

to retain as portfolio loans on the balance sheet  $m_{jctg}^b$ , and how many to finance (the remainder) through GSE securitization  $m_{jctg} - m_{jctg}^b$ . Jumbo mortgages cannot be securitized and are retained on the balance sheet  $m_{jctNC} = m_{jctNC}^b$ . Each bank has only one balance sheet across markets in which it participates. Denote by  $m_{jg}^b = \sum_{ct} m_{jctg}^b$  the amount of type  $g$  mortgages that lender  $j$  chooses to retain on the balance sheet. In other words, suppose the bank originates conforming loans in the New York City and Houston MSAs, and it chooses to finance \$100 million on its balance sheet. From a financing perspective, it does not matter which market these loans were originated in.

#### IV.B.1 Origination

Mortgage origination is costly, beyond the mere financing cost of a mortgage. Lenders incur non-financing costs such as costs of an appraisal and title check, document processing, and loan closure, which involve labor and equipment. We designate the per-dollar origination cost of lender  $j$  of mortgage type  $g$  as  $w_{jg}$ , and the total origination cost in market  $ct$  is:

$$\sum_g m_{jctg} w_{jg} \quad (\text{S.1})$$

This specification allows for different origination costs across banks, non-fintech shadow banks, and fintech shadow banks. For example, this heterogeneity allows us to capture potential cost savings from technology employed by fintech shadow banks who use less labor in lending.

#### IV.B.2 Financing and Regulatory Burden

Recall that mortgages can be financed two ways. Conforming mortgages can be sold to GSEs, i.e., OTD. Alternatively, conforming and jumbo mortgages can be financed by using a bank's internal funds as portfolio loans. These two types of financing can have different costs.

##### *Originate-to-Distribute Financing*

Lenders can securitize conforming mortgages through GSEs. Since GSEs purchase mortgages at predetermined prices, all lenders face the same originate-to-distribute financing cost in a given market, which we model as an ability to obtain funding for a conforming mortgage at a rate  $\sigma_t^{GSE} = \sigma_t^b + \sigma^{GSE}$ . Here  $\sigma_t^b$  represents the underlying financing costs of funding absent any costs arising from intermediation and captures the current interest rate environment in the macroeconomy.  $\sigma^{GSE}$  captures additional costs coming from the lender using GSE financing, which can include the guarantee fee (g-fee) charged by the GSEs for coverage of projected credit losses from borrower defaults in the securitized pools. In other words, when the firm originates-to-distribute a mortgage, it earns the spread on the mortgage rate minus the financing and non-financing origination costs  $r_{jctg} - \sigma_t^{GSE} - w_{jg}$  for every dollar of the mortgage. Reflecting the post-crisis period, which we study, we assume that securitization is only available for conforming loans; jumbo loans must be retained on balance sheet. One could easily account for a jumbo securitization in the same way (see Section V.E).