period January 2007–April 2020. With panel convergence methods, we show the existence of heterogeneity in long-term co-movements among banks' loan pricing, while periods following the tightening in financial conditions display short-term deviations from general tendencies as demonstrated by dispersion indices. Our empirical design also entails the construction of competition indicators for aggregated and consumer segment-based credit market developments. Quantile regression results validate that the improvements in industry competition are related to the lower level of lending rate dispersion in housing and vehicle segments in a statistically significant manner, whereas an opposite relationship is evident for general-purpose loans.
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1. Introduction and literature review

Price formations could be subject to instabilities given market structures and the behavior of economic units.[1] The credit market is a suitable setting to analyze price dispersion since frictions such as information asymmetries exist on both the demand and supply-side; banks face uncertainties in their assessment of borrowers' credibility, while borrowers face frictions in determining how competitive a loan offer is (Van Damme, 1994; Cerqueiro et al., 2011).[2] Lenders' screening costs, assessment of borrowers' debt repayment capacity and perceived credit risk under an imperfect information setting can generate variations in loan rates across banks. However, this range in prices is bounded by the adverse selection of riskier borrowers into higher price offer pools, and market competition (Edelberg, 2006; Livshits et al., 2011; Adams et al., 2009; Einav et al., 2013; Allen et al., 2014). Banks deviating from the average loan rate face two opposing effects on their balance sheets; while the price impact boosts profits, the decline in the quality of the borrowers decreases it. The profit-reducing effect might dominate and bring higher interbank competition, leading to a convergence in interest rate distributions. Moreover, an increase in the number of competing banks reduces the range of product differentiation among banks, which further reduces rate dispersion. In this context, higher competition and the competition-induced decline in rates may increase the share of borrowers

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[1] As argued by Stigler (1961), imperfect information among buyers may result in equilibrium price dispersion in the market for goods and price heterogeneities (even across relatively homogeneous products). With variation in buyers' ability to search for lower prices, sellers can price discriminate and charge different customers variant prices for the same product. The resulting degree of price dispersion in a market might be shaped by the costly search of information, consumer switching costs, product differentiation, and macroeconomic outlook (Salop and Stiglitz, 1982; Janssen and Moraga-González, 2004; Reinganum, 1979; Burdett and Judd, 1983; Schlesinger and Von der Schulenburg, 1991; Kim et al., 2003).

[2] Throughout the rest of this paper, we use the term "dispersion" to describe the extent to which loan interest rates display variations across cross-sectional units, in our case, banks.

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with better credibility, while they also reduce bank rents and therefore erode banks' incentive to screen (Carletti, 2008).

In this paper, we aim to decipher the interaction between rate dispersion and banking competition. We particularly focus on consumer loan segments whose rate dispersion is more pronounced relative to corporate loans as households lack the transparency of independently audited firm balance sheets, and carry a lower frequency of loan extension incidents which reduce the bank's opportunity to extract agent-specific information (Campbell, 2016; De Graeve et al., 2007; Ongena and Smith, 2000; Dell'Ariccia, 2001). Using a detailed bank-level data on lending rates at a weekly frequency from Turkish banking industry, we first propose a new tool to monitor loan rate dispersion in order to investigate the degree of coherence in bank-level lending rates. We document the presence of dispersion in all consumer loans using our new indexation mechanism. Specifically, the dispersion tends to decline when average loan rates elevate with phases of tighter monetary policy and episodes of macroeconomic/financial volatilities. Next, utilizing sectoral competition indicators, we determine the impact of competition on rate dispersion. We show that higher competition reduces dispersion in vehicle and housing loans, whereas variability in general-purpose loan rates increases.

The macroeconomic outlook, monetary policy stance and credit risk of the loan consumer base may exert influence on the dispersion in loan rates.[3] In addition, competition also plays a role in the asymmetric response to changes in market rates. One strand of the literature focuses on the link between a lower level of competition among banks and dispersion in loan interest rates as more concentrated banking sectors can accommodate anti-competitive behavior and higher loan rates for profitability concerns (Bain, 1956). In other words, as stated by Baquero et al. (2018), the market power of individual banks might be translated into discretionary pricing in the loan rate-setting process, eventually creating wider rate dispersion in the sector. In highly competitive markets, banks are likely to reduce interest rates for loan customers, while also maintaining acceptable credit risk in loan portfolios. However, the degree of such rate cuts will be bounded due to other factors such as funding costs and profitability, resulting in a narrower dispersion. Since the extent of price variation for roughly standardized products is defined as the lack of perfect competition, a negative association is expected between loan rate variability and the extent of competition. More recently, Baquero et al. (2018) analyze microcredit markets for 67 countries by summarizing the level of competition in these markets with HHI proxies. They find that reduced loan rates coincide with improved competition for profit-based microfinancing institutions. Gropp et al. (2014) reveal that stronger competition in European banking sectors facilitates coherent loan pricing by enhancing the pass-through from market rates to loan rates. They also state that the degree of co-movement among loan rates in response to policy rate is higher in consumer and mortgage loans compared to business loans.[4]

Our results are mainly informative for this strand of the literature by showing that while vehicle and housing loan rates move in the expected direction, general-purpose loans move in the opposite direction based on implications of banking sector competition. We tie this outcome to the different levels of collateralization associated with these loan types. Loans with higher collateral levels may be priced more competitively with less market-wide dispersion as they carry relatively lower credit risk. Much like asymmetric information, insufficient collateral is often viewed as financial friction on its own, especially in SME lending (Beck and Demirgüç-Kunt, 2006). This channel tends to be amplified, especially during financial turbulences, as lenders may seek larger collateral coverage (Bernanke and Gertler, 1989; Bernanke et al., 1996; Kiyotaki and Moore, 1997), specifically from riskier borrowers (Berger and Udell, 1990). Thus, relevant to our setting (which focuses on different consumer loan segments), compared to self-collateralized loan types such as vehicle or housing loans, general-purpose loans that are uncollateralized would be subject to differential variation in loan rates (regardless of competitive pressures) since banks reflect the associated potential risk to the price of the loan (Cerqueiro et al., 2011).

We also build on the extant literature employing various statistical methods to handle and monitor loan rate variations.[5] We establish our empirical setting for extracting loan rate dispersion based on the method of Darracq-Pariès et al. (2014) utilizing a wider set of volatility indicators applied on cross-sectional distribution of loan pricing at each time point as well as the fitting of

[3] There is evidence linking higher loan rate/credit growth dispersion with uncertainties about monetary policy stance and financial market developments (Ivashina and Scharfstein, 2010; Puri et al., 2011; Delis et al., 2014; Kosak et al., 2015). Altavilla et al. (2020) document that monetary policy pass-through had weakened in the post-2008 period by using bank-level data of the Eurozone countries. Better lending conditions enhanced by unconventional monetary and fiscal policies are found to result in credit easing and compensate the impacts of policy uncertainties by improving long-term pass-through and decreasing the loan pricing dispersion. Credit risk and expected losses in loan portfolios, especially during times of financial distress, may lead to rising interest rates guided by bank behavior involving profit concerns, even when the level of competition in the market is high (Marquez, 2002).

[4] In the context of prior literature, De Haan and Sterken (2005) examine the Dutch mortgage market by using high-frequency bank-level data for 1997–2003 to document asymmetric pricing behavior, partly related to bank market power. They show that banks with relatively higher market power can charge loan rates involving higher margins and their loan pricing follows the market rates less closely than other banks. Moreno-Burbano et al. (2019) study commercial loans extended to Colombian firms with micro-level datasets to evaluate the impact of banking sector competition in price dispersion. Controlling for financial sector structure, firm and loan characteristics, and defining interest rate variation as the relative spread of loan rate over the term premium of a bond with equivalent maturity, they find inconclusive results on the impact of market concentration on loan rate dispersion. Conversely, Mallett and Sen (2001) document that market concentration would result in higher pricing tendencies using survey data on Canadian small business loans. Van Leuvensteijn et al. (2008) analyze the impact of loan market competition on loan rates determined by European banks during 1994–2004. They reveal that banks tend to price the loans in accordance with market averages if competitive pressures are stronger. Cottarelli and Kourelis (1994) and Borio and Fritz (1995) find that loan rates adjust sluggishly to shifts in market rates when the sector is less competitive. Cottarelli and Kourelis (1994) focus on a cross-country setting and describe what is termed as "lending rate stickiness" corresponding to the smaller degree of variation in interest rates when the policy rate is altered. In this setting, competition is an important dimension of financial structure determining the rate stickiness and policies aiming to remove the barriers to competition are likely to enhance the monetary policy transmission. Borio and Fritz (1995) assess the collusive behavior in short-term lending rates by evaluating the asymmetric responses of loan pricing to interest rate shocks derived from monetary policy stance in developed countries and found that stronger competition would result in less volatile loan pricing and a smaller spread between lending and market rates.

[5] Some works use loan or bank-level datasets to retrieve the difference between interest rates and reference mean/median values at specified time intervals (Baquero et al., 2018; Moreno-Burbano et al., 2019). Others utilizing micro-level data calculate variability indicators like sub-sample standard deviation, inter-percentile ranges and coefficient of variation across cross-sectional units like banks, loans, and countries. (Nakane and Koyama, 2003; Vajanne, 2007; Martin-Oliver et al., 2008). Another group of papers aims to capture the loan rate variation by adjusting the model specification. Cerqueiro et al. (2011) use a heteroscedastic regression model incorporating the precision of loan pricing by augmenting a variance equation. Kok and Lichtenberger (2007) analyze the presence of loan rate dispersion across countries by contrasting coefficients for country dummies in regressions with loan rates as the dependent variable. Few studies employ alternative methods like calculating the marginal rate by taking the difference of individual loan interest rates over a benchmark, such as bond rate (Allen et al., 2014), or adjusting the bank-level loan rate by credit risk indicators (Ushakova and Kruglova, 2018).

cumulative distribution function to undertake the indexation process. Our paper contributes to the existing empirical literature on two fronts. This is the first study aiming to document the consumer loan rate dispersion for the Turkish banking sector by using the bank-level interest rate data compiled by the Central Bank of Turkey (CBRT) at weekly frequency. This paper also undertakes the first empirical work to associate consumer loan rate variability with competitive conditions in the Turkish banking sector.

The rest of the paper is structured as follows. Section 2 describes the data and methodology, Section 3 presents the empirical results on divergence and dispersion behavior of bank-level loan rates, the evolution of competitive conditions in the Turkish banking industry and the effect of competition on interest rate dispersion. Section 4 makes conclusive remarks.

2. Data and methodology

We restrict the sample period for this study to the interval of January 2007–April 2020.[6] The adoption of inflation targeting regime in 2006 motivates the starting date given that the subsequent period was characterized with contained inflationary pressures accommodating a new plateau for interest rates in Turkey. This choice concerning the sample period also allows us to observe the influence of the Global Financial Crisis (GFC) in 2008 on domestic financial conditions and interest rate formations. In addition, from a functionality perspective, our bank-level data has a superior informative value in the post-2006 episode because of the relatively lower number of non-missing observations and better coverage.

Our dataset is composed of two micro-level banking databases. The first one is a detailed bank-level dataset containing consumer loan interest rates accrued on the flow of loans at weekly frequency. We focus on 15 operational commercial deposit banks in the Turkish industry to map the dynamic volatilities in loan pricing. We exclude investment, development and participation banks as their business operations, loan pricing mechanisms and consumer segmentation are different from those of conventional commercial banks.[7] The resulting sample is representative of the entire sector; heterogeneous regarding bank size, ownership status (state, private and foreign banks) as well as the loan extension and deposit collection (Fig. 1). Panel convergence analysis and construction of dispersion indices are conducted by using these series. For the latter parts of the empirical analysis with competition indicators, we utilize another micro-level dataset on the monthly stock values of credits allocated by these commercial banks in general-purpose, vehicle and housing segments.

We supplement these two micro-level datasets from CBRT with macro-level data to be used as control variables in the analyses associating loan rate dispersion with competitive forces in quantile regressions. Overall asset pricing formations, which could be influential for the wealth effects, and the value of collaterals are captured with the logarithmic growth of the BIST100 index.[8] The income prospects and labor market conditions possibly governing the debt-repayment capacity of households are tracked with the employment ratio. General credit risk developments in consumer loans are represented by the consumer NPL ratio of the sector.[9] In terms of capturing the supply-side forces at play, we choose to utilize the capital adequacy ratio and liquidity ratio of the banking sector. The interest rate charged on TL deposits is also integrated into the list of covariates to control for funding cost risks and, to some extent, to capture the impact of the monetary transmission mechanism. Data definitions and sources are presented in Table 1.

In line with other countries, Turkey has implemented a variety of counter-cyclical prudential measures targeting consumer lending since the GFC (Cerutti et al., 2017). Therefore, we use the macroprudential policy index of Eroğlu (2018) to account for the course of these policies which may have played a role on the pricing of loans.[10] These series are obtained through a comprehensive analysis of the policies by assessing the easing/tightening in macroprudential instruments such as required minimum payments, general provisions, risk weights, loan installment restrictions, FX loan limitations, loan-to-value ratios, and taxation. As it can be seen in Figure A1 of the Appendix, upward movements of indices correspond to the tightening of policies, whereas downward movements reflect easing in the macroprudential outlook.[11]

Our methodological approach follows a multi-step procedure. First, we investigate panel convergence among banks by allowing the heterogeneous agent behavior. Next, we evaluate the weekly variability in loan pricing of banks to construct our baseline dispersion indices. In the following step, we generate competition indicators for different consumer loan segments. Finally, we establish the connection between loan rate dispersion and competitive conditions through quantile regressions.

The first phase of our empirical setting is designed to statistically evaluate the joint movement of consumer loan interest rates among the panel of commercial banks through the implementation

[6] The sample interval ends just before the onset of the Covid-19 outbreak in Turkey which was a period marked by large global volatilities. To support economic agents' cash flow management, the Turkish banking sector has introduced many supportive campaigns in 2020 in both retail and corporate loans (FSR, 2020). Naturally, the implementation of these campaigns are linked to higher volatilities in loan utilization and interest rates in those periods. Since our dispersion index fits a cumulative distribution over the entire study period, including the Covid-19 months in the analysis would allow this exceptional period with unique dynamics to significantly alter the features of our indices. The long-term perspective of our convergence methodology does not support an alternative approach to separately investigate Covid-19 months. As a result, we have excluded the period marked by Covid from the analysis.

[7] The dataset reports each loan issuance above 1000 TL on a monthly basis. We exclude the domestic branches of foreign banks as their market share is very small, and focus on 15 out of a total of 34 deposit banks operating in Turkey. As of the last data point, the panel of banks included in this study contains around 97%, 71%, and 93% of total general-purpose, vehicle and housing loans issued by the whole sector, respectively.

[8] Prior studies in the empirical literature for Turkish case also consider the movements in stock exchange as a representative proxy for domestic financial asset prices and financial conditions (Duran et al., 2010, 2012; Kara et al., 2015). Besides, general literature also posits a closer relationship between collateral values and stock market price dynamics, ultimately influencing credit allocations (Kapopoulos and Siokis, 2005; Chabakauri and Han, 2020). Alternatively, we use the house price index to approximate domestic financial asset returns and collateral values but we observe that baseline findings remain robust. We thank the anonymous reviewer for pointing out this issue.

[9] In untabulated set of results, we use alternative ex-post and ex-ante risk indicators like Z-score, the ratio of provisions to total loans, the ratio of risk-weighted assets to total assets, the ratio of Stage 2 loans to total loans. We observe that baseline findings remain robust.

[10] We gratefully acknowledge the contribution of Egemen Eroğlu for sharing the updated version of macroprudential policy indices based on Eroğlu (2018).

[11] FX-denominated household lending has been limited in 2009. At the end of 2013, a maturity cap of 36 months for general-purpose loans was introduced. The cap has been changed to 48 months in 2016, back to 36 months in 2018, extended to 60 months in 2019 and back to 36 months in 2020. Loan to value (LTV) ceilings for housing loans (75%) and vehicle loans (70% up to 50.000 TL, 50% beyond) were introduced in 2011 and 2014, respectively. For housing loans, the LTV ratio was raised to 80 percent in 2016, and to a range between 80% and 90% in 2019 depending on the residential energy performance. The price thresholds for vehicle LTV ratios were raised from 50,000 to 100,000 TL in 2017, and from 100,000 to 120,000 TL in 2019.

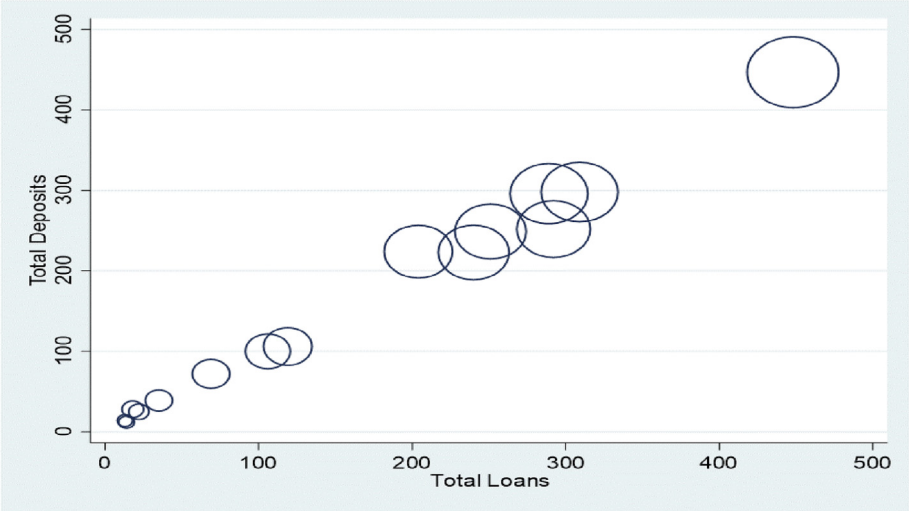

Fig. 1. Loans and deposits of the sample banks (December 2019, Billion TL).
Source: Bank Association of Turkey. Notes: Sizes of the bubbles are scaled according to the total assets of the sample commercial banks.

Table 1
Data definitions.

Variable	Retrieval/Transformation	Source
Dispersion GP 1	Level, Dispersion index calculated for GP loans by using bank-level data and CDF method	CBRT, Authors' Calculations
Dispersion GP 2	Level, Dispersion index calculated for GP loans by using bank-level data and PCA method	CBRT, Authors' Calculations
Dispersion Vehicle 1	Level, Dispersion index calculated for vehicle loans by using bank-level data and CDF method	CBRT, Authors' Calculations
Dispersion Vehicle 2	Level, Dispersion index calculated for vehicle loans by using bank-level data and PCA method	CBRT, Authors' Calculations
Dispersion Housing 1	Level, Dispersion index calculated for housing loans by using bank-level data and CDF method	CBRT, Authors' Calculations
Dispersion Housing 2	Level, Dispersion index calculated for housing loans by using bank-level data and PCA method	CBRT, Authors' Calculations
HHI Sector	Year-on-Year Difference, Competition indicator calculated for total loans by using bank-level data	CBRT, Authors' Calculations
HHI GP	Year-on-Year Difference, Competition indicator calculated for GP loans by using bank-level data	CBRT, Authors' Calculations
HHI Vehicle	Year-on-Year Difference, Competition indicator calculated for total loans by using bank-level data	CBRT, Authors' Calculations
HHI Housing	Year-on-Year Difference, Competition indicator calculated for total loans by using bank-level data	CBRT, Authors' Calculations
MAP GP	Year-on-Year Difference	Eroğlu (2018)
MAP Vehicle	Year-on-Year Difference	Eroğlu (2018)
MAP Housing	Year-on-Year Difference	Eroğlu (2018)
Asset Prices	Year-on-Year Logarithmic Growth, BIST 100 Index	Bloomberg
Employment	Year-on-Year Difference, Seasonally Adjusted, Employment Ratio	TurkStat
Consumer NPL	Year-on-Year Difference, NPL Ratio of Consumer (General-Purpose, Vehicle and Housing) Loans	CBRT
CAR	Year-on-Year Difference, Ratio of Equity Capital to Risk-Weighted Assets	CBRT
Deposit Rate	Year-on-Year Difference, Weighted Average Flow Deposit Interest Rate Applicable to TL Deposits	CBRT
Liquidity Ratio	Year-on-Year Difference, The Ratio of Liquid Assets (Cash, Receivables, Securities) to Total Deposits	CBRT

of the log(t) regression model.[12] As outlined in Du (2017), log(t) regression test developed by Phillips and Sul (2007) is superior compared to alternative convergence testing procedures (including panel unit root tests, co-integration, and dynamic panel estimations) and is known to integrate heterogeneous agent behavior (and its time-varying evolution) into the estimation procedure. Moreover, it does not make restrictive assumptions concerning the stationarity properties of the examined series. The method is also flexible in the sense that it is applicable to the sub-segments of the dataset to reveal the convergence dynamics. In this framework, panel convergence analysis is applied on different consumer loan segments with robustness analysis being iterated across bank ownership status, different phases of sample period as well as the large-small bank categorizations. The course of loan shares across these divisions are provided in Figures A2 to A4 in the Appendix. Large banks are determined by ranking the sample banks according to total asset sizes.

The model initially decomposes the panel of consumer loan rates (X_{it}) with time ($t = 1,\ldots,T$) and bank ($i = 1,\ldots,N$) dimensions as follows:

$$X_{it} = g_{it} + a_{it} \tag{1}$$

where g_{it} stands for permanent components and a_{it} represents transitory components. The permanent component g_{it} could be capturing bank-specific factors that influence the setting of interest rates such as the bank's liquidity, credit risk, or market segment preferences. At the same time, they could also be embodying a

[12] In earlier studies, convergence hypothesis testing has been largely conducted in empirical growth literature to assess the notion that cross-country per-capita output will approach a common level (Barro and Sala-i Martin, 1997; Luginbuhl and Koopman, 2004; Pesaran, 2007). However, such methods have also been preferred to investigate long-term convergence outcomes in other cases such as house prices (Montañés and Olmos, 2013; Churchill et al., 2018; Ganioğlu and Seven, 2019), income inequality (Tian et al., 2016), corporate taxation (Regis et al., 2015), equity markets (Apergis et al., 2011), and bond yields (Antonakakis et al., 2017) among many others. Most similar to our case, Vajanne (2007) examined the convergence of retail banking credit interest rates charged on loans extended to households and firms in the pre-2008 period by examining the speed and depth of market convergence in the Eurozone through convergence tests based on panel unit root testing procedure.

common factor across banks, such as the country's access to international funds markets, which would impact all the banks in the sample. To reflect this fact, this equation could be further transformed as:

$$X_{it} = \left(\frac{g_{it} + a_{it}}{v_t}\right) v_t = \delta_{it} v_t \tag{2}$$

where v_t is the single common component derived from banks and δ_{it} can be defined as the time-varying idiosyncratic factor measuring the distance between common trend component v_t and panel data of the bank loan rates (X_{it}). As explained by Phillips and Sul (2007), since δ_{it} can not be directly estimated, common factor should be removed as follows:

$$h_{it} = \frac{X_{it}}{\frac{1}{N}\sum_{i=1}^{N} X_{it}} = \frac{\delta_{it}}{\frac{1}{N}\sum_{i=1}^{N} \delta_{it}} \tag{3}$$

here, h_{it} is termed as the relative transition parameter monitoring the transition path of bank i regarding the panel average of all banks at a specific time t. This equivalence also implies that the cross-sectional mean of h_{it} should be unity and the cross-sectional variance of the same term should satisfy the following condition:

$$H_{it} = \frac{1}{N}\sum_{i=1}^{N} (h_{it} - 1)^2 \to 0 \text{ if } \lim_{t\to\infty} \delta_{it} = \delta \text{ for all } i \tag{4}$$

In this context, as mentioned by Phillips and Sul (2007), the panel convergence of bank loan rates (X_{it}) requires the following conditions:

$$\lim_{t\to\infty} \delta_{it} = \delta \text{ for all } i \tag{5}$$

To test the convergence, a specific form is imposed on the time-varying loading coefficient δ_{it} as follows:

$$\delta_{it} = \delta_i + \sigma_{it}\varphi_{it},\ \sigma_{it} = \frac{\sigma_i}{L(t)t^{\alpha}},\quad t \geq 1, \sigma_i > 0 \text{ for all } i \tag{6}$$

where $L(t)$ is a slowly varying function and α is an arbitrary decay rate. The simulations conducted by Phillips and Sul (2007) show that $L(t) = \log(t)$ results in the best performance in terms of size distortion and test power. Consequently, given that $\alpha \geq 0$ the null hypothesis of the convergence can be established as follows, which would be tested against the alternative hypothesis of non-convergence for some bank i:

$$\begin{aligned} H_0 &: \ \delta_i = \delta \text{ and } \alpha \geq 0 \\ H_A &: \ \delta_i \neq \delta \text{ or } \alpha < 0 \end{aligned} \tag{7}$$

This test is implemented through the following log(t) regression model via one-sided t-test and the limit distribution of the t-statistic can be formulated as follows, where r is the fraction of the sample T:

$$\begin{aligned} &\log\left(\frac{H_1}{H_t}\right) - 2\log(\log(t)) = a + b\log(t) + \varepsilon_t \\ &\text{for } t = [rT], [rT]+1, \ldots, T \text{ with } r > 0 \\ &t_b = \frac{\widehat{b} - b}{s_b} \to N(0,1) \end{aligned} \tag{8}$$

After evaluating the panel convergence behavior across banks, in the second phase of the empirical framework, we utilize the weekly bank-level loan rate to quantify the time-varying volatility in the consumer loan pricing. In this study, to construct the loan rate dispersion indices, we follow the method applied by Darracq-Pariès et al. (2014) given its coverage and tractability of interpretation. They monitor cross-country lending rate heterogeneities by calculating six different volatility indicators and performing an index aggregation procedure by fitting a cumulative distribution function to keep track of the monthly loan rate dispersion in Eurozone countries. Our study builds upon this method but deviates from Darracq-Pariès et al. (2014) on four dimensions. We perform the analysis with data driven from a higher frequency (weekly rather than monthly), we consider banks as our cross-sectional units (instead of countries), and we introduce two additional volatility inputs (nominal and normalized values of the minimum-maximum range) and propose an alternative method (principal component analysis-PCA) for the ultimate index construction. In the first step, for each weekly observation of consumer loan rates, following 8 volatility measures are created across the panel of 15 banks:

$$Standard\ Deviation = \sqrt{\frac{1}{15} * \sum_{i=1}^{15} (Loan\ Rate_i - \mu)^2} \tag{9}$$

$$Coefficient\ of\ Variation = \frac{Standard\ Deviation}{\mu} \tag{10}$$

$$Range = Max - Min \tag{11}$$

$$Range\ Normalized = \frac{Max - Min}{Max + Min} \tag{12}$$

$$Interquartile\ Range = Q3 - Q1 \tag{13}$$

$$Interquartile\ Range\ Normalized = \frac{Q3 - Q1}{Q3 + Q1} \tag{14}$$

$$\begin{aligned} &Median\ Absolute\ Deviation = Median(\\ &\quad \times |Loan\ Rate_i - Median(Loan\ Rate_i)|) \end{aligned} \tag{15}$$

$$Median Absolute Deviation Normalized = \frac{Median Absolute Deviation}{Median(Loan Rate_i)} \tag{16}$$

where, $Loan\ Rate_i$ denotes the consumer loan interest rates of the individual banks (weighted over different maturities by loan amounts), μ stands for the average loan rate of the panel of sample banks; *Min*, *Max*, $Q1$ and $Q3$ demonstrate minimum, maximum, 25th percentile and 75th percentile values of the loan rate distribution across banks, at a specified week. Normalized indicators are combined with levels to enable the volatility comparison with different loan categories. Furthermore, range-based volatility measures are included since traditional indicators like *Standard Deviation* and *Coefficient of Variation* can be heavily influenced by outliers. In the following step, the cumulative distribution function (CDF) is fitted to these volatility inputs over the time horizon and the functions are then averaged to create the first version of our *Dispersion Index*. The *Dispersion Index* is bounded by the [0,1] interval where higher values correspond to a greater discrepancy in loan pricing between banks. An alternative version of the index is also produced by combining the volatility indicators through a PCA and isolating the first static factor. In lieu of the first version, larger values of the index indicate higher divergence in

loan pricing across commercial banks. These two indices are obtained for each of the general-purpose, vehicle and housing loan segments. End-of-month values of the indices are considered for the subsequent analyses in this paper.

$$F(x) = P(X \leq x) = \sum_{x_i \leq x} P(X = x_i) \tag{17}$$

$$Dispersion\ Index\ 1 = \frac{1}{8} * \left(\sum_{s=1}^{8} F(x)_s \right) \tag{18}$$

$$Dispersion\ Index\ 2 = First\ Principal\ Component\ of\ the\ V olatility\ Inputs \tag{19}$$

In the third phase of the empirical setting, the association between loan rate dispersion and competition is established. As both dispersion indices and competition indicators may display asymmetric and non-linear dynamics, we employ the quantile regression method.[13] More specifically, the following models are estimated in a stepwise manner:

$$Dispersion\ Index_t = \beta_0 + \beta_1 \Delta HHI\ Sector_t + e_t \tag{20}$$

$$Dispersion\ Index_t = \beta_0 + \beta_1 \Delta HHI\ Loan_t + e_t \tag{21}$$

$$Dispersion\ Index_t = \beta_0 + \beta_1 \Delta HHI\ Loan_t + \beta_2 Controls_t + e_t \tag{22}$$

In this context, *Dispersion Index* refers to the two different indices created in the second step of our analyses, in equations (18) and (19), for each of the retail loan segments. Our sectoral and loan segment competition indicators are constructed as HHI. *ΔHHI Sector* represents the monthly change in the HHI calculated from our sample of banks' total loans capturing how competitive forces evolve on the sectoral level. In addition to this, *ΔHHI Loan* denotes the values the HHI takes in each of the specific loan segments and represents specifically the course of competition in general-purpose, vehicle, and housing loans. In the most comprehensive specification of the quantile regressions, we enrich the specification by accounting for other control variables reflecting supply and demand-side determinants of consumer loan pricing including the presence of macroprudential policies, asset prices, labor market conditions, credit risk, capital adequacy, and bank liquidity. These estimations are repeated for the two variants of dispersion indices, over three consumer loan categories, and five different quantile levels. We take the 10th, 25th, 50th, 75th, and 90th percentiles in the conditional distribution of rate dispersion given explanatory variables to reflect excessively lower, moderately lower, median, moderately higher and excessively higher loan pricing variations, respectively. In the quantile regression model, for the specific quantile τ of the dependent variable, coefficients are estimated by solving the following minimization problem in a generalized multivariate setting:

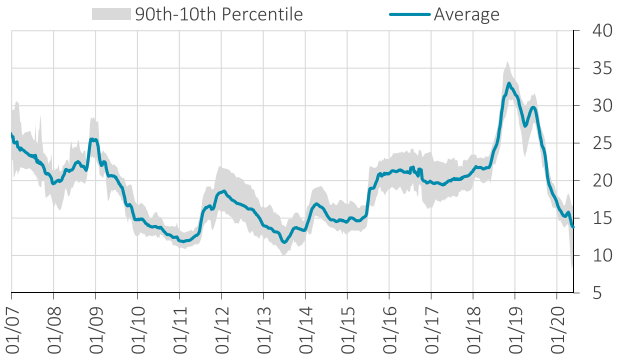

Fig. 2. General-purpose loan interest rates (4-week MA).
Source: CBRT

$$Q_\tau(y_i) = \beta_0(\tau) + \beta_1(\tau)x_{i1} + \ldots + \beta_p(\tau)x_{ip} \tag{23}$$

$$\min_{\beta_0(\tau),\ldots,\beta_p(\tau)} \sum_{i=1}^{n} \rho_\tau \left(y_{i-}\beta_0(\tau) - \sum_{j=1}^{p} x_{ij}\beta_j(\tau) \right)^2 \tag{24}$$

where $\rho_\tau(r)$ is referred as the check loss function and is defined as $\rho_\tau(r) = \tau \max(r,0) + (1-\tau)\max(-r,0)$. For each specific quantile level τ, the solution to this minimization problem brings a unique set of regression coefficients.

To proxy the level of competition, we utilize HHI constructed by summing the square of market shares of all agents in the examined market (Hirschman, 1964). HHI measures are incrementally calculated for each of the consumer loan segment embodying general-purpose, vehicle and housing loans by using the bank-level credit data. In general, HHI can take values ranging from very close to zero, which indicates a very competitive market structure, to 10000 in the case of perfect monopoly structures, with lower values displaying diminishing concentration and improving competition. Values below 1500 are usually considered to indicate competitive market settings (Mehta et al., 2016).[14]

3. Empirical results

We first present the historical movements of bank-level loan rates in Figs. 2–4. At first glance, all three categories of interest rates follow a similar pattern over the course of the sample period. General-purpose loans have more sizeable fluctuations regarding cross-bank loan rate differences, compared to vehicle and housing loans, which we evaluate as being linked to the uncollateralized nature of general-purpose loans, and the banks' choice to reflect more of the expected risk into the pricing of the loan. Conversely, on the other end of the collateralization spectrum, housing loan

[13] Unlike the standard linear regression techniques, the quantile regression, introduced by Koenker and Bassett (1978), can provide a better description of the data by considering the effect of covariates on the entire distribution of the response variable, not merely its conditional average. Additionally, as quantile regression is distribution agnostic, the regression does not assume parametric distribution for the response variable, nor does it assume a constant variance like ordinary least squares (OLS). This type of methodology is also known to be robust to outliers. While OLS aims to minimize the sum of squared errors, the quantile regression method minimizes a sum that gives asymmetric penalties for over-prediction and underprediction. Thus, a quantile regression can investigate how the predictive relationship between loan rate dispersion and change in competitive conditions varies over different levels of rate dispersion.

[14] Earlier studies in the competition literature put forward measures derived from structural characteristics of the markets. Initially conceptualized by Bain (1956), what is termed as Structure-Conduct-Performance (SCP) paradigm argues that market structure shapes collusive tendencies among individual banks (Hannan, 1991). On top of this, structural features which influence pricing strategies and other decisions can create excess profit opportunities for banks. If the collusion phenomena result in a smaller number of entities that behave independently, then the remaining ones can strive for higher profits given that the market structure may resemble that of an oligopoly. In the empirical literature, the analogy between market concentration and competition is established with a variety of measures, concentration ratio (CR) and HHI being the most widely used. While both measures aim to capture the market share dispersion in an industry, their focus area within a market is fundamentally different.

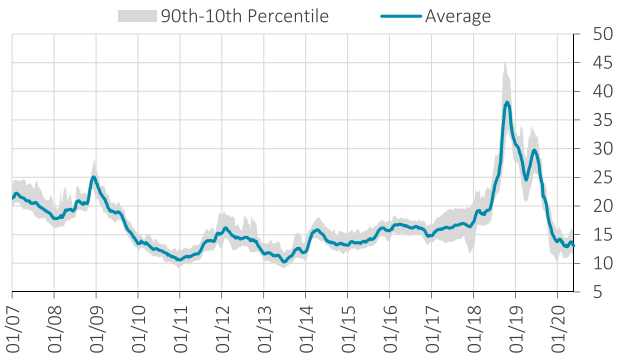

Fig. 3. Vehicle loan interest rates (4-week MA).
Source: CBRT

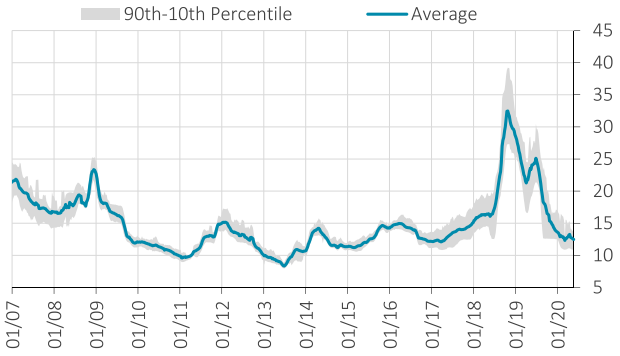

Fig. 4. Housing loan interest rates (4-week MA).
Source: CBRT

terms, conditions and maturity structure are known to be similar across banks leading to more harmonious loan rate realizations. In addition, a common feature shared by all loan types is the narrowed range in pricing dispersion during the episodes defined by sizeable increases in average loan rates (coinciding with macroeconomic and/or financial volatilities) followed by rising variations in subsequent periods.

In addition to average loan rates, pricing distribution across individual banks has displayed fluctuations, as indicated by the 10th and 90th percentile bands in the abovementioned figures. Interestingly, the earlier part of our sample, immediately before 2008, witnessed relatively volatile loan rate formations in the sector. Visualized by the spikes in our percentile series, this dispersion in loan pricing practices is evident in all three consumer loan segments as the period was characterized by a different financial regulatory landscape and relatively subdued household loan volumes. The impact of the global financial volatilities caused by the GFC was short-lived, thanks to the rebound in economic activity and income.

The following period was marked by sizeable capital inflows which supported local currency loan growth with longer maturities, in part due to the growing positions in FX derivative markets employed to extent long-term local currency-denominated financing for Turkish households. This trend continued until the beginning of 2012 when a comprehensive macroprudential framework was introduced to prevent the accumulation of macro-financial risks. This set of regulations was involved with a combination of policy tools including reserve requirement ratios, installment restrictions, general provisions, and loan-to-value ratios. The utilization of such measures increased the costs associated with the rate-setting processes and market penetration for the commercial banks and gave way to slight elevations in loan rates. The sudden shift in global risk appetite caused by the Fed's signaling of policy reversal in 2013 (Taper Tantrum) had also a strong impact on local financial conditions of emerging economies. The monetary policy tightening by CBRT in the following period has resulted in a concordant increase in consumer loan rates.

The financial volatilities in 2018 resulted in a large currency depreciation coupled with increases in risk premia, worsened valuations in stock markets, deterioration in liquidity conditions, the loss of momentum in economic activity accompanied by inflationary pressures. This was met with an unparalleled policy rate hike, which was quickly transmitted to consumer loan pricing. It should be emphasized that, during this period, loan rate formations diverging from the common trend have taken place in all three consumer segments. However, as liquidity conditions and credit risk outlook improved, economic activity re-accelerated on the back of domestic demand, credit incentive packages, and a more accommodative monetary and macroprudential policy stance.

3.1. Panel convergence tests

Having summarized the background and trends in loan data in a descriptive way, we proceed with providing our initial results on panel convergence test results summarized in Table 2. In the general case, our null hypothesis of panel convergence of bank-level interest rates is rejected at a 5% significance level on a one-sided test, when the test statistic is less than -1.65.

We present the log(t) regression test results for general-purpose loans in the first panel. When all banks and the whole sample period are considered, results show that in the Turkish banking sector overall, there exists a long-run equilibrium for which general-purpose loan rates converge to. To investigate if loan rates diverge from their respective steady states within bank groups, we implement the same testing procedure over the whole sample by differentiating the data with respect to bank ownership status including state, private and foreign banks. Although this is not the case for government-owned and private groups, foreign banks' general-purpose loan rates display statistically significant divergence patterns. To further clarify the heterogeneity in the long-term behavior of loan rates, we repeat log(t) regression tests over different phases of the sample period by separating the weekly interest rate data into two intervals of similar length: 2007M1-2013M12 and 2014M1-2020M4 with the intense utilization of macroprudential policies and Taper Tantrum acting as a breaking point. While the divergent tendencies of foreign banks were evident in the first part of the sample, surprisingly, this period also includes divergent behavior of state banks which is not observed over the whole sample.

Following a similar approach for vehicle loans, empirical results obtained from the overall sample indicate that the null hypothesis of panel convergence is rejected. In other words, bank-level interest rates have demonstrated varied dynamics in longer horizons. This result is particularly applicable for private and foreign banks and contains statistical significance in both sub-samples. More strikingly, even state banks had been subject to divergence in the more recent part of the sample. We motivate this divergence with the size of the market as well as the differences in the value of the collateral, namely the purchased vehicles themselves. This group of loans tends to be lower in volume compared to the rest of the retail loan market, and banks make up about 50% of the vehicle loan market, while the rest belongs to financing companies. The results highlight the fact that smaller sub-market size, even within a larger and competitive market, may lead to divergent pricing mechanisms. In addition, second-hand cars (unlike second-hand houses)

Table 2
Log(t) convergence test results for bank-level consumer loan rates.

	Sample Coverage	Coefficient	Standard Error	T-Statistic	Number of Observations
GP Loans					
Total Sample	All Banks	−0.049	0.179	−0.276	11,090
	State Banks	0.873	0.347	2.512	2400
	Private Banks	0.116	0.216	0.539	4959
	Foreign Banks	−0.456	0.271	−1.683*	3731
2007M1-2013M12	State Banks	1.167	0.557	2.096	1389
	Private Banks	−0.357	0.221	−1.621	2602
	Foreign Banks	−1.485	0.206	−7.187*	2046
2014M1-2020M4	State Banks	−0.483	0.241	−2.003*	1011
	Private Banks	0.543	0.200	2.713	2357
	Foreign Banks	0.151	0.294	0.511	1685
Vehicle Loans					
Total Sample	All Banks,	−0.812	0.117	−6.951*	10,982
	State Banks	−0.019	0.357	−0.053	2397
	Private Banks	−0.615	0.168	−3.656*	5087
	Foreign Banks	−1.240	0.179	−6.927*	3498
2007M1-2013M12	State Banks,	0.134	0.594	0.225	1388
	Private Banks	−0.825	0.155	−5.323*	2944
	Foreign Banks	−1.256	0.166	−7.556*	2110
2014M1-2020M4	State Banks	−0.622	0.345	−1.798*	1009
	Private Banks	−0.861	0.240	−3.582*	2143
	Foreign Banks	−1.223	0.187	−6.540*	1685
Housing Loans					
Total Sample	All Banks	−0.154	0.292	−0.527	11,015
	State Banks	2.622	0.406	6.451	2403
	Private Banks	−0.684	0.134	−6.927*	5123
	Foreign Banks	−0.144	0.289	−0.498	3493
2007M1-2013M12	State Banks	2.696	0.595	4.527	1389
	Private Banks	−0.473	0.146	−3.234*	2923
	Foreign Banks	−0.135	0.328	−0.412	1999
2014M1-2020M4	State Banks	−0.783	0.506	−1.546	1010
	Private Banks	−0.781	0.211	−3.698*	2200
	Foreign Banks	−0.157	0.130	−1.207	1494

Notes: * denotes the rejection of the null hypothesis of convergence at 5% significance level.

may be evaluated at quite unique prices and associated with unique risk premiums due to their individual wear and tear, which may also motivate the variation in lending rates through the collateral channel in this particular loan type. Lastly, despite the fact that findings on housing loans present a convergent trend when all banks are considered, there is divergence across private banks' housing loan rates throughout the whole sample period.

Even though we demonstrate some sector-wide convergence in general purpose and housing loan rates by using a method that aims to capture the long-run loan rate variability exhibited by banks, our results also support the view that there is no certain and uniform convergence behavior in consumer loan rate formation in the Turkish banking sector across different sub-periods. As a result, it would also be informative to monitor the shorter-term variation in individual banks' loan rates through indexation techniques.

Certain caveats can be made about possible heterogeneities in these results. For general-purpose loans, it is known that state banks generally implement campaign credit packages in different periods as countercyclical policies so that it might cause divergence among those banks' general purpose loan rates. Moreover, the asset sizes of foreign banks are relatively smaller than other banking groups, eventually leading to possible divergence in their general-purpose loan extensions and rates. In this regard, results for private banks are more in line with the argument speculating the existence of a particular long-run equilibrium on which general-purpose loan rates converge. In relation to heterogeneous results for housing loans, credit schemes with competitive pricing by state banks are known to increase their market share, but it also causes heterogeneous reactions from other banks. While state banks implement coordinated strategies for providing housing loan facilities, other banks seem to be in partial competition with state banks. Additionally, during some parts of the sample period, extending housing loan facilities with higher interest rates to riskier customers might be another supporting factor for the divergence observed among private bank housing loan rates.

On top of the analysis of long-term loan convergence based on ownership status, we also undertake the sub-group analysis depending on bank size in Table 3. In terms of general-purpose loans, we see that there is a general tendency towards long-term joint movements with the exception of small banks in the earlier parts of the sample. However, the panel convergence is not preserved for vehicle loans as small banks' pricing tendencies differ from each other in a statistically significant way during the whole sample, whereas this divergence is even shared among larger banks in the latter period. Again, in contrast with general-purpose loans, banks diverge from each other significantly in setting housing loan rates, which is more emphasized for smaller banks. Because foreign banks are all small banks, findings on general-purpose loans are also coherent with the argument of divergent movement of small banks in the earlier part of the sample. Similarly, considering that state banks are comparably larger, in terms of housing loans, there is a joint movement tendency of large banks in the earlier part of the sample.

Table 3
Log(t) convergence test results for bank-level consumer loan rates.

Sample Coverage		Coefficient	Standard Error	T-Statistic	Number of Observations
GP Loans					
Total Sample	Large Banks	−0.084	0.224	−0.374	5429
	Small Banks	−0.093	0.218	−0.429	5661
2007M1-2013M12	Large Banks	−0.113	0.343	−0.331	3072
	Small Banks	−0.851	0.173	−4.901*	2965
2014M1-2020M4	Large Banks	−0.145	0.210	−0.692	2357
	Small Banks	0.299	0.248	1.207	2696
Vehicle Loans					
Total Sample	Large Banks	−0.362	0.279	−1.299	5563
	Small Banks	−0.815	0.089	−9.125*	5419
2007M1-2013M12	Large Banks	−0.250	0.414	−0.604	3209
	Small Banks	−0.949	0.125	−7.570*	3233
2014M1-2020M4	Large Banks	−1.235	0.245	−4.993*	2354
	Small Banks	−0.762	0.098	−7.708*	2186
Housing Loans					
Total Sample	Large Banks	0.660	0.463	1.426	5568
	Small Banks	−0.417	0.232	−1.796*	5447
2007M1-2013M12	Large Banks	1.683	0.321	5.234	3212
	Small Banks	−0.391	0.225	−1.738*	3099
2014M1-2020M4	Large Banks	−1.704	0.443	−3.839*	2356
	Small Banks	−0.423	0.231	−1.831*	2348

Notes: * denotes the rejection of the null hypothesis of convergence at 5% significance level.

3.2. Dispersion indices

The dispersion indices constructed for general-purpose, vehicle, and housing loans are presented in Figs. 5–7. The index values represent the position of the cross-sectional loan rate variation compared to all sample observations. In other words, an increase in the index signals wider loan rate dispersion whereas a decline implies the dispersion is getting narrower. One important finding is the robustness of the result to the index formation method. There seem to be minor differences between indices created by the CDF method and PCA technique in terms of the general course of the variability, except for housing loans where the PCA-based index is relatively more subdued for a few periods.

According to results, the general-purpose loan rate dispersion declined in the crisis episodes like the GFC and 2013 Taper Tantrum as well as the introduction of macroprudential measures by curbing household's FX borrowing in June 2009. Banks seem to follow similar risk pricing practices (or risk preferences) during episodes following these volatilities. One exception seems to be the second half of 2016 when elevated credit risk in this segment coupled with prominent uncertainties increased pricing dispersion between banks for a relatively longer period. From 2017 onwards, until the recent Covid-19 outbreak in 2020, banks' pricing tendencies appear to be similar for general-purpose loans. During this period, initially, the dispersion between commercial banks collectively increased. This coincided with the early stages of the Treasury-backed credit guarantee scheme targeting SME loans, in which there were differences in adoption rates across different types of banks, and the scheme also created differences between banks in loan pricing in non-scheme loans. As the scheme utilization was rolled out to the rest of the sector, the dispersion index decreased in tandem. From another perspective, especially after 2018, the average interest rate charged on general-purpose loans raised rapidly, which might lead to a cross-segment transition of customer base from demand-side and this trend might be supported by the profitability concerns of the banks from supply-side.

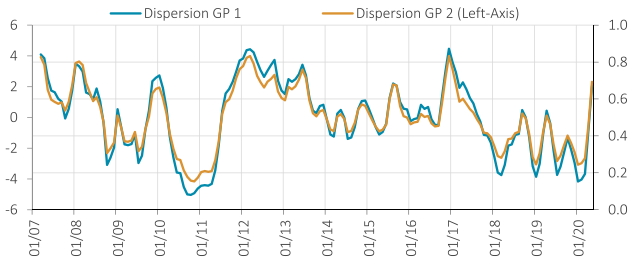

Fig. 5. Loan rate dispersion index (general-purpose loans, 3-month MA).
Source: CBRT, Authors' Calculations

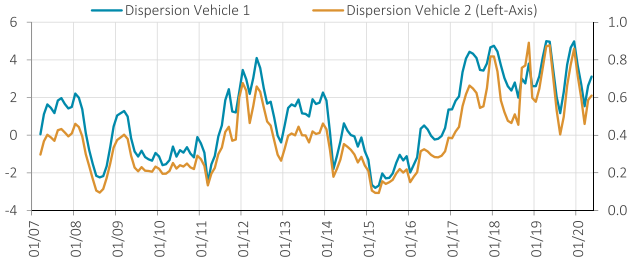

Fig. 6. Loan rate dispersion index (vehicle loans, 3-month MA).
Source: CBRT, Authors' Calculations

While the raw data suggests smaller dispersion compared to other segments, the in-sample historical ranking of vehicle loan rate variation quantified by the dispersion index displays heterogeneities over the sample period. The higher level of dispersion is evident around 2012, probably due to the imposition of macroprudential measures in other retail loan segments which may have changed banks' pricing approaches in this segment as well. In addition, another important finding is that loan rate volatilities persist considerably after 2017. This outcome is characterized by volume developments at the time, as the vehicle loan stock was relatively stagnant, partially due to exchange rate movements and incidents of public bank campaigns offering less costly vehicle financing. Besides this dynamic, the period is marked by rising competition from financing firms which extend approximately similar loan balances to deposit banks for this.

In the last set of dispersion indices, the time-wise trend of the

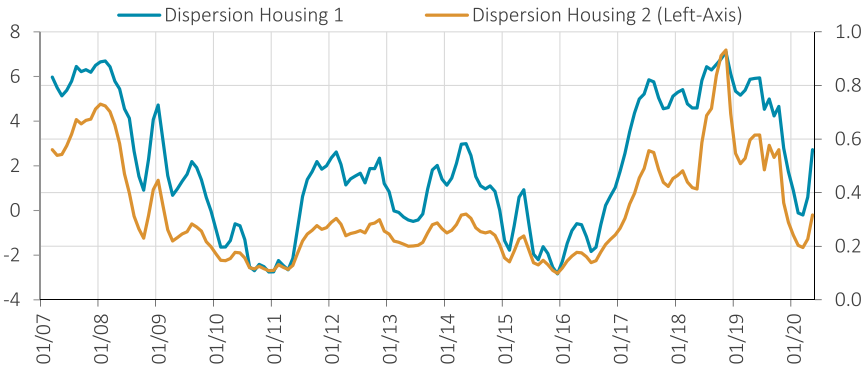

Fig. 7. Loan rate dispersion index (housing loans, 3-month MA).
Source: CBRT, Authors' Calculations

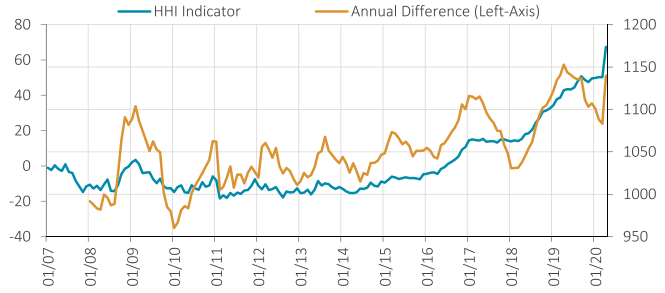

Fig. 8. Competition in total loans.
Source: CBRT, Authors' Calculations

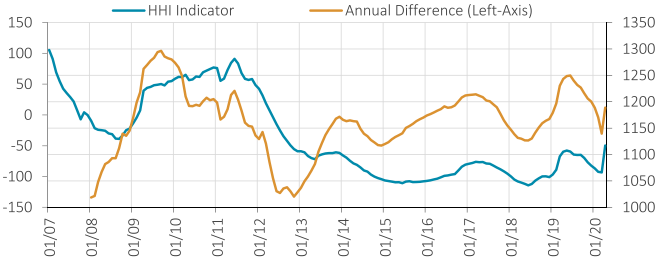

Fig. 9. Competition in general-purpose segment.
Source: CBRT, Authors' Calculations

housing segment indices indicates volatile pricing behavior in earlier parts of the sample in line with less developed housing segment and lower credit volume during that era as well as the presence of FX-indexed housing loans which created a wedge in loan pricing.[15] Following the macroprudential policy step in 2009 limiting household FX borrowing, loan pricing behavior converged until the end of 2010. However, slightly volatile pricing tendencies are observed after the introduction of the LTV related macro-prudential policy set from 2011 onwards. More prominent rises in dispersion index were experienced after 2016 during which house prices plummeted and house sales (including the sales financed by bank credits) declined drastically. However, especially after the first half of 2019, credit impulse provided by the countercyclical use of state banks and later embraced by private banks resulted in dispersed pricing in this segment, whereas house prices rebounded and sales were re-accelerated.

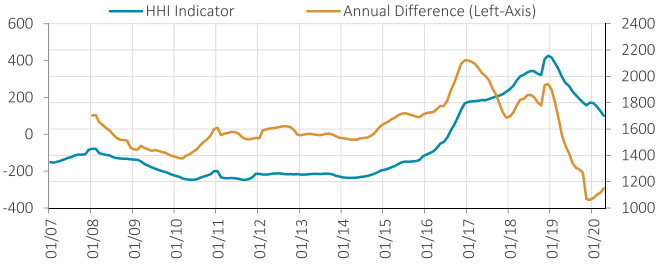

Fig. 10. Competition in vehicle segment.
Source: CBRT, Authors' Calculations

3.3. Competition indicators

The change in competition outlook measured by HHI indicators are presented in Figs. 8–12. Upward movements in these indices are interpreted as increasing market concentration and downward movements represent a fall in market concentration. As a rule of thumb, HHI values less than 1500 are considered to indicate a highly competitive market structure, whereas values exceeding this level imply a less competitive structure.

From a macro perspective, in total loans, we observe a relatively

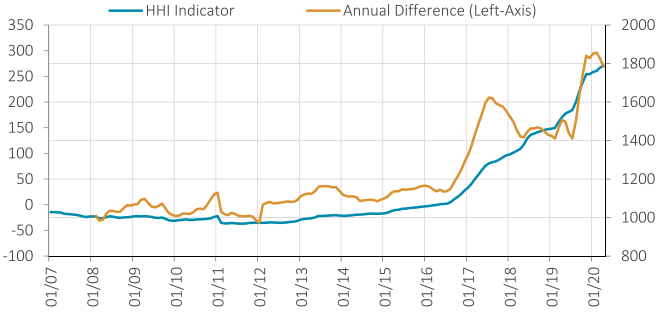

Fig. 11. Competition in housing segment.
Source: CBRT, Authors' Calculations

[15] The majority of FX-indexed loans were issued between March and September of 2008.

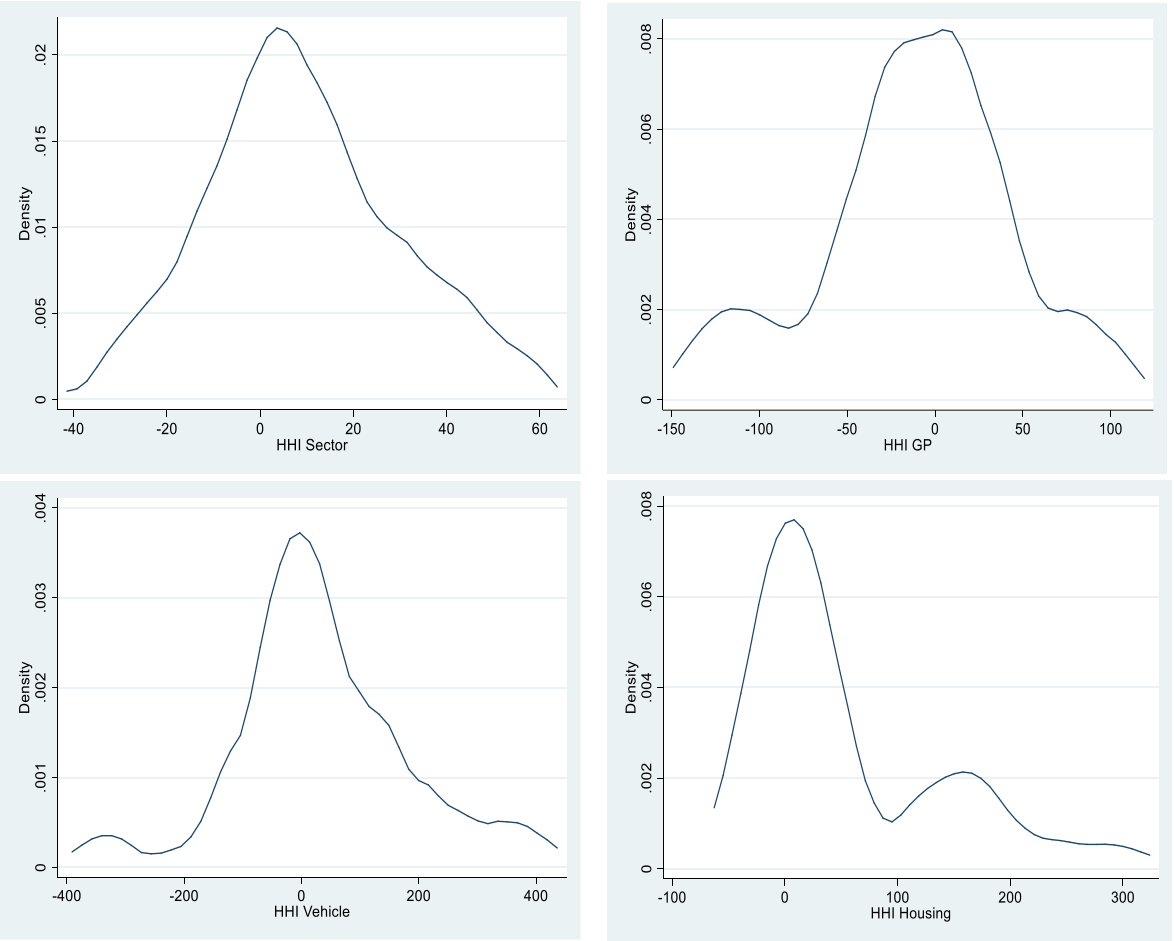

Fig. 12. Distribution of competition indicators (Kernel density estimates).

stable high competition for the Turkish banking sector for the most of sample period. Nevertheless, there is an increase in concentration after 2016 due to the heavier presence of state banks in the sector, especially through targeted loan campaigns as a countercyclical tool to offset the stagnation in economic activity at a time when other bank types cutback on their overall lending momentum due to worsened expectations, increasing credit risk perceptions, and profitability concerns. In fact, even going beyond our sample of banks, the share of loans provided by state banks in total bank loans increased from 30% to almost 50% levels during the later phases of the examined period.

Turning our attention to consumer loan segments, HHI proxies show that there are differences across the three segments in terms of the overall level of competition. Although the competitive performance of sample banks was slightly lower in earlier periods, credit allocation in general purpose loans seems to be distributed more evenly across the banks, particularly after 2012. This development coincides with higher economic growth and per-capita income, improved labor market conditions, relatively stagnant household indebtedness, and contained credit risks, all of which are the factors contributing to the concordant credit supply by individual banks in this segment. In the subgroups, housing and vehicle loan segments are revealed to be more concentrated credit groups as HHI values had been higher. This can be attributed to the impact of lower volume and banking sector presence in vehicle loans after 2016, and the increasing role of state banks in credit extension seems to overturn the competition in those segments, and therefore signal a temporary change in the competition level in the market rather than a structural shift. One exception might be the downward trend of the HHI indicator for vehicle loans after 2019 during which the banking sector started to gain momentum compared to financing firms, thanks to credit impulses and campaigns with favorable credit terms, as mentioned before.

Changes in the indices monitoring total loans and vehicle loans have slightly right-skewed distributions indicating the tendency of a moderate decline in competitive conditions over throughout the sample period. Distributional features are somewhat different for general-purpose loans for which Kernel density estimates indicate a left-skewed distribution. This can be attributed to the improvements observed in general-purpose loan segment regarding the level of concentration. As expected from the historical analysis, the distribution of HHI proxy in the housing segment is dominated with larger positive values demonstrating the easing in competitive forces in this credit group.

3.4. The relationship between competition and loan rate dispersion

When the correlation between HHI outcomes and loan rate dispersion indices is evaluated, results do not overlap across loan types and indexation method (Fig. 13). In contrast to earlier findings in the empirical literature and economic intuition, there exists a negative correlation between general-purpose loan rate variation and HHI indices leading to the conclusion that decline in competition coincides with less disperse loan pricing. Although this relationship is somewhat weak for total loan competition, the direction of the relationship is more visible when the HHI GP index is

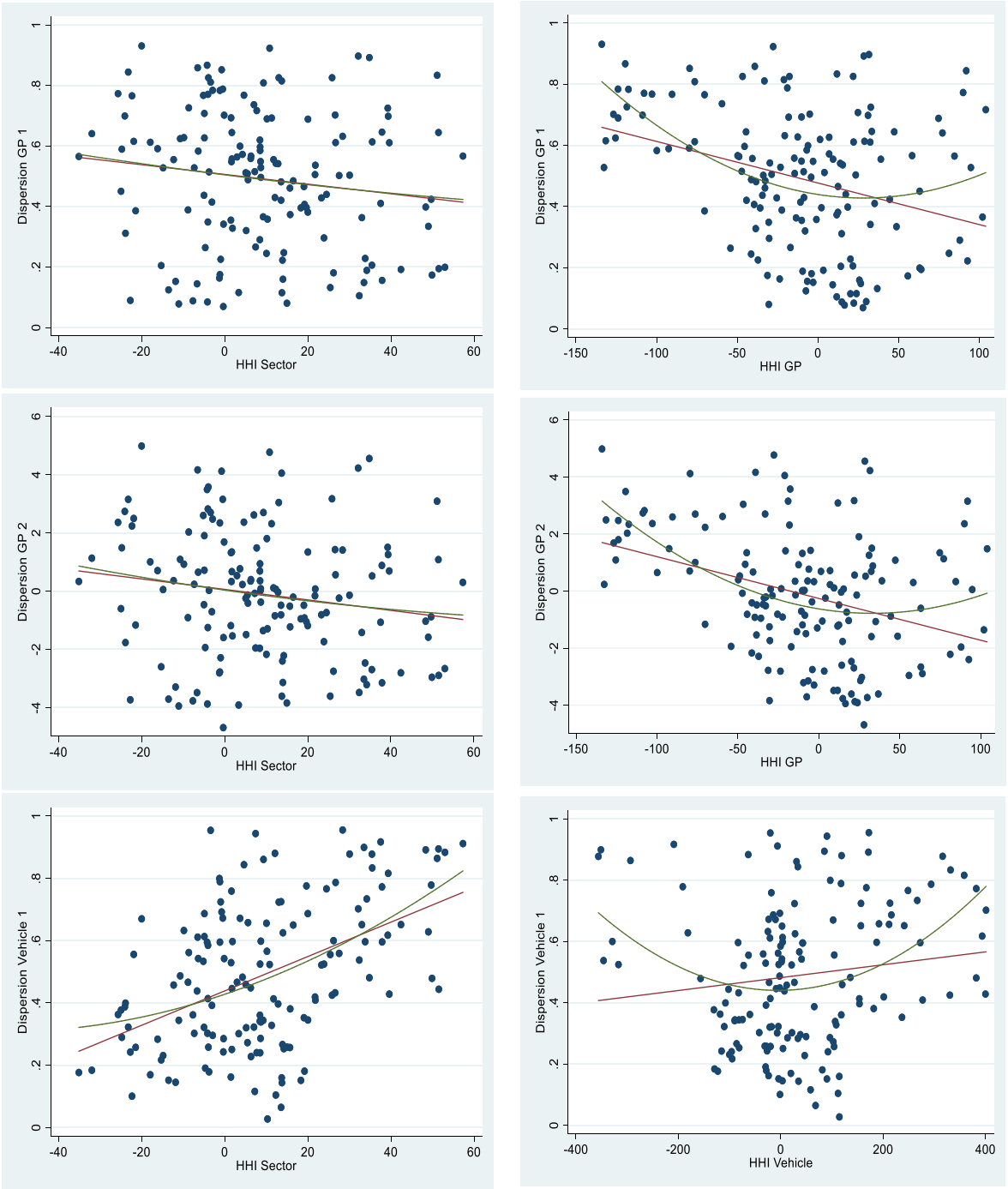

Fig. 13. Scatter plots.

used. Since potential nonlinearities may impact the relationship, quantile regression estimations specifically designed to capture the variant impact of HHI on loan rate variability over the sample period may add analytical value as an additional observation which we explore below. Besides this, no significant differences are encountered when the indexation method for dispersion is switched from CDF fitting to factor analysis.

In contrast with the general-purpose results, we find a positive relationship between vehicle loan rate dispersion and HHI indices. In other words, any worsening in the competition outlook coexists with the much wider loan pricing variations across commercial banks. The degree of association is much stronger when the sectoral competition is controlled for, while the asymmetric features are more explicit when competition exclusive to the vehicle segment is inspected. The historical co-movement between loan pricing formations and competitive conditions is more visible when the first indexation method (CDF fitting) is applied. A similar association is found for housing loans and is also driven by the existence of outliers for HHI changes.

Quantile regression results formally testing the impact of HHI indices on the distribution of loan rate dispersion conditional on covariates in a multivariate setting are presented in Tables 4–6,

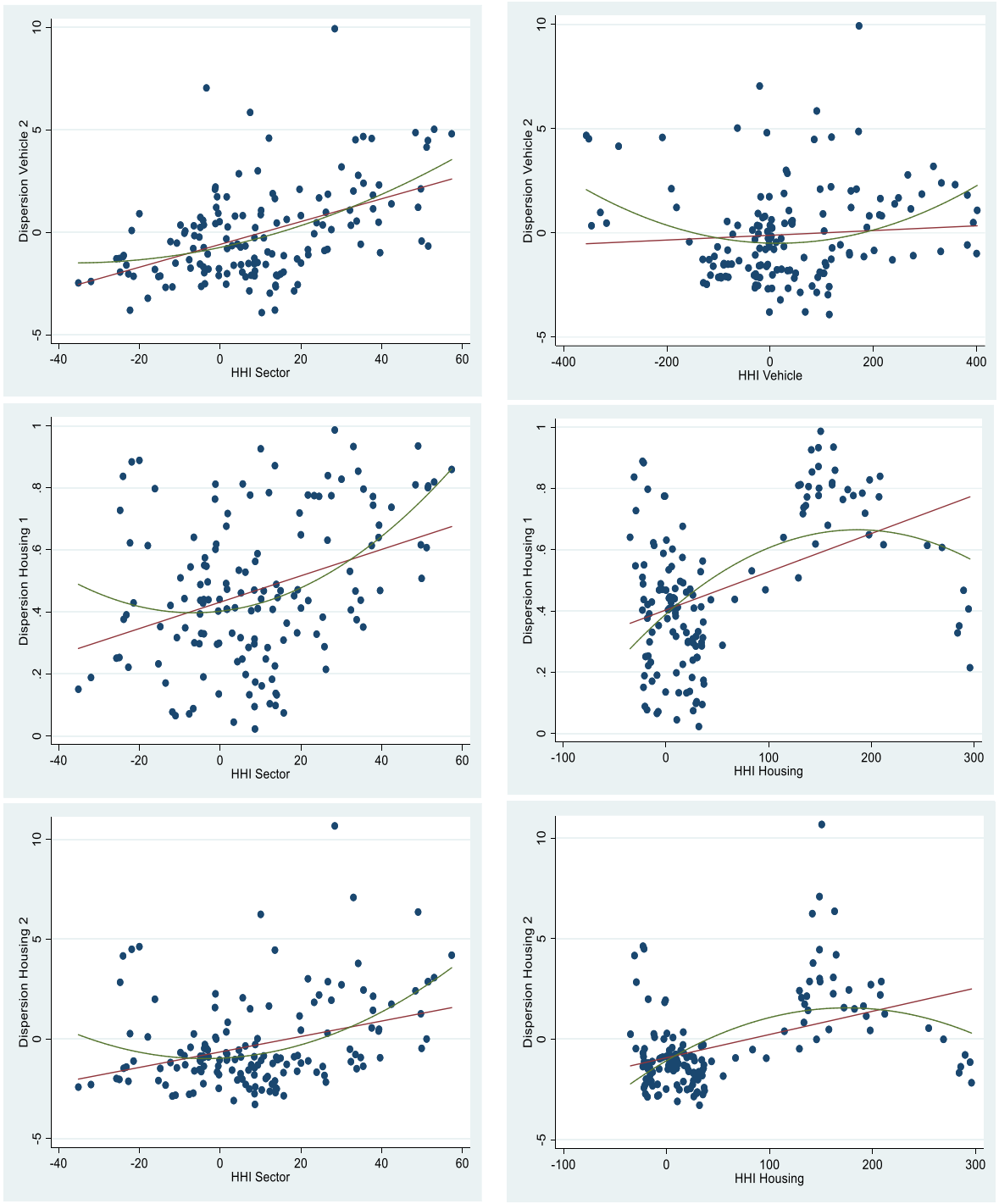

Fig. 13. (*continued*).

when dispersion is measured by the baseline CDF approach. The results relevant to the alternative definition of indices retrieved from the PCA method are given in Tables A1 to A3 in the Appendix. As explained before, we followed an incremental approach including three different specifications for each version of the dispersion indices. The initial set of results presents the role of the HHI index capturing the competition in total loans across different percentiles of the distribution, while the second set analyzes the same association by utilizing the competition indicator tracking the segment-level competition.[16] In the broadest specifications, the impact of segment-level competition is captured in the presence of other demand and supply-side factors. The quantile thresholds (10th, 25th, 50th, 75th and 90th percentiles) are chosen to

[16] Quantile process plots of the second group of specifications are presented in Fig. 14. Green lines represent quantile regression coefficients, shaded areas represent 95% confidence intervals and dashed black lines display constant OLS coefficients.

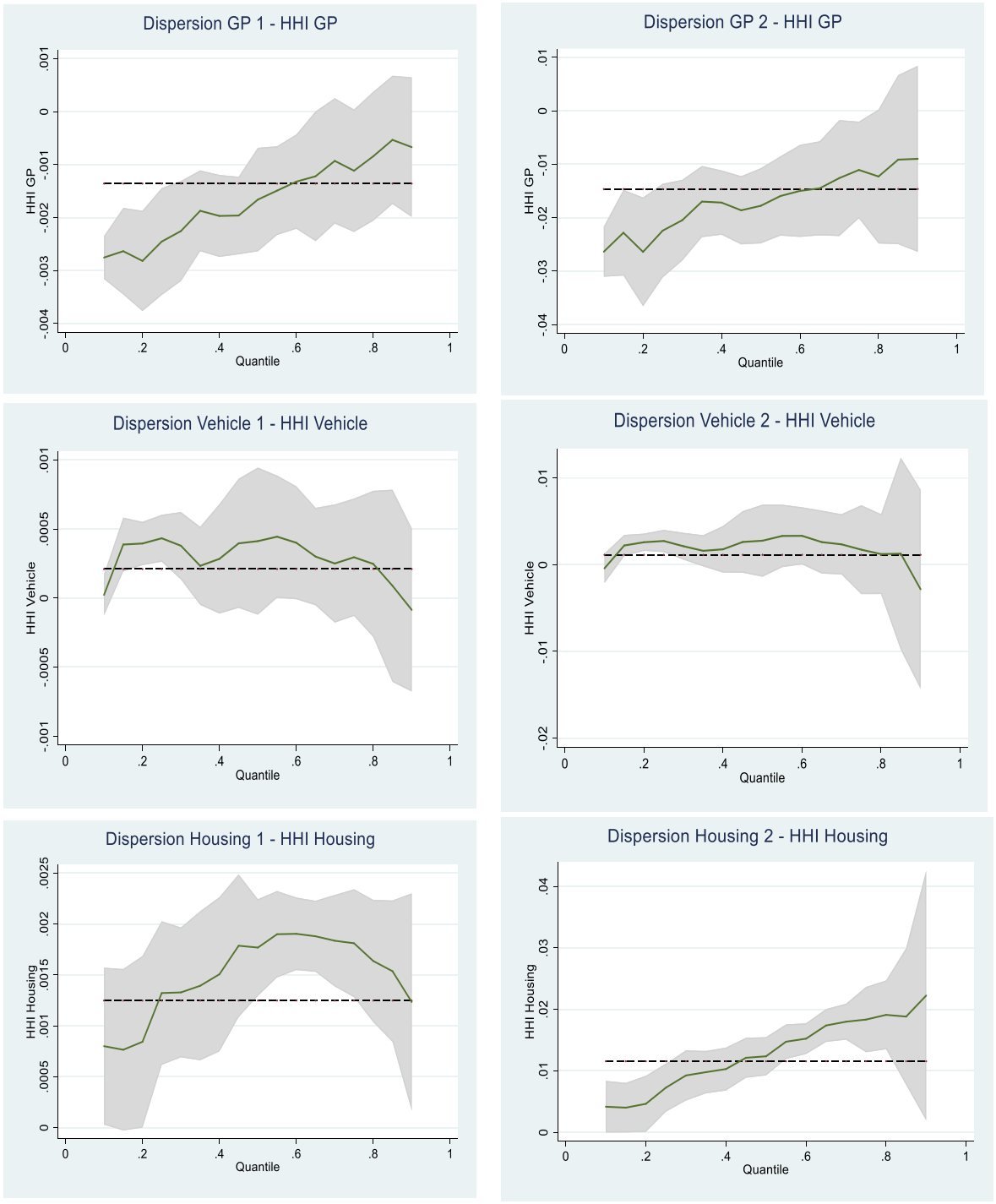

Fig. 14. Quantile process plots for HHI loan covariates.

represent excessively low, moderately low, median, moderately high and excessively high interest rate dispersion, respectively.

Table 4 (and Table A1 in the Appendix) presents estimation results for general-purpose loan rate dispersion with different indexation methods. When *Dispersion GP* 1 (obtained by CDF fitting) is taken as the dependent variable, the statistically significant negative relationship with sectoral HHI is only detected for the 50th percentile referring to the stable course of dispersion. However, when the segment-based HHI index is taken as the covariate, the negative impact is pronounced in almost all of the thresholds, except for the 90th percentile around which extreme rate variations are observed. These results preserve their sign and significance when bank-specifics controlled for in the final five columns. Hence, it can be argued that, contrary to expectations and prior literature, improved competition in this loan segment does not unify the loan pricing tendencies of the banks. Additionally, positive and significant coefficients are found across lower percentiles for variables representing macroprudential policies (10th percentile), employment (25th percentile), consumer NPL (10th and 25th percentiles) and liquidity ratio (10th and 25th percentiles). Thus, it can be deduced that macroprudential policy tightening, increases in employment ratio, worsening in consumer

Table 4
Quantile regression results.

Dependent Variable: Dispersion GP 1	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
HHI Sector	0.0005	−0.0027	−0.0032**	−0.0021	−0.0019										
	(0.0011)	(0.0018)	(0.0012)	(0.0014)	(0.7999)										
HHI GP						−0.0027***	−0.0024***	−0.0016***	−0.0011**	−0.0006	−0.0024***	−0.0023***	−0.0018**	−0.0021**	−0.0008
						(0.0004)	(0.0006)	(0.0004)	(0.0005)	(0.0005)	(0.0006)	(0.0005)	(0.0007)	(0.0008)	(0.0007)
MAP GP											0.0488**	−0.0038	−0.0370	−0.0013	−0.0064
											(0.0224)	(0.0191)	(0.0285)	(0.0313)	(0.0279)
Asset Prices											0.0014	−0.0009	0.0005	−0.0008	0.0010
											(0.0015)	(0.0012)	(0.0019)	(0.0021)	(0.0018)
Employment											0.0132	0.0558***	0.0440	0.0216	0.0443
											(0.0247)	(0.0211)	(0.0314)	(0.0346)	(0.0308)
Consumer NPL											0.1563***	0.1578***	0.0675	0.0189	0.0432
											(0.0332)	(0.0283)	(0.0421)	(0.0463)	(0.0413)
CAR											−0.0114	−0.0084	−0.0017	−0.0059	−0.0638**
											(0.0207)	(0.0176)	(0.0262)	(0.0288)	(0.0257)
Deposit Rate											−0.0005	−0.0036	−0.0068	−0.0173**	−0.0107
											(0.0063)	(0.0053)	(0.0080)	(0.0088)	(0.0078)
Liquidity Ratio											0.0110*	0.0140**	0.0064	0.0163*	0.0055
											(0.0064)	(0.0055)	(0.0081)	(0.0089)	(0.0080)
Observations	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
Pseudo R-squared	0.004	0.024	0.034	0.011	0.002	0.093	0.103	0.069	0.045	0.017	0.246	0.242	0.126	0.089	0.113

Notes: Robust standard errors are given in parentheses. Constant terms are included in the regressions. ***, **, * denotes the statistical significance at 1%, 5% and 10% levels, respectively.

Table 5
Quantile regression results.

Dependent Variable: Dispersion Vehicle 1	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
HHI Sector	0.0044***	0.0051***	0.0054***	0.0060***	0.0047***										
	(0.0014)	(0.0011)	(0.0014)	(0.0010)	(0.0015)										
HHI Vehicle						0.0000	0.0004***	0.0004**	0.0003	−0.0001	0.0000	0.0002	0.0002	0.0001	−0.0001
						(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
MAP Vehicle											−0.0357	−0.0172	−0.0061	−0.0097	−0.0078
											(0.0263)	(0.0298)	(0.0251)	(0.0237)	(0.0239)
Asset Prices											−0.0018	0.0020	0.0017	−0.0005	0.0011
											(0.0015)	(0.0016)	(0.0014)	(0.0013)	(0.0013)
Employment											−0.0010	−0.0608*	−0.0858***	−0.1138***	−0.1273***
											(0.0293)	(0.0332)	(0.0279)	(0.0264)	(0.0266)
Consumer NPL											−0.0843**	−0.1121**	−0.1461***	−0.2498***	−0.1992***
											(0.0342)	(0.0388)	(0.0326)	(0.0308)	(0.0311)
CAR											0.0691***	0.0493**	0.0409**	0.0502***	0.0188
											(0.0196)	(0.0222)	(0.0187)	(0.0176)	(0.0178)
Deposit Rate											0.0093	0.0137*	0.0083	0.0020	0.0045
											(0.0073)	(0.0083)	(0.0070)	(0.0066)	(0.0066)
Liquidity Ratio											−0.0017	−0.0121**	−0.0103**	−0.0056	−0.0043
											(0.0052)	(0.0059)	(0.0050)	(0.0047)	(0.0047)
Observations	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
Pseudo R-squared	0.067	0.111	0.131	0.159	0.141	0.001	0.034	0.015	0.025	0.008	0.165	0.179	0.263	0.294	0.317

Notes: Robust standard errors are given in parentheses. Constant terms are included in the regressions. ***, **, * denotes the statistical significance at 1%, 5% and 10% levels, respectively.

Table 6
Quantile regression results.

Dependent Variable: Dispersion Housing 1	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
HHI Sector	0.0055***	0.0038***	0.0057***	0.0051***	0.0016										
	(0.0015)	(0.0014)	(0.0012)	(0.0017)	(0.0019)										
HHI Housing						0.0008***	0.0013***	0.0018***	0.0018***	0.0012**	0.0013**	0.0016***	0.0023***	0.0029***	0.0024***
						(0.0003)	(0.0004)	(0.0003)	(0.0003)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0002)
MAP Housing											0.0470	0.0844***	0.0761***	0.0696***	0.0600***
											(0.0367)	(0.0316)	(0.0253)	(0.0199)	(0.0171)
Asset Prices											−0.0002	0.0015	0.0018	0.0006	0.0012
											(0.0017)	(0.0015)	(0.0012)	(0.0009)	(0.0009)
Employment											−0.0205	−0.0417	−0.0160	0.0051	−0.0205
											(0.0379)	(0.0327)	(0.0262)	(0.0206)	(0.0206)
Consumer NPL											−0.0532***	0.0704	0.1503***	0.1738***	0.1552***
											(0.0513)	(0.0441)	(0.0353)	(0.0278)	(0.0238)
CAR											0.0632**	−0.0058**	−0.0543***	−0.0943***	−0.0817***
											(0.0265)	(0.0228)	(0.0183)	(0.0144)	(0.0123)
Deposit Rate											0.0391***	0.0319***	0.0277***	0.0196***	0.0226***
											(0.0074)	(0.0063)	(0.0051)	(0.0040)	(0.0034)
Liquidity Ratio											−0.0248***	−0.0100*	−0.0045	−0.0036	−0.0046
											(0.0062)	(0.0054)	(0.0043)	(0.0034)	(0.0029)
Observations	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
Pseudo R-squared	0.053	0.067	0.075	0.106	0.021	0.057	0.056	0.126	0.204	0.082	0.240	0.284	0.352	0.459	0.456

Notes: Robust standard errors are given in parentheses. Constant terms are included in the regressions. ***, **, * denotes the statistical significance at 1%, 5% and 10% levels, respectively.

credit risk outlook and banks' preferences to hold more liquid assets contribute to much wider loan rate dispersion, albeit at lower parts of the condition distribution. Moreover, incremental increases in capital adequacy and deposit rates are relevant to narrowed loan pricing ranges, only when dispersion is considerably high across 75th and 90th percentiles. The results obtained with *Dispersion GP* 2 show that the abovementioned relations are mostly robust, even when the dispersion index is constructed with a different methodology. When competitive conditions are reinforced, general-purpose loan rates have larger dispersion and this effect is more pronounced when the segment-based competition is considered. One particular difference is related to control variables as the significance of labor market conditions is lost and the explanatory power of the asset prices is enhanced.

Table 5 (and Table A2 in the Appendix) depicts estimation results for vehicle loan rate dispersion. Regardless of the choice of index construction, both sets of results validate the positive relation between loan pricing dispersion and market concentration stemming from total loans. This finding is robust across different dispersion levels as results are significant across all the threshold values. When segment-based competition is examined, this relationship is preserved only for 25th and 50th percentiles representing contemporaneous dynamics characterizing excessively and moderately low loan rate variation. However, the significance of competitive forces is lost when other controls are added. In contrast to general-purpose loans, for vehicle segment, *Employment* and *Consumer NPL* are found to have negative coefficients which are significant across almost all of the quantiles. Results indicate that increases in employment ratio and, consequently the possible improvements in household income, loan demand, and debt-repayment capacity would result in more harmonious loan pricing in the vehicle segment. In contrast to findings specific to general-purpose loans (and previous literature), increases in NPL ratio diminish loan pricing dispersion in vehicle loans. From the loan supply perspective, as another significant finding across all percentiles, highly capitalized banks tend to price vehicle loans in a similar manner.

Table 6 (and Table A3 in the Appendix) provides estimation results for housing loan rate dispersion. The changes in competition outlook, calculated from total loans and housing segment, have positive and significant coefficients reflecting the behavior that commercial banks conduct loan pricing at more dispersed intervals when the concentration intensifies. The findings specific to the segment-based competition are robust to the inclusion of other controls as well as the choice of threshold values. As a distinct result, macroprudential measures seem to be more influential for housing loan pricing compared to other segments and any tightening in macroprudential policy mix is transmitted to additional variability in loan rate dispersion, which is significant for all percentiles except for the first one. Similar to what is seen for general-purpose loans, deterioration in credit risk assessments would be channeled into more dispersed loan rate distribution but, for this particular segment, the finding is significant for moderate and excessive loan pricing deviations. The overwhelming majority of the results across different percentiles validate the negative and positive significant impacts of *CAR* and *Deposit Rate*, respectively.

Overall, our main findings for vehicle and housing loans support the view that improvements in the competitive conditions might also reinforce the synchronization in lending rates. In other words, common policy features such as facilitating the capital inflows to banking sector with new banks becoming operationalized as well as encouraging banks to diversify their lending activities based on geographical, portfolio-based and product-related dimensions would all bring loan pricing behavior contributing to the financial stability.

In addition to this, quantile regression results reveal profound

findings for bank-level supply factors, other than market structure. We see that stronger capital buffers in the form of higher *CAR* can be associated with lower dispersion in rate setting for some thresholds in general-purpose and housing loans. Hence, policies aiming to improve the capital position of the banking sector might contribute to the unified loan pricing in these segments.[17] Similarly, *Liquidity Ratio* is found to be negatively correlated with loan dispersion in the case of vehicle and housing loans for some thresholds. As an inference, policies aiming to improve the access to and lower the cost of liquid funds for banking sector can be related to less dispersed loan pricing, albeit this relation is not applicable for general-purpose loans. In this context, recent actions taken by CBRT to compound the liquidity of the banking system can also be considered as a channel supporting lower dispersion in loan rate setting. Last but not least, the findings related to *Deposit Rate* (which is only significant for housing loans) implying the positive correlation between lending rate dispersion and deposit rate can be approached from a policymaking perspective. It can be deduced that accommodative monetary policy represented as a more stable deposit rate formation might pave way for an outlook in which outliers in rate setting is observed at low frequency.

4. Conclusion

In this paper, we analyze the degree of coherence in loan pricing for the Turkish banking sector in the retail loan segments. We first observe that during our sample period there are more fluctuations in general-purpose loan rates across commercial banks, relative to collateralized loan types of vehicle and housing loans. In particular, similar term structure in housing loans across banks might have played a part in shaping harmonious loan rate realizations across the sector. Nevertheless, in panel convergence tests we show the presence of heterogeneity concerning long-term co-movements of rates charged by the sample panel of banks.

In the second step of our empirical design, the degree of loan rate variations across banks is quantified by implementing several indexation mechanisms. Our findings imply that, for all sub-segments (general-purpose, vehicle, and housing loans), banks' pricing distributions get narrowed down (implies a lower index value) during episodes defined by sizeable increases in average loan rate tendencies, which are generally characterized by macroeconomic shocks or financial volatilities, and the distribution becomes more dispersed in periods subsequent to tightening in financial conditions.

In the third layer of our empirical setting, we investigate the role of competitive conditions on consumer loan rate variability. Contrary to intuition and prior literature, we find that for general-purpose loans, a higher degree of competition is linked to a larger pricing distribution in the market. It is considered that the increase in the range of products offered or segments targeted during high competition periods and banks' attempt to increase their market share might have caused this result. On the other hand, pricing distributions in vehicle and housing loans decreases as competition increases, in line with expectations and the literature.

Overall, these results have high significance for policymakers. We introduce a new tool to monitor the movement of loan interest rates at the bank-level, which is a relevant factor for financial stability. Hence, on top of indicators capturing loan rate levels, the policy texts of CBRT might be amended by including dispersion indices tracking the variation of interest rate formation across individual banks. Besides, time-varying degree of association between rate dispersion and competition might be extracted periodically to reveal any potential deviation regarding the established relationship.[18] The series will carry importance for policymakers in monitoring the competition level in the industry, as banking industry competition can be considered as one of the mitigating factors hindering the divergence in loan pricing tendencies of individual banks, especially for vehicle and housing loans. Our findings also hint that the loan pricing tends to unify among banks when financial conditions are tightened supporting the functioning of monetary policy transmission mechanism.

Appendix

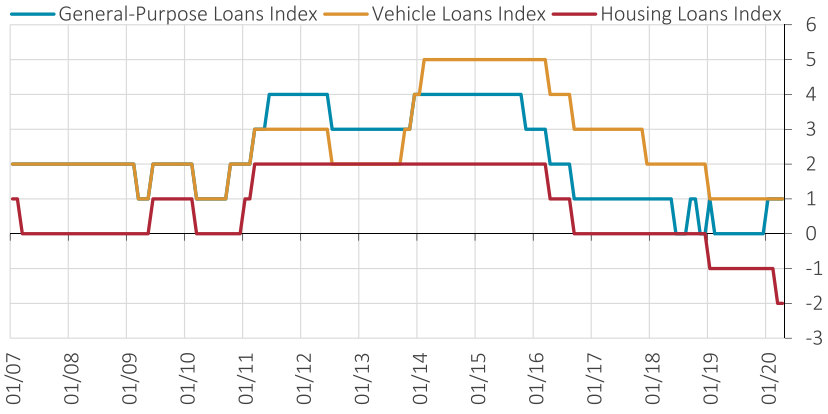

Fig. A1. Macroprudential Policy Indices
Source: Updated version based on Eroğlu (2018).

[17] In this context, policy steps in May 2020 aiming to support state banks through capital injections could be classified as policy action whose positive side-effects might be reflected in loan pricing.

[18] We acknowledge that time-series quantile regressions are likely to suffer from potential limitations and instabilities due to lower number of observations restricting the robustness of baseline relationship between loan rate dispersion and competition. Future research agenda might utilize more detailed datasets and alternative techniques to overcome such limitations and establish causal inferences. We thank the anonymous reviewer for highlighting this issue.

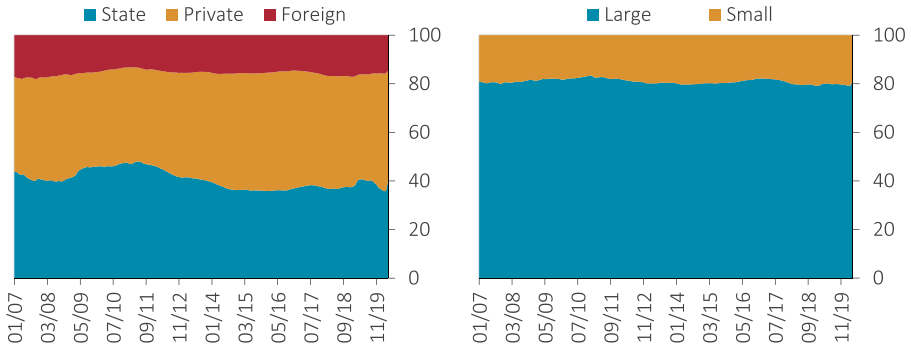

Figure A2. Market Shares in General-Purpose Loan Segment by Bank Ownership and Size (Percent)

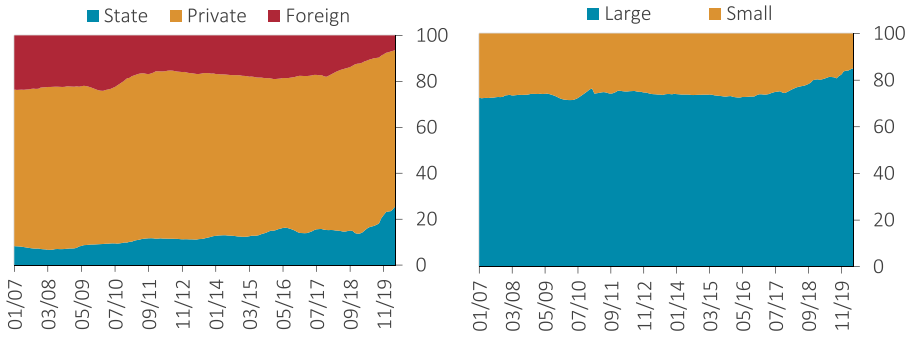

Fig. A3. Market Shares in Vehicle Loan Segment by Bank Ownership and Size (Percent)

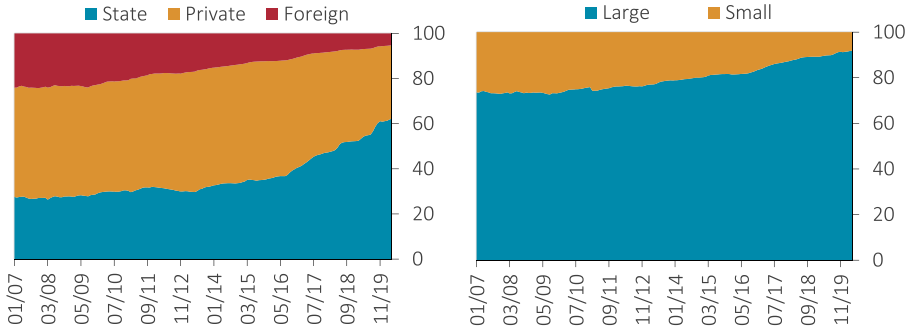

Fig. A4. Market Shares in Housing Loan Segment by Bank Ownership and Size (Percent)

Table A1
Quantile Regression Results

Dependent Variable: Dispersion GP 2	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
HHI Sector	0.0093	−0.0295**	−0.0276***	−0.0243*	−0.0138										
	(0.0132)	(0.0149)	(0.0104)	(0.0137)	(0.0194)										
HHI GP						−0.0263***	−0.0224***	−0.0177***	−0.0111**	−0.0089	−0.0224***	−0.0240***	−0.0189***	−0.0227***	−0.0144
						(0.0031)	(0.0052)	(0.0041)	(0.0048)	(0.0073)	(0.0040)	(0.0043)	(0.0064)	(0.0069)	(0.0091)
MAP GP											0.4089***	0.1373	−0.2185	0.0632	−0.3135
											(0.1551)	(0.1648)	(0.2485)	(0.2676)	(0.3500)
Asset Prices											0.0287***	−0.0019	0.0082	0.0023	−0.0020
											(0.0103)	(0.0109)	(0.0165)	(0.0177)	(0.0232)
Employment											−0.0642	0.2895	0.2822	0.3123	0.4418
											(0.1712)	(0.1819)	(0.2743)	(0.2954)	(0.3863)
Consumer NPL											1.6611***	1.6167***	0.8099**	0.2861	0.2973
											(0.2293)	(0.2438)	(0.3675)	(0.3957)	(0.5176)
CAR											−0.2944**	−0.1668	−0.2634	−0.1317	−0.6388**
											(0.1429)	(0.1519)	(0.2290)	(0.2466)	(0.3226)
Deposit Rate											0.0040	−0.0156	−0.0572	−0.1432**	−0.1582
											(0.0436)	(0.0464)	(0.0699)	(0.0743)	(0.0985)
Liquidity Ratio											0.0688	0.1091**	0.0694	0.1268*	0.1361
											(0.0445)	(0.0473)	(0.0713)	(0.0667)	(0.1004)
Observations	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
Pseudo R-squared	0.006	0.021	0.035	0.027	0.003	0.120	0.103	0.085	0.072	0.018	0.277	0.253	0.147	0.131	0.135

Notes: Robust standard errors are given in parentheses. Constant terms are included in the regressions. ***, **, * denotes the statistical significance at 1%, 5% and 10% levels, respectively.

Table A2
Quantile Regression Results

Dependent Variable: Dispersion Vehicle 2	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
HHI Sector	0.0354***	0.0282***	0.0512***	0.0709***	0.0679***										
	(0.0092)	(0.0089)	(0.0120)	(0.0106)	(0.0136)										
HHI Vehicle						−0.0004	0.0027***	0.0028*	0.0017	−0.0028	0.0001	0.0014	−0.0009	−0.0019	−0.0044
						(0.0011)	(0.0008)	(0.0015)	(0.0018)	(0.0038)	(0.0018)	(0.0019)	(0.0017)	(0.0020)	(0.0034)
MAP Vehicle											−0.0526	−0.0351	−0.0511	−0.0125	−0.3559
											(0.2197)	(0.2360)	(0.2062)	(0.2503)	(0.4137)
Asset Prices											−0.0134	0.0157	0.0190	0.0014	0.0219
											(0.0121)	(0.0130)	(0.0114)	(0.0138)	(0.0229)
Employment											−0.2410	−0.5544**	−1.1069***	−1.3694***	−1.3497***
											(0.2447)	(0.2628)	(0.2296)	(0.2787)	(0.4607)
Consumer NPL											−1.0570***	−0.9216***	−1.0915***	−2.1013***	−1.9182***
											(0.2859)	(0.3070)	(0.2683)	(0.3257)	(0.5382)
CAR											0.6342***	0.4038**	0.2687*	0.4496**	0.2912
											(0.1637)	(0.1758)	(0.1536)	(0.1864)	(0.3081)
Deposit Rate											0.0400	0.1015	0.1572***	0.0856	0.1523
											(0.0610)	(0.0655)	(0.0572)	(0.0694)	(0.1148)
Liquidity Ratio											−0.0157	−0.0881*	−0.0582**	−0.0208	−0.0463
											(0.0435)	(0.0468)	(0.0408)	(0.0496)	(0.0820)
Observations	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
Pseudo R-squared	0.061	0.089	0.134	0.194	0.223	0.001	0.027	0.010	0.014	0.021	0.145	0.156	0.251	0.298	0.357

Notes: Robust standard errors are given in parentheses. Constant terms are included in the regressions. ***, **, * denotes the statistical significance at 1%, 5% and 10% levels, respectively.

Table A3
Quantile Regression Results

Dependent Variable: Dispersion Housing 2	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
HHI Sector	0.0245***	0.0198***	0.0350***	0.0582***	0.0413										
	(0.0071)	(0.0067)	(0.0089)	(0.0140)	(0.0391)										
HHI Housing						0.0041***	0.0073***	0.0124***	0.0183***	0.0222**	0.0066**	0.0088***	0.0162***	0.0238***	0.0207***
						(0.0016)	(0.0021)	(0.0019)	(0.0024)	(0.0094)	(0.0028)	(0.0029)	(0.0029)	(0.0040)	(0.0049)
MAP Housing											0.2488	0.4544**	0.5439***	0.4743*	0.3788
											(0.1986)	(0.2105)	(0.2047)	(0.2852)	(0.3521)
Asset Prices											0.0045	0.0124	0.0134	0.0196	0.0203
											(0.0093)	(0.0099)	(0.0096)	(0.0134)	(0.0166)
Employment											−0.0655	−0.3952*	−0.2618	−0.1596	−0.6037*
											(0.2052)	(0.2175)	(0.2115)	(0.2947)	(0.3638)
Consumer NPL											−0.2300	0.2655	0.7715***	1.7076***	1.9351***
											(0.2773)	(0.2939)	(0.2858)	(0.3982)	(0.4916)
CAR											0.3649**	0.0155	−0.2575*	0.9209***	−0.9177***
											(0.1433)	(0.1519)	(0.1477)	(0.2058)	(0.2541)
Deposit Rate											0.2045***	0.2087***	0.2267***	0.2583***	0.4151***
											(0.0398)	(0.0422)	(0.0410)	(0.0572)	(0.0706)
Liquidity Ratio											−0.1207***	−0.0489	−0.0147	0.0008	0.0500
											(0.0336)	(0.0356)	(0.0346)	(0.0483)	(0.0596)
Observations	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
Pseudo R-squared	0.034	0.046	0.055	0.135	0.036	0.036	0.045	0.119	0.215	0.102	0.176	0.227	0.327	0.464	0.537

Notes: Robust standard errors are given in parentheses. Constant terms are included in the regressions. ***, **, * denotes the statistical significance at 1%, 5% and 10% levels, respectively.

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