banks decide how many of the mortgages to retain on the balance sheet. A common balance sheet implies that a lender cannot set prices across markets independently.

IV.C Estimation

We estimate the demand and supply parameters separately. To estimate the model, we aggregate the loan-level data to market-lender-type observations. A market is defined as an MSA-year-loan purpose, e.g., refinances in New York City in 2013. In each MSA-year, we measure demographic data including means and standard deviations of log incomes and log house prices from the ACS data. Within MSA-years, we separate markets into mortgages originated for new purchases and mortgages originated for refinances, the idea being that a borrower looking for one type of loan is not in the market for another type.

We compute risk-adjusted interest rates in a market by projecting out FICO and LTV differences. We then project each loan's actual interest rate to its predicted interest rate differences so that each loan in the market has the market-wide average FICO score of roughly 760. This adjustment ensures that across markets and lenders we are comparing interest rates of similarly risky borrowers. Next, we aggregate from the loan level to the time and market level by taking the average of these residualized interest rates across product and lender types.

We obtain the number of unique lenders (N_{bct}, N_{fct}, and N_{nct}) by taking the median number of lenders per census tract within the MSA. This captures the typical number of loan offerings from each type of lender that a borrower faces. Market size is defined as one-tenth of the total number of households in the case of new originations—under the assumption that one-tenth of households are potentially in the market for a new home per year—and as the total number of outstanding mortgages in the case of refinances. We estimate the model using data between 2010 and 2015.

IV.C.1 Demand Estimation

Our estimation roughly follows Berry et al. (1995) and Nevo (2000), with several differences. The first important difference is that borrowers choose loan quantity, in addition to choosing whether to take up a mortgage. In other words, while Berry et al. (1995) is a discrete-choice model, our model is discrete-continuous. Therefore, in addition to estimating standard preferences for interest rates (governed by α_i) and non-price attributes of mortgages (governed by γ_i and $q_{jt} + \xi_{jct}$), we have to estimate the preferences for mortgage size. These are governed by a borrower's (unobserved) ideal mortgage size F_i, and the disutility of choosing a mortgage which is too small, β_i. The most significant departure from the standard Berry et al. (1995) and Nevo (2000) type of estimation is the use of the discontinuity at the conforming loan limit in addition to aggregate data. In other words, we introduce bunching-style identification into a structural model.

To identify consumer preferences, we need to instrument for prices. We exploit an institutional feature of how GSEs set interest rates of conforming mortgages. Hurst et al. (2016) show that, for political economy reasons, mortgage pricing for GSE loans does not adjust for spatial risk. In other words, in some areas the financing cost of a conforming mortgage is higher than in other areas, and is unrelated to mortgage demand. Accordingly, we use the variation in mortgage pricing across regions to obtain