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Functional Creative Economies: The Spatial Distribution of Creative Workers

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Abstract

Although cities face a myriad of challenges, they seem to be mitigated by the economic and agglomeration benefits that accrue to cities. Among these benefits is that high human capital and "creative class" individuals disproportionately aggregate in cities. In fact, the **share** of the workforce that is highly-skilled increases with city size and not just the number of highly-skilled workers. This creates tremendous complications for smaller cities and rural areas that not only suffer "brain drain" but also have to address the economic, productivity, and prosperity challenges that result from having a lower share of the workforce in those occupations that generate those benefits. A possible source of remediation that has been offered is proximity to major agglomerations and metropolitan areas. Small cities and rural regions may be spatially advantaged by their proximity. Using detailed demographic and geographic data for Ontario from Statistics Canada, this paper investigates the relationship between population, density, proximity, and the share of the workforce in the creative class for all Ontario Census subdivisions (CSD). Population and density are always important factors for the local creative class. A linear spatial model revealed no significant relationship while a gravity model shows a minor but significant relationship. In general, only close proximity or a very large creative population is positively related to a larger creative class in small cities and rural areas. The results suggest that functional creative economies should be characterized by fairly limited spatial distances when considered on a provincial scale.

Keywords: human capital, creative class, agglomeration benefits, brain drain, linear spatial model

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1.0 Introduction

We live in a creative economy. Regional success and prosperity are at least dependent on the ability to attract and retain talented, highly skilled individuals (Florida, 2002) as they are on job growth (Storper & Scott, 2009). Regions are reliant on the creative class (Florida 2002) to help generate the increases in productivity and regional incomes necessary to raise the standard of living (Florida, Mellander, & Stolarick, 2008). This creates complications for rural areas and smaller cities whose workforce usually has a lower share of creative workers than larger cities.

The share of the workforce that is highly-skilled increases with city size and not just the number of highly-skilled workers. This creates tremendous complications for smaller cities and rural areas that not only suffer "brain drain" but also have to address the economic, productivity, and prosperity challenges that result from having a lower

share of the workforce in those occupations that generate agglomeration benefits. A possible source of remediation that has been offered is proximity to major agglomerations and metropolitan areas. Small cities and rural regions may be spatially advantaged by their proximity to larger city concentrations of creative workers. Using detailed demographic and geographic data for Ontario from Statistics Canada, this paper investigates the relationship between population, density, proximity, and the share of the workforce in the creative class for all Ontario Census subdivisions (CSD). Population and density are always important factors for local creative class. A linear spatial model revealed no significant relationship while a gravity model shows a minor but significant relationship. In general, only close proximity or a very large creative population is positively related to a larger creative class in small cities and rural areas.

This paper will next present brief background and earlier findings on agglomeration impacts and the regional drivers of a creative workforce and discuss creative class research that has been completed in a Canadian and/or rural context. It will next investigate whether proximity to a large number of creative workers in nearby regions can help ameliorate the lower creative workforce share associated with being a smaller region. Finally, it will conclude with a general discussion of the findings and policy implications with a focus on smaller cities and rural areas.

2.0 Background/Literature Survey

As the focus of this paper is on understanding the strength of the centripetal force of agglomeration economies in pulling a creative workforce into a metropolitan area versus the centrifugal forces that pull people away from crowded, dirty, noisy, crime-ridden cities to more bucolic, outdoor amenity laden, uncrowded, unspoilt rural locations, some understanding of agglomerations and the underlying forces would be beneficial.

2.1 Agglomeration Economies: Industry, Location and Human Capital

Alfred Marshall (1890/2009), building on Adam Smith (1776/2007), discussed "industrial districts" as not only places where co-location of similar industries reduced costs and promoted economies of scale. He also identified them as locations where skills were developed and shared – where "mysteries of the trade become no mystery; but are as it were, in the air…" This set up the basis for what continues to be a central mystery of urban economics: Why agglomerations?

Agglomeration theories generally coalesce around three main themes. The first based on similarity of industry and specialization argues that economies of scale and the competitive advantage that it creates drives firms to co-locate to compete (Hotelling, 1929). The second approach focuses on the location itself and argues that the specific combination of resources, transportation linkages, governance, access to capital, and other shared, regional infrastructure and amenities, what Feldman and Martin (2005) labelled "jurisdictional advantage", create cost and competitive advantages for related firms or those with "related variety" (Boschma, 2009), who then co-locate because the location is so attractive. In the first approach, the co-located firms create the advantage while in the second, the location itself creates the advantage that the firms capitalize upon. The third argument for agglomeration economies returns to Marshall's point about skills – co-location of firms facilitates the creation of human capital and the transfer of skills. This approach considers that most skill transfer requires co-location to be efficient or successful. The transfer of skills and the generation of new human capital are reflected in increased wages for individuals and increased productivity for

firms (Rauch, 1991). This knowledge-based approach to agglomeration economies supports both specialization (Porter, 1996, and many others) and diversity (Jacobs, 1961, and others) of industries as generators of regional advantage. It also considers the agglomeration as a way to generate advantageous economies of scope (Florida, Mellander, & Stolarick, 2012). As the focus of this paper is on understanding how strong agglomeration forces are with regard to individuals, the third theme of human capital will be the primary focus of this review.

The literature around agglomerations of firms and industries and the various benefits created, costs shared, and other basic approaches to regional economies of scale is significant and varied. For a short overview see Combes, Duranton, Gobillon, Puga, & Roux (2009). Ellison & Glaeser (1999) specifically looked at the agglomeration benefits accruing to firms from location specific amenities, what they called "natural advantages". They found that roughly one-fifth of the benefit that firms received from agglomeration were from natural advantages and that the remaining 80% of the benefits must be from something else. They attributed this additional benefit to knowledge spillovers through a process of elimination but did not specifically test for it. Puga (2010) looked across the entire landscape of agglomeration and determined that the systematic variation in productivity levels across space were the result of various factors including industrial clustering and benefits being created by locations. In re-examining the causes of urban growth, Storper et al. (2009) point out that scale economies and the creation of jobs associated with scale have historically been a critical factor in expanding agglomerations.

While the importance of human capital to urban growth and the relationship between human capital, productivity, and agglomeration economies (Rauch, 1991) has become an accepted fact of urban economics, it was Lucas (1988) citing Jane Jacobs (1969) who first pointed out the importance of human capital to regional development. Using almost a century's worth of data on cities and human capital levels, Simon and Nardinelli (2002) showed how early initial levels of human capital generated higher later levels of regional human capital. They showed that the growth is very persistent with long lags, but that the effects were geographically limited. Glaeser and Saiz (2003) found that especially in declining regions of the country, skilled cities grew more quickly. Higher levels of human capital helped to act as a shock absorber and help cities in more challenged regions re-tool and grow. They also found that cities were going more quickly because of the agglomeration productivity effects that were created and not from the attractiveness of the city and its amenities.

Glaeser and his many collaborators have extensively considered the knowledge-based approach to understanding agglomeration economies (Berry & Glaeser, 2005; Ellison et al., 1999; Glaeser, 1997; Glaeser & Maré, 2001; Glaeser & Resseger, 2010; Glaesar et al., 2003, and others). Some have previously been discussed, but a brief summary of their findings would be beneficial. Agglomerations create knowledge transfer and skill acquisition, and density helps to speed up those interactions (Glaeser, 1997) so large dense cities have greater agglomeration benefits. He also shows how cities would be especially attractive to younger people who come to learn and would only remain attractive to older individuals if they can find a way to benefit from their interactions with younger people. Glaeser and Mare (2001) show that workers actually acquire their skills in cities rather than cities simply being accumulations of already highly-skilled individuals, and the wage premium from those additional skills persists after leaving the city – "[C]ities speed the accumulation of human capital (p. 316)."

Although cities help to build skills, skilled areas do attract more skilled workers (Berry et al., 2005). Over time, the distribution of human capital across the US has become more concentrated in fewer places. In line with Simon et al. (2002), Berry et al. (2005) found that high human capital generates even higher human capital. This is the result of human capital being generated locally as well as attracted from other areas. Most recently by Glaeser et al. (2010), the linkage between worker productivity and population has been investigated. They found that cities and skills are highly complementary and that in highly skilled cities, the agglomeration effect of scale economies creates a strong positive correlation between population and worker productivity. They do not investigate or consider whether it is actually the skilled individuals alone rather than the underlying entire population that is generating the effect. They also reiterate the earlier finding that density improves productivity – a finding also reached by Knudsen, Florida, Gates, & Stolarick (2007).

One generally unexplored question about agglomeration economies is how the boundaries should be defined. Mitchell and Stimson's (2010) work on defining functional regions in an Australian context may be the only exception. Where exactly do agglomerations end? Are commuting-based (labour market) definitions sufficient? Does density play a role (Knudsen et al. 2007)? Does proximity play a role (Lagendijk & Lorentzen, 2007)? Mitchell and Stimson's (2010) work suggests that labour markets are generally sufficient and proximity is an important consideration. If looking at how the location decisions of creative workers play out for small cities and rural areas, proximity to an existing agglomeration of creative workers may be an important factor.

2.2 Literature About Rural Creative Economies

Little has been done to try to understand and evaluate the creative class in a rural context, but there has been some work in both the US and Canada. In the US, McGranahan & Wojan (2007) re-evaluated the creative class concept for a rural setting and found that in rural counties the presence of the creative class was positively and significantly associated with growth. They also found that natural amenities and quality of life were important factors in attracting creative workers to a rural setting. Their redefined creative class did not include education, healthcare, or legal workers. They expanded their work to also consider entrepreneurship (McGranahan, Wojan, & Lambert, 2011; also Barkley, Henry, & Lee, 2006). McGranahan et al. (2010) found that "the interaction of entrepreneurial context with the share of the workforce employed in the creative class is strongly associated with [employment and firm] growth (p. 1)." They found that outdoor amenities were again especially beneficial to attracting creative workers and generating growth. They also found that low amenity counties often relied on "smokestack chasing" or urban proximity strategies for growth, but these were not that successful. Their results suggest that while the centripetal force from agglomeration can make urban areas attractive, the centrifugal force from outdoor amenities can be stronger. This implies that proximity to urban areas may not be an important factor in attracting and retaining creative class in non-metropolitan regions. Looking more broadly at the rural US landscape (McGranahan, Cromartie, & Wojan, 2010) shows that one-third of all non-metropolitan US counties lost 10% or more of their population *from out migration* over the 1990-2010 time period. While rural poverty is an issue, these losses were not from poverty. Amenities, especially outdoor amenities, can also play a role, but, overall, geographic isolation, poverty and a lack of amenities do not create a lack of economic opportunity. Plenty of successful, growing counties can be found in remote locations of the US.

2.3 Literature About Rural Creative Economies in Canada

In looking at rural Canada, Bollman (1999) found that in a rural context "a well-educated workforce provides … a necessary but not sufficient condition [to attracting firms and jobs] (p. 7)." Looking across Canada, the more rural a community, measured using metropolitan influence zones which are based on commuting patterns, or, effectively, the further away a community is from a metropolitan area, the less educated that community. So, unlike McGranahan et al.'s (2007) finding that human capital can be anywhere, regardless of urban proximity, Bollman's results suggest that for Canada, urban proximity may be an important factor in understanding creative class location concentrations. Also, while the US may have growing counties in remote locations, the remoteness of Canada's north is a different context. In examining the creative class in the Canadian periphery, Petrov (2007) found that Canada has "hot spots [in the cold]" with higher creative class concentrations. Similar to the US, selected isolated locations had a larger creative class presence and higher growth than their surroundings. He also found that towns dominated by a single industry had a very low creative class presence (Petrov, 2008). Entrepreneurship and leadership were more important for success than education, reinforcing a point often overlooked that the creative class is not defined by education but by what people are actually doing. Canada's aboriginal communities were also found to be more creative.

Limited research has been undertaken into looking at creative class, growth, and distance in British Columbia (Hughson, Nadler & Viaud, 2010). While not looking specifically at the relationship between share of the workforce in the creative class and distance from Vancouver, they did look at growth and found that growth decreases as distance from Vancouver increases. They only considered the small cities of northern BC and did not look at the more rural locations. They did determine that while the "friction of distance proves an obstacle (p. 1)," increased accessibility between the cities and Vancouver (measured in their case by airport size) can alleviate distance. As proximity also means increased accessibility, it should be expected to be significant.

Understanding where creative workers are locating requires evaluating the balance between the centripetal force created by agglomeration economies and the centrifugal force of creative workers desiring outdoor amenities and quality of life. Are creative workers more tightly concentrated in metropolitan areas and selected "hot spots" to take advantage of agglomeration effects? Or, do they try to balance the two by moving to the exurbs as a way to be close enough to the action but yet still have the bucolic quality of life? Exactly how big are agglomerations or creative economy functional regions? If agglomeration is the driving factor, distance from strong creative concentrations (metropolitan areas) will only be a factor over very short distances, if at all. If proximity over greater distances is found to be a factor, rural locations can trade on their location and spatial proximity to attract and retain creative workers.

2.4 Background

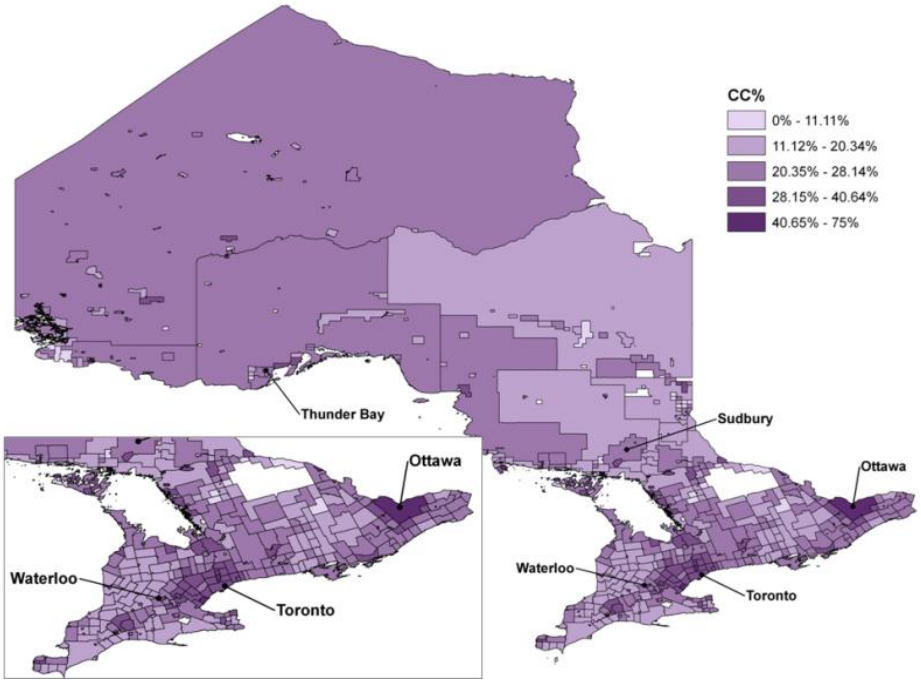

Figure 1. Ontario Census Subdivisions

Figure 1 shows the distribution of creative class workers by share of the workforce across Ontario. The regions shown on the map and used throughout this analysis are Census Subdivisions (CSD) as defined by Statistics Canada. They are defined to conform to municipal boundaries but are also used to make up the balance of the province. For the most part, they are comprised of cities, towns, townships, and counties, but they are defined to contiguously cover the entire province. Figure 1 shows that creative workers are more highly concentrated in two areas. The first is the larger metropolitan areas, especially in southern Ontario (Ottawa and the greater Toronto area (GTA) or greater golden horseshoe (GGH)). The second is a higher concentration in less populated areas which is a reflection of the need to provide human services (education, healthcare) across a large geography. This is consistent with other findings in Canada (Petrov, 2007, 2008) and the United States (McGranahan et al., 2007; Mcgranahan et al., 2011). The creative workforce as identified here is all workers who have an occupation that is identified as "creative" as defined by Florida (2002; see his appendix for the general definition), and the definition used here exactly matches the one used for both Canada and Ontario in *Ontario in the Creative Age* (Florida & Martin, 2009).

The higher concentration of creative workers in larger cities while briefly discussed by Florida (2002) and others has basically become a stylized fact. It is widely accepted but little investigated. One exception is (Andersen, Hansen, Isaksen, & Raunio, 2010) but they focused only on a Scandinavian context.

Figures 2 and 3 show the relationship between total employment (x-axis) and total creative class employment (y-axis) for Ontario Census subdivisions (CSD) at both the overall level (all CSDs) and for regions with total workforce below 100,000. (Regions with Creative employment under 100 are excluded since the estimates are

not very reliable, but including them does not change the results.) Creative employment gets larger as regional workforce increases. And, the result holds over small, medium, and large regions (the tiniest regions are not shown).

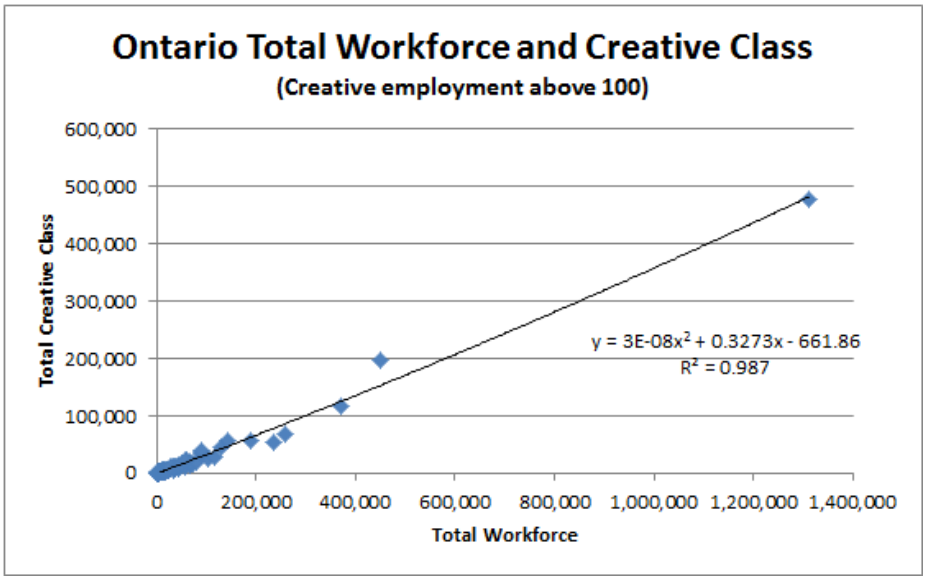

Figure 2. Creative Employment and Total Workforce

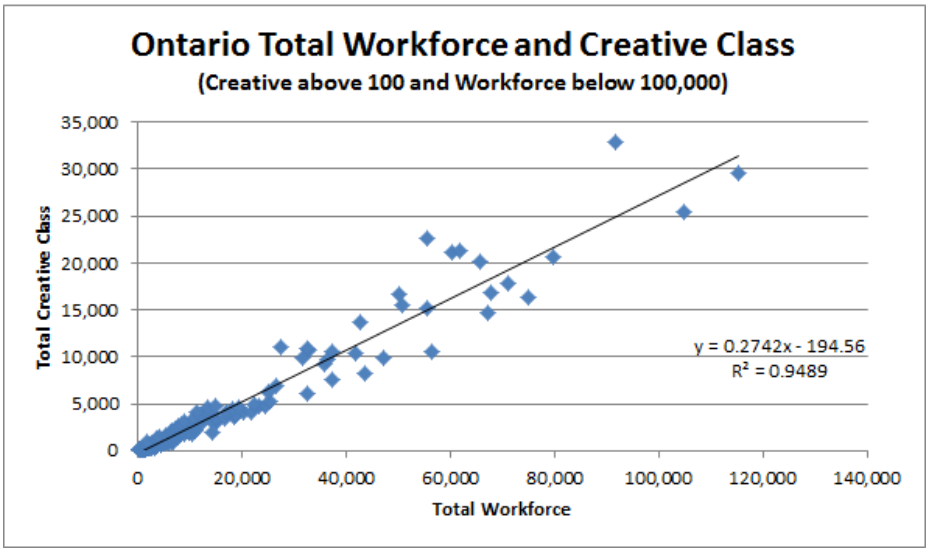

Figure 3. Creative Employment and Total Workforce (Workforce under 100,000)

Figure 4 shows total workforce size (logged) and share of the regional workforce that is in the creative class. The data has not been limited in any way at the upper bound but has been limited at the lower bound. As the estimates are not very reliable for the smallest of regions, only places whose creative workforce is 100 or more have been included. Figure 4 shows that the share of the workforce that is in the creative class increases as the workforce gets larger. (The two outliers are the smallest CSD included and the home of nuclear facility.) Taking the logarithm of the total workforce, allows for a greater comparison over a much wider range of values. The relationship is as

expected; as total regional workforce increases, the number of creative workers increases at an even faster rate. While the creative workforce grows with the overall workforce, the creative workforce grows even faster as the total workforce gets larger. Clearly, smaller counties face greater challenges in retaining and attracting a creative workforce. So, the smaller cities and rural areas of Ontario have a more difficult time attracting and retaining a creative workforce.

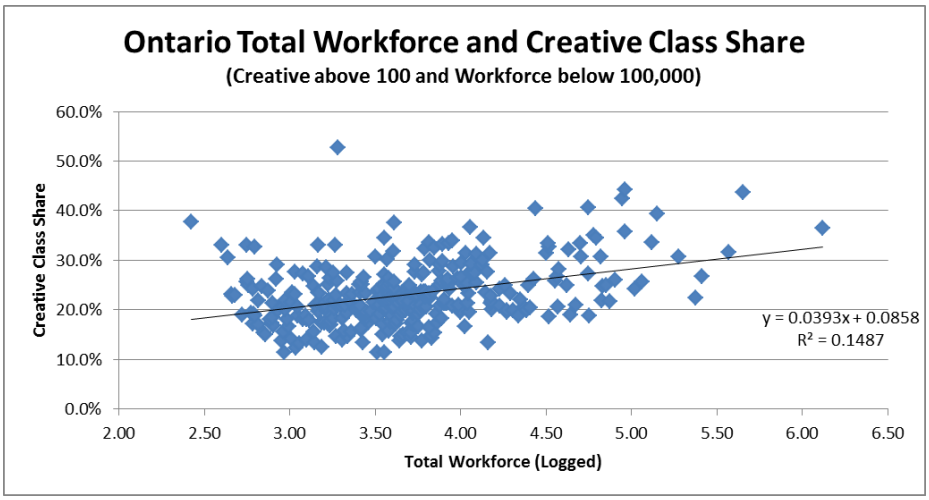

Figure 4. Creative Employment Share and Total Workforce (Workforce under 100,000)

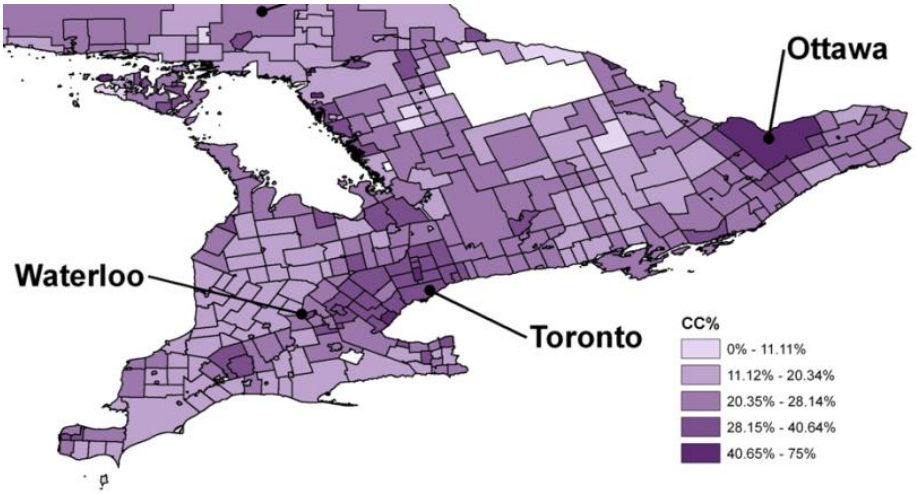

Figure 5. Southern Ontario Creative Class

Figure 5 repeats Figure 1 but shows only southern Ontario (by far the most populous part of the province). A few major cities have been identified on the map. The other areas with high concentrations of creative workers (darker shade) are generally other cities across southern Ontario. Looking at Figure 5 a pattern seems to emerge—the largest cities have the highest share of creative workers, in line with what has already been discussed, but then the areas surrounding these largest cities also have a fairly large share of creative workers. The most rural places seem to have the lowest share of creative workers, especially when those rural areas are

more isolated and farther from larger metropolitan areas. As has already been discussed, this could be a pure population or density effect. Places close to Toronto or Ottawa also have fairly large populations and higher population densities than those places that are not as close to the big city. But, even places outside of the Toronto Census Metropolitan Area (CMA), as defined by Statistics Canada using commuting patterns, that have fairly low populations and densities still seem to have a larger share of their workforce in the creative class than places that are further afield. It is a bit of a bull's eye effect with the large city with the highest creative share in the middle and creative share decreasing with distance from the middle. It is clearly not a perfect relationship and may just be a reflection of population and density and nothing else. Using the incredibly rich dataset on the entire province of Ontario, this relationship will be tested in two ways.

To understand if the number of creative workers in one location is influencing the number of creative workers in other locations inverse distance weighted creative employment totals will be calculated for all possible pairings among the 578 CSDs in Ontario. These are not symmetrical because of the weighting. The distance can be weighted in two ways. First, a linear or straight-line calculation (actually a great circle calculation) can calculate the distance between the centroids in latitude and longitude for any pair of CSDs. By dividing the number of creative workers in another CSD by the distance from the current CSD and repeating for 577 CSDs and then summing the results, every CSD in Ontario is given an inverse distance weighted creative worker total for the rest of Ontario. Places that are very close to a large creative workforce, for example, close to Toronto, have a higher total than places that are further away. And, places like Toronto that have a relatively much larger creative workforce can exert their influence over a wider area than cities with a smaller creative workforce.

A second way to use distance to weight creative workforce totals is to build a gravity model instead of a linear model. This second measure has been selected as a way to allow for any potential impacts of neighbouring creative workers to be much more spatially limited. While other gravity models are possible as our other approaches to limit impact to more proximate locations, the approach taken here is a standard and typical approach. So, rather than dividing by distance, the square of distance is used instead. Effectively, this greatly reduces the geography over which a city's creative workforce could have influence, or permits places with a fairly small creative workforce to influence only their immediate neighbours.

To help explain these two approaches and to more clearly demonstrate the impact from each of the two distance weighting approaches, consider the following example. There are three cities of various geographic sizes and with different creative populations. These cities, A, B, C are just on a line with A and B 10 km apart; B and C 100 km apart; and A and C 110 km apart. A has a creative workforce of 500. B has a creative workforce of 50,000, and C has a creative workforce of 5,000.

Using the linear (just distance) model results in Table 1:

Table 1. *Linear Distance Example*

City/Pair City	A	B	C	Σ weighted
A	--	5000	45.5	5045.5
B	50	--	50	100
C	4.5	500	--	504.5

Just looking at city A, we see that it is 10 km within 50,000 creative workers (50,000 / 10 = 5,000) and 110 km away from 5,000 creative workers (5,000 / 110 = 45.5). So, overall, city A is has 5,045.5 creative workers (weighted) around it. Similar calculations were completed for the other cities.

Using the gravity (distance squared) model results in Table 2:

Table 2. *Gravity Distance Example*

City/Pair City	A	B	C	Σ weighted
A	--	50	0.4	50.4
B	5	--	0.5	5.5
C	~0	5	--	5

Looking again at city A, we see that, using distance squared, puts just over 50 weighted creative workers in its neighbourhood (50,000 / 102 = 50; 5,000 / 1102 = 0.4). The actual weighted total values from the gravity model are greatly reduced and many CSDs have fairly small weighted totals indicating that there is little opportunity for surrounding creative workforces to have an influence.

For the 578 CSDs in Ontario, the creative workforce has an average size of 3,385, a median of 344, and a standard deviation of 22,901. The values are highly skewed to the left with a long thin tail to the right – a very large number of regions have fairly small values while a few have larger values. Using linear distance to weight the creative workforce, the regions on average have a weighted total neighbouring creative workforce of 13,197 with a standard deviation of 13,255. The linear weighting process evens out some of the extreme differences and is not as highly skewed as the distribution of creative workforce counts. Using the gravity model to weight the creative workforce mostly restores the skewed distribution but is not as skewed as the original creative workforce counts. With the gravity model, the average region has a weighted neighbourhood total creative workforce of 465 and a standard deviation of 1,293. 459 of the 578 regions have a gravity weighted total under 500 and 267 of the regions are under 100. As designed, the gravity weighting only picks up either very close neighbours or fairly close regions with very large creative workforce totals.

Because such a large number of CSDs in Ontario are so small for which reliable data is not readily available and which unnecessarily introduces noise, analysis shown has been limited to only those CSDs which have regional Creative class employment of 100 or more. (Results using all CSDs have also been completed and the results do not vary significantly from those presented below and are available from the author on request.) Using only the small and larger towns and cities but not the tiniest ones reduces the sample from 578 to 340. (There are two CSDs with population numbers but no occupational detail). Table 3 shows the statistical summary for the variables to be used in the analysis and the names that are used to present the results. The mean and median values show the amount of skew in the raw data and also show that, as is typical, logging the values helps to reduce that skew.

Table 3. *Summary Statistics*

Variable	Description	N	Mean	Median	Standard Deviation	Minimum	Maximum
Dependent Variables							
CC	Creative Class Workforce	338	5,770	901	29,735	100	478,615
LOGCC	Natural Log of Creative Class Workforce	338	3.03	2.95	0.648	2.00	5.68
CC_SHARE	Share of total workforce in creative class	338	0.230	0.220	0.061	0.113	0.528
Independent Variables							
WORKFORCE	Total Workforce	338	19,001	4,085	82,012	265	1,311,655
LOGPOP06	Natural Log of total population	338	3.96	3.90	0.571	2.60	6.39
POPGR	Population growth (share) 2001-2006	340	-0.032	-0.029	0.077	-0.53	0.282
DENSITY06	Population density (residents per km2)	340	219.1	24.3	449.5	0.00	3,972
SUMCCDISWGT	Distance weighted Creative class in rest of Ontario (linear)	340	16,861	11,984	14,876	1,096	105,557
LOGSCCDW	Natural log of SUMCCDISWGT	340	4.08	4.08	0.370	3.04	5.02
GRAVITYCC	Distance weighted Creative class in rest of Ontario (gravity)	340	634.7	211.4	1,399	1.46	14,368
LOGGRCC	Natural log of GRAVITYCC	340	2.30	2.33	0.706	0.165	4.16

3.0 Results

Tables 4 and 5 show the results of estimating total regional creative workforce (Table 4) and share of regional workforce in the creative class (Table 5) using total region workforce size (logged for estimating creative share), regional population growth (2001-2006), population density, and the sum of the inverse distance weighted creative workforce in the other 339 Ontario CSDs (logged for estimating creative share). Population growth was included to allow for the possibility that growing regions, rather than simply larger regions are actually what is associated with larger creative

workforce shares. (VIF, variance inflation factor, values were calculated for all regressions to check for multicollinearity, and none of the regressions had values high enough to even suggest that multicollinearity may be an issue.)

While the R-square in Table 4 is impressive, it is almost entirely the relationship between workforce size and total creative workforce that is driving the results. Population growth is not significant. Density is significant and negative, but as density is correlated with total population size, which is correlated with total workforce, the negative is indicating that among regions with similar populations the region with the larger area (lower density) is more likely to have more creative workers. To examine just the impact of density on the relationship, the regressions are repeated without total workforce (see below). Most importantly for this analysis, the regression shows no significant relationship between the size of a region's creative workforce and the distance weighted size of the creative workforce of that region's neighbours. The results in Table 4 show that using the linear distance weighting, a region's neighbours do not influence the size of its creative workforce; a region's creative workforce size is being driven by total workforce size and little else.

Table 4. *Total Regional Creative Regression (linear distance)*

Root MSE	3434.52801	R-Square	0.9868
Dependent Mean	5769.85207	Adj R-Sq	0.9867
Coeff Var	59.52541		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-560.92821	284.67196	-1.97	0.0496
WORKFORCE	1	0.36977	0.00290	127.36	<.0001
POPGR	1	2435.46652	2880.32030	0.85	0.3984
DENSITY06	1	-2.83203	0.55369	-5.11	<.0001
SUMCCDISWGT	1	0.00010349	0.01441	0.01	0.9943

Table 5 shows that when the share of the regional workforce that is in the creative class is considered instead of just the absolute size of the creative workforce, the results are consistent. However, less of the variation in the regional shares is explained. Density is no longer significant, and population growth is now both significant and negative. So, far from regional growth as explaining the creative share of the workforce, these results (and all the results that follow) show that places that experienced higher population growth were more likely to have a lower share of their workforce in the creative class. This is actually in keeping with the finding that population growth is not related to other measures of regional prosperity (productivity growth or wage growth). Population growth is not necessarily a benefit to a region (Gottlieb, 2002). As a larger presence of the creative class is more associated with regional prosperity, this negative relationship is not unexpected. As with the regression in Table 4, the linear distance weighting of creative employment in the rest of Ontario (logged) is not significantly related to the regional share of creative employment.

Table 5. *Share Regional Creative Regression (linear distance)*

Root MSE	0.05445	R-Square	0.2176
Dependent Mean	0.23027	Adj R-Sq	0.2082
Coeff Var	23.64462		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.15263	0.04025	3.79	0.0002
LOGPOP06	1	0.02666	0.00678	3.93	0.0001
DENSITY06	1	0.00001222	0.00000819	1.49	0.1369
POPGR	1	-0.25019	0.04620	-5.42	<.0001
LOGSCCDW	1	-0.00932	0.00928	-1.00	0.3161

Tables 6 and 7 repeat the analysis in Tables 4 and 5 but switch to the gravity-weighted approach to calculate the size and proximity of a region's neighbours' creative workforce. The results in Table 6 are very similar to Table 4 with similar explanations for those results, but with one important exception. Using the gravity-weighting, neighbouring creative workforces have a positive significant relationship with the size of the regional creative workforce. Being close to places that have a larger creative workforce helps to increase the size of your creative workforce even when overall workforce size is taken into consideration.

Table 7 mirrors Table 5 almost exactly. This includes the insignificant result for gravity-weighted creative workforce in the neighbouring regions. While being close to regions that have a large creative workforce may help to increase the total size of another region's creative workforce, it does not seem to impact the latter region's share of the workforce that is creative when regional workforce controls are included.

Table 6. *Total Regional Creative Regression (gravity weighted)*

Root MSE	3411.42029	R-Square	0.9870
Dependent Mean	5769.85207	Adj R-Sq	0.9868
Coeff Var	59.12492		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-649.72941	218.99218	-2.97	0.0032
WORKFORCE	1	0.37009	0.00289	128.19	<.0001
POPGR	1	4178.87001	2765.27515	1.51	0.1317
DENSITY06	1	-3.11805	0.55318	-5.64	<.0001
GRAVITYCC	1	0.31286	0.14705	2.13	0.0341

Table 7. *Share Regional Creative Regression (gravity weighted)*

Root MSE	0.05449	R-Square	0.2164
Dependent Mean	0.23027	Adj R-Sq	0.2070
Coeff Var	23.66260		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.12402	0.02548	4.87	<.0001
LOGPOP06	1	0.02638	0.00684	3.86	0.0001
DENSITY06	1	0.00001220	0.00000820	1.49	0.1379
POPGR	1	-0.24611	0.04664	-5.28	<.0001
LOGGRCC	1	-0.00356	0.00503	-0.71	0.4796

As was mentioned earlier, the estimated coefficient on regional density is not as expected, which is likely the result of the strong correlation between regional workforce size and density. To test for this possibility the regressions from Table 4 (total workforce; linear distance) and Table 7 (workforce share; gravity model) were repeated without total workforce size. As expected, the coefficient on density does become positive. The linear distance approach continues not producing a significant result. However, dropping total workforce size (logged) from the gravity-based approach shows a strong, positive and significant relationship between both density and the gravity-weighted size of neighbouring creative workforces (logged). Additionally, the R-squared for the revised regression more than doubles from 0.207 to 0.445. With controls for density (which is correlated with region size) and population growth, the gravity-weighted size of neighbouring creative workforces, has a positive relationship with the regional share of the workforce that is in the creative class.

It is possible that the density measure is acting in a way so that neighbours have to be even closer than what the gravity model accomplishes in order to positively increase creative share. In effect, having higher density and having neighbours with large creative workforces only helps a region if that region is very, very close. Neighbours may actually have to be continuous or literal neighbours in order to influence the share of region's workforce that is in the creative class. Because the regions being evaluated here are CSDs they are closer to individual cities than metro regions. The results in Table 9 may be capturing the creative economy functional regions – a collection of regions that are fairly close together and all have higher densities actually meets one possible definition of a metropolitan region. Nevertheless, these results do indicate that proximity and a strong creative presence can influence both the overall size of the creative workforce in region and the share of the region's total workforce that is creative.

Table 8. *Total Regional Creative Regression (linear distance); without region size*

Root MSE	24178	R-Square	0.3447
Dependent Mean	5769.85207	Adj R-Sq	0.3388
Coeff Var	419.04290		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-1786.36105	2002.86912	-0.89	0.3731
POPGR	1	15042	20265	0.74	0.4585
DENSITY06	1	39.65705	3.11076	12.75	<.0001
SUMCCDISWGT	1	-0.04348	0.10140	-0.43	0.6684

Table 9. *Share Regional Creative Regression (gravity weighted); without region size*

Root MSE	0.48274	R-Square	0.4501
Dependent Mean	3.03182	Adj R-Sq	0.4451
Coeff Var	15.92241		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	2.36335	0.09603	24.61	<.0001
DENSITY06	1	0.00067716	0.00006170	10.98	<.0001
POPGR	1	-1.69052	0.41096	-4.11	<.0001
LOGGRCC	1	0.20336	0.04315	4.71	<.0001

4.0 Conclusions and Policy Implications

The original question addressed by this research is: So, what about rural regions and the creative class? Given that attracting and retaining a talented, high-skill (creative) workforce is a prerequisite for regional prosperity and success; do smaller cities and rural area have much of a chance? We started by discussing the relationship between the size of a region's workforce and both the size and share of that region's workforce that is in the creative class. It became fairly clear that larger regions out-perform smaller ones both by growing their creative workforces faster than their underlying workforce and by increasing the share of their workforce in the creative class. We also saw that this relationship is even stronger among smaller regions.

So, if limited size is a liability for building a strong regional creative economy, what else can small cities and rural areas consider? Returning to the creative class map of southern Ontario and considering other maps produced for other regions not included here, a strong possibility presents itself – maybe proximity to a larger creative workforce is a factor. Although if found to be important, this finding may offer scant solace to cities and rural areas that are not close to a major metropolitan region. However, looking at this does accomplish two other important points that

would be important to a wide variety of areas. First, knowledge is power – forewarned is forearmed – if proximity really does play an important role, how important is it? How much proximity? How close is close enough? Although measured in kilometers, distance is really a question of time (commuting time, travel time). Understanding the role of distance could help with prioritizing regional transportation plans and other connectivity issues as ways to help mitigate distance from a major creative center. The second question that understanding proximity helps to address for isolated areas is: So, is Prince Edward County a good example or just the beneficiary of a good location? Prince Edward County (PEC), Ontario (Stolarick, Denstedt, Donald, & Spencer, 2010) has been held up as an example of what other rural, predominantly agriculturally driven regions could do to develop their creative economies. And, while PEC definitely gains advantage from tourism and its relative proximity to Toronto, Ottawa, and Montreal, at the core, the development of PEC has been about developing a creative economy and attracting talented, skilled creative workers to become residents of the county. If its proximity to Toronto and Ottawa is an important factor, knowing that will allow other regions to discount the learning they take away from PEC when considering their own, less-proximate situation. On the other hand, if PEC is too far away to benefit from the size of the creative workforces in the major cities of Ontario, other rural areas can more seriously consider the PEC example.

Measuring the potential impact of "nearby" creative workers was approached using two different measures. The first was a linear creative workforce divided by distance calculation, and the second divided creative workforce by distance squared. The two measures both allow for the size of other creative workforces to impact a local region. The gravity based measure dramatically increases the potential impact of distance so finding any effect would require both proximity and a very short distance between two regions. The linear measure will allow for a positive effect when either the distance is short or the other region's creative workforce is very large. By looking at both measures, the role of distance can be more firmly established and the investigation of the PEC question completed. If linear distance is found to be significant, PEC would likely be seeing a positive local creative workforce impact from its proximity to Toronto and Ottawa. While, if only the gravity model is found to hold, then PEC would not be benefiting from proximity.

The analysis shows clear results. As expected from the earlier analysis, regional overall workforce size is an important factor for both regional creative workforce size and share of the regional workforce in the creative class. The linear approach to measuring the impact from the creative workforces of other regions is not significantly related to a region's creative workforce or creative workforce share. The gravity base approach, however, does show a positive significant relationship between neighbors' creative workforces and the region's total regional creative workforce. A similar relationship to regional share of creative workforce does show up when total workforce size is excluded.

The results are clear. Being close (really close) to a region with a large creative workforce likely means that your creative workforce is also larger. If you are part of the same functional area (commuting shed) and have a higher density, being very close to a region with a large creative workforce would be associated with an increase your region's share of the workforce that is creative. In terms of the proximity questions, yes being close can help but the impact is spatially limited and does not reach very far. And, in terms of Prince Edward County, while some

of the proximity benefit derives from tourism, the creative economy benefits and increasing creative class presence does not result from the county's proximity to Toronto and Ottawa and their surrounding regions.

We set out on this paper to ask about rural regions and the creative class. What have we found and what does it mean? Smaller regions are disadvantaged. They have greater difficulty attracting and retaining the creative workforce needed to help generate regional success. Those difficulties are systemic. It is within the nature of almost all smaller regions to under-perform. There are some outstanding exceptions that over-perform, but they are not easily replicable. However, there is still a great deal of variation across all region sizes. Even among regions with total creative workforces of under 500, the share that is creative workers varies from under 10 to over 35%. So, there is hope.

Although smaller regions may be disadvantaged by their size, they are not particularly disadvantaged by their location. While immediate proximity can be an advantage, the effect is limited to a fairly short distance with a fairly large creative workforce. Proximity to Toronto is no more an advantage to Peterborough at 137 km distant than it is to Thunder Bay at 1,270 km away. Given the variation in regional creative employment and the relatively small role played by geography, regions can identify and evaluate benchmark regions and strong performers from a wide variety of locations to find the best and emerging practices that can help them to develop their own creative economies.

5.0 References

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