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Housing market dynamics with delays in the construction sector ☆

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ABSTRACT

Housing supply is subject to several types of delays. On average, it takes 6 months to get approved for a residential building permit and another 2–4 quarters to complete a construction project. We present a simple two-sector model that incorporates these observations and show that the effect of these delays is not uniform: while they amplify the response of house prices to demand shocks, they dampen the effects of housing supply shocks. Moreover, construction activity depends on the relative duration of the shocks and the construction delays: delays dampen construction booms following temporary shocks, but exaggerate building activity following permanent changes in demand or supply conditions. Our results highlight the importance of capturing the nature and the persistence of the shocks when studying the effects of construction sector delays on housing market dynamics.

1. Introduction

Housing construction is subject to several types of lengthy delays. According to Gyourko et al., 2008, it takes on average 6 months to secure authorization for a new project. Once the construction permit is issued, the average length of time from start to completion of new privately owned residential buildings varies from 6 months for one-unit buildings to 12 months for two or more units. As a result, most residential homes are built based on the expectation that a buyer will be found following the project commencement or even after the unit is built (so called "on spec" construction), thus causing construction companies to take on the risk of real estate investment. Because construction activity must be forward-looking, and also because building costs tend to be "front-loaded," - with returns achieved only after the costs have been sunk, the combined effect of these delays on the housing market dynamics is non-trivial.

By incorporating these salient features into a two-sector model of the housing market, we demonstrate that the impact of delays on housing prices depends critically on the nature of the underlying shocks. Price response is amplified following an increase in housing demand, but is muted by supply-side innovations. Additionally, delays impart different dynamics on construction activity depending on shock duration: they reduce supply responsiveness to temporary shocks, but increase the volatility of new construction output following permanent changes in demand or supply conditions.

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Time-to-build delays in investment projects were first introduced by Kydland and Prescott (1982). However, as acknowledged by DiPasquale (1999) and Rosenthal (1999), the microfoundations of housing supply dynamics have been relatively overlooked compared to housing demand. Most of the research exploring the links between housing market and the macroeconomy focuses on the demand side of the real estate market, with the supply of real estate generally treated either as being fixed (Iacoviello, 2005) or as responding contemporaneously to demand (Iacoviello and Neri, 2010; Favilukis et al., 2010).[1] We introduce this well-documented but frequently overlooked feature of the construction sector into a model of the housing market to better understand its effects on the housing market dynamics.

Several recent papers have pointed out that various construction delays can significantly lower the responsiveness of housing supply to economic disturbances and thereby amplify the magnitude of house price fluctuations. On the empirical front, Glaeser and Ward (2009),Huang and Tang (2012), Ihlanfeldt (2007),Quigley and Raphael (2005), examine the importance of regulatory constraints, which range from financial fees to zoning restrictions to delays in the approval process, for the housing supply elasticity. Among theoretical and structural estimation models, Mayer and Somerville (2000) find that development fees have relatively little impact on new construction, but regulations that lengthen or otherwise constrain the development process have significant effects on housing starts. Paciorek (2013) reports that construction lags and marginal costs play critical and complementary roles in distorting the elasticity of housing supply and in amplifying housing market volatility. Glaeser et al., 2008 present a simple model of housing bubbles which predicts that localities with more elastic housing supply have fewer and shorter bubbles with smaller price increases. Malpezzi and Wachter (2005) offer theoretical support for the importance of supply sluggishness in explaining boom and bust cycles in housing markets. On the other hand, Davidoff (2013) finds that differences in supply elasticity cannot explain the observed cross-sectional variation in housing prices during the 2000s housing cycle.

The structural papers referenced above do not explicitly study the effects of construction supply shocks on the housing market, while the reduced form empirical studies do not make a clear distinction between the two types of innovations in their estimations.[2] However, Davis and Heathcote (2005) and Iacoviello and Neri (2010) provide evidence that fluctuations in residential investment and house prices can also be driven by supply shocks in the housing market. We find that between 1974 and 2007, the U.S. has experienced three distinct episodes of significant negative correlation between housing prices and investment, suggesting that the housing market was driven primarily by supply side factors. This evidence motivates a more careful distinction between supply and demand shocks in studying the implications of construction sector delays on housing market dynamics.

Given the focus of this study, it is useful to provide some narrative for the importance of supply shocks on housing production. Generally, these shocks capture the reduced-form effects of anything from weather to government regulations (such as subsidies and federal tax breaks) that alter the incentives of real estate market participants. As a more concrete example, according to the 2013 report by the U.S. Business and Industry Council, the share of import penetration in the construction machinery and equipment sector reached 50.55%.[3] Therefore, it is not unreasonable to expect that changes in international demand, trade policies, or exchange rates can alter the cost structure of the construction sector and thus act as supply shocks. For instance, in 2004 the U.S. had experienced a severe cement shortage, as higher demand by the Chinese construction sector for internal infrastructure projects has diverted cement supply of other countries.[4] Similarly, fluctuations in oil prices, which are important contributors to housing supply dynamics, are likely to affect construction firms' activity.

Our model allows us to distinguish between supply and demand shocks in the housing market in a general equilibrium setup.[5] Our main findings are twofold. First, a sluggish response of the construction sector, combined with an exogenous increase in *demand* for housing, leads to higher volatility in house prices, consistent with the findings of the papers referenced above. Construction sector activity, however, is dampened as the firms internalize the fact that both demand and prices will fall by the time new houses are ready for sale. On the other hand, longer delays lower the amplitude of house price fluctuations after a *supply* shock. Following the same logic, builders anticipate the shock fading somewhat by the time the first set of permit applications is approved and new houses are available for sale. Consequently, housing supply increase is not as pronounced, and house price need not drop as low in order to clear the market. This result is robust to changes in several key parameter values, including the share of land and capital in the production of housing, as well as the ease of labor mobility between sectors.

Second, the strength of these mechanisms depends on the persistence and the timing of shocks. While unfavorable weather patterns or cement shortages are usually unforeseen but fairly short-lived, other types of shocks such as engineering advances of changes in government regulations tend to be permanent and observable at least a few periods prior to their arrival. In our model, permanent

[1] One exception we are aware of is Davis and Heathcote (2005). However, the authors do not study the effect of delays on housing market dynamics.

[2] We should note that Paciorek (2013) includes a cost shock into the structural supply equation, although the model simulations only focus on the effects of demand innovations on housing variables.

[3] The statistical appendices for the 2013 USBIC Import Penetration Report (based primarily on the U.S. Census Bureau's Annual Survey of Manufactures) can be accessed at http://americaneconomicalert.org/USBICImportPenetrationAppendices2013.pdf.

[4] The Christian Science Monitor, "Cement shortage hits US housing boom," August 17, 2004.

[5] General equilibrium models have the advantage of capturing important spillovers between different economic sectors. This framework allows us to accurately model the effects of interest rate policy on resource allocation; in addition, endogenous income dynamics plays an important role in capturing labor movements between the two sectors.