The Role of Contagion in the American Housing Boom

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Executive Summary
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One of the striking features of the recent American housing boom and bust is its heterogeneity across housing markets. Not only did markets experience cycles of very different magnitudes, but their timings were also varied. Previous work by Ferreira and Gyourko (2011) shows that while not all markets boomed, the majority did boom at very different times over a nearly decade-long period from 1997-2005.[1] The earliest cases began from 1997-1999 and were highly concentrated among metropolitan areas on the two coasts, specifically in California and the mid-New England region. From the west coast, housing booms then spread inland towards central California and to neighboring states to the east and north. From the east coast, housing booms spread to other markets in New England and then to neighboring regions to the south, eventually reaching the majority of Florida markets in 2004 and 2005.

This spatial heterogeneity is suggestive of potential spillover effects that disseminate housing price changes across geographies. Spillovers are usually referred to as contagion in the financial economics literature because most empirical work on the topic deals with market comovements after a country suffers a negative economic shock.[2] In this paper we estimate the role of contagion (spillovers) during the last American housing cycle.[3] More specifically, we estimate whether the price correlation across space between two different housing markets, above and beyond that justified by local common shocks, was an important factor during the last housing boom - and also in the bust.

There are three empirical challenges to convincingly identifying contagion effects. One is to determine, in a non-*ad hoc* manner that does not bias results, the timing of the period in

[1] Detailed references for all research cited in this executive summary are available in our full paper.
[2] See Forbes and Rigobon (2002) and Dungey, et. al. (2005). This definition has been used to study financial contagion in many contexts including the 1987 U.S. stock market crash (King and Wadhwani, 1990; Lee and Kim, 1993), the 1994 Mexican peso crises (Calvo and Reinhart, 1996), and the Hong Kong stock market crises of 1997 (Corsetti et al., 2005).
[3] We interchangeably use the terms contagion and spillover during the rest of the paper.

which some shock occurs that could engender contagion. For example, in the studies of stock market and currency crises referenced above, the onset of the crisis typically does not vary across countries, which is likely to bias upward contagion estimates. A second challenge is to address the potential for specification search bias. As Leamer (1983) showed, using the same data both to identify the timing of the shock of interest and to measure price changes in that period can bias estimates upward. This issue has not been addressed in the contagion literature, as it is common practice to use a given (typically aggregate) price series to determine both the timing of the shock and the magnitude of price volatility. The third challenge relates to properly accounting for omitted factors. In our context, these include common local variation in economic conditions and prices that can bias one towards finding contagion.[4]

Our approach to estimating contagion in housing markets begins by employing a novel micro data set containing the complete set of housing transactions that occurred between 1993 and 2009 for 99 metropolitan areas, corresponding to more than 23 million observations. We are able to merge this housing data with a rich set of local market fundamentals, including local employment and income of potential home buyers. This combined data is then used to address each of the aforementioned empirical challenges.

First, theory is used to avoid a strictly *ad hoc* dating of the beginning of local housing booms. We use a prediction of Glaeser, et. al.'s (2012) dynamic version of the classic model of spatial equilibrium in urban economics to help identify when booms begin. As is described more fully in the complete paper, this leads us to date the beginning of the boom by when a structural break in the market's price appreciation rate occurs. The timing of when booms start varies widely across metropolitan areas – see Figure 1– providing us with many shocks to estimate

[4] Forbes and Rigobon (2002), for example, showed that accounting for heteroskedasticity in price volatility can reverse conclusions in their study of comovements across national stock markets.

average contagion effects and to test whether contagion varies along various dimensions such as MSA supply elasticity. Second, to address the specification search bias issue, we use our large underlying micro data to create randomly split samples so that the data used to determine the timing of when booms begin is distinct from that used to measure price volatility. Third, we limit omitted variable biases by adopting many strategies that are usually unavailable in many contagion studies: a) flexibly controlling for a host of local fundamentals, the characteristics of houses and respective buyers, and local credit market conditions; b) controlling for region-specific trends in house prices, and common variation that arises with the timing of local booms; c) including lagged price data to deal with unobserved and time-varying heterogeneity; d) dealing with potential reverse causality with an instrumental variable approach that uses income and an additional lag of close neighbor's price changes.

Our main estimates reveal strong evidence of contagion: a one percentage point higher house price appreciation rate in a nearby metropolitan area last quarter is associated, on average, with about a 0.1 percentage point higher own price growth rate this period, all else constant. Only near neighbors matter, as recent price changes in faraway metropolitan areas are not found to influence the focal market. This pattern of results is robust to different measures of closeness, which include the traditional geographic measure based on the physical distance and an economic measure based on migration flows between the areas. It is particularly noteworthy that this average impact of near neighbors is strongest right after shocks, i.e., after focal or neighboring markets boom. Back-of-the-envelope calculations and comparisons suggest that contagion could account for as much as one-fifth of the magnitude of local market booms in their first year. In addition, contagion remains an important component of local price variation for many years after the beginning of a housing boom. Investigation of possible heterogeneity in

this effect finds that the average contagion elasticity is slightly stronger for MSAs that had late booms and that had elastic supplies of housing.

We also investigate whether our evidence of contagion is robust to the potentially confounding factor of expectations, which may have played an important role in house price appreciation in the last housing cycle and could be correlated with past price changes in neighboring MSAs. We first include a simple form of expectations of local market fundamentals in our main econometric model to see if this materially affects the magnitude of the estimated contagion effect. It does not. However, including a measure of future own market prices reduces the contagion effect by half, but never makes it disappear. While more work on this issue remains to be done, this suggests that at least part of the contagion effect that we estimate is likely to be associated with non-fundamental or behavioral factors. This conclusion has potentially important policy implications, as to the extent that contagion at least partially reflects non-fundamental forces, policy makers may want to rethink the advisability of not responding to booms in asset markets such as housing.

In addition to estimating the magnitude of contagion at the beginning of and during the boom, we also investigated the extensive margin to see if the timing of booms was affected. Hazard models show that the probability of a boom beginning this quarter is indeed influenced by close metros that boomed last quarter. The standardized marginal effect is such that the focal market has about a 30% higher probability of booming this quarter. This magnitude is on a par with that associated with a one standard deviation increase in the focal market's contemporaneous own income growth rate. In addition, any contagion from a near neighbor appears to manifest itself quickly, as neighbors' booms further back in time do not have appreciably larger effects.

The one place where we find no evidence of contagion playing a role is in the bust. This is the case both for magnitudes and timing. This result is perhaps not all that surprising since the timing of the bust across MSAs is heavily concentrated around 2006 and 2007, while the buildup of the housing boom took almost a decade. Moreover, it highlights difficulties in detecting spillovers during economic or financial crashes that quickly spread across countries, regions, or firms.