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Interest-rate fee substitution: credit facilitation in segmented markets

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Interest-rate fee substitution: credit facilitation in segmented markets

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Abstract

We use administrative data covering the universe of mortgage originations to individual real estate investors in the United Kingdom to study financing outcomes following a large, unanticipated increase in interest rates. Post-shock, originations become more concentrated among specialist lenders, who exhibit lower interest rate pass-through for larger borrowers. To offset these smaller rate increases, they charge higher loan fees, thereby attenuating the impact of higher rates on interest-coverage ratios and facilitating credit. High-frequency evidence from loans on offer show similar responses, indicating that specialist lenders adjust product design to target specific borrower types and, in doing so, reinforce market segmentation.

Key words: Mortgages, interest rates, fees, loan underwriting, market segmentation.

JEL classification: D1, G5, R21, E43.

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1 Introduction

Banks are inherently exposed to interest rate risk—a vulnerability made starkly evident by the collapse of Silicon Valley Bank and other regional institutions amid the recent monetary tightening in the United States (Jiang, Matvos, Piskorski, and Seru, 2025). Higher interest rates can, on the one hand, boost lenders' short-term profitability, as loan rates typically adjust more quickly than deposit rates, widening net interest margins. At the same time, rising rates increase risk exposures and trigger significant deleveraging by borrowers across the banking sector. In this environment, loan underwriting takes on heightened importance, functioning as a key mechanism for managing credit risk and sustaining credit supply in the face of the disruptions caused by sharp rate increases.

Our paper provides novel evidence on the effects of higher interest rates on loan pricing and underwriting, and on the heterogeneous responses of lenders and borrowers. We do so in the context of the residential real estate investor market and the loans granted to individual landlords.[1] In 2022, in the United Kingdom (UK), which is the focus of this paper, roughly 20% of all residential properties were privately rented,[2] and roughly £41 billion worth of residential mortgage loans were granted to landlords.[3] This translates into important links between real estate and credit markets that operate through the banking sector.[4] While our analysis focuses on the UK mortgage market, the joint use of origination fees and interest rates in loan pricing is a pervasive feature of lending markets more generally, so that the mechanism we uncover may have relevance more broadly.[5]

The primary data source is an administrative dataset covering the universe of UK buy-to-let (BTL) mortgages originated since 2018, roughly 1.2 million loans. To help us identify the effects of higher interest rates, we exploit the UK Chancellor's mini-budget announcement of 23

[1] Residential rental markets allow borrowing constrained households to rent a home while saving for a down payment and facilitate workers' mobility. The demand for rental housing has to be met by a supply side in which private landlords often play a dominant role.

[2] This is roughly 5 million properties out of a 25 million housing stock (https://www.statista.com/statistics/286444/england-number-of-private-rented-households/). Most properties in the private rental sector (PRS) are rented out by individual landlords, but companies also play a role.

[3] This is roughly 13% of all residential mortgage loans to individuals (including those to homeowners). The data are from the Bank of England and Financial Conduct Authority, MLAR Table 1.33.

[4] The importance of the links between real estate and mortgage markets was evident during the global financial crisis (see, Mian and Sufi (2011), Corbae and Quintin (2015), Adelino et al. (2016), Albanesi et al. (2022), among others).

[5] Recently, in the United States (US), there have also been significant increases in residential mortgage origination fees (CFPB, 2024).

September 2022 (the "event"). The proposed unfunded tax cuts were received with skepticism in the UK by bond markets and led to a sudden and unexpected large increase in interest rates. For instance, the 2-year swap rate increased from 4.44% the day before to 5.56% the day after the announcement. The effects on the cost of borrowing persisted for several months thereafter.

For both borrowers (real estate investors) and lenders, the spread between property yield and loan interest rate is an important metric, as it affects the ability to service debt and the expected equity returns. We show that, after a long period of stable rental yields and mortgage rates of roughly 5.5% and 3% respectively, the event triggered sharp increases in mortgage rates followed by smaller increases in rental yields. The much larger increases in mortgage rates than in yields led to sharp declines in interest coverage ratios (ICRs), which are one of the main criteria for loan underwriting.[6]

The regulatory framework enables the use of a difference-in-differences (DiD) empirical design that compares loans across both borrower and lender types. On the borrower side, we focus on the size—measured by the number of rental properties owned—with larger landlords deemed riskier by regulators and, as our analysis shows, paying higher interest rates than their smaller counterparts. On the lender side, we differentiate between those with high versus low ex-ante exposure to the BTL mortgage market relative to the owner-occupied sector, referring to them as specialist and non-specialist lenders, respectively.[7] Our empirical specifications control for several time-varying regional and property characteristics through the inclusion of high-dimensional interactive fixed effects.

We find that, after the event, there is significant deleveraging by all BTL borrower types and loan originations become concentrated among specialist lenders, who increase interest rates less than non-specialist ones. Focusing on differences between borrower types, we find that loan interest rates increase significantly less for large than for small landlords—particularly among specialist lenders. This highlights a differential pass-through of increased interest rates, with both lender and borrower heterogeneity playing an important role.

Additionally, we document significant effects on loan origination fees that impact the overall cost of loans. Post-event, specialist lenders increase fees more than non-specialist ones —particularly for larger (portfolio) landlords, for whom they increase interest rates less. In further analysis, we show how this substitution of a higher interest rate with a higher fee mitigates the

[6]The other main criteria is loan-to-value (LTV). We provide evidence on LTVs, but our focus is ICRs.

[7]All of our results are robust to an alternative classification of lenders into non-high-street and high-street. High-street lenders are primarily designated as such because they typically maintain a branch located on the high street and tend to have more diversified business activities than smaller lenders.

effects of the interest rate shock on ICRs, and allows specialist lenders to originate larger loans while meeting regulatory thresholds for loan underwriting. This novel evidence on fee–rate substitution as a tool to facilitate credit and loan underwriting at times of higher interest rates constitutes a first main contribution of the paper.

In terms of the economic magnitudes, in the pre-period, loans issued by specialist lenders to large borrowers are on average more expensive in interest rate (53.7 bps) and in initial fees (17.7 bps) than those originated by non-specialist lenders to the same borrower type. This pattern is consistent with specialist lenders expanding credit access to such borrowers but charging a premium for doing so. In the post-period, specialist lenders raise interest rates relatively less (-21.6 bps) but offset this with higher fees (43.6 bps) relative to non-specialists for the same borrower types. A back-of-the-envelope calculation shows that, after the event, specialist lenders become relatively cheaper: for a five-year fixed-rate loan that is refinanced after five years, dividing the initial fee change by five to convert it into an annual figure and adding it to the rate change yields 43.6/5 - 21.6 = -12.9 bps.[8]

It is well known that trading off fees against the loan interest rate can be used to screen borrowers with heterogeneous prepayment probabilities (early contributions include Brueckner (1994) and Stanton and Wallace (1998); recent evidence for the U.S. syndicated loan market is provided by Berg, Saunders, and Steffen (2016)). This is important, but not the mechanism at work in our setting. Typical UK mortgages feature an introductory period with fixed discounted rates at end of which prepayment penalties no longer apply and borrowers commonly refinance (Belgibayeva et al., 2025). Therefore, in our setting prepayment risk is limited, identifying the role of fees in credit facilitation. This role may also be at work in the US, given the recent increase in residential mortgage origination fees alongside the increase in interest rates (CFPB, 2024).

If fees are part of lenders' pricing strategy to facilitate credit access, they should be more prevalent where constraints bind more tightly— i.e., at lower ICRs and when interest rates are higher. In further analysis, we therefore examine how fees vary along the ICR distribution. Pre-event, fees are relatively flat across origination ICRs, though at a higher level for specialist than for non-specialist lenders. Post-event, fees increase for loans from both lender types; however, while fees charged by non-specialist lenders remain relatively flat in ICR, specialist fees increase much more at low ICRs, producing a steeply declining fee profile in ICR. In terms of economic magnitude, they vary from 200 basis points in the lowest ICR bucket to around

[8]The median loan in our sample has an initial fixed rate period of five years.

100 basis points in the middle of the distribution.

In further tests, we examine whether, after the event, specialist lenders are relatively more likely to originate loans to their existing borrowers or to new borrowers. To do so, we rely on whether a borrower already has another mortgaged rental property with the same lender, and find that specialist lenders are relatively more likely to lend to new customers, and this pattern strengthens after the event. In contrast, non-specialist lenders increasingly concentrate on existing customers in the post-event period. Thus, specialist lenders use pricing strategies not only to facilitate credit to existing borrowers, but also to acquire new customers. Together, these results provide additional support to the view that specialist lenders use fees to facilitate credit access at times of sharp increases in interest rates.

Loan originations are the result of supply and demand. While separating the two is challenging, we use our second main data set on the universe of loans *on offer* (menu of contracts) by each lender *on each day* during a two-year window around the event to shed further light on the supply side.[9] The key question is whether the loan outcomes observed after the credit tightening event stem solely from borrowers selecting among an unchanged menu of loan contracts, or whether they also reflect changes in product offerings. The high-frequency of the data and the unexpected nature of the event are particularly useful for identification.

The data show that immediately after the event both specialist and non-specialist lenders significantly reduced the number of loans they offer. In the subsequent weeks, as uncertainty subsided and lenders repriced their loans, the number of product offerings increased; however, the cost of borrowing remained significantly higher than before the event. Importantly, we find that, prior to the event, specialist lenders charged higher fees on loans offered to large landlords, and —unlike non-specialist lenders —they further increased these fees immediately (in the days) after the event. Although these results are consistent with the origination data, they are important since they provide evidence of adaptation by specialist lenders in their product offerings so as to protect their business during interest rate shocks and, in doing so, reinforce market segmentation. This novel evidence on how specialist lenders adjust product design in response to rate shocks to target specific borrower types—and its implications for credit market segmentation—constitutes our second main contribution.

Another important piece of evidence supports the narrative of lender adaptation to keep credit flowing. As part of the underwriting process, lenders must calculate a stress test ICR. Specialist lenders, on average, use lower interest rates in their stress testing and originate loans

[9]The data has been used by Coen, Kashyap, and Rostom (2023) and Benetton (2021) to study price discrimination in the UK residential mortgage market.

with longer interest rate fixation periods —for which the regulatory stress testing requirements are less stringent. After the event, specialist lenders increase the stress test interest rate applied to larger landlords less than that applied to small landlords, while the opposite is true for non-specialist lenders. These effects are visible in both the loan originations and the high-frequency loans on offer data.

Thus, our analysis uncovers significant credit market segmentation, with both borrower and lender heterogeneity playing important roles. Greenwald and Guren (2025) develop a model in which the effect of credit on house prices depends on the degree of segmentation in housing markets. Our analysis shows the importance of segmentation arising from credit markets, with differences in pricing and credit access strategies, and in responses to the credit tightening event across lender and borrower types.

The substitution of interest rates with fees allows specialist lenders to facilitate and sustain lending volumes during periods of rising rates, but it also exposes them to greater risks. In the last section, we therefore, examine the risk management of these lenders along two key dimensions. First, we examine the restrictions imposed on the maximum number of properties per landlord that lenders are willing to finance. We find that the proportion of loans offered by specialist lenders featuring such restrictions is smaller than that among non-specialist lenders, and it decreases immediately after the event. Second, we examine restrictions on the maximum advance amount (across all properties) that a bank is willing to lend to each borrower. We find that specialist lenders employ this tool to a much greater extent: over 95% of them impose such restrictions early in the sample, and although this proportion decreases slightly around the event, the average remains above 90%—significantly higher than that for non-specialist lenders.[10] These results show that specialist lenders set limits on the maximum amount lent to each landlord to mitigate borrower-specific risk, although these limits do not necessarily address aggregate sector risk.

Related Literature. Our paper is related to the literature that emphasizes the importance of fees in consumer credit (Stango and Zinman, 2014; Ru and Schoar, 2016), mortgage markets (Brueckner, 1994; Stanton and Wallace, 1998; Buchak and Jørring, 2025), and corporate credit (Berg, Saunders, and Steffen, 2016). Fees can be used to screen borrowers that differ in pre-payment risk, but also to target inattentive or unsophisticated borrowers who focus on the loan

[10] As far as maximum loan amounts are concerned, conditional on a restriction being imposed, they are roughly equal to an average of £4 (£2.7) million throughout the sample period for specialist (non-specialist) lenders, with no significant changes post event.

interest rate and ignore the fees. Relatedly, Benetton, Gavazza, and Surico (2025) show how, during a period of unconventional monetary policy, UK residential mortgage lenders substitute a higher interest rate by loan fees.[11] Their model estimates show that on average borrowers are more sensitive to interest rates than fees, particularly lower income and first-time buyers, which they hypothesize may result from borrowers shopping around for lower interest rate products, while paying less attention to fees.

While we also examine the role of fees in credit, and the trade-off between fees and interest rates, the mechanism behind this trade-off is novel, as it centers on ICRs and credit facilitation to real estate investors, in a rising interest rate environment. By focusing on the BTL market, where underwriting criteria are transparent and straightforward, we can identify the mechanism behind the substitution.[12] Our estimates reveal that lenders more dependent on the sector for their lending activities are more willing to adapt and substitute interest rates with fees to facilitate credit, particularly to the larger and presumably more sophisticated investors.

Our work contributes to the literature on role of lenders in the underwriting process and regulatory arbitrage in mortgage markets. Several papers in this literature have focused on non-traditional lenders such as non-bank mortgage originators (Demyanyk and Loutskina, 2016; Gete and Reher, 2021; Ganduri, 2023) and fintech firms (Buchak, Matvos, Piskorski, and Seru (2018)). Our key contribution is to show how lenders more exposed to a particular segment of the mortgage market, including also but not only non-bank lenders,[13] change loan features when interest rates rise so as to facilitate credit access and in this way counteract the negative effects of the reduction in loan volumes on their business activities. In this respect, our paper contributes to the literature studying gap filling behavior by lenders (e.g., Chen, Hanson, and Stein (2017), Gopal and Schnabl (2022), Berg, Fuster, and Puri (2022)) and to the large literature on credit expansion and underwriting standards in mortgage markets (e.g., Mian and Sufi (2009), Keys, Mukherjee, Seru, and Vig (2010), but see also Adelino, Schoar, and Severino (2016) for a different perspective).

The literature on bank specialization has highlighted the role of information advantage for lending activity, arising from industry-specific knowledge (Paravisini, Rappoport, and Schnabl,

[11] Their analysis covers the 2010-2014 period focusing on residential mortgages and the Bank of England Funding Lending Scheme.

[12] In the residential mortgage market studied by Benetton, Gavazza, and Surico (2025) lenders carry out an affordability assessment that takes into account income and committed expenditures, but the data on the latter is not available and the criteria used by lenders is not as transparent as in the BTL sector, that we study.

[13] Our sample of non-specialist lenders includes some non-bank mortgage originators, which are responsible for a relatively small but growing fraction of the lending volume.

2023; Blickle, He, Huang, and Parlatore, 2025),[14] and being particularly valuable at times of distress (Iyer, Kokas, Michaelides, and Peydró, 2022; Blickle, Parlatore, and Saunders, 2025). The specialist lenders that we study may possess information advantages in assessing the credit risk of large landlords.[15] However, since the loans in our sample are collateralized by residential real estate, with a maximum loan-to-value of 75 percent, information advantages likely play a smaller role than in uncollateralized lending (e.g., Berger, Frame, and Ioannidou (2011)). Nonetheless, our results highlight the importance of product design in targeting specific borrower types and, in doing so, reinforcing market segmentation.

Our focus on loan features means that our work is related to a large literature on mortgages that has, in the context of residential mortgage markets, studied mortgage fixation period (e.g. Koijen, Van Hemert, and Van Nieuwerburgh (2009); Campbell and Cocco (2003)), the role of house prices for borrowing behavior (Palmer, 2015; Fuster and Willen, 2017; Cloyne, Huber, Ilzetzki, and Kleven, 2019; Ganong and Noel, 2020), among others. In addition, and although the interest rate shock was not the result of monetary policy tightening, our analysis speaks to the role of mortgages in the transmission of monetary policy (Garriga, Kydland, and Sustek, 2017; Di Maggio, Kermani, Keys, Piskorski, Ramcharan, Seru, and Yao, 2017; Greenwald, 2018; Amromin, Bhutta, and Keys, 2020), on the less-studied market for mortgages among individual landlords who are significantly exposed to interest rate shocks.

Lastly, we contribute to the growing literature at the intersection of finance and real estate that explores the role of investor composition in rental markets. Most of this work focuses on institutional investors and their impact on neighborhoods and local housing affordability (Garriga, Gete, and Tsouderou, 2020; Gurun, Wu, Xiao, and Xiao, 2023; Austin, 2022).[16] The landlords that we study are different from these institutional investors; they are the so called "mom and pop" landlords and unlikely to have significant local market power. In this dimension our paper is closer to the small literature that focuses specifically on individual landlords, such

[14] See also, Paravisini, Rappoport, Schnabl, and Wolfenzon (2015).

[15] This mechanism could be tested by examining post-event changes in mortgage delinquencies across loans issued by specialist and non-specialist lenders to different borrower types. During our sample period, however, delinquencies were rare, which could indicate either that specialist lenders assessed risks effectively or that such risks simply did not materialize.

[16] See also Francke, Hans, Korevaar, and van Bekkum (2023) who examine a Dutch legal ban on buy-to-let investments that led to an increase in the share of first-time buyers, but did not have a significant impact on house prices. On the theory side, Favilukis and Van Nieuwerburgh (2021) develop an equilibrium model to study welfare effects of house purchases by out of town buyers. They find substantial increases in house prices and rents, which benefit owners but are detrimental for renters. LaPoint (2022) studies how property tax delinquencies facilitate institutional real estate investment in major U.S. metro areas with effects on gentrification.

as Bézy, Levy, and McQuade (2024) and Levy (2021), the latter studying housing policy in a model with home biased landlords. Our data includes a very precise location of both the rental property and the landlords' home, which we use to provide novel evidence on the magnitude of home bias.[17]

Our paper is organized as follows. Section 2 describes the data and the institutional setting. Section 3 studies market dynamics around the event, including on rental yields and interest rates. Section 4 is the main results section; it provides evidence on the interest rate pass-through to fees, how it differs across borrower and lender types, and of adaptation by specialist lenders to facilitate credit. Section 5 studies lender risk management. The final section concludes.

2 The data and underwriting criteria

2.1 Data sources

Our first main data source is an administrative dataset that includes loan level buy-to-let mortgage *originations* in the UK. Our second main data source is the Moneyfacts data that includes detailed information on buy-to-let mortgages *on offer* in the market in each day.

Buy-to-let (BTL) loan originations. The information is reported by lenders to the Bank of England and there were several phases in the data collection process. Phase 1 started in 2017 Q3. It was followed by phase 2, effective 2018 Q1, during which significantly more information was added to the data. We use data starting in 2018 Q1 and until the end of 2023 Q3.

The BTL data includes comprehensive information on all loans granted to individuals but not property companies. Because of this, and the focus of the analysis on individual landlords, we restrict the sample to those classified as "Individual" as identified in the data by the borrower sector variable. We also remove a small proportion (0.4%) of foreign currency (non-GBP) loans, entries with a zero interest rate (9 observations) and loans with a capped interest rate (48 observations). After removing these observations, the data includes roughly 1.2 million loan originations.

Figure 1, Panel (a) plots the time series evolution of the number of loans originated in each quarter. There was a significant decline in the second quarter of 2020, the result of Covid-

[17] See also Gargano and Giacoletti (2022) for an analysis of how Australian landlords value the income paying nature of the properties, and how the low interest rate environment that prevailed between 2016 and 2019 has coincided with a substantial increase in the share of landlords.

19.[18] The decline in loan origination was significantly larger in the period after the mini-budget announcement, marked with a dashed vertical line, from roughly sixty thousand in 2022 Q3 to roughly half of this value in 2023 Q3.

[Insert Figure 1 here]

During our sample period, roughly two thirds of the loans are remortgages. Most UK mortgages have an initial period (typically between 2 and 5 years) of fixed and discounted interest rate, at the end of which it reverts to a higher variable rate. It is fairly common for borrowers to refinance at the end of this initial period. The second largest category are loans for property acquisition, with roughly three hundred thousand entries (25% of the total).[19]

The BTL data does not include the exact property address, however, it does include its postcode and a typical UK postcode only includes 15 properties. The sample includes roughly 490,000 unique property postcodes, which is a lower bound for the number of unique properties covered by the data.

Buy-to-let (BTL) loans on offer. The Moneyfacts data includes loan-level daily information on all loans available in the market, including the identity of the lender offering the product, loan type (e.g. initial period of interest rate fixation), interest rate, the maximum loan-to-value and other qualifying criteria, loan fees, among other. We have data from the beginning of September 2021 to the end of our sample period, roughly twelve months before and after the event, corresponding to 2.05 million product-day observations. The underwriting criteria that we explain below determines whether borrowers qualify for the loan, but conditional on borrowers qualifying, it does not affect the loan interest rate. Furthermore, interest rates vary by loans on offer but there is no differentiation across borrowers taking a given loan.

2.2 Buy-to-let loan originations

The origination data includes a variety of property, loan and borrower information. We describe the information that is relevant for the analysis.

[18] In the UK, the first lockdown was announced on 23 March 2020 and most legal restrictions ended by March 2022.

[19] Other quantitatively less important but still relevant types are further advances (additional borrowing from existing lender, roughly 5% of the total) and let-to-buy loans —loans taken by those who decide to rent out their current home (roughly 4% of the total).

Property. The data includes information on property value. Among loans that were originated for property acquisition, the property value is equal to the purchase price and for the remainder loan types, it is a value determined through an appraisal. The average (median) property in our sample is worth £268 (£210) thousand. The mean (median) monthly rental income is £1,050 (£850). We calculate rental yields by multiplying monthly rent by twelve and dividing by property value:

$$\text{Rental yield} = \frac{\text{Annual rental income}}{\text{Property value}}. \tag{1}$$

The mean (median) rental yield is 5.3% (5%), but there is significant heterogeneity. Percentiles 10 and 90 are 3.8% and 7.2%, respectively.

[Insert Table 1 here]

There is information on several property characteristics, including type (detached house, semi-detached house, flat, etc), whether it is a new or existing dwelling, number of bedrooms (the mean (median) number is 2.47 (2)), and whether the property is in multiple occupation (multiple tenants, each renting a room directly from the landlord).

Loan. In addition to the previously mentioned origination date and loan type (property acquisition, remortgage, etc), the data includes information on the regulatory framework that applies —Financial Conduct Authority (FCA) or Prudential Regulation Authority (PRA) regulated, the implications of which are discussed in section 2.3.[20] The mean (median) loan amount is £154 (£124) thousand.

For each loan, we calculate the loan-to-value (LTV) ratio by dividing loan amount by property value:

$$\text{LTV} = \frac{\text{Loan amount}}{\text{Property value}}. \tag{2}$$

The typical maximum LTV on BTL loans is 75%, and this is reflected in its distribution. The mean (median) LTV is 61% (66%), percentile 75 is 75%, and percentile 90 is 75.7%. The initial loan fees (on average equal to £1,317) may be added to the outstanding loan balance (capitalized), leading to LTVs just above the 75% threshold.[21]

[20] The FCA regulates the UK financial services industry with a focus on consumer protection. The PRA is part of the Bank of England and it is responsible for the regulation of banks, building societies, credit unions, insurers and major investment firms. In our sample, there is small but increasing number of loans provided by lenders that do not fall under the supervision of either the FCA or the PRA. We give further details below.

[21] The average value of the loan fees that are capitalized is £932, reflecting the fact that they are indeed capitalized for a large proportion of loans.

The typical BTL loan is characterized by an initial period of significantly discounted and fixed interest rate, at the end of which it reverts to a higher variable rate (the reversion rate, equal to an index plus a premium). The mean (median) discounted rate in our sample is 2.63% (2.34%), reflecting the low interest rate environment that characterizes the early part of the sample period. The corresponding values for the reversion rate —calculated at loan origination, i.e. using the values of the index at this point —are 5.10% (4.99%).

The vast majority of BTL borrowers (roughly 96%) take loans with an interest rate that is fixed during the discounted period (the remainder 4% opt for floating rate). The typical length of this initial period is between 2 and 5 years: percentile 25 of the distribution of fixation term is 2.08 years increasing to 4.9 at the median (and to 5.18 years for percentile 90). Roughly 4 in 5 loans are interest only (IO), i.e. they involve no amortization of principal. The average mortgage term is roughly 21 years, but there is considerable heterogeneity; percentile 10 is only 12 years and percentile 90 is 30 years.[22]

There are at least two key reasons why most borrowers opt for IO loans. First, landlords benefit from mortgage interest tax deductibility. Prior to April 2017, they did so at their marginal tax rate. But a reduction in tax benefits was phased in over the following three years, and from April 2020 landlords only benefit from interest tax deductibility at the basic tax rate of 20%.[23] Second, IO loans have lower debt servicing requirements, releasing capital for other uses.

Roughly one-third of BTL borrowers extract equity when remortgaging. Among these, 18.9% do so to make improvements to the rental property and 28.1% to expand or re-leverage their portfolio. The remaining 53% obtain extra funds for other use —not specified in the data, but which include consumption or investments other than in property.

Borrower. BTL borrowers are on average (at the median) 47.1 (47) years old, but there is considerable heterogeneity. Percentile 10 (90) of the age distribution is 33 (63) years. There is information on borrower income and tax rate, but it is not comprehensive and available for 42.7% and 50.4% of the observations, respectively. The average (median) income is £65,010 (£42,400). The average (median) tax rate is 28% (20%).

The data also has information on credit scores. For the majority (71%) of loans, lenders use internal scores to assess credit risk. External agencies such as Equifax, Experian and Callcredit

[22]Note that the term only has a direct impact on the required debt servicing for the 20% of principal repayment loans.

[23]This change implies a reduction in the benefits of debt financing for those in the 40% and 45% tax brackets. See https://www.gov.uk/government/news/changes-to-tax-relief-for-residential-landlords.

(now TransUnion) are used in 7.9%, 9.1% and 2.2% of the originations, respectively.[24] Since lenders and agencies rely on their own specific scoring system and scale, the credit score values included in the data are not directly comparable across providers.[25]

In addition to the rental property postcode, the data includes the borrower's residence postcode, which we use to calculate distance. Recall that a typical postcode only includes 15 properties, so that we are able to do so with a high degree of precision. We use the Office of National Statistics Geographical data and calculate distance as "the crow flies," following Vincenty (1975). The median value is only 5.4 kms. Percentiles 25 (75) are 1.5 (21) kms. Therefore, the vast majority of landlords invest locally and hold geographically undiversified real estate investments.

Lender. The data identifies the lender for each loan that we use to construct two groups of lenders according to their exposure to the BTL segment of the mortgage market. First, for each unique lender in the BTL origination data, we obtain its loan origination volume in the owner-occupied segment of the residential mortgage market.[26] We then calculate, for each lender, and for loans originated between January 2018 and December 2019, the total BTL loan volume as a share of the total residential mortgage loans (including the BTL and owner-occupied segments). This is a measure of the relative importance of the BTL segment of the mortgage market for lenders. The median share, calculated across all lenders, is 28.14%. We designate lenders with a share of BTL lending above the median as specialist, reflecting their specialization in the BTL sector, and the remainder as non-specialist.[27] Specialist lenders are responsible for 29.7% of the BTL loan volume during the first two years of the sample.

We are interested in studying how specialist and non-specialist lenders respond to the events triggered by the mini-budget announcement in September 2022. Thus, we use loans originated early on, and several years before the event, to classify lenders. As further robustness, we

[24]For the remaining roughly 10% loans a credit score is not used.

[25]Roughly 0.34% of the loans are granted to borrowers who have been in arrears on a previous or current mortgage or another loan within the last 2 years, where arrears is defined as three or more months of missed payments. There are a further 17 loans to borrowers who have been subject to a bankruptcy or debt relief order in the last 3 years (0.0014% of the total) and 40 loans to borrowers who have been subject to an individual voluntary arrangement within the last 3 years (0.0033% of the total).

[26]In the BTL data, there are 57 unique lenders over the whole sample period. In order to measure their loan originations in the owner-occupied segment of the residential mortgage market, we use the Product Sales Data (PSD001), an administrative dataset collected by the FCA.

[27]During the January 2018 to December 2019 period, 48 out of the 57 unique lenders originated at least one BTL mortgage. We do not classify the 9 lenders that did not originate any BTL mortgage during these initial two years of our sample.

show that the results are not sensitive to the specific definition but holds more broadly when we classify lenders into high-street (largest seven lenders with a high-street branch presence) and non-high-street, a classification that has exhibited little or no change over the years (Coen et al., 2023). Naturally, there is some overlap between these classifications: all of the high-street lenders are included in the sample of non-specialist lenders.

2.3 Underwriting criteria and the importance of landlord type

The main underwriting criteria are LTV and an affordability assessment. The typical maximum LTV is 75% and lenders do not deviate from this maximum. The affordability assessment examines ICRs, borrowers' credit history and it may also take into account borrowers' other income.

The underwriting criteria depends on the type of loan/borrower and the regulations that apply. In our data, roughly one in five loans are classified as Consumer buy-to-let mortgages and are regulated by the FCA. Most of the remaining four-fifths fall under the supervision of the PRA, except for those originated by shadow lenders.[28] There are three types of loans/landlords, as follows:

Accidental landlords. Consumer buy-to-let mortgages are subject to FCA regulations. They are for "accidental" landlords, meaning individuals who have become a landlord as a consequence of events. The rented property has been lived in by the borrower or by a member of his/her family (or has been inherited), and has not been purchased by the landlord with the intention of renting it out. The rental income from the property is not intended to be the main source of borrower income, and personal income (other than rental income) may be taken into consideration in the underwriting process, similar to a residential mortgage.

Intentional landlords. Landlords who bought a property with the intent of renting it out are considered by the regulatory framework to be "professional" landlords. Therefore the main distinction relative to accidental landlords is their intent. Although they are called "professional," most are the so called mom-and-pop landlords and we refer to them as intentional.

The Supervisory Statement SS13/16 of September 2016 sets minimum underwriting standards for BTL mortgages that are not classified as consumer buy-to-let. In particular, the document gives guidance on the underwriting affordability criteria that must be used by lenders operating in this segment of the market, including interest coverage-ratio (ICR) stress tests.

[28] There is a residual category of less than one percent of other loans that we drop from the sample.

ICRs are calculated from rental income, interest rates and loan amount using:

$$\text{ICR} = \frac{\text{Annual rental income}}{\text{Interest rate} \times \text{Loan amount}}. \tag{3}$$

The industry standard is to set the minimum ICR threshold to 125% for lower rate tax payers (20% tax rate) and 145% for higher tax rate payers (40% tax rate). The PRA does not prescribe a minimum ICR, but states that it does not expect it to be lower than this industry standard. Consistently, lenders in our sample do not deviate from this guidance.

When assessing affordability, lenders should take into account the effects of likely future increases in interest rates (using market expectations) over a minimum period of five years (unless the interest rate is fixed or capped for a period of five years or more). They should do so by using a stress test interest rate that takes into account market expectations of future interest rates and a minimum 200 basis points increase in mortgage rates. A minimum stress test interest rate of 5.5% should be used, unless the interest rate is fixed or capped for a period of five years or more, in which case stress testing is not required.

Portfolio landlords. Those borrowers who own (wholly or in part) four or more mortgaged rental properties (across all lenders) are classified as "Portfolio landlords" (Supervisory Statement SS13/16). Therefore, portfolio landlords are essentially large landlords who finance their property investments with debt. Roughly one in five of the loans originated in our sample are for portfolio landlords, who are subject to additional underwriting tests. In particular, SS13/16 point 4 specifies that lenders should have adequate risk management and controls for lending to portfolio landlords, and actively manage maximum LTV and minimum ICR, portfolio concentration and exposure to high risk segments. Therefore, the regulatory framework views loans given to portfolio landlords as being riskier than those given to other landlord types.

Banking regulations typically view the BTL segment of the mortgage market as being riskier than the owner-occupied sector. In particular, Basel III assigns risk weights that depend on the LTV of the loan and on whether the loan is secured by an owner-occupied property or an investor property (the latter is defined as a "real estate mortgage that is dependent on the cash-flows of the real estate"). Loans secured by investor properties are assigned risk weights 10 to 35 percent higher than loans secured by owner-occupied properties.[29] Within the BTL

[29]For example, for a 75% LTV loan the risk weight is 30% for a loan secured by a owner-occupied property and 45% for one secured by a rental property. This translates into capital requirements of 3.15% and 4.73%, respectively (see for example Goodman and Zhu (2023)).

segment, Basel III does not distinguish between loans granted to accidental, intentional and portfolio landlords. However, as explained above, the PRA regulations do so, which may affect different lenders' willingness to grant loans. Our analysis will compare loans by different lenders to different landlords and how the loan characteristics changed after the interest rate shock. But before we do so, we first focus on borrower heterogeneity.

Panel (b) of Figure 1 plots the proportions of loans granted to each landlord type. They remained relatively stable throughout, with roughly 60% granted to intentional landlords, and 20% to accidental and portfolio landlords each.

With the information on underwriting criteria in mind, we consider the type of affordability assessment used by lenders in practice. For the majority of loans (83%), lenders rely solely on ICRs. For an additional 8.6%, they rely both on ICRs and borrowers' income. For 6.4% they rely solely on borrowers' income. Finally, for 1.9% of the entries the affordability of the mortgage is assessed more widely. Therefore, ICRs have a prominent role in the process, and the vast majority of lenders rely solely on these.

Table 2 shows summary statistics for several variables of interest, by landlord type. Panel A shows that larger landlords achieve higher rental yields. Panel B shows fairly high mean origination ICRs due to the low-interest rate environment that characterized the early part of our sample (444% for accidental, 415% for intentional and 406% for portfolio landlords). The corresponding percentile 10 values are 205%, 206% and 190%, respectively. Naturally, the values will be considerably lower in the more recent period.

[Insert Table 2 here]

The data has information on the stress tested interest rate used by the lender, that we use to calculate stress tested ICRs. The mean stress tested interest rate is 5.23% for accidental, 5.19% for intentional, and 4.96% for portfolio landlords. The respective mean stress tested ICRs are 218%, 212% and 253%, respectively. (The percentile 10 values are 124%, 125% and 139%). Therefore, loans to portfolio landlords have on average higher stress tested ICRs, even though they have lower origination ICRs. They also have higher origination fees.

Panel C summarizes borrower characteristics, by landlord type. Portfolio landlords are on average older, have higher income and face higher marginal tax rates than intentional landlords. The same patterns hold when comparing intentional and accidental landlords, but the differences are smaller. Accidental landlords own on average 1.42 (median 1) mortgaged properties, intentional landlords own on average 1.72 (median 2) mortgaged properties, and portfolio

landlords own on average 8.4 mortgaged properties (median 6, percentile 90 equal to 13). Therefore, portfolio landlords own on average a significantly larger number of properties than other landlord types.

The distances between rental property and landlord home are consistently small for all landlord types. For instance, the median distances are 5.2, 5.3 and 6.2 km for accidental, intentional and portfolio landlords, respectively. We report additional descriptive statistics by landlord type in Appendix Table IA.A1.

2.4 ICRs and maximum loan amounts

Lenders are compensated through the loan interest rate premium and loan fees with both, ceteris paribus, contributing positively to lender profitability. In this section, we show how, in the presence of ICR constraints, increasing fees and keeping interest rates lower has an impact on maximum loan amounts (or, for a given loan amount, it improves ICRs).

As a simple example, consider a property that generates 1 of annual rental income. Assume that the loan is interest-only, with an initial period of discounted rates of 5-years at the end of which it is refinanced, and a minimum ICR of 1.25. As baseline, consider a loan interest rate of 2.5% and an initial fee of 0. Assuming that the LTV constraint is not binding, the maximum loan amount determined by the ICR constraint below is 32:

$$\text{ICR} = \frac{1}{2.5\% \times \text{Max loan amount}} \geq 1.25. \tag{4}$$

We compare this loan to an alternative with initial fees of 1%, but with interest rate of 2.3% (20 basis points lower, or 1% divided by the 5 years of the loan). We assume that the initial fee is added to the loan amount. In this case, the maximum loan amount determined by the ICR constraint is 34.438, calculated from $1/(1.25 \times 2.3\% \times 1.01)$, where the last term in the denominator reflects the interest payments required on the fee that is added to the loan balance. Therefore, increasing loan fees with a corresponding decline in the interest rate relaxes the ICR constraint, and allows for a significant 7.62% increase in the maximum loan amount. Naturally, for this to work, the LTV constraint cannot be binding. During periods of rising interest rates, ICR constraints are relatively more likely to become binding.[30] We will return to this example later on in Section 4.5.

[30] In the BTL market, loan fees can be added to the outstanding loan balance, even if that brings the loan over the maximum LTV.

3 Market dynamics around the event

In this section, we characterize the event and its effects on rental yields, mortgage rates, origination LTVs and ICRs.

3.1 The event

In order to identify the effects of tighter credit conditions, we rely on the mini-budget announcement of September 23, 2022. It was in a first instance a fiscal event: the UK chancellor unexpectedly announced a "Growth Plan" that consisted of large unfunded tax cuts to promote economic growth,[31] but it had significant credit market effects.

It is relevant to understand the backdrop against which the mini-budget announcement took place. After a period of low inflation and interest rates, inflation started increasing rapidly in the third quarter of 2021. This was followed in early 2022 by increases in the Bank of England base rate and mortgage rates.[32] The unexpected announcement of the plan in September 23 was received with skepticism by markets and it quickly translated into a large unexpected deterioration in credit conditions, visible in several mortgage market metrics.

Panel (a) of Figure 2 plots the daily number of different BTL mortgage products on offer by all lenders and the average initial interest rate on these products (both calculated from the Moneyfacts data), for the 12 months before and after the event. The vertical line in the figure marks the mini-budget date. Interest rates were already increasing and the number of products on offer declining prior to the event, but the event itself led to sudden steep declines in the number of products on offer and steep increases in interest rates. We exploit these steep changes and their differential effects on heterogeneous borrowers and lenders for identification.

[Insert Figure 2 here]

Panel (b) plots a Google trends search of the term "Mini-budget." While mini-budgets tend to occur every six months, they do not attract nearly as much attention as the one that we exploit. Furthermore, the large spike in searches exactly at the time of the event reveals its unanticipated nature. The UK Chancellor resigned on October 14 and this was followed by the resignation of the Prime Minister on October 25. Over the weeks that followed the new

[31] The tax cuts included bringing forward the planned decrease in the basic rate of income tax from 20% to 19%, abolishing the highest marginal rate of income tax of 45%, reversing planned increases in corporation tax and national insurance, and abolishing a proposed Health and Social Care Levy.

[32] Appendix Figure IA.A1, Panel (a) plots the time series of several economic variables over the sample period.

UK chancellor announced a reversal of the mini-budget policies. Even though the uncertainty reduced and the number of products on offer recovered, mortgage rates remained significantly higher than their pre-event levels.[33]

Our empirical approach compares loans originated before and after the event to different landlord types by different lenders using an event-study specification. For parts of the analysis, we use the whole sample but for others we focus on the loans originated in the 12 months before and after the event. It is important to note that interest rates were already increasing before the event, which will be reflected in the loans originated in the pre-event period. But as Figure 2 makes clear, the event triggered a sudden unanticipated and large deterioration in credit conditions, on which we rely for identifying the different dimensions of response by lenders and borrowers. In our empirical strategy, we exploit heterogeneity in borrower size and lender exposure, that aids in identifying the effects of higher interest rates.

The origination data includes the date on which the loan was completed, but not the date on which the mortgage offer was initially received by the borrower. Mortgage offers are typically valid for up to three months after they are received, with borrowers choosing whether or not to accept them. This means that many of the loans originated immediately after the event will be based on pre-event terms, and it may take up to a quarter for the credit effects of the event to be fully reflected on new originations. This is also the reason why, as Figure 1 shows, the more significant decline in the number of loan originations takes place only in the first quarter of 2023. The Moneyfacts data on the loans on offer on each day allows us to shed light on changes in product design around the event.

3.2 Rental yields and loan interest rates

Landlords typically use the rental income generated by the property to service the loans. Panel (a) of Figure 3 plots the times series evolution of average rental yields (in percent), by landlord type. Rental yields were fairly stable throughout the sample period until the event quarter (marked by a vertical line), after which they started increasing.[34] In the cross-section of land-

[33]Panel (b) of Appendix Figure IA.A1 plots the daily UK policy uncertainty index to show that although the period after the event was characterized by significant uncertainty, within 90 days of the event it was back to pre-event levels.

[34]In Appendix Figure IA.A4 we decompose the evolution of rental yields into the evolution of rents and property values using an event study specification. Prior to the event rents and values increased in tandem, reflecting a cash-flow channel in property valuation. After the event even though rental income continues to grow, property values stopped increasing. The increase in interest rates that operates through a discount rate channel more than offsets the positive valuation effects of higher rents.

lord types, rental yields are on average lowest for accidental landlords, followed by intentional landlords, and highest for the larger portfolio landlords. This suggests that, ceteris paribus, portfolio landlords are in a better position to service the loans, and this was the case both pre- and post-event.

[Insert Figure 3 here]

Further, we study rental yields in a regression framework to better control for heterogeneity on several dimensions that might help explain the differences across borrower type. The unit of observation is the rental yield on property i, located in local-area j, and used as collateral for the loan originated at time t. We construct indicator variables for landlord type, Intentional_{ijt} and Portfolio_{ijt}, and estimate regressions of rental yield on these dummies and other control variables (the X_{ijt} and ω_{jt} terms):

$$\text{Yield}_{ijt} = \alpha + \beta^{\text{Intentional}}\text{Intentional}_{ijt} + \beta^{\text{Portfolio}}\text{Portfolio}_{ijt} + \gamma X_{ijt} + \omega_{jt} + \epsilon_{ijt}, \qquad (5)$$

where ϵ_{ijt} is the error term. In the first column of Panel A of Table 3 we do not include any controls, so that the estimated coefficients on the landlord type dummies capture differences in unconditional averages and the constant the mean for the base group which is accidental landlords. They imply average rental yields of 4.87% for accidental landlords, 5.33% for intentional landlords, and 5.62% for portfolio landlords. These differences are economically meaningful and statistically significant.

[Insert Table 3 here]

We attempt to shed light on the drivers of these differences. First, there may be differences in yields across property types, with different landlords selecting into different types. In column (2) we add indicator variables for property type (Detached, Terraced, and Other, with flats as base group) and number of bedrooms. There are small decreases in the estimates for portfolio and intentional dummies, reflecting the fact that different landlord types select properties with different characteristics.[35] Second, there may be differences in yields across property location and the areas that landlords select into. In column (3) we add local area fixed effects to the set of explanatory variables. The geographical unit is a local authority, with 400 local authorities in

[35] Although not reported in the table, our estimates imply rental yields that are roughly 90 basis points lower for detached houses than flats.

the whole of the UK. There is a very large increase in the explanatory power of the regression, as measured by Adjusted-R^2, from 0.06 in column (2) to 0.40 in column (3), showing that location is an important determinant of yields.[36] In column (4) we add time (quarter) fixed effects to the regressions, but excluding local area fixed effects. The estimates and explanatory power of the regression are similar to those in column (2). In column (5) we add the interaction of local area and time fixed effects, with estimates similar to those in column (3). This shows that the cross-sectional variation in rental yields in our sample is significantly larger than the time-series variation. In order to characterize the latter, we estimate the following event-study specification:

$$\begin{aligned}\text{Yield}_{ijt} = &\sum_{k\in\{2018Q1,2023Q3\}} \beta_k^{Intentional} \cdot D_k \cdot \text{Intentional}_{ijt} + \\ &\sum_{k\in\{2018Q1,2023Q3\}} \beta_k^{Portfolio} \cdot D_k \cdot \text{Portfolio}_{ijt} + \gamma X_{ijt} + \omega_{jt} + \epsilon_{ijt},\end{aligned} \tag{6}$$

where as before i is the property used for collateral, j is the local-area where the property is located, t origination quarter, X_{ijt} is a vector of other explanatory variables, ω_{jt} are local-area fixed effects and ϵ_{ijt} is the residual.[37] The estimated coefficients on the landlord type dummies show the additional yield achieved by each of these landlord types relative to the base group, which is accidental landlords, in event time. Standard errors are clustered at the local area level.

Panel (b) of Figure 3 plots the estimated regression coefficients and corresponding confidence intervals for the interaction terms. The base quarter is the mini-budget event date of 2022/Q3. The estimated coefficients post-event are not significantly different than the pre-event ones. Therefore, even though there are cross-sectional differences across landlord types, and portfolio landlords are able to achieve higher yields on their assets, the nature of these differences did not significantly change post-event, reducing the likelihood that changes in loan interest rates are due to changes in rental yields.

To study whether landlords of properties with higher or lower yields tend to take loans from certain lenders, in the last column of Panel A of Table 3 we add lender fixed effects. There

[36] In Appendix Figure IA.A3 we plot average rental yields by geography and landlord type. Rental yields are lower in London and the South East, reflecting the higher level of house prices in these areas. There are interesting differences across landlord types. Portfolio landlords achieve significant higher yields on properties located in the North of the country than accidental landlords.

[37] As before, we control for property characteristics such as the number of bedrooms and the type of property.

is a small increase in the Adjusted-R^2 and a small decline in the estimated coefficients on the landlord type dummies suggesting that this is not economically very important. Put differently, lender selection effects are already captured by the other variables included in our empirical specification.

We now focus on the loan interest rates. In Panel (c) of Figure 3, in addition to rental yields, we plot the time series evolution of the average interest rate for loans originated in each quarter. Interest rates were fairly stable at an average below 3% prior to the event, generating spreads between rental yields and interest rates of between 250 and 300 basis points. This changed dramatically after the mini-budget announcement: interest rates increased rapidly leading to a significant narrowing of spreads. This is in spite of the increase in rental yields, which as the graph shows, was an order of magnitude smaller than that of mortgage rates. The narrower spreads makes the property investments less attractive for landlords and the loans riskier for lenders. In terms of differences across landlord types, the figure shows that prior to the event, mortgage rates were on average higher for portfolio than for intentional landlords, which in turn were slightly higher than those charged to accidental landlords. After the event, the differences appear to quickly narrow.

We estimate similar regressions to those previously estimated for rental yields (Equation 5), but with the loan interest rate as dependent variable. In the UK mortgage market loan pricing is mainly by LTV band. Therefore, in all of the specifications we also control for LTV using dummies (LTV less than 55, (55-65], (65-75] and greater than 75).[38]

The first column of Panel B of Table 3 shows that interest rates were on average 27 (7) basis points higher for portfolio (intentional) landlords than the base group of accidental landlords. When we control for property characteristics and local area fixed effects, these differences become slightly smaller, equal to 22 (6) basis points (column 3). Controlling for origination quarter significantly improves the explanatory power of the regression, but the estimated coefficient on the portfolio dummy is almost unchanged at 22 basis points (column 4). In column (5), we interact origination quarter with local area, and the interest rate difference becomes 19 (3) basis points for portfolio (intentional) landlords. Therefore, across all these specifications, we find that portfolio landlords pay on average higher interest rates than other landlords. This is consistent with loans given to portfolio landlords being riskier than those given to other landlord types.

In order to study the evolution of interest rates across landlord type over time, we estimate

[38]A credit risk assessment focused on interest coverage ratios is done to decide whether to grant the loan, but conditional on loan approval, the assessment does not impact the loan interest rate.

an event-type specification (as in Equation (6)). Panel (d) of Figure 3 plots the estimated coefficients and their corresponding 95% confidence intervals. They show that prior to the event interest rates were higher for portfolio landlords followed by intentional. However, post-event the interest rate differences became negative, with particularly large changes from pre- to post-event for portfolio landlords. In other words, the interest rate increases post-event were relatively smaller for the larger landlords.

In the last column of Panel B of Table 3 we include lender fixed effects. There is a large increase in Adjusted-R^2 from 0.54 to 0.79 and the estimated coefficient on the portfolio dummy becomes significantly smaller and equal to only 3 basis points. This suggests that there is significant variation across lenders and landlord types that is correlated with the interest rates that they pay on their loans. In the next section, we explore the nature of this variation.

3.3 Origination LTVs, ICRs, and Fees

Figure 4 provides evidence on the main criteria for loan underwriting, namely LTVs and ICRs. Panel (a) plots the quarterly evolution of average LTVs. They were fairly stable before the event, at values slightly over 60% for portfolio and intentional landlords, and roughly 5 percentage points lower for accidental landlords (Recall that the maximum LTV for BTL is 75%). However, there is significant deleveraging after the event, slightly larger for accidental than the other landlord types.

[Insert Figure 4 here]

Panel (b) plots the ICRs calculated using both the loan interest rate (ICR origination) and the stress test rate (ICR stress). Origination ICRs were above 400% for much of the sample period, but declined steeply as interest rates rose. In contrast, the ICRs calculated using stress test interest rates remained relatively stable throughout, including after the event. This is the result of the significantly lower increase in stress test interest rates compared with the loan rates combined with the post-event reduction in leverage. We investigate this further in the analysis that follows. The sharp decline in origination ICRs starting in the second quarter of 2022 makes ICR constraints more likely to bind.

Panel (c) plots quarterly evolution of average fees, by landlord type. Average fees are fairly stable in the first part of the sample, and higher for portfolio and intentional than accidental landlords. The gap between portfolio and the other landlord types increases in the second quarter of 2022, and becomes particularly large in the quarters after the event, with an average

difference of around 60 basis points. In the next section, we explore the role of this change in fees in credit facilitation and study how it varies with lender type.

4 Lender heterogeneity and credit facilitation

The results in Panel B of Table 3 show that there is significant variation in loan interest rates across lenders that is correlated with landlord type. In this section we shed light on the nature of this variation, by considering the two groups of lenders that we have previously defined: specialist lenders, with a high exposure to the BTL market as measured in 2018 and 2019, and the remainder (non-specialist). Figure 5 plots the number of loans granted by each of the lender types in each month, focusing on the year before and after the event.

[Insert Figure 5 here]

The number of originations is fairly stable in the year preceding the event, but there are significant drops starting in December 2022. This is two months after the event and it may in part due to some borrowers having had pre-approved loan offers before the mini-budget announcement, with the corresponding loan originations occurring later.[39] Although the number of originations decreases for both lender types, the decline is much more pronounced for non-specialist than specialist lenders. In Appendix Figure IA.A5 we compare origination volumes in the 12 months before and after the event, distinguishing lenders further among big 7 banks, smaller banks, building societies and shadow banks. The largest decline is among the non-specialist big 7 banks, compensated by an increased importance of specialist building societies and small banks.

4.1 Loan characteristics by lender type

To shed light on the variation in loan characteristics across lenders and landlord types, in a first step, we present summary statistics for several variables of interest dividing the sample between loans originated by specialist and non-specialist lenders.[40] Panel A of Table 4 shows the results

[39]The process is such that borrowers approach lenders for an offer. The loan offer is typically valid for a period of 3 months before it expires. This means that those borrowers who requested offers prior to the mini-budget announcement may have decided to go ahead after the announcement, in which case they were borrowing at the lower pre-event interest rate.

[40]We distinguish between loans originated in the 12 months before and the 12 months after the event but the conclusions are similar if we include the full sample in the pre-event data.

for the pre-event period. Column (1) shows that a smaller proportion of the loans originated by non-specialist lenders (15%) are granted to portfolio landlords than the corresponding figure for loans originated by specialist lenders (35%). Specialist lenders charge on average higher interest rates to all landlord types but the average LTVs are broadly similar across across lender types (for each landlord type, columns 2 and 4 respectively).

[Insert Table 4 here]

As part of the underwriting process, lenders carry out an affordability assessment calculating ICRs with the initial loan interest rate and a stress tested one. The average values of the stress test interest rates are shown in column (3) of Panel A of Table 4. Calculating their difference relative to the loan interest rate, gives values for specialist lenders of 2.23%, 1.97% and 1.82% for accidental, intentional and portfolio landlords. The corresponding differences for non-specialist lenders are 2.76%, 2.86% and 2.43%, respectively. Therefore, specialist lenders use less stringent stress testing, which can be partly explained by the longer fixation terms of the loans that they grant (column 5). As explained in section 2.3, a less stringent stress testing is required for loans with an interest rate that is fixed for 5-years or longer.

Lenders are compensated through the interest rate premium and loan fees. Column (6) shows average loan fees calculated as a proportion of loan amount. Panel A shows that, within lender type, and in the pre-event period, loan fees are highest for portfolio landlords, followed by intentional and accidental landlords. Loan fees are significantly higher for loans granted by specialist than non-specialist lenders.[41]

Panel B shows averages for loans originated post-event and Panel C the differences in the averages post- minus pre- (Δ post-period). There were decreases in the number of loan originations, but smaller in percentage terms among specialist than non-specialist lenders. The increases in interest rates, both initial and stress test, were smaller among specialist than non-specialist lenders, and smallest for loans granted by specialist lenders to portfolio landlords (Panel C, columns 2 and 3). This differential increase in loan interest rates does not seem to be explained by the changes in LTV (column 4).

Interestingly, column (6) of Panel C shows that the increases in loan fees have patterns that are the mirror image of the increases in loan interest rates shown in column (2): the increases in

[41] Higher higher origination fees when paid upfront reduce the cash-flows that borrowers receive. In the BTL market origination fees are often capitalized i.e., added to the outstanding loan balance. Over the whole sample period, the proportions of loans with capitalized fees are 0.58 for accidental, 0.59 for intentional, and 0.67 for portfolio landlords.

fees are higher among specialist than non-specialist lenders, and highest among loans granted by specialist lenders to portfolio landlords.

4.2 Interest rate pass-through to fees

The summary statistics shown in the previous section point towards a substitution of interest rates by fees, with a degree of substitution that varies with lender and borrower type. In this section, we estimate the degree of substitution using regression analysis and provide evidence on its role in facilitating credit access by specialist lenders to larger landlords.

4.2.1 Across lender type variation

We estimate how the interest rate (and origination fees, which are the dependent variables in the regressions) differ across borrower and lender types, before and after the event, using dummies for their types and for post-event observations:

$$\begin{aligned} \mathrm{y}_{ijt} = \beta_0 + \beta_1 \mathrm{Specialist}_{ijt} + \beta_2 \mathrm{Portfolio}_{ijt} + \beta_3 \mathrm{Intentional}_{ijt} \\ + \beta_4(\mathrm{Portfolio}_{ijt} \cdot \mathrm{Specialist}_{ijt}) + \beta_5(\mathrm{Intentional}_{ijt} \cdot \mathrm{Specialist}_{ijt}) \\ + \beta_6(\mathrm{Post}_{ijt} \cdot \mathrm{Specialist}_{ijt}) + \beta_7(\mathrm{Post}_{ijt} \cdot \mathrm{Portfolio}_{ijt}) + \beta_8(\mathrm{Post}_{ijt} \cdot \mathrm{Intentional}_{ijt}) \\ + \beta_9(\mathrm{Post}_{ijt} \cdot \mathrm{Portfolio}_{ijt} \cdot \mathrm{Specialist}_{ijt}) + \beta_{10}(\mathrm{Post}_{ijt} \cdot \mathrm{Intentional}_{ijt} \cdot \mathrm{Specialist}_{ijt}) \\ + \gamma X_{ijt} + \omega_{jt} + \epsilon_{ijt}, \end{aligned} \tag{7}$$

where i is the property used for collateral, j is the local-area where the property is located, t origination quarter, X_{ijt} is a vector of other explanatory variables that include property characteristics and LTV dummies, and ϵ_{ijt} is the residual.[42] Post is an indicator taking the value of one for all mortgages originated after 2022/Q3. We use data for the full sample period, but the main results are robust to using the shorter time window used for calculating the previously shown summary statistics. In all of the regressions we control for local area times origination-quarter fixed effects (ω_{jt}). Standard errors are clustered at the local area level. The base groups in the above specification are accidental landlords and non-specialist lenders.

Table 5 reports the estimated coefficients. The dependent variables are the loan interest rate (in basis points, column 1) and fees as a share of the loan amount (in basis points, column 2). The sum of the estimated coefficients on specialist (β_1) and the interaction of portfolio

[42] The LTV dummies are (55,65], (65,75], and >75 (omitted category being $\leq$ 55).

with specialist (β_4) characterize the pre-event loans granted by specialist lenders to portfolio landlords, relative to those granted by non-specialist lenders to same landlord types. The sum of the estimated coefficients on post interacted with specialist (β_6) and post interacted with portfolio and specialist (β_9) show how the loans characteristics changed after the event. Panel (a) of Figure 6 plots these sums and the corresponding confidence intervals.

[Insert Table 5 and Figure 6 here]

In the pre-period, loans granted by specialist lenders to portfolio landlords are on average more expensive in interest rate (53.7 bps) and in initial fees (17.7 bps) than those originated by non-specialist lenders to the same borrower type. This is consistent with specialist lenders facilitating credit access to large borrowers, but charging more for doing so. Interestingly, in the post-period, specialist lenders increase the loan interest rate they charge relatively less (-21.6 bps), but compensate this by higher fees (43.6 bps), compared to loans by non-specialist lenders to the same borrower types. The substitution of loan interest rates by origination fees improves origination ICRs and facilitates credit access. A back-of-the-envelope calculation shows how these estimates imply that after the event, compared to pre-event, specialist lenders become relatively cheaper than non-specialist ones for portfolio landlords: for a 5-year loan, the change in fees can be divided by 5 and added to the change in interest rate, to obtain 43.6/5-21.6=-12.9 bps.

Panel (b) of Figure 6 compares loans by specialist lenders to portfolio landlords to those by the same lenders to accidental landlords. We again find post-event a relative decrease in interest rates (-43.6 bps) and increase in fees (52.6 bps), with loans granted to portfolio landlords becoming relatively cheaper than those granted by the same lenders to accidental landlords (52.6/5-43.6=-33.1 bps). This suggest a differential approach by specialist lenders in the treatment of portfolio and accidental landlords. We investigate this further, by focusing on within lender type variation. (We return below to the stress test estimates in Panels (a) and (b) and the other panels in the figure.)

4.2.2 Within lender type variation

The previous regressions compared loans given by different lender types to different landlord types. We now study whether the differences across landlord type are significant when focusing exclusively on within lender type variation. For this purpose, we divide the sample into loans originated by each of the two lender types, and estimate regressions separately for each.

Panel A of Table 6 shows the results for the loan interest rate as dependent variable. Columns (1) and (4) show that portfolio landlords pay higher interest rate on loans compared to accidental and intentional landlords, within both types of lenders. In columns (2) and (5), we interact the post and the landlord type dummies. The negative estimates on these interaction terms show that post event the interest rates increased less for portfolio and intentional landlords than accidental ones. This happens both within non-specialist and specialist lenders. Lastly, in columns (3) and (6), we account for time-varying unobserved lender characteristics by interacting lender fixed effects with origination quarter fixed effects. The estimated coefficients become smaller (in absolute value), but the conclusions are similar.

[Insert Table 6 here]

Panel B of Table 6 shows the estimates for loan fees, computed as a fraction of the loan amount. Compared to the base case of accidental landlords, both lender types receive relatively more fees from portfolio and intentional landlords (columns (1) and (4)), with relative differences economically larger in the sample of specialist lenders. Furthermore, post-event, specialist lenders increased the fees that they charge portfolio landlords (12.5 bp, column (6)) while the corresponding estimate for non-specialist lenders is not statistically significant (-1.1 bp, column (3)). This suggests a differential use of fees in the pricing strategies of specialist and non-specialist lenders in response to the event. In the remainder of this section we provide further evidence in support of this hypothesis.

4.2.3 Fees in the distribution of origination ICRs

Lenders are compensated through interest rate premia and fees with both, ceteris paribus, contributing positively to loan profitability.[43] For a given minimum ICR, substituting a higher interest rate by higher fees facilitates credit access since it increases the maximum loan amount (or for a given loan amount it improves ICRs). If fees are used as part of lenders' pricing strategy to facilitate credit access, then they should be more prevalent when the constraints are more binding, meaning at lower ICRs. In this section, we examine how fees vary across the ICR distribution.

Figure 7 plots average fees paid by portfolio landlords against origination interest coverage ratios (ICRs), binned in 50-percentage-point buckets starting at 125% on the horizontal axis.

[43] We say ceteris paribus since naturally a higher loan interest rate or higher fees could lead to adverse selection, more default, and decreases in lender profitability.

The left panel reports estimates for specialist lenders; the right panel for non-specialist lenders. Each panel distinguishes pre- and post-event originations. Fewer post-event observations at high ICRs result in wider confidence bands in that range.

[Insert Figure 7 here]

Focusing first on the pre-period (circle), fees are relatively flat across the ICR distribution, albeit at a higher level for specialist than for non-specialist lenders, with larger gaps at low ICRs. Post-event (sqaures), fees rise for loans from both lender types; however, while fees charged by non-specialists remain comparatively flat in ICR, the left-hand panel shows much larger increases by specialist lenders at low ICRs, yielding a steeply declining profile of origination fees in ICR (from around 200 basis points in the lowest ICR bucket to less than 100 basis points in the middle the distribution). This evidence further supports the argument of fees being used to relax ICR constraints.

4.3 Customer acquisition: new versus existing borrowers

In this section, we study whether, after the event, specialist lenders are more likely to originate loans to their existing borrowers or to new borrowers. To do so, we rely on a variable that captures the total number of rental properties owned by a given portfolio landlord that are already mortgaged with the same lender. We construct a dummy variable equal to one if, at the time of loan origination, the borrower has at least one additional mortgage outstanding on a different rental property with the same lender, and zero otherwise. This indicator is the dependent variable in our regressions. We restrict the sample to portfolio landlords and compare loans originated by specialist lenders with those originated by non-specialist lenders (the base group), in the post-event period relative to the pre-event period (the base group).

Table 7 reports the results for specifications that differ in the set of fixed effects included, following a structure similar to that used in the earlier regressions for loan interest rates. The large estimated constants in columns (1) and (2) show that, in the pre-period, non-specialist lenders are much more likely to originate loans to portfolio landlords who are already their customers. The positive coefficients on post indicator in the first row show that this focus on existing customers strengthens in the post-period.

[Insert Table 7 here]

Interestingly, the estimates reveal a different behavior by specialist lenders. The negative coefficients on the specialist dummy show that they are relatively less likely to originate loans to existing costumers than non-specialist lenders. Moreover, the negative coefficient on the interaction between post and specialist shows that this tendency becomes even stronger in the post-period. Column (6) shows that this result is robust to a stringent specification that includes local-area-by-quarter and lender fixed effects, and is economically meaningful. Thus specialist lenders use pricing strategies not only to facilitate credit to existing borrowers, but also to acquire new customers.

4.4 Lender pricing strategies: fees in the menu of products on offer

The previous analysis focused on loan originations, market outcomes that result from the supply and demand of loans by heterogeneous lenders and borrowers. In this section, we use Moneyfacts data to study fees on the loans *on offer* in the market, and how they changed after the event, providing insight into the supply side of the market. The key question is whether lenders changed the characteristics of the products they offer in response to the event or, alternatively, the different origination outcomes are simply the result of different choices from the same loan menu. Our identification strategy exploits both the high-frequency nature of the data and the unexpected nature of the event.

The Moneyfacts dataset records fees in free text and distinguishes among fee types (e.g., arrangement, booking). Some products quote fixed fees in pounds, others quote percent fees, and some list both.[44] We express fees on a comparable basis by converting total fixed fees into a percentage of loan amount using the median loan size of £123 thousand reported in Table 1, and adding this to the percent fees to obtain an overall fee measure. (Appendix C shows results separately for fixed and percentage fees; the patterns emphasized in this section are driven primarily by variation in percentage fees.)

We compare loans offered by specialist and non-specialist lenders by estimating the average fees on the products on offer by each of these lender types in each week, controlling for the maximum loan-to-value (κ_{LTV}).[45] The equation that we estimate:

[44] We parse the text to extract all pound-denominated amounts (following £ sign) and percentage amounts (preceding %) by fee type. For entries with multiple values within a type, we sum them to obtain total fixed and total percentage fees per product. Appendix C provides additional details.

[45] A shortcoming of the Moneyfacts data is that it does not clearly distinguish among loans on offer to the different landlord types (accidental, intentional and portfolio). We are able to identify those loans that are not available to accidental landlords, meaning they are available only to intentional/portfolio landlords (roughly

$$\text{Fees}_{lt} = \alpha + \sum_{w \neq w_0} \beta_w \cdot \mathbf{1}\{\text{week} = w\} + \kappa_{LTV} + \varepsilon_{lt}, \tag{8}$$

where l denotes the lender and t the week, with week zero corresponding to the event week.

Figure 8 plots the estimates. Pre-event, fees are fairly stable, but on average higher for loans priced by specialist lenders. In the weeks immediately preceding the event - when interest rates were already increasing - specialist lenders increased the fees that they charge. In the weeks immediately after the event, specialist lenders increased them significantly more, by roughly 50 basis points, widening the fee gap relative to non-specialist lenders. The discontinuous jump in fees on products on offer at the event date indicates an immediate specialist lender response. Only later in the sample did non-specialist lenders raise their fees, bringing them closer to those of specialists; during this period, specialist fees also eased.

[Insert Figure 8 here]

This section shows that specialist lenders adjusted product design to facilitate credit access for landlords—particularly large (portfolio) landlords. The patterns align with the origination evidence but are important since they shed further light on the supply side of the market responses.

4.5 Back-of-the-envelope calculations

With the previous estimates in hand, we return to the maximum loan amount calculations presented in Section 2.4. Our objective is to quantify how the increase in fees affects the maximum loan size that specialist lenders can extend to portfolio landlords while still satisfying the ICR constraint. In the post-period, specialist lenders charge portfolio landlords, on average, 173.44 basis points in fees and 455.39 basis points in interest rates (Panel B.1 of Table 4). For a five-year fixed-rate loan refinanced at the end of the fixation period, this combination is approximately equivalent to a loan with zero fees and an interest rate of (455.39+173.44/5)=490.08 basis points. Although such a loan is hypothetical, it provides a useful benchmark for defining an overall loan cost. In our calculations, we hold this overall loan cost constant while varying the composition between fees and interest rates. The maximum loan size per £1 of rental income for such an hypothetical loan is $1/(1.25 \times 0.049008) = £16.32$.

66% of the 2.05 million loan observations). Appendix C reports fees for these different landlord categories.

The post-period fees charged by non-specialist lenders on loans to portfolio landlords average 113.03 basis points (Panel B.2 of Table 4). If specialist lenders were to set their fees at this level while keeping the overall loan cost constant, the implied interest rate would be (490.08-113.03/5)=467.47 basis points. Under these parameters, the maximum loan amount consistent with the ICR constraint is $1/(1.25 \times 1.011303 \times 0.046747) = £16.92$. We scale these per-pound-of-rental-income loan sizes by the annual median rental income in our sample (£10,200; from Panel A of Table 1).

We report the resulting values in the last column of Table 8. The first two rows present the benchmark cases of zero fees and the post-period non-specialist lender fee. The remaining rows show results for alternative portfolio-landlord fee scenarios: row 3 applies the post-period change in specialist fees from Panel (a) of Figure 6; row 4 uses the average post-period specialist fee from Panel B.1 of Table 4; and rows 5 and 6 report results using the post-period non-specialist and specialist fees for the lowest ICR bucket shown in Figure 7.

[Insert Table 8 here]

As can be seen from the Table, the differences in loan sizes are large and economically significant varying between £2,526 (comparing row 2 to row 3) to £11,021 (comparing row 1 to row 6), largest for borrowers in the lowest ICR bucket, who are likely to be the most constrained.

In summary, the results in this section show that specialist lenders facilitate credit access by structuring loans in ways that expand lending volumes. They also highlight a differentiated approach between specialist and non-specialist lenders in their treatment of large borrowers, likely reflecting the greater dependence of specialist lenders on loan originations within the buy-to-let segment of the mortgage market for their overall performance.

4.6 Additional evidence of credit facilitation

In this section, we compare interest rates used by specialist and non-specialist lenders in the stress testing of loans originated to different landlord types, and how they changed following the event. We also examine how loan default probabilities calculated as part of the underwriting process vary across lender and borrower types. The underlying idea is that if specialist lenders facilitate credit access, this should be reflected not only in the substitution between interest rates and fees, but also in other dimensions of the underwriting process.

4.6.1 Stress test interest rates

We estimate Equation (7) for the stress test interest rate as dependent variable. The estimation results are shown in Appendix Table IA.A2; here we focus on the same two sets of comparisons analyzed before. The last two columns of Panel (a) of Figure 6 compare the stress test interest rates in loans originated by specialist lenders to portfolio landlords to those in loans originated by non-specialist lenders to the same landlord types. The former are 7.8 bps higher than the latter, but this difference is significantly smaller than that in the loan interest rates (53.7 bps), so that a lower premium is used in the stress testing by specialist lenders. Furthermore, post-event, the stress test interest rates used by specialist lenders decline by 27.1 bps relative to those of non-specialist lenders. The last two columns of Panel (b) of the same figure show that specialist lenders use less stringent stress testing of loans to portfolio landlords than to accidental landlords, and more so post-event.

Focusing on within lender type variation, Panel A of Table 9 shows estimates for the stress test interest rate used by lenders on loans to different landlord types, obtained from dividing the sample in non-specialist and specialist and estimating regressions separately for each. Columns (1) and (4) show that both lender types use relatively lower stress test rates for portfolio and intentional landlords than accidental ones. Interestingly, we also find that they react differently post event. Non-specialist lenders increase relatively more the stress test rate that they use for portfolio and intentional landlords (column 2), while the estimated coefficients for specialist lenders are negative (column 5). In columns (3) and (6) we control for lender times quarter fixed effects. Both lender types use lower stress test rate for portfolio landlords post event, but the difference is larger post event for specialist lenders.

[Insert Table 9 here]

Panel B of Table 9 shows results for similar regressions with the initial period of interest rate fixation (years) as dependent variable. Column (2) shows that while post-event there is a decline in the average period of interest rate fixation for loans granted to portfolio landlords by non-specialist lenders, the reverse is true for loans originated by specialist lenders to the same landlord types (column 5). These estimates are relative to loans granted to accidental landlords by each of the lender types. The fixation term matters since the stress testing regulatory requirements are less stringent for loans with an interest rate that is fixed for 5 years or more. The relative increase in fixation length for loans originated by specialist lenders to portfolio landlords facilitates loan originations to the larger (riskier) landlords.

The Moneyfacts data include information on the product-specific stress-testing that applies to each loan on offer. In Appendix C, we parse the textual fields and compute, for each product, the stress-test interest-rate premium relative to the contractual loan rate. For five-year products—where regulations do not prescribe a minimum stress-test rate—the stress-test premium applied by specialist lenders is lower than that used by non-specialists. At the event, non-specialists roughly doubled their premia to 1%, with significant volatility, whereas specialists left premia unchanged at pre-event levels. This has an effect on maximum loan size. With a loan rate of 5% and a minimum ICR of 1.25, a 50 bps premium differential—implying stress-test rates of 5.5% versus 6.0%—translates into a 9.09% difference in maximum loan amount.

4.6.2 Estimated default probabilities

As part of the underwriting process, lenders estimate loan default probabilities, which are reported for many—but not all—observations in our dataset. The missing values may reflect either that lenders did not compute a default probability or that they chose not to report it. We construct two variables: an indicator for whether the default probability is reported and a variable capturing its reported value. We then estimate Equation (7) using them as dependent variables and present the results in Appendix Table IA.A2. Notably, the table shows that specialist lenders are, on average, less likely than non-specialist lenders to report default probabilities.

The first two columns of Panel (c) of Figure 6 show that, in the pre-event period, specialist lenders were 31% less likely than non-specialist lenders to report estimated default probabilities for loans to portfolio landlords, and that this reporting likelihood declined by an additional 26% after the event. The last two columns indicate that, conditional on reporting, specialist lenders' estimated default probabilities for these loans were 0.2 percentage points lower pre-event but increased post-event. This post-event rise may reflect selection in which loans are reported.

Panel (d) compares loans originated by specialist lenders to portfolio versus accidental landlords. It shows that specialist lenders are less likely to report default probabilities for portfolio landlords in the pre-event period, and that this reporting gap increases further after the event. Conditional on reporting, specialist lenders also assign lower default probabilities to portfolio landlords, with the difference widening post-event. Taken together, these patterns provide evidence of credit facilitation by specialist lenders toward larger borrowers.

5 Risk management

Credit facilitation by specialist lenders to large borrowers boosts lender profits, at least in the short term, but also increases their exposure to BTL sector risks. Such practices may ultimately lead to losses if mortgage delinquencies or defaults rise. During our sample period, these risks did not materialize. In this section, we use the Moneyfacts data to examine how lenders manage these risks.

The variable "Property portfolio" contains information on whether lenders impose restrictions on the maximum number of landlord properties that they are willing to finance (E.g. "Max 10 Props With Lender", "max props: any number of properties", "Max 20 props"). We create a dummy variable that takes the value of one if there is a lender restriction on the maximum number of properties and zero otherwise (either with the lender or overall).[46] In addition, for loans with a restriction, we create a variable with the value of the maximum number of properties that can be financed (with the lender offering the loan, or overall if no maximum number with the lender).

The same "Property portfolio" variable includes information on whether the lender imposes a restriction on the maximum amount (in £s) that it is willing to lend to each borrower (across all loans that the lender provides to the borrower), and what that amount is. We construct a dummy variable that takes the value of one in case the restriction is imposed and zero otherwise, and another variable with the maximum amount (conditional on restriction).

We estimate regressions similar to Equation (8) but with maximum number of properties and maximum loan amount as dependent variables (both the indicators and the number). Panel (a) of Figure 9 shows that the maximum number of properties restriction is used by specialist lenders to a lesser extent than non-specialist ones. As for its time series evolution, in the weeks before the event, as interest rates started rising, there is an increase in the proportion of loans on offer with restrictions. However, when the mini-budget is announced, the proportion of loans with restrictions decreases significantly, particularly among specialist lenders, before rising again.[47]

[Insert Figure 9 here]

Panel (b) of Figure 9 shows the results for the average maximum number of properties (for

[46] Some lenders impose restrictions both on the maximum number of properties with the lender and the overall number (across all lenders), while others impose restrictions only on the former or the latter.

[47] Although not shown in the figure, this decrease is due a disproportionate number of loans which imposed restrictions being withdrawn from the market, rather than a change in the features of existing loans.

the loans on offer with a restriction). The average values are similar for both lender types, albeit more volatile for specialist lenders, with a time-series evolution that mirrors that of the indicator variable. Thus, specialist lenders are less likely to impose restrictions on the maximum number of properties that they are willing to finance, and they are more likely to react to changes in the economic environment and make changes to their product offerings.

The bottom two panels of Figure 9 present estimates for the dummy indicating a restriction on the maximum advance (Panel (c)) and for the maximum total advance amount, in millions of pounds (Panel (d)). Most lenders—and specialist lenders in particular—impose such restrictions. Among specialist lenders, the share applying a maximum advance restriction exceeds 95% early in the sample and, although it declines slightly before and after the event, remains above 90% on average. These averages are consistently higher for specialist than for non-specialist lenders. Conditional on a restriction being imposed, the maximum advance amounts average about £4 million for specialist lenders and £2.7 million for non-specialists throughout the sample period, with no economically meaningful change following the event.

These results indicate that specialist lenders, while facilitating credit access for large landlords, impose limits on the maximum amount lent to each borrower, thereby containing individual exposure. This practice mitigates idiosyncratic borrower risk but does not necessarily reduce exposure to aggregate sectoral risk.[48]

6 Conclusion

We have used administrative data covering the universe of mortgage loans granted to individual landlords in the United Kingdom to examine the effects of an unexpected and sudden credit tightening event. On the asset side, we observe an increase in rental yields driven by a modest decline in property values alongside continued rent growth. The co-movement between property values and rents that prevailed before the event broke down temporarily, as higher discount rates offset the positive cash-flow effects of rising rents.

Despite the increase in rental yields, the much larger rise in interest rates led to a sharp decline in interest coverage ratios, which—alongside loan-to-value ratios—are the main criteria in loan underwriting. On the lender side, we compare loans originated by lenders that prior to the event had high exposure to the buy-to-let segment of the mortgage market (which we

[48]We have also investigated differences in geographical exposure of specialist and non-specialist lenders. The vast majority of loans on offer are available across all regions, and we did not find significant differences in the geographic concentration of loan originations between the two lender types.

call specialist lenders) to those with low exposure (non-specialist). Specialist lenders charge, on average, higher interest rates—particularly on loans to larger and riskier investors.

Following the credit tightening, both lender types increased loan interest rates, though specialist lenders raised them less on loans to larger landlords. At the same time, specialist lenders raised upfront loan fees relatively more for these borrowers. This fee–rate adjustment allowed them to better satisfy underwriting standards—particularly interest coverage ratio (ICR) requirements—while maintaining credit access for larger borrowers, on whom they rely more heavily for business activity. Consistent with this pattern, specialist lenders also applied smaller increases in the stress test interest rates for larger landlords than for other borrower types. These effects are evident both in newly originated loans and in the menu of loans on offer, revealing how specialist lenders adjust product design in response to rate shocks to target specific borrower types.

Our results reveal substantial segmentation across lender and borrower types, with clear implications for financing outcomes. They highlight the incentives of heterogeneous lenders and the margins along which they adjust loan contracts and underwriting during periods of rising interest rates to mitigate the impact on their lending activity. Specialist lenders make use of the shift from rate to fees to a greater extent, and more so when originating loans to larger borrowers, who are more important for their business.

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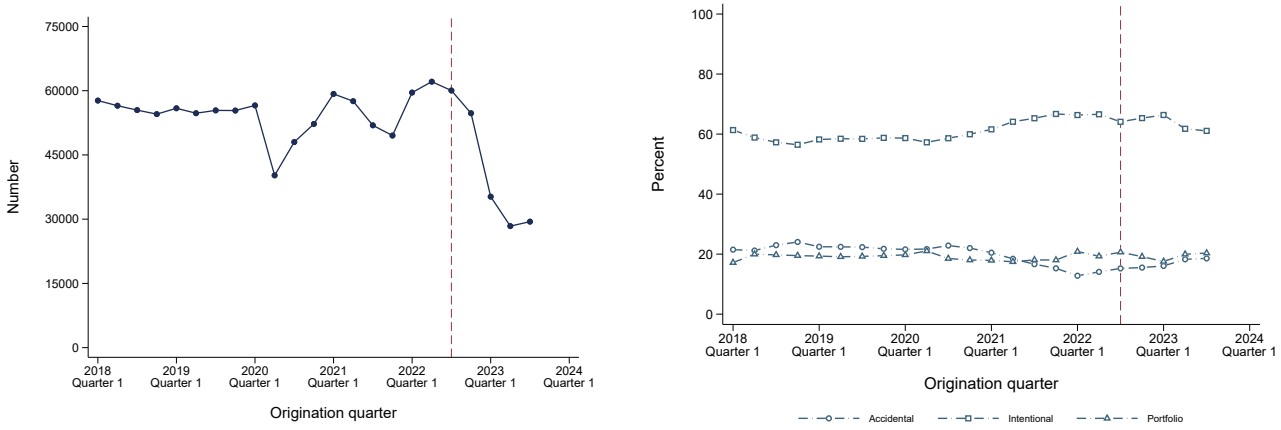
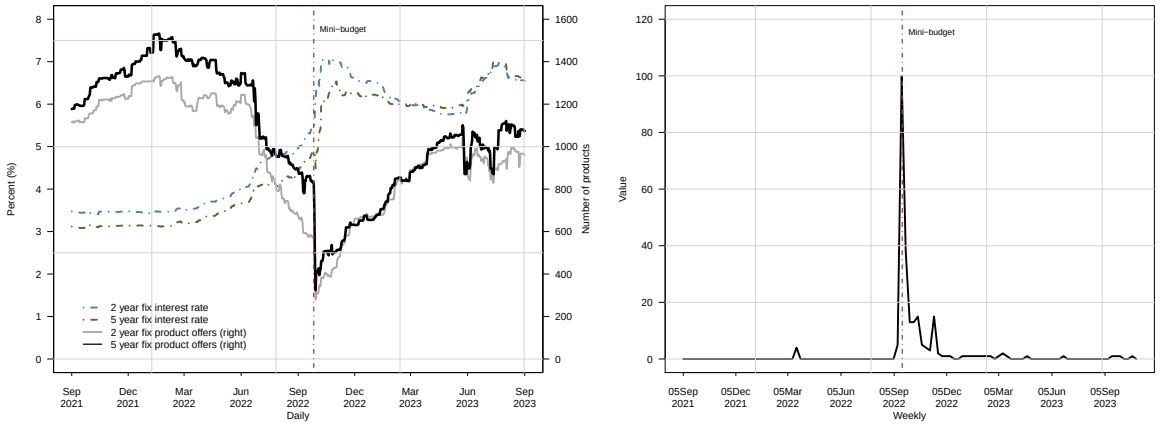


(a) Number of loan originations

(b) Loan origination, by landlord type

Figure 1: Loan origination and composition by landlord type

Panel (a) plots the total number of loans originated in each quarter over the sample period. Panel (b) plots the proportions of loans granted to each landlord type. Circles represent Accidental landlords, squares represent Intentional landlords, and triangles represent Portfolio landlords. The dashed vertical line (maroon) marks 2022/Q3, the event date, wherein the U.K. government unexpectedly announced a "mini-budget" that advocated for a significant unfunded reduction in taxation sparking a strong bond market reaction and dramatically increasing mortgage borrowing costs within a few days.

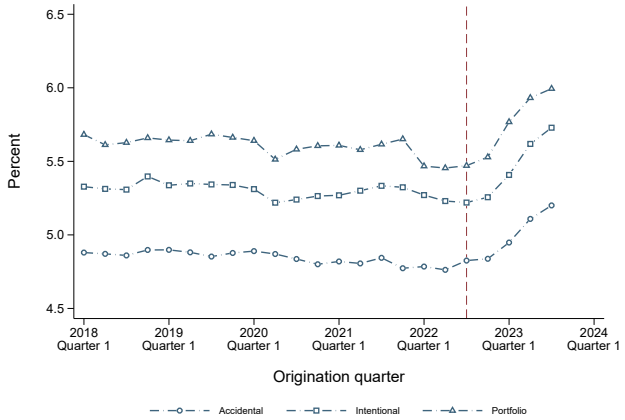


(a) Buy-to-let products on offer

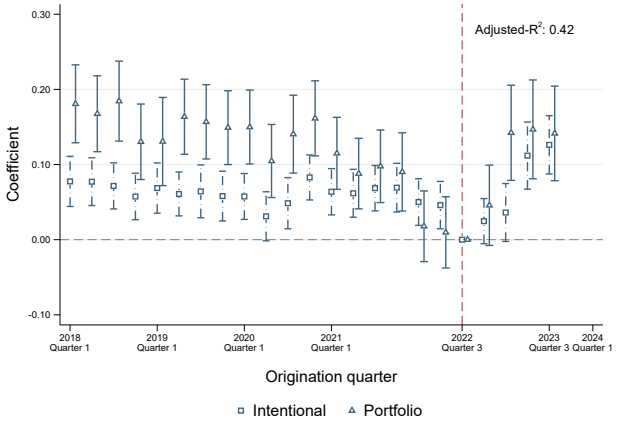
(b) Google Trends

Figure 2: Loans on offer around the event

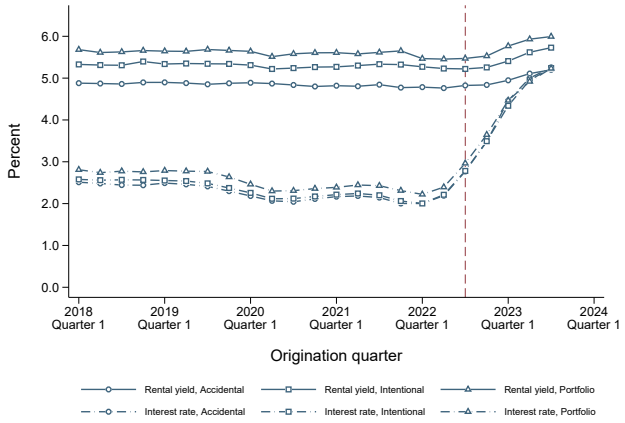
Panel (a) plots the daily average interest rate for 2 and 5-year fixed-rate mortgage products *on offer* and their count. The data are from Moneyfacts for the ±12 months around the mini-budget. Panel (b) plots the Google trend weekly query for the term "Mini-budget," where the numbers represent search interest relative to the highest point on the chart (re-scaled to 100) for the given region and time (±12 months around the mini-budget). In both panels the dashed vertical line (maroon) marks the event date wherein the U.K. government unexpectedly announced a "mini-budget" that advocated for a significant unfunded reduction in taxation sparking a strong bond market reaction and dramatically increasing mortgage borrowing costs within a few days.



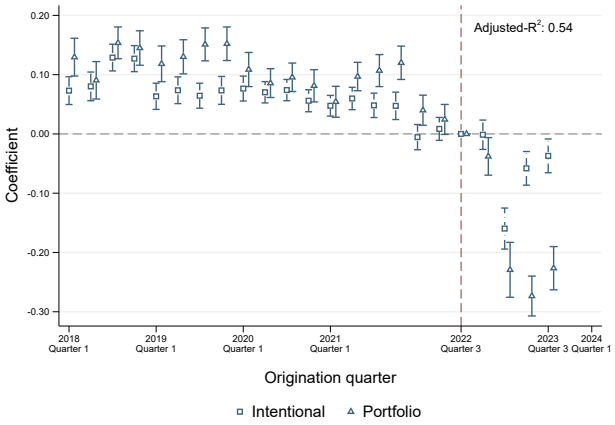
(a) Rental yields



(b) Rental yield, regression coefficients



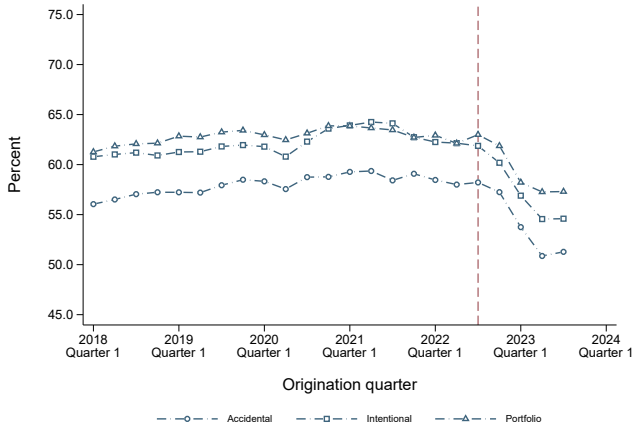
(c) Rental yields and interest rates



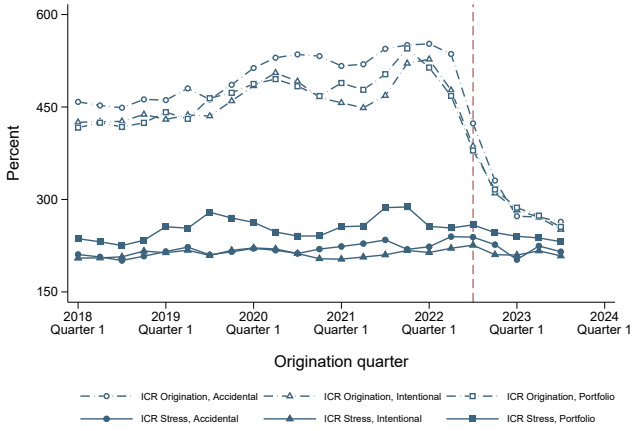
(d) Interest rate, regression coefficients

Figure 3: Rental yields and loan interest rates

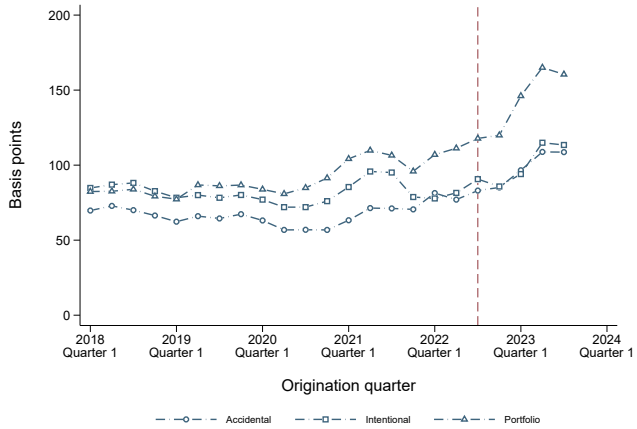
Panel (a) plots the time-series evolution of average rental yields in percent, split by landlord type. Panel (b) plots the estimated coefficients and their 95% confidence intervals from an event-study difference-in-differences specification outlined in Equation (6). The specification controls for property characteristics and local-area-by-origination quarter fixed effects. Panel (c) plots the time-series evolution of the average rental yield and initial loan interest rate (in percent) by landlord type. Panel (d) plots the estimated coefficients and their 95% confidence intervals from an event-study difference-in-differences specification (Equation (6)) with the initial loan interest rate as dependent variable. Squares (triangles) represent Intentional (Portfolio) landlords. The estimated coefficients are relative to Accidental landlords and normalized to zero in 2022/Q3, the event date, marked by the dashed vertical line (maroon).



(a) Loan-to-value



(b) Interest coverage ratio



(c) Origination fees

Figure 4: Loan-to-value, interest coverage ratios and fees

Panel (a) plots the time-series evolution of the average origination loan-to-value (in percent). Panel (b) plots the time-series evolution of origination interest coverage ratios (in percent) calculated for the loan interest rate and for the interest rate used in the stress test. Panel (c) plots the time-series evolution of the average fees as a fraction of loan amount (in basis points). All panels plot averages for the different landlord types. Circles represent Accidental landlords, squares represent Intentional landlords, and triangles represent Portfolio landlords. The dashed vertical line (maroon) marks the event date.

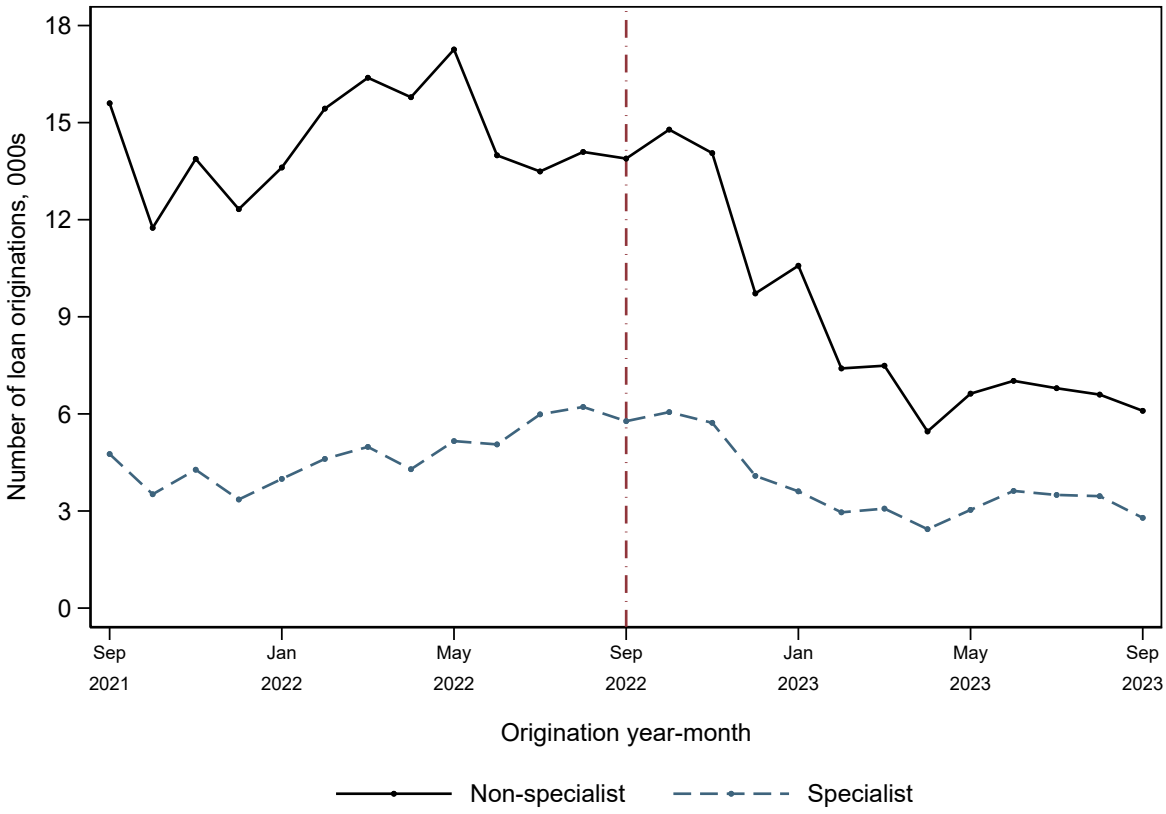
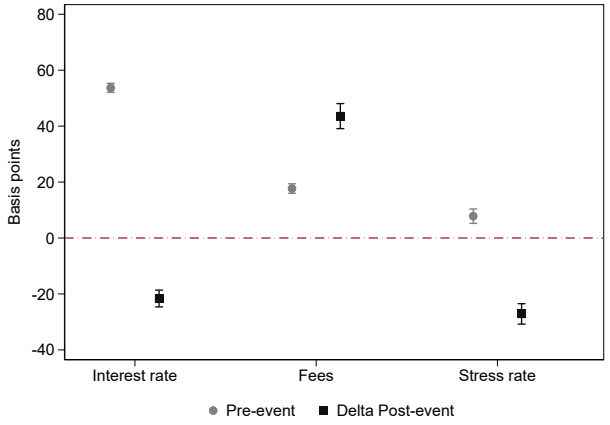
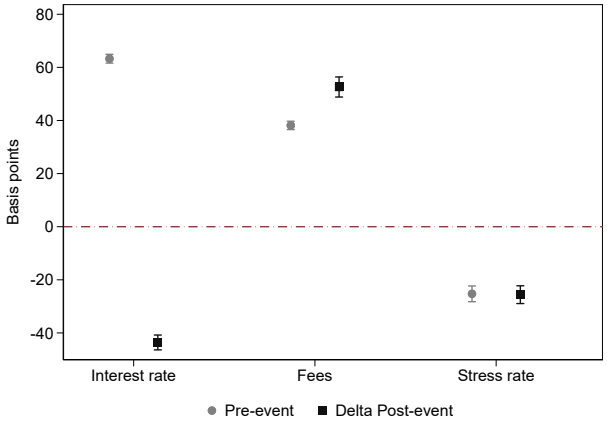


Figure 5: Loan originations by lender type

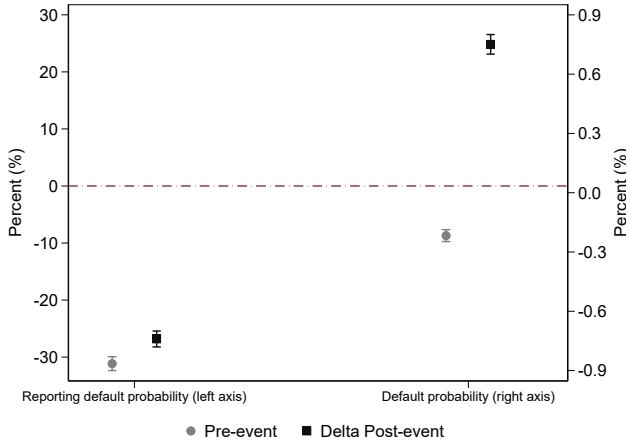
The solid (dashed) line plots the number of loans originated in each year-month by Non-specialist (Specialist) lenders. The dashed vertical line (maroon) marks the event date.



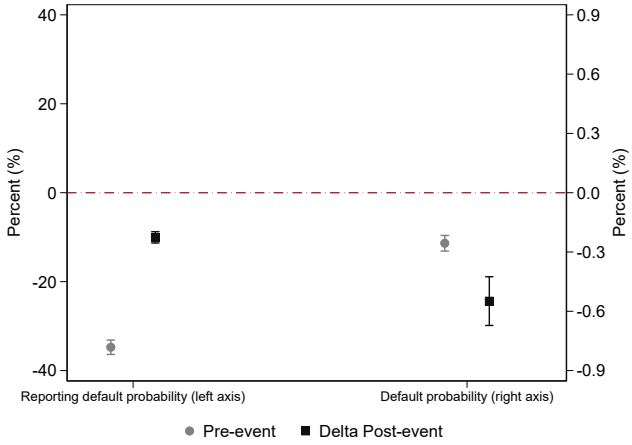
(a) Specialist/portfolio relative to nonspecialist/portfolio



(b) Specialist/portfolio relative to specialist/accidental



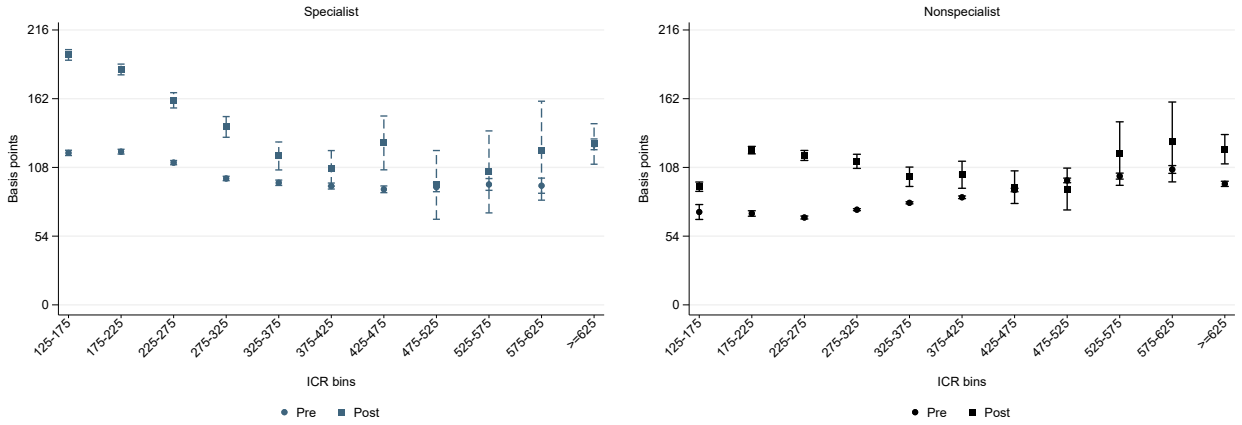
(c) Specialist/portfolio relative to nonspecialist/portfolio



(d) Specialist/portfolio relative to specialist/accidental

Figure 6: Changes in loan characteristics by lender and borrower type

Panel (a) (Panel (c)) compares loan interest rates, origination fees, and stress-test interest rates (the reporting of default probabilities and the estimated default probabilities conditional on reporting) for loans from specialist versus non-specialist lenders to portfolio landlords. Panel (b) and Panel (d) compare the same variables for loans from specialist lenders to portfolio landlords relative to those from specialist lenders to accidental landlords. The figures draw on the estimates in Table 5 and Appendix Table IA.A2, showing pre-event estimates in gray circles and post-event changes (Delta post-event) in black squares.



(a) Specialist lenders (b) Nonspecialist lenders

Figure 7: Average origination fees by lender type and ICR bins

The figure plots average origination fees as proportion of loan amount on loans by specialist (left) and non-specialist lenders (right) to portfolio landlords as a function of origination ICR (in the horizontal axis). The confidence bands show the 95% confidence interval around the averages. The figure distinguishes between pre- (circle) and post-event (square) fees.

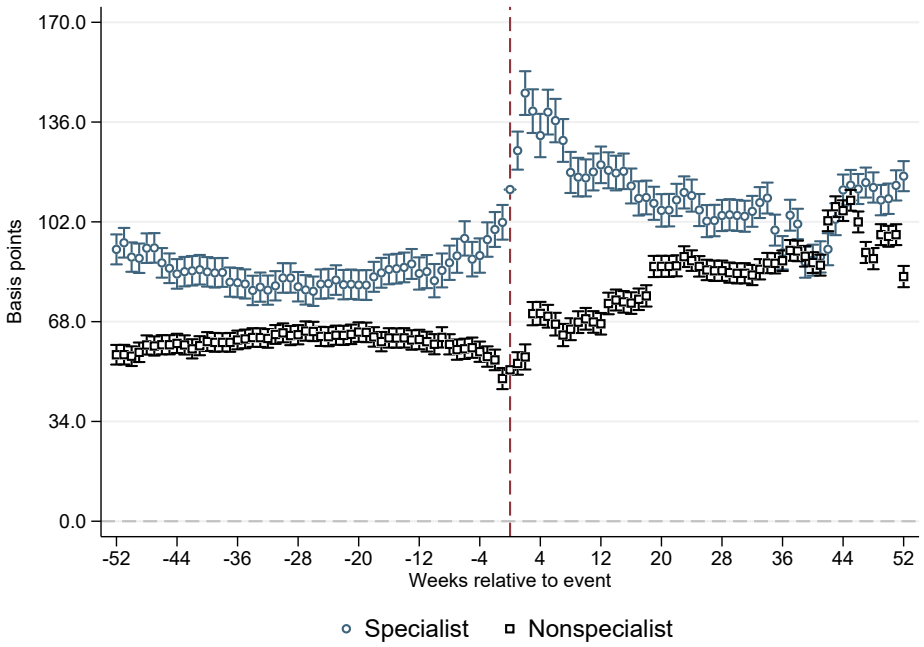
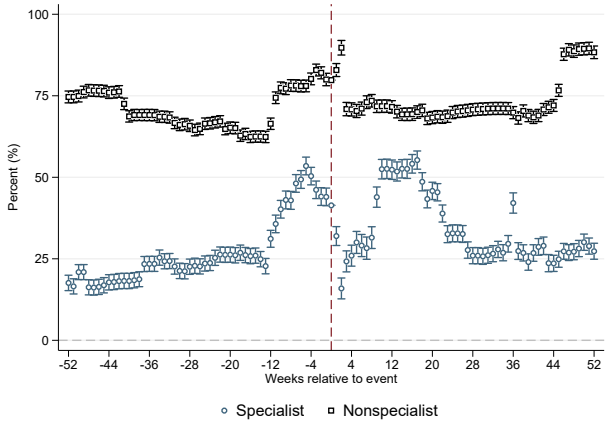
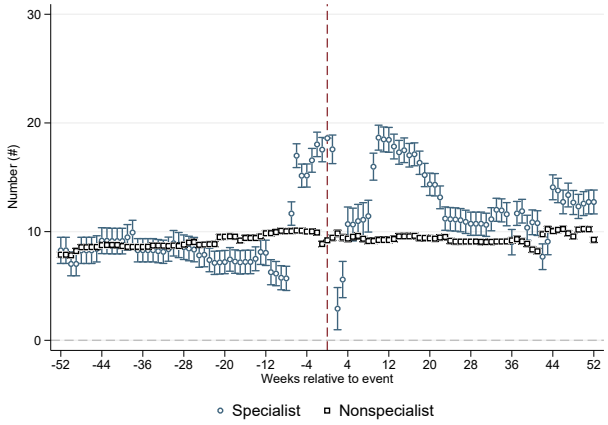


Figure 8: Product fees for the products on offer by lender type

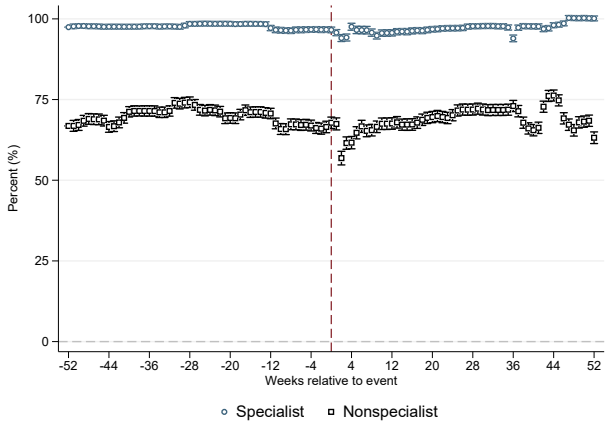
The figure plots the evolution of origination fees for loans on offer by lender type. The data are from Moneyfacts. For each lender type, Specialist and Nonspecialist, the estimates along with their 95% confidence intervals are separately obtained from estimating Equation (8).



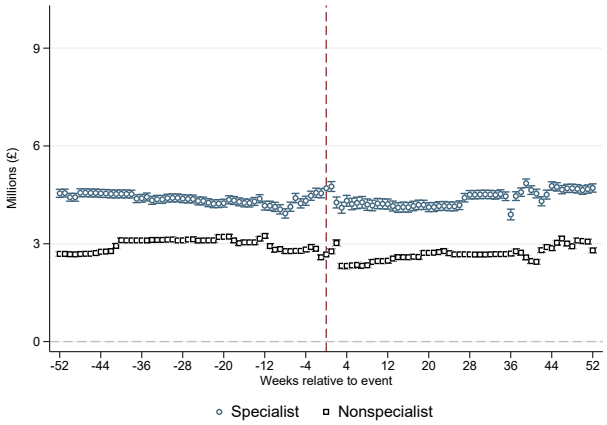
(a) Indicator for restriction on maximum number of properties (% of products)



(b) Maximum number of properties, conditional on restriction



(c) Indicator for restriction on maximum advance (% of products)



(d) Maximum advance (£s million), conditional on restriction

Figure 9: Risk management: maximum number of properties and advance restrictions

The figure uses Moneyfacts data to estimate equation (8) separately for specialist and nonspecialist lenders. The dependent variables are: in Panel (a), an indicator for restriction on the maximum number of properties that can be financed; in Panel (b), the maximum number of properties, conditional on restriction; in Panel (c), an indicator restriction on the maximum total advance amount that the lender may loan the borrower; and in Panel (d), the maximum advance in million £s, conditional on restriction. The dashed vertical line (maroon) marks the event date.

Table 1: Summary Statistics

This table presents descriptive statistics for the universe of mortgages granted to individual landlords in the United Kingdom from 2018/Q1 to 2023/Q3. The number of originated loans included in the sample is 1,172,223. Annual rental yield is calculated by multiplying monthly rental income by 12 and dividing by property value. Loan-to-value is loan amount divided by property value. Interest rate is the initial interest rate. Fixation term is the initial period during the which the loan interest rate is fixed. Income is other borrower income (other than the rental income). Distance to the rental property is measured from the borrower's home. The number of buy-to-let properties refers to the total number of mortgaged properties that the borrower owns (not only the one for which the loan is originated).

Variable	Mean	Sd	P10	P25	Median	P75	P90
				Panel A: Property			
Rental income (monthly, £)	1050	770	525	635	850	1300	1750
Property value (£)	268,357	241,414	95,000	135,000	210,000	335,000	495,000
Rental yield (annual, percent)	5.30	1.50	3.80	4.33	5.00	6.00	7.20
				Panel B: Loan			
Loan amount (£)	153,820	120,301	53,096	80,245	123,495	196,995	286,250
Loan-to-value (percent)	60.88	16.91	36.72	52.78	65.75	75.00	75.69
Interest rate (basis points)	262.57	102.04	173.00	199.00	234.00	293.00	388.00
Fee over loan amount (basis points)	84.76	89.86	0.00	4.02	68.34	121.07	196.08
Fixation term (years)	4.09	2.43	1.95	2.08	4.90	5.06	5.18
Mortgage term (months)	255.63	80.14	144.00	192.00	264.00	300.00	360.00
				Panel C: Borrower			
Age (years)	47.18	11.38	33.00	38.00	47.00	55.00	63.00
Annual income (£)	65,010	231,251	15,000	26,955	42,400	70,000	119,500
Marginal tax rate (percent)	28	12	20	20	20	40	40
Distance (kilometers)	35.43	80.23	0.30	1.49	5.43	21.03	113.47
Number of buy-to-let properties	3.06	6.01	1.00	1.00	2.00	3.00	6.00

Table 2: Summary statistics by landlord type

This table presents descriptive statistics for the universe of mortgages granted to individual landlords in the United Kingdom from 2018/Q1 to 2023/Q3, by landlord type. Accidental landlords are those who initially bought the rental property to live in or who inherited it (228,127 loans). Intentional landlords acquired the property with the intention of renting it (715,566 loans). Portfolio landlords are intentional landlords who own four or more mortgaged properties (228,530 loans). Interest coverage ratio (ICR) is equal to the ratio of annual rental income to interest payments. The origination (stressed) ICR is calculated with the initial (stress tested) loan interest rate.

Variable	Landlord type	Mean	Sd.	P10	P25	Median	P75	P90
			Panel A: Property					
Rental yield	Accidental	4.86	1.14	3.65	4.13	4.71	5.40	6.25
(percent)	Intentional	5.32	1.52	3.81	4.35	5.04	6.00	7.20
	Portfolio	5.62	1.68	3.96	4.52	5.28	6.36	7.76
			Panel B: Loan					
Loan to value	Accidental	57.49	18.02	30.35	48.11	61.20	73.00	75.40
(percent)	Intentional	61.52	16.56	37.93	53.57	66.72	75.00	75.69
	Portfolio	62.37	16.32	40.68	55.81	66.99	75.00	76.11
Interest rate	Accidental	252.78	99.43	169.00	194.00	224.00	273.00	375.00
(basis points)	Intentional	260.27	103.10	172.00	199.00	229.00	285.00	385.00
	Portfolio	279.89	99.34	179.00	209.00	254.00	329.00	399.00
Origination ICR	Accidental	444.36	351.60	205.48	278.57	355.14	470.88	686.52
(percent)	Intentional	414.76	293.69	206.31	275.34	351.02	454.58	610.89
	Portfolio	406.14	319.33	190.44	256.87	335.64	437.69	594.18
Stress-tested ICR	Accidental	217.97	343.43	123.53	133.88	151.82	191.24	290.73
(percent)	Intentional	212.42	455.58	125.00	138.26	156.54	193.55	261.82
	Portfolio	252.72	818.66	138.49	145.05	165.25	205.85	279.27
Fee over loan amount	Accidental	70.65	80.89	0.00	1.33	56.54	97.18	162.86
(basis points)	Intentional	84.64	88.95	0.00	4.41	69.42	121.02	196.08
	Portfolio	99.28	98.51	0.00	4.63	82.23	150.61	219.89
			Panel C: Borrower					
Age	Accidental	44	10	31	36	42	50	59
(years)	Intentional	47	11	32	38	46	55	62
	Portfolio	51	11	37	44	52	59	65
Income	Accidental	55,846	122,733	12,918	25,040	40,000	64,000	105,122
(£)	Intentional	56,595	216,288	14,020	25,310	39,000	60,278	100,500
	Portfolio	97,287	320,744	22,560	37,600	61,177	104,073	179,102
Distance	Accidental	36.98	84.01	0.00	0.97	5.21	23.98	118.75
(kilometers)	Intentional	35.30	79.93	0.33	1.46	5.26	20.68	114.25
	Portfolio	34.64	77.66	0.69	2.06	6.16	20.01	107.22
Buy-to-let properties	Accidental	1.42	1.18	1.00	1.00	1.00	2.00	2.00
(number)	Intentional	1.72	0.77	1.00	1.00	2.00	2.00	3.00
	Portfolio	8.41	11.57	4.00	4.00	6.00	8.00	13.00

Table 3: Rental yields and interest rates

The dependent variable in Panel A is the annual rental yield calculated by multiplying monthly rent by 12 and dividing by property value, while in Panel B is the loan interest rate. In column 1, we include indicator variables for landlord types, *Portfolio* and *Intentional*. The base case is *Accidental*. In column 2 we control for property characteristics (number of bedrooms and property type). In column 3, we also include local-area (local administrative unit, level 1) fixed effects, while in column 4 we add origination quarter fixed effects. In column 5, the empirical specification includes the interactive fixed effects between local-area and origination quarter. Column 6 includes lender fixed effects. The regressions in Panel B include loan-to-value bracket dummies, namely (55,65], (65,75], and >75 (omitted category being ≤ 55). The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Panel A: Rental yield (percentage points)					
	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio	0.755***	0.710***	0.400***	0.713***	0.408***	0.382***
	(0.034)	(0.031)	(0.017)	(0.031)	(0.018)	(0.018)
Intentional	0.463***	0.444***	0.261***	0.448***	0.268***	0.259***
	(0.021)	(0.019)	(0.013)	(0.020)	(0.014)	(0.014)
Constant	4.866***	4.997***				
	(0.043)	(0.081)				
Adjusted-R^2	0.03	0.06	0.40	0.06	0.41	0.43
Dependent variable:	Panel B: Interest rate (basis points)					
	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio	27.287***	25.718***	21.808***	21.497***	18.756***	2.994***
	(0.769)	(0.658)	(0.567)	(0.438)	(0.392)	(0.252)
Intentional	7.025***	7.617***	5.537***	4.035***	2.541***	0.123
	(0.505)	(0.463)	(0.392)	(0.324)	(0.291)	(0.186)
Constant	251.668***	245.681***				
	(0.569)	(1.014)				
Adjusted-R^2	0.01	0.02	0.04	0.53	0.54	0.79
Property characteristics		Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Local-area			Yes			
Origination quarter				Yes		
Local-area × quarter					Yes	Yes
Lender						Yes
LTV dummies (Panel B only)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,167,418	1,145,535	1,145,535	1,145,535	1,145,504	1,145,504

Table 4: Summary statistics pre- and post-event, by lender and borrower type

Panel A (Panel B) presents summary statistics for loans originated in the 12 months before (12 months after) the event. In each table, we distinguish between loans originated by specialist and non-specialist lenders. The first column reports the number of originated loans to each landlord type. The remaining columns show the averages of several variables. *Interest rate* is the initial loan interest rate; *Stress rate* is the interest rate used in the stress-test done as part of the underwriting; *Loan-to-value* is calculated by dividing loan amount by the property value; *Fixation term* is the initial period of fixed interest rate (in years); *Lender fees* are calculated as a proportion of loan amount; *Interest coverage ratio, origination* is the ratio of rental income to loan interest payments; *Interest coverage ratio, stress* is the ratio of rental income to interest payments calculated using the stress test rate. Panel C shows the differences between pre- and post-period (post- minus pre-).

Landlord type	Number loans	Interest rate (bp)	Stress rate (bp)	Loan-to-value (%)	Fixation term (yrs)	Loan fees (bp)	ICR origination (%)	ICR stress (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A.1: Specialist lenders, pre-period				
Accidental	7,398	259.90	482.44	57.41	4.51	115.98	440.48	232.18
Intentional	29,978	283.33	480.65	60.03	5.13	122.87	424.27	248.41
Portfolio	19,844	280.31	462.66	63.83	4.69	135.32	383.72	240.13
				Panel A.2: Non-specialist lenders, pre-period				
Accidental	25,582	215.81	491.47	58.69	4.09	66.26	480.12	230.68
Intentional	120,605	211.14	497.43	62.67	4.21	71.82	463.90	212.28
Portfolio	25,707	223.36	466.69	61.75	4.37	87.91	488.36	280.40
				Panel B.1: Specialist lenders, post-period				
Accidental	6,749	468.12	585.39	53.59	4.24	134.43	249.85	201.10
Intentional	23,545	477.67	574.22	57.11	5.00	145.34	261.69	218.43
Portfolio	14,053	455.39	551.31	60.80	4.73	173.44	259.08	230.08
				Panel B.2: Non-specialist lenders, post-period				
Accidental	17,932	429.53	602.43	53.94	3.76	82.05	289.77	221.00
Intentional	70,488	413.49	616.00	57.27	4.00	82.00	281.24	205.53
Portfolio	14,212	427.69	577.16	57.56	4.07	113.03	285.85	251.35
				Panel C.1: Specialist lenders, Δ post-period				
Accidental	-0.09%	208.22	102.95	-3.82	-0.27	18.45	-190.63	-31.08
Intentional	-0.21%	194.34	93.57	-2.92	-0.13	22.47	-162.58	-29.98
Portfolio	-0.29%	175.08	88.66	-3.03	0.04	38.11	-124.64	-10.04
				Panel C.2: Non-specialist lenders, Δ post-period				
Accidental	-0.30%	213.72	110.96	-4.75	-0.33	15.78	-190.35	-9.68
Intentional	-0.42%	202.36	118.57	-5.40	-0.21	10.18	-182.66	-6.75
Portfolio	-0.45%	204.33	110.48	-4.18	-0.29	25.13	-202.51	-29.05

Table 5: Changes in interest rate and fees by lender and borrower type

This table estimates changes in interest rate and fees by lender and landlord type around the event. *Specialist* lenders are defined as lenders with above-median share of BTL mortgage origination between January 2018 and December 2019 (*Non-specialist* lenders is the omitted category). *Portfolio* and *Intentional* are dummies for the landlord type (*Accidental* is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3. Column 1 shows results for the loan *Interest rate* as dependent variable and column 2 for the origination *Fees* defined as a proportion of loan amount. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being $\leq$ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Interest rate (bp)	Fees (bp)
	(1)	(2)
Portfolio × Specialist × Post	-9.384***	20.356***
	(1.885)	(2.946)
Intentional × Specialist × Post	13.904***	5.407**
	(1.590)	(2.472)
Portfolio × Specialist	16.579***	-9.989***
	(0.963)	(0.815)
Intentional × Specialist	14.657***	2.858***
	(0.833)	(0.737)
Post × Specialist	-12.243***	23.228***
	(1.509)	(1.986)
Post × Portfolio	-21.960***	9.032***
	(1.127)	(1.555)
Post × Intentional	-14.011***	-9.383***
	(0.742)	(0.804)
Portfolio	9.566***	20.456***
	(0.332)	(0.398)
Intentional	-0.455**	10.672***
	(0.195)	(0.263)
Specialist	37.115***	27.681***
	(1.274)	(0.793)
Property characteristics	Yes	Yes
LTV dummies	Yes	Yes
Fixed effects:		
Local-area × quarter	Yes	Yes
Adjusted-R^2	0.59	0.13
Observations	1,141,654	1,141,654

Table 6: Initial loan interest rate and fees, within lender type

The dependent variables are the initial loan interest rate (Panel A) and initial loan fees as proportion of loan amount (Panel B) in basis points. Columns (1) through (3) (Columns (4) through (6)) present estimates for non-specialist (specialist) lenders defined as lenders with below-median (above-median) share of BTL mortgage origination between January 2018 and December 2019. *Portfolio* and *Intentional* are dummies for the landlord type (*Accidental* is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3, the event date. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being ≤ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Lender type:	Non-specialist			Specialist		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Panel A: Interest rate (basis points)					
Portfolio	3.117***	5.292***	4.776***	3.464***	8.001***	5.468***
	(0.333)	(0.360)	(0.328)	(0.317)	(0.317)	(0.291)
Intentional	-0.276	1.057***	0.857***	1.083***	2.758***	2.123***
	(0.207)	(0.193)	(0.177)	(0.294)	(0.308)	(0.282)
Post × Portfolio		-20.913***	-13.059***		-32.869***	-11.678***
		(1.103)	(1.113)		(1.425)	(1.216)
Post × Intentional		-12.750***	-10.547***		-13.494***	-6.681***
		(0.736)	(0.781)		(1.096)	(1.022)
Adjusted-R^2	0.74	0.74	0.75	0.83	0.83	0.86
Dependent variable:	Panel B: Fees (basis points)					
Portfolio	7.775***	6.694***	8.125***	19.783***	16.307***	5.797***
	(0.396)	(0.404)	(0.387)	(0.639)	(0.623)	(0.559)
Intentional	6.293***	6.426***	6.087***	5.592***	5.900***	6.148***
	(0.219)	(0.224)	(0.228)	(0.427)	(0.437)	(0.430)
Post × Portfolio		10.364***	-1.078		23.480***	12.470***
		(1.469)	(1.391)		(2.377)	(2.323)
Post × Intentional		-0.890	-0.426		-2.263	4.429**
		(0.800)	(0.855)		(1.959)	(1.792)
Adjusted-R^2	0.25	0.25	0.28	0.44	0.44	0.54
Property characteristics	Yes	Yes	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Local-area × quarter	Yes	Yes	Yes	Yes	Yes	Yes
Lender	Yes	Yes		Yes	Yes	
Lender × quarter			Yes			Yes
Observations	825,870	825,870	825,869	315,650	315,650	315,642

Table 7: Customer acquisition

This table estimates changes in lending to portfolio landlords around the event. The dependent variable is an indicator for whether the borrower has another mortgage outstanding on a different property with the same lender at the time of loan origination. *Specialist* lenders are defined as lenders with above-median share of BTL mortgage origination between January 2018 and December 2019 (*Non-specialist* lenders is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3. The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	$\mathbb{1}_{\text{Same lender}}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.055***	0.054***	0.052***			
	(0.005)	(0.005)	(0.005)			
Specialist	-0.039***	-0.040***	-0.037***	-0.038***	-0.037***	
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	
Post × Specialist	-0.088***	-0.085***	-0.087***	-0.088***	-0.090***	-0.061***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Constant	0.594***	0.762***				
	(0.004)	(0.006)				
Property characteristics		Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Quarter				Yes		
Local-area			Yes			
Local-area × quarter					Yes	Yes
Lender						Yes
LTV dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.02	0.02	0.02	0.02	0.04	0.26
Observations	225,603	221,811	221,810	221,811	221,598	221,596

Table 8: Maximum loan size for different fee-interest rate combinations

The table shows the maximum loan size for different fee-interest rate combinations so that the 1.25 interest coverage ratio is satisfied. The first row shows the results for an hypothetical loan with zero fees. In the remaining rows we vary the fees based on the estimates in the paper and adjust the interest rate so that the overall loan cost remains unchanged.

Scenario	Source	Fees (%)	Int. rate (%)	Max. loan (£)
1. Hypothetical	Table 4, Panel B.1	0	4.90	166,504
2. Nonspecialist mean	Table 4, Panel B.2	1.13	4.67	172,605
3. Specialist estimate	Figure 6, Panel (a)	1.57	4.59	175,131
4. Specialist mean	Table 4, Panel B.1	1.73	4.56	176,132
5. Nonspecialist low ICR	Figure 7, Panel (b)	0.93	4.72	171,649
6. Specialist low ICR	Figure 7, Panel (a)	1.96	4.51	177,525

Table 9: Stress test interest rate and initial fixation period, by lender type

The dependent variables are the stress test loan interest rate (Panel A) and initial period of interest rate fixation (Panel B). Columns (1) through (3) (Columns (4) through (6)) present estimates for non-specialist (specialist) lenders defined as lenders with below-median (above-median) share of BTL mortgage origination between January 2018 and December 2019. *Portfolio* and *Intentional* are dummies for landlord type (*Accidental* is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3, the event date. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being ≤ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Lender type:	Non-specialist			Specialist		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Panel A: Stress test interest rate (basis points)					
Portfolio	-11.090***	-11.106***	-8.927***	-11.935***	-11.505***	-12.346***
	(0.324)	(0.300)	(0.310)	(0.681)	(0.728)	(0.732)
Intentional	-4.647***	-5.455***	-2.299***	-5.856***	-5.682***	-6.125***
	(0.195)	(0.173)	(0.140)	(0.734)	(0.784)	(0.746)
Post × Portfolio		0.183	-3.786***		-3.133*	-7.583***
		(1.402)	(1.355)		(1.785)	(1.614)
Post × Intentional		7.343***	-5.258***		-1.398	-2.460*
		(1.046)	(0.889)		(1.447)	(1.318)
Adjusted-R^2	0.50	0.50	0.60	0.48	0.48	0.53
Dependent variable:	Panel B: Fixation term (years)					
Portfolio	0.244***	0.262***	0.230***	0.286***	0.250***	0.249***
	(0.009)	(0.009)	(0.009)	(0.017)	(0.019)	(0.019)
Intentional	0.154***	0.164***	0.146***	0.114***	0.117***	0.136***
	(0.006)	(0.006)	(0.006)	(0.014)	(0.015)	(0.014)
Post × Portfolio		-0.173***	0.036		0.249***	0.063*
		(0.024)	(0.027)		(0.037)	(0.033)
Post × Intentional		-0.098***	-0.069***		-0.018	0.070**
		(0.016)	(0.016)		(0.035)	(0.030)
Adjusted-R^2	0.07	0.07	0.17	0.30	0.30	0.33
Property characteristics	Yes	Yes	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Local-area × quarter	Yes	Yes	Yes	Yes	Yes	Yes
Lender	Yes	Yes		Yes	Yes	
Lender × quarter			Yes			Yes
Observations	825,870	825,870	825,869	315,650	315,650	315,642

Internet Appendix for

"Interest-Rate Fee Substitution:
Credit Facilitation in Segmented Markets"

A Additional Figures and Tables

Figure IA.A1 provides additional evidence on the macroeconomic consditions surrounding the event. Panel (a) plots the monthly time series for several macroeconomic variables from January 2018 to September 2023: the Bank of England base rate (dark gray), the year-on-year consumer price inflation (CPI) change (brown), the 2-year fixed rate for 75% LTV buy-to-let (blue) and residential (green) mortgages, and the England and Wales National House Price Index (black) plotted on the right vertical axis. Panel (b) plots the daily UK policy uncertainty index. In both panels, the dashed vertical line (maroon) marks the event date, when the U.K. government under Prime Minister Liz Truss unexpectedly announced a "mini-budget," which advocated for a significant unfunded reduction in taxation. This announcement sparked a strong bond market reaction and dramatically increased mortgage borrowing costs within a few days, which we exploit for identification.

Figure IA.A2 plots the time-series evolution of the average loan amount, by landlord type. Loan amounts are on average larger for accidental landlords who also own more expensive properties. This explains why their average LTVs are lower, in spite of the larger loan amounts. Post event there is a decrease in the average loan amount, more significant for accidental than the other landlord types.

Figure IA.A3 shows average rental yields by location and landlord type. Location is Local Administrative Unit (LAU, Level 1). The solid (black) boundaries highlight the NUTS 1 level regions. The regions marked in white indicate no transactions. The sample covers 392 out of a possible 400 LAUs.

Rents versus property values. In the main paper we have shown that rental yields were higher for portfolio landlords, followed by intentional and accidental landlords, and that there was an increase in rental yields post-event. Rental yields may be higher because of higher rental income or because of lower property values (or a combination of the two). We provide evidence on this.

In terms of the cross-sectional differences, the average rental incomes for accidental, intentional and portfolio landlords are £1,145, £1,035, and £1,024, respectively. The corresponding figures for property value are £313k, £264k, and £245k. Therefore, even though larger landlords receive on average lower rental income (roughly 10% lower), they do so on significantly

lower priced properties, generating the higher yields.

We use regression analysis to investigate the source of the increases in yields post-event, and how they differ across landlord types, while controlling for property characteristics and other variables. More precisely, we take the logarithm of rents and the logarithm of property values and regress them on property characteristics and local area fixed effects using an event-study specification:

$$\begin{aligned} \mathrm{y}_{ijt} = \sum_{k \in \{2018Q1, 2023Q3\}} \beta_k^{Accidental} \cdot D_k \cdot \mathrm{Accidental}_{ijt} + \beta_k^{Intentional} \cdot D_k \cdot \mathrm{Intentional}_{ijt} + \\ \sum_{k \in \{2018Q1, 2023Q3\}} \beta_k^{Portfolio} \cdot D_k \cdot \mathrm{Portfolio}_{ijt} + \gamma X_{ijt} + \omega_j + \epsilon_{ijt}, \end{aligned} \quad \text{(A.1)}$$

where i is the property used for collateral, j is the local-area of where the property is located, t origination quarter, X_{ijt} is a vector of other explanatory variables that include property characteristics (type and number of bedrooms), ω_j are local-area fixed effects and ϵ_{ijt} is the residual. The estimated coefficients on the landlord dummies show estimated rental income (Panel (a) of Figure IA.A4) and property value (Panel (b) of the same figure) for each of the landlord types in event time, relative to the base quarter 2022/Q3. Standard errors are clustered at the local area and corresponding 95% confidence intervals are shown.

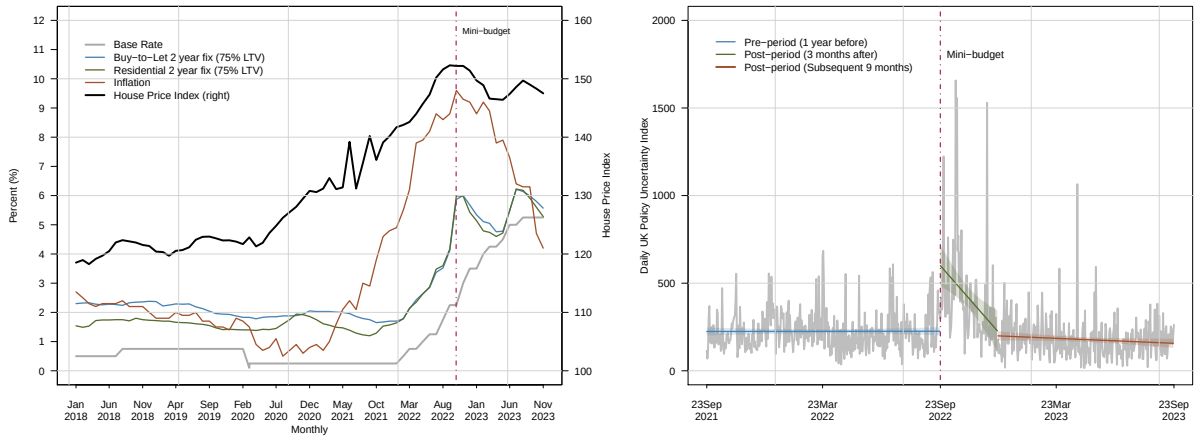
The figures show that prior to the event both rents and values increased in tandem, reflecting a cash-flow channel in property valuation. However, in the quarters after the event, even though rental income continues to grow at a rapid pace, property values stopped increasing. The increase in interest rates that operates through a discount rate channel more than offsets the positive valuation effects of higher rents. These collateral value effects imply additional risks for lenders.

Figure IA.A5 plots the fraction of the origination volume by lender type in the 12 months before (Panel (a)) and in the 12 months after (Panel (b)) the event. The figure distinguishes between specialist and non-specialist lenders and within each of these categories between the Big 7 banks (7 largest banks), other smaller banks, building societies and shadow banks. All of the Big 7 banks are non-specialist.

Table IA.A1 reports additional summary statistics of borrowers, by landlord type. Portfolio landlords have on average and at the median higher marginal tax rates than the remaining landlord types. They are more likely to make use of interest only loans (9 out of 10), but their

fraction is still high among the other landlord types (0.74 for accidental and 0.79 for intentional). As expected, the fraction of loans for house purchase granted to accidental landlords is negligible. Accidental landlords receive on average higher monthly rental income on their properties (£1,145), followed by intentional landlords (£1,035) and portfolio landlords (£1,023). Properties owned by portfolio landlords have on average more bedrooms, but the differences relative to those owned by other landlord types are small.

Table IA.A2 shows the estimated changes in loan characteristics by lender and borrower type obtained from estimating Equation (7) in main body of the paper. Column (1) shows results for the stress test interest rate (in basis points) as dependent variable; Column (2) for the initial interest rate fixation term (in years); Column (3) for the indicator variable that takes the value of 1 if the data includes the lender reported loan default probability; and Column (4) for the value for the default probability (in percentage points).



(a) Macroeconomic conditions

(b) UK Daily Policy Uncertainty Index

Figure IA.A1: Macroeconomic conditions and uncertainty

Panel (a) plots the monthly time series for several macroeconomic variables from January 2018 to September 2023: the Bank of England base rate (dark gray), the year-on-year consumer price inflation (CPI) change (brown), the 2-year fixed rate for 75% LTV buy-to-let (blue) and residential (green) mortgages, and the England and Wales National House Price Index (black) plotted on the right vertical axis. Panel (b) plots the daily UK policy uncertainty index from https://www.policyuncertainty.com/uk_daily.html. A linear fit and the corresponding 95% confidence interval is generated separately for 1 year before the mini-budget event, the first 3 months, and the following 9 months thereafter. The dashed vertical line (maroon) marks the event date, when the U.K. government under Prime Minister Liz Truss unexpectedly announced a "mini-budget," which advocated for a significant unfunded reduction in taxation. This announcement sparked a strong bond market reaction and dramatically increased mortgage borrowing costs within a few days.

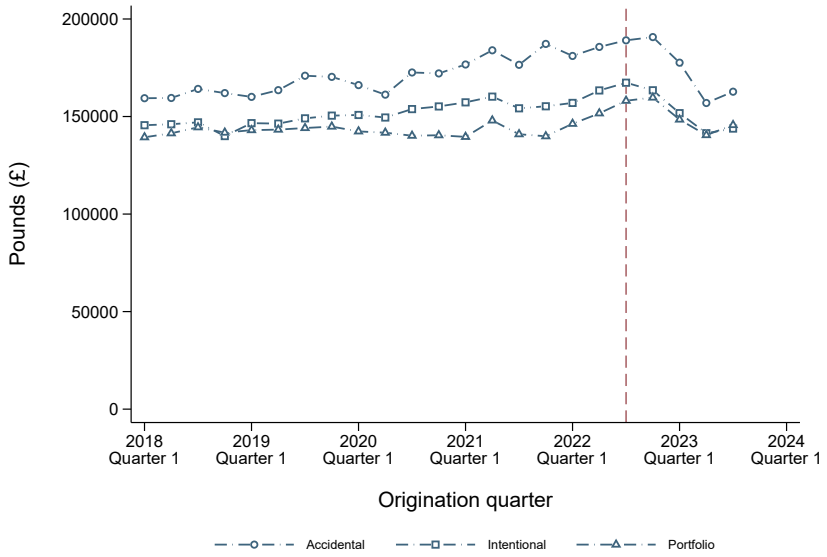
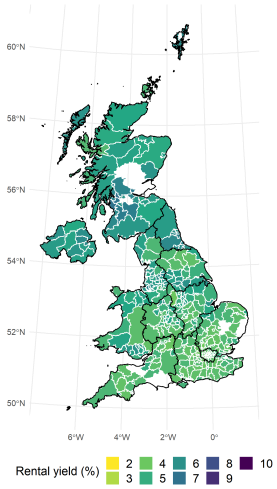
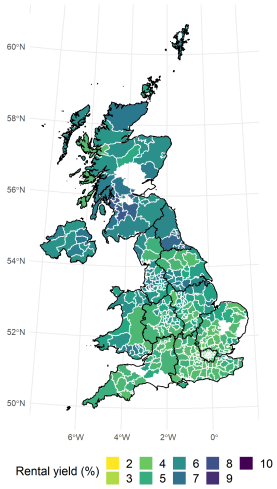


Figure IA.A2: Loan amount by landlord type

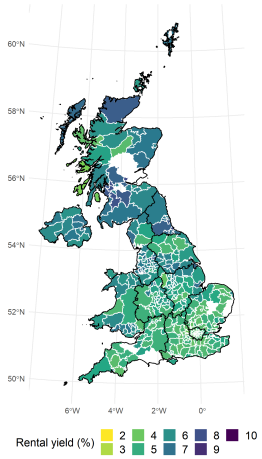
The figure shows the time-series evolution of average loan amounts, split by landlord type. Circles represent Accidental landlords, squares represent Intentional landlords, and triangles represent Portfolio landlords. The dashed vertical line (maroon) marks Quarter 3 of the fiscal year 2022, wherein the U.K government under Prime Minister Liz Truss unexpectedly announced a "mini-budget." It advocated for a significant reduction in taxation and included other looser set of policies that were largely unfunded, sparking a strong bond market reaction and dramatically increasing mortgage borrowing costs within a matter a few days.



(a) Accidental Landlords



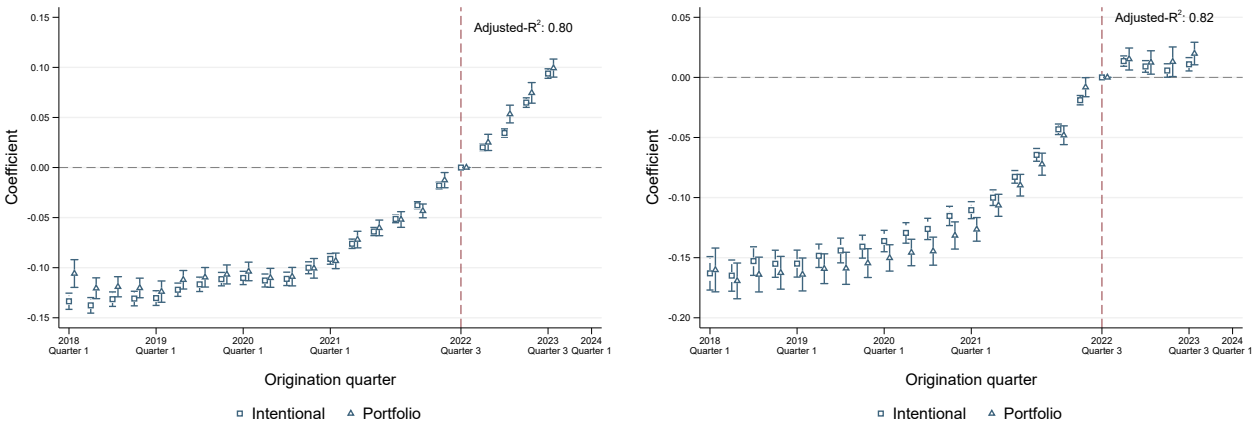
(b) Intentional Landlords



(c) Portfolio Landlords

Figure IA.A3: Average rental yields by location and landlord type

The figure plots the average rental yield of rental properties located within each Local Administrative Unit (LAU, Level 1) and owned by each landlord type. The solid (black) boundaries highlight the NUTS 1 level regions. The regions marked in white indicate no transactions. The sample covers 392 out of a possible 400 LAUs.

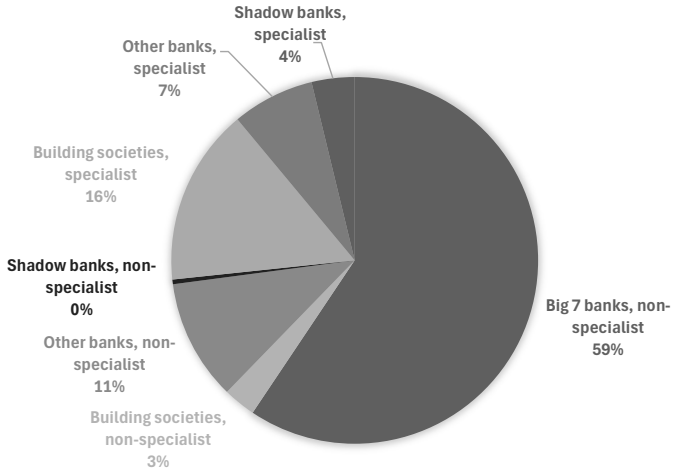


(a) Monthly rental income, event-study

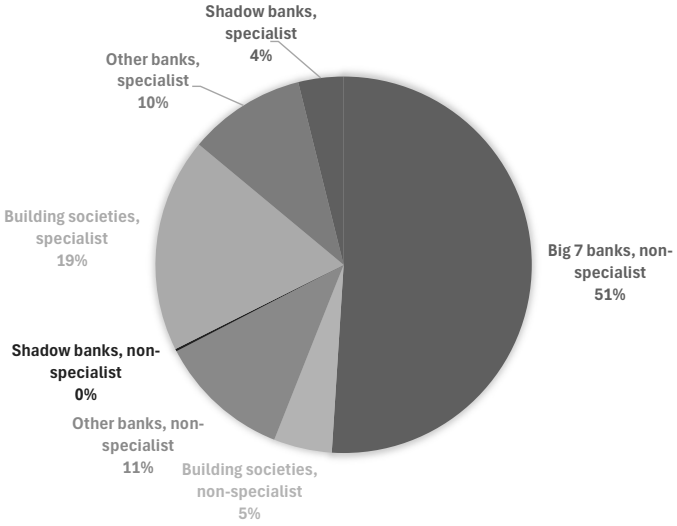
(b) Property value, event-study

Figure IA.A4: Monthly rental income and property values, event study

The figure plots the estimated coefficients and their 95% confidence intervals from an event-study difference-in-differences specification outlined in Equation (A.1) with log monthly rental income (Panel a) and log property value (Panel b) as dependent variables. Squares (triangles) represent Intentional (Portfolio) landlords. The estimated coefficients are normalized to zero in 2018/Q1. The dashed vertical line (maroon) marks 2022/Q3, the "mini-budget" announcement (event) date.



(a) Pre-event



(b) Post-event

Figure IA.A5: Loan origination volume by lender type

The figure plots the fraction of the origination volume by lender type in the 12 months before (Panel (a)) and in the 12 months after (Panel (b)) the event. The figure distinguishes between specialist and non-specialist lenders and within each of these categories between the Big 7 banks (7 largest banks), other smaller banks, building societies and shadow banks. All of the Big 7 banks are non-specialist.

Table IA.A1: Summary statistics of borrowers, by landlord type

This table presents descriptive statistics for the universe of mortgages granted to individual landlords in the United Kingdom from 2018/Q1 to 2023/Q3, by landlord type. Accidental landlords are those who initially bought the rental property to live in or who inherited it. Intentional landlords acquired the property with the intention of renting it. Portfolio landlords are intentional landlords who own four or more mortgaged properties. Tax rate is the marginal tax rate at origination. IO loans is the fraction of interest-only loans. Proportion of house purchases is the fraction of buy-to-let mortgages for house purchases. Monthly rental income is the value of expected gross rental income. Number of bedrooms is the number of property bedrooms.

Variable	Landlord type	Mean	Std. dev	P10	P25	Median	P75	P90
Tax rate	Accidental	27.4	11.6	20.0	20.0	20.0	40.0	40.0
(percent)	Intentional	27.6	11.8	20.0	20.0	20.0	40.0	40.0
	Portfolio	31.9	11.7	20.0	20.0	40.0	40.0	45.0
Interest-Only loans	Accidental	0.74	0.44	0	0	1	1	1
(fraction)	Intentional	0.79	0.41	0	1	1	1	1
	Portfolio	0.89	0.31	0	1	1	1	1
House purchases	Accidental	0.01	0.09	0	0	0	0	0
(fraction)	Intentional	0.33	0.47	0	0	0	1	1
	Portfolio	0.25	0.43	0	0	0	0	1
Rental income	Accidental	1,145	693	550	700	975	1,400	1,841
(monthly, £)	Intentional	1,035	775	525	625	850	1,250	1,700
	Portfolio	1,023	827	500	600	795	1,200	1,750
Number of	Accidental	2.47	1.02	1	2	2	3	4
bedrooms	Intentional	2.44	1.03	1	2	2	3	3
	Portfolio	2.59	1.45	1	2	2	3	4

Table IA.A2: Changes in loan characteristics by lender and borrower type

This table estimates changes in loan characteristics by lender and landlord type around the event. *Specialist* lenders are defined as lenders with above-median share of BTL mortgage origination between January 2018 and December 2019 (*Non-specialist* lenders is the omitted category). *Portfolio* and *Intentional* are dummies for the landlord type (*Accidental* is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3. The dependent variables are: in column 1, the *Stress rate* defined as the interest rate used in the stress-test done as part of the underwriting; in column 2, the *Fixation term* defined as the initial period of fixed interest rate (in years); in column 3, an indicator variable equal to 1 if the lenders reports the default probability calculated for the underwriting of the loan; in column 4, the value of the default probability, conditional on reporting. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being $\leq$ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Stress rate (bp)	Fix term (yrs)	Report	Def. prob. (pp)
	(1)	(2)	(3)	(4)
Portfolio × Specialist × Post	-4.243	0.397***	-0.234***	0.019***
	(2.644)	(0.044)	(0.010)	(0.001)
Intentional × Specialist × Post	-17.356***	0.445***	-0.034***	0.009***
	(2.275)	(0.039)	(0.009)	(0.001)
Portfolio × Specialist	12.050***	-0.311***	0.022***	-0.005***
	(1.333)	(0.024)	(0.006)	(0.000)
Intentional × Specialist	-3.035***	-0.025	-0.014***	-0.000
	(0.602)	(0.028)	(0.005)	(0.000)
Post × Specialist	-22.894***	-0.516***	-0.034***	-0.011***
	(1.781)	(0.032)	(0.007)	(0.001)
Post × Portfolio	1.539	-0.162***	0.168***	-0.013***
	(1.552)	(0.025)	(0.005)	(0.001)
Post × Intentional	20.358***	-0.071***	0.089***	-0.008***
	(1.163)	(0.016)	(0.003)	(0.001)
Portfolio	-33.073***	0.484***	-0.036***	-0.000**
	(0.528)	(0.012)	(0.004)	(0.000)
Intentional	-4.919***	0.269***	0.035***	-0.002***
	(0.580)	(0.007)	(0.003)	(0.000)
Specialist	-4.254***	1.027***	-0.334***	0.003***
	(0.653)	(0.022)	(0.005)	(0.000)
Property characteristics	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes
Fixed effects:				
Local-area × quarter	Yes	Yes	Yes	Yes
Adjusted-R^2	0.22	0.05	0.19	0.04
Observations	1,141,654	1,141,654	1,141,654	772,586

B High-street and non-high-street lenders

In the main body of the paper we distinguished between lenders which have high exposure to the buy-to-let mortgage market and those which do not, that we called specialist and non-specialist lenders, respectively. In this section, we show that our results are robust to an alternative classification of lenders between high-street and non-high-street lenders. High-street lender is a term used to designate the largest 7 lenders that have a high-street branch presence. Out of the roughly 1.2 million loans originated over the whole sample period, roughly 720 (490) thousand were granted by high-street (non-high-street) lenders. This classification is related to the specialist/non-specialist one; all 7 high-street lenders are in the non-specialist category, reflecting their relatively smaller exposure to the BTL sector.

Figure IA.B1 plots the number of loan originations by lender type focusing on the year before and the year after the event. It shows a larger decrease after the event for high-street than non-high-street lenders

Figure IA.B2 plots the pre-event values and post-event changes in loan characteristics, for interest rate, loan fees, stress-test interest rate, the indicator for whether the lender reports a default probability, and the reported default probability value. Panels (a) and (c) compare loans from non-high-street lenders to portfolio landlords versus loans from high-street lenders to the same landlord type. Panels (b) and (d) compare loans from non-high-street lenders to portfolio landlords versus loans from the same non-high-street lenders to accidental landlords. Panel (a) shows that pre-event non-high-street lenders charge portfolio landlords higher interest rates and fees than high-street lenders, and that post-event they increased the loan interest rate relatively less, but compensated this smaller increase by higher fees increase. These and the other effects shown in the figures are similar to those estimated for specialist/non-specialist lenders. The figures draw on the estimates in Appendix Tables IA.B2 and IA.B5.

Table IA.B1 shows summary statistics for the loans granted by each of these two groups of lenders to the different landlord types. A larger fraction of the loans granted by non-high street lenders are to portfolio landlords. The remaining patterns in the table are similar to those emphasized in the main body of the paper when comparing specialist and non-specialist lenders.

Table IA.B2 shows the estimates for loan loan interest rate and fees, and how they changed

after the event, for high-street and non-high street lenders. The base groups are high-street lenders and accidental landlords.

Table IA.B3, Panel A reports the results for the within lender type initial loan interest rate charged to the different landlord types and how it changed post event. Both high-street and non-high-street lenders charge on average higher interest rates to portfolio landlords. Post-event, when considering within lender type variation, both lender types increased interest rates on loans to portfolio landlords less than those on loans to intentional and to accidental landlords. Panel B reports the results for loan fees. Non-high-street lenders increased relatively more the initial loan fees that they charge the largest landlords, relative to loans originated by the same lenders to accidental landlords.

Table IA.B4 shows the results for the within-lender-type stress test interest rate (Panel A) and fixation term (Panel B). Both high-street and non-high-street lenders use on average a lower stress test interest rate for portfolio landlords than other landlord types. However, post-event high-street lenders increased the stress test interest rate that they use for portfolio landlords whereas non-high-lenders decreased it. Panel B shows that there also are post-event differences in the fixation term of loans to portfolio landlords of high-street and non-high-street lenders, with the former decreasing the length and the latter increasing it, relative to loans to accidental landlords originated by the same lender type.

Table IA.B5 shows the estimates for stress test interest rate, fixation term, the indicator for reporting of default probability, and for the default probability value, and how they changed after the event, for high-street and non-high street lenders, and for the different borrower types. The base groups are high-street lenders and accidental landlords.

These patterns are similar to those emphasized in the main body of the paper when comparing specialist and non-specialist lenders.

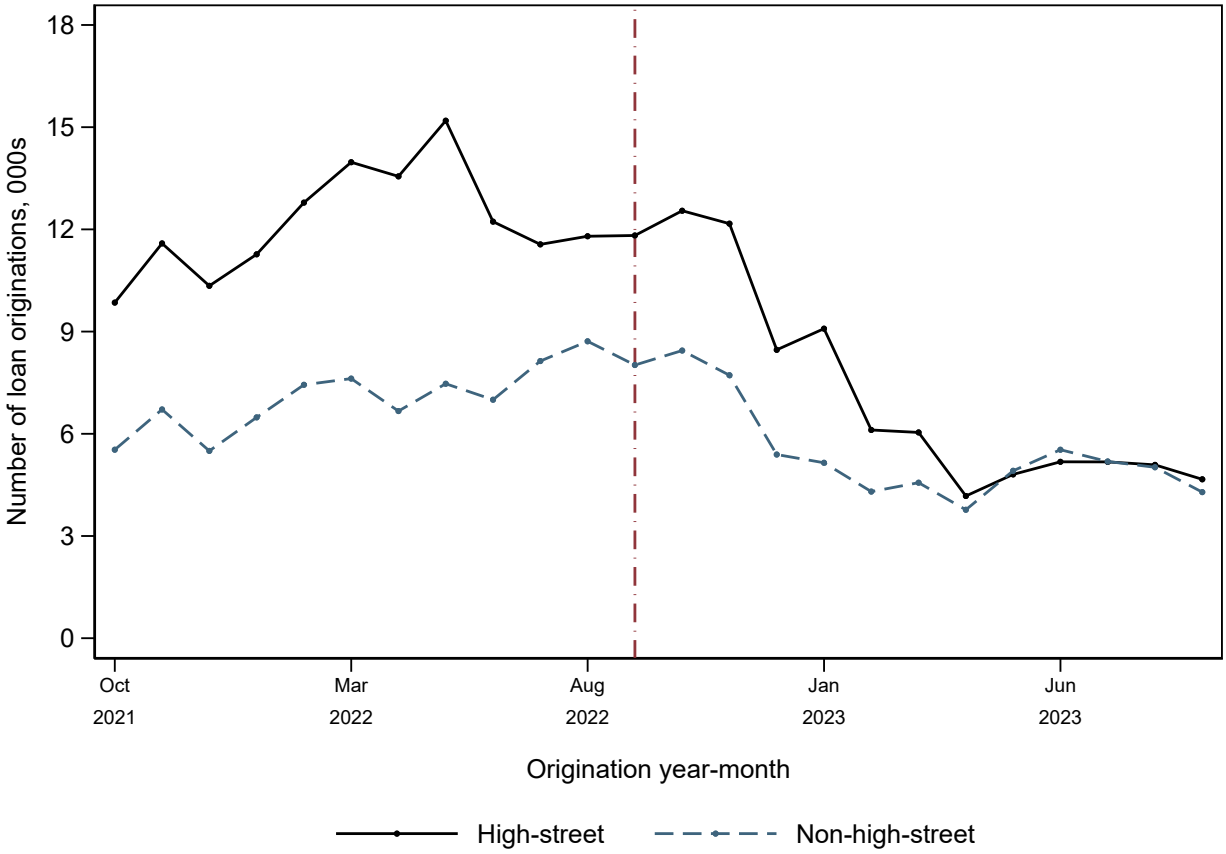
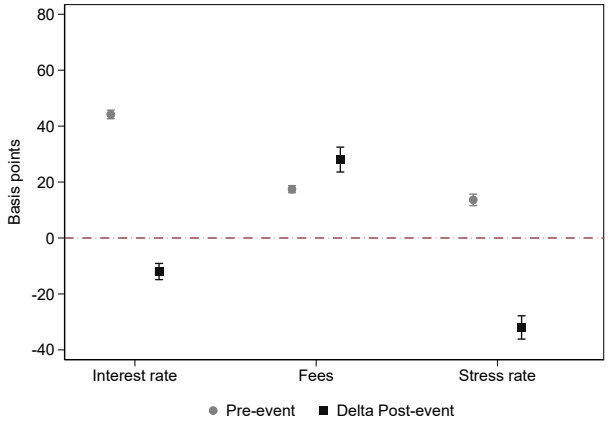
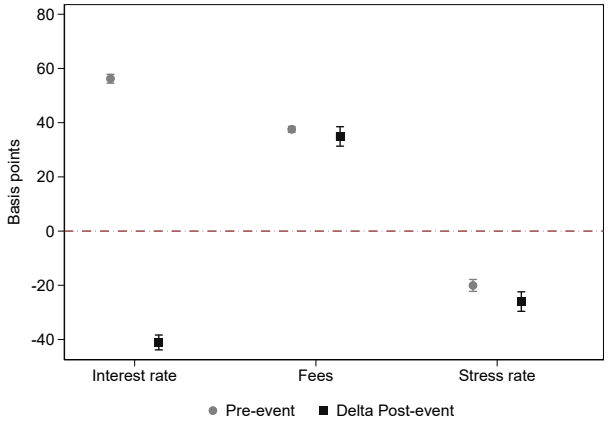


Figure IA.B1: Loan originations by lender type

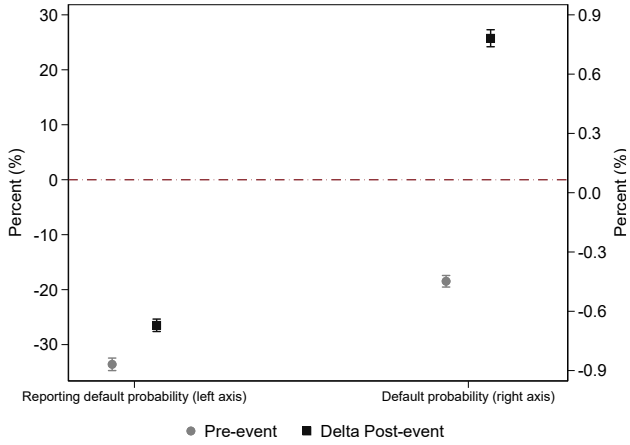
The solid (dashed) line plots the number of loans originated in each year-month by High-street (Non-high-street) lenders. The dashed vertical line (maroon) marks September 2022, wherein the U.K government under Prime Minister Liz Truss unexpectedly announced a "mini-budget." It advocated for a significant unfunded reduction in taxation sparking a strong bond market reaction and dramatically increasing mortgage borrowing costs within a few days.



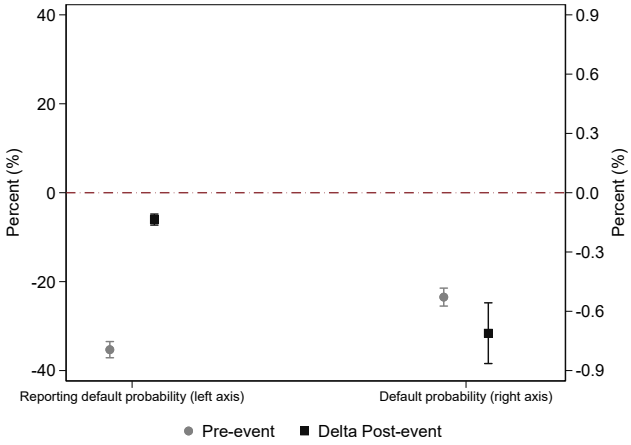
(a) Non-high-street/portfolio relative to high-street/portfolio



(b) Non-high-street/portfolio relative to non-high-street/accidental



(c) Non-high-street/portfolio relative to high-street/portfolio



(d) Non-high-street/portfolio relative to Non-high-street/accidental

Figure IA.B2: Changes in loan characteristics by lender and borrower type

Panel (a) (and Panel (c)) compare loan interest rates, origination fees, and stress-test interest rates (and, respectively, the reporting of default probabilities and the estimated default probabilities conditional on reporting) for loans from non-high-street versus high-street lenders to portfolio landlords. Panel (b) and Panel (d) compare the same variables for loans from non-high-street lenders to portfolio landlords relative to those from non-high-street lenders to accidental landlords. The figures draw on the estimates in Appendix Table IA.B2 and Appendix Table IA.B5, showing pre-event estimates in gray circles and post-event changes (Delta post-event) in black squares.

Table IA.B1: Summary statistics, by landlord and lender type

Panel A (Panel B) presents summary statistics for High-street lenders (Non-high-street lenders). The statistics are calculated over the whole sample period. The first column reports the number of originated loans to each landlord type. The remaining columns show the averages of several variables. *Interest rate* is the initial loan interest rate; *Stress rate* is the interest rate used in the stress-test done as part of the underwriting; *Loan-to-value* is calculated by dividing loan amount by the property value; *Fixation term* is the initial period of fixed interest rate; *Lender fees* are calculated as a proportion of loan amount; *Interest coverage ratio, origination* is the ratio of rental income to loan interest payments; *Interest coverage ratio, stress* is the ratio of rental income to interest payments calculated using the stress test rate.

Landlord type	Number loans	Interest rate (bp)	Stress rate (bp)	Loan-to-value (%)	Fix. term (yrs)	Loan fees (bp)	Origination ICR (%)	ICR stress (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A: High-street lenders				
Accidental	139,034	237.45	520.76	57.48	3.51	61.36	468.04	228.65
Intentional	465,800	242.94	519.01	62.17	3.87	76.09	419.39	205.75
Portfolio	111,860	250.69	488.55	62.31	4.01	85.93	438.30	257.17
				Panel B: Non-high-street lenders				
Accidental	93,176	275.65	529.70	57.51	4.18	84.52	409.03	202.04
Intentional	264,811	290.74	522.93	60.38	4.63	99.68	406.61	224.14
Portfolio	115,754	308.10	503.11	62.43	4.64	112.18	375.07	248.42

Table IA.B2: Changes in interest rate and fees by lender and borrower type

This table estimates changes in interest rate and fees by lender and landlord type around the event. *High-street* lenders are defined as lenders with a presence on the high-street and include the 7 largest lenders. *Non-High-street* lenders are the remainder. The base group are high-street lenders. *Portfolio* and *Intentional* are dummies for the landlord type (*Accidental* is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3. Column 1 shows results for the loan *Interest rate* as dependent variable and column 2 for the origination *Fees* defined as a proportion of loan amount. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being $\leq$ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Interest rate (bp)	Fees (bp)
	(1)	(2)
Portfolio × Non-high-street × Post	1.060	25.130***
	(1.846)	(2.616)
Intentional × Non-high-street × Post	17.113***	13.540***
	(1.397)	(1.802)
Portfolio × Non-high-street	14.544***	-2.429***
	(0.669)	(0.797)
Intentional × Non-high-street	10.148***	0.980*
	(0.589)	(0.588)
Post × Non-high-street	-13.054***	2.913*
	(1.415)	(1.484)
Post × Portfolio	-29.098***	6.873***
	(1.290)	(1.770)
Post × Intentional	-18.124***	-13.637***
	(0.856)	(0.961)
Portfolio	12.037***	20.068***
	(0.342)	(0.446)
Intentional	0.956***	11.781***
	(0.202)	(0.257)
Non-high-street	29.630***	19.889***
	(0.941)	(0.480)
Property characteristics	Yes	Yes
LTV dummies	Yes	Yes
Fixed effects:		
Local-area × quarter	Yes	Yes
Adjusted-R^2	0.58	0.11
Observations	1,145,504	1,145,504

Table IA.B3: Initial loan interest rate and fees, within lender type

The dependent variables are the initial loan interest rate (Panel A) and loan fees (Panel B). Columns (1) through (3) present estimates for High-street lenders while columns (4) through (6) present estimates for Non-high-street lenders. For each lender type, the columns differ in the explanatory variables and set of controls included. *Portfolio* and *Intentional* are dummies for the landlord type (*Accidental* is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being $\leq$ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Lender type:	High-street			Non-high-street		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Panel A: Interest rate (basis points)					
Portfolio	4.409***	6.886***	5.901***	1.733***	5.487***	3.970***
	(0.375)	(0.392)	(0.369)	(0.262)	(0.261)	(0.239)
Intentional	-0.187	1.335***	0.818***	0.624***	1.979***	1.877***
	(0.231)	(0.207)	(0.191)	(0.224)	(0.230)	(0.212)
Post × Portfolio		-26.386***	-16.263***		-26.646***	-9.434***
		(1.275)	(1.325)		(1.185)	(1.072)
Post × Intentional		-16.017***	-12.681***		-10.399***	-6.009***
		(0.860)	(0.881)		(0.843)	(0.829)
Adjusted-R^2	0.74	0.74	0.75	0.82	0.82	0.84
Dependent variable:	Panel B: Fees (basis points)					
Portfolio	5.285***	4.270***	5.918***	20.024***	16.925***	9.318***
	(0.439)	(0.441)	(0.422)	(0.530)	(0.503)	(0.450)
Intentional	4.529***	4.840***	4.344***	7.784***	7.935***	8.611***
	(0.225)	(0.218)	(0.215)	(0.360)	(0.370)	(0.362)
Post × Portfolio		10.904***	-2.916*		20.959***	7.981***
		(1.714)	(1.709)		(1.782)	(1.713)
Post × Intentional		-2.379**	-0.036		-1.205	0.667
		(0.968)	(1.033)		(1.268)	(1.192)
Adjusted-R^2	0.27	0.27	0.30	0.41	0.41	0.50
Property characteristics	Yes	Yes	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Local-area × quarter	Yes	Yes	Yes	Yes	Yes	Yes
Lender	Yes	Yes		Yes	Yes	
Lender × quarter			Yes			Yes
Observations	683,671	683,671	683,671	461,730	461,730	461,718

Table IA.B4: Stress test interest rate and initial fixation period, within lender type

The dependent variables are the stress test loan interest rate (Panel A) and initial period of interest rate fixation (Panel B). Columns (1) through (3) (Columns (4) through (6)) present estimates for the sample of High-street (Non-high-street) lenders. *Portfolio* and *Intentional* are dummies for the landlord type. *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3, the event date. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being ≤ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Lender type:	High-street			Non-high-street		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Panel A: Stress test interest rate (basis points)					
Portfolio	-9.193***	-9.796***	-8.794***	-14.547***	-13.238***	-11.605***
	(0.417)	(0.404)	(0.399)	(0.598)	(0.641)	(0.588)
Intentional	-4.380***	-5.405***	-2.191***	-6.137***	-5.697***	-5.116***
	(0.191)	(0.175)	(0.167)	(0.560)	(0.615)	(0.539)
Post × Portfolio		6.362***	4.790***		-9.263***	-13.336***
		(1.691)	(1.645)		(1.499)	(1.353)
Post × Intentional		10.152***	-3.017***		-3.379***	-4.993***
		(1.308)	(0.991)		(1.209)	(1.067)
Adjusted-R^2	0.52	0.52	0.61	0.46	0.46	0.55
Dependent variable:	Panel B: Fixation term (years)					
Portfolio	0.211***	0.237***	0.199***	0.329***	0.303***	0.286***
	(0.010)	(0.010)	(0.010)	(0.013)	(0.015)	(0.015)
Intentional	0.138***	0.148***	0.127***	0.149***	0.160***	0.164***
	(0.006)	(0.006)	(0.006)	(0.010)	(0.011)	(0.010)
Post × Portfolio		-0.283***	0.012		0.167***	0.043
		(0.025)	(0.028)		(0.030)	(0.028)
Post × Intentional		-0.107***	-0.083***		-0.084***	0.026
		(0.017)	(0.017)		(0.026)	(0.024)
Adjusted-R^2	0.08	0.08	0.19	0.28	0.28	0.32
Property characteristics	Yes	Yes	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Local-area × quarter	Yes	Yes	Yes	Yes	Yes	Yes
Lender	Yes	Yes		Yes	Yes	
Lender × quarter			Yes			Yes
Observations	683,671	683,671	683,671	461,730	461,730	461,718

Table IA.B5: Changes in loan characteristics by lender and borrower type

This table estimates changes in loan characteristics by lender and landlord type around the event. *High-street* lenders are defined as lenders with a presence on the high-street and include the 7 largest lenders. *Non-High-street* lenders are the remainder. The base group are high-street lenders. *Portfolio* and *Intentional* are dummies for the landlord type (*Accidental* is the omitted category). *Post* is an indicator taking the value of one for all mortgages originating after 2022/Q3. The dependent variables are: in column 1, the *Stress rate* defined as the interest rate used in the stress-test done as part of the underwriting; in column 2, the *Fixation term* defined as the initial period of fixed interest rate (in years); in column 3, an indicator variable equal to 1 if the lenders reports the default probability calculated for the underwriting of the loan; in column 4, the value of the default probability, conditional on reporting. The loan-to-value dummies are (55,65], (65,75], and >75 (omitted category being ≤ 55). The property characteristics are property type and number of bedrooms. Local-area dummies are for local administrative unit, level 1. The standard errors are clustered at the local administrative unit (level 1) and are robust to heteroscedasticity. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Stress rate (bp)	Fix term (yrs)	Report	Def. prob. (pp)
	(1)	(2)	(3)	(4)
Portfolio × Non-high-street × Post	-16.722***	0.355***	-0.237***	0.015***
	(2.638)	(0.039)	(0.008)	(0.001)
Intentional × Non-high-street × Post	-25.328***	0.201***	-0.031***	0.008***
	(2.212)	(0.033)	(0.007)	(0.001)
Portfolio × Non-high-street	8.520***	-0.118***	-0.080***	-0.001***
	(1.305)	(0.018)	(0.007)	(0.000)
Intentional × Non-high-street	-2.904***	-0.014	-0.107***	0.003***
	(0.475)	(0.019)	(0.005)	(0.000)
Post × Non-high-street	-15.250***	-0.305***	-0.028***	-0.007***
	(1.910)	(0.027)	(0.006)	(0.001)
Post × Portfolio	5.968***	-0.249***	0.204***	-0.015***
	(1.968)	(0.027)	(0.005)	(0.001)
Post × Intentional	24.398***	-0.044**	0.086***	-0.009***
	(1.459)	(0.018)	(0.004)	(0.001)
Portfolio	-33.696***	0.520***	-0.017***	-0.001***
	(0.510)	(0.012)	(0.006)	(0.000)
Intentional	-4.797***	0.300***	0.061***	-0.003***
	(0.546)	(0.007)	(0.004)	(0.000)
Non-high-street	5.119***	0.674***	-0.255***	-0.003***
	(0.483)	(0.012)	(0.008)	(0.000)
Property characteristics	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes
Fixed effects:				
Local-area × quarter	Yes	Yes	Yes	Yes
Adjusted-R^2	0.22	0.04	0.21	0.04
Observations	1,145,504	1,145,504	1,145,504	774,804

C Loans on offer data

The loans on offer data is from Moneyfacts Group plc, an independent provider that collects daily information on mortgage products *on offer* in the UK. On each day, there are many different loans on offer, by different lenders, of different type (e.g. fixed or variable interest rate), with a given interest rate, maximum LTV, among other differences, which are recorded in the Moneyfacts data. The unit of observation is loan-day. We use data from September 2021 to September 2023, roughly twelve months before and after the event, corresponding to roughly 2.05 million product-day observations.

The dataset includes comprehensive information on mortgage products, comprising various numerical variables along with textual descriptions detailing product requirements, characteristics, and incentives. In this appendix section, we provide an explanation of the variables used in our analysis and carefully describe the process of extracting numerical information from textual variables. We also include additional results.

A shortcoming of the Moneyfacts data is that it does not allow to clearly distinguish among loans on offer to the different landlord types (accidental, intentional and portfolio). The "let-to-buy" and "let-to-buy only" variables can be used to identify loans available to accidental landlords. Let-to-buy refers to a situation when households rent out their existing home and buy a new one to live in, meaning accidental landlords. Roughly 34% of the 2.05 million loan observations in the data are available for let-to-buy. But the vast majority of these same loans are also available to non-accidental landlords: only a very small fraction (1.2%) of the total are let-to-buy only. The remaining 66% are not available for let-to-buy, meaning that they are available for intentional and portfolio landlords only. Therefore, for parts of the analysis we distinguish between loans that are *also* available to accidental landlords (labeled accidental) and those that are not (non-accidental).

C.1 Number of loans

Figure IA.C1 plots the daily number of different 2- and 5-year fixed interest rate loan products on offer, the two largest categories, by lender type. A larger number of products are offered by non-specialist lenders, reflecting their larger size and market share. Before the event both lender types offered more 5-year than 2-year loans. The number of products on offer declined prior to the event, as interest rates increased.

The event triggered a large abrupt decline in the number of loans on offer. As uncertainty

reduced and lenders repriced the loans, the number of product offerings increased. However, interestingly, among specialist lenders the relative importance of 5-year and 2-year loans remained similar to that of pre-event, with a larger number of the former. On the other hand, among non-specialist lenders there is a reversal with a larger increase in the number of 2-year products, whose count becomes larger than that of 5-year ones. This shows how specialist lenders favor relatively more 5-year products for which the regulatory ICR stress testing requirements are less stringent.

C.2 Stress testing

The PRA regulations specify that, when assessing affordability, lenders should take into account likely future increases in interest rates over a minimum period of five years (unless the interest rate is fixed for 5 years or more). They should do so using a stress test interest rate that takes into account market expectations of future interest rates and a minimum 200 basis points increase in mortgages rates. Furthermore, they specify that a minimum stress test interest rate of 5.5% should be used, unless the interest rate is fixed or capped for a period of 5 years or more. Therefore, the regulatory framework treats loans with interest rates that are fixed for at least 5 years more favorably, giving lenders considerable discretion on the interest rate used for the ICR calculation for such loans.

The variable rental income contains a textual description of the minimum product ICR and the interest rate at which that minimum ICR restriction must be satisfied. The minimum ICRs are typically 125 (145) for standard (high) rate tax payers. However, there is some variation across products in these values and those that apply to different borrower types (e.g. second time buyer, remortgagor). For each product, we extract all the reported minimum ICRs and calculate their average.

Figure IA.C2 plots the daily evolution of the average minimum ICRs, distinguishing between lender types and loans that are also available (or not) for accidental landlords. Prior to the event, minimum ICRs were on average higher for specialist lenders, but the differences are relatively small, on average around 2 percentage points for the loans for the intentional/portfolio landlords only. These differences disappeared after the event, due to the decline in ICR for specialist lenders.

The data includes a textual description of the stress test interest rate that lenders use in the minimum ICR calculation. There is variation across products in both the interest rate values and the way they are reported. For some entries, lenders report the interest rate value directly

(e.g. "Calc at managed rate of 5.5%," the most frequent managed rate is 5.5%). For others, lenders report it as a premium over the loan interest rate (E.g. "Calc at Product Pay Rate +2%," the most frequent premium is 2%). There is a much smaller number of products for which lenders report it as a premium over the reversion rate (E.g. "Calc at Revert Rate"). We extract this information from the text, and for all the alternatives we calculate the interest rate premium over the loan interest rate.[49]

Figure IA.C3 plots the daily time-series evolution of the average premia. Panel (a) shows the results for 2-year products. In the early part of the sample they were equal to between 2% and 3%, a result of mortgage rates of around 3% and the regulations specifying a minimum stress test rate of 5.5%. As interest rates increase, there is a steady decline in premia, among both specialist and non-specialist lenders. The event itself triggered increases in premia for both lender types, with significant volatility.

Panel (b) shows that the premia for 5-year fixed rate products are significantly lower than those for 2-year ones. Regulations do not prescribe a minimum stress test interest rate for the former. Pre-event, as interest rates increase, non-specialist lenders decrease the premium they charge on products available only to non-accidental landlords from an average value of 2% to roughly 0.5% just before the event. On the other hand, specialist lenders use a fairly stable, lower premium of between 0.1 - 0.3% throughout.

Interestingly, upon the event, non-specialist lenders double the premia that they use to 1%, with significant volatility, while specialist lenders keep them at their pre-event level. This has an effect on maximum loan amounts. For a loan interest rate of 5% and a minimum ICR of 1.25, a 50 basis points premium difference, making the stress test interest rates equal to 5.5% and 6% respectively, imply a 9.09% difference in maximum loan amount. In the weeks after the event, non-specialist lenders decreased the non-accidental landlords premia, but they remained higher than that of specialist lenders for the remainder of the sample.

C.3 Fees

The origination data showed significant differences in origination fees across lender and borrower types, calculated as a percentage of loan amount. We study fees for the products on offer. The key question is whether lenders changed the fees on the products on offer after the event.

The fees information is included in the Moneyfacts data in textual form, which distinguishes between different types of fees (arrangement, booking, etc). Some products have fees that are

[49] When there there is more than one interest rate reported we extract all and calculate their average.

a fixed £ amount whereas others have % fees. Furthermore, some products have both fixed and percentage fees (for different types of fees). We extract product fees from two variables: "Product Flat Fees", which specifies the amount in pounds, and "Product Percent Fees", which provides the fees as a percentage of the loan amount. Almost all products report either flat fees or percentage fees. There are three different types of fees: (i) completion fees; (ii) booking fees; (iii) arrangement fees. A product may report one or more types of fees, as illustrated in the following examples: "Arrangement £500 ; Booking £699" or "Completion £495". For both flat and percentage fees, we extract each product's reported completion, booking, and arrangement fees, and then calculate the total fees as the sum of these three types. If the product does not have a particular type of fees, either flat or percentage, we set the corresponding value to zero.

We extract the fees information from the textual data by searching for the amounts after the £ and before the % signs. For those entries with more than one value for each of the fee types, we extract all the values and add them to create a total value for the flat fees and another for the percent fees. In the origination data the two are combined into a total percentage of loan amount. But here we analyze them separately, rather than assuming a given loan amount.

Panel (a) of Figure IA.C4 shows the average flat fees (in £s). They are relatively stable over time, but on average higher for those loans that are also available to accidental landlords borrowing from both specialist and non-specialist lenders. Panel (b) plots the percentage fees, for which the differences are more significant. Prior to the event, when interest rates were already increasing, specialist lenders increase the fees that they charge non-accidental landlords from 1.0% to around 1.2% while non-specialist lenders kept them relatively stable at around 0.6%. After the event, specialist lenders increased them further to around 1.4%, and they remained relatively higher throughout the remaining of the sample period. It was only latter part of the sample that non-specialist lenders increased their percentage fees to bring them closer to those of specialists.

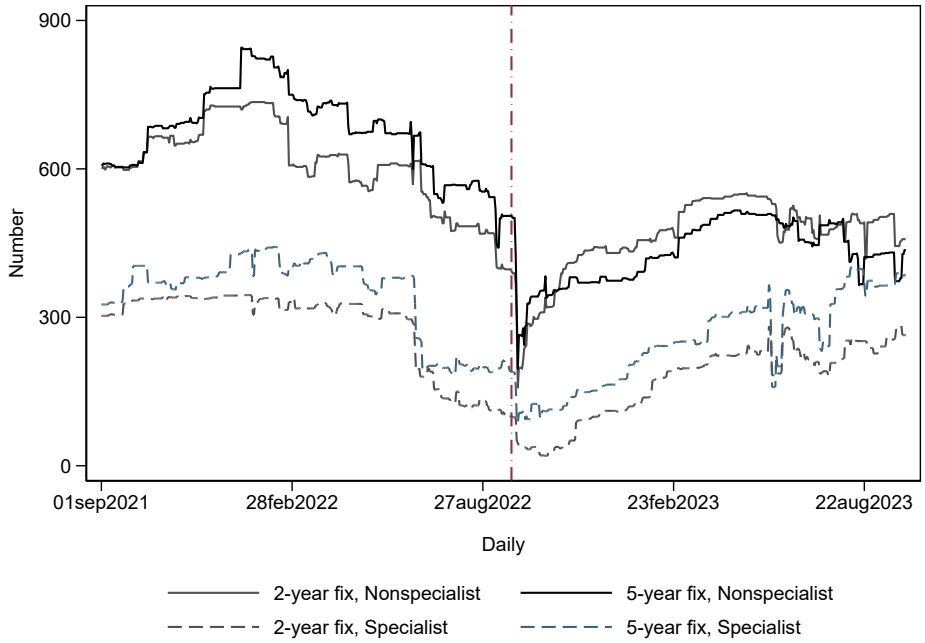


Figure IA.C1: Daily number on loans on offer by lender type and fixation period

The figure plots the number of different products offered on each day by lender type and fixation period, 2- and 5-year fixed interest rate loans. The dashed vertical line (maroon) marks 23 September 2022, wherein the U.K government under Prime Minister Liz Truss unexpectedly announced a "mini-budget." It advocated for a significant unfunded reduction in taxation sparking a strong bond market reaction and dramatically increasing mortgage borrowing costs within a few days. The data are from Moneyfacts.

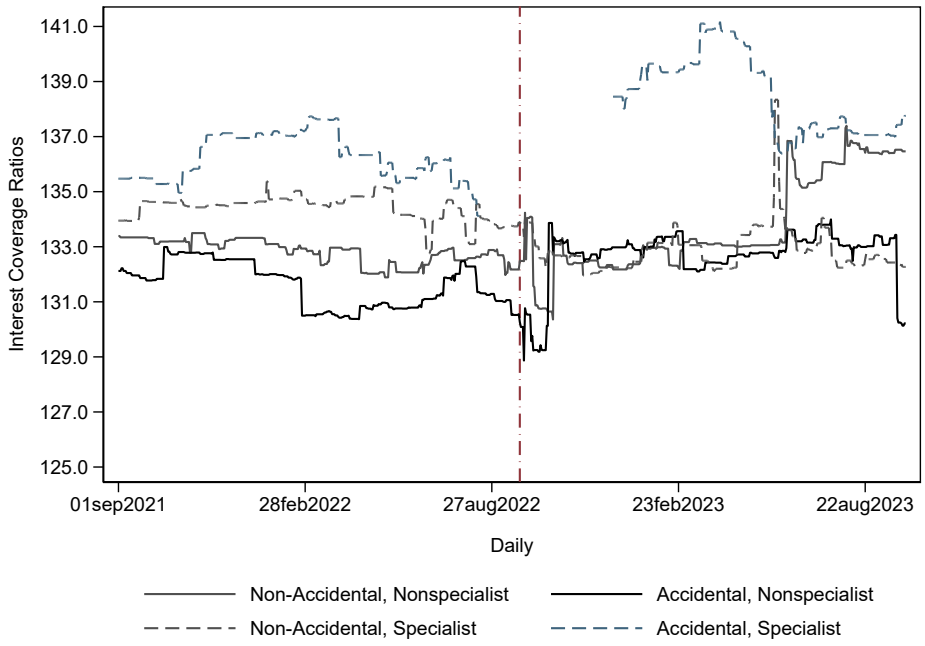
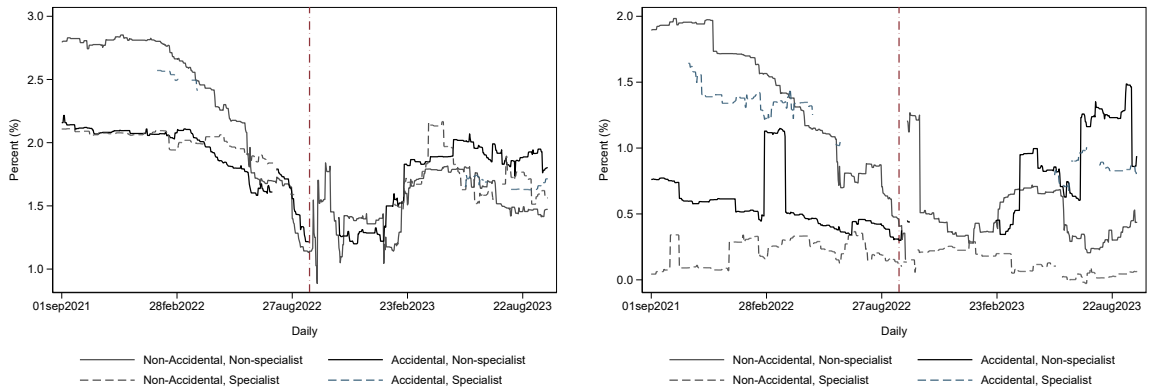


Figure IA.C2: Minimum Interest Coverage Ratios

The figure plots the minimum interest coverage ratios each day by lender type and landlord type. We require that each day there at least 100 products on offer in each category. The dashed vertical line (maroon) marks 23 September 2022, wherein the U.K government under Prime Minister Liz Truss unexpectedly announced a "mini-budget." It advocated for a significant unfunded reduction in taxation sparking a strong bond market reaction and dramatically increasing mortgage borrowing costs within a few days.

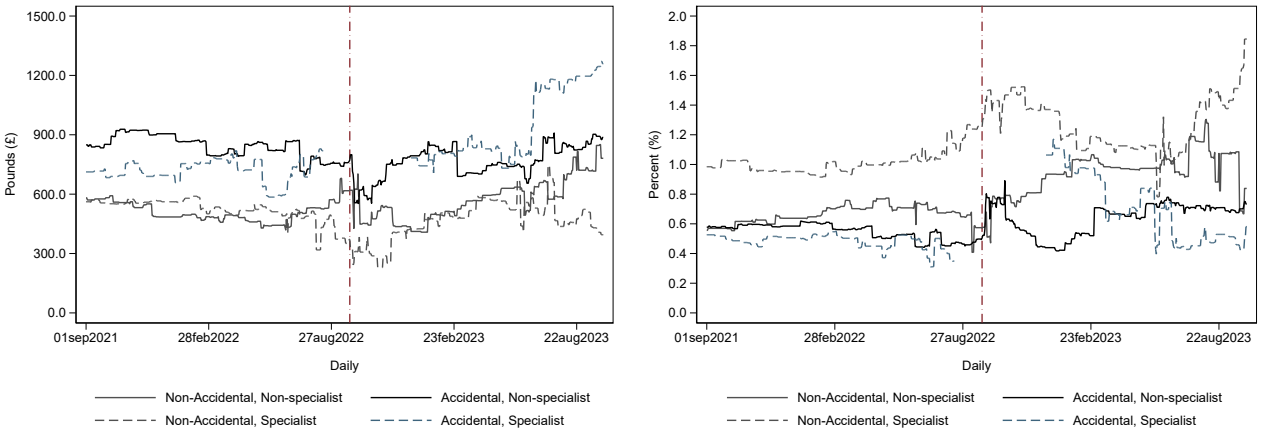


(a) 2-year fixed interest rate

(b) 5-year fixed interest rate

Figure IA.C3: Interest rate premium used in ICR calculations by lender and landlord type

Panel (a) plots the interest rate premium used for ICR calculations for each day split by lender type for 2-year fix products. Panel (b) plots the interest rate premium used for ICR calculations for each day split by lender type for 5-year fix products. Non-accidental refers to loans on offer that are not available to accidental landlords. Accidental refers to loans on offer that are also available to accidental landlords (in addition to intentional and portfolio landlords). We require that each day there at least 100 products on offer in each category. The dashed vertical line (maroon) marks 23 September 2022, the event date.



(a) Product fees (£s)

(b) Product fees (%)

Figure IA.C4: Product fees by lender type

Panel (a) (Panel (b)) plots the daily evolution of the average loan flat (percent) fees by lender and landlord type. We require that each day there at least 100 products on offer in each category. The dashed vertical line (maroon) marks 23 September 2022, the event date.