Credit Facilitation through Substitution of Interest Rates for Fees*

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Abstract

We use administrative data on the universe of mortgage originations to individual real estate investors in the United Kingdom to study financing outcomes around a large unexpected increase in interest rates. Loan originations become more concentrated among specialist lenders who increase interest rates less for larger borrowers, compensating these smaller rate increases by larger increases in loan fees, thus mitigating the effects of the rate increase on interest coverage ratios. The same specialist lenders also facilitate credit access by issuing contracts with less-stringent loan underwriting requirements. The substitution between interest rates and loan fees is present both in loan originations and in the loans on offer in the market.

Keywords: Individual landlords, Mortgages, Interest rates, House prices, Loan underwriting
JEL Classification: D1, G5, R21, E43

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1 Introduction

Banks are inherently exposed to interest rate risk —a vulnerability starkly underscored by the collapse of Silicon Valley Bank and other regional banks amid recent monetary tightening in the United States (Jiang, Matvos, Piskorski, and Seru, 2023). The higher interest rates, on the one hand, positively impact banks' short-term profitability by improving their net interest margins. However, at the same time, they amplify risk exposures and trigger significant deleveraging across the banking sector. In this context, loan underwriting assumes heightened importance, serving as a critical mechanism for managing credit risk and maintaining credit supply, amid the potential disruptions caused by a sharp increase in interest rates.

Our paper provides novel evidence on the effects of higher interest rates on loan underwriting, and on the heterogeneous responses of lenders and its impact on borrowers. We do so in the context of asset and mortgage markets that are important in their own right: the residential rental 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]

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 interest rate increases, we leverage the UK Chancellor's mini-budget announcement of 23 September 2022 (the "event"). The proposed unfunded tax cuts were received with skepticism by markets and led to a sudden and unexpected deterioration in credit conditions, including a 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.

[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 (Mian and Sufi (2011), Corbae and Quintin (2015), Adelino et al. (2016), Albanesi et al. (2022), among others).

For both lenders and borrowers (investors), 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 how, 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 rental yields led to sharp declines in interest coverage ratios (ICRs), which together with loan-to-values (LTVs) are the main criteria for loan underwriting.

We use a difference-in-differences framework to compare loans across both borrower and lender types. On the borrowers side, we focus on 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.[5] Moreover, our empirical specifications control for several time-varying regional and property characteristics through the inclusion of high-dimensional interactive fixed effects.

The estimates show that, after the event, there is significant deleveraging by all landlord types and loan originations become increasingly 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 smaller ones —particularly among specialist lenders, but also when considering variation within lender types. This shows a differential pass-through of increased interest rates, with both lender and borrower heterogeneity playing an important role.

There are, however, additional significant effects on loan origination fees that impact the overall cost of loans. We see that, after the event, specialist lenders increase initial loan fees more than non-specialist ones —particularly for larger (portfolio) landlords, for whom they increase interest rates less. This substitution of higher interest rates with increased upfront loan fees helps sustain loan profitability and, importantly, facilitates credit access to larger borrowers by reducing debt servicing requirements and relaxing ICR constraints. In other words, replacing a higher interest rate with a higher upfront fee mitigates the effects of the interest rate shock on ICRs, allowing lenders to originate larger loans while meeting underwriting regulatory thresholds.

[5] 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.

A further piece of evidence supports this narrative. As part of the underwriting process, lenders must calculate a stress-tested ICR. Specialist lenders, on average, use lower interest rates in their stress testing and originate loans with longer interest rate fixation periods —for which the regulatory stress testing requirements are looser. 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. In addition, specialist lenders extend the average length of the fixation period for loans granted to large borrowers.

Thus, our analysis uncovers significant credit market segmentation, with both borrower and lender heterogeneity playing important roles. This segmentation contributes to the differential responses of borrowers and lenders to the credit tightening event. Greenwald and Guren (2021) develop a model in which the effect of credit on house prices depends on the degree of segmentation in housing markets. Our results suggest that it may also be important to consider additional dimensions of segmentation.

Naturally, originations are the result of supply and demand. While separating the two is challenging, in the last part of the paper, 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.[6] The key question we address 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.

Moreover, we observe significant differences in the product offerings of specialist versus non-specialist lenders —consistent with credit facilitation by the former. Specifically, specialist lenders apply significantly lower interest rate premia when stress testing 5-year fixed-rate loans offered to large borrowers than non-specialist lenders do for equivalent loans.[7] In addition, while

[6]The data has been used by Coen et al. (2023) to study price discrimination in the UK residential mortgage market.

[7]The regulatory framework is less stringent for loans with an interest rate fixed for 5 years or more. For instance, loan regulations do not prescribe a minimum stress test interest rate for 5-year fixed rate products. The interest rate used for the stress testing is disclosed in the product offerings.

specialist lenders maintained low interest rate premia immediately after the event, non-specialist lenders increased theirs. Prior to the event, specialist lenders charged higher percentage fees on loans offered to large landlords, and —unlike non-specialist lenders —they further increased these fees immediately after the event. Although these results are consistent with the origination data, they are important because they shed light on supply-side responses by lenders.

The substitution of interest rates with fees allows specialist lenders to originate larger loans during periods of rising rates, but it also exposes them to increased risks. We 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.[8] 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 et al., 2016). Fees can be used to screen borrowers, but also to target inattentive or unsophisticated borrowers who focus on the loan interest rate. Relatedly, Benetton, Gavazza, and Surico (2024) show how, during a period of unconventional monetary policy, UK residential mortgage lenders substitute a higher interest rate by loan fees.[9] 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

[8] 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 mini-budget announcement.

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

rates, the mechanism behind this trade-off is novel, as it centers on ICRs and credit facilitation, 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.[10] In our setting, more constrained borrowers are particularly sensitive to loan interest rates than to fees, since interest rates have a greater impact on the maximum loan amount. Our estimates reveal that lenders more dependent on the sector for their lending activities are more willing to substitute interest rates with fees to facilitate credit and manage their ICRs.

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 et al. (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,[11] 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.[12] In this respect, our paper is also related to a large literature on credit expansion and underwriting standards in mortgage markets (e.g. Mian and Sufi (2009), Keys et al. (2010), but see also Adelino et al. (2016) for a different perspective).

Our focus on loan features means that our work is also related to a large literature on mortgages that has, in the context of residential mortgage markets, studied mortgage fixation period (e.g. Koijen et al. (2009); Campbell and Cocco (2003)), the role of house prices for borrowing behavior (Palmer, 2015; Fuster and Willen, 2017; Cloyne et al., 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 et al., 2017; Di Maggio et al., 2017; Greenwald, 2018), 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

[10] In the residential mortgage market studied by Benetton et al. (2024) 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.

[11] 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.

[12] In doing so, we also add to the literature on lending specialization by banks (Iyer et al., 2022; Paravisini et al., 2015, 2023; Blickle et al., 2023, 2024).

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 et al., 2020; Gurun et al., 2023; Austin, 2022).[13] The landlords that we study are different from these institutional investors; they are the so called "mom and pop" landlords and unlikely have significant local market power. In this dimension our paper is closer to the small literature that focuses specifically on individual landlords, such as Levy (2021) who studies 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. Gargano and Giacoletti (2022) analyze 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.

Our paper is organized as follows. Section 2 describes the data and the institutional setting. Section 3 focuses on the mini-budget announcement, that led to a sudden large and unanticipated increase in interest rates, and helps us identify the reactions of borrowers and lenders to tighter credit. Section 3 studies the assets, with a focus on rental yields, and how they vary with landlord size. Section 4 is on the financing, and in particular how the debt financing changed in response to the unexpected interest rate increase in the cross-sections of borrowers and lenders. Section 5 studies the menu of loans on offer and lender risk management. The final section concludes.

2 The data and underwriting criteria

2.1 Data sources

Our first main data source is the buy-to-let lending data, 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.

[13] 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 gentrification effects.

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 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-19.[14] The decline in loan origination was significantly larger in the period after the mini-budget announcement, 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). 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).

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. It corresponds to roughly 10% of the total number of private rental properties in the UK.

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

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. In the UK mortgage market there are many different loans on offer, by different lenders, with different interest rates and loan fees, and maximum LTV. 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.

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.

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 £270 (£210) thousand. The mean (median) monthly rental income is £1,054 (£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.[15] The mean (median) loan amount is £155 (£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.[16]

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.[17]

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

[15]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.

[16]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.

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

of 20%.[18] 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 (46) 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 £65,503 (£42,561). The average (median) tax rate is 28.1% (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 (now TransUnion) are used in 7.9%, 9.1% and 2.2% of the originations, respectively.[19] 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. For this reason, we rely primarily on default probabilities to measure credit risk of the borrowers. The average default probability in our sample is 1.8% but percentile 75 is only 0.32% and percentile 90 is 1.83%. These values reflect the skewed nature of the distribution, with a small proportion of borrowers with high default probabilities. 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.[20]

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 (21.1) kms. Therefore, the vast majority of landlords invest locally and hold geographically undiversified

[18] 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.

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

[20] 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).

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.[21] 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.[22] Specialist lenders are responsible for 29.7% of the BTL loan volume during the first two years of the sample. During this same period, the shadow banks classified as specialist lenders are responsible for 4.84% of the BTL origination volume. The corresponding fraction for shadow banks classified as non-specialist is negligible (0.67%).[23]

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 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. 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%. The affordability assessment examines interest coverage ratios, borrowers' credit

[21] 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.

[22] 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.

[23] The corresponding fractions for shadow banks over the full sample period are 8.1% (specialist) and 0.58% (non-specialist), reflecting an increased importance of shadow banks in the latter part of the sample.

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.[24] 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. 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.

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

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

(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 types of landlords.

Figure 1, in addition to the number of loans originated in each quarter, 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 B shows fairly high mean origination ICRs due to the low-interest rate environment that characterized the early part of our sample (471% for accidental, 437% for intentional and 440% for portfolio landlords). The corresponding percentile 10 values are 205%, 208% 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%, 214% 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.

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 1.73 (median 2) mortgaged properties, and portfolio landlords own on average 8.5 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 Online Appendix A.

2.4 Banking regulations

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. 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)). This may affect different lenders' willingness to participate on each segment of the residential mortgage market.

Within the BTL segment, Basel III does not distinguish between loans granted to accidental, intentional and portfolio landlords. However, as explained in previous section, the PRA regulations do so, which may affect different lenders' willingness to grant loans, particularly in a context of rising interest rates. Our analysis compares loans by different lenders to different landlords and how the loan characteristics changed after the interest rate shock.

3 Tighter credit, asset values and yields

3.1 The mini-budget event

In order to identify the effects of tighter credit conditions, we rely on the mini-budget announcement of September 23, 2022. This 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.[25]

Panel (a) of Figure 2 plots the time series of several economic variables over the sample period, that show the backdrop against which the mini-budget announcement took place. After a period of low inflation and interest rates, inflation started increasing rapidly in early 2021. This was followed in early 2022 by increases in the Bank of England base rate and mortgage rates. The vertical line in the figure marks the mini-budget date. The plan was received with skepticism by markets and it quickly translated into an unexpected large increase in yields and a deterioration in credit conditions.

This is visible in several metrics. Panel (b) 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. Mortgage interest rates were already increasing and the number of products on offer declining prior to the event, more so for 2-year than 5-year products. But the event itself led to significantly tighter credit conditions, with sudden steep declines in the number of BTL products on offer and steep increases in mortgage interest rates. While the number of products on offer began to increase soon after, the costs of borrowing remained significantly higher than those pre-event.

Panel (c) of Figure 2 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 Google searches exactly at the time of the event reveals its unanticipated nature.

In addition to an unexpected deterioration in credit conditions, the event led to significant economic uncertainty. Panel (d) of Figure 2 plots the daily UK policy uncertainty index. Although the period after the event was characterized by significant uncertainty, within 90 days of the event it was back to pre-event levels. The UK Chancellor resigned on October

[25]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.

14 and this was followed by the resignation of Liz Truss as Prime Minister on October, 25. Over the weeks that followed the new UK chancellor announced a reversal of the mini-budget policies. Even though the uncertainty reduced, mortgage interest rates remained significantly higher than their pre-event levels.

Our empirical approach will compare 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.

A limitation of the origination data is that it includes the date in which the loan was originated, but not the date on which the mortgage offer was 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 in the immediate period 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 overcomes this limitation.

3.2 Asset values and yields

Landlords typically use the rental income generated by the property to service the loans. In addition, mortgage loans use the properties as collateral. The evolution of both rental income and property values impact the ICRs and LTVs used by lenders in the underwriting process. In this section, we study the evolution of rental yields and property values around the event.

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, after which they started increasing. In the cross-section of landlord types, rental yields are on average lower 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 the time-series and cross-sectional variation in rental yields in a regression framework to better control for heterogeneity on several dimensions that might help explain the evolution. The unit of observation is the rental yield on property i, located in local-area l, and used as collateral for the loan originated at time t. We construct indicator variables for landlord type, Intentional_{ilt} and Portfolio_{ilt}, and estimate regressions of rental yield on these dummies and other control variables:

$$\text{Yield}_{ilt} = \alpha + \beta^{\text{Intentional}}\text{Intentional}_{ilt} + \beta^{\text{Portfolio}}\text{Portfolio}_{ilt} + \gamma X_{ilt} + \omega_{lt} + \epsilon_{ilt}, \tag{4}$$

where ϵ_{ilt} is the error term. 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. Additionally, in our analysis, we progressively control for several dimensions of heterogeneity across property, and time-varying regional and lender characteristics, by way of inclusion of high-dimensional interactive fixed effects (the X_{ilt} and ω_{lt} terms). Further, to better understand which of these factors drive significant variation in the underlying rental yields, we also compare the Adjusted-R^2 and changes in coefficient estimates across specifications.

In the first column 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. They imply average rental yields of 4.87% for accidental landlords, 5.33% for intentional landlords, and 5.63% for portfolio landlords. These differences are economically meaningful and statistically significant.

We attempt to shed light on the drivers generating yield differences across landlord type. 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 (one is the base group). There are small decreases in the estimates for portfolio and intentional dummies, reflecting the fact that different landlord types select properties with different characteristics. Although not reported in the table, our estimates imply rental yields that are roughly 90 basis points lower for detached houses than flats.

[Insert Table 3 here]

Second, there may also be differences in yields across property location, with different landlords selecting into different locations. In column (3) we add local area fixed effects to the set

of explanatory variables. The geographical unit we consider is a local authority, with 400 local authorities in 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). This shows that geographical location is an important determinant of yields. Furthermore, the estimated coefficients on the landlord type dummies are roughly equal to sixty percent of the previous estimates, meaning that forty percent of the differences in yield are due to the differences in the geographical areas which different landlords select into.[26]

In column (4) of Table 3 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). This shows that the cross-sectional variation in rental yields in our sample is significantly larger than the variation that resulted from the event. In order to understand the nature of time-series variation, we estimate the following event-study specification:

$$\begin{aligned}\text{Yield}_{ilt} = &\sum_{k\in\{2018Q1,2023Q3\}} \beta_k^{Intentional} \cdot D_k \cdot \text{Intentional}_{ilt} + \\ &\sum_{k\in\{2018Q1,2023Q3\}} \beta_k^{Portfolio} \cdot D_k \cdot \text{Portfolio}_{ilt} + \gamma X_{ilt} + \omega_{lt} + \epsilon_{ilt},\end{aligned} \tag{5}$$

where as before i is the property used for collateral, l is the local-area of where the property is located, t origination quarter, X_{ilt} is a vector of other explanatory variables, ω_{lt} are local-area fixed effects and ϵ_{ilt} is the residual. 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.

Column (5) of Table 3 shows the results and 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 mini-budget announcement 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 during the post-event period.

To study whether landlords of properties with higher or lower yields tend to take loans

[26] In Appendix Figure IA.A2 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.

from certain lenders, in the last column of Table 3 we add lender fixed effects.. There 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.

Rents versus property values. Rental yields may be higher because of higher rental income or because of lower property values (or a combination of the two). 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. These are simply differences in means. We use regression analysis to control for property characteristics and investigate the source of the increases in yields post event, and how they differ across landlord types.

We take the logarithm of rents and the logarithm of property values and regress them on property characteristics, local area and time (quarter) fixed effects using an event-study specification. Panels (c) and (d) of Figure 3 plot the estimated coefficients and corresponding confidence intervals on the time dummies separately for each of the three landlord types.

They 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. In terms of cross-sectional differences, the figure reveals significantly larger differences in property values than in rental income across landlord types, and these differences did not significantly change after the event.

4 Loan originations

In this section, we turn our attention to the mortgages used by different landlord types, their costs and characteristics, and the lenders who provide the loans, making use of the origination data.

4.1 Loan interest rates, LTVs and ICRs

In Panel (a) of Figure 4, in addition to the previously shown rental yields, we plot the time series evolution of the average interest rate for loans originated in each quarter. The vertical line corresponds to the event quarter, 2022/Q3. The figure shows that 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 interest 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. It is important to note that, as the figure shows, there had been an increase in mortgage rates in the three months prior to the event. But the event itself and the large interest rate increases that it triggered were a surprise, which help us identify the effects of the interest rate shock.

[Insert Figure 4 here]

We estimate similar regressions to those previously estimated for rental yields, but with the initial loan interest rate as dependent variable:

$$\text{Interest rate}_{ilt} = \alpha + \beta^{\text{Intentional}}\text{Intentional}_{ilt} + \beta^{\text{Portfolio}}\text{Portfolio}_{ilt} + \gamma X_{ilt} + \omega_{lt} + \epsilon_{ilt} \qquad (6)$$

where ϵ_{it} is the error term. The estimated coefficients on the landlord type dummies show the additional interest rate that they pay relative to the base group (accidental landlords). In the UK mortgage market there are many products on offer, by different lenders. Loan pricing is mainly by LTV band. 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 have a large effect on price. Therefore, in all of the specifications that we estimate, we control for LTV using dummies (LTV less than 55, (55-65], (65-75] and greater than 75).

The first column of Table 4 shows that interest rates were on average 29 (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 23 (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 differences become 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 as being riskier than those given to other landlord types.

[Insert Table 4 here]

In order to study the evolution of interest rates across landlord type over time, we use an event-study specification where we include interactions between these variables. Panel (b) of Figure 4 plots the estimated coefficients on the interactions 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 pre- and 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 Table 4 we include lender fixed effects. There is a large increase in Adjusted-R^2 from 0.56 to 0.80 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 across different landlord types that is correlated with the interest rates that they pay on their loans. In the next section, we explore lender heterogeneity.

Figure 5 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, as shown by the estimated regression coefficients of the event-study specification shown in Panel (b).

[Insert Figure 5 here]

Panel (c) plots the time series evolution of the average interest rate used in the stress test, along with the initial loan interest rates. The former increased much less. Panel (d) plots

the corresponding ICRs. Those calculated using the initial loan interest rate were above 400% for much 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 mini-budget announcement. 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.

4.2 Loan characteristics by lender type

The results in Table 4 showed that there is significant variation in loan interest rates across lenders that is correlated with landlord type. In order to shed light on the nature of this variation, we consider 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 6 plots the number of loans granted by each of the lender types in each month, focusing on the year before and after the event. The number of originations is fairly stable in the year preceding the event, but we observe 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.[27] Although the number of originations decreases for both lender types, the decline is much more pronounced for non-specialist than specialist lenders.

[Insert Figure 6 here]

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, distinguishing between loans originated in the 12 months before and the 12 months after the event.[28]

Panel A of Table 5 shows the results 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%).

[27] 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.

[28] The conclusions are similar if we include the full sample in the pre-event data.

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 5 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 5. Calculating their difference relative to the loan interest rate, gives values for specialist lenders of 2.22%, 1.98% and 1.83% for accidental, intentional and portfolio landlords. The corresponding differences for non-specialist lenders are 2.75%, 2.86% and 2.44%, 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 fo loan amount. Panel A shows that, within lender type, and in the pre-event period loan fees are higher for intentional than accidental landlords, and they are highest for portfolio landlords. Loan fees are significantly higher for loans granted by specialist than non-specialist lenders. One potential reason for higher fees among specialist lenders is that loan fees (or points) can be used to screen borrowers. However, they can increase lender profits due to fee income that they generate. In addition, when used as substitute to a higher loan interest rate they improve ICRs and facilitate loan underwriting.

At the same time, a key disadvantage from a borrower's perspective is that when used as a substitute, the higher origination fees paid upfront reduces the cash-flows that they receive. A feature, in the BTL market is that the origination fees are often capitalized i.e., added to the outstanding loan balance, and many borrowers do so. In our sample, over the whole time period, the proportions of loans with capitalized fees are 0.58 for accidental, 0.59 for intentional, and 0.67 for portfolio landlords.

Panel B of Table 5 shows similar averages for loans originated post-event, and Panel C shows the differences (Δ) between pre- and post-event. Post event there were decreases in 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 to portfolio landlords by specialist lenders (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). The decreases in average LTV and fixation term are smaller among specialist than non-specialist lenders, and among portfolio than the other landlord types. 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 fees are higher among specialist than non-specialist lenders, and highest among loans granted by specialist lenders to portfolio landlords.

4.3 Facilitating access to credit

The previous summary statistics show that specialist lenders charge higher interest rates than non-specialist ones, but that they increase loan interest rates less post-event, particularly so for the larger portfolio landlords, and that they substitute these smaller interest rate increases by higher fees increases. This allows specialist lenders to facilitate access to credit to larger landlords. This market segmentation across lender and landlord type seems to have become more significant post credit tightening event.

4.3.1 Across lender type variation

We test these hypothesis more formally using regression analysis. More precisely, we test how the interest rate and other loan features differs across landlord and lender types, before and after the event, using dummies for landlord and lender types and for post-event observations (the dummy Post that takes the value of one for post-event observations, and zero otherwise). 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 property characteristics, LTV, local area and origination quarter fixed effects.

Table 6 shows the estimated coefficients. The dependent variables are the loan interest rate (column 1), stress test interest rate (column 2), fixation term (in years, column 3), and fees over loan amount (column 4). The first row shows the estimated coefficients on the specialist lender dummy. They show that such lenders charge relatively higher loan interest rates, but use relatively lower interest rates in the stress testing, tend to grant loans with a longer fixation term, and charge higher fees.

[Insert Table 6 here]

The sum of the estimated coefficients on specialist, portfolio and the interaction of the two characterize the loans granted by specialist lenders to portfolio landlords, relative to those

granted by non-specialist lenders to accidental landlords. Loan interest rates are on average 63.3 basis points higher, but the stress test rate used is on average 25.3 basis points lower. Their fixation term is 1.2 years longer and their fees 0.43 percentage points higher.

The estimated coefficients on the post interacted with the specialist and the portfolio indicators show how the loans characteristics changed after the credit tightening event. Both the loan interest rate and the stress rate decreased in relative terms, and the fixation term and fees over loan amount increased, for loans given by specialist lenders to portfolio landlords. These changes are consistent with those for the previously discussed sample averages, and with credit facilitation by specialist lenders to portfolio landlords.

4.3.2 Within lender type variation

The previous regressions compared loans given by different lender types to different landlord types, and how they changed after the event. We now study whether the differences across landlord type are significant when considering 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.

Table 7 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 specialist and non-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 7 here]

The top panel of Table 8 shows results for the stress test interest rate as dependent variable. 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, which effectively controls for time-varying lender characteristics, such as demand, that might drive the interest rate choices. 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 8 here]

In the bottom part of Table 8 we show 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 fixation period of 5 years or more. The relative increase in fixation length for loans given by specialist lenders by portfolio landlords facilitates loan originations to the larger (riskier) landlords.

Table 9 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 significantly more than the relative increases of non-specialist lenders (0.314 and 0.088 respectively, columns 5 and 2). The fees increase is in contrast with the previously identified relative decrease in loan interest rate for these landlords.

[Insert Table 9 here]

Lenders are compensated through the loan interest rate premium and loan fees with both, ceteris paribus, contributing positively to lender profitability.[29] Substituting a higher loan interest rate by higher fees facilitates credit access since for a given minimum ICR it increases the maximum loan amount or for a given loan amount it improves ICRs. As a simple example, consider a property that generates 1 of rental income and that the minimum ICR is 1.25. Assume also that the LTV constraint is not binding. We compare two interest-only loans of maturity 5 years.

The first has interest rate of 5% and zero upfront fees. The maximum loan amount determined by the ICR constraint is 16. The second loan has initial fees of 2% which are added to

[29] 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 loan balance, and the annual loan interest rate is reduced by 40 basis points (2% divided by the 5 years of the loan). In this case, the maximum loan amount is 17.05, a 6.6% increase over the first loan. In this way, substituting loan interest rate by fees improves ICRs.[30] This simple example shows how loan fees can be used by lenders as a substitute to a higher loan interest rate and in this way increase maximum loan amounts or improve ICRs for a given loan size.

The results in this section show how specialist lenders facilitate credit access by structuring loans in a way that allows them to increase loan volumes while trying to maintain profitability. They also indicate a differential approach between specialist and non-specialist lenders in the treatment of large landlords in response to the event, possibly because specialist lenders depend more on loan originations in the BTL segment to portfolio landlords for their bottom line.

5 Loans 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 the loans *on offer* in the market *on each day*, and how they changed after the event. The high-frequency nature of the data allows us to shed additional light on 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 borrower choices from the same loan menu.

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. (Internet Appendix C includes additional details.)

We compare loans offered by specialist and non-specialist lenders. A shortcoming of the Moneyfacts data is that it does 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 66% of the 2.05 million loan observations). But the vast majority of the

[30] For this to work, the LTV constraint cannot be binding. In the BTL market, loan fees can be added to the outstanding loan balance, even if that brings the loan over the maximum LTV.

loans available to accidental landlords are also available to non-accidental ones. 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).

We first provide evidence on the characteristics of the loans on offer, and how they changed after the event. In the second part of this section, we study some of the loan restrictions that shed light on how lenders manage the risks of lending to large landlords.

5.1 Loan characteristics

5.1.1 Number of loans

Figure 7 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.

5.1.2 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 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.[31]

Figure 8 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.

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

5.1.3 Fees

The origination data showed significant differences in origination fees across lender and borrower types, calculated as a percentage of loan amount. We now 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 a fixed £ amount whereas others have % fees. Furthermore, some products have both fixed and percentage fees (for different types of fees). 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 (see Appendix C for additional details). 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 9 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.

The analysis in this section shows how specialist lenders changed the nature of the products that they offer so as facilitate access to credit to landlords and in particular large landlords. The results are consistent with those for the origination data, but they are important since they shed further light on the supply side of the market.

5.2 Risk management

Credit facilitation by specialist lenders to large landlords contributes to higher lender profits, at least in the short term, but also to an increased risk exposure of such lenders to the buy-to-let sector. It may also lead to lender losses in case of mortgage delinquencies and default. In this section, we use the Moneyfacts data to study how lenders manage this risk.

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"). 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. 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). In addition, for the loans on offer 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 landlord (across all loans that the lender provides to the landlord), and what that amount is. We construct a dummy variable that takes the value of one if there is such a restriction and zero otherwise. And another variable with the maximum amount.

Panel (a) of Figure 10 plots the daily average value of the dummy for restriction on the maximum number of properties. The maximum of number of properties restriction is used by specialist lenders to a lower extent than non-specialist ones. In terms of the time series evolution, in the immediate period 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. Although not shown in the figure, this decrease is due a disproportionate number of loans which imposed restrictions being withdrawn from the market. Panel (b) of Figure 10 shows the results for the average maximum number of properties (for the loans on offer with a restriction). The average values are similar for both lender types, albeit more volatile for specialist lenders.

The bottom two panels of Figure 10 show the results for the dummy indicating a maximum total advance amount restriction (Panel (c)) and the maximum total advance amount (in millions of £s, Panel (d)). Most lenders and in particular specialist lenders impose restrictions on the maximum total amount (across all properties) that they are willing to lend to each landlord. The proportion of specialist lenders that impose such restriction is over 95% early in the sample, and even though it decrease slightly in the period before and after the event, the average values remain above 90%. These average values are higher for specialist than non-specialist lenders.

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 mini-budget announcement.

These results show how specialist lenders, while facilitating credit access to large landlords, impose a restriction on the maximum amount that they lend to each landlord, allowing them to limit their exposure to each individual borrower. It allows them to mitigate idiosyncratic borrower risk but not necessarily aggregate sector risk.

6 Conclusion

We have used an administrative dataset on the universe of mortgage loans granted to UK individual landlords to study the effects of an unexpected and sudden credit tightening event. On the asset side, after the credit tightening, there was an increase in rental yields driven by a decline in property values in spite of rents continuing to increase. The co-movement that characterized changes in rents and property values prior to the event broke down temporarily, as the higher discount rates offset the positive cash-flow effects of higher rents.

In spite of the increase in rental yields, the much larger increase in mortgage interest rates led to a steep decline in interest coverage ratios. Together with loan to values, interest coverage ratios are then main criteria for loan underwriting. On the lender side, we compare the loans originated by those lenders which prior to the event had high exposure to the buy-to-let segment of the mortgage mortgage (which we call specialist lenders) and those with low exposure (non-specialist). The former include small banks and shadow banks and the latter the main banks. Specialist lenders charge on average higher interest rates, and more so on loans to larger landlords that are seen as riskier.

After the credit tightening, both lender types increase their loan interest rates, but less so on loans originated by specialist lenders to larger landlords. Furthermore, there are differential responses in other loan features that show how specialist lenders facilitate credit access to larger landlords. They increase the interest rate that they use in the calculation of stress tested interest coverage ratios relatively less than the one they use for the other landlord types. Moreover, specialist lenders increase upfront loan fees relatively more for large landlords, substituting away from charging higher mortgage rates to fees. These changes allow them to better meet the underwriting standards, namely ICRs, and facilitate credit access to larger landlords, on whom specialist lenders depend more for their business activity.

Overall, these results show significant segmentation across lender and landlord types in mortgage markets, with an impact on financing outcomes. They also shed light on the incentives of heterogeneous lenders, and the margins along which they may adjust loan contracts and underwriting, at times of interest rate rises, so as to mitigate the effects of the rises on their lending activity.

Our analysis uncovers the importance of lender and borrower heterogeneity in responding to a sudden increase in interest rates. Those lenders who derive a larger fraction of their lending activity from the sector before the interest rate increase, that we called specialist lenders, make use of this of the shift from rate to fees to a greater extent, and more so when originating loans to larger landlords, who are more important for their business. A second possible non-mutually exclusive explanation is that specialist lenders are better able to assess the credit risk of larger landlords, and that this risk assessment ability becomes more important after the rate increase. The natural way to test this mechanism would be to study default risk and how mortgage delinquencies changed after the event for loans granted by specialist and non-specialist lenders to different landlord types. During our sample period there have been very few delinquencies overall, which could either mean that the specialist lenders were able to assess the risks as well as non-specialist ones, or alternatively that the risks did not materialize.

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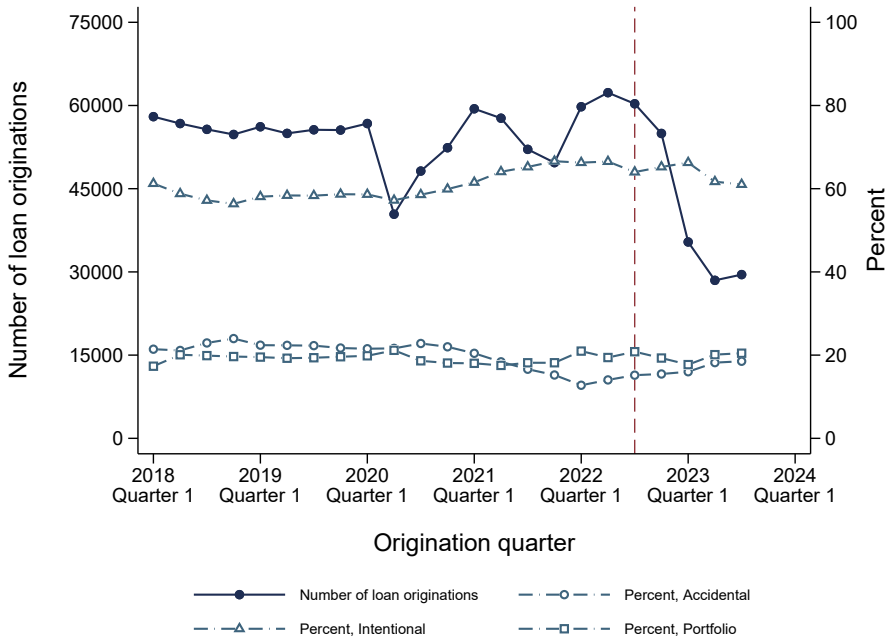
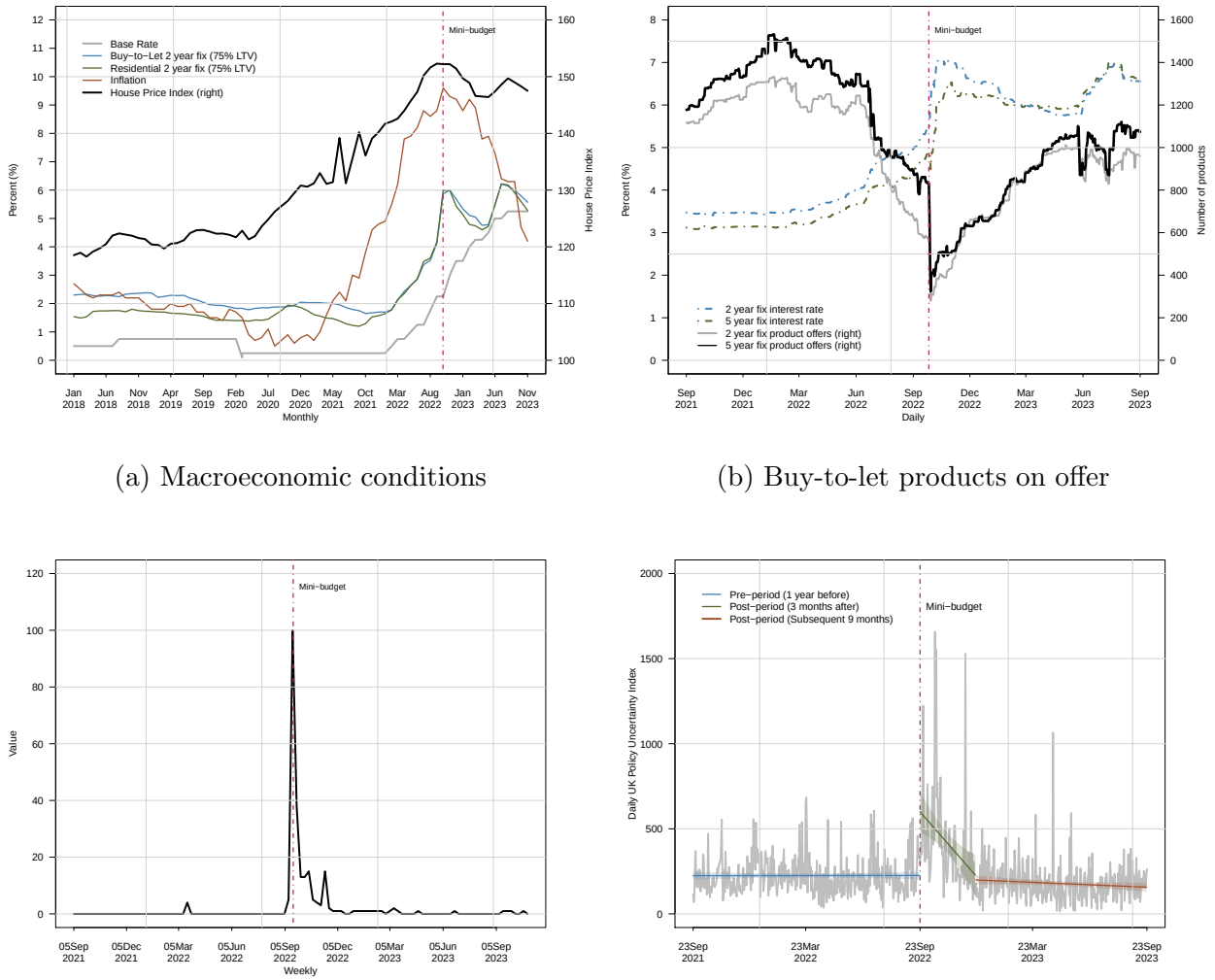


Figure 1: Number of quarterly loan originations and proportions by landlord type

The solid line (black) plots the total number of loans originated in each quarter over the sample period (left axis). The dashed lines (blue) plot the proportions of loans granted to each landlord type (right axis). The dashed vertical line (maroon) marks 2022/Q3, 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) Macroeconomic conditions

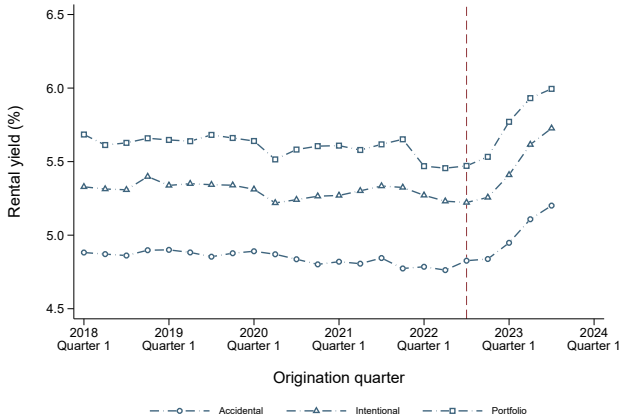
(b) Buy-to-let products on offer

(c) Google Trends

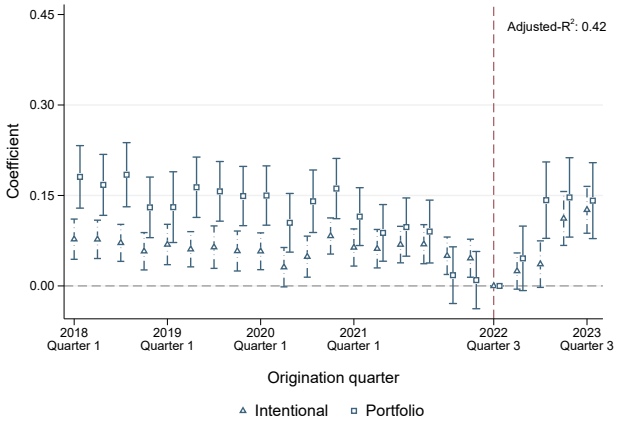
(d) UK Daily Policy Uncertainty Index

Figure 2: UK Macroeconomic context around the mini-budget

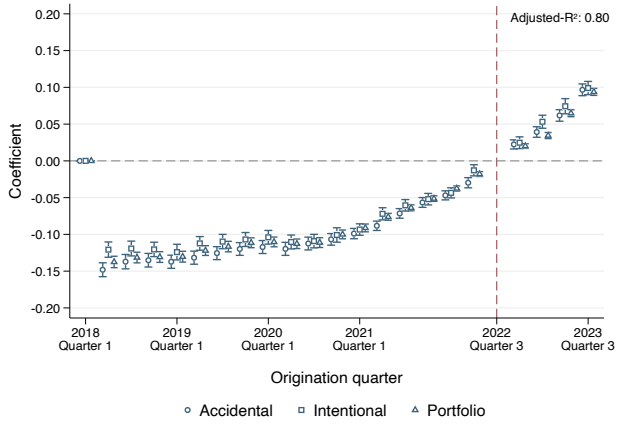
Panel (a) plots the monthly time series for several macroeconomic variables from January 2018 to September 2023: the Bank of England base rate (dark gray), the year-on-year consumer price inflation (CPI) change (brown), the 2-year fixed rate for 75% LTV buy-to-let (blue) and residential (green) mortgages, and the England and Wales National House Price Index (black) plotted on the right vertical axis. Panel (b) plots the daily average interest rate for 2 and 5-year mortgage products *on offer*, and their count. The data are from Moneyfacts for the ±12 months around the mini-budget. Panel (c) 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). Panel (d) 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. In all 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." 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.



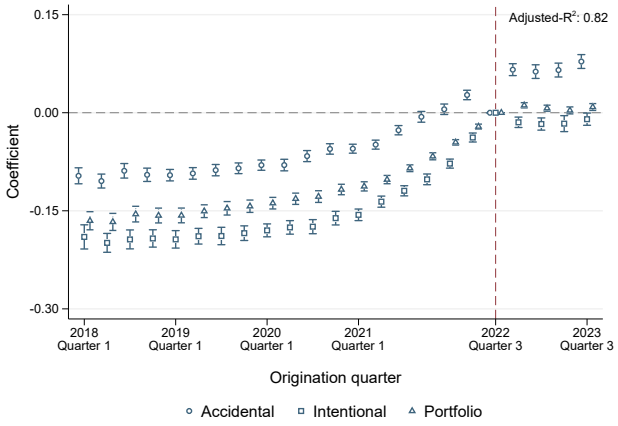
(a) Rental yields by landlord type



(b) Estimated regression coefficients



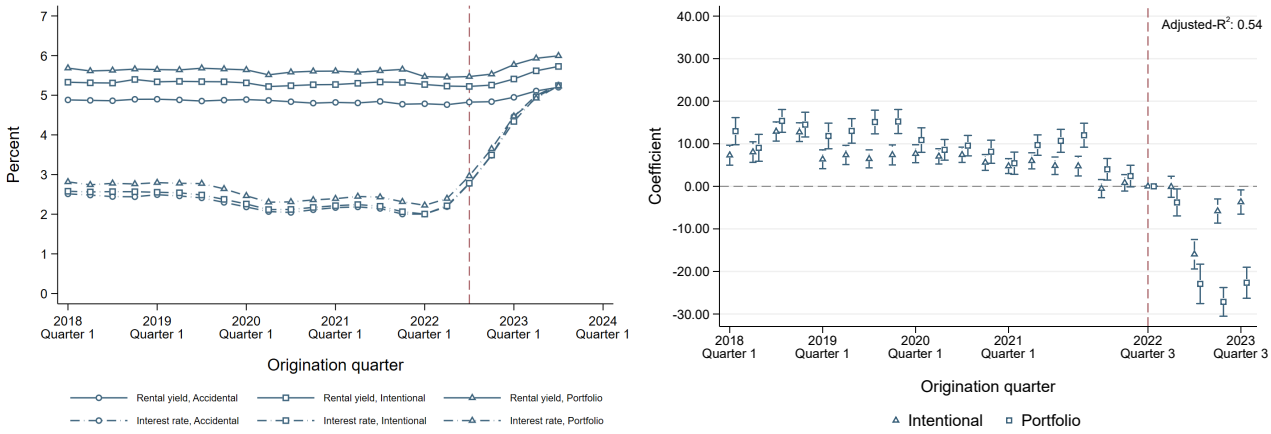
(c) Rental income (monthly)



(d) Property value

Figure 3: Rental yields, rents and property values over time and in cross-section of landlord types

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 (5). The specification controls for property characteristics and local-area-by-origination quarter fixed effects. Squares (triangles) represent Portfolio (Intentional) landlords. The estimated coefficients are relative to Accidental landlords and normalized to zero in 2022/Q3. Panel (c) (Panel (d)) plots the time-series evolution of monthly rental income (property values). The coefficients are estimated from the same event-study difference-in-differences specification with log monthly rental income (Panel c) and log property value (Panel d) as dependent variables. The estimated coefficients are normalized to zero in 2018/Q1. In all panels the dashed vertical line (maroon) marks 2022/Q3, the "mini-budget" announcement (event) date.

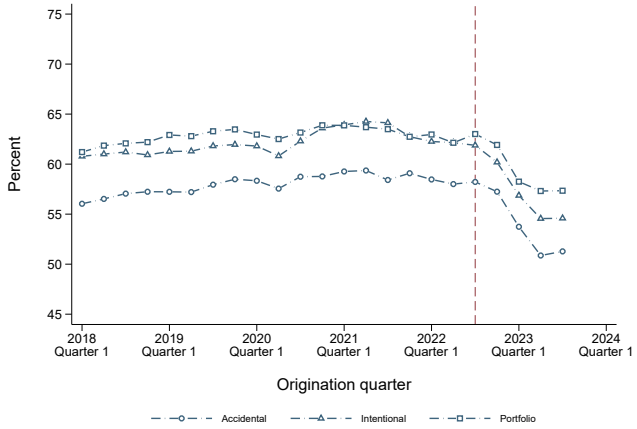


(a) Rental yields and interest rate

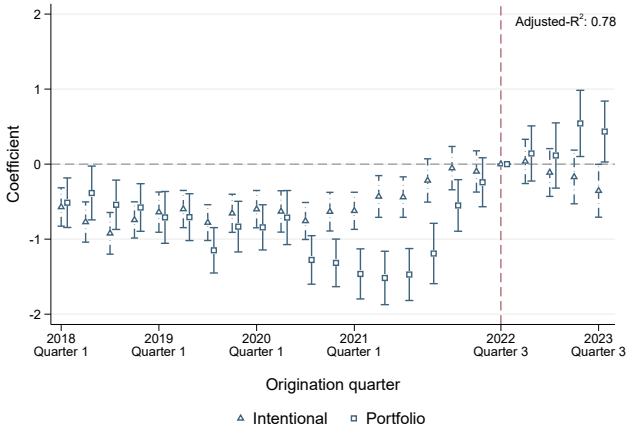
(b) Interest rate, regression coefficients

Figure 4: Loan interest rate over time and in cross-section of landlords

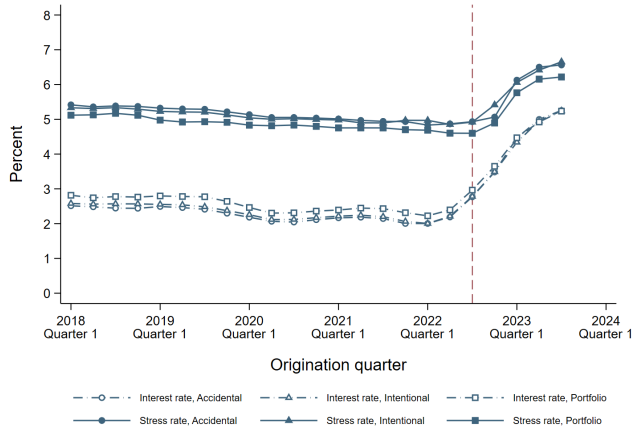
Panel (a) plots the time-series evolution of the average rental yield and initial loan interest rate (in percent) by landlord type. Panel (b) plots the estimated coefficients and their 95% confidence intervals from an event-study difference-in-differences specification with the initial loan interest rate as dependent variable. Squares (triangles) represent Portfolio (Intentional) landlords. The estimated coefficients are relative to Accidental landlords and normalized to zero in 2022/Q3, the "mini-budget" announcement (event) date, marked by the dashed vertical line (maroon).



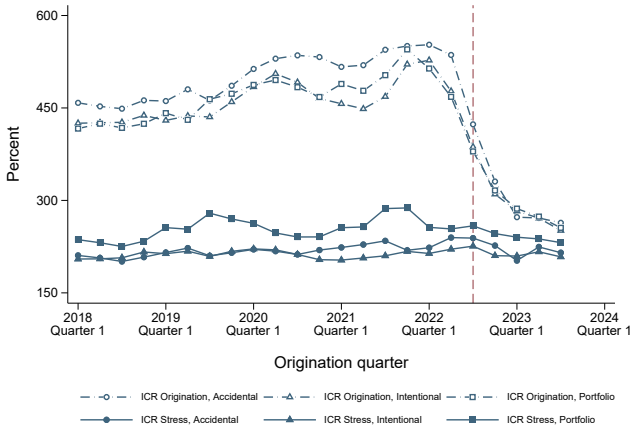
(a) Loan-to-value



(b) Loan-to-value, regression coefficients



(c) Initial and stress test interest rate



(d) Interest Coverage Ratio

Figure 5: Loan-to-value and Interest coverage ratios by landlord type

Panel (a) plots the time-series evolution of the average loan-to-value (in percent) by landlord type. Panel (b) plots the estimated coefficients and their 95% confidence intervals from an event-study difference-in-differences specification with the loan-to-value as dependent variable. Squares (triangles) represent Portfolio (Intentional) landlords. The estimated coefficients are relative to Accidental landlords and normalized to zero in 2022/Q3, the "mini-budget" announcement (event) date, marked by the dashed vertical line (maroon). Panel (c) ((Panel (d)) plots the time-series evolution of interest rates and stress test rates (interest coverage ratios), by landlord type. The dashed vertical line (maroon) marks the event date.

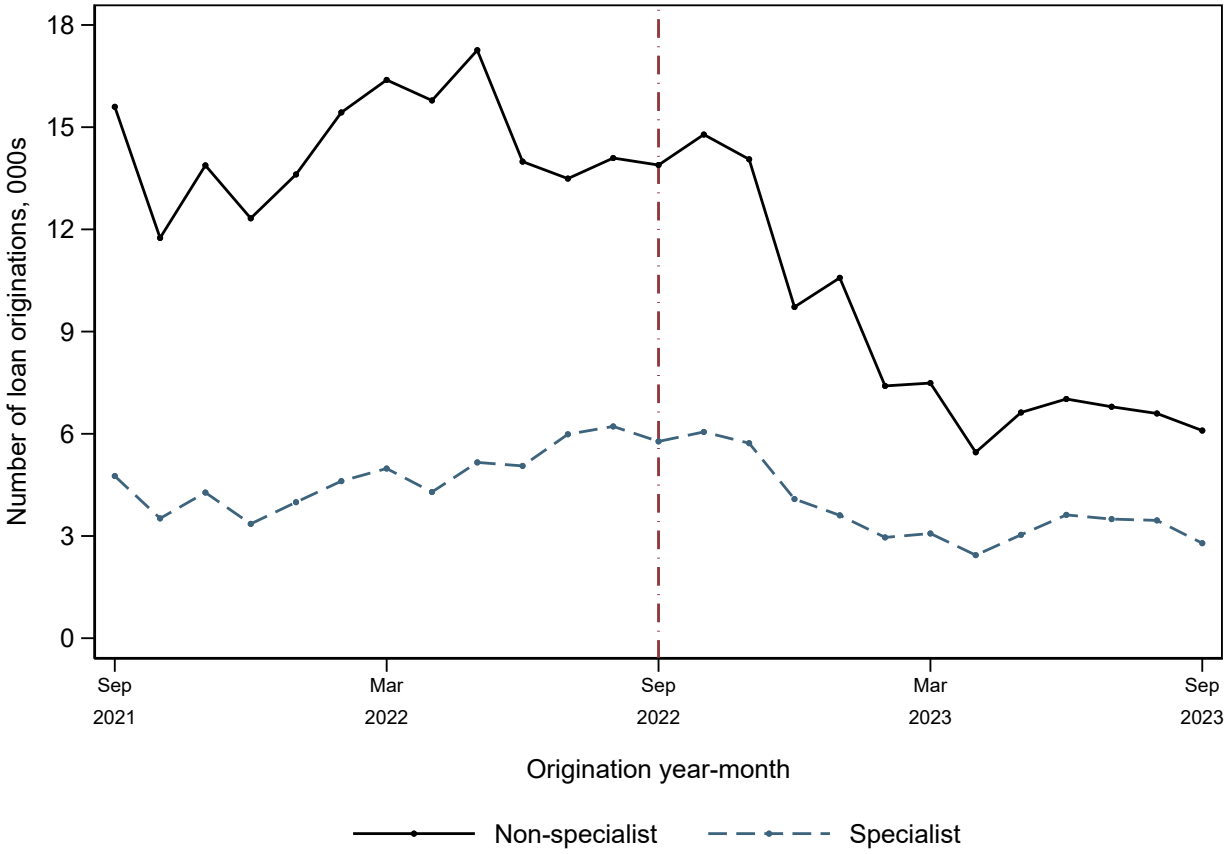


Figure 6: Loan originations by lender type

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 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.

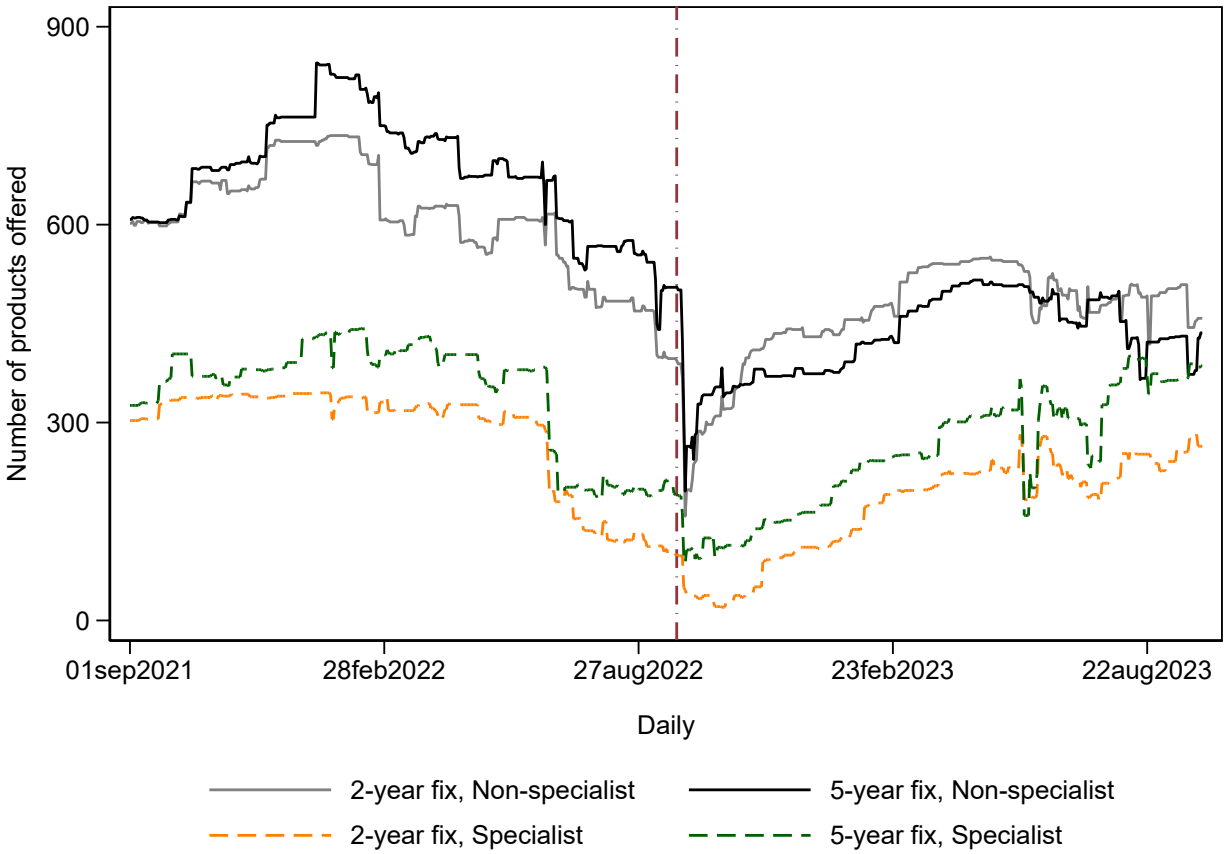
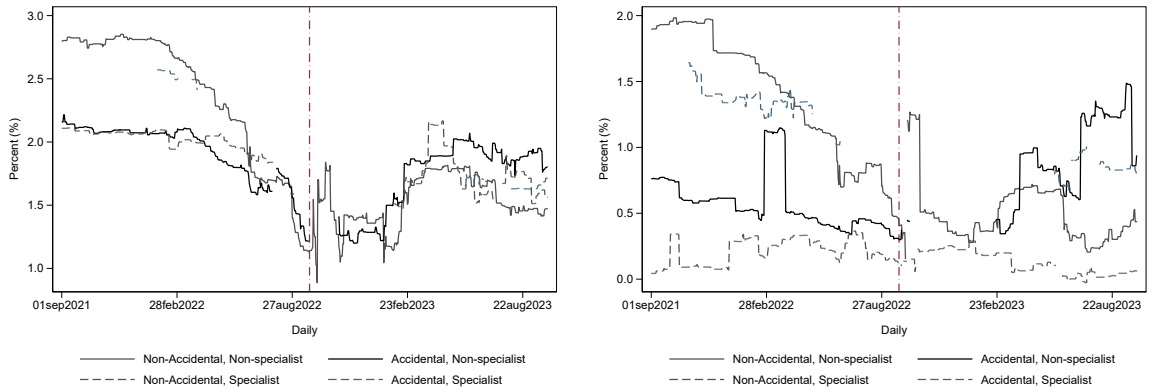


Figure 7: Number on loans on offer by lender type and fixation period

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 is from Moneyfacts.

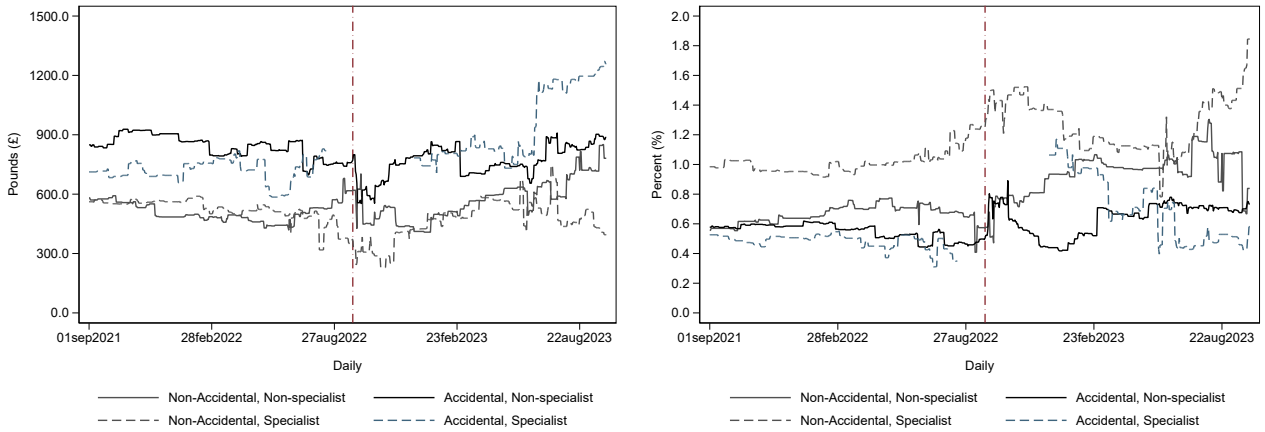


(a) 2-year fixed interest rate

(b) 5-year fixed interest rate

Figure 8: Interest rate premium used for the 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 available to accidental 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.

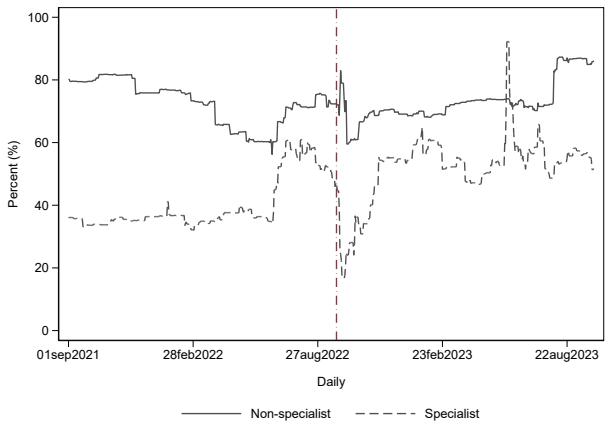


(a) Product fees (£s)

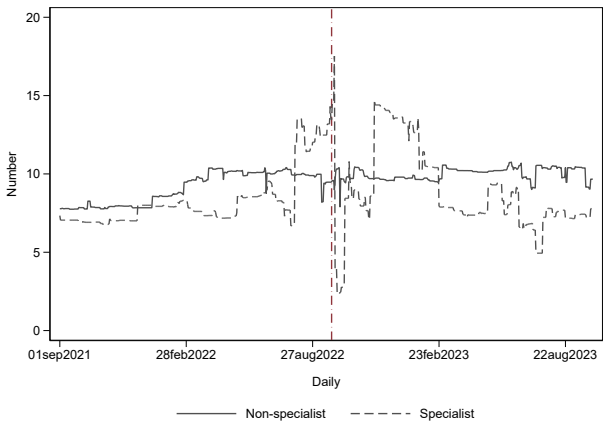
(b) Product fees (%)

Figure 9: Product fees by lender type

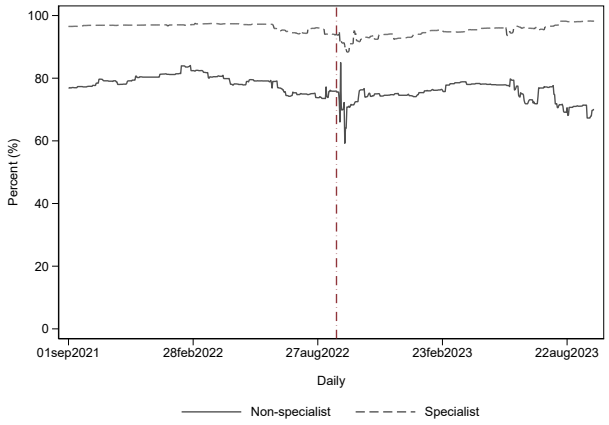
Panel (a) (Panel (b)) plots the daily evolution of the average loan flat (percent) fees by lender and landlord type. We require that each day there at least 100 products on offer in each category. The dashed vertical line (maroon) marks 23 September 2022, the event date.



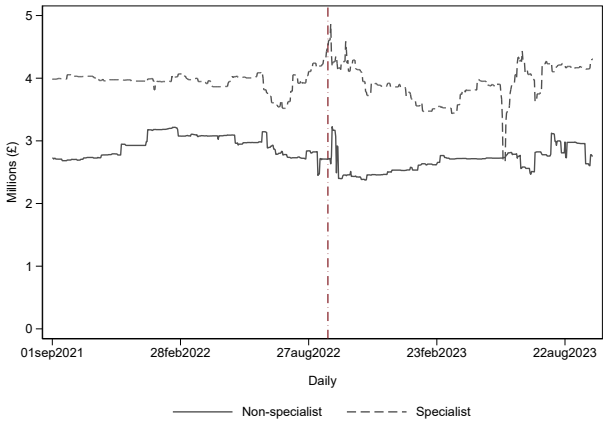
(a) Restriction on maximum number of properties (% of products)



(b) Maximum number of properties, conditional on restriction



(c) Restriction on maximum advance (% of products)



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

Figure 10: Risk management: maximum number of properties and advance restrictions

Panel (a) reports the fraction of products each day by lender type that impose restriction on the maximum number of properties that can be financed. Panel (b) reports the maximum number of properties, conditional on restriction. Panel (c) reports the fraction of products each day by lender type that impose restriction on maximum total advance amount. Panel (d) reports the maximum advance in million £, conditional on restriction. The dashed vertical line (maroon) marks 23 September 2022, wherein the U.K government under Prime Minister Liz Truss unexpectedly announced a "mini-budget."

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, £)	1054	771	525	650	850	1300	1750
Property value (£)	269,874	243,193	95000	135,000	210,000	335,596	500,000
Rental yield (annual, percent)	5.30	1.51	3.80	4.33	5.00	6.00	7.20
				Panel B: Loan			
Loan amount (£)	154,848	121,732	53313	80565	124,000	198,006	288,000
Loan-to-value (percent)	60.89	16.90	36.74	52.80	65.76	75.00	75.70
Interest rate (basis points)	262.82	102.29	173.00	199.00	234.00	294.00	389.00
Initial loan fee (% of loan amount)	0.88	1.20	0.00	0.04	0.68	1.21	1.96
Fixation term (years)	4.09	2.43	1.95	2.08	4.90	5.06	5.18
Mortgage term (months)	255.58	80.15	144.00	192.00	264.00	300.00	360.00
				Panel C: Borrower			
Age (years)	47.1	11.3	33	38	46	55	63
Annual income (£)	65503	231,633	15000	27005	42561	70145	120,000
Marginal tax rate (percent)	28.1	11.8	20	20	20	40	40
Distance (kilometers)	35.50	80.27	0.29	1.5	5.44	21.10	113.72
Number of buy-to-let properties	3.09	6.13	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	4.87	1.14	3.65	4.13	4.71	5.40	6.25
(percent)	Intentional	5.33	1.52	3.82	4.36	5.05	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	57.53	17.99	30.45	48.17	61.23	73.00	75.40
(percent)	Intentional	61.48	16.59	37.82	53.50	66.67	75.00	75.69
	Portfolio	62.38	16.30	40.76	55.80	67.00	75.00	76.12
Interest rate	Accidental	253.26	99.93	169.00	194.00	224.00	274.00	377.00
(basis points)	Intentional	260.22	103.15	172.00	199.00	229.00	285.00	385.00
	Portfolio	280.53	99.81	179.00	209.00	255.00	329.00	404.00
Origination ICR	Accidental	470.68	651.56	204.85	278.06	354.67	470.18	684.19
(basis points)	Intentional	436.55	674.98	207.66	276.35	351.85	455.47	612.24
	Portfolio	439.82	993.21	190.09	256.29	335.29	437.43	593.67
Stressed ICR	Accidental	218.12	344.18	123.90	134.07	152.00	191.41	290.55
(basis points)	Intentional	213.78	458.12	125.00	138.94	157.23	194.38	263.32
	Portfolio	252.65	814.14	138.60	145.08	165.50	206.13	279.37
			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	55,836	122,681	12,900	25,030	40,000	64,000	105,117
(£)	Intentional	56,699	216,493	14,016	25,310	39,000	60,309	100,548
	Portfolio	98,428	322,270	22,602	37,690	61,340	104,563	180,453
Distance	Accidental	36.98	84.01	0	0.97	5.20	23.97	118.75
(kilometers)	Intentional	35.30	79.93	0.33	1.45	5.26	20.68	114.25
	Portfolio	34.67	77.66	0.69	2.06	6.16	20.00	107.21
Buy-to-let properties	Accidental	1.42	1.19	1	1	1	2	2
(number)	Intentional	1.73	0.77	1	1	2	2	3
	Portfolio	8.50	11.81	4	4	6	8	13

Table 3: Rental yields over time and in the cross-section

The dependent variable is the annual rental yield calculated by multiplying monthly rent by 12 and dividing by property value. 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. Lastly, in column 6, we include lender fixed effects 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:	Rental yield (p.p)					
	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio	0.760***	0.714***	0.402***	0.715***	0.408***	0.381***
	(0.034)	(0.031)	(0.017)	(0.031)	(0.018)	(0.018)
Intentional	0.464***	0.444***	0.261***	0.448***	0.269***	0.260***
	(0.021)	(0.019)	(0.013)	(0.020)	(0.014)	(0.014)
Constant	4.868***	5.002***				
	(0.043)	(0.081)				
Property characteristics		Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Local-area			Yes			
Origination quarter				Yes		
Local-area × quarter					Yes	Yes
Lender						Yes
Adjusted-R^2	0.03	0.06	0.40	0.06	0.41	0.43
Observations	1,176,967	1,154,844	1,154,844	1,154,844	1,154,799	1,154,799

Table 4: Initial loan interest rate

This table examines the relationship between the initial loan interest rate and landlord type. The dependent variable is the initial loan interest rate. In column 1, we include indicator variables for landlord types, *Portfolio* and *Intentional* while in column 2, the empirical specification includes the following property characteristics: number of bedrooms and property type, as controls. Additionally, in column 3, we 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. Lastly, in column 6, we include lender fixed effects All specifications control for leverage by including dummies for loan-to-value ratios. Specifically, we include 3 dummies for (55,65], (65,75], and >75 (omitted category being $\leq$ 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:	Interest rate (basis points)					
	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio	28.552***	26.919***	22.861***	21.530***	18.779***	2.861***
	(0.787)	(0.679)	(0.581)	(0.440)	(0.394)	(0.250)
Intentional	7.236***	7.802***	5.663***	4.031***	2.532***	0.064
	(0.511)	(0.469)	(0.396)	(0.324)	(0.290)	(0.185)
Constant	252.226***	246.408***				
	(0.578)	(1.039)				
Property characteristics		Yes	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Local-area			Yes			
Origination quarter				Yes		
Local-area × quarter					Yes	Yes
Lender						Yes
Adjusted-R^2	0.01	0.02	0.04	0.55	0.56	0.80
Observations	1,176,967	1,154,844	1,154,844	1,154,844	1,154,799	1,154,799

Table 5: Summary statistics pre- and post-event, by landlord and lender 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 (%)	Stress rate (%)	LTV (%)	Fix. term (yrs)	Loan fees (%)	ICR (%)	ICR stress (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A.1: Specialist lenders, pre-period				
Accidental	7,398	2.60	4.82	57.4	4.5	1.25	466.0	232.2
Intentional	29,979	2.83	4.81	60.0	5.1	1.35	458.5	248.5
Portfolio	19,845	2.80	4.63	63.8	4.7	1.46	412.7	240.1
				Panel A.2: Non-specialist lenders, pre-period				
Accidental	25,582	2.16	4.91	58.7	4.1	0.69	526.6	230.7
Intentional	120,605	2.11	4.97	62.7	4.2	0.74	485.1	212.3
Portfolio	25,707	2.23	4.67	61.7	4.4	0.89	519.7	280.4
				Panel B.1: Specialist lenders, post-period				
Accidental	6,749	4.68	5.85	53.6	4.2	1.50	255.3	201.1
Intentional	23,545	4.78	5.74	57.1	5.0	1.67	271.0	218.4
Portfolio	14,053	4.55	5.51	60.8	4.7	1.95	284.8	227.6
				Panel B.2: Non-specialist lenders, post-period				
Accidental	17,932	4.30	5.99	53.9	3.8	0.86	302.7	222.4
Intentional	70,488	4.14	6.11	57.3	4.0	0.84	290.3	207.5
Portfolio	14,212	4.28	5.75	57.6	4.1	1.14	293.7	252.3
				Panel C.1: Specialist lenders, Δ post-period				
Accidental	-0.09%	2.08	1.03	-3.8	-0.3	0.25	-210.7	-31.1
Intentional	-0.21%	1.94	0.94	-2.9	-0.1	0.31	-187.5	-30.1
Portfolio	-0.29%	1.75	0.89	-3.0	0.0	0.49	-127.8	-12.5
				Panel C.2: Non-specialist lenders, Δ post-period				
Accidental	-0.30%	2.14	1.08	-4.7	-0.3	0.17	-223.9	-8.3
Intentional	-0.42%	2.02	1.13	-5.4	-0.2	0.10	-194.7	-4.7
Portfolio	-0.45%	2.04	1.08	-4.2	-0.3	0.25	-226.0	-28.2

Table 6: Changes in loan characteristics by landlord and lender type

This table presents changes in loan characteristics by lender and landlord type around the event. *Specialist* lenders, defined as lenders with above-median share of BTL mortgage origination between January 2018 and December 2019. The dependent variable in column 1 is the loan *Interest rate*; column 2 reports *Stress rate* defined as the interest rate used in the stress-test done as part of the underwriting; column 3 reports *Fixation term* defined as the initial period of fixed interest rate (in years); and column 4 reports *Lender fees* defined as a proportion of loan amount; *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 ≤ 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	Stress Rate	Fix Term	Fee Loan Amt
	(1)	(2)	(3)	(4)
Specialist	37.115***	-4.254***	1.027***	0.321***
	(1.274)	(0.653)	(0.022)	(0.010)
Portfolio	9.566***	-33.073***	0.484***	0.206***
	(0.332)	(0.528)	(0.012)	(0.005)
Intentional	-0.455**	-4.919***	0.269***	0.114***
	(0.195)	(0.580)	(0.007)	(0.003)
Portfolio × Specialist	16.579***	12.050***	-0.311***	-0.093***
	(0.963)	(1.333)	(0.024)	(0.010)
Intentional × Specialist	14.657***	-3.035***	-0.025	0.042***
	(0.833)	(0.602)	(0.028)	(0.009)
Post × Specialist	-12.243***	-22.894***	-0.516***	0.310***
	(1.509)	(1.781)	(0.032)	(0.028)
Post × Portfolio	-21.960***	1.539	-0.162***	0.060***
	(1.127)	(1.552)	(0.025)	(0.018)
Portfolio × Specialist × Post	-9.384***	-4.243	0.397***	0.305***
	(1.885)	(2.644)	(0.044)	(0.039)
Post × Intentional	-14.011***	20.358***	-0.071***	-0.114***
	(0.742)	(1.163)	(0.016)	(0.011)
Intentional × Specialist × Post	13.904***	-17.356***	0.445***	0.118***
	(1.590)	(2.275)	(0.039)	(0.034)
Property characteristics	Yes	Yes	Yes	Yes
LTV dummies	Yes	Yes	Yes	Yes
Fixed effects:				
Local-area	Yes	Yes	Yes	Yes
Origination quarter	Yes	Yes	Yes	Yes
Observations	1,141,654	1,141,654	1,141,654	1,141,654

Table 7: Initial loan interest rate, by lender type

The dependent variable is the initial loan interest rate in basis points. Columns (1) through (3) present estimates for non-specialist lenders, defined as lenders with below-median share of BTL mortgage origination between January 2018 and December 2019 while Columns (4) through (6) present estimates for specialist lenders, defined as lenders with an above-median share of BTL mortgage origination between January 2018 and December 2019. 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 wherein the U.K government under Prime Minister Liz Truss unexpectedly announced a "mini-budget." 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 (basis points)					
Lender type:	Non-specialist			Specialist		
	(1)	(2)	(3)	(4)	(5)	(6)
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)
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
Adjusted-R^2	0.74	0.74	0.75	0.83	0.83	0.86
Observations	825,870	825,870	825,869	315,650	315,650	315,642

Table 8: Stress test interest rate and initial fixation period, by lender type

The dependent variables are the stress test loan interest rate (top panel) and initial period of interest rate fixation in years (bottom panel). Columns (1) through (3) ((4) through (6)) are estimated on the sample of non-specialist (specialist) 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:	Non-specialist			Specialist		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	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:	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

Table 9: Loan fees, by lender type

The dependent variable is the initial loan fees. Columns (1) through (3) ((4) through (6)) are estimated on the sample of non-specialist (specialist) 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:	Non-specialist			Specialist		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Loan fees as a fraction of loan amount					
Portfolio	0.084***	0.075***	0.088***	0.259***	0.213***	0.077***
	(0.005)	(0.005)	(0.005)	(0.009)	(0.008)	(0.008)
Intentional	0.074***	0.076***	0.073***	0.074***	0.073***	0.074***
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)
Post × Portfolio		0.088***	-0.016		0.314***	0.257***
		(0.017)	(0.016)		(0.034)	(0.035)
Post × Intentional		-0.014	-0.010		0.009	0.122***
		(0.011)	(0.011)		(0.029)	(0.028)
Adjusted-R^2	0.16	0.16	0.18	0.35	0.35	0.43
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
"Credit Facilitation through Substitution of Interest Rates for Fees"

A Data description

In this section we report additional details on the data and summary statistics.

Figure IA.A1 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.

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 the other landlord types are small.

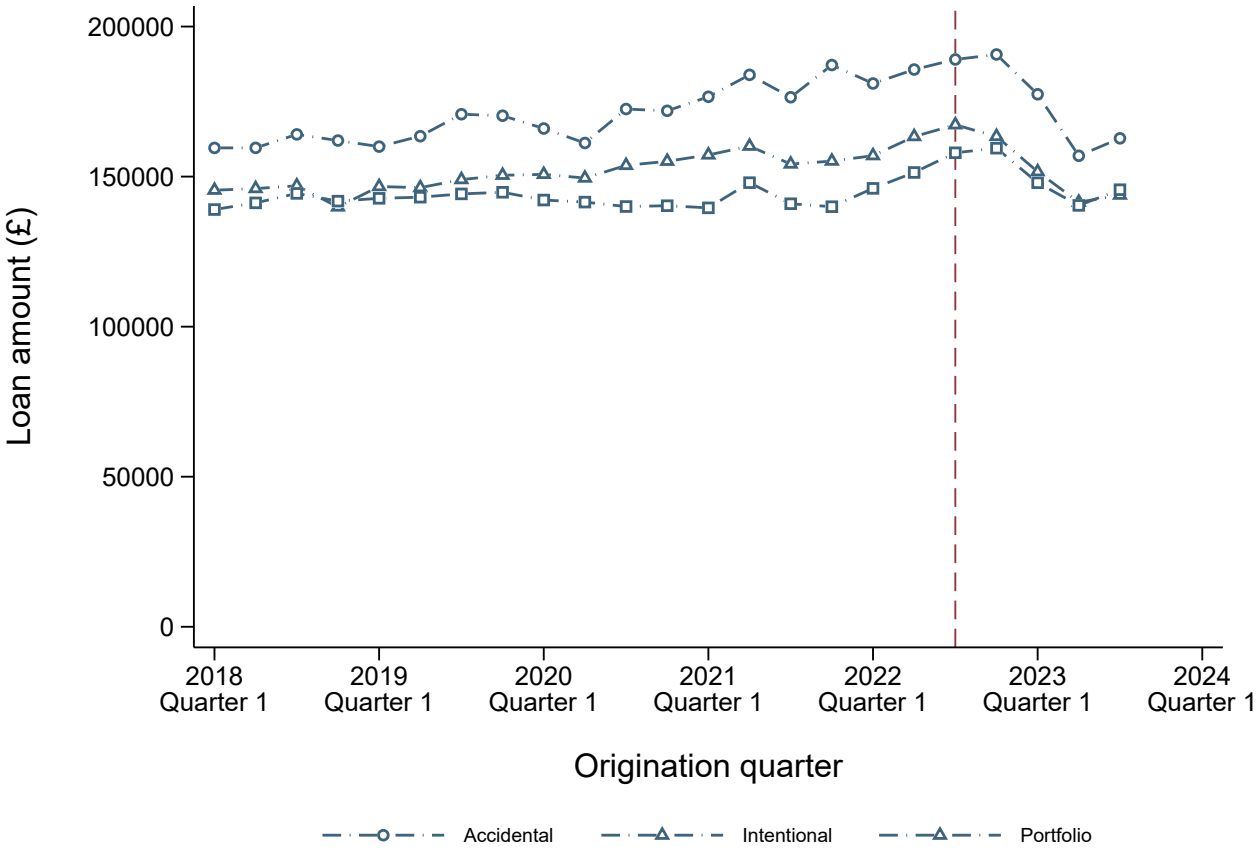
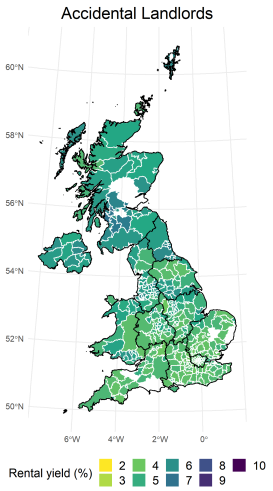
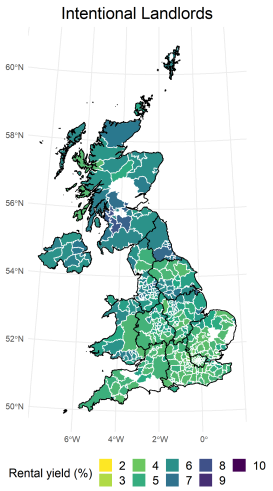


Figure IA.A1: Loan amount by landlord type

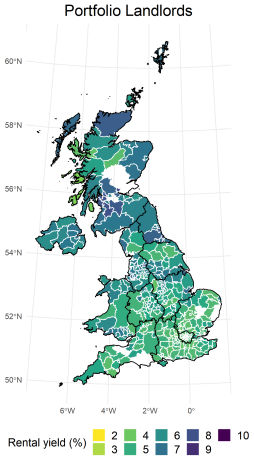
The figure shows the time-series evolution of average loan amounts, split by landlord type. Circles represent Accidental landlords, squares represent Portfolio landlords, and triangles represent Professional landlords. The dashed vertical line (maroon) marks Quarter 3 of the fiscal year 2022, wherein 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

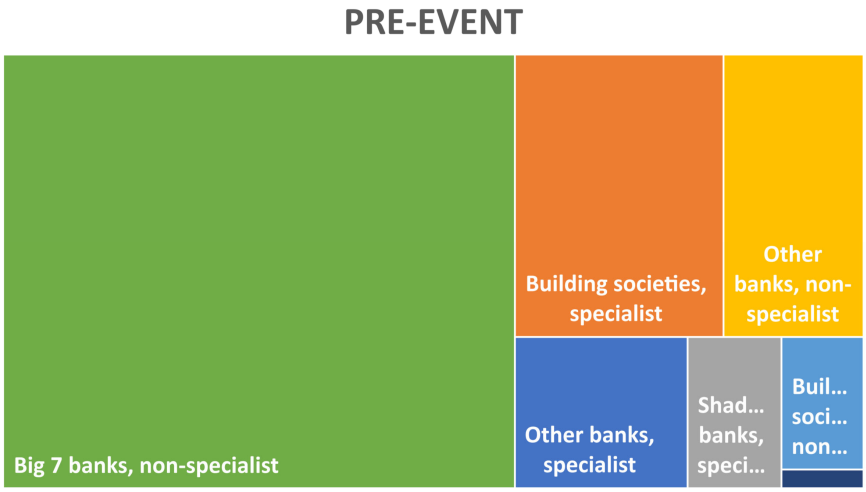
Figure IA.A2: Average rental yields by location and landlord type

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.

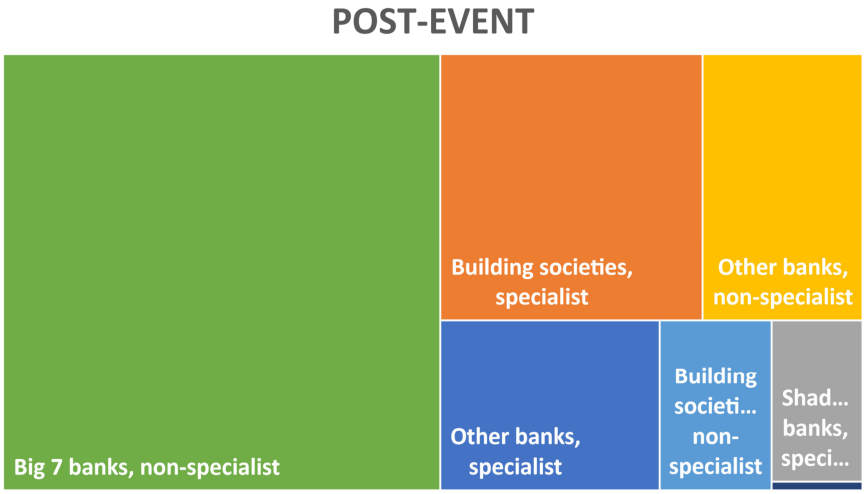
Table IA.A1: Summary statistics of borrowers, by landlord type

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 (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). 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
IO 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	0.24	0.43	0	0	0	0	1
Rental income	Accidental	1,145	694	550	700	975	1400	1842
(monthly, £)	Intentional	1,035	758	525	625	850	1250	1700
	Portfolio	1,023	815	500	600	795	1200	1750
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	1.44	1	2	2	3	4



(a) Pre-event



(b) Post-event

Figure IA.A3: 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.

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 a mainstream bank that has a high-street branch presence. Of the 57 unique lenders in the BTL origination data, we classify 7 of them into high-street and the remainder into non-high-street. This means that out of the 1.21 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.

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 reports the results for the initial loan interest rate charged by the two groups of lenders 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. However, post event they increased relatively less than those on loans to intentional and to accidental landlords.

Table IA.B3 shows the results for the stress test interest rate and the initial loan fees. 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 and relative to accidental landlords, high-street lenders increased the stress test interest rate that they use for portfolio landlords whereas non-high-lenders decreased it. Furthermore, non-high-street lenders increased relatively more the initial loan fees that they charge the largest landlords. These patterns are similar to those emphasized in the main body of the paper when comparing specialist and non-specialist lenders.

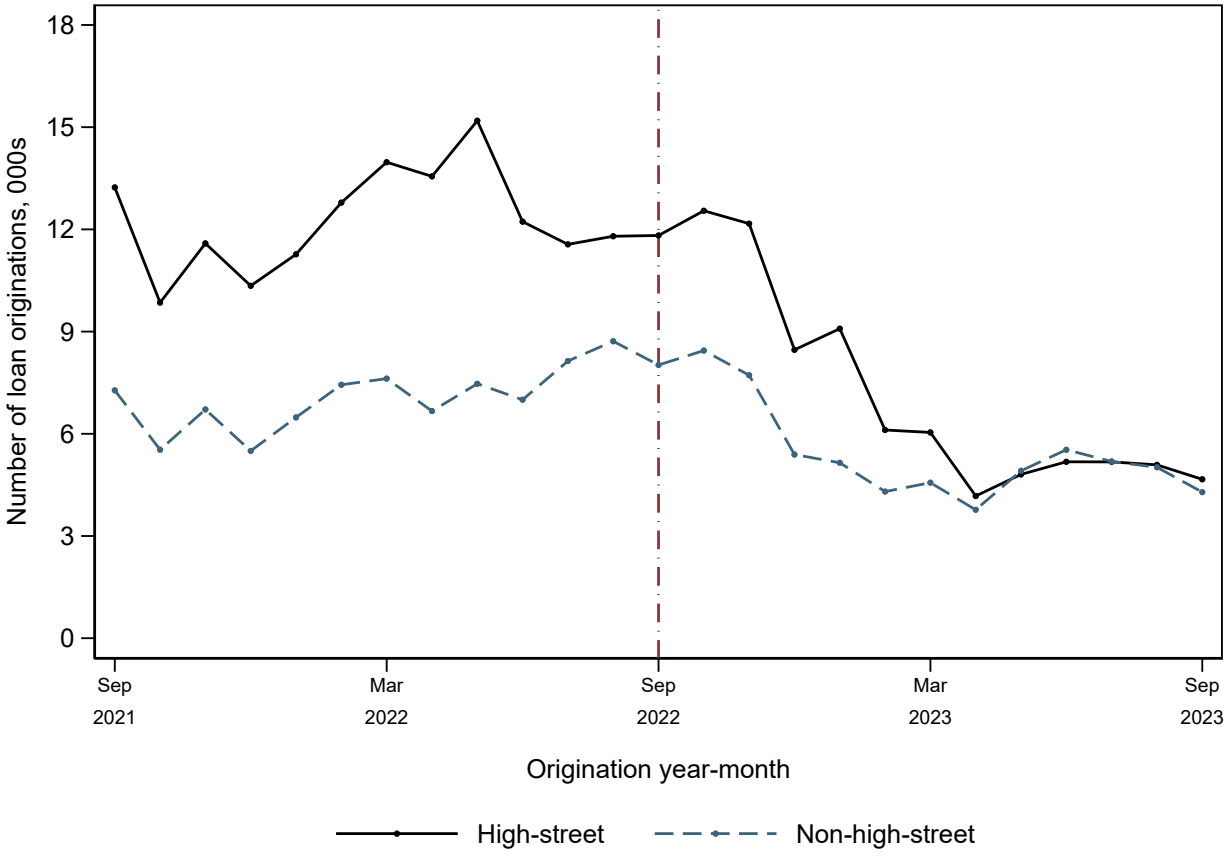


Figure IA.B1: Loan originations by lender type

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.

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 (%)	Stress rate (%)	LTV (%)	Fix. term (yrs)	Loan fees (%)	ICR (%)	ICR stress (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A: High-street lenders				
Accidental	139,186	2.37	5.20	57.48	3.51	0.6	502.81	228.91
Intentional	466,840	2.43	5.18	62.17	3.87	0.8	433.70	206.01
Portfolio	112,582	2.51	4.88	62.31	4.01	0.9	454.53	257.00
				Panel B: Non-high-street lenders				
Accidental	95,104	2.75	5.28	57.51	4.23	0.9	425.81	202.40
Intentional	273,077	2.90	5.20	60.37	4.67	1.1	438.49	225.25
Portfolio	121,271	3.07	5.02	62.36	4.71	1.2	427.19	247.69

Table IA.B2: Initial loan interest rate, by lender type

The dependent variable is the initial loan interest rate. 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 wherein the U.K government under Prime Minister Liz Truss unexpectedly announced a "mini-budget." 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 (basis points)					
Lender type:	High-street			Non-high-street		
	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio	4.321***	6.960***	5.907***	1.569***	5.465***	3.939***
	(0.372)	(0.394)	(0.369)	(0.261)	(0.259)	(0.239)
Intentional	-0.245	1.311***	0.823***	0.602***	2.040***	1.880***
	(0.228)	(0.207)	(0.191)	(0.226)	(0.230)	(0.213)
Post × Portfolio		-26.480***	-16.372***		-27.415***	-9.430***
		(1.243)	(1.287)		(1.137)	(1.066)
Post × Intentional		-15.761***	-12.793***		-10.928***	-5.943***
		(0.819)	(0.842)		(0.832)	(0.827)
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
Adjusted-R^2	0.75	0.75	0.76	0.82	0.82	0.85
Observations	689,188	689,188	689,188	465,433	465,433	465,421

Table IA.B3: Stress tested interest rate and loan fees, by lender type

The dependent variables are the stress tested loan interest rate (top panel) and initial loan fees (bottom panel). Columns (1) through (3) ((4) through (6)) are estimated on 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:	Stress tested interest rate (basis points)					
Portfolio	-9.515***	-10.374***	-8.774***	-14.537***	-13.340***	-11.703***
	(0.428)	(0.423)	(0.400)	(0.591)	(0.634)	(0.580)
Intentional	-4.788***	-5.847***	-2.187***	-6.060***	-5.745***	-5.104***
	(0.188)	(0.178)	(0.167)	(0.558)	(0.618)	(0.539)
Post × Portfolio		8.719***	3.650**		-8.322***	-13.282***
		(1.614)	(1.546)		(1.497)	(1.352)
Post × Intentional		10.245***	-3.006***		-2.393*	-4.814***
		(1.279)	(0.886)		(1.225)	(1.049)
Adjusted-R^2	0.50	0.50	0.61	0.47	0.47	0.55
Dependent variable:	Loan fees as a fraction of loan amount					
Portfolio	0.057***	0.049***	0.065***	0.246***	0.203***	0.111***
	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)
Intentional	0.053***	0.057***	0.051***	0.096***	0.095***	0.103***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
Post × Portfolio		0.088***	-0.039**		0.292***	0.159***
		(0.018)	(0.017)		(0.025)	(0.026)
Post × Intentional		-0.032**	-0.003		0.012	0.047**
		(0.013)	(0.013)		(0.018)	(0.018)
Adjusted-R^2	0.18	0.18	0.20	0.32	0.32	0.39
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	689,188	689,188	689,188	465,433	465,433	465,421

C Loans on offer

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. This 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 a detailed 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 use 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. In the main paper we distinguish between loans available *also* to accidental landlords (accidental) and the remainder (non-accidental).

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.C1 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.

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.

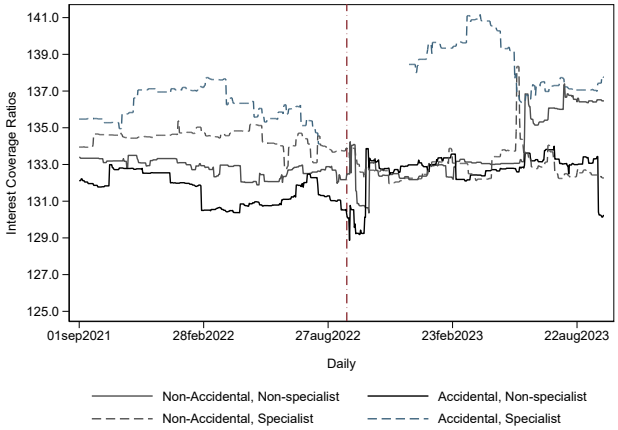


Figure IA.C1: Minimum Interest Coverage Ratios

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.