FISCAL ZONING AND FISCAL EXTERNALITIES

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This research studies the location of development within local governments that are overlapped by multiple school districts. The hypothesis is that local governments will be more permissive in granting development rights within its boundaries as their share of the school district’s total area declines because the fiscal costs of student education are shared across communities outside their boundaries. The preferred estimates employ a border discontinuity design within 0.2 miles of school district boundaries to compare 2001 to 2011 land development from satellite imagery data in Ohio. The findings support the hypothesis for incorporated municipalities, but not among unincorporated governments.

Keywords: regulatory federalism, fiscal zoning, conterminous borders, property taxation, education finance

JEL Codes: H7, R52

I. INTRODUCTION

This research studies the location of development within general purpose local governments that are overlapped by multiple independent school districts. The tested hypothesis is that local governments will be more permissive in granting development rights within their boundaries as their share of the school district’s total area declines because the fiscal costs of student education are shared across communities outside the government’s boundaries. Data is drawn from GIS satellite imagery on the development of land between 2001 and 2011 in Ohio. To sharpen the identification strategy in the likely presence of unobservable determinants of land use, the study tests for within local government discontinuities in development growth that occur along school district boundaries. The findings demonstrate that development intensity increases in the presence of greater fiscal externalities from school districts, but that the phenomena are limited to incorporated cities and villages despite the ability of unincorporated townships to also engage in zoning.

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The findings of this paper are directly relevant to the fiscal federalism concern over the appropriate spatial configuration of overlapping levels of government, a main determinant of which is the extent to which local governments can be trusted to handle their own affairs. However, “local government” often constitutes multiple administrative boundaries for determining zones of local public services provided by various general purpose local governments and special districts. A fragmented metropolitan area is one where numerous municipalities can be encountered; whereas a concentrated structure implies that general purpose local governments hold authority for provision of most services rather than assigning responsibility for provision to independent special districts (e.g., water, sewer, fire, schooling, etc.).

Most of the literature on fiscal externalities and the structure of local public economies examines the effect of the degree of fragmentation and concentration on public sector size. Decreasing concentration and increasing fragmentation might surrender economies of scale in administration costs by encouraging duplication of functions, but households might better monitor smaller and more specialized governments. Oates’ (1972) decentralization theorem also states that fragmentation and reduced concentration provide more opportunity for consumer efficiency gains by enlarging the choice set of taxes and public services. The subject of fiscal externalities in this literature largely arises in decisions over tax rates in these systems. That is, choices in taxation by one unit impact nearby and overlapping unit tax bases. The dominant theoretical view of tax competition across nearby units theoretically results in suboptimally low tax rates and subsequent underprovision of local public goods (Zodrow and Mieszkowski, 1986; Wilson, 1999; Brueckner, 2000; Zodrow, 2010). Overlapping units of government, by contrast, are theoretically more incentivized to overtax their base relative to a single harmonized political union (e.g., Oates, 1972; Hettich and Winer, 1988; Sobel, 1997; Hoyt, 2001; Keen and Kotsogiannis, 2002). This literature is of further relevance in the perpetual debate over whether or not the property tax is, in fact, a tax. Efficient fiscal zoning is an important component of the “benefit view” of the property tax that would render it a functional user fee for government services (Oates and Fischel, 2016).

There is also empirical research attempting to pin down both the overall effect of fragmentation and concentration on the size of local public economies (e.g., Berry, 2008; Hendricks, Jimenez, and Lal, 2011; Goodman, 2015; Jimenez, 2015), as well as countless attempts to discern the role of these fiscal externalities in polycentric governance structures (e.g., Wasylenko, 1980; Turnbull and Djoundourian, 1993; Wassmer, 2002; Brueckner, 2003; Revelli, 2003; Andersson, Aronsson, and Wikstrom, 2004; Campbell, 2004; Burge and Rogers, 2011; Creedy and Gemmell, 2013; Duncan and Gerrish, 2014).

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1 Ostrom, Tiebout, and Warren (1961) referred to the continually evolving division and redistricting of these administrative zones in reaction to changing voter preferences and cost pressures for economies of scale as “polycentricity” in government structure.

2 The semantics for referring to this topic varies in federalism literature. This paper adopts the terminology of Boyne (1992) that is commonly repeated in public administration research.
This research distinguishes itself from the previous work by holding constant the institutional context of fragmented and concentrated local government, investigating instead a non-fiscal outcome (land development) as a function of the degree of fiscal externality implied by the specific spatial structure of local government.\(^3\) In the process, this paper also engages in a policy relevant arena. “Fiscal zoning” is the practice of considering the fiscal implications of prospective development opportunities. Collectively, local government zoning is one of the largest and most extensive forms of government regulation in the United States. Zoning can be used to restrict development for community benefit, which potentially allows for the management of both pecuniary and non-pecuniary externalities. In doing so, it allows for communities to weigh various associated benefits of development against their costs. Particularly desirable developments might be granted property tax abatements and highly permissive land use regulations, whereas others might be assessed special impact fees or blocked altogether. The practice of fiscal zoning in this manner plausibly incentivizes local governments to allocate development rights to their highest valued use (Fischel, 2015). Arguably, the case for the decentralization of regulatory powers strengthens under evidence of local governments’ success in the practice of fiscal zoning.

While development zoning is the prerogative of general purpose local governments, special districts (e.g., school districts, water districts, library districts, fire districts, etc.) are frequent commenters and advisers in zoning decisions when their specific overlapping areas are impacted. For example, special districts dependent on property taxes will often weigh in on proposals for encouraging development through tax increment financing plans that are perceived to benefit cities at the expense of overlapping units. Just such concerns motivated Missouri to pass Tax Increment Financing (TIF) reform in 2016 that gave greater influence to overlapping units that draw on the same revenue source (e.g., Schlinkmann, 2016), as well as proposed legislation in Indiana for school district representatives to be added to sponsoring redevelopment commissions.\(^4\)

The next section seeks to clarify fiscal zoning and the expected role of fiscal externalities. Section III lays out the empirical strategy in terms of the selection of Ohio, the empirical model for identification, and the data. Section IV presents the results of the empirical analysis and its many robustness checks before concluding with discussion in Section V.

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\(^{3}\) To the best of my knowledge, this is the first paper to empirically connect fiscal zoning to land use rather than another fiscal variable. The existing research on zoning choice and fiscal externalities has come from urban planning literatures investigating the proclivity of outlying communities attempting to attract development in fringe areas where costs imposed on their neighbors are unrecognized (Nelson and Duncan, 1995; Persky and Wiewel, 2002), with a predominant emphasis in its role as a determinant of urban sprawl (Carruthers, 2002, 2003; Carruthers and Ulfärsson, 2002).

\(^{4}\) For further illustration, examples from other states of schools weighing in on development policy can be found in school districts opposing low-income housing (Butts, 2015), redevelopment of a shopping mall (Roberts, 2015), development of a transportation district (Whittle, 2010), and higher density apartments Columbus Dispatch (2003).
II. FISCAL ZONING IN THE PRESENCE OF FISCAL EXTERNALITIES

Fiscal zoning, also known as “community site supply theory,” describes the practice of emphasizing relationships between fiscal variables, business location, and the supply of development rights granted by local governments. The theoretical models most frequently cited in the literature (e.g., Fischel, 1975; White, 1975; Fox, 1978; McHone, 1986; Erickson and Wollover, 1987; Ross, 2013) sought to determine optimal land use patterns along a spatial continuum that subsequently identified the acceptable quantity of industrial development. For the purpose of this paper, the essence of this literature can be represented in a stylized example where a developer seeks the right to build. The fiscal dividend \((FD)\) from permitting this build on land area \(i\) depends on the incremental taxable base contribution \((V)\) taxed at a nominal rate of \(\tau\) while imposing cost \((C)\) on the general purpose local government \((G)\):

\[
FD_{iG} = \tau_G V_i - C_G.
\]

A positive fiscal dividend implies that the existing residents can gain from the proposed development by providing net governmental funds that could be used to finance additional programs or reduce taxes. The fiscal dividend decision rule could be augmented to consider some positive or negative non-fiscal effects that might raise or lower the bar for project passage, but this can be ignored without loss of generality.

A second layer of program services can be added which spatially overlaps the location of the proposed development regulated by the general purpose government. This special district \((S)\) has its own rate \((\tau_s)\) and cost of service \((C_s)\), so a corresponding fiscal dividend exists for this district as well \((FD_{iS})\):

\[
FD_{iS} = \tau_S V_i - C_S.
\]

A special district with boundaries that are conterminous to those of the local government would share an identical aggregate tax base and set of voters. Projects expected to yield a positive fiscal dividend in both equations \((1)\) and \((2)\) would be passed as the cash flows suffice to carry the cost of all services. The preexisting voters might also consistently support a project which yields enough positive fiscal dividends to compensate for net losses in the other unit as they bear the full effects of both outcomes, but since resources across governmental bodies are not easily transferred they might understandably prefer a project whose aggregate fiscal dividend is smaller but positive in both arguments. In either case, the decision rule for approving the development right would carry the property that \(FD_{iG} + FD_{iS} \geq 0\) and the full impacts of the decision reside within the community.

Now suppose we have a case where the overlapping special district serves multiple areas in addition to the area within the general purpose government responsible for granting the development. Within the special district, tax rates are uniform across all areas within its boundaries. In this case, the enfranchised population of the general purpose government only gains or loses the special district’s fiscal dividend in propor-
tion to their stake in the district \((0 < \phi < 1)\), as the remainder of the net fiscal impacts are spread across other communities served by the district. Instead of \(FD_{iG} + FD_{iS} \geq 0\) from equations (1) and (2), the local government’s fiscal decision rule under fragmented special districts can be expressed as:

\[
FD'_{iG} = \tau_G V_i - C_G + \phi FD_{iS}.
\]

The conterminous decision rule represents a special case of equation (3) where \(\phi = 1\), so the fragmentation of special districts across multiple communities results in an incomplete consideration of the full fiscal dividend. This fiscal externality consequence of fragmentation implies that projects negative in \(FD_{iS}\) will be more likely to be approved for development, while as those positive in \(FD_{iS}\) will tend to be underapproved. In practice local governments typically compete for economic base by offering tax incentives by lowering \(V_i\). A development which would produce jobs, for example, might be recruited to an area by offering a reduced taxable valuation of the property being developed \((V_i)\). Property tax abatements, tax increment financing, and property tax exemptions often work by reducing \(V_i\) so as to reduce or eliminate the property tax burden for favored forms of development which frequently draw the ire of overlapping special districts and other overlapping general purpose governments (Lefcoe, 2011; Youngman, 2016).\(^5\) In doing so, the property tax levy is redistributed to the other taxpayers in the overlapping jurisdictions.\(^6\) If the special district is one of those overlapping districts and it is fragmented across multiple communities, then the population represented by the zoning authority does not bear the full burden of this cost shift.

School districts are employed as the special district of interest in this research. For residential development, they are a case where fiscal dividends are likely to be negative because revenues from intergovernmental aid account for less than the full share of total revenues, with the difference coming from local revenues.\(^7\) In the case of residential development, adding another child to the school system will require locally sourced revenues from the overlapping communities. According to the United States Census Survey of Government Finances, the average city school reports about 40 percent of its total revenues as coming from own sources (local taxes and fees).\(^8\) Ohio school districts are above average in this regard, with local revenues contributing about 48 percent of

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\(^5\) Tax increment financing districts are not always used as a business incentive and instead are a way of financing development projects on the basis of new growth, but some communities use them as an incentive by lowering the base valuation and setting a TIF rate below the general rate. See Kenyon, Langley, and Paquin (2012) for a more extensive review of the property tax incentives used in practice.

\(^6\) Most states practice the “classic levy” or “residual rule” to property taxation, where the revenue to be collected is divided by the aggregate property tax base to determine the rate, so that property tax revenues are not directly determined by changes in the aggregate tax base.

\(^7\) There is another related literature on the role of intergovernmental aid in school finance and its effect on land use, much of it originating in the study of California’s Proposition 13 (e.g., Chapman, 1981; Schwartz, 1997–1998).

\(^8\) This calculation was extracted from the Lincoln Institute of Land Policy’s Fiscally Standardized Cities Database, which draws on the aforementioned Census data.
total revenues in fiscal year 2012. The resulting concern of overdevelopment in school districts is echoed in a review of the prevalence of non-congruent school districts by Fischel (2010, p. 2):

If a city matches up with the district, it has an incentive to consider the consequences of its zoning decisions, since the same set of voters — city and school district — will be affected by them. When the city does not match with a particular district whose land it controls, it may be happy to rezone to a higher density, even though the district may suffer overcrowded schools and higher taxes.

Commercial and industrial development is also frequently opposed by school districts that raise concerns over competing uses of public funds and the aforementioned tax incentives that lower taxable assessed values of properties.

Consistent with the Fischel hypothesis, Ross, Hall, and Resh (2014) found that school districts with non-congruent municipal boundaries had larger class sizes than their equivalent congruent counterparts by 1.8 to 2.3 pupils. Despite larger class sizes, in a separate study Hall (2015b) found these schools to produce lower levels of locally generated revenues per pupil. Similarly, a hedonic regression of home values by Hall (2017) found that there was a positive willingness to pay for congruent boundaries, which is also consistent with the local public administration in non-congruent areas underperforming relative to their equivalent congruent counterparts. In a study of California’s parcel tax, Lang and Sonstelie (2015) find increasing degrees of congruency between school districts and city boundaries to be a strong and statistically significant predictor of parcel tax adoption; the researchers argue that conterminous borders make it easier for school districts to utilize city resources for proposing and passing political propositions for the parcel tax. The next section designs a test of the mechanism between border congruency and development intensity that is implied by the fiscal externality effect in fiscal zoning.

III. EMPIRICAL APPROACH

A. Choice of Ohio

It is exceptionally difficult to develop a one-size fits all empirical strategy across states when institutional context is paramount in studying local governance. This alone tends to push studies of local governance to within state designs, but further exacer-

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9 This is Ohio school districts of all types, not just exclusively in city areas. Data source is Ohio Department of Taxation.

10 See the National Education Association (2003) report on school funding conflicts inherent to local tax incentives, in which Ohio is one of the seven states in the case study. Specific examples of school district boards opposing TIFs in Ohio are found in Faulhaber (2016) on a plaza renovation, Botkin (2017) on infrastructure, and Corvo (2015) on commercial development.
bating the problem is the need for data. School district data in particular tends to be non-standardized across states in both school financial reporting (e.g., differing budget calendars, different accounting basis, etc.) and in measures of school performance. The National Center for Education Statistics, for example, reports samples of certain data, but even in metropolitan areas there is not an ideal level of spatial coverage for a study investigating relationships between adjacent communities. Using a single state that has more uniform reporting of accounting with consistent and regular mandatory examinations for student proficiency is better suited for the purposes of this research.

To test the social phenomenon of interest, that is, the responsiveness of local governments to fiscal externalities among overlapping special districts, the setting must be limited to a state with local control over land use regulation. Generally, states with home rule powers will be more advantageous because local governments are presumed to possess powers not forbidden by the state. Ideally, the coverage of home rule is broad, and not limited to a specific set of cities, so that all local governments have statutory authority to act on incentives. Ohio fits both of these considerations, and contains a reasonable mix of both incorporated and unincorporated areas that can be found in most states of America.\(^1\)

Further narrowing the list of attractive states for this test is the necessity of non-congruent boundaries between local governments and school districts. Figure 1 displays the spatial configuration of boundaries for both schools and census subdivisions for Ohio in 2010.\(^2\) Many southern states, by contrast, organize school districts at the county level as part of a legacy of racial integration and busing programs (Fischel, 2009). A handful of states alternatively have state or regional commissions that assume the authority for zoning in unincorporated areas, so development activity in these areas are less likely to reflect choices that would be made by representatives of the local communities.\(^3\)

For the purpose of this investigation it is advantageous to have unincorporated local governments responsible for their own zoning, as they are in Ohio, rather than zoning powers being deferred to a higher level of government such as the county. This allows for unincorporated local governments sharing school districts to have the opportunity to respond to the fiscal externality incentive, and since generally there are many more unincorporated local governments than counties it provides for more trials in which the hypothesized behavior may be realized.

Ideally this research would find a state in which there is the occasional randomization of boundaries in schools and municipalities, but a more realistic prospect is to find one with an institutional history that at least diminishes concerns over contemporaneous endogeneity that causes the organization of boundaries to be determined by development growth. In addition to meeting the aforementioned criteria, Ohio carries an additional advantage in that the school district boundaries are historically difficult to change, either through direct adjustment or municipal annexation. Almost all school borders in

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1. Pennsylvania, Rhode Island, New Jersey, and Massachusetts have no unincorporated land.
2. All but 19 of the county subdivisions displayed in the map are local governments, the exceptions mostly being water territories covering the Great Lakes and a handful of other unorganized territories.
3. Connecticut, Maine, North Dakota, and Vermont are examples of states that fit this description.
Ohio are as they were in 1965 (Jacobs, 1998). Owing to concerns over desegregation and “white flight,” a moratorium on interdistrict land transfers and annexations was imposed from 1980 to 1986 by the Ohio General Assembly (Columbus Dispatch, 2010). The Ohio Board of Education, which is statutorily charged with addressing school district annexation requests, has also been extremely reluctant to transfer properties if there exist parties which oppose the request and strengthens the case for exogeneity of contemporary boundaries to current development decisions. Ohio Administrative Code 3301-89-02(B)(9), for example, requires affected school districts to answer whether “the loss of either pupils or valuation be detrimental to the fiscal or educational operation of the relinquishing school district?” The state’s Supreme Court compounds the difficulties of transferring properties that involve a change in school district. The raison d’être for annexation, in the eyes of the court, is to facilitate the interest of private land ownership rather than furthering a municipal desire for expansion. As noted by Ohio
Supreme Court Justice Stratton in *Smith v. Granville Township Board of Trustees* (693 N.E. 2d 219 [Ohio St. Ct. 1998]): “The spirit and purpose of the annexation laws of Ohio are to encourage annexation to municipalities and to give weight to the requests of property owners relative to the governmental subdivision in which they desire their property to be located.”

**B. Model Specification and Identification Strategy**

When fiscal costs of student education are shared with another jurisdiction, the theory implies that the city will be more likely to approve development than if they are burdened with the full cost. Let $y$ represent the level of development approved for area $i$ in city $c$. If all areas within city $c$ were identical in all manners relevant to the choice to develop, the expectation of a given area’s development is to reach the level desired by the community ($\alpha_c$). More or less development will be realized in an area because of specific traits that affect the return on development ($\theta_i$), as well as random idiosyncratic features ($\epsilon_i$):

$$y_i = \alpha_c + \theta_i + \epsilon_i.$$  

Now consider an extension where different areas in the city are uniquely defined by their service to a given school district ($s$) whose features ($Q$) affect the city’s return on development. A school of a higher quality, for example, may be a more lucrative area to develop than a lower quality school district, ceteris paribus. Finally, assume there is a transfer payment to school district $s$ that is a function of the proportion of the city’s area share of the school district ($\sigma_{ics}$). The model is now specified as

$$y_i = \alpha_c + \theta_i + Q_{ls} \delta + \gamma \sigma_{ics} + \epsilon_i.$$  

The variable of interest in equation (4) is the city’s share of school district $s$ ($\sigma_{ics}$), with the expectation that $\gamma$ is negative if the propensity to build increases as the share declines.

Figure 2 illustrates a stylized example from Turtle Creek, Ohio. The map marks three unique areas of Turtle Creek (A + B + C) according to their local school district. The other local governments whose populations are served by these school districts are not

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14 That parcel owners are primary drivers of municipal boundary changes is reflected in the Census Bureau Boundary and Annexation Survey data report, which indicates that during the entire 2000s, an Ohio city or village that undertook an annexation acquired on average about 47 acres, or 0.07 square miles. The largest municipal boundary change in the state was actually a detachment from Clyde City of 4.25 square miles, and the second largest was a 1.25 mile annexation to Canton.
15 For brevity, this section refers to a general purpose local government as a “city” generically and regardless of its actual incorporation status.
16 The most conventional approach here would likely be to say that the level desired by the community is that desired by the median voter, but the finding may be consistent with multiple competing models of local collective action.
shown to simplify the picture. In total, Turtle Creek is about 30 mi², with the largest area (C) served by Hardin-Houston schools that occupies about 21.47 mi². In total, Turtle Creek represents about 28.4 percent of Hardin-Houston’s total school district area. The smallest area of Turtle Creek is area B, which is 4.2 mi² and represents about 6.1 percent of Anna Local School District’s territory. Approximately 10.3 percent of Fort Loramie school district serves the population in area A of Turtle Creek, an area that is about 4.6 mi². The relationship hypothesized is that, ceteris paribus, fiscal externalities are greatest in region B whose share is the smallest, and lowest in region C where the Turtle Creek’s area share of a school district is the largest. Within Turtle Creek, the fiscal externality incentive is most favorable to development in area B. Of course, fiscal dividends and by extension fiscal externalities are not directly observable to the researcher, and as in the previously cited empirical literature (i.e., Ross, Hall, and Resh, 2014; Hall 2015, 2017; Lang and Sonstelie, 2015) this paper is implicitly using area share as a proxy variable.

Figure 2
Administrative Boundaries for Turtle Creek (Black) and Overlapping School Districts (Grey)

Notes: Turtle Creek occupies area A + B + C. Area A is served by Fort Loramie schools, area B by Anna schools, and area C by Hardin-Houston.
Source: 2010 U.S. Census Bureau TIGER/Line Shapefiles for Unified School Districts and County Subdivisions. Turtle Creek Census ID is 3914977854.
for the degree of fiscal externality.\textsuperscript{17} A similarly interesting proxy variable might have been the share of households or residents instead of land area.

The use of city fixed effects in estimating equation (4) differences away the city invariant factors and results in a within-city effects interpretation that is consistent with desired inference, as \textit{within} the city the development should intensify where area share of the school declines. The remaining point of concern is to control for terms in $\theta_i$ and $Q_{is}$ that may be correlated with the area share and the error term. This paper will rely on public finance variables and test score data to be discussed later. Unfortunately, most administrative data is limited to the governmental unit as the level of observation, which limits available controls for $\theta_i$.\textsuperscript{18}

In order to further mitigate the potential influence of omitted variables, a border differencing strategy will be pursued. Specifically, the analysis will target “interior” school district borders that pass through local governments, and exclude “exterior” borders that are conterminous with the boundaries of the local government. The local government controls zoning on both sides of these interior school district boundaries, and the identifying assumption will be that within a narrow bandwidth of the border the local unobservables will be identical and can be differenced away. Figure 3 depicts Turtle Creek’s boundaries with a 0.2 mile buffer zone surrounding each side. There are three interior border segments appearing as dashed lines within Turtle Creek: the boundary between regions A and B, A and C, and B and C. The buffer zone extends 0.2 miles to each side with each pair designated as containing a “left” and a “right” side. The unit of observation in this analysis is then the border segment $(b)$ dividing two distinct regions $(i)$ and $(i')$. The specification in equation (4) is updated accordingly by differencing these two areas specifications from one another as:

\[
y_i - y_{i'} = (a_c - a_{c'}) + (\theta_i - \theta_{i'}) + (Q_{is} - Q_{is'})\delta + \gamma(\sigma_{ics} - \sigma_{i'cs}) + (\epsilon_i - \epsilon_{i'}).
\]

The identifying assumption to follow is that within a narrow band surrounding the interior school border $\theta_i = \theta_{i'}$, so that the differencing procedure eliminates the bias from unobservables and $\gamma$ will be an unbiased estimate of the local average treatment effect for the variable of interest. The specification can be read as the difference in development within 0.2 miles of the interior border as a function of differences in other observable characteristics of the regions. Using the border segment notation to represent the differences in sides, the specification to be estimated is:

\[
y_b = a_c + \theta_b + Q_{bs}\delta + \gamma\sigma_{bcs} + \epsilon_b.
\]

\textsuperscript{17} A similarly interesting proxy variable would be the share of households or residents instead of land area, but such data was not available for this research.

\textsuperscript{18} Census block group data is smaller in geographic coverage than governmental unit, but the boundary definitions are not consistent between 2000 and 2010. There exists proprietary data purporting to sell this, but they represent approximations based on some kind of overlapping shares rather than direct recounting under new definitions. Furthermore, the data at this level with universal coverage is just population and housing counts, which is similar to the development outcomes employed as dependent variables.
Both equations (4) and (6) will be estimated to determine the magnitude of the effect, but the estimation of equation (6) is considered to be the main results. Note that, although city fixed effects would presumably be differenced away in equation (5), they are reintroduced to the specification of equation (6) so that the interpretation of the variables reflects the within-city deviations inference. Robust standard errors will be clustered on the general purpose government to reflect the repeated draws of the areas in constructing the pairs.

C. Data Construction and Descriptive Statistics

The measurement of development as the dependent variable is derived from the National Land Cover Databases for 2001 and 2011 produced by the Multi-Resolution...
Land Characteristics (MRLC) consortium. The databases provide a raster map providing a color coded classification of the type of land cover at each pixel. This allows the map to be overlaid against a map of administrative boundaries and for the calculation of each area’s share of each type of land cover. The classifications of land coverage for a given year include developed low intensity (class 22), developed medium intensity (class 23), and developed high intensity (class 24). According to the MRLC, low and medium intensity development differ in the mixture of constructed materials and vegetation, and most commonly include single-family housing units; developed high intensity consists of 80 to 90 percent impervious surfaces, and are typically high density areas with apartment complexes, row houses, and commercial/industrial properties. The measures of development used as dependent variables in this analysis reflect the difference in the 2011 share of the land areas within this classification scheme from 2001. A “weighted” measure of development is calculated in the following fashion for a given year $t$ in area $i$:

$$y_{it} = 3(\text{Share highD}_{it}) + 2(\text{Share medD}_{it}) + (\text{Share lowD}_{it}).$$

Also calculated for a robustness check is an “unweighted” measure that sums the area shares without pre-multiplying the integer that increases with intensity. The advantage of the weighted measure is that it reflects the intensity of build-up, even if the development did not expand spatially to encompass more area. In both weighted and unweighted measures, development as measured for the regression analysis in area $i$ is the simple change between the two surveys in the estimation of equation (4):

$$y_i = y_{i2011} - y_{i2001}.$$  

For the border discontinuity strategy, development intensity in equation (6) is measured as the adjacent border difference in this term:

$$y_b = (y_{i2011} - y_{i2001}) - (y_{i'2011} - y_{i'2001}).$$

The main variable of interest, the school district’s land area as a share of total land area in the city, is also calculated using GIS data. Specifically, shapefiles from the United States Census Bureau on 1,585 local governments and 616 unified school districts in 2010 are overlaid as in Figure 1, then integrated and intersected to produce 3,334 unique combinations of local governments and school districts. The Turtle Creek illustration in Figure 2 is an example where the process produced three unique regions from the overlay of school and local government maps. Eliminating the local governments with just one school district, unorganized territories, and the island school districts on Lake Erie reduced the sample to 2,715 areas from 1,002 local governments. In this sample, there existed 1,971 interior boundaries from 996 local governments that were not determined by rivers or other bodies of water.
For data on school quality, Ohio produces numerous measures for school performance from standardized tests. This research employs the 4th grade reading and math proficiency test scores as measures of quality. The high school exams have varying degrees of stringency for student graduation, and several are taken by students repeatedly across multiple years until passed (e.g., certain 9th grade proficiency exams). The 4th grade exams are more consistent in this manner, but ultimately it does not make any substantive difference for the estimates on the variable of interest which set of test score indicators are used. In addition to the school test scores, fiscal data are included as controls using local revenues as a share of total revenues and per pupil total expenditures. The former might capture local support for schools and the prospect of self-financing development, whereas the latter captures the amount of resources directed to the school district for investment in the students.

Additional detail on the data construction and sources can be found in Table 1. Summary statistics relevant to the regression analyses are found in Table 2. To provide a sense of scale, Figure 4 demonstrates the weighted development index for 2011 in the areas of the four school districts overlapping New Franklin City, which is near Akron. In the figure, development is rated by the darkness of the greyscale. The data’s mean level weighted development index for 2011 is 0.1867, which is between what is observed in New Franklin’s overlap with Manchester (0.14) and Coventry (0.23).

D. Data and Inferencing

The ability to use satellite imaging opens the door to a grander array of research questions, including topics like this that require data that can be aggregated across space at a very granular level and in a spatially unconventional manner. However, several caveats still apply in inferencing the estimation of equations (4) and (6).

First, the policy mechanism to affecting land use is fiscal zoning, but observed development is an imperfect mapping. In particular, some pro-development zoning is aspirational in that there may be relatively undeveloped land that has been zoned for high levels of density. The actual zoning code is not observed in the data, which indicates only whether there is development of various grades. Zoning code is notoriously difficult to meaningfully interpret into data on development stringency, and actual land use is a proxy for the level of permissive zoning in a particular area. The threat to the research design here is that undeveloped areas would be zoned for high intensity development in a manner directly contradictory to the hypothesized correlation between school area share and actual land use. If this effect exists, it would bias the results away from finding the hypothesized effect.

A second issue is that the color coding of density yielded by satellite imagery does not indicate the fiscal dividends of those developments added between 2001 and 2011. The underlying theory is that for some development proposals, positive fiscal dividends exist for the general purpose local government with zoning powers but not for the school district; when fiscal dividends are negative to the school district, local governments are more likely to reject development proposals as their stake in the school district increases.
that would result in a negative estimate of $\gamma$ in equation (4) and (6). If the estimate of $\gamma$ is zero or positive, it could just be that prospective development where fiscal dividends are typically positive to both the local government and the school district. That is, it could be the case that local governments would engage in the hypothesized fiscal zoning when such cases arise, but that these cases do not occur very often. This is definitely a plausible occurrence, as development offers heterogeneity in fiscal dividends across different types of governments, and a particularly attractive development for schools might get pushed by the general purpose government into the area of the dominant school district for that purpose. The more often the observed development occurs with positive fiscal dividends to both local governments and schools, the less likely the estimation of equations (4) and (6) is going to be able to detect the hypothesized behavior. If fiscal dividends on actual development was observable, it would arguably make sense to filter out cases where fiscal dividends were positive to both. Since this goes unobserved and all cases of actual development are included in the data, the estimates are again plausibly biased against finding the hypothesized impact.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development intensity$^1$</td>
<td>A weighted measure of land cover development calculated as $3(\text{Share highD})+2(\text{Share medD})+(\text{Share lowD})$, where each component is the land share devoted to high, medium, and low development.</td>
</tr>
<tr>
<td>Share of area developed$^1$</td>
<td>A measure of land cover devoted to development calculated as $(\text{Share highD})+(\text{Share medD})+(\text{Share lowD})$, where each component is the land share devoted to high, medium, and low development.</td>
</tr>
<tr>
<td>Area share of school district$^2$</td>
<td>The area of school districts in city $c$ divided by total land area in school district $s$.</td>
</tr>
<tr>
<td>Passing 4th grade reading$^3$</td>
<td>The proportion of school district students in 4th grade passing the state proficiency examination in reading.</td>
</tr>
<tr>
<td>Passing 4th grade math$^3$</td>
<td>The proportion of school district students in 4th grade passing the state proficiency examination in mathematics.</td>
</tr>
<tr>
<td>Local share of revenue$^4$</td>
<td>The proportion of total school district revenues from local sources.</td>
</tr>
<tr>
<td>Per pupil spending$^4$</td>
<td>School district total expenditures per pupil.</td>
</tr>
</tbody>
</table>

Sources: (1) Author’s calculations from National Land Cover Database. (2) U.S. Census Bureau Tiger Line Maps. (3) Ohio Department of Education. (4) Ohio Department of Taxation.
Table 2
Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Area</th>
<th></th>
<th>Border Differenced</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Development intensity</td>
<td>0.018</td>
<td>0.063</td>
<td>-0.007</td>
<td>0.279</td>
</tr>
<tr>
<td>Share of area developed</td>
<td>0.008</td>
<td>0.036</td>
<td>0.002</td>
<td>0.089</td>
</tr>
<tr>
<td>Area share of school district</td>
<td>0.173</td>
<td>0.242</td>
<td>0.045</td>
<td>0.437</td>
</tr>
<tr>
<td>Passing 4th grade reading</td>
<td>0.254</td>
<td>0.098</td>
<td>0.005</td>
<td>0.107</td>
</tr>
<tr>
<td>Passing 4th grade math</td>
<td>0.309</td>
<td>0.132</td>
<td>0.008</td>
<td>1.447</td>
</tr>
<tr>
<td>Local share of revenue</td>
<td>-0.034</td>
<td>0.083</td>
<td>0.002</td>
<td>0.179</td>
</tr>
<tr>
<td>Per pupil spending</td>
<td>3.167</td>
<td>1.165</td>
<td>-0.003</td>
<td>0.128</td>
</tr>
</tbody>
</table>

Notes: Development intensity and share of area developed is differenced between 2011 and 2001. Differenced values between 2010 and 2000 are local share of revenue, per pupil spending ($, thousand), passed 4th grade reading and math. Area share of school district is measured in 2010.

Figure 4
New Franklin City Weighted Development Index by School District

Notes: The names on the left-side indicate the name of the overlapping school district the boundaries of New Franklin City. In parentheses is the school’s weighted development index for the identified area.
IV. RESULTS

A. Main Results

Table 3 presents the estimation of both equations (4) and (6) with and without control variables. All specifications include local government fixed effects, and the robust standard errors are clustered by local government. The main findings of this paper are inferred from the border discontinuity specification of equation (6) with all control variables, which appears in the last column of Table 3. The other columns are provided to demonstrate the sensitivity of the findings to both the border differencing strategy and the choice of control variables.

| Table 3 |
|------------------|------------------|------------------|------------------|------------------|
| Regression Results on Development Intensity in Areas with Schools Shared Across Multiple Local Governments, 2001 to 2011 |
| Dep: Development Intensity | Entire Area | Border Region | Entire Area | Border Region |
| Area share of school district | $-0.008^*$ | $-0.138^{***}$ | $-0.008^*$ | $-0.113^{***}$ |
| | (0.005) | (0.039) | (0.005) | (0.032) |
| % Passing 4th grade reading | 0.010 | 0.057 | 0.010 | 0.091 |
| | (0.031) | (0.091) | | |
| % Passing 4th grade math | $-0.012$ | $-0.036^{***}$ | $-0.012$ | $-0.036^{***}$ |
| | (0.022) | (0.009) | (0.022) | (0.009) |
| Local share of revenue | 0.010 | 0.076 | 0.010 | 0.074 |
| | (0.021) | (0.074) | (0.021) | (0.074) |
| Per pupil spending | $-0.003$ | $-0.242^{**}$ | $-0.003$ | $-0.242^{**}$ |
| | (0.002) | (0.103) | (0.002) | (0.103) |
| Intercept | $0.019^{***}$ | $-0.008^{***}$ | $0.031$ | $-0.003$ |
| | (0.001) | (0.002) | (0.023) | (0.002) |
| Within R$^2$ | 0.001 | 0.037 | 0.004 | 0.070 |
| Between R$^2$ | 0.013 | 0.007 | 0.020 | 0.005 |
| Overall R$^2$ | 0.000 | 0.026 | 0.002 | 0.036 |
| Number of groups | 1,002 | 996 | 1,000 | 968 |
| Number of observations | 2,715 | 1,971 | 2,660 | 1,908 |

Notes: All specifications include local government fixed effects. Robust standard errors are clustered by local government with statistical significance indicated at the 1% (***) , 5% (**), and 10% (*) level. All variables represent the difference between their 2010 and 2000 values, except for area share of school district that is time invariant. In the Border Region specifications, all variables are also differenced from their border adjacent value.
The point estimates with no control variables are very similar to the point estimates from the specification using all control variables. It should be noted, however, that there is nothing in the border differencing strategy that provides a causal argument for any variable except the region’s local share of the school district. The purpose of these controls is only to capture any relevant correlation with attributes of the school system that would incentivize or discourage development intensity in a given area within the local government. The border differencing strategy, by contrast, has a substantial impact on the findings in Table 3. When development intensity of the entire region is regressed on the region’s local share of school district the effect sizes are negative and statistically significant at the 10 percent level. The effect of the region’s local share of the school district on the difference in development intensity within 0.2 miles of the interior border has an effect size more than ten times greater than the entire region estimate. This is consistent with the existence of local unobservables being correlated with both development intensity and local share of school district whose bias is removed by the border differencing approach. The border differencing approach also finds the effect size to be statistically significant at the 1 percent level.

The results of Table 3 are consistent with the concern that local governments respond to fiscal externalities. The smaller the school district’s area share within the local government, the more intensely the land was developed during the period. The point estimate of –0.113 is statistically significant at the 1 percent level, and the effect size is about 40 percent of a standard deviation of the dependent variable.\(^{22}\) Suppose a school district that overlapped with the city increased in size to include more area outside the city by an amount large enough to reduce the city’s share by two standard deviations (48 percent), the point estimate from the border discontinuity indicates that the city would increase development intensity by \((0.48 \times 0.113 =) 0.054\) points on the development index. A 0.054 point difference is larger than the difference between Norton and Manchester or half the difference between Northwest and Manchester on Figure 4, so this finding appears economically significant.

Table 3 reports estimates of the effect of these regions within all local governments in Ohio. It is possible, however, that the propensity to respond to these fiscal externality incentives increases with the zoning powers available to the local unit. As previously discussed, local governments in Ohio are either unincorporated townships or have incorporated into a city or village.\(^{23}\) While all of these local governments have zoning authority under Ohio law, incorporation provides broader assumed zoning powers than are available to unincorporated areas.\(^{24}\)

\(^{22}\) Calculation: \(-0.113/0.279= -0.406\).

\(^{23}\) Villages have between 1,600 and 5,000 people, cities are larger. In the Census data, these are categorized as “C” type classifications (C2 and C5 in Ohio), whereas townships are T1. The census data also includes places that are not a legally existing government of any type (class Z), but these areas are dropped from the data.

\(^{24}\) Incorporated municipalities (cities and villages) have any powers not explicitly denied to them by state statute or judicial precedent. By contrast, unincorporated areas are considered creatures of state statute, and therefore only possess the zoning powers that are explicitly authorized by the Ohio General Assembly in Ohio Revised Code 519.12. All local governments, incorporated or unincorporated, have the ability to create TIF districts and/or property tax abatements.
sample according to whether the local government is incorporated as one of Ohio’s city classes (city or village) or if it holds only township status. The results demonstrate that both the full region and the border difference estimates only detect the hypothesized fiscal zoning response within the incorporated areas. The effect is particularly pronounced in the border discontinuity approach, where the effect of local school share in the development index is −0.251 among the incorporated sample, more than double the effect size of the pooled sample on Table 3. In fact, the unincorporated area shows no propensity to this relationship. In the border differencing results, the local share of school district has a point estimate of 0.012 with a 95 percent confidence interval of 

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Regression Results on Development Intensity in Areas with Schools Shared Across Multiple Local Governments by Incorporation Status, 2001 to 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Incorporated</td>
</tr>
<tr>
<td></td>
<td>Entire Area</td>
</tr>
<tr>
<td>Area share of school district</td>
<td>−0.038*** (0.013)</td>
</tr>
<tr>
<td>% Passing 4th grade reading</td>
<td>0.133 (0.267)</td>
</tr>
<tr>
<td>% Passing 4th grade math</td>
<td>−0.090 (0.209)</td>
</tr>
<tr>
<td>Local share of revenue</td>
<td>0.147 (0.112)</td>
</tr>
<tr>
<td>Per pupil spending</td>
<td>−0.006 (0.008)</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.060 (0.088)</td>
</tr>
<tr>
<td>Within R²</td>
<td>0.029</td>
</tr>
<tr>
<td>Between R²</td>
<td>0.002</td>
</tr>
<tr>
<td>Overall R²</td>
<td>0.010</td>
</tr>
<tr>
<td>Number of groups</td>
<td>135</td>
</tr>
<tr>
<td>Number of observations</td>
<td>394</td>
</tr>
</tbody>
</table>

Notes: All specifications include local government fixed effects. Robust standard errors are clustered by local government with statistical significance indicated at the 1% (***), 5% (**), and 10% (*) level. All variables represent the difference between their 2010 and 2000 values, except for area share of school district that is time invariant. In the Border Region specifications, all variables are also differenced from their border adjacent value.
–0.029 to 0.054, so the precision of the estimate is high enough to indicate no discontinuity in the development along the school district boundary. The 95 percent confidence interval for the border discontinuity estimate among incorporated areas is –0.403 to –0.099, so the statistical evidence clearly indicates that incorporated and unincorporated areas have different responses in that the fiscal incentives are being acted upon only in incorporated areas. This finding might be driven by the availability of greater zoning powers among incorporated areas, or it might be that incorporated areas have more development opportunities that allow for flexibility in where to locate development within its boundaries. For the economic significance of the incorporated finding, a two standard deviation decrease in city share would increase the development index by about \((0.48 \times 0.251) = 0.120\). Looking to Figure 4, this increase is larger than the difference in development between Northwest and Norton, and about the same as the difference between Norton and Coventry, which is quite substantive.

B. Additional Robustness Checks

Table 5 replicates the results in Tables 3 and 4 using the change in land area developed instead of the development intensity index as the dependent variable. As explained in Section III.C, this alternative measure captures spatial expansion of development and ignores potential build-up of existing development. Qualitatively the findings are largely unchanged, but statistical significance is sensitive, particularly in the border differencing results. Table 5 still indicates that the larger the area’s share of the school district, the less likely there will be spatial expansion of development among incorporated areas. This is found in both development in the entire area and in the area along the interior boundaries, albeit statistical significance is lost in the border differencing approach. Unincorporated areas continue to show no evidence of zoning differences incentivized by the fiscal externality incentive.

Although not reported, another robustness check is to employ school district independent variables from the year 2000 (instead of the change between 2010 and 2000). The reason for this check is that it avoids direct endogeneity that might occur if development in the area also affects these independent variables. However, the estimates of that check are extremely similar to those of Tables 3 and 4. Furthermore, the reported results are also only minimally sensitive to the inclusion of the base year of level of the development index.\(^\text{25}\) Overall there is very little evidence that the specification of control variables qualitatively influences the findings.

\(^{25}\) All discussed but unreported robustness checks are available upon request from the author. In these specifications, including the starting year development index was most influential on the Entire Area estimates in Table 3, where the point estimates dropped from –0.008 and statistically significant at the 10 percent level to –0.007 and statistically insignificant. The border region estimates were the same at the reported rounding level with statistical significance dropping to the 5 percent level. Table 4 saw the border region for incorporated areas estimates increase in effect size from –0.251 to –0.256 with the base year inclusion, and statistical significance declined from the 1 percent to 5 percent level.
Table 5
Regression Results on the Proportion of Land Area Developed in Areas with Schools Shared Across Multiple Local Governments, 2001 to 2011

<table>
<thead>
<tr>
<th>Dep: Share of Area Developed</th>
<th>Entire Area</th>
<th>Border Region</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full Sample</td>
<td>Incorporated</td>
</tr>
<tr>
<td>Area share of school district</td>
<td>-0.006**</td>
<td>-0.028***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>% Passing 4th grade reading</td>
<td>0.029</td>
<td>0.201</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.203)</td>
</tr>
<tr>
<td>% Passing 4th grade math</td>
<td>-0.016</td>
<td>-0.136</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.163)</td>
</tr>
<tr>
<td>Local share of revenue</td>
<td>0.013</td>
<td>0.081</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Per pupil spending</td>
<td>-0.002**</td>
<td>-0.004</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.005</td>
<td>-0.014</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.052)</td>
</tr>
<tr>
<td>Within R²</td>
<td>0.008</td>
<td>0.054</td>
</tr>
<tr>
<td>Between R²</td>
<td>0.000</td>
<td>0.015</td>
</tr>
<tr>
<td>Overall R²</td>
<td>0.003</td>
<td>0.031</td>
</tr>
<tr>
<td>Number of groups</td>
<td>1,000</td>
<td>135</td>
</tr>
<tr>
<td>Number of observations</td>
<td>2,660</td>
<td>394</td>
</tr>
</tbody>
</table>

Notes: All specifications include local government fixed effects. Robust standard errors are clustered by local government with statistical significance indicated at the 1% (***), 5% (**), and 10% (*) level. All variables represent the difference between their 2010 and 2000 values, except for area share of school district that is time invariant. In the Border Region specifications, all variables are also differenced from their border adjacent value.
C. Placebo Test

The preferred results are in the border differencing approach that should eliminate the influence of local unobservable variables. A placebo test is presented here to see how plausible it is that this differencing could generate a result like this, particularly since it is somewhat difficult to interpret the development index by numbers alone. Perhaps there is enough spatial heterogeneity in development that narrow bands produce lots of variation that is then coincidentally correlated with the difference in city area share. To pursue this idea, a grid of arbitrarily drawn rectangles that represent “pseudo school districts” is overlaid on the real map of county subdivisions to produce a new set of uniquely overlapping combinations of governments and pseudo-schools. The grid of pseudo schools overlaying governments in the left panel with the

![Figure 5](image.png)

**Figure 5**
Pseudo School Districts Real County Subdivision Boundaries for Falsification Test

Note: Areas represent unique intersections of county subdivisions and rectangular grid representing pseudo-school districts used in falsification test.

---

26 This was produced using a grid of lines generated from Ohio’s maximum and minimum latitude-longitudinal coordinates. The lines are evenly spaced at 0.138 longitudinal and 0.11 latitudinal coordinates apart.
resulting intersections that produce the new map on the right from which the area share of the pseudo school district can be calculated. The border differencing data process is replicated by again buffering the interior borders out to 0.20 miles and their weighted development intensity calculated for differencing.

The resulting placebo dataset has a mean cross-border difference in development intensity of –0.0167 with a standard deviation of 0.072, compared to a mean and standard deviation of 0.007 and 0.279 in the real data. The implied 95 percent confidence intervals demonstrate that the real data boundaries contain sharper and larger discontinuities than other areas selected at random for the placebo data. Estimating equation (6) on the pseudo data yields a point estimate of 0.00098 and p-value of 0.735. The comparable specification from the main results is the border region estimates of Table 3, which was –0.138 and statistically significant at the 1 percent level. This is suggestive evidence against the finding of this paper being an artifact of the research design.

V. CONCLUSIONS

Just as an individual firm producing pollutants may not consider the external costs on public health, local governments granting development rights might not consider costs that fall outside their jurisdiction. This paper examines the case of development in Ohio between 2001 and 2011 as an outcome partially determined by the degree to which school costs are shared across communities represented by distinct local governments. The preferred estimates employed a border discontinuity design that examined the development intensity within 0.2 miles of school district boundaries within the local government. The school district on the side of the boundary with the larger share of its land area coming from the local government was less likely to have experienced growth in development intensity. The point estimate is statistically significant and economically substantive. If one side of the border decreased its land area share of the school district by an amount equivalent to one standard deviation relative to the cross border school district, the differential in development intensity increased by about 18 percent of its standard deviation. Further investigation revealed that the effect was entirely driven by incorporated cities and villages and there was no evidence of the phenomenon among unincorporated governments.

The findings provide credence to the concern that local governments respond to fiscal externalities with differential treatment of development rights. If fiscal zoning is defensible for economically efficient allocation of land use rights (e.g., Hamilton, 1975; Fischel, 1975, 2015), then the findings suggest that there may be welfare gains in greater border harmonization between general purpose governments and overlapping special districts. If zoning is inefficiently hostile to development, as some critics have contended (e.g., Been, 1994; Glaeser, Gyourko, and Saks 2005; Barseghayan and Coate, 2016; Turner, Haughwout, and van der Klaauw, 2014), then this particular over-development incentive might be welfare improving a la the theory of the second best.

Calculation: (–0.113 × 0.437)/0.279 = –0.178.
Some qualifications should be noted. Ohio provided a useful institutional setting for social science causal hypothesis testing, but it also potentially limits the external validity of the findings for policy makers for other states. Secondly, land area share of the school district is just a proxy for the degree of fiscal externality. This was an approach unique to any previous literature and future efforts might devise improved methods of measurement. Similarly, measuring the degree of development intensity is a topic that will likely continue to see improvements as satellite imagery and other data efforts are realized. Furthermore, this research essentially treated all local governments as equal in their capacity to administer zoning and land use regulation, as it is notoriously difficult to measure the stringency of zoning laws. Survey efforts, like the Wharton Residential Land Use Regulatory Index (Gyourko, Saiz, and Summers, 2008) that covers selected areas across the United States, might be exploited to uncover heterogeneous effects. Finally, while the interest in fiscal zoning in the presence of fiscal externalities is of generalizable interest between the local government and any other overlapping special district, it may be the case that there are heterogeneous effects across different types of special districts. School districts are the special district under empirical investigation in this paper and it is possible that their formation, history, and connection to general purpose governments could result in different findings than other special districts. Fischel (2009) argues that school district formation arose through a bottom-up decentralized process through the mid-20th century, and it is possible that this history may differ from other special districts in a way that is relevant to the ability to fiscally zone to exploit these externalities. For instance, if school communities formed in a way that would allow them to favorably influence zoning in their local governments, one might expect there to be less responsiveness to fiscal externalities, and the estimates of this paper would represent something of an underestimate of what would be found in other special districts (e.g., public libraries). These prospects represent interesting opportunities for future research.

ACKNOWLEDGMENTS AND DISCLAIMERS

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CONFLICT OF INTEREST DISCLOSURE

The author has no financial arrangements that might give rise to conflicts of interest with respect to the research reported in this paper.
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