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Land use regulations and the value of land and housing: An intra-metropolitan analysis

Nils Kok[a,*], Paavo Monkkonen[b], John M. Quigley[c]

[a] Maastricht University, Netherlands
[b] University of California, Los Angeles, CA, United States
[c] University of California, Berkeley, CA, United States

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ABSTRACT

Inferences about the determinants of land prices in urban areas are typically based on housing transactions, which combine payments for land and long-lived improvements. In contrast, we investigate directly the determinants of urban land prices within a metropolitan area – the San Francisco Bay Area. Our analysis focuses on the relationship between the regulation of urban development within different jurisdictions and land prices, while considering other factors that shape the value of land, such as topography and access to jobs. We find that cities that require a greater number of independent reviews to obtain a building permit or a zoning change have higher land prices, *ceteris paribus*. Finally, we relate the variation in land prices to the prices paid for housing in the region and show that local land use regulations are closely linked to the value of houses sold. This is in part because regulations are so pervasive, and also because land values represent such a large fraction of house values in the San Francisco Bay Area.

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1. Introduction

The price of land is a basic indicator of the attractiveness and the economic value of a specific site and of the amenities available at that location. These amenities include a diverse collection of attributes, ranging from the productivity of a site in agriculture to the quality of an urban neighborhood surrounding a given location. In urban areas, variations in the price of land reflect the locational and geographical advantages of a particular site, as well as local externalities and governmental policies regulating its use. Land use regulations in urban areas are crucial determinants of the form of cities, their spatial patterns of physical development and occupancy, the housing and transport costs of residents, and their economic well-being. Land use regulations can thus affect land prices directly, through the specific uses permitted, but also indirectly by creating neighborhoods and cities of a certain character.

Although much is known about the determinants of rural land values in the US (Goodwin et al., 2003; Alston, 1986), there is no comparable body of empirical evidence on the determinants of urban land values. The most important reason why measuring the value of urban land has been problematic is the dearth of direct observations on sales of urban land. For the most part, land values are estimated from variations in the selling prices of housing by making assumptions about the production function for housing (Davis and Heathcote, 2007).[1] However, this methodology does not account for variations in the land component of housing output within metropolitan regions,[2] and it does not account for factors which may distinguish the value of land at the intensive margin from the value of land at the extensive margin, *i.e.*, the difference between the value of an additional unit of land for a built-up property and the value of marginal land in lots of newly-constructed housing (see Glaeser and Gyourko, 2003, for a discussion).

However, a new source of data on the price of land in urban areas has recently become available. City and county assessors record the sales prices of parcels of vacant land and "teardown"

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* Corresponding author. Address: Maastricht University, School of Business and Economics, PO BOX 6161, 6200MD, Maastricht, Netherlands. Tel.: +31433883838; fax: +31 43 3884875.

E-mail addresses: n.kok@maastrichtuniversity.nl (N. Kok), paavo.monkkonen@ucla.edu (P. Monkkonen).

[1] There are also a few analyses of small samples of teardowns (*i.e.*, redevelopment parcels) to investigate the value of land in built-up urban areas. See Rosenthal and Helsley (1994) and Dyer and McMillen (2007).

[2] For example, Davis and Palumbo (2008) estimate land values over time for 46 US cities using indices of aggregate house prices, assumptions about production relationships, and the creative measurement of residential capital.

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parcels, and the CoStar Group collects this information on a regular basis.[3] In this paper, we use this data source in an extensive analysis of the way land use regulations shape land and housing prices in the San Francisco Bay Area in California.

The San Francisco Bay Area has historically had the highest housing prices in the US, and the rate of increase in housing prices has been among the highest experienced by any large US metropolitan area, at least until the recent collapse in the US housing market. Within the Bay Area, there is substantial variation in the economic and geographic conditions of land parcels, not only proximity to jobs and economic conditions, but also wide variations in topography – in elevation and proximity to water, open space, and natural amenities, as well as exposure to earthquake risk. Importantly, the Bay Area is also infamous for a restrictive pattern of land use regulation and for containing some of the most land constrained Metropolitan Statistical Areas (MSAs)[4] in the United States (Hilber and Robert-Nicoud, 2013; Saiz, 2010).

Because the power to regulate land use is wielded by city and county governments in the United States, there is significant intra-metropolitan variation in the stringency of regulation. This intra-MSA variation has received limited attention in the literature, especially in terms of its relation to land prices. Unlike at the regional level, where evidence for the impact of land use regulations on housing prices is rather strong (Green et al., 2005; Huang and Tang, 2012; Saiz, 2010), predicted city level impacts of restrictions are less clear, especially on land prices (Glaeser and Ward, 2009; Ihlanfeldt, 2007; Ohls et al., 1974).

In the empirical analysis below, we utilize detailed survey data on land use regulations in the 110 independent jurisdictions in the Bay Area (for more detail, see Quigley et al., 2009) to investigate the linkage between these regulations and land prices. We disaggregate the regulatory index into components in order identify those land use controls that exhibit a significant association with prices. We then link land values to house values, using a large sample of sales of single-family housing in the San Francisco Bay Area.

We find that factors of topography, geography, and demographics are strongly related to the price of land. For example, earthquake risk reduces land prices substantially, and parcels located on hills are more expensive, not because of the intrinsic benefit of elevation, but because of population sorting and man-made amenities nearby. Of course, the primary focus of the paper is land use regulations. We document that some regulations are significantly related to land prices, and thus the value of houses sold in the region. In part this is because regulations are so pervasive, and in part because land values represent such a large fraction of house values in the San Francisco Bay Area.

Although our models incorporate a large number of controls related to the natural and man-made local environments of parcels, we acknowledge that our findings are not based on a randomized experiment. In an ideal randomized trial, heterogeneous owners would be randomly assigned to different parcels of land exposed to varied regulatory conditions. In such a case, OLS estimates of the impact of land use regulations would yield causal effects. In reality, of course, there is a market for land and a hedonic pricing gradient emerges as heterogeneous potential owners choose their optimal location. In Section 2 of the paper, we explicitly discuss this identification problem, the assumptions that must hold for OLS estimates to not suffer from bias due to omitted variables and self-selection issues, and some of the benefits and drawbacks from using an instrumental variable approach as an alternative specification. In the empirical analysis, we follow the identification strategy of Glaeser and Ward (2009), including a comprehensive set of demographic variables in an OLS regression to reduce the omitted variable bias and concerns about endogeneity. As a robustness check, we also use instrumental variables to estimate the models.

The remainder of this paper is organized as follows: Section 2 is a brief review of literature on land use and regulations, land prices, and housing prices. Section 3 describes the key sources of land price data and the measures of physical and economic geography used in the analysis. Section 4 relates variation in land prices to our intra-urban measures of economic geography, and Section 5 investigates variation in local regulation and land prices within the metropolitan region. In Section 6, which analyzes the relation between housing values and land values, we make the linkage to the work by Saiz (2010) and Davis and Palumbo (2008) more explicit, and we note the complementarity in approaches. Section 7 is a brief conclusion.

2. Determinants of urban land prices

2.1. Demography and topography

This paper contributes new empirical evidence on determinants of urban land prices. The key factors that determine land values within urban areas – accessibility, amenity levels, and topography – were framed almost five decades ago (Brigham, 1965); however, empirical evidence on the relative importance of these factors remains scant. As discussed in the introduction, the dearth of empirical analyses of land prices is primarily due to a lack of data on land transactions. Existing studies are limited in scope; for example, Peiser (1987) uses data on 467 transactions of vacant land, whereas Kowalski and Paraskevopoulos (1990) use data on just 56 transactions. Both studies employ models with relatively few explanatory variables.

New evidence on the determinants of urban land prices is worthwhile, though many of the hypotheses tested might seem standard in the housing price literature. Yet the market for vacant land is unusual, especially within existing urban areas. Land is "greatly differentiated; there is a notable lack of information; trading is infrequent, subject to high transaction costs and elaborate 'bargaining'" (Adams et al., 1968: 250). Additionally, the development option is an important element embedded in vacant land, which has been argued to increase land values with higher levels of uncertainty in the property market (Titman, 1985). We provide some evidence on this latter argument in Section 6.2 of the paper.

2.2. Land use regulation

Research on the role of land use regulation in property markets dates back at least to the 1970s (Ohls et al., 1974), yet it remains important, given continued disagreement over the magnitude of impacts and the challenge in identifying causality. Moreover, regulations governing the use of land have become more numerous and more onerous in recent decades, and housing has become more costly in some metropolitan areas (Glaeser and Ward, 2009; Quigley et al., 2007). Although there has been some recent work on the motivations behind the adoption of stringent land use regulations (Hilber and Robert-Nicoud, 2013; Kahn, 2011), these new explanations provide nuance to rather than supplanting the basic insights of decades earlier. As Hamilton (1978) and Fischel (1980) posit in what came to be called the "homevoter hypothesis," municipalities, responding to voter preferences,

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[3] Data from CoStar on the hedonic and financial characteristics of commercial office buildings have formed the basis for several recent microeconomic analyses of US property markets (*e.g.*, Eichholtz et al., 2010, Fuerst and McAllister, 2011). Nichols et al. (2013) use these data to create land price indexes for 23 MSAs; a subset of the CoStar data was exploited by Haughwout et al. (2008) in their analysis of land prices in New York.

[4] The nine-county San Francisco Bay Area includes the MSAs of San Francisco-Oakland-Fremont, San Jose-Sunnyvale-Santa Clara, Santa Rosa-Petaluma, Vallejo-Fairfield, and Napa.

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