

## “How Do Foreclosures Exacerbate Housing Downturns”

Adam Guren and Tim McQuade

Harvard University

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Foreclosures are one of the dominant features of the ongoing housing market downturn. From 2006 through 2011, approximately 7.4 percent of the owner-occupied housing stock experienced a foreclosure, and with nearly one quarter of homeowners with a mortgage owing more than their house is worth, foreclosures will likely be important going forward. As foreclosures have ballooned, Real Estate Owned (REO) sales – that is sales of foreclosed homes owned by banks and the GSEs – have dominated the market as prices and transaction volumes have plunged. In particular, the retail (non-foreclosure) market has disproportionately frozen up.

Despite the importance of foreclosures in the housing downturn, economists have not closely examined how the housing market equilibrates when there are a substantial number of distressed sales. This paper presents a model in which foreclosures have important general equilibrium effects that can explain much of the recent behavior of housing markets.

Our approach is to construct, analyze, and calibrate a dynamic general equilibrium model which is focused on the effects of foreclosures at the housing market level. This stands in contrast to much of the empirical literature on foreclosures which uses fine geographic fixed effects to assess the extremely local externalities of having a foreclosure next door as opposed to several blocks away.

We first focus on the mechanisms through which foreclosures affect the overall market equilibrium by exogenously introducing foreclosures into a standard search-and-matching model of the housing market. We then embed the housing market model into a framework in which default is endogenous, leading to two-way feedbacks between foreclosures and price declines that amplify the effect of foreclosures, and conduct a quantitative analysis to assess the potential magnitude of the channels we identify.

To model foreclosures, we make two key assumptions. First, REO sellers have higher holding costs because banks get no flow utility or rent from vacant homes and have strong financial incentives to get foreclosed homes off their books promptly. Second, individuals who are foreclosed upon cannot immediately buy a new house because their credit is ruined. We introduce these two key assumptions to an otherwise-standard Diamond-Mortensen-Pissarides search framework with stochastic moving shocks, random search, idiosyncratic house valuations, and Nash bargaining over price.

Together, the two key assumptions imply that a wave of foreclosures dries up the market for normal sales, reduces volume and price, and widens the foreclosure discount – all of which are consistent with the stylized facts about the housing market in the recent downturn. These results occur due to three main effects.

First, because foreclosed individuals are locked out of the market, foreclosures reduce the likelihood that a seller will meet a buyer in the market through a “market tightness effect.” This

mechanically reduces the probability of sale but also triggers behavioral responses as the outside option to transacting improves for buyers and deteriorates for sellers. The decline in the outside options is particularly strong for REO sellers, who have a higher opportunity cost of not meeting a buyer in a given period. Consequently, REO sellers offer larger discounts and sell more frequently when they match with a buyer, whereas retail sellers cut prices by less and sell less frequently when they match with a buyer.

Second, buyers have an elevated probability of being matched with a distressed seller next period, which further raises the outside option to transacting, creating a “choosey buyer effect.” This effect is novel and plays an important role in explaining the disproportionate freezing up of the retail market. It also formalizes folk wisdom in housing markets that foreclosures empower buyers and lead them to wait for a particularly favorable transaction.

Third, there is a “compositional effect.” As the average sale looks more like an REO sale, any weighted average variable such as the aggregate price index looks more like a distressed sale. Since REOs sell at a discount and sell more quickly, this effect reduces prices but raises volume.

With reasonable parameters, these general equilibrium effects create a sizable decline in prices. There is a modest decline in volume as retail volume plunges but the shortfall is partially made up by foreclosures. However, because in practice foreclosures are not exogenous, it is difficult to assess the quantitative importance of foreclosures in the downturn with our baseline model.

To provide a more realistic treatment of the downturn and to assess the quantitative magnitude of the general equilibrium effects we identify, we embed the basic model of the housing market in a richer model of mortgage default in which borrowers with negative equity may default on their mortgage or be locked into their current house despite a desire to move. This generates a new amplification channel: an initial shock that reduces prices puts some homeowners under water and triggers foreclosures, which cause more price declines and in turn further default. This two-way feedback amplifies the general equilibrium effects of foreclosures. Lock-in of underwater homeowners also impacts market equilibrium by keeping potential buyers and sellers out of the market.

Before analyzing the model quantitatively, we assess whether the hallmarks of such an interaction are present in the data. In order to get a significant price-foreclosure feedback, there must be both a large number of homeowners with low equity and a sufficiently large shock to put many of these homeowners under water. Using CoreLogic data for the 100 largest MSAs, we show that this is exactly the case: when we regress the log of the price decline in the bust on the size of the price decline in the boom, the fraction of the population with less than 20 percent equity in 2006, and their interaction, we find a positive and both statistically and economically significant coefficient on the interaction.

Having found suggestive evidence in favor of a price-foreclosure feedback, we use the richer model to quantitatively evaluate the extent to which foreclosures have exacerbated the ongoing housing bust. The quantitative analysis takes a two-pronged approach. First, we assess the strength of the amplification channel and its sensitivity to various important parameters. Second,

we fit the model to data from the 100 largest MSAs to assess the empirical size of the amplification channel and test its implications across metropolitan areas.

When fit to the data, the model does a good job explaining the size of the price decline, the number of foreclosures, price declines in the retail market, and the REO share of sales both nationally and across markets. It also is consistent with the foreclosure discount over the cycle. While the model falls short of explaining the full sales decline, it does a good job of explaining differences in the sales decline across markets. This suggests that other forces have depressed transaction volume nationwide. These forces, which may include nominal loss aversion, tightening credit, a slowdown in household formation, or the erosion of home equity limiting the ability of potential buyers to trade up to a better home, are an important subject for future research.

Using our calibrated model, we can simulate a counterfactual housing crisis without default. These counterfactuals reveal that foreclosures cause substantial overshooting of prices: foreclosures exacerbate the aggregate price decline in the downturn by approximately 50 percent in the average MSA (or in other words account for a third of the decline) and exacerbate the price declines for retail sellers by over 30 percent.

These quantitative results suggest that policies that mitigate foreclosure could ameliorate the housing downturn. Consequently, we analyze the impact of the foreclosure crisis on welfare in our model and simulate three foreclosure-mitigating policies: slowing down foreclosures, refinancing mortgages at lower interest rates, and reducing principal. While we do not conduct a full normative analysis, the simulations of these policies highlight some of the important trade-offs faced by policy makers.

We find that in order to make a substantial impact on the market equilibrium, policies must be large and carefully targeted. We also find that while limiting the number of foreclosures that can be processed at once reduces the decline in the overall price index, it delays the market's recovery and actually makes the decline in retail prices worse. However, this policy simulation assumes that banks do not respond to the limits by reducing the number of foreclosures or by negotiating short sales with homeowners, which may occur in practice.

Overall, our analysis suggests that foreclosures have played a crucial role in exacerbating the housing downturn. By raising the number of sellers and reducing the number of buyers, by making buyers more choosy, and by changing the composition of houses that sell, foreclosures freeze up the market for retail sales and reduce both price and sales. When combined with a two-way feedback between prices and foreclosures that emerges when negative equity is necessary for foreclosure, these general equilibrium effects can be significant. Indeed, our quantitative calibration suggests foreclosures exacerbate aggregate price declines by as much as 50 percent and retail price declines by as much as 30 percent.