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How well do urban growth boundaries contain development? Results for Oregon using a difference-in-difference estimator☆

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ABSTRACT

Urban containment policies, including urban growth boundaries (UGBs), are a common tool used by city planners to promote compact development. We analyze how well UGBs do in containing development using fine-scale GIS data on cities in Oregon. Earlier studies on UGBs yield mixed results, with some authors finding no effects of UGBs on housing market variables and urbanization rates and others finding significant effects. A challenge in measuring these effects is that the location of the UGB is unlikely to be an exogenous determinant of a land parcel's value for development. The panel structure of our dataset allows us to estimate the UGB's effect on the probability of development using a difference-in-difference estimator applied to a narrow band of plots along each city's UGB. This estimator controls for time-invariant unobservable variables and common temporal effects among plots, thereby mitigating the potential for biased estimates due to the endogeneity of the UGB's location. We also pursue a novel approach to controlling for time-varying factors that exploits our fine-scale data. We find that UGBs contain development in many of the Oregon cities we examine, although there are some cities in which development rates are the same inside and outside of the UGB. Our results reveal that, in most cities, the effect of the UGB is small relative to pre-existing differences in development probabilities. This suggests that it may be difficult to identify UGB effects with cross-sectional data, the approach commonly taken in previous studies.

1. Introduction

Although sometimes viewed with skepticism by urban economists (e.g., Brueckner, 2000), urban containment policies, such as urban growth boundaries (UGBs), are now a common tool used by city planners to promote compact development. Wassmer (2006) reports that, by 2000, some form of urban containment policy had been adopted in 23% of Census-designated urbanized areas in the U.S. There is a large empirical literature on the effects of land-use controls on housing and land markets, including a number of studies that examine UGBs.[1] The results of the UGB studies are decidedly mixed. Some authors (Pendell, 1999, 2000; Jun, 2004; Cho et al., 2006, 2007) find that UGBs have no effect on housing market indicators and urbanization rates, while others find significant effects on land prices (Knaap, 1985; Grout et al., 2011), housing prices (Phillips and Goodstein, 2000), urban area size (Wassmer, 2006), and the likelihood of land development (Kline and Alig, 1999; Cunningham, 2007).

One of the challenges in measuring the effects of UGBs is that many of the factors that influence housing prices, urbanization rates, and other outcomes of interest also affect decisions by city planners about where to place UGBs. In Oregon, for example, planners are required by law to consider factors such as housing affordability and access to transportation infrastructure when designating UGBs. As such, whether a house or land parcel is located inside or outside of the UGB is unlikely to be an exogenous determinant of its value or development status. Quigley and Rosenthal (2005) note that many earlier studies ignore the endogenous relationship between housing prices and land-use regulations. A number of recent studies, however, have addressed the endogeneity of regulations using instrumental variables or quasi-experimental methods (e.g., Boarnet et al., 2011; Ihlanfeldt, 2007; Lynch et al., 2007; McMillen and McDonald, 2002; Zhou et al., 2008; Turner et al., 2012). Few of the earlier UGB studies acknowledge the potential endogeneity problem, and most treat location with respect to the UGB as an exogenous regressor. Exceptions include Grout et al. (2011), who use a regression discontinuity design (RDD) to measure effects of the Portland, Oregon, metropolitan area UGB on property values. Cunningham (2007) estimates a hazard model of land development to test effects of the Seattle UGB, and in the spirit of RDD restricts his sample to parcels located close to the UGB to assess the robustness of his results. Studies of the effects of Enterprise Zones (EZ) on the performance of economically

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[1] See Quigley and Rosenthal (2005) for a recent review of studies that evaluate effects on housing prices.

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distressed areas also confront the problem of non-random assignment of the treatment (e.g., Hanson, 2009; Krupka and Noonan, 2009; Hanson and Rohlin, 2013). Following the logic of RDD, Hanson and Rohlin (2013) compare changes in employment in census tracts bordering EZ areas to employment changes for tracts that border areas whose application for an EZ was denied.

This paper examines the effects of UGBs in Oregon on land development rates. Although much attention is given to the Portland metropolitan area UGB, all incorporated cities in Oregon are required to designate UGBs under the statewide land-use planning program (DLCD, 2010). As of 2010, 217 UGBs were in place within the state. The purpose of Oregon UGBs is to contain urban growth, but not to halt it. Each UGB is required to include land for future development so as to accommodate 20 years of forecasted population growth. Moreover, there are a number of ways in which development can occur outside of UGBs. Development is allowed on lands that were zoned for this purpose prior to UGB designation and lands that are part of small, unincorporated towns. In addition, subject to restrictions, some development is permitted on lands outside of UGBs that are zoned for farm, forest, and rural residential uses.[2] Finally, city and county planning commissions can grant variances to development restrictions.

As the preceding discussion makes clear, under Oregon's land-use planning program, land development can occur inside and outside of UGBs. This paper addresses the question, how successful have Oregon's UGBs been in containing this development? We make use of a fine-scale panel data set on land use combined with digitized information on the placement of UGBs. Our study has several distinguishing features. First, we measure the direct effects of a regulation on the outcome it is intended to influence. Many earlier studies examine the relationship between housing and land prices and indices of regulatory restrictiveness, which represent the combined effect of many regulations. The regulations applied by a local government often have very different objectives—from the recovery of costs for public facilities to environmental preservation—and, thus, are likely to have varying effects on prices. A restrictiveness index may, therefore, be an imprecise measure of the regulations applied in each jurisdiction. Ours is one of few studies that analyze land development explicitly, an appropriate focus given that the purpose of UGBs is to affect development patterns.[3]

Second, we measure land development decisions as well as the placement of the UGB with great precision. We obtain land-cover data from the Land Cover Trends (LCT) project of the U.S. Geological Survey. The LCT data provide repeated observations of developed and undeveloped lands at a 60-meter scale. We also obtained digitized maps of exact UGB locations through time, allowing us to categorize plots in terms of location inside or outside the UGB (or, in terms of the quasi-experimental literature, we define treated and untreated groups of plots). The fine-scale data allow us to focus our analysis on a narrow band of plots (1 km in width) located just inside and outside of the UGB. Many earlier studies on land-use controls have used aggregate (MSA- or county-level) data. With aggregate data, the researcher exploits variation among jurisdictions in regulations, but this comes at the cost of precision in measuring both regulations and outcome variables.

Finally, the panel structure of our data allows us to measure the effects of UGBs using a difference-in-difference (DID) estimator. The enabling legislation for Oregon's land-use planning program (Oregon Senate Bill 100) was passed in 1973, and UGBs were proposed, approved, and adopted during the subsequent 10-year period. We observe land cover in 1973, before UGB adoption, and in 2000, more than a decade after the UGBs had been in place. Thus, with observations of treated and untreated plots before and after application of the treatment, we can obtain a DID estimate of the average treatment effect (ATE). For our application, the ATE equals the percentage point difference in the change in the probability of land development over time associated with being inside instead of outside the UGB. The DID estimator controls for time-invariant unobservables and common temporal effects among plots, thereby mitigating the potential for biased estimates due to the endogeneity of the UGB's location.[4] Biased estimation of the ATE is still a potential problem, however, if the placement of the UGB is correlated with time-varying unobservables. Given the long time period spanned by our data (1973 to 2000), temporal variation in some of the factors influencing development is likely. We pursue two strategies to control for time-varying factors, including a novel approach that exploits our fine-scale data. We define 1-square kilometer (sq. km) blocks of plots that straddle sections of the UGB, and control for unobservable factors with block-specific time-varying indicator variables.

The next section provides some background on Oregon's statewide planning system. This discussion makes clear that land developers were unlikely to have anticipated the effects of UGBs as of 1973, which we define as the "pre-treatment" period. In Section 3, we describe the data used in the analysis and, in Section 4, we present the estimation approach. Section 5 provides a discussion of our results and, in Section 6, we present several robustness checks. In Section 7, we offer concluding thoughts.

2. Oregon's land-use planning system

Prior to the 1960s, land-use planning in Oregon was conducted at the local level and consisted primarily of zoning for urban development. In the 1960s, legislation was passed that enabled exclusive farm use zoning and allowed for use-value assessment of agricultural lands for property tax purposes. Senate Bill 10, passed in 1969, required all cities and counties to develop comprehensive land-use plans and established planning goals to guide local planning decisions. The law had little effect, however, because it lacked an enforcement mechanism, provided no funding for implementation or technical assistance to local planners, and did not establish state-level oversight. Most cities and counties simply neglected to develop plans, and the law was challenged immediately, though unsuccessfully, through the public initiative process.

Senate Bill 100, approved in May 1973, addressed many of the shortcomings of Senate Bill 10. Its main achievement was to create the architecture of the current statewide planning system. It established the Land Conservation and Development Commission (LCDC), a seven-member board that adopts state land-use planning goals, implements rules, and assures local compliance with state goals. Senate Bill 100 also created the Department of Land Conservation and Development (DLCD), which provides technical assistance to the LCDC. Senate Bill 100 included a list of statewide planning goals, but left the implementation to the LCDC. In December 1974, the LCDC adopted the original set of 14 planning goals (there are now 19), which must be addressed in all local comprehensive plans. The goals relate to citizen involvement; land-use planning; agricultural lands; forest lands; natural resources,

[2] These restrictions prevent the building of large-scale residential subdivisions outside of UGBs and were the impetus for the Measure 37 initiative in 2004, which would have required local governments to either compensate landowners for property value losses or to waive land-use regulations. Measure 37 was repealed in 2007 and replaced by Measure 49, which allows Measure 37 claimants to build up to three houses, but places limits on large-scale housing developments.

[3] While UGBs are just one element of the regulatory regime in Oregon, they are the primary mechanism by which local governments decide where development will occur. Zoning, for example, is adjusted to be consistent with UGBs once they are designated. As such, it is appropriate to attribute the effects measured in this study to UGBs and not to other regulations.

[4] Cunningham (2007) employs a dataset on land development decisions with a similar structure, and the estimated model includes dummy variables for location outside the UGB and time periods after the UGB was put in place, as well as the interaction of these two variables. In a linear DID model, the coefficient on the interaction term is the ATE. In Cunningham, however, these variables enter the model non-linearly through the hazard function, which means the estimated coefficient on the interaction term has a different interpretation and is affected by omitted time-invariant factors. More discussion of these points is provided in Section 3.