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Jane Jacobs and the Value of Older, Smaller Buildings

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Problem, research strategy, and findings: In recent years, some economists and urban development advocates have argued that historic preservation is fundamentally at odds with a growing, diverse economy. We supply empirical support for Jane Jacobs's (1961) seminal argument about the value of "plain, ordinary, low-value old buildings," finding that older, smaller buildings support dense, diverse streets and neighborhoods (p. 187). We use spatial regression models to analyze how social and economic activity relate to building characteristics in Seattle (WA), San Francisco (CA), Tucson (AZ), and Washington, DC. On a per commercial square foot basis, areas with older, smaller buildings and mixed-vintage blocks support more jobs in new businesses, small businesses, and businesses in creative industries. However, while areas with older, smaller buildings have greater diversity of resident age and higher proportions of small businesses, we also find lower proportions of Hispanic and non-White residents, indicating limited racial and ethnic diversity.

Takeaway for practice: Focusing on new construction alone to achieve denser, more sustainable cities elides the important role that older, smaller buildings play in dense, diverse neighborhoods. Planners should support the preservation and reuse of older buildings and the integration of old and new buildings. Relevant policies include adaptive reuse ordinances, performance-based energy codes, context-sensitive form-based coding, and deregulation of parking requirements.

Keywords: preservation, Jane Jacobs, diversity, economic development, community development

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In *The Death and Life of Great American Cities*, Jane Jacobs (1961) argues that "plain, ordinary, low-value old buildings" are critically needed environments for small, entrepreneurial businesses and healthy districts and cities (p. 187). Despite Jacobs's prominence in urban theory and her place in most graduate planning curricula, scholars rarely study the role of older buildings and the importance of a mix of old and new buildings in supporting neighborhood vitality. This leaves city planners and policymakers without a clear rationale for supporting older and diverse urban fabric.

We assess the extent to which areas of Seattle (WA), San Francisco (CA), Tucson (AZ), and Washington, DC, with small-scaled building stock, older building age, and a greater mix of building age, have greater population density, greater density of jobs, and greater diversity of residents and economic activity. We do so using metrics constructed on a 200-m by 200-m grid over these four cities. We analyze the relative densities of jobs in small businesses and new businesses in areas with older, smaller buildings and greater diversity of building age compared with areas predominantly characterized by large, new buildings.

We first review research on the value of older, smaller buildings and mixed-vintage blocks, as well as research and theory on the value of density and diversity. Next, we explain our research strategy, including the data and measures used, and detail the findings of our analysis. We conclude the study with suggestions for future research and discussion of tools for keeping older buildings in use while still promoting new real estate development for growing populations and economies.

We find that the presence of older, smaller buildings and greater diversity of building age is associated with significantly greater population density,

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lower median age of residents, greater diversity of the age of residents, greater density of jobs per commercial square foot of space, and higher proportions of jobs in small businesses. Contrary to expectations, we also find significantly lower proportions of Hispanic or non-White residents where there are older, smaller buildings and greater diversity of building age.

Our findings offer some support for Jane Jacobs's 1961 observations about the value of a mix of old and new buildings and counter arguments from Glaeser (2011) and others that density and affordability can be best supported by simply increasing the overall supply of units. Growing cities seek density in new development and redevelopment to reduce automobile dependency, energy consumption, and infrastructure costs, and to increase the use of transit and other alternative transportation modes. We argue, however, that a focus on density alone elides the important role that older, smaller buildings play in supporting small businesses and functional, diverse neighborhoods. Planning tools and programs that support the continued use and adaptive reuse of existing older, smaller buildings constitute compelling options for managing growth while retaining neighborhood character.

Future research should dig further into Jacobs's (1961) observations by directly comparing the performance of landmarked buildings and buildings in historic districts with that of buildings that are simply old and low in valuation. Researchers should also explore the extent to which areas with buildings constructed prior to major shifts in construction techniques and materials—buildings constructed before the postwar suburban boom, for instance—perform differently than areas with buildings that are merely old relative to a city's overall building stock.

Valuing Older, Smaller Buildings

One of the most revered and widely read urban planning works, Jane Jacobs's 1961 book, *The Death and Life of Great American Cities*, sheds light on the important role that diversity plays in supporting healthy neighborhoods and cities. An outsider to the planning profession, Jacobs wields keen observations and pithy arguments to openly criticize city planning and urban renewal and calls for a renewed focus on the "intricate…ballet" of city streets and sidewalks throughout the day and night (p. 50). Jacobs gives considerable attention to the "need for aged buildings" in urban neighborhoods and argues that the healthiest areas of cities need not just old buildings, but new buildings interspersed with the old (p. 187). She observes that old buildings and new buildings require differing levels of economic yield—the financial return generated in the buildings—and that new businesses often naturally emerge in buildings with low economic overhead (Jacobs, 1961).

Despite Jacobs's considerable influence on planning practice and research, many of the seminal ideas in *The Death and Life of Great American Cities* have received scant empirical testing. Weicher (1973) and Schmidt (1977) conduct statistical tests of the relationships between land use diversity, diversity of building age, and measures of neighborhood vitality and find limited evidence supporting Jacobs's assertions. Schmidt (1977) uses the census tract as the unit of analysis and explores data related to crime and delinquency, mental illness, and death rates. Weicher (1973) analyzes 65 of Chicago's community areas—neighborhood boundaries, as they were defined by social scientists at the University of Chicago around 1930—and finds that diversity of land uses is actually associated with higher rates of delinquency, mental illness, and death.

In more recent years, economists and urban development advocates have challenged Jacobs's focus on the value of old, small-scaled buildings. Glaeser (2011) recognizes Jacobs's work advocating for diversity and arguing for mixed-use zoning, but he holds that her claim that old buildings support entrepreneurship is ill supported. Glaeser (2011) believes Jacobs "thought that preserving older, shorter structures would somehow keep prices affordable for budding entrepreneurs. That's not how supply and demand works" (p. 147). He notes that new construction may not itself house "any quirky, less profitable firms, but by providing new space, the building will ease pressure on the rest of the city's real estate" (p. 148). Other urban development advocates have joined this argument, connecting preservation with high rents and limited supply of space (Been, Ellen, Gedal, Glaeser, & McCabe, 2014; Real Estate Board of New York, 2014). Hedonic price models tend to show that historic district designation is associated with increased property values (Gilderbloom, Hanka, & Ambrosius, 2009; Haughey & Basolo, 2000; Rypkema & Cheong, 2011).

A crucial distinction between our study and studies pointing to the effects of historic districts is that the latter are focused on protected districts as opposed to buildings that are just older. The difference is between preserved districts of valued architectural character, which tend to have relatively higher property values (Leichenko, Coulson, & Listokin, 2001), and Jacobs's (1961) "plain, ordinary, low-value old buildings" (p. 187). We seek to evaluate the spirit of Jacobs's insight that old buildings serve an important function when evaluated in their neighborhood context. Market effects within designated historic districts can sometimes include limits on new construction activity; our focus on older buildings assumes no such limitation.

A variety of sources can be used to support the position that older, smaller structures have positive associations with social, economic, and cultural diversity and vitality. In recent years, a number of scholars have theorized about the value of older buildings in creating a sense of history, a sense of place, and a shared cultural legacy in cities (Benfield, 2014; Lerner, 2014; Wolfe, 2013). Brand (1994) argues that older buildings, including those without obvious architectural or historical significance, are more flexible and adaptable to multiple uses and expansions and contractions of businesses. Ewing and Clemente (2013) establish metrics for quality urban design through regression analysis and field validation and find that older buildings are statistically tied to greater pedestrian activity and constitute an important component of the distinctiveness of a place's urban design. Researchers have connected older buildings with the arts and creative economy (Chan, 2011; Grodach, Currid-Halkett, Foster, & Murdoch, 2014). Richard Florida (2012, 2013), the creator of the concept of the "creative class," has been outspoken about the value of older buildings. Grodach et al. (2014) find statistical evidence that small, prewar buildings are significantly associated with the presence of clusters of arts industries within and across metropolitan areas.

Valuing Density and Diversity

We argue that older, smaller buildings have important linkages with density and diversity. But what research supports the idea that density and diversity are necessarily positive urban attributes? Density, if presented in the context of walkable and diverse neighborhoods, is a dominant, defining quality of sustainable cities (Burgess & Jenks, 2000; Campbell, 1996; Campoli, 2012). The value of density has always been important in city planning and policy and has made a resurgence in recent years thanks in particular to research from scholars such as Glaeser and Gottlieb (2006) and Glaeser (2011). Density is associated with access to services within walking distance and a pedestrian orientation that minimizes car dependence. The broader environmental goals of density include a reduction of carbon dioxide emissions, lower land consumption, transit feasibility, and energy efficiencies (Ewing, Bartholomew, Winkelman, Walters, & Chen, 2008). Places that are low density tend to be single use, with disconnected street networks, increased auto dependence, and decreased transit use and walking.

An implicit assumption of this research is that human interaction is valuable, both in reducing the literal spatial cost of transactions between consumer and producer and increasing the number of interactions that a person might have in dense areas (Carlino, Chatterjee, & Hunt, 2006; Glaeser, 2011; Glaeser & Gottlieb, 2006). Low-density development poses a significant barrier when it comes to the provision of neighborhood-level facilities, or access to jobs and urban services. While high density in central cities is likely to have lower affordability, income diversity, which assumes some level of affordability, is found in places with mid-level density, such as inner-ring suburbs (Talen, 2006).

The value of diversity—which most often refers to racial and ethnicity diversity, cultural diversity, income diversity, or land use diversity—is implicit in much of the existing research and theory on cities and city life. Some leading scholars of urban affairs prize cities as loci of difference and diversity, including Fischer (1975), Harvey (2000), and Lefebvre (1991). Even where urban cultural diversity is marketed and sold as a tool of economic development (Lang, Hughes, & Danielsen, 1997), the forging of diverse urban lifestyles is nevertheless regarded as an essential asset of cities (Zukin, 1998).

Diversity is considered a primary generator of urban vitality because it increases interactions among multiple urban components. What counts for Jane Jacobs (1961) is the "everyday, ordinary performance in mixing people," forming complex "pools of use" that are capable of producing something greater than the sum of their parts (pp. 164–165). Allan Jacobs and Donald Appleyard (1987) argue that diversity and the integration of activities are necessary parts of "an urban fabric for an urban life" (p. 117). For Dolores Hayden (2003), the mixture of housing, schools, and shopping is the basic definition of "a good pedestrian neighborhood" (p. 121).

Diversity is also clearly linked to measures of economic vitality and innovation. Jacobs (1961) considers urban diversity, the "size, density, and congestion" of cities, "among our most precious economic assets" (p. 219). There has been disagreement over the role of diversity in generating knowledge spillovers—the transfer of knowledge across individuals or groups—but the view that diversity of industries in proximity generates growth, rather than specialization within a given industry, is generally accepted (Glaeser, Kallal, Scheinkman, & Shleifer, 1992; Quigley, 1998). The richness of human diversity is an economic asset because innovation within firms can come from spillovers outside of the firm. Spillovers depend, to some degree, on spatial proximity, since distance affects knowledge flows (Glaeser, 2000). Richard Florida (2002) has been particularly explicit in arguing for the importance of diversity in economic terms, but his argument is structured differently. His creative capital theory states that high densities of diverse human capital (the proportion of gay households in a region is one measure), not diversity of firms or industries in the conventional economic view, is what promotes innovation and economic growth (Florida, 2002), although there has been some critique about what this means for urban planning (Glaeser, 2005). According to Florida (2004), cities that are open to "diversity of all sorts" are also the ones that "enjoy higher rates of innovation and high-wage economic growth" (p. 1).

Diversity promotes economic health because it fosters opportunity. In Jacobs's (1961) words, cities, if they are diverse, "offer fertile ground for the plans of thousands of people" (p. 14). The lack of diversity offers little hope for future expansion, either in the form of personal growth or economic development; in fact, class segregation has been shown to lower a region's economic growth (Ledebur & Barnes, 1993). Nor are nondiverse places able to support the full range of employment required to sustain a multifunctional human settlement. Diversity of income and education levels means that the people crucial for service employment, including local government workers (police, fire, school teachers, etc.) and those employed in the stores and restaurants that cater to a local clientele, should not have to travel from outside the community to be employed there.

Research Approach

We use spatial lag and spatial error regression modeling to assess the relationships between the predictors of building age, diversity of building age, and the average building size, or granularity, of the built environment on various outcome measures of social and economic density and diversity. We build 200-m by 200-m lattice overlays over the cities of Seattle, San Francisco, Tucson, and Washington, DC, calculating key characteristics of the buildings located in each grid square using county assessor data.

As with other forms of multivariate regression, spatial lag and spatial error regression models calculate the extent to which variation in a dependent variable can be accounted for by variation in an array of independent predictor variables. As such, the results of this analysis alone do not signal causal relationships. Furthermore, we do not imply that the buildings by themselves predict or lead to social and economic outcomes. Such a statement would clearly constitute environmental or architectural determinism (Franck, 1984). Rather, building on the longstanding theories of Jacobs (1961), Newman (1973), Whyte (2001), and others, we argue that characteristics of the built environment tend to play a limited—but important—role in influencing behaviors and outcomes.

Our study expands upon the methodology established in the *Older, Smaller, Better* report produced by the National Trust for Historic Preservation's Preservation Green Lab (2014). That report includes analysis of the performance of 200-m by 200-m sections of Seattle, San Francisco, and Washington, DC, according to the characteristics of the buildings. For this study we add an additional city, Tucson, to test the performance of older, smaller buildings and mixed-vintage blocks in a relatively new, midsized city. Further, where the *Older, Smaller, Better* report focuses solely on mixed-use and commercial areas, here we add residential areas to models focused on social measures, and include additional variables of interest.

The Study Cities

In this study we explore the relationships between building characteristics and measures of diversity and density in the city jurisdictions of Seattle, San Francisco, Tucson, and Washington, DC. These four cities are the central cities of a cross-section of U.S. metropolitan statistical areas that are approximately 1 million persons or larger. Important to this study, each of these cities and their metro areas continue to grow. Selecting this particular mix of cities provides an ideal opportunity to test the broad-based outcomes of different types and patterns of urban growth among various cities in terms of industrial mix, history, demography, geography within the United States, and relationships to nearby metros.

Seattle and San Francisco are similar in that they are large, West Coast cities with growing populations, high-tech manufacturing, and thriving software industries (Abbott, 1992; Markusen, DiGiovanna, & Lee, 1999; Markusen, Hall, Campbell, & Deitrick, 1991; Saxenian, 1983). Washington, DC, is also growing, but has an earlier growth trajectory than any of the other cities and is marked by federal and international government jobs and property ownership (Knox, 1991). Tucson, the smallest of the cities and metro areas, has grown in the shadow of its younger and once-smaller neighbor, Phoenix, as part of the explosive growth of manufacturing and retirement in the "Sunbelt" since World War II (Konig,1982; Luckingham, 1984), and as part of a rapidly developing "megapolitan Sun Corridor" already containing 86% of Arizona's population (Gammage et al., 2008). Whereas San Francisco and Washington, DC, are spatially contained by bodies of water and close-in geographic borders, the borders of Seattle and Tucson encompass a much larger portion of the metropolitan area and are thus more inclusive of postwar development outside the city center.

Table 1. Key characteristics of study cities.

	Seattle	San Francisco	Washington, DC	Tucson
Land area of city (in square miles)[a]	83.9	46.9	61.1	226.7
Median year constructed of buildings citywide[b]	1968	1935	1929	1973
Percentage of buildings constructed before 1945[b]	21.2%	71.2%	72.6%	4.7%
Median number of buildings per grid square[b]	18	24	31	13
Median standard deviation of building age per grid square[b]	22.0 y	19.0 y	11.0 y	7.2 y
Number of grid squares in city with at least 5 residents[a]	10,030	3,860	5,122	9,035
Population per square mile citywide[a]	7,250.9	17,179.1	9,856.5	2,294.2
Median age of residents citywide[c]	36.1	38.5	33.8	33.0
Percentage of city population Hispanic or non-White[c]	33.3%	58.3%	64.9%	53.4%
Median household income citywide[c]	$65,277	$75,604	$65,830	$37,032
Number of grid squares in city with at least 5 jobs and 50 commercial square feet[d]	4,172	1,876	1,953	3,309
Median percentage of private jobs in small businesses per grid square[d]	22.9%	34.1%	18.6%	20.6%

Notes:
a. U.S. Census Bureau Quickfacts—2010 Data.
b. Based on authors' analysis of city and county property data.
c. American Community Survey, 2009–2013 5-year estimates.
d. Based on authors' analysis of city and county property data and 2011 Longitudinal Employer-Household Dynamics Data from the U.S. Census Bureau's Center for Economic Studies.

The cities whose attributes we examine in this study vary dramatically in their respective building stock. As seen in Table 1, San Francisco and Washington, DC, have much older building stock than Seattle and Tucson, as well as blocks with comparatively small buildings and narrow facades. Whereas about 70% of San Francisco and Washington, DC's buildings were constructed before 1945, only about 20% and 5% of buildings in Seattle and Tucson were constructed in that time period, respectively. Of the four cities, Seattle generally has greatest diversity of building age.

Data and Method

The data we use in this study come from a variety of sources and, more importantly, from a variety of geographies. A significant concern was the modifiable areal unit problem first identified by Openshaw and Taylor (1979).[1] Following the recommendation of Wong, Lasus, and Falk (1999), we create a lattice, or grid, as a new zoning system for each city. This allows us to minimize the varying sizes and boundaries of geographies used within each city and their variation between cities.[2] In this study, the conceptual model tying building characteristics to social and economic diversity and density is operationalized with a lattice grid that is 1/8 mile on each side (200-m by 200-m grid square). Selection of a 1/8-mile lattice grid approximates the buildings, block-level census data, and consumption and production interactions typical over one to two square city blocks.

We calculate density measures by disaggregating data from the census block to the grid square geography. We draw measures of residential density in terms of population and housing units from the 2010 U.S. Census. We draw measures of job density from the 2011 Longitudinal Employer-Household Dynamics Workplace Area Characteristics (WAC) dataset constructed by the U.S. Census Bureau's Center for Economic Studies. We focus on the total count of jobs, total count of private jobs in firms with fewer than 20 employees, total count of private jobs in firms less than four years old, and percentage of private jobs that are in firms with fewer than 20 employees. We also include data on the total number of jobs in creative industries, which we define here as the combined counts of jobs in arts, entertainment, and recreation (North American Industry Classification System [NAICS] sector 71); information (NAICS sector 51); and professional, scientific, and technical services (NAICS sector 54) industries. To control for the height of buildings and support an apples-to-apples comparison of job density across different types of buildings, we also calculate the counts of jobs per commercial square foot, drawing on county assessor data on building size and use. These per commercial square foot measures thus compare the relative intensity of use of the building overall.

To measure diversity, we use variations on the Simpson Index used in ecology to measure exposure of groups. The Simpson index is equal to the sum of the squared shares of each population group (Simpson, 1949; White, 1986). The Racial and Ethnic Diversity Index (REDI) uses combinations of the U.S. Census Bureau's nonoverlapping racial and ethnic categories as they appear in the 2010 Decennial Census. The index is based on measuring the probability of selecting two individuals from five different groups: Hispanic; non-Hispanic White; non-Hispanic African American; non-Hispanic Asian; and a fifth category that includes all other ethnic and racial groups.

We construct a similar index to measure diversity of the age of residents. For this measure, we create five groups based on the count of residents in each age group: residents younger than age 18; residents between the ages of 18 and 34; residents between the ages of 35 and 49; residents between the ages of 50 and 64; and residents age 65 and older. Finally, we use the Herfindahl–Hirschman index to measure job diversity. The Herfindahl–Hirschman index is very similar to the Simpson diversity index but often uses different notations and is used mostly with economics to measure market concentration of firms within an industry (Calkins, 1983; Herfindahl, 1950; Hirschman, 1980). In this study, we use the index to measure the diversity of jobs within five industry groups: information (NAICS sector 51); arts, entertainment, and recreation (NAICS sector 71); professional, scientific, and technical services (NAICS sector 54); retail trade (NAICS sectors 44–45); and accommodation and food services (NAICS sector 72).

We create two citywide models to test whether a mix of small, old, and new buildings is related to dense and diverse neighborhoods. The first model uses the median age of buildings; the standard deviation, or diversity, of building age; and the granularity of buildings, here defined as the number of buildings in a 200-m by 200-m grid square. These measures are included as three independent predictor variables. The second model uses a composite character score measure calculated by combining the z standardized median building age, diversity of building age, and granularity measures into a single predictor variable. We estimate both models for each of the four cities and each of the dependent variables using the GeoDa (v.1.4.1.) software package.[3] To account for variation in important, non–building-characteristic factors, all models also include tract-level 2013 median income data from the American Community Survey, as well as a measure of development activity equal to the combined value of all permitted construction activity between 2009 and 2013. To account for transit accessibility, Seattle, San Francisco, and Washington, DC, models also include the Transit Score metric that corresponded to each grid square's latitude and longitude, as calculated by Walk Score®. No Transit Score® metrics exist for Tucson, so Tucson models include only median income and construction permit variables along with building characteristics.

Density and Older, Smaller Buildings

We analyze the relationship between the age, size, and diversity of age of buildings and key measures of residential density and density of jobs.

Residential Density

We find that our character score measure—signaling the presence of older, smaller buildings and mixed-vintage blocks—is significantly associated with greater population density both in terms of the number of residents and number of housing units in all four of the cities considered in this analysis. Table 2 shows the results of our spatial regression analysis using the character score composite measure. In Seattle, San Francisco, and Washington, DC, smaller buildings and greater diversity of building age are associated with greater residential density. In Tucson, diversity of building age is negatively associated with residential density. In Seattle, Tucson, and Washington, DC, areas with older buildings have significantly less residential density using an aggregate measure: the total count of residents and housing units in a grid square without regard to total built square footage. A per square foot measure may yield different results.

Job Density

We measure the density of jobs both as an aggregate count of jobs per 200-m by 200-m grid square and on a per commercial square foot basis within the grid squares, as seen in Table 3. Looking at aggregate counts, we find that there are significantly fewer jobs in high character score areas in San Francisco, Tucson, and Washington, DC. Given that larger, newer buildings are often many floors higher than older structures with smaller footprints, this finding is not a surprise. However, we find that high character score areas actually perform as well or better than areas with larger, newer buildings when comparing the number of jobs per commercial square foot. Similarly, we find that the character score measure is positively associated with significantly more jobs in creative industries per commercial square foot in Seattle, Tucson, and Washington, DC.

Table 2. Spatial regression models: Character score analysis.

	Seattle	San Francisco	Washington, DC	Tucson
Density				
Population density				
Number of housing units	7.82*	9.35	8.44	14.72
Number of residents	15.68	13.92	11.76	18.51
Density of jobs				
Number of jobs	–1.66*	–2.36*	–5.47*	–2.40*
Jobs per commercial square feet (log)	19.07	–0.12	2.97	0.75
Density of creative jobs				
Number of creative jobs	–0.58	–0.80*	–5.40*	–0.57*
Creative jobs per commercial square feet (log)	12.38	–1.08	2.02	3.50
Density of jobs in new businesses				
Number of jobs in firms <4 years old	2.57*	–2.08*	–1.59*	0.22*
Number of jobs in new firms per commercial square feet (log)	19.23	3.34	7.30	5.05
Density of jobs in small businesses				
Number of jobs in firms with <20 employees	2.59*	0.33*	–0.91*	2.00*
Number of jobs in firms with <20 employees per commercial square feet (log)	25.14	3.84	11.91	9.21
Diversity				
Racial and ethnic diversity				
Percentage Hispanic or non-White	–6.66	–2.81	–5.60	–2.31
Racial and ethnic diversity index	–1.24	–1.69	0.75	–5.40
Age of residents				
Median age of residents	–5.49	–4.02	–4.20	2.87
Resident age diversity index	9.88	3.74	5.81	6.38
Diversity of economic activity				
Percentage of private sector jobs that are in firms with <20 employees	16.92	12.00*	6.77	10.84
Diversity of economic activity index	–0.35	–1.86	–1.22	4.55

Notes:
Table displays z values associated with building characteristics measures for each city. Shaded cells indicate significant result at <.05.
*Spatial lag model used based on diagnostic tests. All z values without an asterisk indicate results from a spatial error model.

Following Jacobs (1961), the results of this analysis generally support the idea that older, smaller buildings and blocks with a mix of old and new buildings provide space for new businesses and small businesses. In all four cities, we find significantly more jobs in new businesses per commercial square foot of space in areas that have high character scores. On an aggregate basis, in San Francisco, we find significantly fewer jobs in new businesses in high character score areas. In Seattle, meanwhile, we find significantly greater aggregate counts of jobs in new businesses in high character score areas. This difference may have to do with concentrations of tech startups in San Francisco's downtown and financial district, which have a mix of large, old and new structures. Altogether, of the 24 individual component measures of building fabric analyzed across the four cities in this study, we find only two measures that are significant in a direction that runs contrary to our expectations, compared with eight measures that support Jane Jacobs's (1961) arguments connecting these building characteristics to the presence of new businesses.

Finally, we find strong evidence tying the character score measure with the presence of small businesses, here defined as businesses with fewer than 20 employees. In all four cities, we find a significant positive relationship between the character score metric and the number of jobs in small businesses per commercial square foot. In Seattle and Tucson, we find that higher character score ratings are positively associated with significantly more jobs in small businesses, both on a per square foot basis and as an aggregate count. Of the 24 component building fabric measures

Table 3. Spatial regression models: Components of character score and density measures.

Density	Seattle			San Francisco			Washington, DC			Tucson		
	Med. bldg. age	Bldg. age diversity	Granularity	Med. bldg. age	Bldg. age diversity	Granularity	Med. bldg. age	Bldg. age diversity	Granularity	Med. bldg. age	Bldg. age diversity	Granularity
Population density												
Number of housing units	12.30	8.32	18.71	–1.11*	0.42*	9.44*	2.96	3.85	13.72	6.04	–4.45	31.36
Number of residents	11.93	6.45	29.86	0.66	2.33	20.64*	3.36	3.74	20.15	7.15	–3.36	38.01
Density of jobs												
Number of jobs	0.45*	0.01*	–1.23*	1.16*	1.02*	–2.43*	3.77*	1.12*	–2.99*	–0.43*	1.38*	–4.91*
Jobs per commercial square foot (log)	–7.82	1.33	18.01	–0.09	–1.13	0.41	–0.62	–0.51	3.89	–3.00	–4.10	1.33
Density of creative jobs												
Number of creative jobs	1.35*	2.01*	–1.05*	0.57*	1.58*	–1.10*	4.08*	–0.78*	–1.03*	1.12*	2.45*	–1.98*
Creative jobs per commercial square foot (log)	–6.63	–1.96	12.64	0.39	–1.11	–0.45	0.05	–1.47	3.92	–1.51	–1.50	3.99
Density of jobs in new businesses												
Number of jobs in firms <4 years old	–2.02*	1.52*	–0.08*	1.54*	1.97*	–1.79*	2.37*	3.31*	–1.20*	–1.36*	0.44*	–1.61
Number of jobs in new firms per commercial square foot (log)	–8.66	1.04	16.18	–1.86	–1.24	3.85	–0.54	0.93	8.32	–1.92	–4.04	7.79
Density of jobs in small businesses												
Number of jobs in firms with <20 employees	–2.18*	2.23*	–0.81*	–1.84*	1.70*	–2.40*	2.08*	2.59*	–0.37*	–2.05*	3.64*	–2.73
Number of jobs in firms with <20 employees per commercial square foot (log)	–11.72	1.77	23.17	–2.80	–2.91	5.27	–3.01	1.37	11.27	–5.08	–1.91	7.98

Notes:
Table displays z values associated with building characteristics measures for each city. Shaded cells indicate significant result at <.05.
*Spatial lag model used based on diagnostic tests. All z values without an asterisk indicate results from a spatial error model.

analyzed across the four cities in this study, four measures yield results that counter the hypothesis that areas with older, smaller buildings and greater diversity of building age support greater density of jobs in small businesses, and 13 measures yield results that support Jacobs (1961). Three of the four measures that countered our hypothesis emerged from the model assessing the aggregate count of jobs in small businesses: median building age in Washington, DC, and granularity in Tucson and San Francisco. The fourth measure, diversity of building age in San Francisco, emerged in the model analyzing jobs in small businesses per square foot.

Diversity and Older, Smaller Buildings

To explore social and economic diversity, we analyze data on population diversity in terms of race and ethnicity, diversity of resident age, and median age of residents. We analyze data on economic diversity through measures of diversity of industries represented and percentage of jobs in businesses with fewer than 20 employees.

Population Diversity

We find significant evidence that high character score areas—areas with older, smaller buildings and mixed-vintage blocks—have significantly greater diversity of resident age and younger median age of residents. The character score measure predicts significantly greater diversity of resident age in all four cities and younger median age of residents in three of the four cities. Tucson provides one exception to the pattern tying characteristics of the built environment with data on the age of residents. In Tucson, the median age of residents is significantly higher in areas with high character scores. This may be due to lower numbers of children in areas with older buildings because those neighborhoods have fewer schools or because families are not able to afford housing in historic districts with higher property values and rental rates. We find that greater diversity of building age consistently predicts significantly younger median age of residents. In all four cities analyzed in this study, areas with a greater mix of old and new structures have significantly younger residents. In fact, greater diversity of building age is also linked to significantly less diversity of resident age, likely as a result of the larger proportion of the population represented by young people.

We find that the character score composite metric is associated with less racial and ethnic diversity, contrary to our expectations. We analyze the relationship between building characteristics and two measures of racial and ethnic diversity: the REDI and the percentage of the population that is Hispanic or non-White. Our analysis shows that the character score measure is associated with significantly lower proportions of Hispanic or non-White residents in all four cities. We find no significant relationship between the character score and our racial and ethnic diversity index in Seattle, San Francisco, or Washington, DC, but in Tucson, high character scores are associated with significantly lower scores on the REDI index. We find that older median building age is a significant predictor of lower proportions of Hispanic or non-White residents in the four study cities and a significant predictor of lower REDI index scores in Tucson and Seattle. It is possible that our 200-m by 200-m grid may obscure neighborhood-level racial patterns, and that building characteristics play little—if any—role in the racial and ethnic makeup of a block. This warrants further exploration in future research. Furthermore, future research should explore the relationship between building characteristics and changes in racial and ethnic composition of neighborhoods over time, rather than as a single snapshot.

Economic Diversity

We find some support for our hypothesis that areas with high character score ratings have greater diversity of economic activity. In all four cities, high character score areas have significantly higher proportions of jobs in businesses with fewer than 20 employees. Greater granularity in the building stock—smaller average building size—seems to be the most significant link with greater granularity in the economic makeup of the area. Table 4 shows the results of our spatial regression analysis focused on diversity measures and individual building characteristics. We find that smaller building size is significantly linked to higher proportions of jobs in small businesses in all four cities.

Our findings relating building characteristics to diversity of industries are mixed. We find that the character score composite measure is associated with significantly less diversity of industries in Tucson. In our analysis using the individual components of the character score, we find that greater diversity of building age is significantly associated with a more diverse mix of jobs in creative industries, jobs in retail trade, and jobs in food and accommodations in Seattle, San Francisco, and Washington, DC. We find that older median age of buildings is also a significant predictor of greater diversity of economic activity in Seattle and San Francisco. Contrary to expectations, however, we find that areas with larger buildings have significantly greater economic diversity. This may be a function of the construction of the diversity measure and warrants further exploration. Constructing the measure with overall square footage as a

Table 4. Spatial regression models: Components of character score and diversity measures.

	Seattle			San Francisco			Washington, DC			Tucson		
Diversity	**Med. bldg. age**	**Bldg. age diversity**	**Granularity**	**Med. bldg. age**	**Bldg. age diversity**	**Granularity**	**Med. bldg. age**	**Bldg. age diversity**	**Granularity**	**Med. bldg. age**	**Bldg. age diversity**	**Granularity**
Racial and ethnic diversity												
Percentage Hispanic or non-White	14.40*	3.54*	–0.51*	5.71*	–1.27*	2.28*	3.93*	–2.08*	–0.75*	3.91	1.36	–1.26
Racial and ethnic diversity index	11.84*	5.97*	0.50*	1.18	0.48	–1.91	–0.14	0.02	1.25	5.73	0.77	–3.85
Age of residents												
Median age of residents	–2.81	–4.04	–7.44	2.99	–3.90	0.18	2.8	–3.21	–1.01	–8.29	–3.10	–0.34
Resident age diversity index	–7.89	–2.11	9.83	–0.55	–2.21	7.37	0.57*	–2.68*	9.24*	–6.90	–2.11	5.38
Diversity of economic activity												
Percentage of private sector jobs that are in firms with <20 employees	–7.34	2.13	15.74	–7.21*	–1.25*	9.01*	–1.51	0.55	8.70	–2.25*	2.33*	12.43*
Diversity of economic activity index	2.92	–3.17	5.42	2.75	–3.92	2.89	1.64	–3.06	3.00	–0.79	–1.73	7.14

Notes:
Table displays z values associated with building characteristics measures for each city. Shaded cells indicate significant result at <.05.
*Spatial lag model used based on diagnostic tests. All z values without an asterisk indicate results from a spatial error model.

statistical control or different industries represented in the mix may yield different results.

Preservation, Conservation, Diversity, and Density

These findings indicate that median age and size of buildings are often important factors in influencing the economic bottom line for residents and businesses and that diversity of building age is associated with measures related to distinct preferences and qualities of place. We find that median building age and building granularity measures are significant predictors of measures of density where affordability may be a major concern. For instance, in multiple cities, older median age and smaller building size are significant predictors of several jobs per square foot measures, along with population density and diversity of resident age. Diversity of building age, meanwhile, is linked to significantly lower median age of residents and greater diversity of economic activity in multiple cities. Areas with older, smaller buildings may have lower rents and smaller spaces for small businesses and residents with limited financial resources. Diversity of building age may signal recent reinvestment and the presence of a mix of old and new businesses, which may be desirable to young professionals. Future research should explore the ways in which median age, building scale, and diversity of building age diverge or converge with different types of measures, including rental rates and more detailed information about the residents and businesses occupying different parts of cities. Such analysis could have powerful planning and policy implications.

In many regards, Tucson stands apart from the other cities in the analysis. Tucson is the only city in the study where the character score measure is significantly associated with older median ages of residents, significantly lower racial and ethnic diversity index values, and significantly lower diversity of economic activity. As seen in Table 1, Tucson's built fabric is distinct from the other study cities in important ways. Areas of Tucson that have high character scores include both a core area around the University of Arizona and blue collar neighborhoods further out. The demographics of the former area include a mix of owner-occupants with relatively higher incomes and education levels in designated historic districts with higher property values, and renting college students and the limited types of businesses catering to them. The latter areas have predominantly Hispanic residents, more family housing, and a limited range of business types. Both areas are fairly racially and ethnically homogenous. Further analysis of cities with predominantly large, new developments would likely yield rich insights into how areas with older, smaller buildings perform in the context of a different city form. Analysis of other types of cities, including cities that are not experiencing growth, may also yield new information and insights.

Given the relative predominance of newer buildings in Tucson, it might be fair to ask whether the z standardized values that together compose the character score measure are appropriate. Z standardization renders the actual age of buildings moot, effectively comparing the age of buildings only with each city's respective citywide average value. This raises an important question with both methodological and theoretical implications. Jane Jacobs (1961) argues that the value of old buildings is largely a function of the limited economic yield required of the building. Preservationists and building scientists, meanwhile, argue that construction quality, design, and materials have shifted dramatically over time. Do blocks with greater proportions of buildings constructed before 1945, or before 1920, perform better than blocks with buildings predominantly constructed after those times? Future research might dig into this question further by analyzing both the z standardized data and data connecting the year of construction with major industrywide shifts in construction and design. Further research should also compare the performance of undesignated older buildings with landmarked buildings and structures in historic districts.

Our analysis of the density of jobs per square foot shows that there are similar or greater concentrations of jobs in areas of cities with older, smaller buildings compared with areas with mostly large, new buildings. This supports Jane Jacobs's (1961) argument that businesses are launched and take risks in old buildings and, if successful, "grow into" new buildings as the business matures. This finding also suggests a finer point often lost in larger discussions of supply and demand. The adaptable quality of older buildings, combined with their lower required economic yield, make these structures more hospitable environments for nascent entrepreneurs and businesses operating on new business models. Cities with healthy economies will undoubtedly need both high-rise towers for large, established employers and smaller-scaled vernacular buildings for startups and fledgling retailers (Brand, 1995).

Perhaps the greatest outcomes for cities might come if planners and economic development officials recognized the valuable role that old buildings can play in supporting distinctive retail corridors of locally owned businesses, mixed-use streets with bustling sidewalk ballets, and incubators for successful startups. Any discourse presenting a false choice between historic landmark designations and laissez-faire, unencumbered development ignores how carefully crafted policy tools and development programs can support a healthy mix of old and new structures. Substantial additions and new infill projects can be found in many landmark districts.

In addition to landmark designation, there are a range of policies, programs, and codes that support the preservation and reuse of older, nondesignated buildings. Adaptive reuse ordinances like those adopted in Los Angeles and Phoenix remove barriers to building reuse and have had substantial impact on cities' built fabric (City of Los Angeles, 2006; City of Phoenix, n.d.). Deregulation of parking requirements, a component of Los Angeles' 1999 Adaptive Reuse Ordinance, supported the reuse of more than 65 older and historic buildings and led to more housing and greater variety of housing in the area (Manville, 2013; Shoup, 2011). In Maricopa County (AZ), cities near Phoenix have recently adopted or are currently considering the adoption of adaptive reuse ordinances, which suggests that adaptive reuse ordinances may represent a competitive advantage for regional development (City of Tempe, 2015). Smart building codes and flexible, performance-based codes can also support old buildings. The City of Seattle recently adopted an optional outcome-based energy code that allows architects and developers to retain character-defining features of buildings while renovating the structure for new uses (Pinch, Cooper, O' Donnell, Cochrane, & Jonlin, 2014). More broadly, conservation districts, form-based zoning, and other context-sensitive tools enable new development to fit alongside older sections of cities (Listokin, Listokin, & Lahr, 1998). Future research should catalog the variety of policies that focus on zoning, parking, and building and energy codes while supporting the preservation and reuse of older buildings.

Conclusion

In this study, we assess whether older, smaller buildings and mixed-vintage blocks are associated with greater economic and social diversity and density, as suggested by Jane Jacobs's seminal 1961 work, *The Death and Life of Great American Cities*. We find some support for her observations in our study of four cities, including significant statistical links between the presence of older buildings and a mix of old and new buildings, and measures of job and population density. However, while areas with older, smaller buildings have greater diversity of resident age and higher proportions of small businesses, we also find significantly lower proportions of Hispanic and non-White residents, indicating limited racial and ethnic diversity. This analysis suggests that city planners and policymakers should consider how cities' older buildings—both those designated and not—support small businesses and diverse communities. A focus on density alone, as recently promulgated by some economists and urban development advocates, obscures the unique and important role that older, smaller buildings play in supporting small businesses and functional, diverse neighborhoods. Evolving planning and policy tools such as conservation districts, adaptive reuse ordinances, form-based codes, reduced parking requirements, and incentives for building reuse offer important strategies to support these assets.

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Notes

1. The MAUP, in urban analysis, arises from the aggregation of point-level data under a myriad number of jurisdictional, transportation, and census zoning systems with differing sizes and boundaries. Analysis on data aggregated using these, or other, zoning systems will have different results, even when using the same analytical method and the same underlying data (compare with Horner & Murray, 2002; Wong, Lasus, & Falk, 1999).

2. Point data were aggregated to each grid cell. Data from polygon sources were disaggregated using an area-weighted distribution from census geography to grid cell similar to Wong et al. (1999). The result was a latticed set of grid cells for each city; each grid cell was assigned data from each data source and was either aggregated from point data or disaggregated from polygon data.

3. Diagnostics for spatial dependence revealed a significant Moran's *I*, suggesting the use of a spatial model and the use of the Lagrange multiplier error model for the vast majority of the dependent variables. In select instances, where diagnostics indicated that the measures in one grid square affected the values of those measures in adjacent grid squares, we used a Lagrange multiplier lag model (Anselin, 2004; Anselin & Bera, 1998; Anselin, Bera, Florax, & Yoon, 1996). The spatial lag structure was parameterized using a first-order queen weights spatial contiguity matrix selected to reflect consumption and interaction patterns between lattice-grid cells.

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