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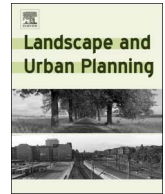
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The fiscal trade-off: Sprawl, the conversion of land, and wage decline in California's metropolitan regions

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ABSTRACT

Suburban jurisdictions are disproportionately likely to convert their land to land uses that maximize revenue generation. Yet, the jurisdictions that convert land to more fiscally lucrative uses are likely to experience gains in low-wage retail jobs – possibly contributing to poor upward mobility. This study offers a new perspective on both the factors behind and effects of the conversion of land use to sales taxable uses, via a unique dataset that identifies land use changes on 1.2 million parcels in California (from tax assessor data) from 2007 to 2013. After linking to data on compactness, municipal tax structure, and economic characteristics, the study examines first how various urban form and fiscal factors shape conversion (controlling for economic and demographic variables), and then how conversion to more fiscally lucrative uses (along with urban form and fiscal factors) affect net job quality, specifically wages, over time. Not only does fiscal structure, particularly municipal dependence on sales tax revenue, lead to the conversion of land to fiscally lucrative uses, controlling for other factors, it also contributes to wage decline. The more compact the urban fabric, the less likely is land use conversion, yet the greater the wage decline. The findings of this study suggest that land use conversion may thwart broader economic development goals.

1. Introduction

Urbanization processes continually reshape how land is used. In metropolitan areas with valuable land in the urban core, property owners, often with the encouragement of city officials, may convert land to a use considered higher and better, i.e., more lucrative. One use that offers relatively high returns is retail, which generates not just revenues for business owners, but fiscal returns for governments in the form of sales taxes. Conversion to retail does not occur uniformly across metros: Suburban jurisdictions often disproportionately depend on sales tax revenue, suggesting an association between retail land use conversion and sprawl (Chapple, 2016; Wassmer, 2002). On the other hand, parcels that convert to commercial use more generally tend to cluster and be located close to the core (Fragkias & Geoghegan, 2010; Landis & Zhang, 1998).

Conversion of land use can facilitate the location and expansion of businesses with high sales tax yields. However, many of these businesses, particularly in the retail sector, tend to pay relatively low wages. This begs the question – as urbanization leads to land use changes, are jurisdictions sacrificing local job quality? The conversion of land to sales tax-generating uses in particular may have opportunity costs by crowding out other uses. This may improve job accessibility for residents in the laborshed, but essentially entraps them in low-wage,

dead-end jobs (Hanson & Pratt, 1995). It may also explain the challenges sprawling areas experience in fostering the upward mobility of their residents (Ewing, Hamidi, Grace, & Wei, 2016).

To study these relationships, this study links a unique dataset of the conversion of land use in California from 2007 to 2013 to data on urban form (the compactness index from Ewing & Hamidi, 2014), businesses (from the National Establishment Time Series, or NETS data), and wages (from the Quarterly Census of Employment and Wages). Using multivariate regression, the analysis first develops an understanding of the factors behind land use conversion, particularly municipal dependence on the sales tax. Then, the article turns to the role of fiscal structure and urban form in explaining wage declines at the neighborhood level.

The next section reviews the literature on the conversion of land use and its connections to fiscal motives, sprawl and job quality. After an overview of methods and data assembled for this study, the article turns next to a description of the extent and nature of the conversion of land to fiscally lucrative uses in the state of California. The following section explores and models the relationship between conversion, sprawl, and job quality. A final section concludes by offering policy implications.

2. Linking the conversion of land use, sprawl, and job quality

2.1. Understanding the conversion of land use

Most studies of the conversion of land have focused on the transformation of agricultural or vacant parcels to residential use, with the aim of understanding and predicting metropolitan development, particularly the process of sprawl (e.g., Carrion-Flores & Irwin, 2004; Irwin & Bockstael, 2007). Research on conversion to commercial use typically combines commercial office and retail into a single category, and focuses on the conversion from vacant to commercial. Several factors consistently shape conversion: distance to the nearest central business district, freeway access, population growth, lot size, land costs, adjacent uses, local density, and land use policies (Fragkias & Geoghegan, 2010; Landis & Zhang, 1998; Liu, Yue, & Fan, 2011). However, the direction of the impact varies, even within the same metropolitan area: for instance Landis and Zhang (1998) find that job growth and highway access have a positive effect in some Bay Area counties but negative in others.

The conversion of land to commercial, or more specifically, retail use may be an indicator of the "fiscalization of land use," when local governments make local land use decisions in order to maximize revenue generation through both the attraction of tax-generating uses and the reduction of government service costs. Were fiscalization rampant, states might be seeing increases in property and sales tax revenue. Yet, over time dependence on sales and property tax has actually been declining. The share of local revenues garnered from property tax has decreased nationally from 25.6% in 1972 to 16.6% in 2005, compensated by increases in personal income tax and fees for services, among other sources (Rueben & Rosenberg, 2008). More recently, throughout the US, states are experiencing a slow decline in sales tax revenue per capita, due in part to a shift in economic activity from the consumption of goods to services (Coleman, 2015).

Because of Proposition 13′s cap on property tax assessment, California has experienced much slower growth in property tax revenues than have other states (Gamage, 2009); since its jurisdictions have had to scramble for new revenues, California offers a unique lens into land conversion and fiscal strategies. Proposition 13′s property tax limits have shifted the focus of the fiscalization strategy from property to sales tax. Local jurisdictions have little incentive in boosting property values long-term, because they get so little property tax revenue back from the state (Wassmer, 2002).

The State of California collects the locally levied sales tax, which ranges from 7.5 to 10% depending on the city, and returns 1% to the municipality—the "situs rule", also known as the Bradley-Burns law. Thus, for the average California city, sales tax revenue makes up a relatively small share (8%) of the total revenues, and just one-fourth of the tax revenues. The value of the 1% is primarily that it is not dedicated to specific purposes but can be used at the city's discretion (Lewis, 2001a).

The dependence on sales tax revenue may impact urbanization processes. The desire to improve city finances may lead cities to rezone land for retail or other taxable uses, to respond more favorably to development proposals that will bring in new tax revenues, and/or to dole out incentives in order to attract fiscally remunerative land uses. In some cases, incentives exacerbate urban sprawl, by subsidizing business moves from older urban sites to greenfields (LeRoy, Hinkley, & Tallman, 2000). However, since local retail is a residentiary sector that is generally not growing, it will likely not impact economic growth at the aggregate (regional) level, but rather just redistribute retailers among municipalities (Wassmer, 2002).

That cities embrace the fiscalization of land use is common wisdom among planners, yet there are just two studies that attempt to analyze it, both focusing on California (Lewis, 2001a; Wassmer, 2002). Neither study looks at the actual conversion of land, instead measuring fiscalization indirectly via either the city intent to attract retail or the relationship between sales tax revenue and retail activity. The following sections explore their findings in more detail, looking specifically at how they relate first to sprawl and then to job quality.

2.2. The fiscalization of land use and sprawl

Municipalities seem to embrace the fiscalization of land use. Given a variety of land use choices, surveyed California city managers say they prefer retail, followed by office, mixed use, and light industrial, with multi-family residential and heavy industrial at the end of the list (Lewis, 2001a). If local governments follow up on their preferences—a hypothesis not tested in his study—then they may overzone for retail and underzone for residential and industrial uses, or target more incentives to retail uses (Lewis & Barbour, 1999; Lewis, 2001a).

There has been little scholarly attention paid to the role of urban form—specifically, compact development—in fiscalization. Yet, there is likely a close relationship between fiscalization and sprawl. For instance, an extensive literature establishes the cost of sprawl (Burchell, Downs, McCann, & Mukherji, 2005; Carruthers & Ulfarsson, 2008; Frumkin, 2002; Lambert, Srinivasan, & Katirai, 2012). These costs—new infrastructure, extra maintenance and services such as emergency response, environmental impacts, health impacts, fuel costs, and opportunity costs—likely place stress on municipal finances, which then could result in more fiscalization of land use.

However, studies do establish that cities and suburbs (a possible proxy for sprawl) differ. The above-mentioned city manager survey found that, when asked about their preferences for development, city managers in suburban municipalities tend to rank retail land use higher than do those in central cities (Lewis, 2001b). Similarly, reliance on sales tax revenue has a significant and positive influence on suburban (non-central-city) retail activity, although urban growth boundaries can reduce this retail sprawl over time (Wassmer, 2002). Because of their increase in retail, suburbs gain business taxes and franchise or license fees as well (ibid.). A more recent study showed that the reliance of California jurisdictions on sales taxes has remained relatively constant over the past decade – but is much more concentrated in suburban neighborhood types: sales taxes comprise 2–5% of the budget in cities like San Francisco or Los Angeles, but 12–14% in the suburbs (Chapple, 2016).

Thus, in sum, though there is minimal evidence, reliance on sales tax seems to increase retail activity in the suburbs, quite possibly because jurisdictions are making land use decisions on a fiscal basis. Suburbs in particular are attracted to the sales tax generation potential of big box retail and auto malls, and may accommodate demands for large, highway-accessible lots, often on the urban fringe—i.e., sprawl. But it should be noted that much of this academic debate over the development effects of taxation took place from the 1980s through the early 2000s, and there has been very little research since.

Yet, questions remain. First, recent years have seen both rising income inequality and the mid-2000s subprime crisis (or Great Recession), which have created fiscal stresses on both local governments and individual households. At a time of declining wages, does the conversion of local land use to retail contribute to the losses? Second, research to date has only examined fiscalization of land use in city versus suburb when it may be the compactness (or lack thereof) of the local urban form itself that is shaping conversion patterns. Thus, this article contributes an analysis of the relationship between sprawl, land use conversion, and job quality.

2.3. Linking land use conversion and urban form to job quality

There is little research on the relationship between land use conversion, urban form, and local labor markets. In general, models of wage dynamics rarely analyze patterns below the regional level, considered the geography at which labor markets function. Thus, a rich literature on the rise of low-wage labor markets (see, for example,

Appelbaum, Bernhardt, & Murnane, 2003; Katz & Murphy, 1992; and Osterman, 1999) pays little heed to intra-metropolitan patterns and suburbs in particular. Analysis of suburban job quality comes mostly from the literature on suburban poverty, which shows that the rise in poverty in the suburbs may be related in part to the declining quality of nearby jobs (Kneebone & Berube, 2013). Although there are new suburban job centers, they tend not to locate near minority communities, and job accessibility is declining particularly in the suburbs, in part due to job sprawl (Kneebone & Holmes, 2015; Raphael & Stoll, 2010).

One study that directly addresses the relationship between sprawl and labor market outcomes – specifically, upward mobility – is Ewing, Hamidi, Grace, and Wei (2016), which shows that sprawling areas have lower rates of upward mobility, due in part to lower job accessibility. Although the study hypothesizes social capital, racial segregation, and income segregation to have indirect effects as well, only the income (specifically, poverty) segregation does (Ibid.). The study uses a compactness index (Ewing & Hamidi, 2014), a compound measure that incorporates measures of population, employment, and urban form; this study adopts that index as well.

3. Methods and data

Conducting this analysis meant building and linking several datasets at the neighborhood (measured by census tract), city and county levels: data on land use conversion, urban form, labor market and business patterns, fiscal structure, regional characteristics, and demographic characteristics. In using the tract as the unit of analysis, this study differs from conventional studies of the conversion of land use, which look at parcel-level changes; studies of the fiscalization of land use, which typically use cities; and studies of the labor market, which typically use metropolitan areas. The tract is thus an intermediate level that allows us to examine the role of neighborhood context – urban form (such as compactness), demographics, and business clusters – while still examining parcel characteristics (aggregated to the tract) and controlling for city fiscal characteristics and regional context. Table 1 describes the variables used.

To analyze land use conversion for California census tracts, I created a dataset that analyzes land use change between 2007 and 2013 on all recorded parcels in California, a total of about 1.2 million parcels, representing about 40% of acreage in the state; for this analysis, I use tax assessor parcel data from Dataquick, a dataset that includes only parcelized acreage. In both 2007 and 2013, 99.5% of parcels included the

use code, the field used to construct the conversion variable. It is not possible in this dataset to determine if a parcel has been subdivided, so the analysis is not able to identify development that occurred on newly created parcels.

The tax assessor data for each county adopt a use code that identifies property use, based on data provided by jurisdictions from a combination of general plan, zoning, and permit files. Because the data may be inconsistent between jurisdictions due to the different data collection methods employed, Dataquick standardizes the data; moreover, there are very little missing data and the dataset is updated yearly. A recent study that validated Dataquick assessor data from the previous year in the field found that its land use codes were still 71–100% accurate (Chapple et al., 2017). Thus I was able to analyze changes in use code between 2007 and 2013. Representing conversion of land use to fiscally lucrative uses are parcels which were converted (according to their use code) from a non-sales-taxable use in 2007 (e.g., residential, manufacturing, or park space) to a sales-tax-generating use (e.g., stores, gas stations, restaurants, auto malls, casinos, and so forth). This conversion may occur either because the parcel has changed use or because the zoning has changed (or both). Parcels were summarized to the tract level to create the conversion variable – percent change from 2007 to 2013 in the number of sales-taxable properties. Of the 8057 census tracts in California, 7063 are included in the database, representing all 26 of California's metropolitan areas. Other assessor parcel characteristics summarized to the tract level include the number of properties in a sales taxable classification in 2007, the total assessed value in 2007 (to proxy for land value), and the share of parcels that are either commercial or vacant (to look at clustering and development potential).

At the tract level, this database was then linked to the tract-level compactness index (Ewing & Hamidi, 2014). The compactness index is a compound index (with 0 representing sprawl and 100 and above representing compactness) that incorporates population and employment density, job-population balance, job mix, walk score, block size, and intersection density and configuration. Because it already captures dimensions of urban form and job accessibility, it is collinear with many variables and supplants them in the analysis.

As a proxy for job centers, a variable generally found significant in land use conversion models, the analysis uses a regional job accessibility variable from Salon, Boarnet, and Mokhtarian (2014), which is a gravity model-based measure (specifically, the distance-weighted sum of the number of jobs located between five and 50 miles of the census tract). From the U.S. Census, I linked tract-level control variables on the

Table 1
Variables in the analysis.

Variable type	Variable	Mean	Standard deviation
Labor market	Change in unemployment rate, metropolitan region, 2007–2013	4%	8%
	Average weekly wages in local industry, 2007 (2013$)	$ 898	$ 250
	Metropolitan employed labor force, 2007	3,245,855	2,525,378
Industry mix	Share retail employment 2007	22.0%	13.9%
	Share professional services, FIRE, and IT employment 2007	17.2%	11.0%
	Share construction and utilities employment 2007	6.6%	6.6%
	Share admin and government employment 2007	11.7%	10.2%
Fiscal structure	Number of sales-taxable parcels, 2007	33.58	45.63
	Total assessed value of property in tract, 2007	$ 481,310,191	$ 504,595,554
	Share of sales tax revenue in city budget, 2004	12.6%	8.8%
	Total city sales tax revenue, 2004	$ 104,866,593	$ 161,541,745
Urban form	Compactness index, 2010	107.23	20.475
	Share of tract acreage that is commercial	11%	15%
	Share of tract acreage that is vacant	9%	15%
Land use change	Percentage change in parcels with sales-taxable use, 2007–2013	41%	346%
Demographic characteristics	Share of housing units more than 30 years old, 2000	51.5%	28.1%
	Share of persons in poverty, 2000	14.9%	11.5%
Location	Regional job accessibility (gravity formula for 5–50 miles)	17.15	12.33
	Los Angeles-Long Beach-Santa Ana MSA (dummy)	41.4%	49.2%
	Riverside-San Bernardino-Ontario MSA (dummy)	11.0%	31.3%
	San Francisco-Oakland-Fremont MSA (dummy)	13.1%	33.8%
	San Diego-Carlsbad-San Marcos MSA (dummy)	8.4%	27.9%

age of the housing stock and share of the population in poverty. Next joined to the database was data from the California State Controller's Office on sales tax and total revenues for California cities.

In general, the data came from a year prior to the period under study (2007–2013), to avoid endogeneity: thus, the regional job accessibility indicator is from 2003, the tax data from 2004, and the Census data from 2000. However, the compactness index is only available for 2010 (though its intersection factor comes from 2007). Since its major components, such as walkability and block size, are slow to change, using 2010 data should not impact the analysis in any significant way.

To represent business activity, the database draws from the National Establishment Time- Series database (NETS), a private-sector generated database that combines Dun & Bradstreet data on individual establishments into an annual time series from 1990 through 2013; this study only used establishment and employment data from 2007 and 2013. Calculating wages at the local level – necessary for this study in order to relate wage changes to neighborhood and city dynamics – was a multi-step process; although the NETS data provide business data at the address level, reliable wage data by industry sector are available only at the county level from another dataset. Studies that analyze local labor markets often encounter challenges in obtaining data on wages at the tract or even city level; thus, common practice is to use wages at the regional labor market level to represent local wage dynamics (Bendavid-Val, 1991). This is not unreasonable, since employers compete for employees from the regional labor market (represented in this case by counties) and set wages accordingly. In addition, the availability of extremely detailed (6-digit NAICS) industry data in the NETS allows for considerable precision in establishing average wage levels.

Thus, individual business data at the 6-digit NAICS level were linked to data on average county wages by detailed industry sector from the Quarterly Census of Employment and Wages; where data were unavailable (due to confidentiality issues) at the 6-digit level, a higher level (5-, 4-, or 3-digit NAICS) was substituted. A weighted average wage per tract (in 2013 dollars) was then calculated based on number of employees per industry. For example, if a tract had 100 warehouse workers at an average wage of $15 per hour and 100 retail workers at an average wage of $10 per hour, tract average wages would be $12.50 per hour. To provide data on industry mix, data on employment by sector were aggregated to the tract level. Finally, to proxy for regional labor market strength, as well as the effects of the Great Recession (which pushed wage levels down) the data were linked to California Employment Development Department employed worker totals and unemployment rates by metropolitan area, a standard proxy for the laborshed.

The final dataset includes over 7000 census tracts, but missing variables mean that the regressions generally include 4000 to 6000 records each. Still, the relatively large size of this sample may result in highly significant findings where in reality the effect size, or the magnitude of the difference between groups, is quite minimal (Sullivan & Feinn, 2012). To test for this possibility, I ran regressions on multiple random samples with 25% of the records. These tests confirmed the overall regression effects in two-thirds of the tests. In the other one-third of the random samples, variables were insignificant, likely because the sample was drawn disproportionately from regions where the phenomena of interest (conversion of land, municipal reliance on sales tax revenue, and/or wage declines) were less pronounced. Ultimately, to take advantage of the richer data while still representing the diversity of California's regions (as is typical in California studies such as those by Kahn, 2007; Salon, 2016), the analysis employs all census tracts with complete data, along with dummies representing regional location (based on OMB definitions for metropolitan area).

The constructed dataset facilitates the exploration of how fiscal considerations and urban form shape both the conversion of land use and changes in wages, controlling for factors such as location, demographics, labor market characteristics, and industry mix (Fig. 1).
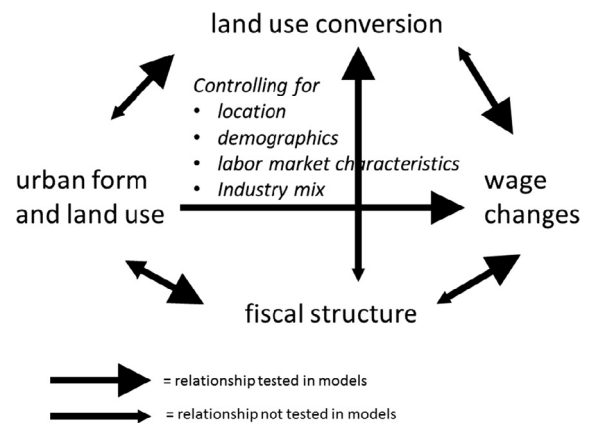

Fig. 1. Conceptualizing the relationships.

Specifically, this study asks (1) how do urban form and fiscal variables contribute to the conversion of land use to sales-taxable uses, controlling for other factors? It then builds on that analysis, using the same variables to ask (2) what is the role of fiscal, urban form, and land use conversion variables in local wage changes? If we can identify factors associated with land use conversion, as well as a relationship between conversion, fiscal, and other variables and wage decline, this then suggests that local jurisdictions can act to stem wage declines through land use policies.

4. Understanding the relationships

4.1. Overview: Conversion of land use and wage changes

Overall, from 2007 to 2013, California saw the conversion of at least 115,000 acres of land to sales-taxable uses (the total could be higher due to missing data). To illustrate this, Fig. 2 shows the conversion of land from non-sales-taxable to sales-taxable uses in the Los Angeles region, which has occurred mostly outside the city of Los Angeles.

Jurisdictions depend on a variety of tax revenues to balance their budgets, and the extent of their reliance on sales tax revenue varies. This then affects the conversion of land. To examine this relationship, I construct a typology describing whether tracts lie within municipalities that are relatively dependent on property tax, sales tax, or both (Fig. 3). (A municipality is considered dependent on a revenue stream if it provides an above-median share of its revenue, relative to other municipalities in the state.) Indeed, there are significant differences in the likelihood of parcel conversion depending on the tax context in the jurisdiction. Conversion from non-taxable to taxable uses is by far most likely in areas with high reliance on property and sales tax, a situation that may create a climate of fiscalization ($p = .000$) (Fig. 3). This tax reliance is overwhelmingly concentrated in suburban areas; for instance, among the top tracts for conversion are Rancho Cucamonga in San Bernardino County, Hercules in Contra Costa County, and Napa in Napa County. Older urban areas that have been redeveloped appear as well, such as the area around the Staples Center in Los Angeles.

The other dependent variable of interest is wage change. Although the average change in weekly wages in a census tract (in constant 2013 dollars) was an increase of two dollars, tracts across the state experienced wide variation. Experiencing wage losses of over $1000 per week were tracts in San Francisco, La Brea, and Redwood City, all in neighborhoods undergoing a transformation to a low-wage service economy. These places were all characterized by the loss of high-end professional service and information technology jobs, replaced largely by jobs in health, government, and education, and to a lesser extent retail. Wage gains of over $1000 were also concentrated in high-cost metros like San Francisco and Los Angeles, e.g., in neighborhoods adjacent to Hollywood (such as Burbank) and Silicon Valley (such as Menlo Park,
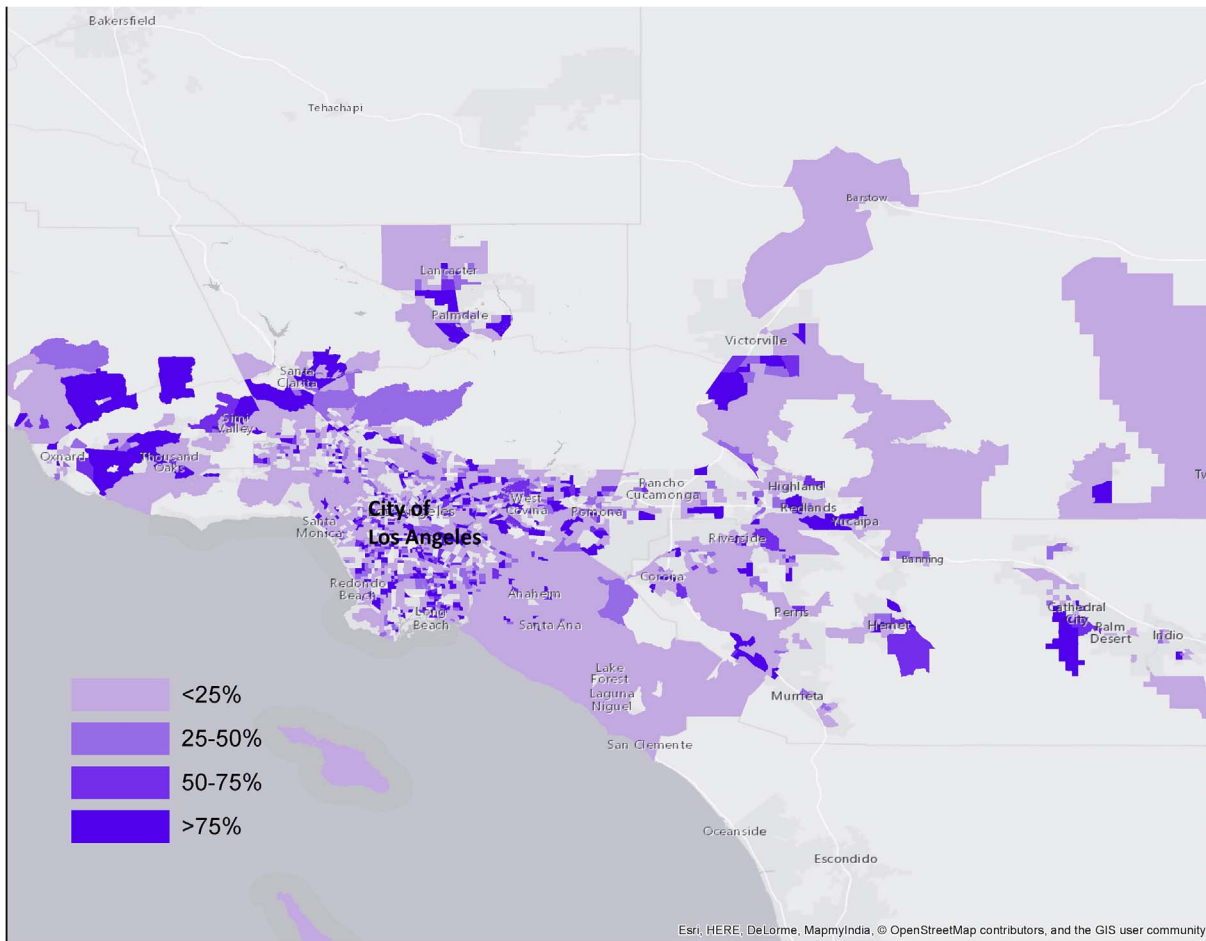
Fig. 2. Share of non-sales-taxable acreage converted to sales-taxable acreage, Los Angeles region, 2007–2013. Source: Author's calculation.
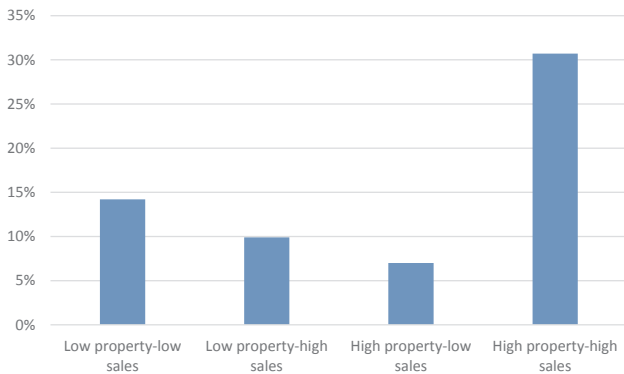

Fig. 3. Share of properties converted in census tract, by tax dependency type. Source: Author's calculation.

where Facebook is located). These neighborhoods generally experienced deep losses in retail, education, and health employment and gains in professional service and information technology jobs.

Looking at correlations helps to clarify the relationships among the variables, particularly conversion of land use, sales tax dependence, change in wages, and compactness. There is no significant relationship between conversion and wage change ($r = -0.16$, $p = .18$), between sales tax dependence and wage change ($r = -0.023$, $p = .474$), or between compactness and wage change ($r = 0.005$, $p = .656$). However, conversion is negatively correlated with compactness ($r = -0.099$, $p = .000$) and positively correlated with sales tax dependence ($r = 0.036$, $p = .016$).

4.2. Understanding conversion of land use

The analysis first examines the role of factors – labor market, urban form, tax structure, location, and demographics – in explaining conversion of land use to sales-taxable uses (Table 2). As is the convention with land use conversion models, this analysis uses binary logistic regression; specifically, the model predicts census tracts with an above-median share of converted parcels. The model is highly significant, predicting 85.9% of the cases, with a pseudo R^2 of 0.268.

In predicting the conversion of land use to sales-taxable use, a variety of factors associated with urban form and fiscal structure matter, controlling for other factors. The factor with the greatest impact on conversion is local dependence on sales tax revenue: a one percent increase in share of sales tax revenue in the city budget makes it more than four times as likely that a parcel will be converted to a sales-taxable use. Other fiscal structure variables that lead to more conversion are the total amount of sales tax revenue in the city budget and the total assessed value in the neighborhood; however, if there are already a large number of sales-taxable parcels in the neighborhood, the odds of conversion decrease. The urban form variable also has a significant impact on conversion: the more compact the neighborhood, the less likely it is to experience land use conversion. A large regional economy (as measured by employment) is more likely to experience conversion, but the other labor market control factors make it less likely. Not surprisingly, a strong economy, as evidenced by high local wages and high job accessibility, make conversion to sales-taxable uses less likely. However, an increase in regional unemployment also makes conversion less likely. Regional location matters as well, with conversion more likely in the Los Angeles-Orange County and Riverside-San Bernardino-

Table 2
Explaining tract-level conversion of land use, 2007–13.

Type	Variable	Coefficient	Odds ratio
Labor market	Average weekly wages in local industry, 2007 (2013$)	−0.001[**]	0.999
	Change in metropolitan unemployment rate, 2007–2013	−0.556[***]	0.574
	Metropolitan employed workers, 2007	0.000[**]	1.000
Location	Regional job accessibility (gravity measure, jobs 5–50 miles away)	−0.025[**]	0.975
	Riverside-San Bernardino-Ontario MSA (dummy)	0.516[**]	1.675
	Los Angeles-Orange County MSA (dummy)	1.582[*]	4.864
	San Diego MSA (dummy)	−1.564[***]	0.209
Demographics	Share of housing units more than 30 years old, 2000	−1.446[***]	0.236
Urban form	Compactness index, 2010	−0.008[**]	0.992
	Share of tract acreage that is commercial	0.206	1.228
	Share of tract acreage that is vacant	−0.195	0.823
Fiscal structure	Share of sales tax revenue in city budget, 2004	2.147[***]	8.560
	Total city sales tax revenue, 2004	0.000[***]	1.000
	Number of sales-taxable parcels, 2007	−0.027[***]	0.973
	Total assessed value of property in tract, 2007	0.000[***]	1.000
	Constant	3.346[***]	28.377

N = 3879, % correctly predicted 85.9%.
Pseudo R-square = 0.268, χ^2 = 0.000, −2 log likelihood = 2592.76.
  *** p = .000.
  ** $p < .05$.
  * $p < .10$.

Ontario metropolitan areas, but less likely in San Diego county.

4.3. Understanding wage changes

To focus further on the role of the conversion of land use in wage changes, the analysis next looks at change in average weekly wages from 2007 to 2013 at the census tract level as a function of various factors. Specifically, since the wage data are continuous and normally distributed, with a linear relationship to the conversion variable, this analysis uses ordinary least squares regression. The analysis first statistically tests the significance of traditional labor market indicators, such as regional economic strength, local industry structure, and initial wage levels, in predicting wages, and then adds variables accounting for fiscal structure and urban form (prior to the wage changes). Each model also tests the significance of land use conversion in wage changes. If localities depend on the sales tax, or if certain types of urban form are associated with business that pay low wages, such as retail, we might expect to see declines in average wages. Because collinearity diagnostics revealed some issues with sectoral, locational, urban form, and tax variables, not all were included in the analysis.

Table 3 shows the modeling results for the four models, which are highly significant, although the low adjusted R^2 suggests that these variables do not by themselves explain wage loss; it is likely instead that factors internal to the firm such as liquidity or mergers and acquisitions play a critical explanatory role. Moreover, the high significance levels may reflect the large sample size used in the regressions. Model 1 examines the role of regional and local labor market dynamics, the traditional explanatory factors behind wage levels, finding expected results, with an adjusted R^2 of 0.252. Having a larger regional labor market in the base year results in wage increases, while starting with higher wages results in wage declines, all else equal. Not surprisingly, the strength of the metropolitan economy and shifts in industry structure shape wage changes: growth in unemployment is associated with wage declines, as is an increasing share of retail and administrative/government employment. Regional dummies also matter, with location in the Riverside-San Bernardino-Ontario MSA resulting in wage declines. Most importantly, conversion of land to fiscally lucrative uses is significant and negatively related to wages.

Model 2 complicates the analysis by adding the compactness index, which is also significantly and negatively related to wages, as well as a control for local conditions, the share of neighborhood residents in poverty, which has a similar negative and significant impact on wages.

Model 3 focuses instead on fiscal structure variables, finding a significant role for local fiscal structure in wage declines; not only does the dependence on sales tax lead to wage declines, but so does the number of parcels already with sales-taxable uses in 2007. However, the higher the local assessed value – a proxy for land prices – the greater the wage increases. (Due to collinearity issues, this and subsequent models remove several other variables, resulting in lower explanatory power.)

Model 4 then combines a key measure of fiscal structure, the share of sales tax revenue in the city budget, with the compactness index. Both compactness and dependence on sales tax revenue are significant and negative predictors of wage change: the more compact the tract, or the more its host city depends on sales tax, the greater the wage loss, even controlling for regional economic factors. Moreover, throughout the models, land use conversion remains a significant predictor of wage decline.

5. Discussion

Recent years have seen a significant amount of land in California converted to fiscally lucrative uses. This is often occurring in more suburban areas, particularly those with a high degree of dependence on sales and property tax for operating revenue. Might this conversion of land also account for declining wages? This analysis first examined the factors predicting land use conversion, finding that fiscal considerations, as well as a less compact urban form, are significantly associated with conversion to fiscally lucrative uses. It then addressed whether this conversion has also led to wage changes, confirming that sales tax dependence and land use conversion significantly predict the decline of wages.

Economists typically explain wage changes based on a set of labor market characteristics. Most readily measured are the mix of local industries and the tightness of the local labor market, although institutional factors clearly have an impact as well (Osterman, 1999). Not surprisingly, then, this analysis showed that these labor market variables matter in predicting wage dynamics. Yet, land conversion and dependence on local sales tax also predict wage declines. This suggests that local jurisdictions, which presumably are encouraging the conversion of land, may be trading off higher tax revenues for lower wages. It also suggests that locals may have some power to shape wage outcomes, should they choose to do so, by restricting or directing the conversion of land. Of course, it is not possible to know what would happen in the absence of conversion; the opportunity costs may be

Table 3
Explaining tract-level wage change, 2007–13.

Type	Variable	Model 1: Labor market			Model 2: Compactness			Model 3: Fiscal structure			Model 4: Fiscal structure and compactness		
		B	Beta	t-stat	B	Beta	t-stat	B	Beta	t-stat	B	Beta	t-stat
Labor market	Average weekly wages in local industry, 2007 (2013$)	-0.099	-0.172***	-12.613	-0.114	-0.197***	-14.265	-0.170	-0.285***	-14.593	-0.128	-0.215***	-11.825
	Change in metropolitan unemployment rate, 2007–2013	-12.088	-0.069***	-4.800	-10.745	-0.061***	-4.113	-14.748	-0.081***	-4.195	-23.001	-0.126***	-6.406
Industry mix	Metropolitan employed workers, 2007	9.813E-06	0.173***	11.590	1.089E-05	0.193***	12.346	1.151E-05	0.195***	9.754	1.226E-05	0.207***	10.273
	Difference in percent retail, 2007–13	-327.500	-0.152***	-12.354	-330.359	-0.153***	-12.510	-139.116	-0.058***	-3.850	-158.714	-0.066***	-4.325
	Difference in percent administrative and government, 2007–13	-642.956	-0.352***	-28.154	-641.379	-0.350**	-28.223						
	Difference in percent professional, IT, and FIRE 2007–13	417.326	0.187***	15.759	413.306	0.185***	15.689						
	Difference in percent construction and utilities, 2007–13	288.052	0.068***	5.846	288.652	0.068***	5.859						
Location	Riverside-San Bernardino-Ontario MSA (dummy)	-38.362	-0.062***	-4.452	-41.924	-0.091***	-7.463	-35.261	-0.059***	-3.723			
	San Diego MSA (dummy)	31.025	0.058***	4.147	29.637	0.059***	5.085	18.154	0.037**	2.334			
Land use change	Percentage change in parcels with sales-taxable use, 2007–2013	-253.463	-0.024**	-2.111	-280.132	-0.026**	-2.342	-343.387	-0.029*	-1.906	-301.423	-0.026*	-1.679
Urban form	Compactness index, 2010				-0.151	-0.022*	-1.618				-0.498	-0.062***	-3.769
Demographics	Share of population in poverty, 2000				-128.264	-0.099**	-7.837	-116.534	-0.087***	-4.968			
Fiscal structure	Share of sales tax revenue in city budget, 2004							-89.349	-0.053***	-3.389	-53.389	-0.032**	-2.033
	Number of sales-taxable parcels, 2007							-0.219	-0.067***	-4.087			
	Total assessed value of property in tract, 2007							3.277E-08	0.111***	6.188			
	Constant	112.167	***	8.816	151.907	***	9.001	186.495	***	10.030	217.534	***	8.601
	Adj. R²	0.252			0.262			0.072			0.046		
	Significance	0.000			0.000			0.000			0.000		
	N	4492			5928			4151			4152		

*** p = .000.
** p < .05.
* p < .10.

negligible or zero if the land would have remained vacant or residential without conversion.

Compactness, measured at the tract level, leads to wage declines, controlling for labor market dynamics. This finding both confirms and contradicts earlier work predicting upward mobility by Ewing, Hamidi, Grace, and Wei (2016), which found a positive effect of compactness and a negative effect of income segregation. Although further research is warranted, one likely explanation is that this study deploys the compactness index at the tract level, while Ewing et al. use the metropolitan version. For metropolitan regions, it is well established that compactness enhances economic performance (productivity and wages) via agglomeration economies (Cervero, 2001). But at a neighborhood level, compact urban form may not have the same payoffs. Research on industrial districts and economic growth has long suggested that successful districts such as Silicon Valley or the Third Italy function at a regional scale (see, for instance, Saxenian, 1996).

The logistic regression identified some significant factors that shape the conversion of land use to sales-taxable uses. Controlling for labor market dynamics, fiscal factors play an important role; in particular, the higher the dependence on sales tax revenues, the larger the total sales tax revenues, and the higher the assessed value of local properties, the more conversion.

Not surprisingly, the regional economy – both the change in unemployment rate and the region a jurisdiction is located in – matters. That increases in unemployment regionally decrease the amount of conversion locally suggests several potential explanations. Given a poor regional economic outlook, there may be little potential to attract new sales tax base through retail; intra-city competition for retail won't work if high unemployment means lower consumer spending and businesses are not interested. Additionally, municipalities may be focusing on job creation rather than tax revenue.

Most interestingly, the more compact the development patterns, the less conversion occurs, controlling for other factors. These relationships are complex and warrant further research. But this finding does suggest the possibility that more compact development patterns yield benefits that reduce the need to chase sales tax base. For example, there could be fiscal benefits to compact development that help dissuade jurisdictions from converting their land to fiscally lucrative uses. Future research should investigate the potential connection between compact development patterns and fiscal stability.

6. Conclusion and policy implications

The recent growth in low-wage jobs (and wage inequality more generally) raises questions about what kinds of actions cities can take to help stem wage decline. Certainly local living wage ordinances offer promise to improve wage and labor conditions (Lester, 2012). Yet, this study suggests that local fiscal considerations are another factor behind wage declines. Thus, might restricting conversion – or at least not incentivizing it – be an alternative approach?

Although this analysis identifies fiscal factors that are behind the conversion of land use, it is not possible with this dataset to determine how the conversion actually transpires: is it through variances granted to property owners, rezoning by the municipality, or simply a change of uses? Thus, further research would be necessary to determine what policy changes could slow the pace of conversion.

However, the jurisdictions where conversion is occurring tend to be those with relatively high sales tax revenue. Thus, the most direct way to reduce the pressures that lead to conversion would be through changing how state and local revenue is distributed. As long as local jurisdictions receive some portion of sales tax back from the state, they will have the motivation to pursue fiscally lucrative uses. One solution that has been suggested – particularly relevant to states like California with property tax limits – is to return more property tax to localities, rather than sales tax (Lewis, 2001a). Compared to the fiscalization of land use via the sales tax, which favors retail land uses, this kind of

fiscalization may lead to development that is more balanced between commercial and residential uses (Barbour, 2007; Lewis, 2001a). The most effective way to get more property tax revenue back into local hands is probably through a swap for sales tax revenue; however, attempts to enact such a swap have historically fallen short (Barbour, 2007; Coleman, 2000).

Jurisdictions may trade off higher sales tax revenues for lower wages because of the direct benefit; the labor market is regional, so there is little incentive to pursue high-wage industries. This suggests that the most effective strategies to curtail the fiscalization of land use will be regional as well. The idea of regional tax base sharing to even out fiscal disparities dates back to the Minneapolis-St. Paul region in the 1970s, though it has proven challenging to adopt elsewhere (Orfield, 2002). Yet, by equalizing the tax share at the county level, it might be possible to lessen the fiscalization incentive. The county might redistribute sales tax revenues to local governments on a per capita basis, a policy that would incentivize residential growth (Lewis & Barbour, 1999). Optimally, this would be enacted in conjunction with reforms that return more property tax to localities, so that governments would still have an incentive to pursue development. Another promising proposal would reallocate property tax through regional allocation boards, a solution that would avoid the inequities of relying exclusively on local governments, while allowing responsiveness to local needs (Gervais & Rayford, 2012). These might be designated based upon electoral district boundaries (such as the state senate districts), with a mix of appointed and elected officials, with voting power allocated to be representative of the population (ibid.).

The more compact the urban form, the less land conversion seems to be taking place. At the same time, compact urban form seems to lead to wage declines. More research is needed to clarify these relationships. It may be necessary to decompose the compound compactness index into its component variables in order to pinpoint the factors behind each of these dynamics. Likewise, the construction of the land conversion variable here has limitations. For example, it spans a period from 2007 to 2013 when municipalities were under great fiscal stress as they recovered from the Great Recession. It measures change in parcels, not acreage, so conversion may actually be much more extensive in tracts with large lots than in those with many small parcels.

The conversion – and thence fiscalization – of land use occurs not just through land use and permitting decisions, but also via incentives. Jurisdictions have very few tools that will affect regional growth, but location incentives are notoriously inefficient (Markusen, 2007). In response, some states have enacted reforms that slow the giveaways. Most involve either increased transparency (for instance, analysis of costs and benefits), new standards (especially for wages), or clawbacks (contractual restrictions that allow governments to recover funds from the firm if they don't meet agreed-upon standards for jobs and earnings) (LeRoy, 2007). But incentives are unlikely to improve wages unless the regional economy is strong. Ultimately, as this paper makes clear, land use and tax policy are but one tool to address declining wages.

Previous studies of the fiscalization of land use have focused either on the motives of local officials, or the change in retail activity. This study is the first to examine how much land has actually been converted to sales-taxable uses. Future studies should attempt to determine the relationships between the intentions of local government, the conversion of land, and the retail activity that results. Ultimately, these questions may entail a more qualitative research approach, in order to identify the motives of diverse stakeholders, from local government, to property owners, to developers, to businesses and residents.

Acknowledgements

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