

Creative City Development as a Process of Homogenization: A Class-Based
Analysis using Agent-Based Modeling

by

Megan Elizabeth Robinson

Thesis

Submitted to the Faculty of the
Graduate School of Vanderbilt University
in partial fulfillment of the requirements

for the degree of

MASTER OF ARTS

in

Sociology

August, 2016

Nashville, Tennessee

Approved:

Date:

Daniel B. Cornfield, Ph.D

6/1/2016

Holly J. McCammon, Ph.D.

6/1/2016

Abstract

City development around the needs of a particular group or class is not a new phenomenon. The ramification of urban planning to suit the perceived needs of any one group is progress at the expense of others. The transition from a manufacturing economy to a knowledge and creative economy has caused city officials to reevaluate their economic development strategies. Heavy industry and manufacturing are no longer associated with prosperity. Industrial sectors that align more closely with the tenets of the contemporary economy are more favorable for development purposes. Using the case of Austin, Texas, this paper examines the effects of creative and super-creative industrial sector accumulation on class-based stratification via the impact of such accumulation on employment availability. The present study utilizes agent-based modeling (ABM) as a means to simulate economic change, and citizen adaptations to change, in the context of the creative city. Findings indicate that creative and super-creative sector accumulation contribute to class-based homogenization, where a decrease in employment availability outside of the rapidly accruing creative and super-creative sectors negatively impacts the ability of people not possessing a relevant skill-set to remain in the city.

Introduction

Cities are “territories in which social reproduction - a notion intimately tied to the notion of quality of life - takes place” (McCann 2007: 89). Like urban planning, the social reproduction to which McCann (2007) refers is a deliberate process. Cities are not planned in the spirit of perfect equity. People are unlikely to migrate to or stay in areas where they do not perceive opportunity to exist (Rosler 2013). Differential access to opportunity produces stratification. Austin, Texas, the current boom town of the southwest, is not an exception. There, the chamber of commerce made a calculated decision in the early 1900s to discourage heavy industry from locating in the city limits. City management believed that the pursuit of other economic sectors, such as government services, would be better towards staving off the creation of impoverished slum areas, which they associated with manufacturing (Orum 1987).

The relationship between a city, its inhabitants, and its management is reciprocal. When working class jobs exist only at a nominal level, there are fewer people working within those sectors to advocate for their own interests. The social structure of the city is reproduced over time without the input of the inhabitants whose occupations have married them to the bottom

rung of the ladder. In Austin's case, the effect has been a decades-long progression towards progress and prosperity in the context of the contemporary US economy. With an estimated population of 912,791 and counting (at 157 new residents per day), Texas' central city is one of the three fastest growing in the United States.ⁱ It is the thirteenth largest city in the country, and the fourth most populated in the state. Since 2011 Austin has been featured on fifty different national lists and rankings, placing high in lifestyle-oriented categories like top cities to live in, best cities for a particular age group, and best real estate prospects. Austin's economic outlook has been ranked in similarly flattering fashion, with Austin placing second, third, and fourth in Forbes' 2014 rankings for Best Cities for Future Job Growth, Top Large Cities for Jobs, and Most Creative Cities, respectively.ⁱⁱ

Blight avoidance is a practice in exclusivity. By associating urban blight with manufacturing, and planning an economic model based plainly in the avoidance of working class poverty, Austin city planners and officials laid a very specific foundation from which the social structure of the city would be built. Austin's push to position itself as an ideal location for conducting business has been far from directionless. The purpose of the present research is to use Austin as a case for examining the impact of knowledge and creative industry sector accumulation strategies on changes in the occupational division of labor within the city, where class proximity to the industrial sectors of interest influences perceptions of the metropolis as a livable space. Do creative development strategies foster class-based homogenization in cities?

Review of Literature

The City of Austin has a long history of routing unique paths to economic development, often operating one mode ahead of broader macroeconomic trends. As far back as 1928, city planners were being advised to focus their efforts on the city's "unique," "unusual," and

“extraordinary” characteristics, receiving explicit cautions against deviating from the city’s established “peculiar” advantages.ⁱⁱⁱ In the early 1900s, Austin’s peculiar advantages towards building a sustainable local economy included “numerous state institutions, schools, and the State University,” as well as the area’s natural beauty. These same advantages persist in the city at present, magnified tenfold by time. The city has specialized, aligned, and trained its local economy to anticipate transitions in macroeconomic approaches to product creation and processing. Though macro-scale events such as globalization and the decentralization of production and the rise of neoliberalism will not be discussed here in detail, a review of 21st century economic modalities, contemporary metropolitan planning strategy, and labor market stratification is necessary towards meaning making around the negative effects of knowledge and creative city development.

Service, Knowledge, and Creative Economies

The 21st century economy is characterized by swift technological change. More than that, it is characterized by a global economy which forces cities to actively work at reaffirming and repositioning themselves as places of economic opportunity, particularly as national and international competitors emerge and develop their own marketing strategies for business acquisition. By the 1990s it was clear that capital was relocating to and accruing in cities perceived as capable of supporting a new class of economic functions, namely the creation, exchange, and use of information (Hall 1997). These new functions, which supplanted the old ways of manufacturing and handling, represented a definitive shift towards the advancement of humans over nature.

Advanced economies, including the United States, began the transition to services as early as the 1940s (Hall 1997). The transition from industrialism, which favored production, to

post-industrialism, which favors processing, is considered an ongoing effort. For ease of classification, the service economy is often evaluated in terms of procedure and output. There are three primary criteria. In a service economy, consumption must be concurrent with production of the service, the service should have a shelf-life, and the service itself should be ultimately intangible (Roberts et al. 2000). By mid-century, manufacturing, while not obsolete, was outmoded. Service industries were on the rise in the US throughout the 1970s, but were not independent enough to generate the revenue required to incentivize intensive urban restructuring (Roberts et al. 2000). Manufacturing gave the service economy a leg to stand on, to the point where the two modes of economic production became nearly indistinguishable in some sectors (Powell and Snellman 2004). Despite acting as a support structure to services, manufacturing continued to fall further into disfavor as the century progressed. Resource allocation became intensely stratified between the old and new economic systems. The change from goods-based to people and interactions-based systems of making economic transactions had an especially profound effect on cities. A distinct trait of the service economy is the sheer variety of economic sectors in which services are located. The shift to services coincided not only with the suburbanization of white, middle-class Americans, but also with a rise in consumerism. Increased levels of consumption encouraged entrepreneurialism, which required a generalist, soft skills labor force (Law 2009).

The knowledge economy emerged in part as a niche market to fill needs and deficits manifesting from service sector growth and innovation. The preface of the knowledge economy is that “knowledge can be embodied in both goods and services (Powell and Snellman 2004: 202). Different approaches to qualifying the definition and function of the knowledge economy have identified disparate time periods for the sector’s appearance as a mode of economic

opportunity. One approach, which positions the knowledge economy as a by-product of the science-based industries that materialized in the early 1960s, maintains that theoretical knowledge is a primary source for innovation, where new discoveries and new knowledge from those discoveries engender knowledge production ad infinitum (Powell and Snellman 2004). A second and less popular approach focuses on the macroeconomic context of the 1990s, citing unique financial-market developments as causing expansions in knowledge industry and boosting knowledge industry productivity. Regardless, the knowledge economy is consistently defined as a mode which grants primacy to intellectual pursuits and applications over others, particularly the fabrication of nature, where intellectual pursuits and applications are typically designed to improve upon existing goods, services, and practices (Powell and Snellman 2004).

The co-dependency of the service and knowledge economies is similar to the relationship between manufacturing and services. In the beginning, services supported knowledge work by creating demand for innovative, intelligently designed solutions to a common problem in business conducted between persons - keeping the customer or constituent satisfied. The dependency grew, and by the mid-1980s the service sector was the largest consumer of knowledge-related technologies (Powell and Snellman 2004). The intense co-mingling of service and knowledge as economic modes posed a planning dilemma for cities. With both modes proving profitable, cities had to determine which mode, specifically, they should favor in further planning for economic growth, provided that they even should deliberately favor one over the other.

The inertia behind the knowledge economy, and the value of the goods being produced through it, had a dispersive effect. Whereas services had benefitted from technological advances and increased effort at intellectual innovation, individual members of the knowledge sphere

began to capitalize on others' dependency of their innate talents. The creative economy includes industries involved in "the generation and exploitation of intellectual property" (Cunningham and Jaaniste 2010: 31). Creative industries are focused on promoting, not improving, goods that already exist. As a by-product of the knowledge economy, the creative economy is a direct reflection of the game-between-persons transaction design identified by Bell's theorization on post-industrialism (1976). Like the knowledge economy, the creative economy is premised on a belief that certain individuals possess creative talents, skills, or other knowledge that could enhance the products of others. Creative industries make use of cultural forms, such as music, film, design, and other types of media as a way to promote and transfer creative output to the general public (Tepper 2002). The advancement of creativity as an economic form came about due to its close relationship with culture and cultural change. Knowledge and creative industries skillfully manage the generation of ideas. In the urban context, the creative economy manifests in competitive aesthetic and amenities-based growth strategies, deliberately designed to attract knowledge and creative economy workers (Florida 2002).

Transitions to Knowledge and Creative Development

Economic transitions are associated with societal restructuring. The three-fold purpose of urban policy is to encourage growth, equity and diversity (Fainstein 2005). Strategizing towards creative city development limits the capacity of urban policy to fulfill two of its three most general purposes. Knowledge and creative development strategies are representative of social structures of accumulation. Social structures of accumulation (SSA) are characterized primarily by their "distinct institutional arrangements" which reflect "the balance of power amongst capital, labor, and the state." (Lobao et al. 1999: 573). When a city government engages in creative development strategy, it signifies the presence of a growth-oriented SSA in which the

knowledge and creative industry sectors have been prioritized over others based on their structural proximity to profitability in the context of the contemporary economy. More directly, the industrial composition of social structures of accumulation is indicative of the economic development priorities set by the local institutional regime, where said regime contributes to the reproduction of the accumulation process by using policy and political influence to capitalize upon whatever resources have been determined to be economically viable (Grodach 2012).

Social structures of accumulation and the institutional regimes that ensure their continuation limit the capacity of urban policy to properly engage with diverse and equitable development strategies by virtue of their regulating the ‘rules of the game’ (Grodach 2012). Florida’s (2002) creative class thesis is an example of one such rulebook. The creative class thesis holds that cities, particularly cities whose industrial sectors are vulnerable to offshoring, must take measures to attract knowledge and creative workers in order to generate capital in the post-industrial, globalized economy (Florida 2002). State and local governments can attract workers from the knowledge and creative industry sectors by making concentrated efforts to develop open, “tolerant” spaces complete with urban amenities such as boutiques, cafés, music venues, and outdoor recreation spaces (Florida 2002; Hoyman and Faricy 2009: 314; Zukin et al. 2009). The creative class thesis, which encourages a knowledge and creative industry SSA, states that cities intending to engage with creative development strategies must arrange themselves around the needs of the workers responsible for the creation of the most profitable product. Failure to invest in soft infrastructure, namely amenities, signals to knowledge and creative workers that a city would be unable and unwilling to sustain their lifestyle.

In his criticism of the creative class thesis, Peck (2005) states that creative city development, while the darling of modern urban development policies, comes at the expense of

interurban competition and gentrification, two situations in which historically disadvantaged groups cannot sufficiently compete. Rapid urbanization and growth intensive periods of city development exacerbate social and economic inequalities. Transition processes worsen extent stratification, with upheaval in previously stable structures inducing social closure and differential bias in the reconstruction of social institutions, including city life. Creative city development is predicated on hierarchical distributions of power, where the perceptions and interests of the institutional regime and other elites overwhelmingly dictate the direction development policy will take (Carr 2012). Social closure occurs when a privileged or empowered group restricts access to opportunity by seizing upon an attribute, in this case, employable skill and proximity to economic profit, and uses it to enhance their own privilege (Parkin 1974). Gentrification is commonly defined as neighborhood ascent involving reinvestment, usually resulting in the displacement of tenured residents, the entry of people with higher levels of educational attainment or middle-or-upper-class membership, and changes in “social, economic, cultural, and physical landscape” (Owen 2012: 345). Like amenities development, gentrification is the deliberate “production of urban space” to meet the needs of a more affluent citizenry (Hackworth 2002: 815; Zukin et al. 2009). As processes of social closure in the urban context, amenities development and gentrification affirm the stratification of classes by monopolizing space and social order around the needs of a small but privileged group (Parkin 1974).

Occupational Division of Labor

No economic mode stands alone. The advancement of services did not cause manufacturing to go extinct, just as the rise of the knowledge and creative economies did not signal the end of service and service-based transactions (Thompson 1975; Cohen and Zysman 1987). It is highly unlikely that any one city is completely devoid of manufacturing, in the same

way that it is unlikely for any one city to be completely devoted to services or the knowledge and creative sectors. Still, a transition from one mode of production to another directly implies a devaluation of things associated with the former mode. This is especially true when the negative interaction between the old and the new is visible, as it is when manufacturing and significant employment in manufacturing buttressed by a creatively oriented city begins to inhibit growth (Thompson 1975).

City restructuring is a reactive response to a new division of labor between economic modes (Hall 1997). The social priority afforded to different occupations has shifted (Mouw and Kalleberg 2010). When an occupational type serves the advancement of a municipal economy, its relevancy is rewarded by opportunity. Opportunities are structurally supported and manifest differentially according to an occupation's position within the economic structure. To position work and occupations in such a manner is to link the social organization of work to what Baron and Bielby (1980) refer to as "five hierarchically connected units of analysis: economy, industry or sector, firm, job, and individual" (738). Market specialization and globalized production has caused city governments to re-evaluate which industrial sectors, exactly, contribute more towards the realization of creative city economic growth than others.

Florida's creative class thesis is prefaced upon the categorization of occupations into five distinct sectors: super-creative, creative, service, working, and agriculture. The super-creative sector is composed of professions which Florida (2002) presents as the "thought leadership of modern society," including scientists and engineers, scholars, analysts and researchers, designers and architects, and members of the bohemian class, such as artists, novelists, actors, and other cultural figures (69). Occupations in the super-creative sector are responsible for "building a better mousetrap...noticing first that a better mousetrap would be a handy thing to have" (Florida

2002: 69). The creative sector is composed of occupations in which workers are required to engage in creative problem solving. Occupations within the creative sector include financial services, legal and health care professions, business management, and jobs in the technology field. At the core of the creative sector is the autonomy given to professionals within each of the listed occupations, where people within the creative sector are often required to engage in independent thought processes while thinking of unique solutions to a variety of different problems (Florida 2002).

The autonomy that Florida (2002) attributes to workers in super-creative and creative sector occupations is a primary difference between workers in the service, working, and agriculture sectors. The service sector, which includes occupations in food preparation and food service, grounds keeping and maintenance, personal care, health care services, office and administrative support, government services, and low-end sales, is based on supporting the needs of the super-creative and creative sectors (Florida 2002). According to Florida (2002), the detriment of the service sector is its inability to produce its own knowledge base. Service occupations may require creativity, but the fabrication of these creative solutions occurs elsewhere. The working and agriculture sectors suffer the same defect. In addition to being highly routinized, occupations in the working sector – construction and extraction, installation and repair, production, and transportation – as well as in the agriculture sector - farming, forestry, and fishing – are thought to be low-skill and require only a high school degree (Florida 2002).

The majority of workers in the contemporary US economy are employed in occupations within the super-creative, creative, and service sectors (Scott 2009; Florida 2002). Storper and Scott (2009) relate employment concentration in these sectors to “slack” in metropolitan

economic bases due to employment loss in older sectors, including working class manufacturing positions and agriculture. Job polarization, a process by which middle-tier jobs disappear from the labor market, and deskilling, where automation and technological advances reduce the manual labor requirements of previously high-skilled jobs, further contribute to the structural reorientation of work and employment opportunity (Fernández-Macías 2012). In the knowledge and creative economy, privately owned knowledge and expertise are valuable commodities. Market specialization has essentialized workers who possess high levels of education and new, unique skill-sets. A primary determinant of one's social position is their occupational role (Baron and Bielby 1980). Workers in less-relevant industrial sectors do not achieve outcomes comparable to their more-relevant or less costly competition, in part because of how their occupational role has been devalued due to economic restructuring.

The market devaluation of labor is pervasive. Manufacturing workers, whose knowledge and skill-sets are considered furthest from those of workers in the knowledge and creative economies, are particularly vulnerable. In their study of labor union decline in the United States, Vachon and Wallace (2013) found that historical centers of industrialization were more likely to retain active labor movements, particularly in the private sector, than cities that were never especially reliant on manufacturing. Conversely, in service oriented or otherwise modernized cities, the “race to the bottom” for accruing knowledge and creative industry workers has the deleterious effect of reducing the power of what organized labor does exist, to the point that labor movements and unions are far less likely to be active and effective in those areas (Vachon and Wallace 2013).

Work is driven by institutions, which are in turn driven by power dynamics and internal and external politics. The dissolution of unions as formal demonstrations of worker solidarity

negatively impacts the ability of workers to resist changes in the “boundaries, mechanisms of access, and work organization of their occupations” (Fernández-Macias 2012: 163). Union fragmentation reduces the leverage labor organizations have in ensuring that work and labor in every sector maintains positions of value in the economy. Workers are being situated in increasingly precarious positions they seldom have the bargaining power to negotiate out of. Any work, blue, pink, or white collar, associated with spatial, social, or cultural flexibility is a target for offshoring. Beyond manufacturing, Kroll (2008) identifies a “globalization of services” which mobilizes work not requiring face-to-face customer interaction (81). The exact impact of globalization, which decentralizes producing, processing, and transactions, occurs unevenly among occupations. Where most economists will argue that persons in the United States who lose their jobs due to offshoring are eventually reemployed, social researchers point to occupational disparity in time until reemployment, wages, and ability to relocate if necessary.

A Theory of Homogenization

Cities are sites of social reproduction (McCann 2007). In the context of a knowledge and creative economy, creative city development practices lead to waxing-waning processes of economic attachment and detachment, acted out amongst the citizens of any city whose main heuristic for managing transition is to construct SSAs constrained by a fixed trajectory based on anticipated economic conditions. The valuable/not-valuable, useful/not-useful spectrum faced by workers in the 21st century has polarized labor and generated profound implications extending beyond micro-level, individually located effects such as employability (Skinner 2004). The built environment of a city is purposefully crafted to promote and serve the accumulation of the most profitable sector within its power to engage (Walton 1993). Structural change, like that which occurs alongside an SSA, enables city planners to redistribute their efforts and prioritize resource

allocation amongst the industrial sectors and, correspondingly, occupations, having the highest growth and profit potential (Walton 1993; Hay 2006). Social and political organization around specific sectors marginalizes people whose work and productive power does not occur within the industrial sectors on which a modern city would hope to capitalize (Hay 2006).

The present study addresses a gap in the creative development and occupational stratification literatures by framing a theme in each, stratification, around a common point of origin, class politics. Intensive development around the knowledge and creative industry sectors creates economic prosperity at the expense of people not located in the social positions that would enable them to become members of or else wise profitably participate in those sectors. The theory of homogenization being formulated and tested in the present study holds that development around industrial sectors privileging the possession of specific knowledge and learned skills over other traits associated with work and employment decreases the ability of people whose skill-sets confine them to less desirable economic sectors, like the agriculture or working sectors, to participate and live in any city that does not recognize the value of their labor, based primarily on their industry's relationship to macroeconomic conditions. I have formulated two hypotheses with which to test this theory.

H1: As a creative sector social structure of accumulation advances, where advancement is taken to mean that the creative sector is comprising steadily more of the city's overall industrial composition, the number of citizens possessing a skill-set suitable to employment in the creative sector will increase (H1a). Through that same process, the expectations for citizens possessing a skill-set suitable to employment in non-creative industries are as follows:

- The number of citizens possessing a skill-set suitable to employment in the agriculture sector will decrease (H1b).
- The number of citizens possessing a skill-set suitable to employment in the working sector will decrease (H1c).
- The number of citizens possessing a skill-set suitable to employment in the service sector will decrease (H1d).
- The number of citizens possessing a skill-set suitable to employment in a super-creative sector will increase (H1e).

H2: As a super-creative sector social structure of accumulation advances, where advancement is taken to mean that the super-creative sector is comprising steadily more of the city's overall industrial composition, the number of citizens possessing a skill-set suitable to employment in the super-creative sector will increase (H2a). Through that same process, the expectations for citizens possessing a skill-set suitable to employment in non-super-creative industries are as follows:

- The number of citizens possessing a skill-set suitable to employment in the agriculture sector will decrease (H2b).
- The number of citizens possessing a skill-set suitable to employment in the working sector will decrease (H2c).
- The number of citizens possessing a skill-set suitable to employment in the service sector will decrease (H2d).
- The number of citizens possessing a skill-set suitable to employment in the creative sector will increase (H2e).

Homogenization occurs when the distribution of skill-sets in the city converges towards an accumulation of citizens holding skill-sets suitable for participation in the knowledge and creative economy, with the number of citizens holding skill-sets associated with the manufacturing and service economy decreasing as the process continues.

Methodology and Data Analytic Strategy

The Case of Austin, Texas

Cities have begun to reorganize their economic development and planning strategies around the rise of the knowledge and creative economy (Vivant 2013; Lloyd 2002). The popularity of Florida's (2002) creative class thesis indicates that city developers perceive creativity and creative outlets as elements that are critical to livability and sustainability. Austin, Texas, is an example of a city that has aggressively pursued creative development strategies as a preferred means of generating economic growth. Since the early 2000s, Austin city officials have enacted several programs dedicated to business growth and retention in the knowledge and creative industrial sectors. One program, Chapter 380, speaks particularly well to the healthy-economy, healthy-city vision city government and developers see for the area. Chapter 380 is a piece of Texas legislation enabling the governments of individual municipalities to offer tax-

based incentives to businesses as a means of encouraging economic development. The primary tool of Austin's version of the Chapter 380 program is the Firm-Based Incentive Matrix (FBIM). An FBIM is used to score companies based on the degree to which they meet the criteria laid out for them in a matrix of scoring categories, including whether or not the firm is in a targeted industry, if the firm under review could bring additional firms within the same industrial sector to Austin, the firm's projected growth and stability, and if the firm plans to settle within the desired development zone.^{iv} A firm's score dictates the type and extent of incentive a company could be offered should it choose to locate in Austin.

The adoption of Chapter 380 and implementation of the FBIM as a means of parceling out tax incentives is indicative of a social structure of accumulation based around specific sectors of industry in the Austin area. Essentially, Chapter 380 and the firm-based incentive matrix allow city development planners to systematically determine which companies do or do not fit the assumptions associated with being a good investment in Austin's future. A firm's FBIM score is a direct indication of the concessions Austin would be willing to make in order to successfully site a qualified business. The implication of Chapter 380 and the scoring categories of the FBIM are thus; Austin is actively striving to accumulate knowledge and creative businesses, and, in so doing, is gradually changing the nature of the social landscape.

The city's current economic development climate reflects a belief on the part of city officials that Austin's growth and future financial security rely primarily on the city's ability to fully engage with the knowledge and creative economy. The creative development orientation of the social structure of accumulation, reproduced in part by the FBIM, indicates that Austin's push to position itself as an ideal location for conducting business is far from directionless, and

has instead been deliberately set by the institutional regime responsible for formulating and approving policy.

Agent-Based Modeling

Agent-based modeling utilizes computer simulation techniques to produce “purposeful representation of some real system” via the creation and replication of empirically and theoretically motivated experiments (Railsback and Grimm 2012: 4). Social science applications of agent-based modeling (ABM) are emergence oriented and purposed towards modeling the dynamic processes under which macro conditions or other institutionally based social structures may generate from individual behavior. As such, ABM is primarily concerned with individual agents and the behaviors attributable to them, holding that social phenomena are traceable to those agents’ interactions with, in, and around their social environment (Epstein and Axtell 1996). Urban scholars and sociologists have used agent-based modeling and computer simulation techniques to model patterns of residential segregation (Brown and Robinson 2006; Yin 2009). The four key assumptions of ABM are that: agents are autonomous, agents are independent, agents follow simple rules, and that agents are adaptive and capable of learning (Macy and Willer 2002). The implication of these assumptions for model theorization are discussed below.

Agent-based modeling is based on the assumption that agents have autonomy, where agents, due to or in spite of the presence or absence of institutions, structural constraints, or other individuals, act as autonomous-decision makers for their own self. ABM models emergence via self-organization, which implies that even though agents are autonomous in their decision making, they are still interdependent and influenced throughout their decision making process by the behavior of others around them or by changes to their environment. To prevent the proliferation of anomalies, agents and the processes by which they make their decisions are

bound by set rules and behaviors. In the context of agent-based modeling, rules and behaviors represent the “microrules” thought to generate social phenomena over time via their role in policing interactions between agents (Epstein and Axtell 1996: 20). The significance of these rules and behaviors to social science applications of ABM is the replication of normative social behavior via the institution of regulatory practices, similar in scope to how a citizen is expected to follow a certain civil and moral code.

Agent-based modeling is a “bottom up” approach to modeling that is used to “perform virtual experiments that test macrosociological theories by manipulating structural factors” (Macy and Willer 2002: 144). The fourth assumption of ABM, that agents are adaptive and backward-looking, represents the culmination of agent-based modeling as a methodological procedure, where capturing individual adaptations and reactions to stimuli emulates “evolutionary processes of selection, imitation, and social influence” (Macy and Willer 2002: 146). By simulating and modeling local-level interactions, social scientists who apply agent-based modeling as a means of simulating human interaction with social-structural conditions stand to develop robust understandings of the dynamics of social groups, particularly in terms of how they shape and are shaped by other beings or things (Macy and Willer 2002).

The research question of interest for this study, do creative development strategies foster class-based homogenization in cities, demands consideration for the actions of agents. City planners and officials are responsible for dictating the growth strategies under which a city’s economy will develop and change. ABM is an appropriate methodology for the present study precisely because it gives explicit consideration to the activities and behavior of agents, where the activities and behaviors of agents directly impact and sets constraints on the decisions and behavior of other actors. Planning activities result in the making of strategic and deliberate

choices designed to purposefully shape the social-structural environment of cities into a particular form. By implementing simple rules of behavior, ABM captures citizens' responses to and interactions with gradual structural change.

An Agent-Based Model of Knowledge and Creative Sector SSA

The Knowledge and Creative Sector SSA model presented here examines the impact of knowledge and creative industry sector accumulation on the social dynamics of a city by using occupational stratification as a mechanism to track changes in class composition as the SSA progresses. The given model is a stylized representation of a theory holding that knowledge and creative sector accumulation generates homogenizing processes in cities due to the impact that economic transitions have on the availability of employment by industrial sector and, consequently, occupation. The model focuses on the interactions of two types of agents, citizens and businesses, with the environment and with each other. The knowledge and creative social structure of accumulation inherent in Austin's planning and development strategy is represented by the model's environment, where the SSA forms the context in which agents have been made to function.

All agents within the model are imbued with characteristics and behaviors that determine the extent of their adaptive capabilities. An agent's characteristics inform their behavior. Characteristics given to citizen agents include an employable skill-set and income. The rules of behavior for citizen agents are sequential, where citizens must first find employment, fix their income to reflect their employment status and occupation, and then attempt to find an affordable place to live. Citizens strive primarily to find employment at a business whose skill requirements for employees exactly match the skill-set of the citizen. If citizens are unable to find an exact match between skill requirement and skill-set due to lack of employment opportunity, they

search for employment with a business whose skill requirements are one less the given skill-set of the citizen. The process of searching for secondary employment opportunities is representative of the underemployment phenomenon associated with the rise of precarious work. A citizen's employment status dictates their income, which in turn determines how much the citizen can responsibly spend on housing. Citizens that are unable to find a job have no income. Citizens who do not have an income, or who have an income insufficient for housing costs, emigrate from the city. The characteristics of business agents are skill-level requirements for employment and number of job openings. The adaptive behavior of business agents is limited to their interaction with citizens. A business must hire qualified citizens, provided that the business has at least one job opening. Businesses are geographically fixed at one location and do not engage in processes of finding an affordable location on which to settle. Businesses have not been modeled to fail in this environment, and so never emigrate from the city.

The five industrial sectors used in this model are agriculture, working, service, creative, and super-creative. These categorizations of industry sectors were informed by the occupational classifications used by Florida (2002) in the development of his creative class thesis, which represents a basic, five-sector model of the economy. The primary functions of the industrial sectors in this model are to serve as component pieces for the social structure of accumulation. A secondary function of the industrial sectors is to create points of differentiation for the level of skill a citizen agent is expected to demonstrate in order to complete the tasks associated with their occupation. The Knowledge and Creative SSA model is arranged so that citizens are always vying for an employment position at the apex of their skills. The industrial sectors and the skill-sets required for employment within them have been assigned values corresponding to their position within the hierarchy of sectoral and occupational desirability associated with the

knowledge and creative economy. For the purpose of the given model, the corresponding skill-set requirements for employment in the agriculture, working, service, creative, and super-creative industrial sectors, respectively, are 1, 2, 3, 4, and 5, with 5 representing high desirability in the context of a knowledge and creative economy and 1 representing low desirability in terms of city planners incentivizing their locating within a city.

While necessary towards capturing the emergence process expected from this stylized representation of macro-economic conditions, the skill-level/skill-set requirements set here are highly simplified and do not fully capture the skill-based occupational stratification inherent within each industrial sector. For example, Florida (2002) locates both surgeons and freelance art occupations in the same super-creative industrial sector. The odds of people in those two occupations having similar incomes, regardless of their both being employed in a highly desirable sector, are slim. Failure to capture within-industry occupational stratification creates an additional model limitation in terms of income delineation per citizen's skill-set. The limitation to income has been rectified in this model by denoting upper and lower income bounds per skill-set, with the intention of approximating the differential pay found between employees of each industry. Income in this model ranges from \$10,000 to \$140,000 and is randomly distributed dependent on one's skill-set. Additional model parameters, including rate of annual rent inflation, minimum and maximum rent values, percentage of income a citizen could responsibly spend on housing, number of new citizens entering the city annually, and proportion of environment representing vacant lots, industrial use lots, or residential lots, where all informed by what has been observed both in the United States nationally and in Austin, Texas.^v

The Knowledge and Creative Sector SSA model runs for 360 time-steps, where each time step is equal to one month. Each simulation runs for the equivalent of 30 years and begins with a

population of roughly 150 - 200 citizen agents.^{vi} 37 new citizens are introduced to the model every year, which helps to induce competition for resources, i.e., employment and housing, while at the same time representing processes of in-migration and population growth. Migrants are endowed with the same characteristics and follow the same rules and behaviors as the city's initial citizenry. Model output is graphical representations of simulated experiments in which the creative and super-creative sectors were each manipulated to represent between 10 - 50% of the city's overall industrial composition, in increments of five. These manipulations occurred via the setting up of two separate simulation experiments, one in which the creative sector was made to accumulate (H1a-e) and another in which the super-creative sector was made to accumulate (H2a-e). As no economic sector functions completely separate from the others, a simple equation was derived to ensure connectivity between sectors while the SSA was in action. The formula used to derive this relationship is represented below:

$$\text{Industrial Composition} = (100 - (\text{service} + \text{creative} + \text{super-creative})) / 2$$

The equation builds a dependency between the value of the accumulating sector and all other sectors included in the model, while acknowledging the predominance of the service sector in the contemporary US economy. The equation also reflects the proportions of Austin's industrial composition as of December 2015, when the super-creative, creative, and service sectors combined made up over 90% of Austin's industrial composition.^{vii} Experiments in creative sector and super-creative sector accumulation maintain the predominance of the service, creative, and super-creative sectors in Austin's economic model while simultaneously simulating the degeneration of empirically observed proportions.

The independent variable of interest in both the creative sector SSA experiment and the super-creative sector SSA experiment is industrial sector. The dependent variable is number of

citizens possessing each skill-set. Experiments were run with the intention of capturing the model's emergence process. Emergence is represented by change in the citizenry's class composition, where the macro-economic conditions associated with knowledge and creative industry sector accumulation causes change in the percentage of businesses associated with each industrial sector, which in turn alters the availability of employment opportunities per skill-set. A citizen agent's class membership is determined by their employable skill-set. This designation follows that which was previously set by Brint (1984), where class has been primarily and simplistically determined by the sharing of "a common resource base in the labor market...or a common relationship to the means of economic production" (42).

Findings

Hypothesis 1a, that as a creative sector social structure of accumulation advances the number of citizens possessing a skill-set suitable to employment in the creative sector will increase, is accepted. Table one shows correlations between key independent and dependent variables. The primary relationship of interest is between percentage of creative industry accumulated as part of the city's overall industrial composition and the number of citizens in possession of each level of skill-set.

Table 1. Correlation matrix between Percent Creative Sector in the City and number of citizens with each skill-set.

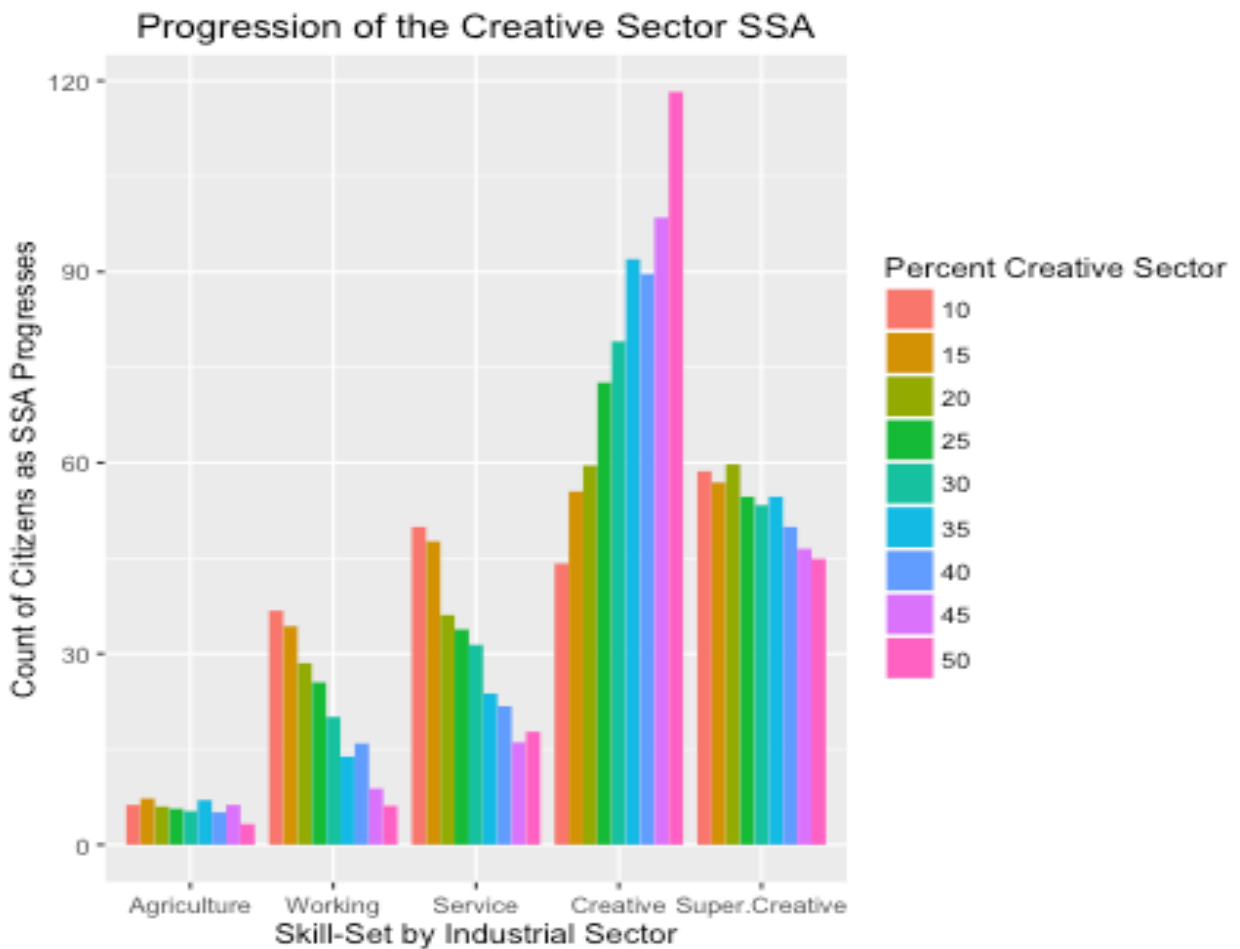
<i>Variable</i>	(1)	(2)	(3)	(4)	(5)	(6)
(1) Percent Creative Sector	1					
(2) Number with Agriculture skill-set	-0.62***	1				
(3) Number with Working skill-set	-0.94***	0.61***	1			
(4) Number with Service skill-set	-0.82***	0.57***	0.87***	1		
(5) Number with Creative skill-set	0.93***	-0.53***	-0.80***	-0.60***	1	
(6) Number with Super-Creative skill-set	-0.39***	0.12***	0.44***	0.58***	-0.17***	1

* $p < .05$, ** $p < .01$, *** $p < .001$.

As the creative sector SSA advances, the number of citizens with skill-sets in agriculture, working, service, and super-creative industries decrease. Hypotheses 1a - 1d, that number of people possessing agriculture, working, and service skill-sets would decrease as the SSA advanced is thus supported. Hypothesis 1e, that the number of people possessing a super-creative skill-set would increase, is not supported. In this model, citizens unable to find employment in their own sector or in the sector requiring 1-minus the value of their true skill-set were asked to make their income zero, thus rendering the worker unable to find affordable housing and forcing them to emigrate from the city. An influx of creative sectors workers would complicate the ability of a super-creative worker who was unable to find a job within their own sector to find a job in the sector immediately below them. It is also possible that the absolute number of people possessing the creative skill-set created too much competition among creative sector skill holders and super-creative skill holders for desirable homes. The decrease in number of people is statistically significant in each skill-set. There is a significant, positive correlation between the percentage of creative industry that has been accumulated and number of citizens possessing a creative sector skill-set. Figure 1 shows the observable effects of this correlation between

number of citizens possessing each level of skill-set and increase in percentage of creative industry conducting business in the city. As stated previously, citizens with agriculture, working, service, and super-creative skill-sets experienced steady decline in their numbers as the percentage of creative industry increased. In contrast, citizens with the creative skill-set saw an increase in their absolute number as the creative industry SSA progressed.

Figure 1. Graph depicting change in number of citizens possessing each level of skill-set by percentage of creative industry accumulation over a span of 30 simulated years.



The results of table one further indicate that there are moderate to strong correlations between each industry sector by number of citizens employed within them. For agriculture, there is a positive correlation between number of people employed in working class industry, the

service industry, and the super creative industry. For working, there is a positive correlation between number of people employed in the service and super-creative industries. For service, there is a positive correlation between number of people employed in the super-creative industry. There are no positive correlations between number of people employed in creative industry and number of people employed in any other sector.

Hypothesis 2a, that as a super-creative sector social structure of accumulation advances the number of citizens possessing a skill-set suitable to employment in the creative sector will increase, is supported. Table two shows correlations between key independent and dependent variables. The primary relationship of interest depicted in table two is between percentage of super-creative industry accumulated as part of the city’s overall industrial composition and the number of citizens in possession of each level of skill-set.

Table 2. Correlation matrix between Percent Super Creative Sector in the City and number of citizens with each skill-set.

<i>Variable</i>	(1)	(2)	(3)	(4)	(5)	(6)
(1) Percent Super-Creative Sector	1					
(2) Number with Agriculture skill-set	-0.04***	1				
(3) Number with Working skill-set	-0.85***	0.11***	1			
(4) Number with Service skill-set	-0.65***	0.19***	0.77***	1		
(5) Number with Creative skill-set	0.25***	0.22***	-0.03***	0.31***	1	
(6) Number with Super-Creative skill-set	0.92***	0.01	-0.71***	-0.45***	0.29***	1

* $p < .05$, ** $p < .01$, *** $p < .001$.

There is a negative correlation between percentage of super-creative industry in terms of the city’s overall industrial composition and number of citizens in possession of the agriculture, working, and service sector skill-sets. Hypotheses 2b - 2d are thus supported. The correlation is particularly strong for citizens in possession of the working skill-set. There is a positive

correlation between percentage accumulation of super-creative industry and the number of citizens holding skill-sets associated with the creative or super-creative industrial sectors, where the positive progression of a super-creative SSA increases the absolute number of creative and super-creatively employed citizens. As such, hypothesis 2e is supported as well. Figure 2 shows the observable effects of these correlations on change in number of citizens possessing each level of skill-set as the percentage of super-creative industry in the city increases. The agriculture, working, and service skill-sets saw a decline in their number as the super-creative SSA advanced. Conversely, number of citizens with the creative and super-creative skill-sets increased.

Figure 2. Graph depicting change in number of citizens possessing each level of skill-set by percentage of super-creative industry accumulation over a span of 30 simulated years.

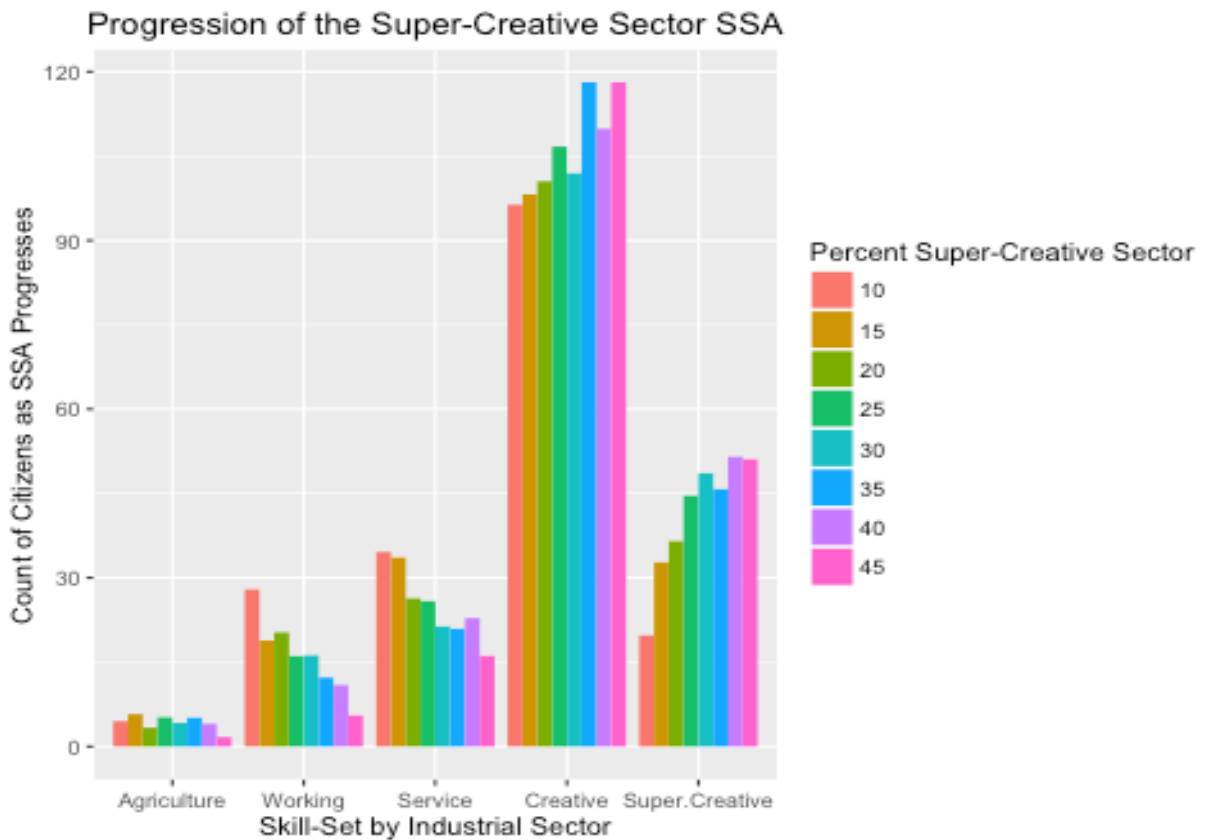


Table two also indicates that there are weak to moderate correlations between the number of people having the corresponding skill-set per industrial sector. The correlation between number of people with the working sector skill-set and number of people with the service sector skill-set was the one exception, with there being a strong positive correlation between employment in those sectors. Number of citizens with the agriculture skill-set was positively correlated with numbers of citizens with the working, service, and creative skill-sets. Number of citizens with the working sector skill-set was negatively correlated with the number of creative sector citizens, and strongly negatively correlated with the number of super-creative skill-set holders. Number of citizens with the service industry skill-set was positively correlated with number having the creative skill-set type, but negatively correlated with number of the super-creative type. The absolute numbers for the creative sector were positively correlated to the super-creative sector.

Discussion

The emergence process of interest in the Knowledge and Creative SSA model was change in the city's class composition, using the mechanism of employable skill-set to denote the class positionality of citizens. Change occurred as the result of an advance of creative and super-creative social structures of accumulation towards holding greater proportions of a city's overall industrial composition. The market devaluation of occupations and labor within the agriculture, working, and service sectors has a deleterious effect on the ability of low to moderately skilled workers to work and live within the confines of a city that aggressively implements creative development policies. These citizens cannot compete against higher-skilled others in searching for affordable housing and for applicable work, assuming some higher-skilled citizens are in a situation of underemployment.

The findings indicate that the advance of creative and super-creative structures of accumulation produced change in the composition of the simulated city's citizenry skill-set. Specifically, increasing the percentage of creative industries and the percentage of super-creative industries had effects with skill-set composition converging towards homogeneity, where the number of citizens employed in the creative or super-creative industry sectors increased (H1a, H2a) while the number of citizens in possession of the service, working, and agriculture, sector skill-sets decreased over the course of the simulation (H1b-d, H2b-d) until most citizens in the model were of the creative and super-creative groups (H2e). This is true even though Hypothesis H1e, that as the creative-sector accumulated the number of people in possession of the super-creative skill-set would increase, was not supported. Figure one indicates that there are more citizens with the super-creative skill-set than citizens with the agriculture, working, or service sector skill-sets.

The convergence pattern affirms what is already known about the nature of social structures of accumulation, that their design reflects desired power balances (Lobao et al. 1999). Failure to incorporate heavy-industry or manufacturing into a city plan is a disservice to those whose occupational training, prior work experience, or educational preparation falls short according to the city government's standards. Austin's firm-based incentive matrix system for determining tax-break incentives for companies in the creative and super-creative sectors is an example of a practical application of SSA in contemporary urban development policy. When SSAs around creative and super-creative sector development are enacted, they initiate processes of social closure which, due to institutional arrangements, limit the potential for urban equalitarianism and hasten the displacement of out-group members (Carr 2012; Parkin 1974). As such, creative development strategizing, while economically supported, fails to be socially

mindful for the potential class-based segregation such policies can incur. The stark necessity of such policies must be evaluated; in both experiments, working and service sector skill-sets were positively correlated to each other, which suggests that increased opportunity for one could bolster the other, with the additional benefit of tightening “slack”.

Mouw and Kalleberg (2010) have stated that the social priority afforded to different occupations has shifted. The Knowledge and Creative SSA model successfully depicts Baron and Bielby’s (1980) “five hierarchically connected units of analysis” as it relates to both the social and development policy reprioritizing associated with the knowledge and creative economic context by demonstrating that agents and the structures operating around them are mutually replicative. Increasing employment opportunity in one industrial sector over others resulted in a decrease in the number of citizens possessing a skill-set other than the one associated with employment in the favored industry. This effect is especially true for increases in the percentage of creative industry, which caused a reduction in number of citizens with agriculture, working, service, and super-creative skill sets. Increases in the percentage of super-creative industry produced deleterious effects only in number of citizens holding the agriculture, working, and service skill-sets. The patterns observed here would not have occurred were it not for the relationship between the economic context, sector, business, occupational requirements for employment, and individual citizens (Baron and Bielby 1980).

Conclusion

The purpose of the present study was to determine if creative development strategies, like those recommended by Florida (2002), foster patterns of class-based homogenization in cities. The mechanism for conducting this research was to construct an agent-based model based on the observed practices of Austin, Texas, a growing technology hub that has aggressively pursued

creative development tactics. Class was examined as a product of one's occupational status and skill-set, where availability of employment and occupational location within a certain industrial sector both contribute to class positionality. The findings have significant implications towards the theorization of knowledge and creative social structures of accumulation as mechanisms of homogenization in the urban context.

Social structures of accumulation are designed around authoritative bodies' perceptions of macroeconomic conditions. City development in the context of the contemporary US economy has been understudied at the micro level. This study sought to address the social inequalities - specifically the ability of individuals to find relevant employment, affordable housing, and, ultimately, remain in the city – that may arise from favoring creative and super-creative industry in city economic development planning. The findings indicate that the economic development practices associated with creative city development strategies produce class-based homogenization.

Future research in this area should examine creative and super-creative social structures of accumulation as mechanisms towards homogenization in urban populations along racial and ethnic groups. Several increasingly creatively oriented cities, including Austin, have demonstrated an unusual change in their racial composition in recent years. These patterns of demographic change, particularly decreases in the percentage of African American residents in creative cities, indicates that one's risk of displacement and exclusion from urban life may not be dictated solely by one's employable skill-set.

Many large metropolitan areas, including old, embattled manufacturing stalwarts like Detroit or Cleveland, cannot afford to bypass a strategy as promising on its face as creative development. However, those city governments must carefully weigh the benefits of deploying a

creative development strategy against the risks of marginalizing citizens whose work is not supported by creative or super-creative occupational structures. Transitions towards creative development, where creative development is denoted by a preference on the part of city officials for industry that falls within the creative and super-creative sectors over others, have observable impacts on city life. In order to prevent citizen displacement by skill-set, city planners must commit to economic development and growth initiatives that would sustain a minimum percentage of each industrial sector as part of the city's overall industrial composition. To do otherwise leads to the willful exclusion of less skilled citizens from cities whose economic prosperity would be made totally inaccessible to them due to the inhospitable nature of the urban environment in terms of ability to find employment and earn an income sufficient enough to afford housing.

Works Cited

- Baron, James N. and William T. Bielby. 1980. "Bringing the Firms Back in: Stratification, Segmentation, and the Organization of Work." *American Sociological Review* 45(5): 737 – 765.
- Bell, Daniel. 1976. *The Cultural Contradictions of Capitalism*. New York: Basic Books.
- Brint, Steven. 1984. "New-Class and Cumulative Trend Explanations of the Liberal Political Attitudes of Professionals." *American Journal of Sociology* 90(1): 30-71.
- Brown, D. G., and D. T. Robinson 2006. Effects of heterogeneity in residential preferences on an agent based model of urban sprawl. *Ecology and Society* XX(YY): ZZ.
- Carr, John. 2012. "Public Input/Elite Privilege: The Use of Participatory Planning to Reinforce Urban Geographies of Power in Seattle." *Urban Geography* 33(3): 420-441.
- Cohen, Stephen S. and John Zysman. 1987. "Why Manufacturing Matters: The Myth of the Post-Industrial Economy." *California Management Review* 29(3): 9-26.
- Cunningham, Stuart and Luke Jaaniste. 2010. "The Policy Journey Toward Education for the Creative Economy." Pps. 29-44 in *Education in the Creative Economy: Knowledge and Learning in the Age of Innovation*, ed. by Daniel Araya and Michael A. Peters.
- Epstein, J.M and Robert Axtell. 1996. *Growing Artificial Societies: Social Science from the Bottom Up*. Brookings/MIT.
- Fainstein, Susan S. 2005. "Cities and Diversity: Should We Want It? Can We Plan For It?" *Urban Affairs Review* 41(1): 3-19.
- Fernández-Macías. 2012. "Job Polarization in Europe? Changes in the Employment Structure and Job Quality, 1995-2007." *Work and Occupations* 39(2): 157-182.
- Florida, Richard. 2002. *The Rise of the Creative Class: And How it's Transforming Work, leisure, Community and Everyday Life*. New York, NY: Basic Books.
- Grodach, Carl. 2012. "Before and After the Creative City: The Politics of Urban Cultural Policy in Austin, Texas." *Journal of Urban Affairs* 34(1): 81-97.
- Hackworth, Jason. 2002. "Postrecession Gentrification in New York City." *Urban Affairs Review* 37(6): 815-843.
- Hall, Peter. 1997. "Modelling the Post-Industrial City." *Futures* 29(4/5): 311-322.
- Hay, Colin. 2006. "What's Globalization Got to Do with It/ Economic Interdependence and the Future of European Welfare States." *Government and Opposition* 41(1): 1-22.

- Hoyman, Michele and Christopher and Faricy. 2009. "It Takes a Village: A Test of the Creative Class, Social Capital, and Human Capital Theories." *Urban Affairs Review* 44(3): 311-333.
- Law, Alex. 2009. "The Callous Credit Nexus': Ideology and Compulsion in the Crisis of Neoliberalism." *Sociological Research Online* 14(4).
- Lloyd, Richard. 2002. "Neo-Bohemia: Art and Neighborhood Redevelopment in Chicago." *Journal of Urban Affairs* 24(5): 517-532.
- Lobao, Linda et al. 1999. "Macrolevel Theory and Local-Level Inequality: Industrial Structure, Institutional Arrangements, and the Political Economy of Redistribution, 1970 and 1990." *Annals of the Association of American Geographers* 89(4): 571-601.
- Macy, Michael W. and Robert Willer. 2002. "From Factors to Actors: Computational Sociology and Agent-Based Modeling." *Annual Review of Sociology* 28: 143-166.
- Mouw, Ted and Arne L. Kalleberg. 2010. "Occupations and the Structure of Wage Inequality in the United States, 1980s to 2000s." *American Sociological Review* 75(3): 402-431.
- McCann, Eugene J. 2007. "Inequality and Politics in the Creative City-Region: Questions of Livability and State Strategy." *International Journal of Urban and Regional Research* 31(1): 188-196.
- Orum, Anthony B. 1987. *The Making of Modern Austin: Power, Money & the People*. Austin, TX: Texas Monthly Press.
- Owens, Ann. 2012. "Neighborhoods on the Rise: A Typology of Neighborhoods Experiencing Socioeconomic Ascent." *City and Community* 11(4): 345-369.
- Parkin, Frank. 1974. "Strategies of Social Closure in Class Formation." pp. 1 – 19 in *The Social Analysis of Class Structure*. Frank Parkin, ed. Tavistock Publications: London.
- Peck, Jamie. 2005. "Struggling with the Creative Class." *International Journal of Urban and Regional Research* 29(4): 740-770.
- Powell, Walter W. and Kaisa Snellman. 2004. "The Knowledge Economy." *Annual Review of Sociology* 30: 199-220.
- Railsback, S.F. and Volker Grimm. 2012. *Agent-Based and Individual-Based Modeling: A Practical Introduction*. Princeton University Press.
- Roberts, Joanne et al. 2000. "Knowledge and Innovation in the New Service Economy." Pp. 10-19 in *Knowledge and Innovation in the New Service Economy*. Birgitte Andersen, ed. Edward Elger Publishing.

- Rosler, Martha. 2013. *Culture Class*. Sternberg Press.
- Scott, Allen J. 2009. "Human capital resources and requirements across the metropolitan hierarchy of the USA." *Journal of Economic Geography* 9: 207-226.
- Skinner, Curtis. 2004. "The Changing Occupational Structure of Large Metropolitan Areas: Implications for the High School Educated." *Journal of Urban Affairs* 26(1): 67-88.
- Storper, Michael and Allen J. Scott. 2009. "Rethinking human capital, creativity and urban growth." *Journal of Economic Geography* 9: 147-167.
- Tepper, Steven J. 2002. "Creative Assets and the Changing Economy." *Journal of Arts Management, Law, and Society* 32(2): 159-168.
- Thompson, Wilbur. 1975. "Economic Processes and Employment Problems in Declining Metropolitan Areas." Pp. 187-196 in *Post-Industrial America: Metropolitan Design and Inter-Regional Job Shifts*. George Sternlieb and James W. Hughes, eds. Rutgers - State University of New Jersey Press.
- Vachon, Todd E. and Michael Wallace. 2013. "Globalization, Labor Market Transformation, and Union Decline in U.S. Metropolitan Areas." *Labor Studies Journal* 38(3): 229-255.
- Vivant, Elsa. 2013. "Creatives in the city: Urban Contradictions of the Creative City." *City, Culture and Society* 4: 57-63.
- Walton, John. 1993. "Urban Sociology: The Contribution and Limits of Political Economy." *Annual Review of Sociology* 19: 301-320.
- Yin, Li. 2009. "The Dynamics of Residential Segregation in Buffalo: An Agent-Based Simulation." *Urban Studies*: 1-22.
- Zukin, Sharon et al. 2009. "New Retail Capital and Neighborhood Change: Boutiques and Gentrification in New York City." *City and Community* 8(1): 47-64.

ⁱ Retrieved from <http://www.forbes.com/sites/erincarlyle/2015/01/27/americas-fastest-growing-cities-2015/2/#329a25e34cf2>. Accessed online. April 8, 2016.

ⁱⁱ Sourced from <http://www.austintexas.gov/departments/local-and-national-rankings>. Accessed online. April 5, 2016.

ⁱⁱⁱ From “A City Plan for Austin, Texas” page 2. Written by development consultants Koch & Fowler, 1928. Manuscript located at the Austin History Center call number A 711.409764 KO.

^{iv} The desired development zone (DDZ) is essentially any part of the greater Austin area not falling into a natural watershed protectionary area. There is a clear demarcation of the DDZ by location of major roadways. Coincidentally, some of the most affluent areas of the city, including Westlake Hills/Rollingwood (suburban), Tarrytown (very suburban), Mt. Bonnell (very suburban), and Cat Mountain (very suburban), are located within watersheds and therefore are excluded from the DDZ.

^v It is recommended that one not spend more than 25 - 30% of income on rent (<http://fortune.com/2015/08/04/housing-30-percent-rule/>). Though considered difficult to follow in contemporary times, the longevity of this recommendation and the use of it in this model is a reflection of the burden housing needs coupled with inadequate income creates for the average citizen. Annual rent inflation in this model was set at 1.5%. Rent values were distributed randomly amongst patches designated as residential lots, with minimum rent being 208 and the maximum being 3850. Citizens were randomly assigned to different race/ethnicities in the model, but as race/ethnicity is not a variable of interest in this particular study, and as the model was not built to capture processes such as implicit bias in employment or residential segregation patterns by race, meaning race had no impact on the citizen's other characteristics or behavior, information regarding this variable has not been included. 38% of the model's patches were designated to industry, 42% to homes, and 20% to vacant lots. Every year 10% of the vacant lots were made to become housing, including affordable housing.

^{vi} The model is initialized with 450 citizens. At the point of initialization, roughly half of those citizens are unable to find employment, set their incomes to zero, and are immediately kicked out of the model before they can be incorporated into data output for analysis.

^{vii} The industrial composition of Austin for the year 2015 was derived from Transwestern's “Austin Economy Market Watch.” Transwestern is a real estate company based in Austin that specializes in capital markets and tenant advisory. The “Austin Economy Market Watch” is a document intended to give future investors and residents an accurate picture of the economic market they are coming in to when moving to the Austin area. The document indicates that occupations in four of the sectors identified by Florida, working, service, creative, and super-creative, had seen growth in 2014. Growth in the service, creative, and super-creative was more extensive than growth in the working sector. Information for the agriculture sector is not provided in the document. Due to site maintenance, County Business Pattern data was not available for use in this study.