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Intra-school district capitalization of property tax rates

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ABSTRACT

While previous studies have attempted to measure property tax rate capitalizations by proximate housing prices, disentangling school quality, and its associated amenities, from tax rates has impeded accurate estimation. I overcome this issue by investigating school districts containing varying tax rates. Identification is derived from the use of school and spatial-temporal boundary fixed effects to eliminate unobserved variation associated with tax districts that can confound capitalization estimates. Results from the primary model provide evidence of a negative capitalization of tax rate levels that corresponds to full capitalization at discount rate of nearly 3.5 percent. Further, property fixed effects are uniquely incorporated within the boundary identification method to show that tax rate changes are capitalized similar to baseline tax rate differences.

1. Introduction

Property taxes comprise a significant portion of housing costs for homeowners, with over 19 billion dollars collected in the United States in 2017 (U.S. Census Bureau, 2017). However, the association of property taxes with the provision of public goods has hindered accurate house price capitalization estimates. Attempts to determine differences in these public goods and include them in hedonic regressions are challenging due to their imprecise and unobserved nature. Of particular importance is school quality and its related unobserved attributes, which must be addressed to obtain accurate property tax capitalization estimates. I overcome this estimation impediment by using unique data for school districts containing multiple tax areas. In addition, I disentangle the competing effects of other public amenities from tax districts through the use of yearly tax boundary controls. The estimates indicate that housing prices are inversely related to property tax rates, and full capitalization occurs with a discount rate of 3.5 percent. Building on these results, property fixed effects are applied to show that property tax rate changes are similarly capitalized as differences in baseline rates. Together, these results present implications for homeowners' incentives to vote for proposed tax changes, and for the collection of tax monies when tax changes are realized.

I extend the existing strand of property tax rate capitalization literature by explicitly controlling for school districts and spatially provided public amenities. These controls eliminate the possibility for school district level attributes to confound estimates, as they have been shown to significantly impact housing prices in the empirical literature (e.g. Haurin and Brasington 1996; Black 1999; Bayer et al., 2007). To include these controls and provide estimates of tax rate level capitalization by house prices, the hedonic method, introduced by Rosen (1974), is utilized with housing, tax, and school data from Franklin County, OH. In the study area, overall property tax rates are spatially independent from school districts; this separation stems from school districts being detached from other tax district designations, such as library and city areas. The resulting spatial pattern of varying tax districts within school districts provides a gradient in tax rates within school districts that can be used for capitalization identification near the tax boundaries, which are implemented to control for other spatially provided public amenities.

In using the hedonic model, unobserved spatially-varying attributes may confound estimates when they are correlated with tax rates. I control for these attributes by implementing multiple levels of fixed effects. First, school level fixed effects account for differences in school quality and spatially related attributes corresponding to school districts. Second, yearly tax district boundary fixed effects control for unobserved spatial-temporal variation within each school district; in addition, the fixed effects are segregated by neighborhood to further reduce the effect of spatial unobservables on estimates. These boundary fixed effects control for the impact of spatially provided public goods not associated with school districts, such as public parks, road cleaning and clearing, and other location specific attributes. Together, the two levels of fixed effects eliminate much of the unobserved variation that can hinder accurate estimation of tax rate capitalization. To expand on the primary specification, property fixed effects are added to the boundary controls to address bias from within-boundary unobserved

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variation in the estimated coefficients and determine the capitalization of changes to property tax rates.

Regressing housing prices on home attributes, tax rates, and spatial and temporal fixed effects, the coefficients for the housing variables are similar to the current hedonic literature; for example, homeowners prefer larger homes and additional bathrooms. The tax rate level coefficient is negative and significant, and provides evidence of a nearly 2.9 percent decrease in housing prices as a result of an increase in the property tax rate of one-tenth percent. This estimate corresponds to a decrease in the mean home sales price of nearly $5,000 for a $180 increase in the yearly tax rate, or a discount rate of 3.5 percent under full capitalization of the difference in property tax levels. The results from the property fixed effects model show that tax rate changes are negatively capitalized by house prices at a rate of 3.9 percent for an increase in the property tax rate of one-tenth percent. Therefore, home sellers are impacted by tax increases through decreases in the market price of their home. This coefficient is larger, but statistically similar, to the tax rate level estimate. The difference in estimates suggests that unobserved amenities may be produce a downward bias on the tax rate level coefficient, or that homebuyers may view changes to the tax rate more negatively due to budget issues, expectations of future increases, or other factors. Adding to the main results, robustness models provide evidence that the main results are robust.

In this paper, data on school districts containing multiple tax rates are used to estimate the capitalization of property tax rate levels. This research is unique in controlling for the impact of school quality, and its related unobserved features, which can bias estimates. The implementation of school district controls and spatial-temporal boundary fixed effects that control for spatially provided public amenities shows that property tax rate levels are negatively capitalized by housing prices. The addition of property fixed effects to the main specification provides evidence that rate increases are negatively capitalized at a similar rate. The results have significant implications for assessing the relationship between tax rates and the user cost of housing, and policies surrounding differing tax rate levels. For example, voting incentives are affected by the extent of capitalization, and tax collections could be overestimated if changes to property taxes reduces the assessed market value of homes.

The remaining sections of this paper are organized as follows: Section 2 discusses related literature; the data and study area are described in Section 3; Section 4 presents the econometric model used for identification of property tax rate capitalization; the results and capitalization percentage are discussed in Section 5; and Section 6 concludes the paper.

2. Related literature

This paper extends the existing literature that investigates the capitalization of property tax rate levels. I improve on the identification of the capitalization by directly controlling for school districts within a hedonic model that includes boundary controls, leading to less biased estimates. In a seminal paper investigating the property taxes, Oates (1969) determines the existence of a relationship between property values and property tax rate levels. However, controlling for differences in public services across space obstructed accurate estimation since these services can bias estimates. This issue continued throughout the early tax rate capitalization research, as discussed in the series of papers by Oates (1973), Pollakowski (1973), King (1977), and Rosen and Fullerton (1977). These obstructions led to varying early estimates for property tax capitalization between 0 percent and 100 percent. Since these initial studies, much of the research on this topic has involved minimizing the bias from spatially provided services.

To avoid the complication of using measures of spatial public services, Palmon and Smith (1998a,b) investigate property tax rates within Municipal Utility Districts (MUDs) in Texas. These MUDs have spatially-varying tax rates, but provide uniform public services to homes within their boundaries. The authors utilize these unique areas where much of the public services are constant to estimate a tax rate capitalization of near 100 percent. However, their research does not account for school districts or neighborhood boundaries that are likely to confound tax rate capitalization estimates. As a result, the estimates are likely to be biased by the extent of the correlation between tax districts and school districts that is unaccounted for in their identification strategy. In this research, I build on this research by accounting for school and yearly tax boundary by neighborhood unobservables.

Gatzlaff et al. (2008) provide an overview of the property tax rate capitalization literature across nearly 40 years. From their sample of more than 15 papers, partial capitalization is the most common empirical finding, but the frequency of papers finding full capitalization has increased over time as methods have improved. The authors also determine several key themes for tax capitalization research, including the importance of considering public services in estimation. I address this matter in this paper directly by controlling for school quality, and other unobserved attributes associated with school districts, and spatially provided public amenities to further the strand of research involving the capitalization of property tax rates.

Recently, a number of authors have investigated policies altering property tax rates. For example, Hodge and Komarek (2016) investigate a place-based property tax reduction in Detroit, MI and find that buyers overcapitalize property tax reduction. The authors suggest this may be due to increased competition and local spillovers. In contrast, other research has found that nationwide tax rate changes may not have widespread impacts on housing prices (Elinder and Persson 2017). Bradley (2017) measures the capitalization of temporary property tax rebates and determines that they overcapitalized in the market, suggesting that homeowners may not be informed about discounting the temporary decrease. Together, these results suggest that homeowner responses to changes in property tax rates may be heterogeneous. In related work, Lutz (2015) investigates the relationship between a shock to property taxes and residential capital investment. The author determines that differences in property taxes are capitalized by housing prices in cities and suburbs, similar to the area of study in this paper. Lower property taxes lead to high levels of new home construction in other regions. England et al. (2013) also examines the effects of property taxes on development. In their study area of New Hampshire, higher property taxes lead to the development of smaller homes on smaller lots.

The hedonic model used in this paper, and in much of the previous research on property tax capitalization, to measure the capitalization of property tax rates can be impacted by unobserved variables related to the attribute of interest. Black (1999) pioneered the use of boundary fixed effects, an extension of regression discontinuity design (Thistlethwaite and Campbell 1960), to control for spatial unobservables that could bias estimates when measuring the capitalization of school quality. To achieve this, the sample of homes near the school attendance boundary that share the same set of unobserved neighborhood characteristics, but are not within the same school boundary, are implemented with fixed effects for each boundary. This identification strategy provides a more accurate capitalization estimate by removing sources of bias arising from spatial unobservables. Extending this research with spatial-temporal controls, Dhar and Ross (2012) determine that school quality has a significant effect on housing prices by employing repeated cross-sections of housing transactions near school district boundaries to improve identification. While the boundary fixed effects estimation strategy has been primarily applied to valuing school quality, the broader set of research utilizing regression discontinuity design has been used across many subfields of economics. In this paper, I apply this method to account for much of the unobserved variation that could hinder accurate capitalization estimation.

Gallagher et al. (2013) implement a boundary identification strategy to estimate property tax capitalization. The authors attempt to