Bank of England

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Staff Working Paper No. 1,104
December 2024

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Abstract

We study the effects intermediaries have on the UK mortgage market by exploiting the strong increase in broker intermediation between 2013 and 2020. Our findings indicate that this rise coincided with more households choosing mortgages with a short fixed term, due to brokers steering households towards these mortgages to increase fees from repeat business. Increased broker intermediation also enabled smaller lenders to reach more customers by geographically diversifying their mortgage portfolios, which gave smaller lenders the opportunity to specialise their mortgage portfolios, concentrating on long fixed-term and high LTV mortgages.

Key words: Mortgages, brokers, banks, household finances, portfolio diversification.

JEL classification: D43, G21, G28.

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The views expressed in this paper are those of the authors and do not reflect those of the Bank of England. We thank participants at the EEA-ESEM Congress 2024. We also thank Philippe Bracke, Sinem Hacioglu, Felipe Netto, Claudia Robles Garcia, Paolo Siciliani, Arzu Uluc, Neeltje van Horen and an anonymous referee for useful feedback.

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ISSN 1749-9135 (on-line)

1 Introduction

Between 2013 and 2020, the proportion of UK mortgages that were sold by intermediaries increased substantially. For example, we observe an increase from 57% to 81% for first-time buyers. One reason driving this increase is the Mortgage Market Review of 2014, a reform by the Financial Conduct Authority which required that most directly sold mortgages required the involvement of a qualified advisor. Banks could avoid the increased cost due to advice by relying more heavily on brokers.

In this study, we analyse the effect of this increase in broker intermediation both on the demand and the supply side of the mortgage market. On the demand side, our results suggest that brokers steer borrowers towards mortgages with a shorter fixed term. On the supply side, we find that brokers allow smaller banks to sell mortgages over a wider area. This greater access to borrowers also allows smaller lenders to specialise their mortgage portfolios by selling a narrower range of mortgage products. Specifically, we observe that smaller lenders are more likely to sell mortgages with a longer fixed term (i.e. more than 3 years) and a higher loan-to-value ratio (LTV) by pricing this subset of mortgages competitively.

In the UK, households either arrange a mortgage directly with a bank (i.e. through the *direct channel*) or through a mortgage broker (i.e. through the *brokered channel*), and brokers collect fees from lenders and households each time they arrange a mortgage.[1] One particular characteristic of the UK mortgage market is that most mortgages have a fixed term (often 2 or 5 years) where interest rate payments are fixed and at the end of the fixed term the interest rate payment usually rises sharply. For this reason, many households re-mortgage at the end of their fixed term. This creates an incentive for mortgage brokers to steer households towards a mortgage with a shorter fixed term in order to earn fees more often.

We show that regions that experienced 10pp increase in broker intermediation tend to experience a 1.8–2 percentage point increase in the proportion of mortgages with a short fixed term, suggesting that brokers play an active role in steering households towards mortgages with a short fixed term. Conducting the analysis on a regional level, we reduce the plausibility that unobserved household characteristic (e.g. risk aversion / financial literacy) explain the increased propensity to take out short fixed term mortgages.

We estimate the steering effect on the loan level as well and show that results do not change significantly when observed loan, household, and property characteristics are controlled for. Furthermore, the steering effect weakens when considering more experienced borrowers, i.e. those that are older, that are home movers (rather than first-time buyers), and that have a higher income.

Another characteristic of the UK mortgage market is that it is fairly concentrated: the six largest lenders (referred to as *larger lenders*) cumulatively have a 78% market share between 2013 and 2020. While these lenders, with large branch networks, tend to operate across the country, the remaining smaller lenders tend to have a geographically concentrated branch network around the lender's headquarters, Direct mortgages are more likely

[1] Some brokers do not charge fees to borrowers but only to lenders.

to be done with a lender the household has a pre-existing relationship with and thus tend to be geographically concentrated for smaller lenders. Meanwhile, brokered mortgages are more geographically diversified, since brokers allow banks to access a wider range of borrowers. This means that an increase in broker intermediation should allow smaller lenders to geographically diversify their mortgage portfolios over a wider area.

Indeed, we find a strong and statistically significant effect of brokers on the geographical diversification of smaller lenders' loan books. This effect holds for several measure of geographical diversity. For example, we observe that households who purchase mortgages from a smaller lender through the brokered channel are on average 195km more distant from the lender's headquarters than households who purchase a mortgages through the direct channel of smaller lenders. By contrast, we do not observe that brokers increase the geographical diversity of larger lenders.

A third characteristic of the UK mortgage market is that lenders have different short-term and long-term funding costs, as well as different costs associated with the process of mortgage applications from the direct and brokered channel. This lender heterogeneity means that each type of product is more profitable for some lenders than others, which creates an incentive for lenders to specialise in the product type that is most profitable for them. We expect that this specialisation is most relevant for smaller lenders as they have higher funding costs and cannot compete well with the large lenders on all products. The increased access to borrowers via brokers facilitates the specialisation for smaller lenders, which might not be able to sell a large number of these specialised products in the local areas only.

We find evidence for this hypothesis in the substantial increase of the market share of smaller lenders on mortgages with both long fixed-term mortgages and high LTV. This specialisation increased the total market share of smaller lenders from 13 to 24 percent. A regression analysis shows that smaller lenders achieve this specialisation by pricing these products competitively particularly via the brokered channel, whereas they sell other products at a higher price than the larger lenders.

1.1 Literature

This paper is connected to several strands of the literature.

First, the literature on the impact of brokers on consumer choice has shown that brokers distort consumers' decision by steering them towards products with higher fees in various settings including the mutual fund industry (Bergstresser et al., 2009), life insurance markets (Anagol et al., 2017) and structured products (Egan, 2019). Most closely related to our study, Iscenko and Nieboer (2018) analysed the impact of the Mortgage Market Review and suggest that brokers steer households towards short fixed-term mortgages. We extend this analysis using a different methodological approach and considering a longer time horizon.

In other work concerning brokers, Belgibayeva et al. (2020) show that brokers increase the probability that borrowers will re-mortgage with a different lender, which suggests that broker intermediation may lead to greater market dynamism and intensify competition

between lenders. Similarly (Iscenko, 2020) find that borrowers are more likely to purchase a mortgage from a lender with whom they already had another financial product. Robles-Garcia (2020) and Mysliwski and Rostom (2022) use structural models to show how brokers affect lenders' pricing decisions and households' search costs. Both studies find that broker intermediation increases consumer surplus compared to a counterfactual scenario where brokers are banned.

Second, our paper is related to work studying borrower's maturity choice of debt. Faulkender (2005) investigates the maturity choice for corporate debt and finds that the strongest determinant in explaining final interest rate exposure is the yield spread, namely the difference in yields between long-term and short-term bonds. As the yield curve steepens, firms are more likely to take on debt with shorter maturity. This has also been shown for the mortgage market in the US (Koijen et al., 2009) and the UK (Miles, 2005). More recently, Liu (2023) investigates how households' choice of fixed term in the UK depends on LTV, developing a model that explains why borrowers with a higher LTV are more likely to choose short fixed-term mortgages. Our analysis of the heterogeneity of the steering effect relates to work on consumer biases and lack of financial sophistication explaining mortgage choices and susceptibility to steering (Guiso et al., 2022; Campbell et al., 2011).

Benetton et al. (2021) show that the capital requirements for lenders with internal ratings-based models (typically larger lenders) lead to a cost advantage for low LTV mortgages which implies that smaller lenders with standard models find it difficult to compete in this submarket and so specialise in selling high LTV mortgages. We observe this specialisation as well and show that it is driven via the brokered channel.

Finally, our work relates to the work on geographical diversification of banks. On the one hand, a first strand of literature investigates a *screening effect* whereby lenders who are able to focus on a small number of local markets have a tendency to screen more intensively compared to lenders with a more diversified loan portfolio (Quigley and Van Order, 1991; Berger et al., 1996; Acharya et al., 2006; Agarwal and Hauswald, 2010; Loutskina and Strahan, 2011; Goetz et al., 2013). While we do not investigate this directly, for our results this would imply that increased broker intermediation may reduce the financial resilience of smaller lenders, by enabling smaller lenders to serve distant customers who they are less able to screen effectively.

On the other hand, other papers investigate a *diversification effect* whereby greater geographical diversificaion of loan portfolios is associated with improved bank safety and greater financial resilience (Hughes et al., 1996; Calem and LaCour-Little, 2004; Goetz et al., 2016). Therefore increased broker intermediation may increase the financial resilience of smaller lenders.

2 Data

The primary dataset we use is the Product Sales Database (PSD)[2] which contains all newly issued residential mortgages in the UK. We restrict attention to first time buyers

[2] https://www.fca.org.uk/data/product-sales-data

in England, Wales and Scotland and focus on, unless stated otherwise, the period from 2013-Q2 to 2020-Q4. There are 2,201,852 mortgages in our baseline sample.

In several of our analyses, we compare two sets of lenders, the largest six lenders, also referred to as *larger lenders* and the remaining *smaller lenders*. Unless explicitly stated otherwise, our interest rate measure is the annualised percentage rate, accounting for fees the borrower pays to the lender and broker.

While most variables have only few missing values, before 2015, fixed term and interest rate were not reported consistently. We impute these variables by matching the PSD origination data (PSD001) with the PSD performance data (PSD007). For mortgages originated from 2013-Q3, we can impute the missing values on the fixed-term length and interest rate with the respective information from PSD007 by exploiting the fact that nearly all mortgages have a fixed term of at least two years and the performance in PSD007 is consistently reported from 2015-Q3.

In our sample period, 90% of the fixed-term mortgages have a fixed term of either 2 or 5 years. We refer to mortgages with a fixed periods of 1–3 years as short fixed-term mortgages and those with at least 4 years as long fixed-term mortgages.

We consider two regional variables in our analysis, the 364 local authority districts (LAD) of England, Scotland and Wales and the 36 regions at the International Territorial Level (ITL).

We supplement this mortgage data with data capturing yields on 2 and 5 year government bonds. This data is published by the Bank of England and used as a proxy for the risk-free rate of return over a 2 and 5 year time-horizon.[3] We define the yield premium to be the difference in yield between the 5 year government bond and 2 year government bond, and use this series to help explain lender pricing decisions and household choices.

Furthermore, we use bank branch data from the Office for National Statistics nomis UK Business Counts data base.[4] Specifically, we replicate the approach by Booth (2022) and filter by sector for banks (Standard Industrial Classification (SIC) code 64.19/1) and building societies (SIC code 64.19/2) industries. We do not have access to the precise branch count as the numbers are rounded to the nearest 5.

Before turning to the main analysis, we first provide some descriptive statistics, relevant for our following analyses.

Figure I shows that the proportion of brokered mortgages increased substantially since 2010. For both larger and smaller lenders, the increase in the proportion of brokered mortgages is steepest between 2014 and 2015, when the MMR was introduced. After the reform, smaller lenders rely more heavily on brokers than the larger lenders.

Table I compares the mean values on key characteristics of mortgages that are sold directly vs. via a broker for all first-time mortgages in 2015. We observe some material differences between these sets of mortgages, in particular mortgages sold through the brokered channel tend to have a higher average loan to income (LTI) and lower average

[3] https://www.bankofengland.co.uk/statistics/yield-curves
[4] https://www.nomisweb.co.uk/datasets/idbrlu

FIGURE I: Proportion of brokered mortgages over time

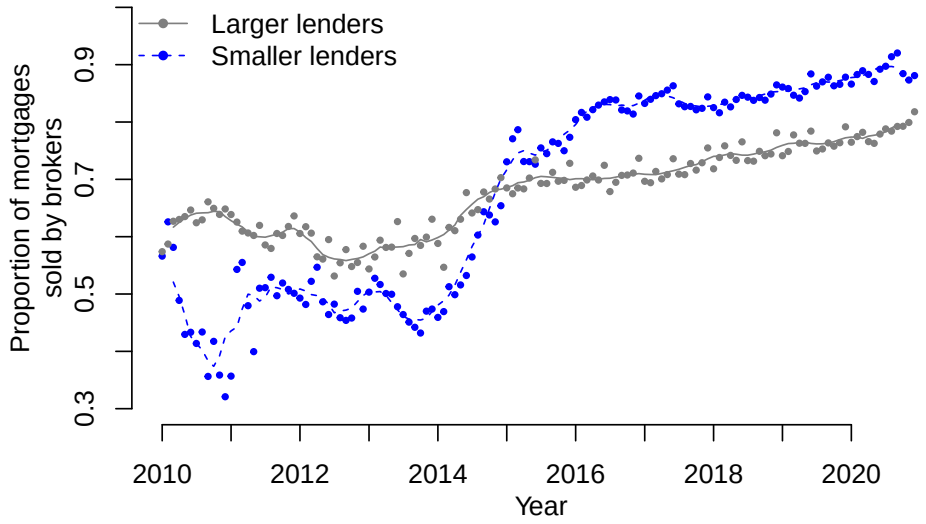


TABLE I: Characteristics of mortgages originated in 2015 (by channel)

Channel	BROKERED	DIRECT
Number of mortgages	191629	72731
Means:		
LTV	77.49	77.85
LTI	3.45	3.28
Interest rate	3.16	3.35
Borrower age	31.10	30.94
Length of fixed period	3.17	3.39
Property value	209,118	193,704
Gross income	46,509	46,501

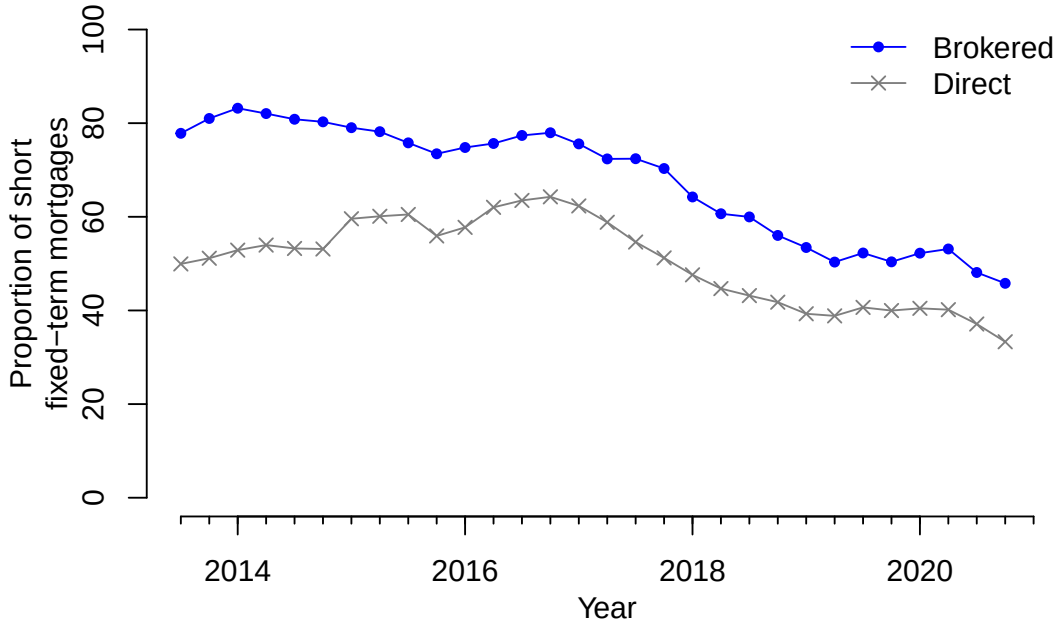
loan to value (LTV). Assuming brokers do not have significant influence over loan value or household income, brokers do not influence LTI or LTV.[5] This motivates our decision to use LTI and LTV fixed effects throughout our analysis.

3 Empirical analysis

We now turn to the main analysis. First, we provide evidence that brokers steer households towards short fixed-term mortgages. Second, we explore the impact of broker intermediation on the geographical diversification of lenders' loan portfolios, showing that brokers enable smaller lenders to geographically diversify their loan portfolios. Third, we show that smaller firms increase their market share in specific submarkets by pricing these products competetivly.

[5]Brokers may influence loan value by encouraging households to borrow larger amounts, although we believe this effect to be relatively small.

FIGURE II: Mean proportion of short fixed-term mortgages by channel over the sample period.



3.1 Broker persuasion effect

Figure II displays the proportion of short fixed-term mortgages sold through the direct channel and brokered channel over time. While the proportion of short fixed-term mortgages sold through both channels declines over time[6] mortgages sold through the brokered channel were consistently more likely to have a short fixed term compared to those sold through the direct channel. One explanation for this is that brokers persuade households to take out short fixed-term mortgages. To test this effect statistically, we run two types of regressions.

First, we test this effect at the loan level by regressing the broker variable on a binary indicator for length of fixed term and controlling for an array of borrower, lender, and property characteristics such as LTV, LTI, and borrower age. Second, we exploit the regional variation in the degree of broker intermediation and regress the year-on-year regional change in the proportion of short fixed-term mortgages on the year-on-year regional change in the proportion of brokered mortgages.

3.1.1 Loan level

Formally, we regress our binary indicator $F_i \in \{0, 1\}$ (which is 1 if mortgage i has a short term and 0, otherwise) on the broker dummy B_i and controls α using a logit model. The error term is denoted by ϵ_i.

$$F_i = \beta^{Broker} B_i + \alpha_i^{Lender-Quarter} + \alpha_i^{LAD} + \text{additional controls} + \epsilon_i \tag{1}$$

[6]The drivers of this decline are discussed in Section 3.4.

For this and all following regressions, continuous controls are transformed to categorical variables by binning them to allow for non-linearities. Joint controls (e.g. lender-quarter) consider all pairwise combinations of the hyphenated variables.

The regression, as shown as Model 1 in Table II, shows a strong broker effect. Model 2 additionally controls for LTI-LTV and Model 3 controls for a larger set of characteristics describing borrowers and their property. The additional controls in Models 2 and 3 do not diminish the broker effect, which supports the persuasion hypothesis and speaks against a selection effect.

While this analysis at the household level provides suggestive evidence that brokers may steer households into mortgages with a short fixed term, we cannot confidently conclude that this is the case. An alternative explanation is that there are unobserved household characteristics which explain both switching from the direct to the brokered channel and choosing a short fixed-term mortgage. For instance, households that are less financially sophisticated may be more likely to choose a short fixed-term mortgage and more likely go to a broker.

TABLE II: Impact of broker on fixed-term (household level)

Dependent Variable:	Binary indicator for short fixed term		
Model:	(1)	(2)	(3)
Variables			
Broker	0.9095***	0.9901***	0.9889***
	(0.0449)	(0.0463)	(0.0470)
Fixed-effects			
Lender-Quarter	Yes	Yes	Yes
LAD	Yes	Yes	Yes
LTI-LTV		Yes	Yes
borrower_age_buckets			Yes
Income			Yes
Mortgage term			Yes
Property value			Yes
Dependent children			Yes
Bedrooms			Yes
Garage			Yes
Type of dwelling			Yes
Newbuild			Yes
Fit statistics			
Observations	2,150,960	2,130,599	2,123,495
Squared Correlation	0.16049	0.19987	0.20399
Pseudo R^2	0.13292	0.16650	0.17051
BIC	2,484,536.9	2,368,369.3	2,349,878.4

Clustered (Lender-Quarter & LAD) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

3.1.2 Regional level

To address the household selection issue discussed above, we conduct a regression analysis at a regional level. By exploiting regional variation – and in particular showing that household choice was more affected in those regions which experienced larger increases in broker intermediation – we are able to conclude with greater confidence that brokers do indeed steer households into mortgages with shorter fixed terms. We use the local authority districts (LAD) as the regional variable. Figures A.I and A.II in the appendix show that the change in the proportion of brokered mortgages between 2013 and 2020 differs substantially between these regions. Assuming household characteristics remain constant over time at a regional level, then any impact from these characteristics will be captured by the regional fixed effects (α_r^{LAD}). However, we cannot control for unobserved shocks that interact with borrower characteristics. Furthermore, we cannot assume that the regional degree of broker intermediation is random. Rather, brokers may locate in areas where demand for their services is high. We use the following regression specification:

$$\Delta F_{r,t} = \beta^{Broker}\Delta B_{r,t} + \beta^{LTV}\Delta LTV_{r,t} + \beta^{LTI}\Delta LTI_{r,t} + \alpha_r^{LAD} + \alpha_t^{Year}, \tag{2}$$

where Δ denotes annual regional changes (e.g. $\Delta B = B_{r,t} - B_{r,t-1}$). For each region-year pair, let F_{rt} be the proportion of short fixed-term mortgages, B_{rt} the proportion of brokers and LTV_{rt}, LTI_{rt} the mean LTV and LTI. The last two terms of Equation 3 are year and lender fixed effects.We remove year-region pairs with less than 100 mortgages and use Driscoll-Kraay standard errors (Driscoll and Kraay, 1998) to correct for temporal dependence and regional dependence.

Table III presents the results. The broker coefficient is statistically significant after controlling for regional changes in mean LTI and LTV. To compare the effects of 0.18–0.20 to the effect estimates on the loan level, we re-estimate the loan-level logistic regressions in Table II using a linear probability model. We observe an estimate of 0.19 for all three loan-level specifications. Given these consistent steering effect estimates across empirical designs, a 10pp increase in the proportion of brokers is associated with a 1.8–2pp increase in the proportion of short fixed-term mortgages.

As a robustness check we relax the assumption that unobserved household characteristics remain constant at a regional level over time. In particular, we assume that changes in household characteristics at a granular regional level (LAD) are equal to the corresponding changes at a higher regional level (ITL). We achieve that by adding the interaction of year and ITL region as a fixed effect to the regression, while our unit of observations are still LAD regions:

$$\Delta F_{r,t} = \beta^{Broker}\Delta B_{r,t} + \beta^{LTV}\Delta LTV_{r,t} + \beta^{LTI}\Delta LTI_{r,t} + \alpha_r^{LAD} + \alpha_t^{ITL-Year}. \tag{3}$$

Table A.II in the appendix shows that the statistically significant ($p < 0.01$) broker effect in this specification is smaller ($\beta^{Broker} = 0.1667$ and 0.184) than that of the baseline regressions reported in Table 3 – but not by much.

As another robustness check, we replicate the baseline regional regression analysis adding

TABLE III: Impact of broker on fixed-term (regional level)

Dependent Variable:	Δ Proportion short fixed term	
Model:	(1)	(2)
Variables		
Δ Prop. brokered	0.1795**	0.1975**
	(0.0680)	(0.0710)
Δ Mean LTV		0.0021
		(0.0011)
Δ Mean LTI		-0.0026
		(0.0107)
Fixed-effects		
Region (LAD)	Yes	Yes
Year	Yes	Yes
Fit statistics		
Observations	2,494	2,494
R^2	0.68776	0.69032
Within R^2	0.02655	0.03453

Clustered (Region (LAD) & Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

the product as a panel variable, where we define a product as the nine possible combinations of three LTV (0–70, 70–85, 85–max) and three LTI (0–3, 3–4, 4–max) levels. Table A.I in the appendix shows the results. The broker effect is even stronger for this specification ($\beta^{Broker} = 0.2318$), which provides further evidence that the steering effect is robust across—and not explained by—borrower characteristics. Finally, we conduct additional robustness checks in Table A.III, where we replicate Model 1 of Table A.I filtering borrowers (high/low LTV and LTI mortgages) and regions (London, regions with high/low population density). The p-value is consistently below 0.1 across all specifications.

Next, we return to mortgage level regression to test the heterogeneity of the steering effect. We hypothesise that more experienced borrowers make more informed choices and are thus less susceptible to steering. We proxy experience by income and age of the borrower, and also contrast the steering effect for two borrower types, first-time buyers[7] and (more experienced) home movers.

Equation 4 illustrates our approach for borrower age.

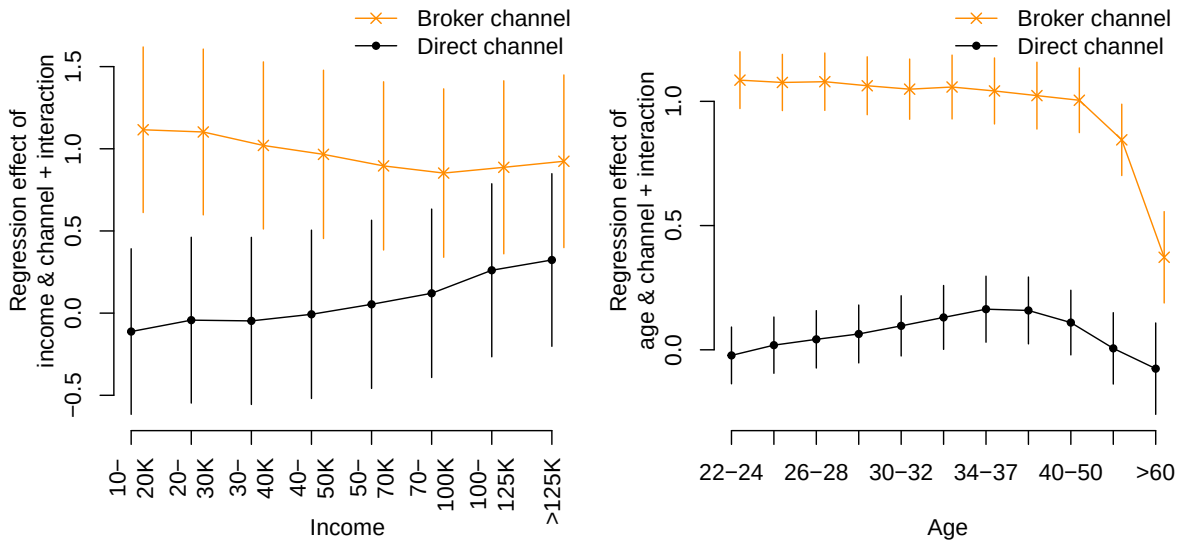
$$F_i = \beta^{Broker} B_i + \beta^{Age} Age + \beta^{Broker \times Age} B_i \times Age + \alpha_i^{Lender-Quarter} + \alpha_i^{LAD} + \alpha_i^{LTI-LTV} + \epsilon_i \quad (4)$$

Figure (top left panel) III plots the steering effect (broker + age + interaction) as estimated by this regression for different age groups. The right panel analogously shows the effect for income and Table A.IV in the appendix presents presents the results for the

[7]Note that all other analyses in this study only consider first-time buyers.

interaction of the broker variable with the borrower type. The decreasing gap between the direct and brokered channel in the charts show that that the broker effect decreases with increasing age and income. Furthermore, while home movers are more likely to take out short fixed-term mortgages, the broker effect has less than half of the magnitude for home movers (0.89-0.51= 0.38) compared to first time buyers (0.89). Collectively, these results provide evidence for our hypothesis that more experienced borrowers are less affected by the steering effect.

FIGURE III: Impact of brokers on length of fixed term for different income and age groups.



We also test the heterogeneity of the broker effect for lenders with different LTV and LTI levels. While the effect seems slightly weaker at lower LTV it is constant for different values of LTI. This corroborates that the broker persuasion effect does not only affect one particular segment of the market.[8]

Finally, Figure A.IV in the appendix shows the steering effect by year. As for the descriptive results (Figure II) we find that the broker effect decreases over time but holds consistently over the whole sample period.

To estimate the impact of the increase in broker intermediation over the sample period, we conduct a very simple counterfactural analysis by comparing the actual scenario where the share of mortgages sold by brokers increased by 22.7 percentage points from 57% to 81% between 2013 and 2020 to the scenario where the proportion of mortgages sold by brokers remained constant at 57% throughout the sample period. Using the coefficient from Model 1 in Table III of 0.18, we estimate that the increased influence of brokers

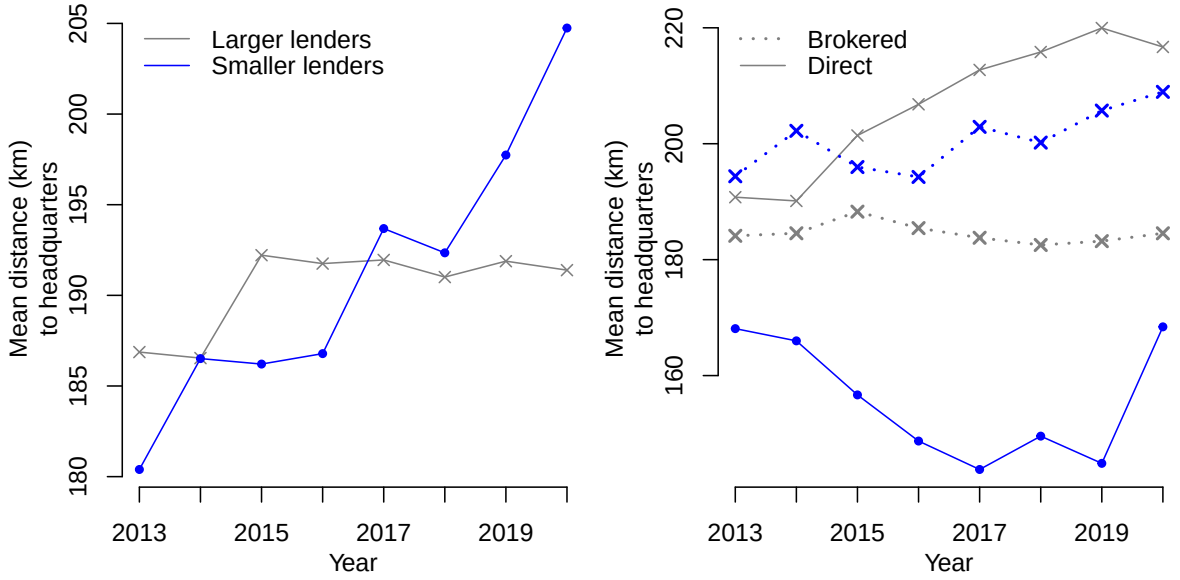
[8]Tangentially, we also observe that households choosing a mortgage with a higher LTV have a higher likelihood of taking out a mortgage with a shorter fixed term. This result – concerning differences in fixed term between households with different LTVs – has been discussed in detail by Liu (2023), who argues that households with a high LTV choose shorter fixed-term rates since they anticipate quickly moving to a lower LTV (due to house price appreciation and principal repayment) and reducing future mortgage costs.

associated with the MMR reform caused approximately 18% of 81 − 57 = 4.3% of first-time buyers to switch from mortgages with a long fixed term to mortgages with a short fixed term.

3.2 Geographical diversification

In this section we investigate the effect of broker intermediation on the geographical diversity of the loan books of smaller and larger lenders. Figure IV (left panel) descriptively shows the average distance of a property to the headquarter of mortgages originated by smaller and larger lenders. We observe a substantial increase in distance for smaller lenders. The right panel of Figure IV suggests that this increase in distance is driven by the brokered channel. Mortgages sold by smaller lenders through the direct channel tend to be closer to the lenders' headquarters than those sold through the brokered channel. This suggests that first-time buyers in the direct channel are more likely to take out a mortgage with a lender that has a branch in the borrowers' region. This effect is weaker for the brokered channel (Iscenko, 2020, see).

FIGURE IV: Geographical diversity by lender type and channel



While the distance to the headquarter is an intuitive measure of geographical diversity it has a crucial limitation: especially, for larger lenders with many branches, the geographical concentration of the business can be unrelated to the location of the headquarters. Therefore, we consider two additional measures of geographical diversity.

Our second metric computes the distance of a property to the geographical centroid $\bar{C}_{l,t,c}$ of all mortgages of lender l in year t and channel $c \in \{\text{brokered}, \text{direct}\}$. Mathematically, this measure is equivalent to computing the mean pairwise distance of all mortgages with the same values on l ,t, and c. This metric also has a drawback as it does not take clusters of mortgages into account. For example, we might observe the same mean distance to the centroid when mortgages are distributed in two highly concentrated clusters compared to a non-clustered dispersed distribution of mortgages across the whole country.

This is why our third metric does not account for geographical distances but measures how clustered mortgages are. We use Shannon entropy $E_{l,t,c}$ to measure the regional concentration of a lender's mortgage book. Concretely, this metric measures the regional concentration of mortgaged properties across the 36 ITL regions. Let $p^r_{l,t,c}$ be the proportion of mortgages in region r of lender l in year t and channel c. Shannon entropy across the regions is calculated as follows: $-\sum_r p^r_{l,t,c} \times log(p^r_{l,t,c})$. If all mortgages are in one region, the entropy is 0, if the mortgages are evenly distributed across regions the entropy is $log(n)$, where $n = 36$ is the number of regions. The standard Shannon entropy measure is biased when the sample size is small. As we also consider smaller lenders with few mortgages in different regions, we use the Miller-Madow bias corrected estimator (Miller, 1955).[9]

We use these metrics to test the hypothesis that smaller lenders geographically diversify via the broker channel more formally. On the level of individual mortgages we regress the distance to the headquarters and centroid on the broker variable. The broker dummy B_i is interacted with a dummy indicating whether a lender is small S_i (i.e. not one of the larger lenders). The main effect of S_i is absorbed by lender-year fixed effects. In addition, we control for region (LAD) effects as properties in less central areas of the country have a lower propensity to be close to a headquarters or the centroid.

$$\begin{aligned} \text{Distance to HQ}_i = \\ \text{Distance to centroid}_i = \end{aligned} \quad \beta^{Broker} B_i + \beta^{Interact} B_i \times S_i + \alpha^{Lender-Year} + \alpha^{LAD} + \epsilon_i. \qquad (5)$$

Table IV shows that the interaction of the broker variable with the smaller lender indicator is large for both distance measures. It follows that - when using these loan level metrics - geographical diversification of brokered mortgages is greater than the geographical diversification of direct mortgages which are more clustered around lenders' headquarters or a central focal point. On average, a brokered mortgage of a smaller lender is 195 km more distant from the headquarter than directly sold mortgages of a smaller lender.

The entropy metric is not defined at the level of individual mortgages, and so we run regressions on the regional level. We regress entropy on the lender-year-channel level on the broker dummy. To ease interpretation, we standardise the entropy metric to have a mean of 0 and a standard deviation of 1. As before we interact the broker variable with a dummy indicating whether a lender is small (S_l). We exclude all lender-year pairs with less than 100 mortgages. We use the same panel data set of lender-year-channel triplets to test the broker effect on our other two geographical diversity metrics as well: mean distance to the headquarter and mean distance to the centroid of a region-lender-channel triplet.

[9]The results do not qualitatively change when using entropy with an alternative bias correction (Schürmann and Grassberger, 1996) or no bias correction.

TABLE IV: Impact of broker and lender type on geographical diversity (household level)

Dependent Variables:	Distance to headquarter	Distance to centroid
Model:	(1)	(2)
Variables		
Broker	-7.744***	-0.3408
	(1.226)	(0.5722)
Broker × Smaller lender	194.7***	47.93***
	(28.74)	(8.082)
Fixed-effects		
Lender-Year	Yes	Yes
Region (LAD)	Yes	Yes
Fit statistics		
Observations	2,204,799	2,298,626
R^2	0.70933	0.90038
Within R^2	0.05147	0.02910

Clustered (Lender-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

$$\begin{matrix}\text{Mean distance to HQ}_{l,t,c} = \\ \text{Mean distance to centroid}_{l,t,c} = \\ \text{Entropy}_{l,t,c} =\end{matrix} \quad \beta^{Broker} B_{l,t,c} + \beta^{Interact} B_{l,t,c} \times S_l + \alpha^{Lender-Year} + + \epsilon_{l,t,c} \quad (6)$$

Table V shows the fitted models. All models have a large significant interaction between the smaller lender indicator and the broker variable. This again provides evidence that brokers facilitate distance lending for smaller lenders.

3.3 Pricing and specialisation

The analysis above suggests that brokers influence demand by steering households towards short fixed-term mortgages. We now turn to the impact of brokers on supply, and in particular the impact of brokers on the pricing of short and long fixed-term mortgages.

To investigate these effects, we regress the annualised percentage rate (APR, including fees payed by the borrower to lender and broker) on two variables, the sales channel (direct vs. brokered) and the type of firm (larger vs. smaller lenders). For ease of interpretability, we create a categorical variable that reflects the four combinations channel and firm type. Our reference category are mortgages sold by large firms via the direct channel. In this analysis, we only consider mortgages with a fixed term of two and five years and control for length of fixed term, product (LTV-LTI), and lender and region (LAD). Apart from

TABLE V: Impact of broker and lender type on geographical diversity (Lender level)

Dependent Variables:	Distance to centroid	Distance to headquarter	Entropy
Model:	(1)	(2)	(3)
Variables			
Broker	0.5949	-25.38***	-0.0570***
	(2.543)	(4.285)	(0.0187)
Smaller lender × Broker	18.28***	107.2***	0.9230***
	(5.016)	(11.58)	(0.1391)
Fixed-effects			
Lender	Yes	Yes	Yes
Year	Yes	Yes	Yes
Fit statistics			
Observations	383	383	383
R^2	0.83832	0.82340	0.83661
Within R^2	0.14588	0.39792	0.31317

Clustered (Lender-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

region, we interact all controls with the month of origination:

$$APR = \beta^{Channel-Firm\ type} B_i + \alpha^{Fixed\ term-Month} + \alpha^{Product-Month} + \alpha^{Lender-Month} + \alpha^{Region} + \epsilon_i. \tag{7}$$

We do not observe fees before 2015, and thus shorten the sample period to 2015–2020 in this analysis.

Model 1 in Table VI shows that larger firms sell brokered mortgage at a reduced price of 6 basis points (bp) compared to direct mortgages. This effect qualitatively holds when only considering mortgages with a short fixed term (Model 2) or long fixed term (Model3).

Smaller firms, on the other hand, sell brokered mortgages at a slightly higher price than direct mortgages and generally are more expensive than larger firms. When only considering, short fixed-term mortgages (Model 2) the price difference between smaller and larger firms increases, while it shrinks substantially when considering long fixed-term mortgages (Model 3). Only for long fixed-term mortgages we observe that smaller firms offer lower prices in the brokered channel than in the direct channel.

Next, we compare the pricing of smaller and larger lenders for high (≥ 85) and low (< 85) LTV replicating the regression approach above. Larger lenders sell high LTV mortgages at a discount via the brokered channel but not low LTV mortgages. On low LTV mortgages, smaller lenders are substantially more expensive than larger lenders in both the direct

and brokered channel. Only, when considering the subset of long-term mortgages with high LTV (Model 6), we observe that small lenders can compete with larger lenders in the brokered channel.

To test the robustness of this finding, we conduct jackknife sampling on the lender level, where we re-estimate the models, each time removing one lender from the sample. Specifically, we estimate 25 models, removing the largest firms one by one from the sample. We show the range of the regression coefficients across the 25 estimated models in Figure V for the models in Table VI. The grey lines connect the coefficients of the same regression specification. While we see some variation in the coefficients, the results generally hold. As a second robustness check we re-estimate the models in Table VI separately for each year in the sample period. The coefficients are visualised in Figure A.V in the appendix and confirm our findings.[10]

Finally, we discuss the link between the different pricing strategies of smaller and larger lenders, and changes in their market share. Figure VI shows that the overall market share (left panel) of smaller lenders increased from 13.1% in 2013 to 23.8% in 2020.

[10]In this analysis, we do not consider the fees to be able to cover the whole sample period (2013-Q2 to 2020-Q4).

TABLE VI: Regression explaining pricing differences between the direct and brokered channel of smaller and larger lenders.

Dependent Variable:	APR					
	All	Short term	Long term	LTV ≥ 85	LTV < 85	LTV ≥ 85 & long
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Direct: small lenders	0.2865***	0.3988***	0.1963***	0.0369	0.5651***	-0.0775***
	(0.0294)	(0.0483)	(0.0251)	(0.0279)	(0.0438)	(0.0188)
Brokered: small lenders	0.3773***	0.5533***	0.1771***	0.0740***	0.7359***	-0.1424***
	(0.0225)	(0.0308)	(0.0181)	(0.0215)	(0.0280)	(0.0173)
Brokered: large lenders	-0.0607***	-0.0339***	-0.0623***	-0.1535***	0.0536***	-0.1777***
	(0.0091)	(0.0121)	(0.0075)	(0.0114)	(0.0067)	(0.0103)
Fixed-effects						
LTV-LTI-month	Yes	Yes	Yes	Yes	Yes	Yes
fixed_period-month	Yes	Yes	Yes	Yes	Yes	Yes
Region (LAD)	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics						
Observations	1,641,754	974,123	667,631	805,101	836,653	261,672
R^2	0.53916	0.54298	0.58167	0.54535	0.38957	0.63477
Within R^2	0.07150	0.09988	0.03648	0.02499	0.16038	0.02299

Clustered (Lender-month) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

FIGURE V: Coefficients of models shown in Table VI when applying jackknife sampling of firms. Grey lines connect coefficients of the same model.

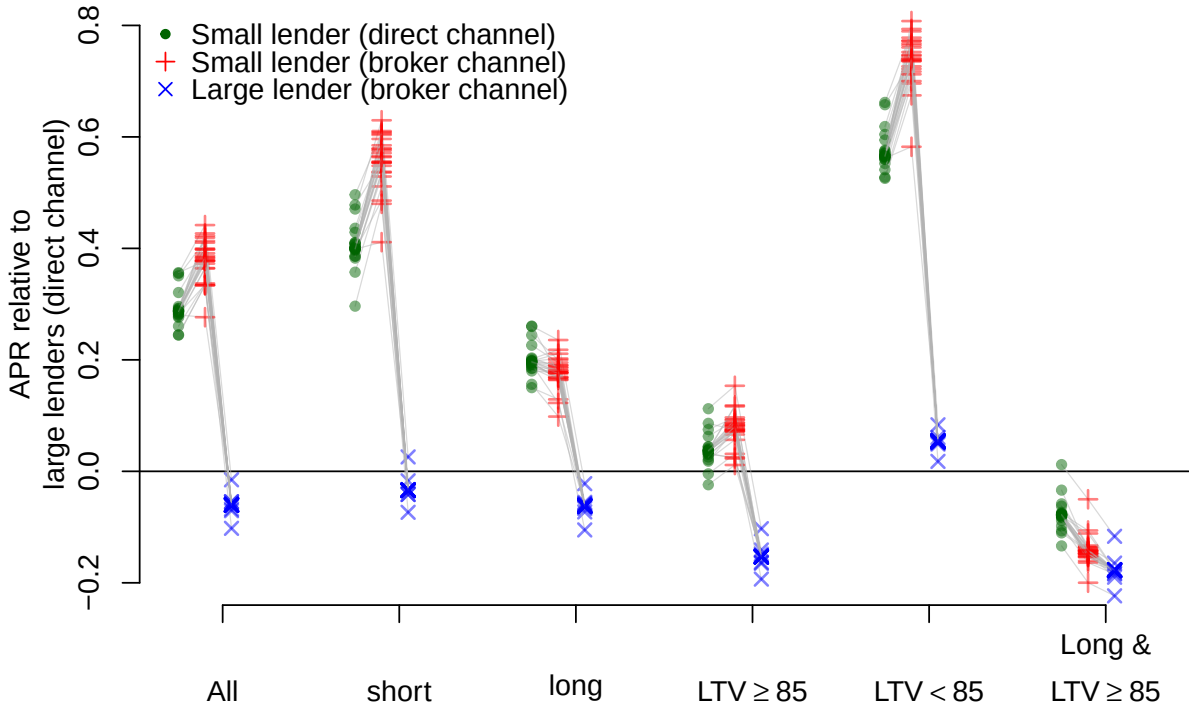
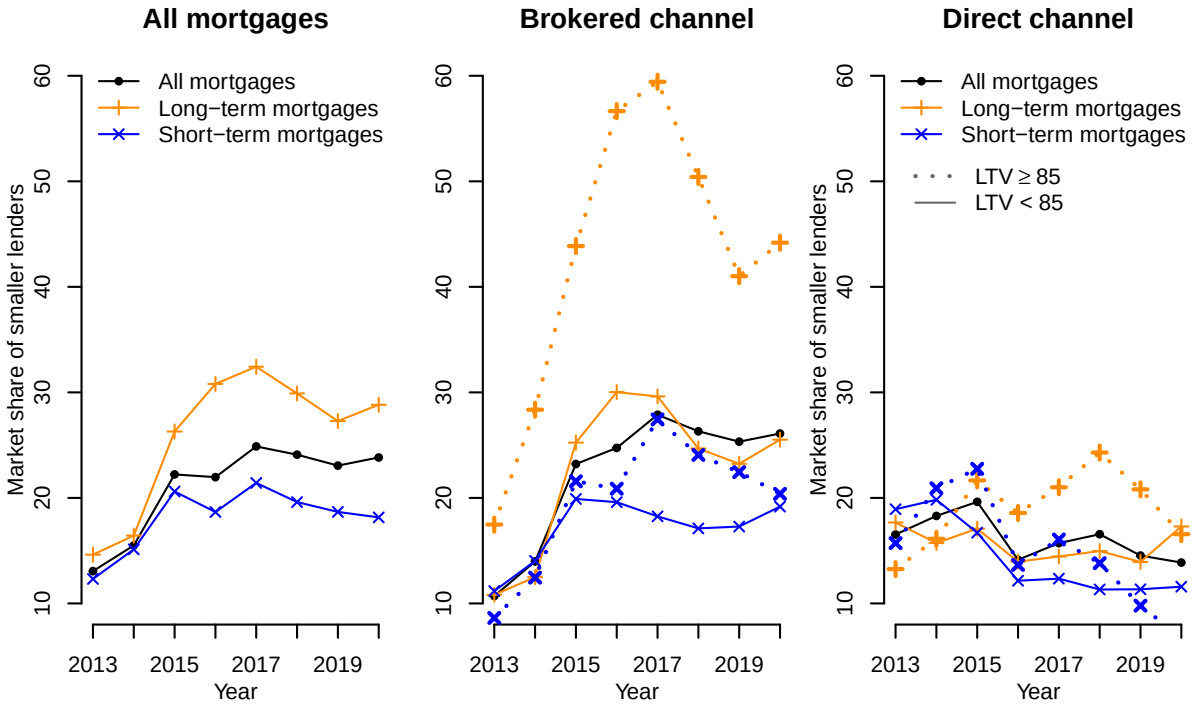


FIGURE VI: Market share of smaller lenders.



Note that at the beginning of the sample period smaller lenders' share of (i) all mortgage lending, (ii) long fixed-term mortgage lending and (iii) short fixed-term mortgage lending were all relatively similar. But over the sample period, the smaller lenders doubled their market share on long fixed-term mortgages from 14.62% to 28.8%, whereas their share of short fixed-term mortgages only increased from (12.3% to 18.2%).

The middle and right panel of Figure VI divide the market into direct and brokered mortgages and differentiate between low and high LTV long and short fixed-term mortgages. These charts illustrate that the increase in the market share of smaller lenders is exclusively driven by the brokered channel. Also, by far the most substantial increase in market share is observed for high-LTV long fixed-term mortgages. These descriptive results are consistent with the analysis of mortgage pricing above and suggests that an increased use of brokers gave smaller lenders more freedom to choose the composition of their mortgage portfolio: smaller lenders had access to more households, which in turn allowed smaller lenders to build up a more specialised mortgage portfolio (i.e. a portfolio skewed away from the market average).

The specialisation of smaller lenders on high LTV mortgages can be attributed to the use internal ratings-based models by larger lenders. These models incentivise lenders to increase the proportion of low-LTV mortgages in their loan book as this decreases their capital requirements (Benetton et al., 2021). On the other hand, this makes it difficult for smaller lenders, which tend to use standard risk models, to compete in this sector of the market, which is why they specialise on high LTV mortgages.

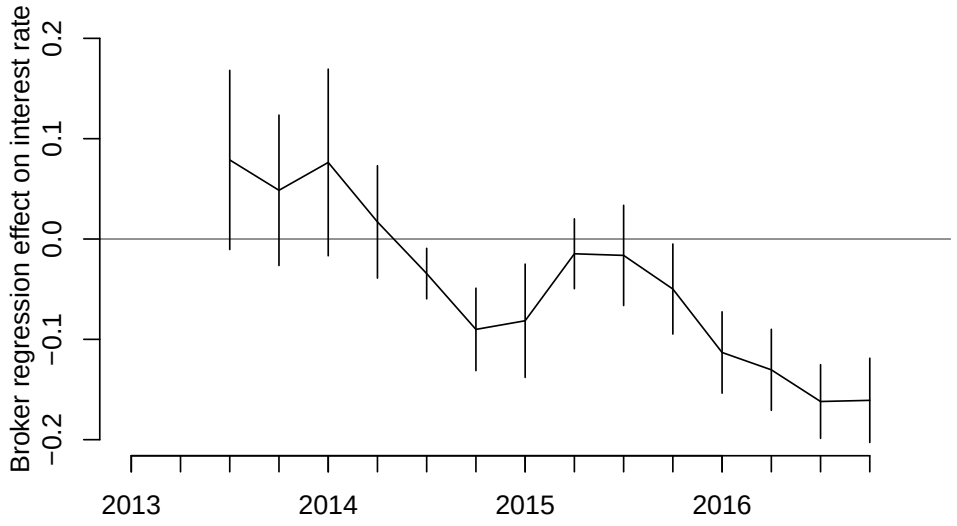
The specialisation of small lenders on long fixed-term mortgages warrants more research. One reason could be that smaller lenders are less willing to sell short fixed-term mortgages through the brokered channel because they have higher funding costs than larger lenders. Fees payed by the lender to the broker reduce the profitability of short fixed-term (as opposed to long-term) mortgages more sharply since initial fees and margins (per year) are similar for both types of mortgages[11] while households are locked-in to long fixed-term mortgages for more years. Supporting this hypothesis, we observe that towards the end of the sample period, some smaller lenders stop selling short fixed-term mortgages through the brokered channel altogether, providing evidence that their higher funding costs means it is not profitable for these lenders to compete in this segment of the market.

3.4 Further results

We now set out some further results that build on the analysis above. First, we discuss the implications of the main results, in particular how increased broker intermediation has been associated with a risk-transfer between lenders and households. Second we provide further discussion and results concerning the factors driving the increase in broker intermediation over the sample period and other factors that influence households' choice of fixed term.

[11] This is confirmed by a regression analysis. After controlling for the loan value and fixed effects (quarter-region, firm-quarter, LTV-LTI-quarter), fees payed from the lender to the broker are only £3.5 cheaper for short fixed-term mortgages.)

FIGURE VII: Broker effect on interest rate.



3.4.1 Explanations for the increase in broker intermediation

The Mortgage Market Review (MMR) was a regulatory change in 2014 that required banks to involve a qualified advisor in most sales through the direct channel, whereas before the MMR lenders were able to sell a significant proportion of mortgages to households through the direct channel without involving a qualified adviser.[12] On the other hand, sales through the brokered channel were less affected by the MMR since these sales already involved a qualified adviser (i.e. a broker).[13] With this in mind, we assume that the implementation of the MMR (i) added larger additional costs to mortgage sales conducted through the direct channel relative to the brokered channel, (ii) lenders responded to this cost increase by decreasing the price and increasing the availability of mortgages sold through the brokered channel (relative to the direct channel) and (iii) households responded to lower prices and increased availability by switching from the direct channel to the brokered channel.

Figure I shows – as observed previously by Iscenko and Nieboer (2018) – that the increase in the proportion of brokered mortgages was highest around the year the MMR was implemented. And Figure VII (see also Figure A.V provides evidence that brokered mortgages were priced cheaper after the implementation of the MMR but not before. The chart shows the broker effect when regressing the interest rate[14] on the broker variable. We separately estimate this regression on each quarter between 2013-Q3 and 2016-Q4s, control for fixed effects (firm, LTV-LTI, fixed period-month, LAD) and cluster the standard errors (firm-month).

[12]For further details on the MMR see: https://www.fca.org.uk/publication/policy/fsa-ps12-16.pdfp14

[13]Before the implementation of the Mortgage Market Review (MMR) in 2014, about one third of mortgages were non-advised, whereas after the MMR banks could only sell mortgages through the direct channel without an in-house qualified adviser in specific circumstances.

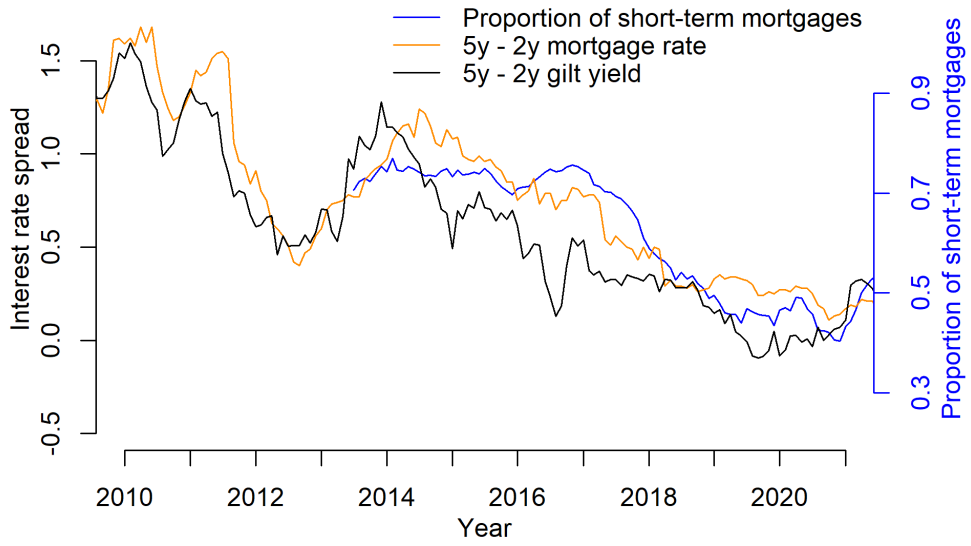
[14]We exclude fees because these are not observed in the data before 2015.

Another potential explanation for the increase in broker intermediation over this period is the closure of bank branches (see FCA, 2018), which in turn made it harder for households to access lenders through the direct channel. We do not have access to high quality bank branch data and can only rely on rounded regional estimates of bank branches to estimate closures across all lenders (see Section 2). We regress the yearly change in the proportion of brokers on the yearly percentage change in the number of bank branches at the LAD regional level. As reported in Table A.V in the appendix, we do not find an effect.

3.4.2 The effect of the yield curve on the choice of fixed term

While brokers play an important role in shaping households decision-making regarding the length of fixed term, the rate premium between short and long fixed-term mortgages seems to dominate this effect. We investigate this in Figure VIII, which compares the yield spread between government bonds with short and long-term maturities (5 year - 2 year) to the interest rate spread between mortgages with short and long fixed terms[15] and the proportion of mortgages with a short fixed term.

FIGURE VIII: Interest rate spread and proportion of short fixed-term mortgages



This chart highlights two effects. First, the interest rate spread between mortgages with different length of fixed term closely follows the yield spread between government bonds. In particular, as the yield curve flattens over the sample period, the interest rate spread between short and long fixed-term mortgages decreases. This suggests that lenders account for changes in the shape of the yield curve when pricing mortgages with different fixed periods. Second, the share of short fixed-term mortgages closely follows the interest rate spread between long and short fixed-term mortgages. For instance, at the beginning of the sample period, the interest rate on short fixed-term mortgages was significantly lower than the interest rate on long fixed term mortgages and a larger proportion of

[15] We use the quoted mortgage rates for 2 and 5-year fixed term mortgages at an LTV of 75 as published by the Bank of England.

households chose short fixed-term mortgages. Meanwhile, at the end of the sample period, the difference in interest rate on short and long fixed-term mortgages had almost disappeared and a much smaller proportion of households chose short fixed terms. This provides evidence that households are sensitive to the initial interest rate they pay and although brokers play a significant role by steering households towards short fixed terms across the whole sample period, we conclude that the share of short-term mortgages is primarily driven by the changing shape of the yield curve over time.

A first explanation for this *yield curve effect* is that it arises from *borrower myopia* (see Faulkender (2005) for a similar discussion concerning the fixed-term length of corporate debt): Households pay too much attention to their immediate interest payments and do not fully take into account the likelihood that rates may be different when they next need to re-mortgage. This causes households to have a stronger tendency to choose short fixed-term mortgages when the yield curve is steep and initial interest payments are significantly lower for short fixed periods compared to long fixed-term mortgages. Similarly, Miles (2005) argues that "many borrowers pay less attention to the likely future relative costs of different mortgages and more to the differential in initial monthly repayments".

A second explanation is that the yield curve effect is driven by *borrower cash-flow constraints* (see Campbell and Cocco, 2003). Cash-flow constraints may cause households to borrow (close to) the largest amount they can access and incentivise them to reduce their initial monthly payments by choosing short fixed-term mortgages which tend to have lower interest rates. Note that, when the yield curve is steep and the interest rate spread between short and long fixed-term mortgages is larger, the incentive for cash-flow constrained households to choose a short fixed-term mortgage is higher. Under this alternative explanation households are fully rational when choosing a short fixed term to alleviate short-term cash-flow constraints.

4 Conclusion

Our results suggest that brokers encourage households to choose short fixed-term mortgages. Households who choose a mortgage with a shorter fixed term are more exposed to risks affecting mortgage rates (in particular the future base rate). Hence, an increase in the share of mortgages with a short fixed term transfers risks concerning the future level of the base rate from lenders to households, who are less able to hedge against and manage these risks. A shift towards mortgages with a short fixed term also speeds up the transmission of monetary policy, since changes in the base rate impact household finances more immediately.

The increase in broker intermediation can also have implications for lender liquidity. This is because lenders often rely on short-term funding (such as deposits) to finance mortgages, which creates maturity mismatch between assets and liabilities. Market conditions that steer households towards mortgages with shorter fixed terms make this maturity mismatch less acute.

Whilst the MMR was introduced for the purpose of consumer protection, by ensuring

that households received adequate advice when choosing a mortgage, the policy was not expected to materially affect competition or change the composition of lenders' portfolios. However, our results suggest that the MMR affected lenders' business models, especially those of smaller lenders, thus giving rise to competition.

Our results show that brokers allow smaller lenders to access customers in regions where they do not have a strong customer base and hence enable smaller lenders to increase the geographical diversity of their loan portfolios. Increased access to customers also allows smaller lenders to specialise their mortgage books and compete more effectively against larger lenders on specific products and gain market share. In particular, it appears that smaller lenders specialise in mortgages with a long fixed term and high LTV.

However, the impact of increased broker intermediation on smaller lender profitability might be ambiguous, since on the one hand these lenders are able to grow market share but on the other hand margins may be squeezed as increased competition puts downward pressure on rates.

Finally, since regional house prices are not perfectly correlated, geographical diversification via increased broker intermediation can lead to increased lender resilience. In particular, brokers ensure smaller lenders are less exposed to sharp drops in house prices in those regions where they have most of their branches.

References

Acharya, V., I. Hasan, and A. Saunders (2006) "Should Banks Be Diversified? Evidence from Individual Bank Loan Portfolios," *The Journal of Business*, Vol. 79(3), pp. 1355–1412.

Agarwal, S. and R. Hauswald (2010) "Distance and Private Information in Lending," *The Review of Financial Studies*, Vol. 23(7), pp. 2757–2788.

Anagol, S., S. Cole, and S. Sakar (2017) "Understanding the incentives of commissions motivated agents: Theory and evidence from the Indian life insurance market," *Review of Economics and Statistics*, Vol. 99, pp. 1–15.

Belgibayeva, A., T. Bono, P. Bracke, J. Cocco, and T. Majer (2020) "When Discounted Rates End: The Cost of Taking Action in the Mortgage Market," *FCA Occasional Paper*.

Benetton, Matteo, Peter Eckley, Nicola Garbarino, Liam Kirwin, and Georgia Latsi (2021) "Capital requirements and mortgage pricing: Evidence from Basel II," *Journal of Financial Intermediation*, Vol. 48, p. 100883.

Berger, A., R. De Young, and G. F. Udell (1996) "Efficiency Barriers to the Consolidation of the European Financial Services Industry," *The Journal of Business*, Vol. Working Paper.

Bergstresser, D., J. Chalmers, and P. Tufano (2009) "Assessing the costs and benefits of brokers in the mutual fund industry," *Review of Financial Studies*, Vol. 22), pp. 4129–4156.

Booth, Lorena (2022) "Statistics on access to cash, bank branches and ATMs,"Technical report, House of Commons Library.

Calem, P. S. and M. LaCour-Little (2004) "Risk-based capital requirements for mortgage loans," *Journal of Banking & Finance*, Vol. 28 (3), pp. 647–672.

Campbell, John Y. and João F. Cocco (2003) "Household Risk Management and Optimal Mortgage Choice*," *The Quarterly Journal of Economics*, Vol. 118, No. 4, pp. 1449–1494, URL: https://doi.org/10.1162/003355303322552847, DOI: 10.1162/003355303322552847.

Campbell, John Y., Howell E. Jackson, Brigitte C. Madrian, and Peter Tufano (2011) "Consumer Financial Protection," *Journal of Economic Perspectives*, Vol. 25, No. 1, p. 91–114, URL: https://www.aeaweb.org/articles?id=10.1257/jep.25.1.91, DOI: 10.1257/jep.25.1.91.

Driscoll, John C and Aart C Kraay (1998) "Consistent covariance matrix estimation with spatially dependent panel data," *Review of economics and statistics*, Vol. 80, No. 4, pp. 549–560.

Egan, M. (2019) "Brokers versus Retail Investors: Conflicting Interests and Dominated Products," *The Journal of Finance*, Vol. 76(3), pp. 1217–1260.

Faulkender, M. (2005) "Hedging or Market Timing? Selecting the Interest Rate Exposure of Corporate Debt," *The Journal of Finance*, Vol. LX, NO. 2, pp. 931–961.

FCA (2018) "Strategic Review of Retail Banking Business Models," pp. https://www.fca.org.uk/publications/multi–firm–reviews/strategic–review–retail–banking–business–models.

Goetz, M., L. Laeven, and R. Levine (2013) "Identifying the Valuation Effects and Agency Costs of Corporate Diverification: Evidence from the Geographic Diversification of US Banks," *The Review of Financial Studies*, Vol. 26(7), pp. 1787–1823.

——— (2016) "Does the geographic expansion of banks reduce risk?" *Journal of Financial Economics*, Vol. 120(2), pp. 346–362.

Guiso, Luigi, Andrea Pozzi, Anton Tsoy, Leonardo Gambacorta, and Paolo Emilio Mistrulli (2022) "The cost of steering in financial markets: Evidence from the mortgage market," *Journal of Financial Economics*, Vol. 143, No. 3, pp. 1209–1226.

Hughes, J. P., W. Lang, J. M. Loretta, and M. Choon-Geol (1996) "Safety in numbers? Geographic diversification and bank insolvency risk," *The Journal of Business*, Vol. Working Paper.

Iscenko, Z. (2020) "Better the lender you know? Limited attention and lender familiarity in UK mortgage choices," *FCA Working paper*, Vol. 55, pp. 1–37.

Iscenko, Z. and J. Nieboer (2018) "Effects of the advice requirement and intermediation in the UK mortgage market," *FCA Occasional paper*, Vol. 34, pp. 1–71.

Koijen, Ralph SJ, Otto Van Hemert, and Stijn Van Nieuwerburgh (2009) "Mortgage timing," *Journal of Financial Economics*, Vol. 93, No. 2, pp. 292–324.

Liu, L. (2023) "The demand for long-term mortgage contracts and the role of collateral," *Bank of England Staff Working Paper*, pp. 1,009.

Loutskina, E. and P. Strahan (2011) "Informed and Uninformed Investment in Housing: The Downside of Diversification," *The Review of Financial Studies*, Vol. 24(5), pp. 1447–1480.

Miles, D. (2005) "Incentives Information and Efficiency in the UK Mortgage Market," *The Economic Journal*, Vol. 115, pp. 82–98.

Miller, George (1955) "Note on the bias of information estimates," *Information Theory in Psychology: Problems and methods*.

Mysliwski, M. and M. Rostom (2022) "Value of information, search, and competition in the UK mortgage market," *Bank of England, Staff Working Paper 967*.

Quigley, J. and R. Van Order (1991) "Defaults on mortgage obligations and capital requireemnts for US savings institutions: A policy perspective," *Journal of Public Economics*, Vol. 44(3), pp. 353–369.

Robles-Garcia, C. (2020) "Competition and Incentives in Mortgage Markets: The Role of Brokers," *Working paper*.

Schürmann, Thomas and Peter Grassberger (1996) "Entropy estimation of symbol sequences," *Chaos: An Interdisciplinary Journal of Nonlinear Science*, Vol. 6, No. 3, pp. 414–427.

A Appendix

FIGURE A.I: Change in proportion of brokered mortgages (2013 vs. 2020)

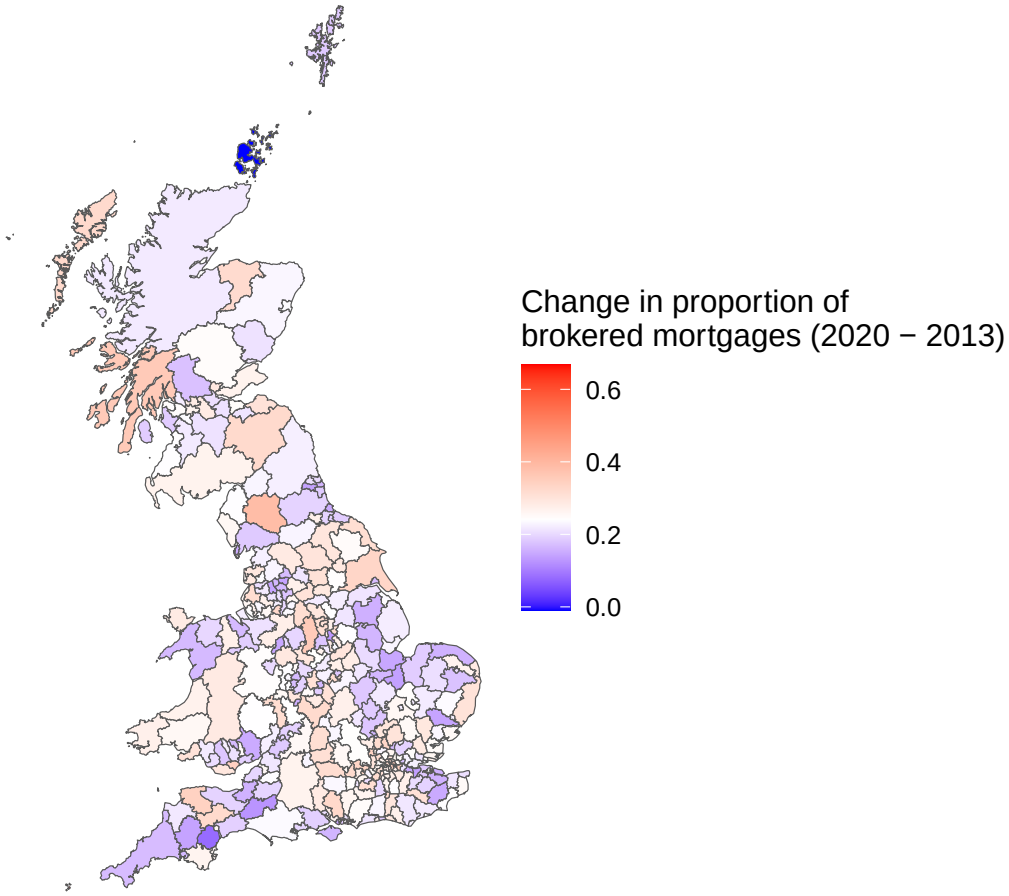


FIGURE A.II: Proportion of brokered mortgages

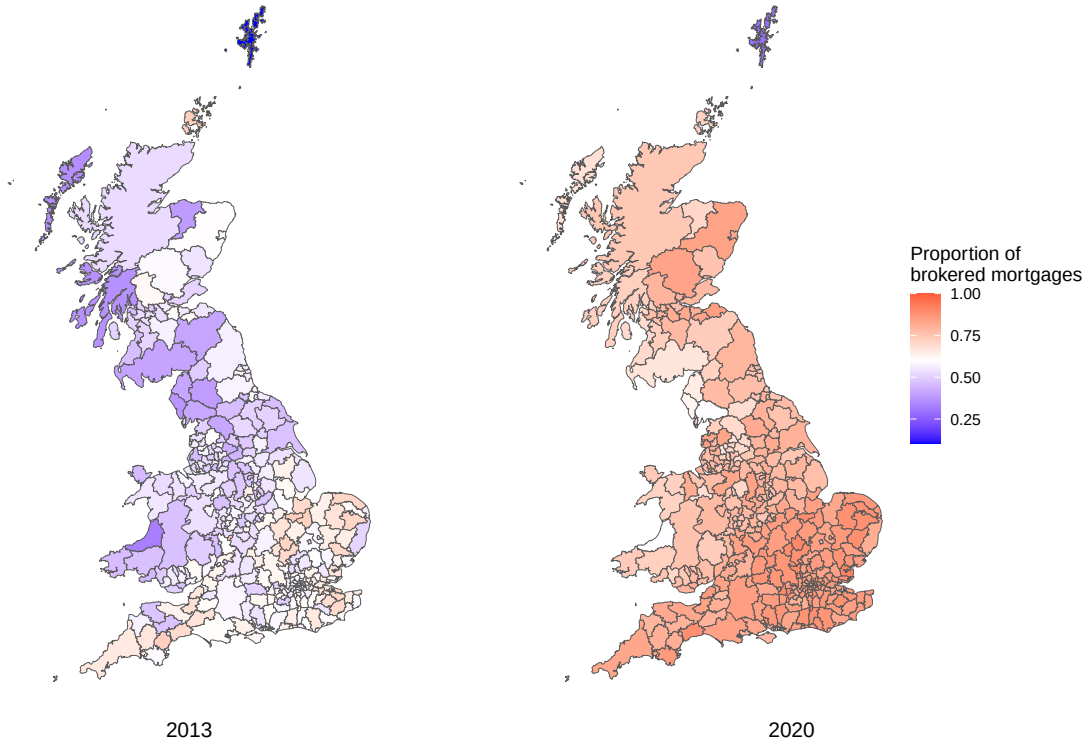


FIGURE A.III: Impact of brokers on length of fixed-term for different levels of LTV (left panel) and LTI (right panel).

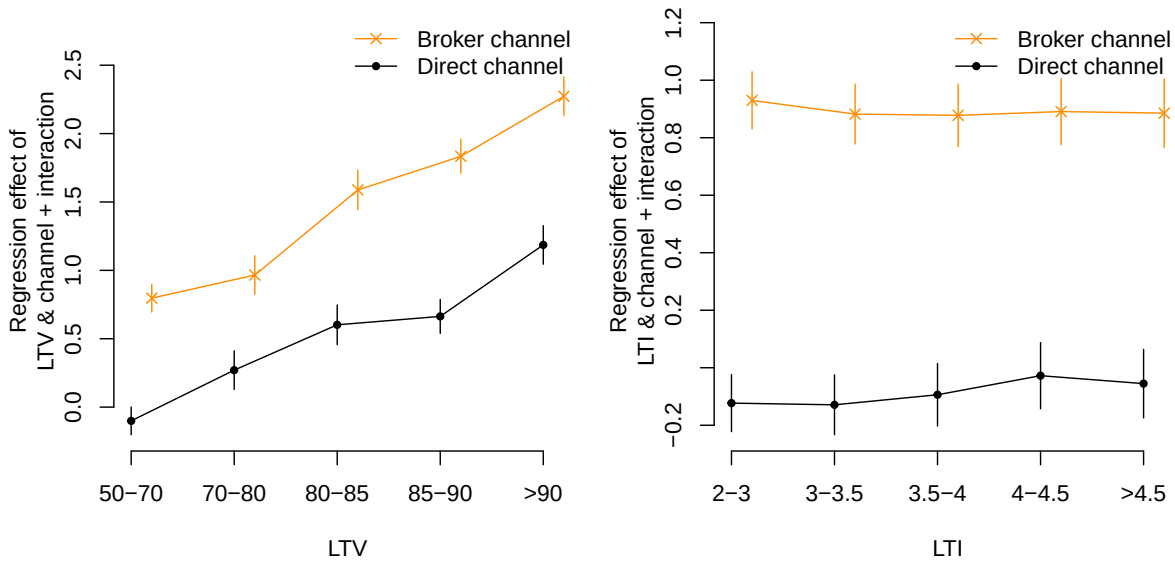


TABLE A.I: Impact of broker on fixed-term (region-product level)

Dependent Variable:	Δ Proportion short-term
Model:	(1)
Variables	
Δ Prop. brokered	0.2292***
	(0.0429)
Fixed-effects	
Region - Product	Yes
Year	Yes
Fit statistics	
Observations	19,277
R^2	0.32414
Within R^2	0.04428

Driscoll-Kraay (L=1) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

TABLE A.II: Impact of broker on fixed-term at LAD level, controlling for ITL-Year fixed effects.

Dependent Variable:	Δ Prop. short-term	
Model:	(1)	(2)
Variables		
Δ Prop. brokered	0.1581***	0.1754***
	(0.0355)	(0.0359)
Δ Mean LTV		0.0027***
		(0.0007)
Δ Mean LTI		-0.0212
		(0.0149)
Fixed-effects		
Region (LAD)	Yes	Yes
Year-Region (ITL)	Yes	Yes
Fit statistics		
Observations	2,494	2,494
R^2	0.75846	0.76107
Within R^2	0.01968	0.03030

Clustered (Region (ITL)-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

TABLE A.III: Robustness checks: Impact of broker on fixed-term (region level) for different subsets of borrowers and regions. Each row shows a different regression model.

	Coefficient	Standard error	p-value	Observations	R^2
LTV ≥ 85	0.17	0.05	0.020	2494	0.64
LTV < 85	0.27	0.06	0.005	2494	0.52
LTI ≥ 4	0.24	0.04	0.001	2494	0.48
LTI < 4	0.20	0.04	0.003	2494	0.61
London	0.23	0.05	0.005	224	0.81
Not London	0.17	0.07	0.048	2270	0.68
Population density >= median	0.19	0.08	0.045	1241	0.64
Population density < median	0.15	0.08	0.089	1253	0.74

Driscoll-Kraay (L=1) standard-errors

TABLE A.IV: Impact of broker on fixed-term by borrower type (First time buyer vs. home mover)

Dependent Variable:	Binary indicator for short fixed-term
Model:	(1)
Variables	
Broker	0.8900***
	(0.0449)
Home mover	0.6010***
	(0.0258)
Broker × Home mover	-0.5084***
	(0.0293)
Fixed-effects	
Lender-Quarter	Yes
Region (LAD)	Yes
LTI-LTV	Yes
Fit statistics	
Observations	4,374,533
Squared Correlation	0.17619
Pseudo R^2	0.14476
BIC	5,034,793.7

Clustered (Lender-Quarter & LAD) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

FIGURE A.IV: Regression effect of brokers on propensity to take out a short-term mortgage. We estimate estimate model for each year using the following fixed effects: Firm, LAD and LTV-LTI.

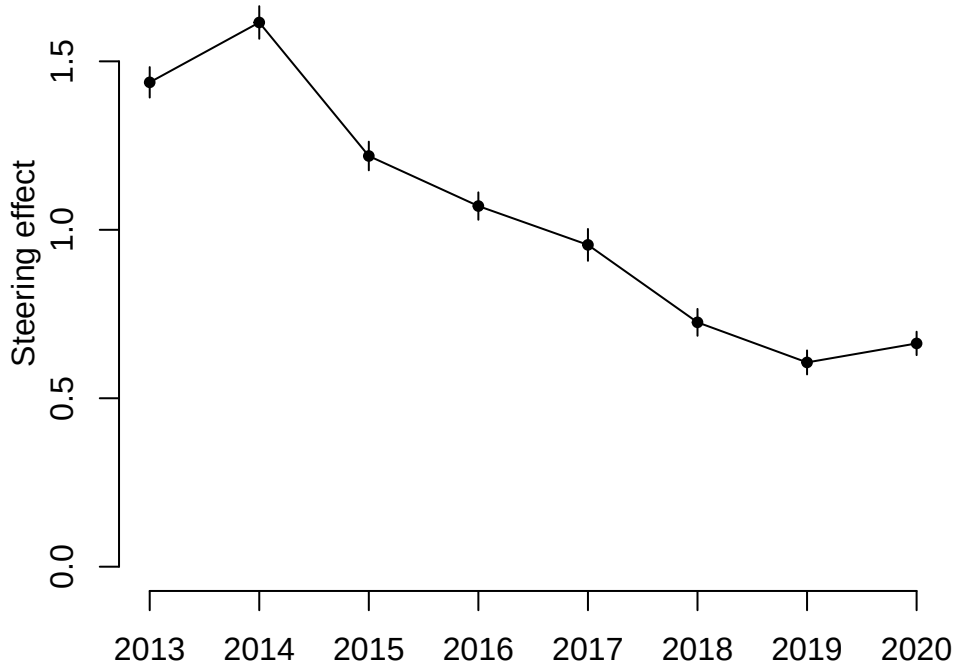


TABLE A.V: Regression effect of bank branch closures on the proportion of brokered mortgages

Dependent Variable:	Y-o-y change in the proportion of brokered mortgages
Model:	(1)
Variables	
Y-o-y percentage change	0.0309
in bank branches	(0.0478)
Fixed-effects	
Region (LAD)	Yes
Year	Yes
Fit statistics	
Observations	222
R^2	0.27545
Within R^2	0.00676

Driscoll-Kraay (L=1) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

FIGURE A.V: Coefficients of models shown in Table A.V when estimating the model separately for each year. Here, the dependent variable is the interest rate (without fees).