# Does Place Contribute to Creativity, Entrepreneurship and Innovation?

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Keywords: creative class, artist location, indicator species, human-scale interaction, creative milieu, economic dynamism

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## *Introduction*

Cultures of Creativity: The Centennial Exhibition of the Nobel Prize poses a simple question to its audience: "What is the most meaningful in the creative process: the creativity of the individuals or the environments in which their work is carried out?" (Lindqvist 2001 p. 9). The exhibition is not meant to detract from the singular genius of the individuals receiving 700 awards, but the question does reduce the dimensionality of honoring these achievements: creativity is distilled as the common critical input across the sciences and humanities, and ten environments that have been particularly fertile in generating Nobel laureates are highlighted. Profiles of these ten environments or creative milieus provide a rare window on the importance of genius *in situ,* thriving on pluralism and unfettered interaction across all levels of organizational hierarchy.

In this paper, we are interested in examining similar—though usually more mundane—phenomena, at larger spatial scales. The motivation for this exercise comes from the academic and policy debates surrounding work on 'creative cities' (Landry 2000) and 'the creative class'

(Florida 2002a), and the contention that places can contribute quite a bit to creativity, entrepreneurship and innovation. In contrast to the Centennial Exhibition, where the insoluble nature of the central question enlivens the story, the failure to isolate the contribution of environment from that of the individual in the discussion of creative cities has enfeebled the debate. Proponents of creative city development strategies have been characterized in academic critiques as junk scientists who merely "know a creative city when they see it." Unfortunately, these critiques have been unable to refute empirically creative city claims, finding the messenger a much easier target than the message. Lost in the debate is the need to empirically struggle with the possibility that town and city planning, cultural policy, or other quality of life issues may directly affect the economic dynamism of a local economy by stimulating the creative energies of its residents.

The creative class debate is useful for identifying problems with the various empirical constructs used by Florida and his collaborators to validate the theory. Our discussion begins by framing this debate, which also provides additional insight on possible strategies to measure the conceptually nebulous construct of creative milieu. We then test whether the creative class and its attraction fuel growth as hypothesized. We then ask whether creative places can be identified apart from the tautological definition requiring a concentration of creative occupations. We derive an empirical measure for this intangible creative characteristic of place using artists as an indicator species of creative milieu. Our findings provide evidence of what we call a "weak definition of creative milieu" across all counties in the US, where a relative surplus of artists was associated with faster growth in other highly creative occupations (Wojan, Lambert and McGranahan, forthcoming). However, evidence that creative milieu affects outcomes such as rates of new firm formation or employment growth (i.e., a strong definition of creative milieu)

applied only to nonmetropolitan counties; the findings for metro areas were merely suggestive. We conclude with a discussion of research needed to answer definitively whether place makes an independent contribution to entrepreneurship and innovation throughout the US.

## *The Creative Class Debate: Squelchers vs. Hipsters*

Academic critiques of Florida's 2002 publication of *The Rise of the Creative Class* were a relatively long time in coming. Perhaps it was hoped that a book written for a popular audience would have its biggest impact on the remainder bin. However, Florida's eventual coronation as urban development guru by the popular press required response from academia. Unfortunately, this delayed response degraded the level of debate because the central ideas corroborated by thin empirical evidence were never challenged by robust evidence. Instead of challenging ideas, the thinness of the evidence became the issue.

The most fundamental critique is that there is nothing especially creative about many members of the creative class. The class is defined by using 10 out of 22 broad occupational categories that conflate high human capital requirements with creativity (Markusen 2006). Funeral directors, claims adjusters and teacher aides are all members of Florida's creative class even if the focus groups he convened for his study contained mainly designers, engineers, scientists, and artists. The uncritical compilation of the creative class opens up the theory to its most biting academic critique—that it has merely found a clever way to repackage human capital theory (Glaeser 2004).

In addition to being overinclusive, the construction of the creative class is also criticized for imposing false common interests across a highly heterogeneous set of genuinely creative workers (Markusen 2006; Hansen, Vang and Asheim 2005). Empirically, Markusen's (2006) in-depth study of artists questions the putative affinity between high-tech industry and the arts

asserted by Florida, noting that high-tech centers such as Silicon Valley and Chicago have a relative deficiency of artists. This doubt is reinforced conceptually in an analysis of the knowledge bases that differentiate occupations within an aggregate creative class (Hansen, Vang and Asheim 2005). Engineers, scientists and artists are likely to display different migration tendencies given differences in the spatial scale pertaining to synthetic, analytic and symbolic knowledge bases that underlie their work, respectively. Occupations reliant on an analytic knowledge base that is highly codified will be most mobile and thus most receptive to policies attracting talent. In contrast, workers in media, advertising, and the arts may be much less mobile given the dual tacit/codified nature of symbolic knowledge.

Despite the earnestness of these critiques, they do nothing to address the central policy question of whether attracting talent is now the key to urban growth, or to move the debate forward regarding the possibility that a place might reinforce the creativity of its workers. In the context of a policy debate that is rapidly moving forward, the academic critiques come across as rather limp "revise and resubmit" verdicts.

On the other side of the debate, weak empirical evidence plays perfectly into the implied hipster gestalt of the creative class: "we know cool places when we see them, and a few confirmatory correlations is all a skeptic needs to become a hepcat, too." Whether intentional or not, suggestive findings have not garnered the type of follow-up commonly expected from researchers concerned about their academic reputation. We briefly review work by Florida (2002b) and Lee, Florida and Acs (2004) which find associations between arts employment with hi-tech industry employment and new firm formation, conjectured to result from a common, unobserved environment or creative milieu.

The focus on "bohemians" (visual, applied and performing artists and authors) in these two studies addresses the potentially serious problem of conflating inputs and outcomes in the isolation of creative milieu. Since bohemians are not reasonably expected to have a direct influence on high-tech industry or entrepreneurial dynamism, their association stems from common unobserved factors that could include creative milieu. But merely asserting that the data are consistent with an unobserved factor they label creative milieu fails to control for confounding factors that may be associated with both the explanatory and outcome variable. That is, a putative creative milieu may be explained by an observable omitted variable. The analyses in both Florida (2002a) and Lee. et al. (2004) leave out the size of the university sector that plausibly could be the unobserved factor explaining the association between the arts employment share and economic dynamism (Wojan, Lambert and McGranahan, forthcoming).

So what exactly is this creative milieu? When defined with respect to outcomes, describing a creative milieu is simple enough. For Landry (2000 p. 133) it is a place where "face-to-face interaction [among a critical mass of entrepreneurs, intellectuals, social activists, artists, administrators, power brokers or students] creates new ideas, artefacts, products, services and institutions and, as a consequence, contributes to economic success." Florida's latest rendition of creative milieu is a place where "a prominent presence of artists, musicians, and other creative people increases overall creativity and innovation by providing stimulus and inspiration for those who actually produce innovations" (Stolarick and Florida 2006, p. 1801).

The definition becomes more strained when defining the requisites for a creative milieu, which are arguably present in nearly all cities:

> [it] is a place…that contains the necessary preconditions in terms of 'hard' and 'soft' infrastructure to generate a flow of ideas and inventions…'Hard' infrastructure is the nexus of buildings and institutions such as research institutes, educational

> establishments, cultural facilities and other meeting places as well as support services including transport, health and amenities. 'Soft' infrastructure is the system of associative structures and social networks, connections and human interactions, that underpins and encourages the flow of ideas between individuals and institutions. (Landry, 2000 p. 133).

Markusen's (2006) main criticism of Florida's use of artists as a signal of creative milieu is that his studies fail to examine the location decisions of artists. His 'bohemian index' is a very useful instrument for producing a confirmatory association for his theory, yet for some reason it does not generate enough interest to warrant closer examination.

Resolving the impasse between the squelchers and the hipsters seems simple enough—let artists move the debate forward. If the main criticism of creative class proponents is weak evidentiary standards that reduce to "knowing creative milieu when they see it," merely nominate cooler and much more numerous surrogates. If artists know a creative milieu when they see it, then those places with vibrant creative milieus should tend to have a relative surplus of artists, given that creativity is the critical job function in arts occupations and that artists are generally more footloose than other workers are. In this way, the location decisions of artists could reveal preferences for "the system of associative structures and social networks, connections and human interactions" making up the intangible soft infrastructure that has eluded empirical analysis.

Before identifying creative milieux, it is important first to determine whether the attraction of the creative class is critical to growth. The fact that a definitive answer to this question only recently emerged five years after publication of *Rise of the Creative Class* is further evidence of a somewhat dysfunctional debate.

## *Does the Creative Class Fuel Growth?*

The principal policy recommendation that cities must attract and retain creative workers is derived from three premises: 1) urban economic development now depends largely on novel combinations of knowledge and ideas, 2) certain occupations specialize in this task, and 3) people in these occupations are drawn to areas providing a high quality of life. Accepting or rejecting the advisability of the policy recommendation would appear to be a simple task of testing the association between 1) and 2), controlling for other possible confounding factors, and then confirming premise 3). In the end, it took a disinterested third party to perform these tests.

Our interest in the creative class debate grew out of the growing importance of natural amenities in explaining rural population growth. A rural variant of the creative class thesis, where highly skilled workers traded wages for quality of life in the middle of their productive lives seemed plausible, though at odds with the common belief that recreation, tourism and retiree migration were the main sources of growth. The first problem we faced in trying to test the theory in rural areas was very weak construct validity of Florida's original measure in isolating highly creative, footloose workers. For example, schoolteachers and health care practitioners are included in Florida's measure, and these occupations comprise a relatively high proportion of the workforce in declining rural counties. Inclusion of occupations providing essential services to a local population would confound inference regarding the contribution of creative occupations to economic development. We recast the creative class measure to address this problem, along with the exclusion of occupations requiring little creativity, which is outlined in Table 1 (McGranahan and Wojan 2007).

[Table 1 about here]

The second problem we faced was dealing with problems of endogeneity between growth in population, employment and the creative class. A three-stage-least-squares model was specified to estimate the structural parameters relating growth in the creative class to growth in employment and population. Finally, controlling for a large number of local attributes allowed explicitly testing whether the associations between the creative class and growth reported by Florida were real, or if the creative class merely served as a proxy for other explanations of growth such as the endowment of human capital.

Table 2 summarizes the critical empirical findings from the effect of the initial level and growth of the creative class on employment growth and net migration in nonmetropolitan counties (McGranahan and Wojan 2007). Although the association between the creative class share in 1990 and employment growth is compelling, the question of most interest for the creative class debate is whether creative workers follow job opportunities or not. Our results suggest that employment growth does not predict creative class growth, consistent with Florida's theory. However, growth in the creative class is a powerful predictor of employment growth. At least in the nonmetropolitan environment these results suggest that the attraction of the creative class is a preferable strategy to the tradition economic development strategy of the recruitment of jobs.

[Table 2 about here]

Our interest in the creative class was not motivated by urban development questions. However, we did append an analysis of metropolitan counties to accommodate the interests of referees and the readership of a regional science journal. Notwithstanding a model specification derived for rural counties, the impact of the creative class on employment growth was large and robust in metro counties as well (Table 3). The results again confirmed that the concentration of

creative occupations did a much better job of explaining differences in growth in employment than the level of educational attainment of the population. The fact that the model was not purposely constructed for analysis of urban phenomena argued against application of a simultaneous equation model, so we are unable to address the "jobs following creative people" finding from the nonmetro analysis.

[Table 3 about here]

The metro results also reinforce critiques that Florida erroneously uses aggregate MSA-level data to support his argument that the creative class is drawn to vibrant central cities where it fuels growth (for a summary see Markusen 2006). Our results suggest that the creative class is diffusing outward from central cities, growing most rapidly in sparsely settled suburbs. These results do not necessarily refute the claim that a vital urban core is critical to attracting young, creative professionals, but it does compel a more nuanced and sophisticated treatment of the life-cycle residential choices of the creative class.

Our findings also confirmed that growth in the creative class is associated with particular local characteristics, which are at least suggestive of some policy instruments that may be able to attract the creative class (McGranahan and Wojan 2007). Given our initial focus on natural amenities, our analysis is able to affirm their attractiveness to the creative class. From the policy perspective, a positive association between creative class growth and employment in sporting goods stores suggests increasing opportunities to enjoy the outdoors may have much broader application than the tradition focus on tourism development.

A significant though rarely mentioned lacuna in Florida's empirical measurement of the creative class is his exclusion of self-employed persons. In using establishment-level data from the Occupational Employment Statistics survey, his rankings fail to account for the substantial

and growing collection of freelance creative workers in many places. However, it is highly plausible that the contribution of the creative class to local growth is dependent on a rich subcontracting network and the spin-off of entrepreneurial ventures. To investigate this possibility further, we interacted the share of employment in the creative class with the share of workers who were self-employed (McGranahan, Wojan and Lambert 2006). Our initial thought was that interaction would correct for deficiencies in both proxies. For example, high self-employment rates are observed in places with few formal employment opportunities, but a low share of employment in the creative class in these places would deflate the interaction. Similarly, high creative class employment may be institutional in nature—concentrated in government facilities, large teaching colleges, etc.—but with little private initiative in the local economy, suggesting that some creative class magnets may not be highly dynamic. Our findings for nonmetro counties in the US are a striking demonstration that the presence of talent, alone, is not enough to fuel dynamic local employment and establishment growth (Figure 1). Private initiative, embodied in high self-employment rates, is the other necessary ingredient.

[Figure 1 about here]

Clearly, if the ability to generate new employment opportunities or new businesses is a primary indicator of the creative energies in a place, then the graph above refutes the central tenet of creative class theory that creative places can be identified solely by the concentration of creative workers. Something other than a creative ethos attracts creative workers to, at least some, places. If creative places cannot be identified simply by their appeal to creative workers, then what can identify them?

## *Are Creative Places Identifiable?*

Our main critique of the creative class debate has been its inertness in seriously challenging the main contention that nurturing the creativity of people is a feasible and preferred strategy for increasing innovation and dynamism in a local economy. Critics have pointed to serious deficiencies in the empirical analyses supporting these claims, but have not proposed alternatives to the tautological conflation of creative workers and creative places.

Rather than using the creative class as an indicator, input and outcome of creative places, our strategy in identifying creative places is to use growth in the creative class as one validation of our indicator (Wojan, Lambert and McGranahan forthcoming). This addresses the central, though previously untested contention, that creative workers are attracted to creative places. An indicator meeting this validation test would satisfy our weak definition of creative milieu, which is a place capable of attracting a broad set of creative workers but with no requirement that the milieu makes an independent contribution to outcome indicators of economic dynamism. If our indicator of creative places were also associated with faster rates of new firm formation or employment growth, then this would satisfy a strong definition of creative milieu. The strong definition of creative milieu provides the first hard test of creative class theory.

The conjecture that artists serve as a signal for creative milieu put forth by Florida (2002b) and Lee, Florida and Acs (2004) is compelling but ultimately unpersuasive as implemented. However, the idea that an easily observable quantity could potentially provide valuable information on a complex but unobserved environmental condition has been a central concern of conservation biologists (Landres, et al 1988). The analogy between the signal role of artists in identifying a creative milieu and the role of indicator species in identifying complex environmental conditions is straightforward. In both cases, the environmental phenomena of interest are observable, although very costly or difficult to measure. Similarly, the relative

prevalence of an easily observable quantity (i.e., species or occupation) hypothetically provides information on the environmental phenomena of interest.

The reason the findings from Florida (2002a) and Lee, et al. (2004) are not compelling is their failure to adhere to the principal admonition of valid indicator species studies: that is to know the indicator species very well (Landres, et al. 1988). As noted above, the bohemian index (or arts employment share labeled the creativity index in Lee, et al.) is inserted merely as an explanatory factor whose seemingly surprising association with hi-tech specialization and new firm formation is explained by their association with a common unobserved factor, interpreted as creative milieu. Transforming this conjecture to an inference analogous to a true indicator species study requires accounting for natural variability in population attributes. Since creative milieu cannot be the only reason some artists locate in some places, failing to account for this variability will confound inferences pertaining to the environmental condition of interest (see also Markusen 2006).

The second problem caused by a failure to study the indicator occupation of artists in detail is the erroneous assumption that the location behavior of artists is germane in only the largest metro areas. The omission of potentially pertinent observations exacerbates small sample problems and biases the results, giving undue influence to highly particular cases such as New York City and San Francisco. In fact, the concentration of artists in a handful of the largest cities is repeated throughout the settlement hierarchy. Small metro arts magnets include Santa Fe and Nashville. A considerable number of arts magnets are found in the largest nonmetro counties (e.g., Ulster County NY, containing Woodstock), extending down to completely rural counties (e.g., San Juan and San Miguel counties in Colorado containing Silverton and Telluride, respectively). Indeed, while only five of the largest metro counties had arts shares above 2

percent in 2000, twenty smaller counties exceeded this threshold (Wojan, Lambert and McGranahan forthcoming).

We address both of these problems in our attempt to explicitly isolate creative milieu (Wojan, Lambert and McGranahan, forthcoming). The problem of germane artist habitat is addressed by estimating our model for all counties in the continental U.S., and by estimating the model with metro and nonmetro subsamples if the processes underlying artist location are different. Controlling for population variability is addressed in the first step of a two-stage model, by modeling the arts employment share as a function of observable county level characteristics ($Z$),

(1) $\textit{Arts employment share (1990)} = f(Z) + v$.

The residual ($v$) from this regression contains measurement, sampling and specification error along with effects associated with unobserved factors and white noise. The extent to which the unobserved effects represent an "artistic milieu"—a surplus of bohemians beyond what would be expected—will depend on the explanatory power of the model and consensus on the appropriate specification of Equation 1. In the second step, the ostensible artistic milieu ($v^*$) is included in a regression to explain an indicator of economic dynamism, along with observable county attributes ($X$),

(2) $\textit{Economic dynamism} = g(X) + \theta v^* + e$.

A positive association between the artistic milieu and an indicator of economic dynamism ($\theta$) would support the hypothesis of a common unobserved factor—a creative milieu—that both attracts artists and benefits local economic activity by attracting more creative workers in other fields.

The one remaining characteristic we need to know about the indicator occupation is its hypothesized connection to the environmental condition of interest. In this respect, the analyses of Florida (2002b) and Lee, et al. (2004) do much better, summarizing Jane Jacobs (1961) and other urban scholars' views on what makes a vibrant city and why these would appeal to artists. For Jacobs, the cross-fertilization of ideas that are critical to innovation is reliant on serendipitous interaction between individuals representing different economic interests, and between economic interests and non-economic dimensions of city life. Jacob's concern that the dominant urban design principles following the Second World War worked to impede this serendipity puts the essential elements of a creative milieu in stark relief. Uncreative places resulting from post-War urban design orthodoxy were highly dependent on the automobile, partitioned into single-use tracts, often resulting in the segregation of the population by class or wealth.

In contrast, cities that worked as creative places were characterized by a high degree of human scale interaction. The co-location of housing and commercial activity enlivened street level interaction throughout the day and evening. Diversity in the housing stock contributed to the potential for serendipitous cross-fertilization by retaining affluent residents amongst working class residents. Jacobs' attaches value to diversity in commercial space using the dictum that "new ideas require old buildings." Given this diversity, emerging activities that tend to be economically marginal can benefit from cheaper rent but also benefit from proximity to established businesses. In addition, vibrant cities support common civic spaces providing venues for chance interaction marked with a sense of place.

Whether serendipitous, human scale interaction is disproportionately attractive to artists is an empirical question. We will have more confidence that this is the case, if a relative surplus of artists is also associated with various measures of economic dynamism.

### *Does Creative Milieu Contribute to Entrepreneurship and Innovation?*

We begin by briefly summarizing the factors we include to explain variation in the artists employment share. While our selection of variables may not be universally accepted, our empirical construction of an ostensible creative milieu is transparent. The art sector employment model is based on two broad sets of conditions. First, we expect the arts share to be higher where demand for the arts is likely to be high. Thus, the proportion of the young adult population in college, employment in business services (more likely to employ designers than other industries), the lodging payroll, the prevalence of smaller lodging establishments (based on anecdotal evidence, a more suitable setting for artists), the proportion of young adults with at least a high school degree and median household income are all expected to be associated with a larger arts share of employment. We also included the share of employment in manufacturing, expecting that large shares in manufacturing would dampen the arts share.

Second, we expected, given their relative mobility, that the arts share of employment would be associated with residential amenities. Some measures may apply particularly to artists: the percent foreign born (Florida's "diversity index"), the percent non-family households, an approximation of Florida's "tolerance" or gay index, the number of non-profit organizations, the number of historic preservation sites, the presence of a winery, and (negatively) the presence of big-box retailers.

Natural amenities included four measures of climate: average January temperature, average January days of sun, temperate Julys and average July humidity (coded negatively).

Expected to be most relevant in nonmetropolitan areas are measures of landscape. Following landscape preferences literature, areas with topographic variation, water area, and a mix of forest and open land are all expected to be positively associated with share of arts employment. (The mix of forest and open land is captured by including both forest and the square of forest, with the expectation of a positive and a negative coefficient, respectively). Descriptive statistics for these variables are provided in Table 4.

Table 5 provides coefficient estimates for variables hypothesized to be associated with the arts employment share for all counties, and for subsamples of metro and nonmetro counties. Despite some similarity between metro and nonmetro estimates, a Chow test of the equality of metro and nonmetro coefficients is strongly rejected.[2] This suggests that artist attraction to the countryside differs from what attracts artists to the city.

[Table 5 about here]

Among the most powerful draws for artists are college towns and university cities (College enrollment). This omission from Florida's (2000a) and Lee, et al.'s (2004) analyses is potentially serious as this provides an instance of an observable covariate with arts employment that may be associated with economic dynamism. Other shared characteristics of metro and nonmetro arts magnets include the negative effect of large retail establishments (Big box retailers). This variable may be picking up similarities in automobile dependent planning in both samples, which the findings suggest tend to repel artists. Finally, arts magnets are also characterized by diversity in lodging options (Lodging size index) in both metro and nonmetro counties. This finding suggests that artists locate in metro and nonmetro areas able to promote high value

[2] In the spatial econometrics literature, this test is used to identify spatial regimes (Anselin, 1988).

tourism characterized by the small independent hotels and bed and breakfasts picked up by this variable.

There are also important differences in metro and nonmetro counties attractiveness to artists, some which were expected. Natural amenities such as mountain topography (Terrain variation), dry winters (January sun-days) and combinations of forest and open space (Land in forest and Forest squared ) are more strongly associated with artist location in nonmetro areas. However, metro artists tended to locate in warmer cities (January temperature and Moderate July). Population growth in the previous decade (Population change, 1980-90) was associated with a larger arts share in nonmetro areas, but not associated with the metro arts share. This is consistent with artists moving to amenity rich rural areas that have also seen substantial population growth, and artists not flocking to the fastest growing metro counties.

Although these findings may be of considerable interest from a cultural economics perspective, it is the unexplained variation in the arts employment share, an ostensible creative milieu, which is of most interest for the present analysis. Given all the things that may be in the residual in addition to creative milieu, transparency requires a thorough examination of its statistical and spatial distribution. The pattern of the arts share residual, plotted against actual and predicted values, is consistent with the results of the Chow test for parameter equivalence between metropolitan and non-metropolitan counties (Figure 2). The magnitude and variability of the residual effects are greater in non-metropolitan counties relative to metropolitan counties. This result was expected given the much larger range in the observed arts employment share in rural areas. This greater variation will increase the probability of identifying a creative milieu effect in rural areas, if one exists.

[Figure 2 about here]

However, the spatial distribution of the residuals is most critical in assessing whether the strategy is picking up an interesting phenomenon. The map in Figure 3 shows the spatial distribution of residuals from the first-stage metropolitan and non-metropolitan regression grouped into quintiles. The Great Plains emerge as a region of considerable concern given the number of nonmetro counties with large residuals. Our failure to identify an artistic renaissance in the Texas and Oklahoma panhandle, in Nebraska, or the Dakotas strongly suggests that this result may stem from sampling error. Since occupational data are compiled from the 1 in 6 long-form sample of the decennial census, the estimated number of workers in relatively rare occupations may be imprecise in counties with few workers, prevalent in the Great Plains. We retain these counties in the analysis, as censoring very small counties would be arbitrary. This will tend to dilute the effect of the ostensible creative milieu on economic dynamism in the nonmetropolitan sample, especially given the relatively poor economic performance of many small Great Plains counties in the 1990s.

[Figure 3 about here]

Many of the other clusters of relatively high residual values are more encouraging regarding an ability to capture creative milieu. High residual values are apparent in the Taos-Santa Fe region encompassing the Sangre de Cristo Mountain range and the Denver-Fort Collins corridor. The metropolitan counties surrounding Nashville are dominated by high residual values, perhaps reflecting the attractive pull of the musical tradition associated with this city. Other metropolitan areas with relatively large residuals are located in or around the Smokey Mountains and New York's Hudson Valley. In nonmetro counties, prior expectations about high-amenity regions in the Mountain West are confirmed. In addition, large residuals in the

Catskills of New York, the Ozarks in Missouri and some counties flanking the Great Lakes are consistent with anecdotal accounts of concentrations of artists in these regions.

Of course, the proof of the residual capturing creative milieu is in the second stage regression with indicators of economic dynamism as dependent variables. The dependent variables in the second stage are net growth in the creative class[3] other than bohemians, net firm growth, net employment growth and net migration. Growth rates for all variables were computed over the 1990 to 2000 interval.

Estimating the growth in the creative class over the decade allows a direct test of the central conjecture that creative people are attracted to creative places. By estimating the association between an ostensible creative milieu and the attraction of workers in creative occupations, this exercise is able to confirm whether an unobserved factor attracts both artists and other creative professionals. However, this test is not fully satisfying as the dependent variable is still an input, not an outcome of creative activity. To examine whether an ostensible creative milieu is associated with the attraction of talent that enables creative interaction, we examine the association between an ostensible creative milieu and net growth in the number of establishments, standardized by total nonfarm, private sector employment (Armington and Acs 2002). An increasing number of establishments serves as a proxy for entrepreneurial dynamism, commingling firm formation with firm failure. Net employment and net migration are included to capture other aspects of dynamism but failure to identify an association between them and an ostensible creative milieu would not diminish support of the strong definition of creative milieu confirmed by faster rates of new firm formation. Descriptive statistics for the dependent

[3] The modified definition of the creative class outlined in Table 1 is used for this analysis.

variables and additional explanatory variables used in the second stage regressions are provided in Table 6.

[Table 6 about here]

The statistical significance of the ostensible creative milieu (RESIDUAL) on creative class growth (*lcc_wo_b9000*) provides an explicit test of the conjecture that artists and other creative class workers are attracted by the same unobserved characteristics. The conjecture is confirmed in both the metro (Table 8) and nonmetro (Table 7) samples. The magnitude of this parameter in both metro and nonmetro samples suggests that a vibrant creative milieu is a critical asset in local development strategies aimed at attracting talent.

[Table 7 about here]

[Table 8 about here]

However, metro-nonmetro differences are more pronounced when comparing the magnitude and significance of the ostensible creative milieu (RESIDUAL) with the other indicators of economic dynamism. The relationship with net firm formation (*nest9000empcbp)* is arguably the most important in assessing economic dynamism given the claim that a creative milieu will generate new products and services (Landry 2000, p. 133). This association is confirmed for the nonmetro sample (Table 7) but cannot be confirmed for the metro sample (Table 8—the reported t-statistic of 1.60 corresponds to a p-value of 0.1097, failing the 10% significance threshold). Although we cannot identify the components of this creative milieu (greater human scale interaction, better restaurants, etc.) it does appear to increase entrepreneurial dynamism in nonmetro counties.

Additional qualitative research is needed to confirm just what the arts share residual is picking up in nonmetro counties. However, these nonmetro results seemingly demonstrate a true

contribution of place to economic dynamism where a creative milieu effect is not conflated with the density of creative agents randomly "rubbing elbows" in the city (Stolarick and Florida 2006). In contrast to more conventional studies examining industrial location or the geography of innovation—or even the preceding analysis of creative class and growth—our explanation of regional performance does not rely on the location of particular *quantities* in a place (e.g., human capital, creative class, R&D spending, transportation infrastructure) but on a proxy for a particular *quality* of place. Our reliance on a residual makes the analysis susceptible to omitted variable critiques, where creative milieu is reduced to a misspecification error. However, we know of no other technique allowing a generalizable analysis of processes thought to be reliant on interaction.

For metro areas, our findings are unsatisfying as they identify a potentially large effect of creative milieu on new firm formation, but one that fails to meet conventional standards of reliability. Given the point estimate, metro counties in the top decile of creative milieu would generate close to twice the number of new establishments per worker compared to metro counties in the bottom decile. This is confirmed in the sample where the top decile generated 3 establishments per hundred workers, on average, compared to 1.6 establishments generated in the bottom decile. Unfortunately, the standard error associated with the point estimate is large. This result makes the claimed association between entrepreneurship and creative milieu identified in Lee et al. (2004) tentative. However, our results cannot refute this association either (Ziliak and McCloskey 2004). The prudent conclusion is to suspend judgment on the existence of a strong creative milieu in metro areas.

### *Research Required for Definitive Answers*

Our initial suspicion is that structural complexity disadvantages the identification of a strong creative milieu in cities, generally. The spatial econometric techniques used to estimate these models strongly corroborate this suspicion. The second stage metro equations are all characterized by spatial lag in the error structure, meaning that values of the outcome variables are dependent on the values in neighboring counties. This spatial lag is most prominent in the new firm formation model. Strong clustering and agglomeration effects, where new firm formation in neighboring counties feeds back strongly in the own county may swamp an own county creative milieu effect.

In contrast, the spatial lag effects in the nonmetro county firm formation equation were considerably weaker. Add to this the much greater variation in creative milieu as compared to the metro sample, and the presumption that many more nonmetro artists are genuinely footloose, and detecting a strong creative milieu in nonmetro counties appears more likely. Parallels from biology are also relevant here. A common research strategy for the study of complex organisms is to start by studying much simpler organisms. The administrative border of nonmetro counties appears to be a reasonable demarcation for studying the phenomena suggested by creative class theory, after controlling for the relatively weak spatial dependence across neighbors. Imposing these same spatial constraints on counties in metropolitan areas, or merely aggregating up to the MSA level may conflict with the spatial scale of real effects. The study of creative places as it applies to cities seems plagued by the modifiable areal unit problem.

Another tack is to examine other indicators of economic dynamism that may be less susceptible to the strong feedback effects associated with new firm formation. One candidate is patenting activity, which might address the association between creative milieu and innovation

more directly than new firm formation.[4] However, the geographic information of patenting activity poses potentially even greater problems as patents are often awarded by place of residence rather than the place where the research is conducted. Using the simple organism analogue, the study of nonmetropolitan patent activity as it relates to creative milieu may provide useful insights.

Our decision to use single equation models in the second stage of our analysis of creative milieu was driven by the need to limit the computational complexity of our regression models, especially as a first cut. However, if the problem is to try to untangle the effects of creative milieu in the growth of cities, a systems approach may be more appropriate. Regional adjustment models provide one such alternative. Traditional regional adjustment models are two-equation migration models, which allow for feedback between employment and population during the growth process (Carruthers and Vias 2005). Most recently, Carruthers and Mulligan (2007) extended the regional adjustment framework to model the feedback between changes in employment, population, and land consumption in metropolitan areas. Their approach combined recent developments in the spatial econometric literature to uncover potentially useful information about social interaction across space.

Our distinction between weak and strong definitions of creative milieu may be artificial if in fact, the attraction of the creative class is the principal driver in new firm formation and/or patent activity, and that creative milieu is a primary attractor of the creative class. This possibility can only be confirmed with a system of regressions tying these growth phenomena together. Until that time, our findings suggest that the contribution of place is mainly through its

[4] We believe that new firm formation, to the extent that it signals entrepreneurship, is a valid measure of the innovativeness of a local economy. Entry of new firms in this context is not only "an (imperfect) mechanism for getting prices right in markets, it is a mechanism for getting product and process specifications right," (Geroski 1995 p. 437).

attraction of creativity embodied in individuals in urban areas. The answer to the Nobel Centennial Exhibition question in the context of metro counties is clear, if only tentative—individuals matter more to the creative process than the environments in which they work. In contrast, the nonmetro environment appears to matter a whole lot more to the creative process.

The most appropriate summation of these mixed results comes from none other than urban development guru Richard Florida: "[G]ood hard statistical analysis can do more than confirm what you already know: It can point you to connections or conclusions you would not otherwise have seen." (Florida 2002a, p. 327).

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**Table 1: Florida's Original Creative Class Occupations and a Recast Creative Class Excluding Economic Reproduction Occupations and Occupations Requiring Little Creativity**

| *STF4 Occupation Title* | *Florida* | *Recast* | *Excluded from Recast* |
|---|---|---|---|
| Management occupations: | *Summary* | | |
| Top executives | X | X | |
| Advertising, marketing, promotions, public relations, and sales managers | X | X | |
| Financial managers | X | X | |
| Operations specialties managers, except financial managers | X | X | |
| Farmers and farm managers | *X*[5] | | X |
| Other management occupations, except farmers and farm managers | X | X | |
| Business and financial operations occupations: | *Summary* | | |
| Business operations specialists | X | | X |
| Accountants and auditors | X | X | |
| Other financial specialists | X | | X |
| Computer and mathematical occupations: | *Summary* | *Summary* | |
| Architecture and engineering occupations: | *Summary* | *Summary* | |
| Architects, surveyors, and cartographers | X | X | |
| Engineers | X | X | |
| Drafters, engineering, and mapping technicians | X | X | |
| Life, physical, and social science occupations: | *Summary* | | |
| Life and physical scientists | X | X | |
| Social scientists and related workers | X | X | |
| Life, physical, and social science technicians | X | | X |
| Legal occupations: | *Summary* | | |
| Lawyers | X | X | |
| Judges, magistrates, and other judicial workers | X | | X |
| Legal support workers | X | | X |
| Education, training, and library occupations: | *Summary* | | |
| Postsecondary teachers | X | X | |
| Teachers, primary, secondary, and special education: | X | | X |
| Teachers, preschool, kindergarten, elementary, and middle school | X | | X |
| Teachers, secondary school | X | | X |
| Teachers, special education | X | | X |
| Librarians, curators, and archivists | X | X | |
| Other teachers, instructors, education, training, and library occupations | X | | X |
| Arts, design, entertainment, sports, and media occupations: | *Summary* | *Summary* | |
| Healthcare practitioners and technical occupations: | *Summary* | | |
| Physicians and surgeons | X | | X |
| Registered nurses | X | | X |
| Therapists | X | | X |
| Other health diagnosing and treating practitioners and technical occupations | X | | X |
| Health technologists and technicians | X | | X |
| High-end sales--part of sales occupation summary category | | | |
| Sales representatives, services, wholesale and manufacturing | X | X | |
| Other sales and related occupations, including supervisors | X | X | |

[5] The category is excluded from the recast measure of the creative class in the analysis that follows based on relatively low creativity requirements for farmers in ONET. Inclusion of this occupation in the creative class measure has profound effects on regression estimates, essentially reversing the positive association between the creative class and growth. The inclusion of this occupation inflates the number of Creative Class workers in heavily farm dependent counties that generally performed poorly over the nineties. For this reason, we also excluded this occupation from the Florida measures in the estimations that follow.

## Table 2: Summary Results of 3SLS Regressions for Nonmetropolitan Counties Using Recast Creative Class

| | Creative class, 1990-2000 | | | Employment, 1990-2000 | | | Net migration, 1990-2000 | | |
|---|---|---|---|---|---|---|---|---|---|
| Independent variables | Estimate | t Value | Pr > \|t\| | Estimate | t Value | Pr > \|t\| | Estimate | t Value | Pr > \|t\| |
| **Change** | | | | | | | | | |
| Employment | -0.2031 | -0.62 | 0.5327 | | | | 0.3960 | 2.30 | 0.0217 |
| Migration | 0.0136 | 0.06 | 0.9495 | 0.4133 | 2.66 | 0.0079 | | | |
| Creative class | | | | 0.2791 | 2.68 | 0.0075 | -0.0076 | -0.13 | 0.8983 |
| **Creative class, 1990 (%)** | -3.8507 | -8.93 | <.0001 | 1.8735 | 3.50 | 0.0005 | 0.2335 | 0.77 | 0.4395 |
| **Quality of life** | | | | | | | | | |
| Settlement | | | | | | | | | |
| Population density, 1990 (ln) | 0.2147 | 3.65 | 0.0003 | 0.0074 | 1.34 | 0.1793 | 0.0551 | 2.17 | 0.0301 |
| Square of density | -0.0119 | -3.22 | 0.0013 | | | | -0.0042 | -2.73 | 0.0064 |
| Commute from county, 1990 (%) | 0.0031 | 3.62 | 0.0003 | 0.0006 | 2.49 | 0.0128 | 0.0011 | 2.75 | 0.0060 |
| Adjacent to metro area, 1990 | 0.0058 | 0.67 | 0.5043 | -0.0057 | -1.13 | 0.2605 | 0.0091 | 2.69 | 0.0071 |
| Landscape | | | | | | | | | |
| Water area (ln %) | 0.0050 | 1.05 | 0.2956 | | | | 0.0023 | 1.36 | 0.1740 |
| Mountains (0-1) | 0.0666 | 2.74 | 0.0063 | | | | 0.0309 | 3.26 | 0.0011 |
| Land in forest, 1995 (%) | 0.0021 | 2.37 | 0.0179 | | | | 0.0012 | 3.46 | 0.0005 |
| Square of forest | -0.00003 | -2.71 | 0.0068 | | | | -0.00001 | -2.93 | 0.0034 |
| Cropland, 1992 (%) | -0.0012 | -2.79 | 0.0053 | | | | -0.0005 | -3.31 | 0.0009 |
| Public lands (%) | 0.0009 | 2.33 | 0.0197 | 0.0001 | 0.68 | 0.4978 | -0.0002 | -1.46 | 0.1443 |
| Climate (z-scores) | | | | | | | | | |
| January sun | 0.0185 | 2.89 | 0.0038 | | | | 0.0048 | 2.01 | 0.0447 |
| January temperature | 0.0027 | 0.32 | 0.7517 | | | | 0.0140 | 4.71 | <.0001 |
| July humidity (low) | 0.0117 | 1.47 | 0.1413 | | | | 0.0087 | 3.13 | 0.0018 |
| Temperate summer | 0.0056 | 0.95 | 0.3432 | | | | 0.0044 | 2.18 | 0.0293 |
| Other | | | | | | | | | |
| Bicycle & sports store jobs/capita | 0.0081 | 2.83 | 0.0047 | | | | | | |
| Historic registration sites (ln) | 0.0045 | 1.21 | 0.2269 | | | | | | |
| **Industry employment, 1990 (%)** | | | | | | | | | |
| (See McGranahan and Wojan 2007, p. 209) | | | | | | | | | |
| **Labor market, 1990 (%)** | | | | | | | | | |
| H.S. completion rate, age 25-44 | | | | -0.0003 | -0.35 | 0.7290 | -0.0019 | -5.66 | <.0001 |
| College graduates, age 25-44 | 0.0119 | 8.61 | <.0001 | -0.0036 | -2.17 | 0.0297 | -0.0012 | -1.31 | 0.1902 |
| Civilian employment rate, age 16-64 | | | | 0.0004 | 0.62 | 0.5322 | 0.0019 | 4.82 | <.0001 |
| Median household income ($) | 0.0682 | 1.87 | 0.0620 | -0.0991 | -4.41 | <.0001 | 0.0168 | 0.76 | 0.4478 |
| **Post-secondary schools (0-1)** | | | | | | | | | |
| (See McGranahan and Wojan 2007, p. 209) | | | | | | | | | |
| **Demographic, 1990 (%)** | | | | | | | | | |
| (See McGranahan and Wojan 2007, p. 209) | | | | | | | | | |
| **Employment change, 1990-2000, in adjacent counties combined (ln)** | 0.5872 | 4.66 | <.0001 | | | | 0.1955 | 3.59 | 0.0003 |
| **Intercept** | -2.6518 | -2.13 | 0.0329 | 2.7350 | 3.57 | 0.0004 | 1.7052 | 2.92 | 0.0035 |
| **$R^2$** | 0.34 | | | 0.44 | | | 0.66 | | |
| **Over ID (Basmann) Pr <** | 0.25 | | | 0.62 | | | 0.79 | | |

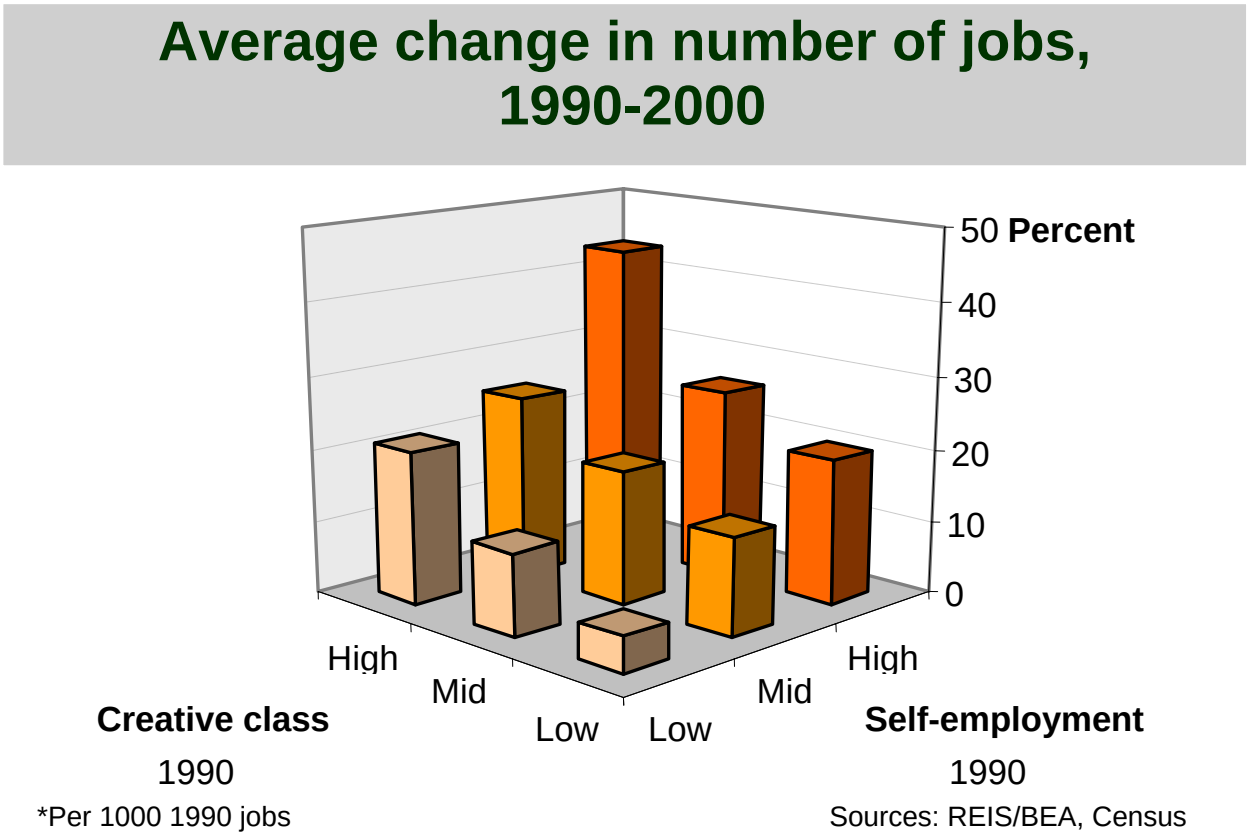
*Source: McGranahan and Wojan 2007*

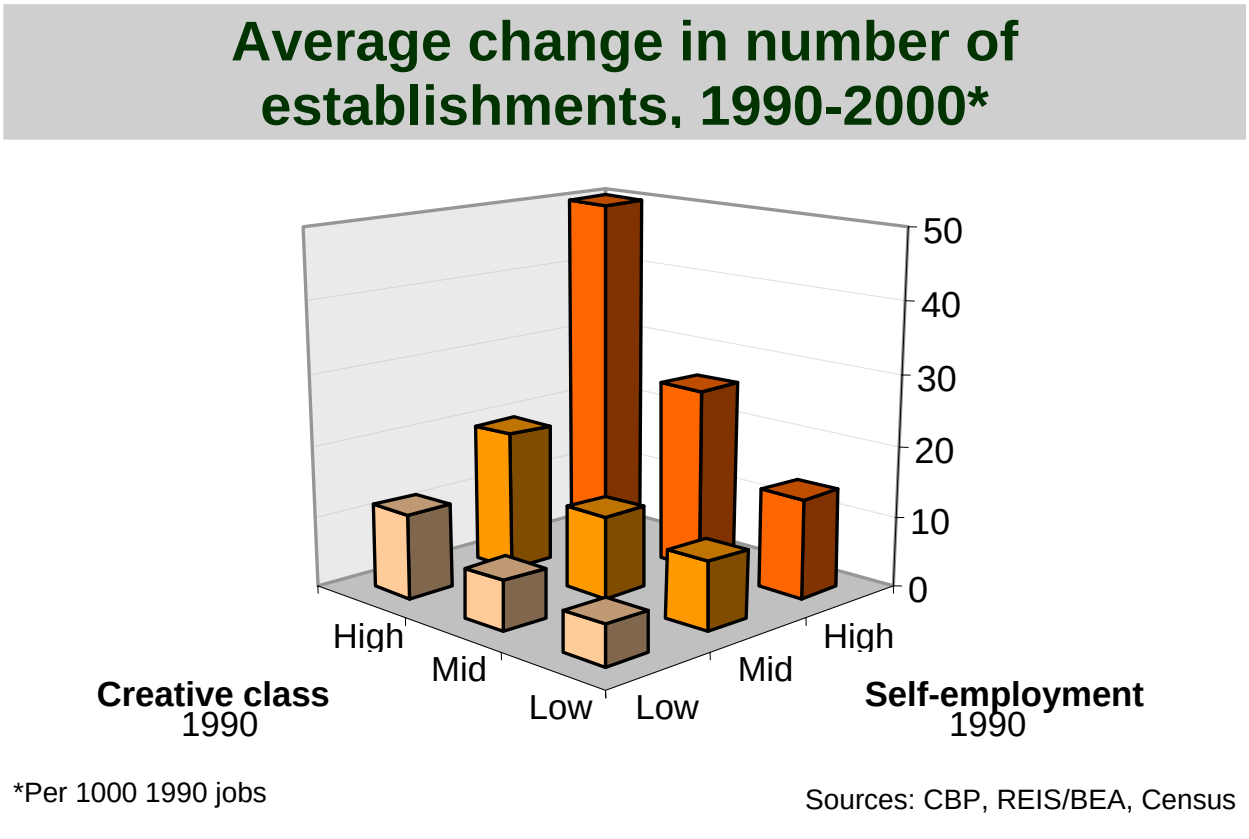
**Table 3: Results of Reduced Form (OLS) Regressions for Metropolitan and Counties with Recast Creative Class***

| | Creative Class 1990 - 2000 | | Employment 1990 - 2000 | | Net Migration 1990 – 2000 | |
|---|---|---|---|---|---|---|
| Independent variables | B | t | B | t | B | t |
| **Creative class,1990 (%)** | -0.2422 | -0.72 | 1.7523 | 6.48 | 1.2171 | 5.65 |
| **Quality of life** | | | | | | |
| Settlement | | | | | | |
| Population density, 1990 (ln) | -0.1210 | -3.05 | -0.0169 | -0.53 | -0.1493 | -5.90 |
| Square of density | 0.0054 | 2.15 | -0.0006 | -0.29 | 0.0075 | 4.71 |
| Commute from county, 1990 (%) | 0.0035 | 8.83 | 0.0028 | 9.03 | 0.0019 | 7.67 |
| Landscape | | | | | | |
| Water area (%, ln) | 0.0099 | 1.46 | -0.0004 | -0.08 | -0.0011 | -0.25 |
| Mountains (0-1) | 0.0375 | 1.18 | 0.0562 | 2.22 | 0.0170 | 0.84 |
| Land in forest, 1995 (%) | 0.0009 | 1.06 | 0.0013 | 1.84 | 0.0014 | 2.50 |
| Square of forest (B/100) | -0.0011 | -1.19 | -0.0013 | -1.71 | -0.0014 | -2.29 |
| Cropland, 1992 (% of land) | 0.0005 | 1.13 | 0.0003 | 0.88 | 0.0001 | 0.36 |
| Public lands (%) | -0.0002 | -0.28 | -0.0015 | -3.12 | -0.0003 | -0.79 |
| National Park (any land) | -0.0330 | -1.19 | 0.0128 | 0.58 | -0.0084 | -0.47 |
| Sports & bicycle store jobs/capita | 0.0247 | 2.96 | 0.0274 | 4.11 | 0.0147 | 2.78 |
| Climate (z-score) | | | | | | |
| January sun | -0.0012 | -0.17 | -0.0060 | -1.04 | -0.0023 | -0.50 |
| January temperature | 0.0421 | 4.65 | 0.0353 | 4.87 | 0.0421 | 7.30 |
| July humidity (low) | -0.0043 | -0.47 | -0.0043 | -0.59 | 0.0103 | 1.76 |
| Temperate summer | -0.0044 | -0.64 | -0.0118 | -2.15 | -0.0134 | -3.08 |
| **Industry employment, 1990 (%)** | | | | | | |
| (See McGranahan and Wojan 2007, p. 211) | | | | | | |
| **Labor market, 1990 (%)** | | | | | | |
| H.S. completion rate, age 25-44 | -0.0014 | -0.95 | -0.0028 | -2.37 | -0.0041 | -4.39 |
| College graduates, age 25-44 | 0.0038 | 2.09 | -0.0031 | -2.13 | -0.0017 | -1.43 |
| Civilian employment, age 16-64 | 0.0073 | 4.66 | 0.0057 | 4.57 | 0.0053 | 5.29 |
| Median household income ($) | -0.0174 | -0.33 | -0.0893 | -2.14 | 0.0591 | 1.78 |
| **Post-secondary schools (0-1)** | | | | | | |
| (See McGranahan and Wojan 2007, p. 211) | | | | | | |
| **Demographic, 1990 (%)** | | | | | | |
| (See McGranahan and Wojan 2007, p. 211) | | | | | | |
| **Job change in adj. counties** | 0.6319 | 11.95 | 0.3496 | 8.26 | 0.3575 | 10.59 |
| **Intercept** | -2.8188 | -7.78 | 2.8953 | 9.97 | 3.0727 | 13.28 |
| **$R^2$** | 0.542 | | 0.584 | | 0.604 | |

*Source: McGranahan and Wojan 2007*

**Figure 1: Interaction of creative class with self-employment powerful predictor of growth**



## Table 4: Descriptive Statistics for Arts Employment Share Equation Variables

| Variable | Description and Source | N | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|---|
| BOHEMSH90 | Arts Employment Share, 1990[1] | 3135 | 0.00597 | 0.003814 | 0 | 0.037005 |
| College enrollment | Percent 18-25 Population Enrolled In College[2] | 3135 | 23.98216 | 14.48488 | 0 | 92.57315 |
| Producer services | Percent Business Services, 1990[2] | 3135 | 5.278235 | 3.013499 | 0 | 51.11648 |
| Lodging payroll | 1990 Payroll in all Lodging Establishments[4] | 3135 | 6006.22 | 46734.49 | 0 | 1809747 |
| Lodging size index | Number of Lodging Estabs/Herfindahl Employment Concentration[4] | 3115 | 48.06584 | 186.1942 | 0 | 5812.78 |
| HS completion, age 25-44 | Percent High School Diploma or More , 1990, Ages 25-44[2] | 3066 | 82.24716 | 9.01038 | 39.66768 | 98.71371 |
| Median household income | Ln of Median Household Income, 1990[1] | 3075 | 3.138591 | 0.254794 | 2.151181 | 4.08234 |
| Manufacturing | Percent Manufacturing, 1990[2] | 3135 | 18.48827 | 10.60255 | 0 | 53.67465 |
| Foreign born (%) | Percent Population Foreign Born[2] | 3102 | 0.0245 | 0.038586 | 0 | 1 |
| Nonfamily households | Percent of all Households Nonfamily[2] | 3102 | 0.113853 | 0.02815 | 0 | 0.39949 |
| Nonprofit organizations | Number of Tax Exempt Nonprofit Organizations[6] | 3107 | 40.71291 | 152.4586 | 0 | 4244 |
| Historical registrations | 1990 National Historic Registrations[5] | 3135 | 17.77129 | 40.84095 | 0 | 1161 |
| Winery | Winery In County[4] | 3135 | 0.057097 | 0.232065 | 0 | 1 |
| Big box retailers | Number of Retail Establishments w/ > 100 Employees[4] | 3135 | 2.533971 | 7.925711 | 0 | 217 |
| January temperature | January Temperature (Z-Score) [3] | 3107 | 0.003021 | 0.993994 | -2.62742 | 2.80765 |
| January sun-days | Jaunuary Days Of Sun (Z-Score) [3] | 3107 | 0.000991 | 0.996282 | -3.11652 | 3.44725 |
| Moderate July | July Residual Temperature[3] | 3107 | 0.002462 | 0.996879 | -2.85779 | 6.50064 |
| July low humidity | July Humidity (-1 X Zscore). [3] | 3107 | -0.00963 | 0.999787 | -1.64342 | 2.87475 |
| Terrain variation | Multiplicative Topography Elevation and Peakedness[3] | 3107 | 5.945929 | 4.952801 | 1 | 20 |
| Land in forest | Percent of Land in Forest[3] | 3107 | 36.56271 | 30.32346 | 0 | 97.28653 |
| Forest squared | Square of Percent of Land in Forest [3] | 3107 | 2256.05 | 2531.08 | 0 | 9464.67 |
| Water area | Ln of Water Area (Z-Score)[3] | 3107 | 0.022234 | 0.9775 | -2.35103 | 2.37209 |
| Population density | Population Density, 1990 (Ln)[2] | 3067 | 5.668869 | 1.595532 | 0.889337 | 12.91529 |
| Density squared | Square of Ln of 1990 Density[2] | 3067 | 34.68096 | 18.80329 | 0.790919 | 166.8047 |
| Commuting rate | Percent Commute Outside County, 1990[2] | 3135 | 27.74442 | 17.43661 | 0.874636 | 88.5485 |
| Population change, 1980-90 | Ln of Population Change, 1980-1990[2] | 3073 | 4.630261 | 0.155947 | 2.61105 | 5.572147 |

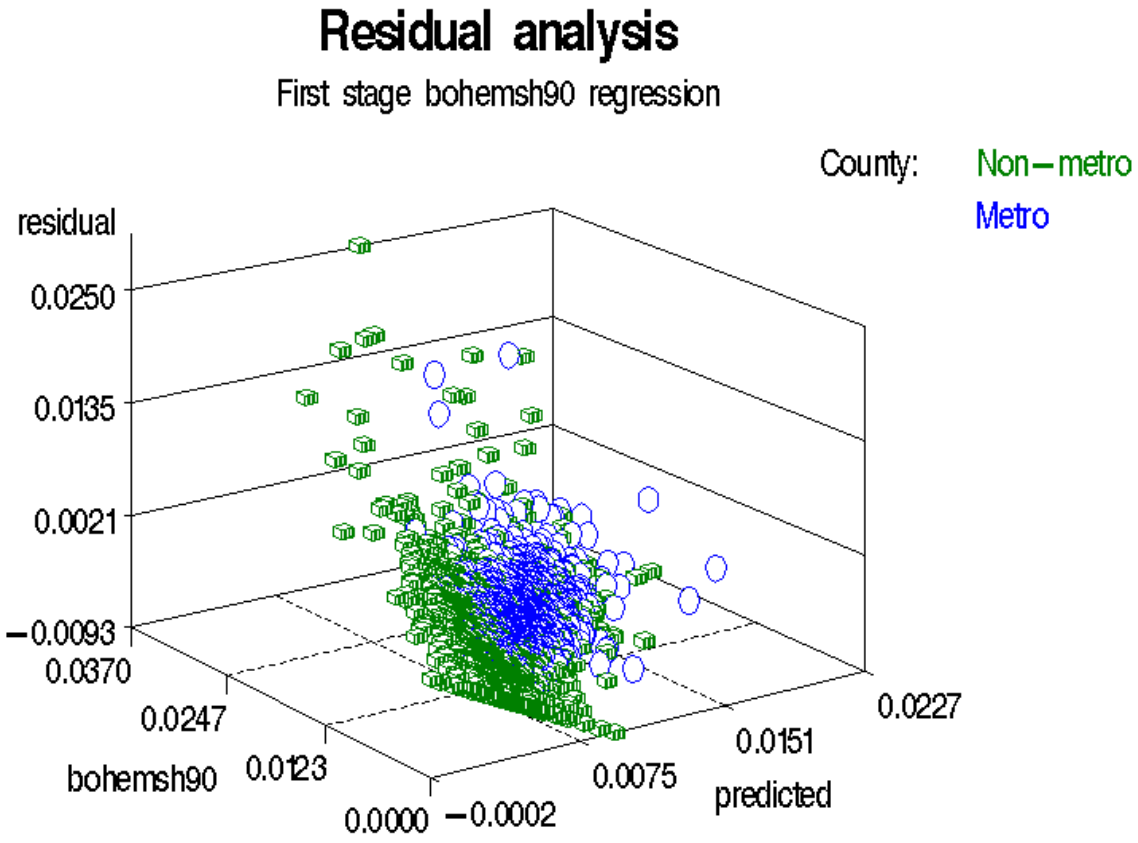
[1] 1990 EEOC Special Tabulation of the Census of Population
[2] 1990 Census of Population
[3] McGranahan 1999
[4] 1990 Enhanced County Business Patterns
[5] National Park Service, National Register Information System
[6] Rupasingha, et al 2006.

Table 5. First stage regression (*bohemsh90* is dependent variable).

| | *Non-metro counties* | | *Metro counties* | | *All counties* | |
|---|---|---|---|---|---|---|
| Variable | Estimate | t test [1] | Estimate | t test | Estimate | t test |
| Constant | -0.023364 | -4.93 | -0.016030 | -3.68 | -0.019457 | -5.74 |
| Art demand measures | | | | | | |
| College enrollment | 0.000019 | 3.67 | 0.000042 | 5.02 | 0.000026 | 5.84 |
| Producer services | 0.000527 | 6.09 | 0.000259 | 2.43 | 0.000369 | 4.36 |
| Lodging payroll | 0.000013 | 0.60 | 0.000003 | 1.67 | 0.000001 | 0.64 |
| Lodging size index | 0.000012 | 2.64 | 0.000002 | 2.19 | 0.000003 | 2.88 |
| HS completion, age 25-44 | 0.000054 | 3.58 | 0.000096 | 3.35 | 0.000068 | 5.09 |
| Median household income | 0.000788 | 1.31 | 0.000976 | 0.94 | 0.001067 | 2.00 |
| Manufacturing | 0.000017 | 1.89 | -0.000003 | -0.16 | 0.000003 | 0.39 |
| Community amenities | | | | | | |
| Foreign born (%) | 0.001823 | 0.65 | 0.005027 | 0.91 | 0.004060 | 1.63 |
| Nonfamily households | 0.019103 | 3.68 | 0.010121 | 1.17 | 0.019744 | 4.24 |
| Nonprofit organizations | 0.000003 | 0.28 | 0.000001 | 0.47 | 0.000000 | -0.26 |
| Historical registrations | 0.000001 | 0.22 | 0.000001 | 0.42 | 0.000002 | 0.89 |
| Winery | 0.000210 | 0.66 | -0.000115 | -0.36 | 0.000035 | 0.16 |
| Big box retailers | -0.000179 | -2.00 | -0.000039 | -1.91 | -0.000053 | -2.33 |
| Climate | | | | | | |
| January temperature | -0.000019 | -0.17 | 0.000539 | 3.19 | 0.000116 | 1.17 |
| January sun-days | 0.000294 | 2.01 | 0.000112 | 0.79 | 0.000259 | 2.26 |
| Moderate July | 0.000146 | 0.98 | 0.000401 | 2.20 | 0.000292 | 2.40 |
| July low humidity | 0.000310 | 1.80 | 0.000281 | 1.48 | 0.000366 | 2.67 |
| Landscape | | | | | | |
| Terrain variation | 0.000055 | 2.40 | 0.000018 | 0.60 | 0.000047 | 2.38 |
| Land in forest | 0.002190 | 2.05 | 0.001718 | 1.06 | 0.002300 | 2.53 |
| Forest squared | -0.002257 | -1.91 | -0.002738 | -1.42 | -0.002190 | -2.21 |
| Water area | 0.000043 | 0.49 | 0.000010 | 0.08 | 0.000086 | 1.15 |
| Settlement | | | | | | |
| Population density | 0.000655 | 1.25 | 0.002096 | 2.54 | 0.000905 | 2.68 |
| Density squared | -0.000030 | -0.55 | -0.000122 | -2.00 | -0.000038 | -1.33 |
| Commuting rate | 0.000004 | 0.60 | -0.000002 | -0.36 | -0.000002 | -0.43 |
| Population change, 1980-90 | 0.002835 | 3.06 | -0.000173 | -0.26 | 0.001524 | 2.27 |
| Spatial error coefficient | 0.198354 | 7.97 | 0.142044 | 4.46 | 0.257626 | 11.97 |
| N | 2,242 | | 794 | | 3,036 | |
| Adj. $R^2$ | 0.33 | | 0.51 | | 0.44 | |

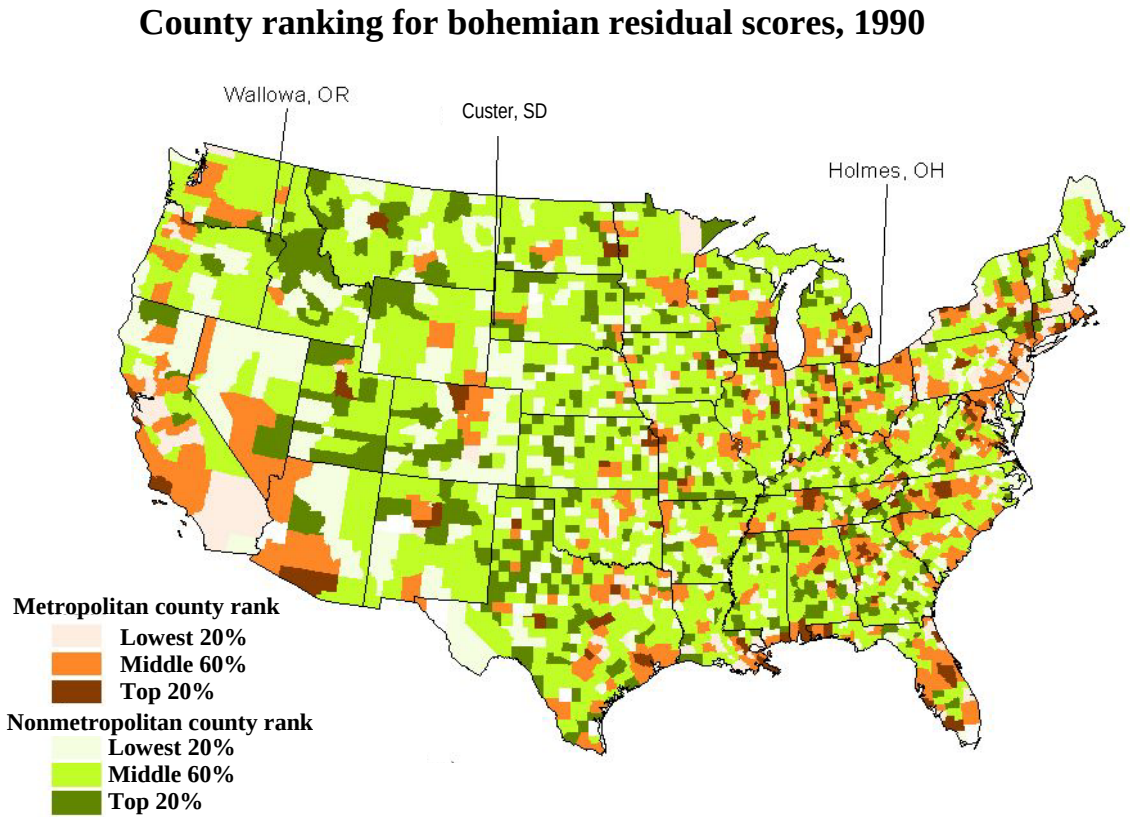
Notes: 1/ t tests calculated using jackknifed standard errors.

**Figure 2. First-stage residual, actual, and predicted values of the artist employment share (BOHEMSH90) in 1990**.




Sources: authors' estimates.

**Figure 3. Spatial distribution of residuals from the first-stage regression, metro- and non-metropolitan counties.**




Sources: authors' estimates.

Table 6: Descriptive Statistics for Outcome Equation Variables

| Variable | Description and Source | N | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|---|
| *lcc_wo_b9000* | Ln(Creative Class Minus Bohemians 2000/ Creative Class Minus Bohemians 1990)[4,5] | 3135 | 0.235712 | 0.215961 | -1.27508 | 1.363928 |
| *nest9000empcbp* | Change in Number of Establishment 1990-2000/Total Nonfarm Private Sector Employment[2, 3] | 3134 | 0.017558 | 0.037752 | -0.20000 | 0.725849 |
| *lemp9000* | Change in Jobs 1990-2000 (Ln of 100X Ratio)[1, 5] | 3135 | 4.732887 | 0.136893 | 4.186995 | 5.68437 |
| *lnetm9000* | Ln of Net Migration, 1990-2000[1, 5] | 3069 | 4.672554 | 0.123956 | 4.172733 | 5.573755 |
| Farming (%) | Percent Agriculture,1990[1] | 3135 | 7.514322 | 8.76729 | 0 | 68.69159 |
| Mining | Percent Mining, 1990[1] | 3135 | 1.748483 | 3.923698 | 0 | 42.18643 |
| Recreation | Percent Recreation Industry, 1990[1] | 3135 | 7.33802 | 3.421404 | 0.890208 | 39.06977 |
| College graduate, ages 25-44 | Percent College Graduate Ages 25-44[1] | 3135 | 16.49321 | 7.607234 | 3.053435 | 60.96939 |
| Pop. Age 8-17 | Percent Population Ages 8-1,7 1990[1] | 3135 | 16.72796 | 2.368383 | 5.420642 | 32.61633 |
| Pop. Age over 62 | Percent Population Ages 62 Plus, 1990[1] | 3135 | 17.70544 | 4.952039 | 1.382148 | 40.2201 |
| Native American | Percent Native American, 1990[1] | 3066 | 1.431395 | 5.980954 | 0 | 93.12256 |
| Black | Percent Black, 1990[1] | 3066 | 8.414846 | 14.1798 | 0 | 85.86615 |
| Hispanic | Percent Hispanic, 1990[1] | 3066 | 4.499956 | 11.13914 | 0 | 97.216 |
| Creative class (excl. artists) | Percent Creative Class Minus Bohemians, 1990[4] | 3135 | 0.123392 | 0.047519 | 0.018349 | 0.436965 |

[1] 1990 Census of Population
[2] 1990 Enhanced County Business Patterns
[3] 2000 Enhanced County Business Patterns
[4] 1990 EEOC Special Tabulation of the Census of Population
[5] 2000 Census of Population, STF4

Table 7. Stage two (outcome), non-metropolitan regressions with bohemsh90 residual.

| | *lcc_wo_b9000* | | *nest9000empcbp* | | *lemp9000* | | *lnetm900* | |
|---|---|---|---|---|---|---|---|---|
| Variable | Estimate | t test | Estimate | t test | Estimate | t test | Estimate | t test 1/ |
| CONSTANT | -2.5485 | -8.99 | -0.2079 | -2.54 | 3.3385 | 17.59 | 3.3270 | 19.01 |
| Settlement | | | | | | | | |
| Density, 1990 (ln.) | 0.0095 | 1.09 | -0.0066 | -2.87 | 0.0023 | 0.42 | -0.0081 | -1.76 |
| Commuting (%) | 0.0029 | 7.88 | 0.0006 | 7.63 | 0.0024 | 12.71 | 0.0020 | 11.68 |
| Pop. change, 1990-2000 | 0.4946 | 9.12 | 0.0532 | 3.26 | 0.3291 | 8.23 | 0.2718 | 7.19 |
| Natural amenity | | | | | | | | |
| Topography | 0.0048 | 3.16 | 0.0007 | 2.29 | 0.0031 | 3.39 | 0.0027 | 3.41 |
| Forest land (%) | 0.2954 | 3.93 | 0.0085 | 0.74 | 0.1914 | 4.25 | 0.1918 | 5.16 |
| Forest squared | -0.2879 | -3.79 | -0.0213 | -1.70 | -0.2049 | -4.65 | -0.1813 | -4.79 |
| Water area | 0.0146 | 2.60 | 0.0002 | 0.25 | 0.0040 | 1.28 | 0.0044 | 1.58 |
| January temperature | -0.0084 | -1.00 | -0.0015 | -1.17 | 0.0063 | 1.08 | 0.0220 | 4.27 |
| January sun days | 0.0077 | 0.93 | 0.0035 | 2.11 | 0.0037 | 0.63 | 0.0082 | 1.65 |
| Temperate July | 0.0114 | 1.35 | 0.0032 | 1.83 | 0.0010 | 0.19 | 0.0050 | 0.99 |
| Low humidity | 0.0199 | 1.98 | -0.0034 | -1.94 | 0.0133 | 2.19 | 0.0190 | 3.66 |
| Industry | | | | | | | | |
| Farming (%) | -0.0015 | -0.99 | -0.0002 | -0.88 | -0.0017 | -2.42 | -0.0012 | -1.98 |
| Mining | -0.0059 | -3.43 | -0.0006 | -2.51 | -0.0063 | -5.40 | -0.0057 | -5.66 |
| Manufacturing | -0.0001 | -0.17 | -0.0001 | -0.67 | -0.0012 | -2.56 | 0.0000 | 0.04 |
| Producer services | 0.0293 | 7.52 | 0.0002 | 0.12 | 0.0010 | 0.45 | 0.0011 | 0.58 |
| Recreation | 0.0101 | 4.50 | -0.0001 | -0.15 | 0.0054 | 3.69 | 0.0038 | 2.93 |
| College graduate, ages 25-44 | 0.0116 | 8.61 | 0.0002 | 0.94 | -0.0014 | -1.90 | -0.0018 | -2.75 |
| Median household income (ln) | 0.1422 | 3.63 | -0.0158 | -2.66 | -0.1050 | -4.76 | 0.0056 | 0.31 |
| Demography | | | | | | | | |
| Pop. Age 8-17 | 0.0067 | 1.80 | 0.0014 | 1.89 | 0.0055 | 2.57 | -0.0045 | -2.51 |
| Pop. Age over 62 | 0.0015 | 0.95 | 0.0000 | -0.17 | -0.0012 | -1.27 | 0.0043 | 5.03 |
| Native American | 0.0006 | 0.62 | -0.0005 | -2.37 | -0.0012 | -2.42 | -0.0005 | -1.37 |
| Black | -0.0020 | -3.86 | -0.0002 | -3.46 | -0.0026 | -7.85 | -0.0013 | -4.85 |
| Hispanic | -0.0018 | -2.34 | -0.0004 | -3.25 | -0.0018 | -3.84 | -0.0011 | -2.96 |
| Creative class (excl. artists) | -5.5465 | -15.77 | 0.1999 | 2.74 | 0.6487 | 3.71 | 0.4466 | 2.94 |
| RESIDUAL | 4.5718 | 2.77 | 1.1758 | 2.78 | 2.0699 | 2.07 | 1.7087 | 1.97 |
| W*bohemsh90 | -0.2445 | -0.06 | -1.2851 | -1.40 | -0.5527 | -0.20 | -1.1307 | -0.44 |
| Spatial error coefficient | 0.4304 | 18.72 | 0.7139 | 5.13 | 0.6368 | 35.20 | 0.6132 | 32.90 |
| N | 2,242 | | 2,242 | | 2,242 | | 2,242 | |
| Adj. $R^2$ | 0.35 | | 0.32 | | 0.72 | | 0.56 | |

Notes: 1/ t tests calculated using jackknifed standard errors.

Table 8. Stage two (outcome), metropolitan regressions with bohemsh90 residual.

| | *lcc_wo_b9000* | | *nest9000empcbp* | | *lemp9000* | | *lnetm900* | |
|---|---|---|---|---|---|---|---|---|
| Variable | Estimate | t test | Estimate | t test | Estimate | t test | Estimate | t test 1/ |
| CONSTANT | -1.2768 | -3.33 | -0.1555 | -2.33 | 1.5281 | 4.03 | 1.1055 | 2.89 |
| Settlement | | | | | | | | |
| Density, 1990 (ln.) | -0.0399 | -4.45 | -0.0073 | -5.10 | -0.0360 | -6.34 | -0.0381 | -6.83 |
| Commuting (%) | 0.0035 | 9.15 | 0.0006 | 7.46 | 0.0019 | 7.65 | 0.0020 | 8.37 |
| Pop. change, 1990-2000 | 0.2294 | 2.65 | 0.0299 | 2.49 | 0.1905 | 2.63 | 0.1737 | 2.59 |
| Natural amenity | | | | | | | | |
| Topography | 0.0006 | 0.38 | 0.0002 | 0.78 | -0.0002 | -0.22 | 0.0003 | 0.27 |
| Forest land (%) | 0.1324 | 1.60 | 0.0020 | 0.15 | 0.1232 | 2.23 | 0.1143 | 2.10 |
| Forest squared | -0.2259 | -2.24 | -0.0040 | -0.22 | -0.1685 | -2.54 | -0.1393 | -2.07 |
| Water area | 0.0069 | 0.93 | 0.0013 | 1.23 | 0.0033 | 0.72 | -0.0008 | -0.18 |
| January temperature | 0.0296 | 3.00 | 0.0016 | 0.83 | 0.0139 | 1.97 | 0.0207 | 3.00 |
| January sun days | -0.0054 | -0.70 | -0.0001 | -0.05 | -0.0027 | -0.49 | -0.0026 | -0.52 |
| Temperate July | -0.0054 | -0.68 | 0.0002 | 0.14 | -0.0083 | -1.68 | -0.0111 | -2.23 |
| Low humidity | -0.0012 | -0.12 | -0.0003 | -0.27 | 0.0014 | 0.22 | 0.0045 | 0.70 |
| Industry | | | | | | | | |
| Farming (%) | -0.0031 | -1.00 | -0.0013 | -2.95 | -0.0036 | -1.93 | -0.0020 | -1.13 |
| Mining | -0.0063 | -1.80 | -0.0013 | -2.29 | -0.0050 | -2.11 | -0.0011 | -0.26 |
| Manufacturing | 0.0015 | 1.41 | -0.0001 | -0.69 | 0.0002 | 0.34 | 0.0019 | 2.76 |
| Producer services | 0.0077 | 1.62 | -0.0005 | -1.04 | -0.0045 | -1.84 | -0.0030 | -1.11 |
| Recreation | 0.0015 | 0.43 | 0.0004 | 0.87 | 0.0061 | 2.52 | 0.0072 | 3.27 |
| College graduate, ages 25-44 | 0.0069 | 4.11 | 0.0004 | 1.46 | 0.0001 | 0.12 | 0.0005 | 0.54 |
| Median household income (ln) | 0.0964 | 1.71 | 0.0090 | 0.54 | -0.0409 | -0.99 | 0.0490 | 1.23 |
| Demography | | | | | | | | |
| Pop. Age 8-17 | 0.0112 | 2.08 | 0.0016 | 1.85 | 0.0079 | 2.28 | 0.0030 | 0.82 |
| Pop. Age over 62 | -0.0037 | -1.91 | -0.0001 | -0.17 | -0.0032 | -2.76 | 0.0021 | 1.67 |
| Native American | -0.0074 | -2.41 | 0.0008 | 0.62 | -0.0064 | -3.23 | -0.0052 | -2.67 |
| Black | -0.0022 | -2.62 | 0.0001 | 0.23 | -0.0021 | -3.90 | -0.0012 | -2.30 |
| Hispanic | -0.0013 | -1.61 | 0.0000 | 0.01 | -0.0007 | -1.37 | -0.0003 | -0.64 |
| Creative class (excl. artists) | -1.3670 | -3.11 | 0.0310 | 0.27 | 0.6906 | 2.41 | 0.6634 | 2.30 |
| RESIDUAL | 4.9128 | 1.99 | 1.0332 | 1.60 | 1.2875 | 0.80 | 0.1628 | 0.11 |
| W*bohemsh90 | 5.2643 | 1.25 | -0.4910 | -0.86 | 2.9596 | 1.08 | 1.0455 | 0.41 |
| Spatial error coefficient | 0.5776 | 7.83 | 0.3029 | 3.55 | 0.5168 | 6.73 | 0.5414 | 6.14 |
| N | 794 | | 794 | | 794 | | 794 | |
| Adj. $R^2$ | 0.40 | | 0.46 | | 0.55 | | 0.54 | |

Notes: 1/ t tests calculated using jackknifed standard errors.