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Aging and urban house prices☆

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ABSTRACT

This paper investigates how changes to the age distribution of cities' resident populations shape the growth rate of local house prices in different market segments. For estimation purposes, we combine city-level demographic information with detailed housing price data for 87 German cities over 1995–2014. We show that house prices and key demographic variables exhibit strong cross-section dependence but are panel stationary in first differences when this form of dependence is accounted for. Employing a mixed-regressive spatial panel model that incorporates spatial fixed effects as well as changes in city size, purchasing power and mortgage rates, we find that real urban house price appreciation tends to be substantially lower in cities that age more rapidly. Population aging has heterogeneous effects across housing segments: sales price growth of condominiums and single-family homes is negatively related to stronger growth of the old-age dependency ratio, while a positive association is found for aging and real rent growth.

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1. Introduction

Housing is a dominant asset in the household portfolio, and the major part of housing wealth in advanced economies is concentrated in urban areas. According to the most recent World Bank data, three out of four Germans, four out of five Americans, and nine out of ten Japanese live in cities.[1] Wealth formation in the household sector is therefore closely tied to the evolution of housing prices in the very same locations that lie at the heart of economic activity (Rosenthal and Strange, 2004).

While a steady trend towards urbanization is expected to keep cities growing in terms of population, an often overlooked impact factor on urban housing wealth is a major shift to the age structure of residents. Many advanced countries are stepping into a rapid aging phase, and there is considerable concern about to what extent population aging will affect housing markets. Starting with Mankiw and Weil (1989), a long list of papers has argued that working age households tend to have greater demand for housing than retirement agers (see, e.g., Engelhardt and Poterba, 1991, Pitkin and Myers, 1994, Ermisch, 1996, Ohtake and Shintani, 1996, Eichholtz and Lindenthal, 2014, and the references therein): in the absence of frictions, the consumption of housing services underlies a lifecycle, which implies that shifts to the age structure alter demand in the market for housing services. A similar argument can be made for the demand of housing as a durable capital good (as for retirement saving): urban house prices will be affected if households entering retirement age dissolve urban housing capital and move towards more remote locations. If demand changes related to aging are reflected in prices (which is plausible in the market for housing), theory suggests that permanent and major increases in the retirement-to-working age ratio of city residents should systematically affect the trajectory of urban housing prices.[2] An issue that has seen much less attention so far in the academic literature is that retirement-age city residents are expected to demand housing in market segments much different from working-age residents. Different segments of urban housing markets should therefore be heterogeneously affected by aging.

The aim of this paper is to examine empirically how historical changes to the age composition of city populations have been related

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[1] See http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS. Depending on national definitions, the term “urban area” can extend to cities, towns, as well as larger conurbations. In this paper, we refer to a sample of 87 administratively self-standing German cities as urban areas.

[2] Since a substantial part of urban housing capital is debt-financed, severe house price declines can pose a threat to household net wealth, which can in turn impair financial stability (Mian and Sufi, 2011). The systemic relevance of urban house prices is further amplified by evidence that real house price changes in cities tend to “ripple” towards geographically adjacent regions (Meen, 1999, Lee and Chien, 2011).

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to the trajectory of housing prices, spanning different types of owner-occupied as well as rental housing. In its scope and research design, the study draws upon recent research by Takáts (2012), who shows that changes to demography have substantially shaped real house price developments in OECD economies during the past 40 years. The cited and related papers are based on macroeconomic data, which is why they deal carefully with issues related to panel stationarity and model specification. However, a remaining concern with their results is *aggregation bias*. It is well established that housing markets are local by nature, being linked together in space through commuting, migration or common shocks (Meen, 2012). Such factors are impossible to be appropriately captured by the analysis of non-spatial data. National analysis also uses to pool data on different (and possibly heterogeneous) housing segments, which precludes any statements on the effects of aging on different submarkets. In a recent contribution on segmented housing search, Piazzesi et al. (2015) find that search activity and inventory co-vary positively within but negatively across cities, a finding that strongly supports the analysis of different housing segments at the city level.[3]

Collecting data from official and private sources, we construct an untapped panel data set that spans yearly observations on real house prices in different market segments and a broad range of demographic and socio-economic variables for 87 German cities over 1995–2014. We manage to make two major contributions to the literature by studying this data. Following recent work on spatial panel models by Lee and Yu (2010a, 2010b), we first derive possibly unbiased estimates for the aging-house price relationship at the city level within a mixed-regressive spatial panel framework. The framework explicitly accounts for cross-section dependence among urban housing markets as well as for spatially autocorrelated disturbances. Along with spatial dependence, we implicitly control for unobserved heterogeneity in the size of local housing supply elasticity by including city-level fixed effects. Secondly, we establish first-time empirical evidence regarding the heterogeneity in how population aging affects different major housing segments: condominiums, single-family homes and (unregulated) rental apartments. While not yet having been scrutinized in the literature, this heterogeneity carries important implications for urban housing policy and planning.

Cities in Germany lend their selves exceptionally useful for the analysis of the links between demography and housing prices. Due to historical circumstances – most notably, the political separation of East and West Germany between 1945 and 1990 – there has been considerable variation in demographic developments across urban areas over the last 25 years. This variation partly originates from differences in birth behavior and life expectancy, but also from large differences in net migration. At the same time, the German system of housing finance has been very stable over the sample period. For U.S. cities, differences in the development of subprime lending, mortgage securitization and home foreclosures have been well documented to considerably affect house price trajectories (Favara and Imbs, 2015, Mian et al., 2015). Since the prevalence of subprime lending has been highly correlated with urban demographics, e.g. with higher shares of minority or young working-age households, empirical estimates of the nexus between demographic changes and house prices based on US data may be severely biased.

The considerable amount of cross-city variation in real house price appreciation rates in German cities is illustrated by Fig. 1. The figure combines a weighted average of inflation-corrected annual percentage changes of condominium prices, single-family home prices and apartment rents for different quantiles of the sample distribution (represented by solid, point and dashed lines) with information on the development of consumer housing credit relative to national GDP. The figure shows that house prices for the median city almost remained constant in real terms over the sample period (tracking aggregate national house prices). The level of heterogeneity in price changes across cities, measured by the absolute difference between the highest and lowest annual appreciation rate, ranges from 9.0 percentage points in 2004 to 18.7 points in 2001. No single city experienced a boom-bust cycle in real house prices over the sample period, as indicated by a national volume of private housing loans that has remained flat relative to aggregate production.

Our econometric results lend strong support to the hypothesis that the development of a city's age structure is a fundamental determinant of local house price evolutions. The effects of population aging are heterogeneous across segments: our favorite specification suggests that real sales price growth of existing condominiums and single-family homes is negatively related to stronger growth in the old-age dependence ratio (with condominium prices being more severely affected than home prices), whereas a positive association is found between increases in the old-age dependency ratio and real rent growth. A possible explanation for this asymmetry is that relative demand for condominiums and homes as a form of capital investment is declining with aging populations, whereas demand for housing services in the urban rental sector increases with growing population shares of the elderly. This interpretation is in line with recent micro data evidence that German households do not tend to substantially downsize housing consumption in old age.

The remainder of the paper is organized as follows. Section 2 reviews the economic theory on the effects of demography on housing demand and prices. It also discusses the existing empirical evidence at the macro and micro levels. Combining the national perspective with a view on individual cities, Section 3 presents stylized facts regarding the past and expected future developments of key demographic indicators in Germany. In Section 4 we present the data, discuss its cross-section dependence and panel stationarity properties and introduce a generic framework for the econometric analysis. Section 5 serves to present segment-wise regression results for spatial and non-spatial panel specifications of the housing price equations. We interpret direct and indirect spatial effects and discuss similarities and differences between housing segments. Section 6 concludes with implications for policy and further research.

2. Literature review

2.1. Demography and house prices: theory

Economic theory suggests at least three distinct channels through which changes in the age structure of a city's resident population can affect local house prices. The first channel is the effect of aging on the *demand for housing services*. Along with incomes and preferences, the total number of adult residents is a major driver of aggregate demand for housing services in a location (Mankiw and Weil, 1989, DiPasquale and Wheaton, 1994). Assuming that the long-run housing supply schedule is finitely elastic, house prices increase after a permanent positive shock to population size. A change in the house price level due to a population shift without any change to the age composition can be labeled as a *size effect*.

In addition to the size effect, the optimal path of individual housing services consumption underlies a life cycle (Flavin and Yamashita, 2002): individual housing services consumption is comparatively low during schooling years, increases with labor market entry, peaks at starting and maintaining a family and decreases again in retirement age.[4] When the relative size of the retirement-age population experiences a permanent upward shift, the price of housing services

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[3] In related work, Genesove and Han (2012) document that changes to aggregate demand shape long-run city house price appreciation much more than shifts of relative demand between intra-city locations.

[4] In the presence of borrowing constraints and other frictions, households face obstacles of smoothing housing services consumption over the life cycle and will purchase self-owned housing (which typically requires a down payment and high levels of creditworthiness) in later stages in life.

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