DOES RESIDENTIAL DIVERSITY ATTRACT WORKERS IN CREATIVE OCCUPATIONS?

Sveta Angelopoulos
School of Economics, Finance and Marketing, RMIT University, Melbourne, Victoria, 3001, Australia. E-mail: sveta. angelopoulos@rmit.edu.au.

Jonathan Boymal
School of Economics, Finance and Marketing, RMIT University, Melbourne, Victoria, 3001, Australia.

Ashton de Silva
School of Economics, Finance and Marketing, RMIT University, Melbourne, Victoria, 3001, Australia.

Jason Potts
School of Economics, Finance and Marketing, RMIT University, Melbourne, Victoria, 3001, Australia.

ABSTRACT: The 'Florida hypothesis' suggests that regional economic growth is driven by inflows of creative workers (the 'creative class'), and that creative class workers are attracted to regions that are tolerant and diverse. This paper seeks to test the second part of the hypothesis for Australia. Evidence suggests that while there is some association between changes in the creative class and tolerance, the association with diversity is weak and inconsistent. We conclude that overall, the Florida hypothesis does not explain the locational decisions of creatives in the Australian context.

KEYWORDS: Creative Occupations, Florida Hypothesis, Quantile Regression, Tolerance, Diversity, Australia, Census

1. INTRODUCTION

Human capital has long been understood to be a driver of economic growth (Schumpeter, 1942; Jacobs, 1961; 1969; Romer, 1986; Lucas, 1988; Landry and Bianchini, 1995; Glaeser, 1998; Glaeser *et al.*, 1995; Andersson *et al.*, 2011; Florida, 2002; 2012; Currid-Halkett and Stolarick, 2012). In recent times, discussion has centred on the role of the creative class in supporting *regional* innovation, prosperity and renewal, and the features that attract creative class workers to particular regions. The *Florida hypothesis* suggests that creative class workers are attracted to regions that are tolerant and diverse. For local governments, this provides a policy avenue by which economic prosperity can be promoted.

The effectiveness of this policy avenue depends on creative workers' locational decision. Using Australian census data measured at the statistical local area (SLA) we consider these decisions across time using both traditional and quantile regression approaches.

Previous assessments of the Florida hypothesis applied to Australia have been sparse and generally narrower in focus. Examples include Berry (2005), who considered the area of Melbourne; and Throsby (2008), who examined the concepts of creativity (focusing particularly on the Bohemian class) and how it pertains to a 'Creative Australia'. Other studies have focused on creatives in different ways. These include, the work undertaken in the development of the 'creative trident' methodology by the ARC Centre of Excellence for Creative Industries and Innovation; Potts (2011), who considered the contribution of creative industries to innovation; and Sorensen (2009; 2011), who extended the scope of industries to include the agricultural sector showing that creativity and innovation are not restricted to urban regions. Recently, Flew (2012) examined the locational decisions of creative industry workers, finding that in Australia, creative workers do not necessarily locate in inner city suburbs, with large numbers preferring outer suburbs. In general these studies failed to detect strong evidence in favour of the Florida hypothesis.

This paper builds on previous research by including a comprehensive classification of creative workers using detailed occupational information and by measuring the degree of regional diversity and tolerance. We found some evidence (albeit weak) of association between both diversity and tolerance and creatives, although not always in the direction anticipated and not necessarily consistent across regions. Overall however, there was little evidence to support the Florida hypothesis.

In the next section we provide a background of the measures used. This is followed by a brief discussion of the degree of diversity and tolerance across Australia using 2011 Census data. The discussion of the econometric analysis follows. A summary of our main findings is presented in the last section.

2. CALCULATION OF MEASURES

For the purposes of this analysis, four principal types of diversity were considered: ancestry, migrant, linguistic, and religious. Tolerance was proxied for by the proportion of residents in a same-sex relationship. In addition to these forms of diversity and tolerance, a set of control factors were included. These include: a population density variable, reflecting the link between highly skilled, creative individuals and city-regions (Jacobs, 1969; Lucas, 1988; Martin and Sunley, 1998; Orlando and Verba, 2005; Duranton and Puga, 2000; Knudsen et al., 2008) and the existing size of the creative class, capturing whether a critical mass factor is present; and education (proportion of the resident population aged 25 and over with a completed degree qualification or higher) and workforce variable (proportion of the resident population that is part of the workforce) controlling for locational decisions being based on socio-economic factors.

Consistent with previous studies (Mauro, 1995; Easterly and Levine, 1997; Alesina and La Ferrara, 2002) the Herfindahl Index was used to construct the various diversity indices:

$$Diversity\ Index = 1 - \sum_{i=1}^{I} \left(\frac{n_i}{N}\right)^2$$

Where N is the total resident population within a region and n is the total number of people of a particular group within that region.

Census data from the years 2001, 2006 and 2011 counting persons place of usual residence measured at the SLA level was used. SLAs were chosen as the most appropriate data spacial unit available at the time of writing. They aggregate to cover the whole of Australia without gaps or overlaps. SLAs are a standard small area spacial unit used in Australian geographical research, including Argent et al. (2010) who focus on rural migration, Taylor et al. (2004); Chin and Harding (2006) and Rahman et al. (2013) focusing on housing, Tanton et al. (2009) and Miranti et al.

(2011) looking at poverty, amongst others. Previous studies have shown that SLAs are 'likely to be socially and economically relevant to their residents' (Turrell *et al.*, 2007 because they are 'based on the boundaries of incorporated bodies of local government where these exist' (ABS, 2011). Generally, SLAs, consist of a 'closely related group of suburbs' (Blakely *et al.*, 2006, p.8), therefore representing an appropriate spatial unit to explore locational decisions. In total, there were 1 389 SLAs, however not all SLAs could be used as major geographical reallocations had occurred as well as some recording zero measures. This resulted in some SLAs being dropped from analysis. Many SLAs where abolished or significantly reduced and areas transferred to other SLAs. Where this occurred, the SLA was omitted from any comparability analysis. For the 2006 to 2011 period this consisted of 18 2011 SLAs not being used while 189 were omitted from the 2001 to 2011 analysis.

Index construction for ancestry, migrant and linguistic diversity was based on the highest level of detail, referred to as 'four-digit level' data. The ancestry diversity index consisted of 316 categories for respondents' classification of their ethnic background while the migrant diversity index was based on 290 groupings for respondents' place of birth. The linguistic diversity index has 499 language sets spoken at home.

In contrast to the other diversity measures constructed, the religious diversity index was based on residents' religious affiliation at the 1-digit level. The one-digit level of data was chosen because it provides a better representation of distinct religious groupings than the three- or four-digit levels. Religious affiliation at the one-digit level uses 7 categories - Buddhism, Christianity, Hinduism, Islam, Judaism, Other Religions, and No Religion, while various branches of Christianity dominate religious groupings at the higher digit level.

To examine the degree of tolerance in Australia, the percentage of residents in a same-sex relationship was considered, following previous studies including Qian (2013). The percentage of same-sex couples was based on self-identification and the census only counted those that consider themselves in a de facto marriage. While the numbers are likely to vastly understate the gay population, they still provide an adequate indicator of tolerance.

The definition of the creative class employed in this investigation corresponds to McGranahan and Wojan (2007). They recast Florida's creative class using the Occupational Information Network (O*Net; US Department of Labor), identifying the occupations that 'generally require a high level of creativity'. This reduced the Florida's creative class by

omitting occupations that required relatively little creativity and those that were involved in economic reproduction and were generally proportional to the resident population, such as schoolteachers. The occupations identified in this recast creative class were used as a base for generating the Australian creative class by matching them to Australian occupations as classified by the Australian and New Zealand Standard Classification of Occupations (ANZSCO). It excludes from the original Florida measure many occupations with low creativity requirements and those involved primarily in economic reproduction. Creative class occupations included a subset of: management occupations; business and financial operations occupations; architecture and engineering occupations; legal occupations; education training and library occupations; and art design, entertainment, sport and media occupations.

3. SPATIAL DISTRIBUTION OF DIVERSITY IN 2011

In Table 1 a set of descriptive measures by SLA are presented using the most recent Census data available. The measures are presented at the 25th and 75th percentiles, together with the mean and medians. The relative proximities of these four descriptives summarise the typical values and the dispersion as well as the shape of the distributions. These three characteristics provide some valuable insights into the spatial distribution of diversity, tolerance and creativity across Australia. In addition, a ratio descriptive is calculated. The ratio descriptive is the 75th percentile divided by the 25th percentile, which provides the means of comparing the relative dispersion of the variables.

According to the means and medians approximately one quarter of the workforce in each SLA belonged to the creative class. In columns two and five the 25th and 75th percentile measures are presented and suggest that one quarter of SLAs in Australia had a creative class component of less than 16 per cent. Interestingly, only 25 per cent of SLAs had a creative class of greater than 31 per cent. The ratio statistic of 1.98 indicates that the top 25 per cent of SLAs ranked according to the percentage of individuals belonging to the creative class had at least double the proportion of creatives when compared to the lowest ranked SLAs. This indicates that there were vast differences in the creative class across SLAs and hints there may be some clustering occurring

Table 1. Summary Statistics for the Distribution of the Creative Class, Measures of Diversity and Control Variables for Australia.

	25th Percentile	Median	Mean	75th Percentile	Ratio
Creative Class (%)	15.98	21.79	24.34	31.61	1.98
Ancestry Diversity	0.74	0.78	0.78	0.83	1.12
Migrant Diversity	0.18	0.31	0.33	0.45	2.57
Linguistic Diversity	0.06	0.14	0.21	0.31	5.25
Religious Diversity	0.38	0.44	0.43	0.50	1.29
Tolerance (%)	0.09	0.18	0.26	0.31	3.48
Popn Density	2.38	172.27	794.64	1419.65	595.25
Foreign-Born (%)	8.94	16.51	18.17	25.05	2.80
Foreign-Born Parent(s) (%)	20.09	33.20	33.27	44.21	2.20
Education (%)	9.78	14.61	20.29	27.09	2.77
Workforce (%)	41.49	45.56	44.97	49.58	1.20

Note: Creative class (%) is based on the McGranahan and Wojan (2007) identification, measured as a percentage of the workforce, with the workforce consisting of all residents identified as part of the total Florida creative class, service class, working class and agricultural class. Tolerance is measured as the percentage of residents in a same-sex relationship; Population Density is the resident population per km^2; Foreign-Born and Foreign-Born Parent(s) are measured as a percentage of the resident population; Education is the percentage of residents aged 25 and over with a bachelor degree qualification or higher; Workforce refers to the percentage of residents in the workforce. Source: Author's calculations using ABS data.

Ancestry diversity was consistently high for most Australian SLAs compared with the other diversity indices in the study, with over 95 per cent of SLAs falling within the 0.65 to 0.95-index range. Ancestry diversity was only 1.12 times greater in the most diverse SLAs compared with the least diverse SLAs. On average, Australian residents' ancestry diversity was high with mean index values of 0.778. Even the least diverse SLAs in Australia were relatively heterogeneous with an average ancestry diversity of 0.744. Only 5.4 per cent of SLAs had an ancestry diversity index below 0.7, suggesting that there was relatively little variability between most SLAs in regard to their high ancestry diversity.

In contrast, there was substantially more variability in migrant and linguistic diversity between regions. Some Australian SLAs consisted of only Australian-born residents, while in others, over 50 per cent of residents were foreign-born. Likewise, there were regions with only English-speaking households and other SLAs in which over 50 per cent of residents did not speak English at home. On average, however, migrant and linguistic diversity in Australian SLAs was low (0.330 and 0.211 respectively) with most households speaking English at home and the majority of residents born in Australia. Migrant diversity was 2.6 times larger and linguistic diversity was 5.2 times larger in the most diverse SLAs relatively to the least diverse SLAs.

Religious diversity was relatively constant for Australian SLAs with a ratio of 1.3 and ranges from a low of zero, indicating that everyone in the SLAs has reported the same religious affiliation, to a high of 0.746. The average religious diversity amongst Australian SLAs was 0.435, rising to an average of 0.552 for the most religiously diverse SLAs.

Reported same-sex couples ranged from zero to five per cent of residents, with 17 per cent of SLAs recording no residents that identify themselves as being in a same-sex de facto marriage relationship. The proportion of same-sex couples was 3.5 times greater in the most '*tolerant'* SLAs relative to the least '*tolerant'*.

The descriptives of the control variables indicate that population density varied considerably as did the proportion of residents with degree and higher qualifications. Population density ranged from 0.001 people per square kilometre to 8 166 people per square kilometre. The average was 795 people per square kilometre but this is exacerbated by the outliers as evident from a median of only 172 and a ratio of 595.245 (Table 1)

In addition to the summaries above, the association between these variables has been assessed using Pearson and Spearman correlations (see appendix). The general conclusion is that the relationship between creativity and both diversity and tolerance differed in strength and direction of (linear) association. In the next section this relationship is tested more thoroughly using regression techniques.

4. ECONOMETRIC ANALYSIS

In this section the results of two sets of econometric analysis are presented. The first test considers whether creatives have been drawn to areas of relatively more diversity and tolerance over a five-year period. The second test replicates the approach for a ten-year period. In each case two types of regression were employed, the standard linear regression approach and the Quantile Regression Technique (Koenker, 2005).

It has been noted that Australia has one of the most residentially mobile populations of any country (Hugo and Harris, 2011, p.3) with 43 per cent of households moving at least once every five years (Long, 1991). Consistent with this observation a relatively more recent study (ABS, 2009) indicates that 43 per cent of people aged 15 years and over had been living in their current residence for less than 5 years and 19.4 per cent for 5 to 9 years.

Accordingly, population mobility studies are often based on one or five-year intervals (Long, 1991; Bell, 1992; 1995), as are reports commissioned by government bodies (for example, Hugo and Harris,

2011). Interestingly, movement over this relatively short interval is most likely reflecting changes in younger adults because mobility tends to slow as age increases (Bell, 1996; Hassan *et al.*, 1996; ABS, 2010).

In contrast, according to HILDA based research (Wilkins *et al.*, 2009), people change their residence on average every ten years. We have therefore also considered this duration. It is likely that the examination of movements over this relatively longer time interval will reflect a slightly older cohort given the previous findings stated earlier.

Explaining Short-Run Changes in the Creative Class

To test the hypothesis that workers in creative occupations are attracted to regions that are more diverse and tolerant, two forms of regressions were fitted. These regressions are based on urban growth models and consistent with research which examines the change in the dependent variable as a function of the independent variables in the base year, including Glaeser *et al.*, (1992 and 1995) and McGranaham and Wojan (2007). Each regression examined whether the levels of diversity and tolerance in 2006 explain the change in creativity from 2006 to 2011. The first regression used the change in creativity as the dependent variable whilst the second used the change in the natural logarithm of the creative class. In both cases the set of control variables identified earlier are fitted. Formally, where y_i denotes the change in creativity for Statistical Local Area (SLA) 'i', the model is defined as:

$$y_i = \alpha + \sum_{j=1}^{k} \beta_j X_{i,j} + \sum_{h=1}^{m} \delta_j \mathrm{Z}_{i,h} + \varepsilon_i, \qquad \varepsilon_i \sim N(0, \sigma^2) \;\; i = 1 \ldots\ldots N.$$

Terms $X_{i,j}$ and $\mathrm{Z}_{i,h}$ denote diversity measures and control variables respectively. The term β_j and δ_j represents the degree and direction of influence of each diversity measure and control variable respectively. In total there were 1 331 SLAs. It is important to note that the dependent variable considered here is the change in creativity and that the independent variables represent past census years. This is different from the descriptive summaries provided in the previous section. The specification in this section was modified to formally test the central question identified at the start of this paper as well as to avoid issues relating to endogeneity. In Table 2, the diversity and tolerance measures and control variables are identified, together with the expected direction

of influence. The expectation is that there is a positive association between the various measures of diversity and tolerance and the change in the creative class. Based on the Florida hypothesis, regions with greater diversity are more likely to attract creatives, thus an increase in the proportion of creative class residents is expected to be evident in those areas.

Table 2. Explanatory Variables and Expected Association Directions

Explanatory Variables	Direction
Variables of Interest (at base year)	
Ancestry Diversity	positive
Migrant Diversity	positive
Linguistic Diversity	positive
Religious Diversity	positive
Tolerance	positive
Control Variables	
Creative Class	positive
Foreign-Born	positive
Foreign-Born Parent(s)	positive
Education	positive
Population Density	positive
Workforce	positive

Source: the Authors

The first group is of primary interest, capturing the various aspects of diversity and tolerance. The proportion of residents that were born overseas and the proportion of residents' parents that were born overseas were also used as indicators of area diversity in the study, complementing the ancestry, migrant and linguistic diversity indices.

Several control variables were employed. The first of these was population density. This was included to take into account whether individuals of the creative class were attracted to areas of higher population density. According to Florida (2002, 2012), creative class workers are more likely to settle in areas of higher density as access to, and availability of amenities and entertainment facilities are greater. Higher density areas also enable greater knowledge spillover, networking and interaction.

Counting people with undergraduate degrees is the standard measure of human capital and included as a control variable in the study. Areas of high human capital tend to also be higher socio-economic areas where schools may be of a higher quality (McGranahan and Wojan, 2007). The number of residents aged 25 and over, with an undergraduate degree or higher was included to test whether members of the creative class are more inclined to settle in these higher socio-economic regions.

The final two control variables - the proportion of residents in the workforce (as a measure of socio-economic status) and the size of the existing creative class (following McGranahan and Wojan, 2007) - test whether creative class workers prefer to settle in areas with an existing high proportion of residents in creative class occupations and where relatively more residents are part of the workforce itself.

Prior to estimating the regression model, the correlations for the change in the creative class and the explanatory variables were calculated (Table 3). They show mixed results for both direction and significance of the Pearson and Spearman's coefficients for the associations between the change/growth in the creative class and the various indicators of diversity. For example, the association between the change and growth in the creative class and ancestry diversity (also religious diversity) was negative, while the association with linguistic diversity was positive. The association with migrant diversity (also with sexual-orientation diversity) was positive for the change in the creative class and negative for the growth in the creative class. Overall, the generally greater magnitude of the Spearman relative to Pearson and the relatively low values of both of the coefficients suggest weak, non-linear associations between the change and growth in the creative class and the level of diversity and tolerance of Australian SLAs. The associations are further explored in the discussion relating to Table 6. The correlations suggest that SLA diversity and tolerance is only a minor consideration for location decisions of the individuals belonging to the creative class.

Five-Year Results

The results of four regression models are presented in Table 5. The table is made up of two panels of regressions. The first panel presents the results when the dependent variable is the change in the creative class and the second panel when it is the growth in the creative class. The foreign-born parents' variable was excluded from the regressions as it was shown

to be highly correlated with both migrant diversity and the foreign-born variable (Table 3).

In all instances the goodness of fit, as measured by the coefficient of determination (r^2), indicates that the models fit poorly (Table 4). Thus, in general, the results indicate that over this five-year period, changes in the proportion of creative workers in any given SLA cannot be explained by diversity and tolerance.

Despite the poor overall fit, individual aspects of diversity and tolerance do seem to be associated with the creative class. The directions of some of the relationships however, are contrary to initial expectations.

Across all the independent variables tested, ancestry consistently affected both the change and the growth of the creative class in Australian SLAs, with results suggesting that creative class workers are more likely to be attracted to SLAs with lower ancestry diversity. Although migrant diversity was significant and positive for both the change and growth in the creative class, its tolerance is consistently small indicating its explanatory power is negligible, dropping out of significance when the percentage of foreign-born residents is excluded as an explanatory variable. The *tolerance* value is a measure of collinearity. It measures the proportion of the variance in the independent variable that is not explained by (or accounted for) by all the other independent variables.

The relationship with religious diversity was negative and significant, affecting both the change and the growth of the creative class in Australian SLAs. Substituting the one-digit religious diversity index for the three or four digit index resulted in the same significant negative relationship between the change and growth in the creative class and religious diversity.

Results for tolerance and linguistic diversity were mixed, suggesting limited appeal to the creative class in their decision to settle in a particular area. Interestingly, tolerance was significant for the change variable, becoming significant for growth only when the percentage of foreign-born residents is dropped from the regression, whereas linguistic diversity was significant only for the growth variable. Both however indicate a positive association.

The percentage of foreign-born residents was significant and negative for both sets of regressions fitted although the tolerance values are very small; suggesting that in reality its explanatory power is likely to be insignificant. The tolerance value of 0.009 indicates that migrant diversity explains less than 1 percent of the variance that is not accounted for by the other independent variables.

Table 3. 2006-2011 Change in the Creative Class Correlation Matrix. Note: **Correlation is significant at the 0.01 level (2-tailed).

		Δ Creative Class	Δ Log Creative Class	Ancestry Diversity	Migrant Diversity	Linguistic Diversity	Religious Diversity	Tolerance	Creative Class	Foreign-Born	Foreign-Born Parent(s)	Education	Population Density
Ancestry Diversity	Pearson	-.092**	-.237**										
	Spearman's rh	.168**	.050										
Migrant Diversity	Pearson	.032	-.075**	.771**									
	Spearman's rh	.144**	.035	.897**									
Linguistic Diversity	Pearson	.099**	.092**	.476**	.735**								
	Spearman's rh	.187**	.087**	.851**	.792**								
Religious Diversity	Pearson	-.057*	-.125**	.609**	.715**	.470**							
	Spearman's rh	.059*	-.013	.612**	.693**	.562**							
Tolerance	Pearson	.082**	-.022	.320**	.365**	.254**	.387**						
	Spearman's rh	.164**	.054*	.548**	.499**	.415**	.410**						
Creative Class	Pearson	-.128**	-.201**	.562**	.628**	.399**	.509**	.493**					
	Spearman's rh	.027	-.134**	.736**	.701**	.611**	.498**	.611**					
Foreign-Born	Pearson	.037	-.065*	.746**	.992**	.760**	.690**	.322**	.592**				
	Spearman's rh	.143**	.035	.889**	.998**	.785**	.682**	.493**	.698**				
Foreign Born Parent(s)	Pearson	.047	-.045	.753**	.969**	.757**	.681**	.295**	.574**	.976**			
	Spearman's rh	.149**	.043	.883**	.980**	.795**	.677**	.476**	.687**	.985**			
Education	Pearson	-.010	-.090**	.498**	.563**	.406**	.479**	.470**	.867**	.546**	.512**		
	Spearman's rh	.102**	-.046	.699**	.630**	.552**	.464**	.578**	.898**	.629**	.626**		
Population Density	Pearson	.089**	-.026	.537**	.656**	.558**	.447**	.548**	.629**	.633**	.611**	.597**	
	Spearman's rh	.163**	.029	.796**	.746**	.706**	.452**	.593**	.762**	.745**	.741**	.682**	
Workforce	Pearson	-.014	-.096**	.349**	.202**	-.013	.193**	.236**	.416**	.178**	.205**	.444**	.260**
	Spearman's rh	.115**	.036	.303**	.252**	.166**	.198**	.206**	.437**	.255**	.274**	.554**	.238**

Source: Author's calculations using ABS data.

Table 4. 2006-2011 Regression Results for the Change and Log Change in the Creative Class.

Dependent Variable	Δ Creative Class		Δ Log Creative Class	
Independent Variables	coef	t-value	coef	t-value
Ancestry Diversity	-9.092	-6.321	-0.923	-9.544
Migrant Diversity	21.284	4.862	1.608	5.459
Linguistic Diversity	1.151	1.704	0.272	5.983
Religious Diversity	-4.817	-4.378	-0.221	-2.981
Tolerance	0.999	3.422	0.023	1.147
Creative Class	-0.174	-11.62	-0.01	-9.722
Foreign-Born	-0.248	-3.576	-0.022	-4.755
Education	0.084	6.957	0.005	6.01
Population Density	0.000	2.965	0.000	0.977
Workforce	0.031	2.377	0.002	2.139
Intercept	7.91	8.118	0.717	10.943
R2	0.153		0.18	

Source: Author's calculations using ABS data.

Looking at the control variables, the only consistently significant relationship was between the level of education and the creative class confirming that the socio-economic environment is likely to be important when considering residency in an SLA. Although the size of the creative class in the region was significant for all regressions fitted, the tolerance levels were consistently low, suggesting that the explanatory power is negligible. The existing size of the creative class does not seem to be a relevant factor for locational decisions made by the creative class. Population density and workforce on the other hand do not appear to be important influences on locational decisions for the creative class.

The unexpected results could be explained by examining the differences in the diversity variables. The average value for ancestry diversity was high (average of 0.767 and median of 0.769) as it takes account of the very diverse background of Australians. These high values for ancestry diversity were in stark contrast to migrant diversity with an average of 0.307 (median of 0.293). This may help to explain the

negative relationship between ancestry diversity and the change/growth in the creative class and the weak positive relationship between migrant diversity and the change/growth in the creative class. Suggesting that the creatives in Australia appear to be in favour of living in areas with some, but not too much diversity. This could imply that there is a positive relationship between moderate levels of diversity and the creative class, becoming negative when diversity becomes 'excessive' or pronounced.

Five-Year Quantile Regressions

Florida's creative class hypothesis states that creatives are more attracted to areas that are more tolerant and diverse. In the previous section the validity of this belief was tested using a traditional regression technique often referred to as an ordinary least squares regression. The results suggested that a clear positive relationship between diversity and creative class changes does not hold. A positive and significant association was only evident for migrant diversity (although the relationship appears to be exceptionally weak with a tolerance value of only 0.009) and tolerance. When focusing on growth, a positive association emerged for linguistic diversity but tolerance was no longer significant. Ancestry and religious diversity were negatively related to both the change and growth in the creative class and consistently significant.

In this section the Florida hypothesis is reconsidered using a quantile regression approach (Koenker and Hallock, 2001). The motive for utilizing this technique is that the association between diversity and changes in the creative class is likely to be more complex and multi-faceted than a linear relationship (which depicts the *average* association) is able to capture. To some extent this is reflected by the difference in the calculated correlations in Table 3 and Table 10 (see appendix). Specifically the non-linear associations are demonstrated by the stronger Spearman's rho (in general) than their Pearson counterparts. The results from this second phase of analysis were remarkably different from the previous analysis suggesting that the original ordinary least squares (OLS) results were not representative changes in the creative class 2006 to 2011. The direction of the relationship as well as the magnitude of the relationship between various types of diversity and change in the creative class varied over different percentiles as seen in Table 5. The percentiles refer to the size of the change in the creative class. For example, the lowest percentile (10th) consists of SLAs that experienced the largest

decreases in the size of their creative class, with the highest percentile (90th) consisting of SLAs that experienced the largest increases in their creative class.The row directly below each of the percentiles specifies the change and log change in the creative class that applies to each quantile experienced by SLAs. For example, the 10th percentile refers to a decrease in the creative class of 1.57 per cent or a decrease in the growth of the creative class of 0.07 per cent. In most instances the OLS result applies to those regions that experienced a moderate amount of positive change over the period.

Table 5. 2006-2011 Quantile Regression Results for the Change and Log Change in the Creative Class.

Quantile Coefficients for Δ Creative Class										
		10	20	30	40	50	60	70	80	90
Δ Creative Class		-1.57%	-0.56%	-0.03%	0.39%	0.80%	1.20%	1.66%	2.20%	3.33%
	OLS Coefficients									
Ancestry Diversity	-10.086**	4.603	-0.775	-2.727	-4.171	-5.220	-11.724**	-12.219**	-14.133**	-18.048**
Migrant Diversity	21.791**	3.280	3.749	9.072**	10.617**	11.799**	15.897**	18.753**	24.890**	35.204**
Lingusitic Diversity	0.472	-6.581**	-3.455**	-1.393	0.025	0.733	1.135	1.562	4.229**	6.3851**
Religious Diversity	-5.225**	-6.485**	-4.091**	-3.357**	-2.010**	-1.935**	-2.590**	-2.256**	-2.672	-4.296**
Tolerance	1.128**	1.040	1.065**	0.835**	0.913**	0.881**	0.884**	0.889**	0.752	-0.145
Quantile Coefficients for Δ Log Creative Class										
		10	20	30	40	50	60	70	80	90
Δ Log Creative Class		-0.07%	-0.03%	0.00%	0.02%	0.03%	0.05%	0.07%	0.09%	0.16%
	OLS Coefficients									
Ancestry Diversity	-1.007**	0.345	0.034	-0.110	-0.388	-0.608**	-0.827**	-1.084**	-1.478**	-1.930**
Migrant Diversity	1.65**	0.386	0.249	0.388**	0.597**	0.813**	0.953**	1.247**	1.408**	2.118**
Lingusitic Diversity	0.215**	-0.259	-0.145	-0.066	0.034	0.080	0.102**	0.173**	0.318**	0.402**
Religious Diversity	-0.255**	-0.244**	-0.164**	-0.126**	-0.076	-0.103**	-0.116**	-0.098	-0.108	-0.229**
Tolerance	0.033	0.026	0.023	0.022	0.023**	0.023**	0.027**	0.022**	0.023	0.029

Note: The size of the change (and log change) associated with each percentile range is stated directly beneath the related percentile. **Significant at the 5%. Source: Author's calculations using ABS data.

The coefficient estimates of the diversity variables are presented in Figure 1. In each case the dependent variable is the change and growth in the creative class. The left panel and the right panel depict the results for the change and growth respectively. In each graph the solid blue line is the OLS estimate corresponding to the second panel of Table 5. The solid red line represents the coefficient estimates for each percentile (Table 5). Points estimates were calculated at the {10, 20, … 80, 90} percentiles. The joining of these points is a straight-line extrapolation. The dotted red lines represent the lower and upper 95 per cent confidence intervals. In general, if the solid blue line is between the upper and lower boundaries the quantile estimate is regarded to be insignificantly different from the OLS estimate. The converse is also true; therefore, if the solid blue is outside the upper and lower boundaries the quantile estimate is regarded

to be significantly different from the OLS estimate. In contrast, if the solid blue line is outside the upper and lower boundaries these are considered significantly different from the OLS estimate.

The comparisons as depicted in Figure 1 indicate that the quantile coefficients align with the OLS estimates only for tolerance. The rest of the quantile results for the diversity variables suggest that the OLS coefficients were not representative for all SLAs, as they varied across the various percentile ranges. The largest variations are observed for migrant and religious diversity (also linguistic diversity regarding the growth in the creative class only).

The negative and significant OLS estimate for ancestry diversity represents most regions except those that experienced a decrease in their creative class or a very slight increase (coinciding with the 10^{th} to 40^{th} percentiles). The outcome for migrant diversity is also consistent with the OLS estimate for most regions although insignificantly different from zero as per Table 5 and Figure 1 confirming the weak association that was identified earlier.

Quantile results differed between the change and growth in the creative class for linguistic diversity. Apart from the extreme end percentiles, the OLS estimate is representative for most of the SLAs, with no significant association between the change in the creative class and linguistic diversity. On the other hand, the positive significant association between the growth in the creative class and linguistic diversity is representative of only SLAs that experienced a growth in their creative class of at least 0.07 per cent (70^{th} percentile).

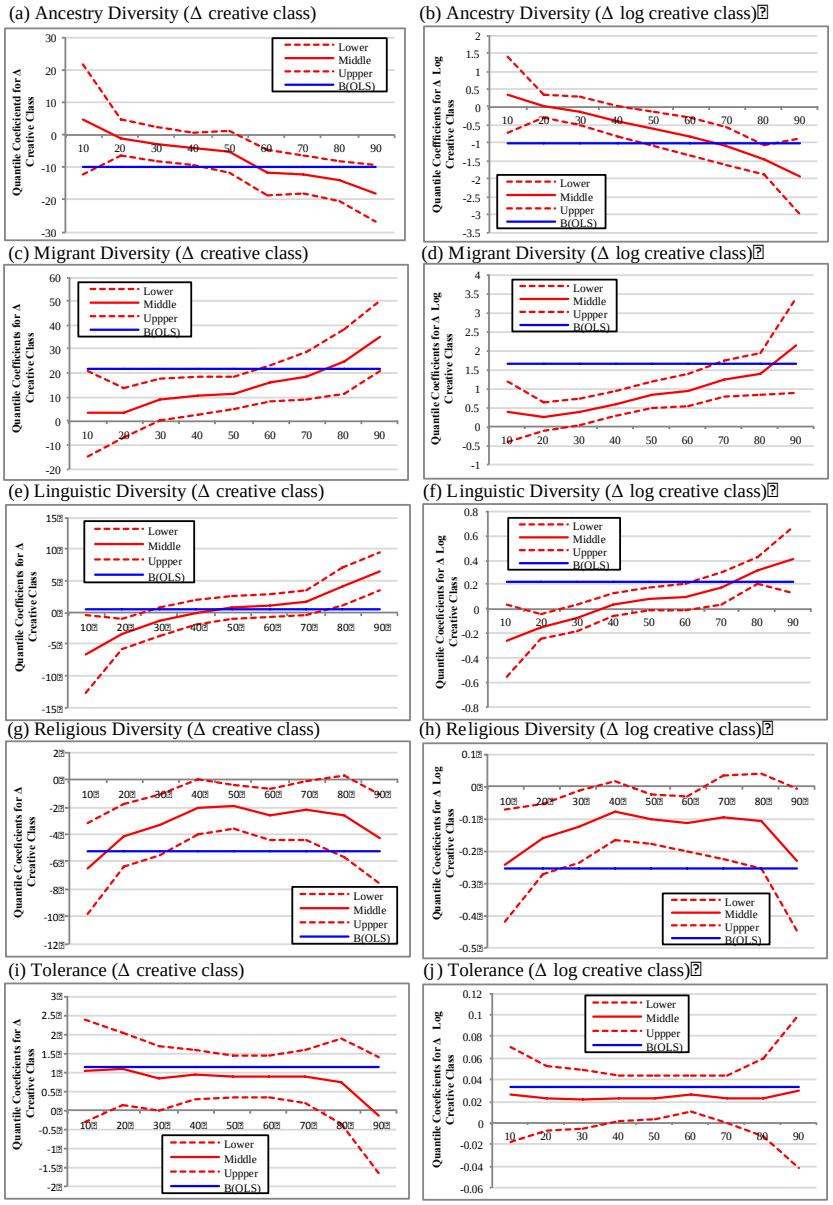

Figure 1. 2006-2011 Estimated Quantile Regression Coefficients with 95% Bootstrap Confidence Bands: Diversity.

Note: solid blue line is the OLS estimate for the independent variable, the solid red line represents the coefficient estimates for each percentile and the dotted red lines represent the upper and lower 95% confidence intervals. Source: Author's calculations using ABS data.

The negative and significant OLS estimate for religious diversity is representative only of SLAs in the extreme end percentiles for the growth in the creative class and for most SLAs when the change in the creative class is considered. When considering tolerance, the quantile results are consistent with the OLS coefficients. There was a positive and significant (although small) association between tolerance and the change in the creative class. This association however becomes insignificant when growth in the creative class is considered.

Explaining Medium-Run Changes in the Creative Class

The previous regressions were refitted to determine whether a ten-year period changes the relationship between the creative class and diversity. Once more, each regression considered whether the levels of diversity (this time in 2001) explain the change in creativity from 2001 to 2011. The first regression used the change in creativity as the dependent variable whilst the second used the change in the natural logarithm. The independent variables are as per Table 2, except proportion of residents with foreign-born parent(s) is not included due to data limitations for 2001. A second set of regressions is also run excluding the proportion of foreign-born residents as a result of the high correlations. The dataset consisted of 1 389 SLAs. Regression analysis used 1 219 SLAs, with 148 excluded from the model as a result of major geographical reallocations of regions between 2001 and 2011 resulting in the SLAs being non-comparable across time. In addition 22 were excluded as a result of zero division values in the data.

The correlations for the change and growth and the explanatory variables are presented in Table 6 showing mixed results for both direction and significance of the Pearson and Spearman's coefficients. Consistent with the 2006-2011 period, the correlation coefficients indicate weak, non-linear associations between the change and growth in the creative class and the level of diversity of Australian SLAs.

Table 6. 2001-2011 Change in the Creative Class Correlation Matrix. Note: **Correlation is significant at the 0.01 level (2-tailed).

		Δ Creative Class	Δ Log Creative Class	Ancestry Diversity	Migrant Diversity	Linguistic Diversity	Religious Diversity	Tolerance	Creative Class	Foreign-Born	Education	Population Density
Ancestry Diversity	Pearson	.185**	.066*									
	Spearman's rho	.309**	.154**									
Migrant Diversity	Pearson	.148**	.102**	.830**								
	Spearman's rho	.270**	.121**	.886**								
Linguistic Diversity	Pearson	.147**	.095**	.747**	.816**							
	Spearman's rho	.270**	.133**	.923**	.857**							
Religious Diversity	Pearson	0.045	0.015	.584**	.694**	.551**						
	Spearman's rho	.118**	0.016	.595**	.679**	.608**						
Tolerance	Pearson	.210**	.108**	.407**	.414**	.347**	.420**					
	Spearman's rho	.340**	.192**	.562**	.531**	.506**	.427**					
Creative Class	Pearson	0.005	-0.026	.588**	.647**	.458**	.507**	.511**				
	Spearman's rho	.222**	-0.001	.738**	.714**	.663**	.497**	.597**				
Foreign-Born	Pearson	.159**	.110**	.810**	.989**	.825**	.669**	.383**	.605**			
	Spearman's rho	.277**	.129**	.876**	.997**	.847**	.667**	.528**	.707**			
Education	Pearson	.142**	0.032	.533**	.533**	.422**	.466**	.492**	.846**	.514**		
	Spearman's rho	.271**	.071*	.665**	.587**	.580**	.442**	.560**	.879**	.584**		
Population Density	Pearson	.224**	.115**	.626**	.638**	.585**	.410**	.588**	.611**	.629**	.560**	
	Spearman's rho	.322**	.143**	.779**	.736**	.718**	.419**	.598**	.767**	.739**	.655**	
Workforce	Pearson	.204**	0.056	.254**	.135**	.084**	.098**	.224**	.298**	.138**	.424**	.277**
	Spearman's rho	.196**	.096**	.283**	.203**	.208**	.128**	.174**	.373**	.209**	.518**	.200**

Source: Author's calculations using ABS data.

The results of the regression models are presented in Table 7 and Table 8, with the second table representing the results of a subset of the variables by excluding the proportion of foreign-born residents. In both tables, the first panel presents the results of the ten-year period while the second panel represents comparable results of the five-year period. Within each panel the results of two regressions are presented, the first set corresponds to when the dependent variable is change and the second set to when it is growth.

Table 7. 2001-2011 and 2006-2011 Regression Results for the Change and Log Change in the Creative Class.

Dependent Variable	Δ Creative Class, (2001-2011)		Δ Log Creative Class, (2001-2011)		Δ Creative Class, (2006-2011)		Δ Log Creative Class, (2006-2011)	
Independent Variables	coef	t-value	coef	t-value	coef	t-value	coef	t-value
Ancestry Diversity	3.99	1.583	-0.26	-1.986	-9.092	-6.321	-0.923	-9.544
Migrant Diversity	7.326	1.496	0.455	1.792	21.284	4.862	1.608	5.459
Linguistic Diversity	-1.982	-1.85	-0.037	-0.673	1.151	1.704	0.272	5.983
Religious Diversity	-5.448	-4.007	-0.216	-3.058	-4.817	-4.378	-0.221	-2.981
Tolerance	2.538	5.347	0.081	3.291	0.999	3.422	0.023	1.147
Creative Class	-0.216	-11.091	-0.006	-6.149	-0.174	-11.621	-0.01	-9.722
Foreign-Born	-0.012	-0.162	-0.001	-0.308	-0.248	-3.576	-0.022	-4.755
Education	0.118	7.198	0.003	3.149	0.084	6.957	0.005	6.01
Population Density	0.001	3.574	0.000	1.893	0	2.965	0.000	0.977
Workforce	0.061	3.889	0.001	1.264	0.031	2.377	0.002	2.139
Intercept	-1.655	-0.995	0.239	2.774	7.91	8.118	0.717	10.943
R2	0.187		0.255		0.153		0.18	

Source: Author's calculations using ABS data.

Table 8. 2001-2011 and 2006-2011 Regression Results for the Change and Log Change in the Creative Class (excluding Foreign-Born %).

Dependent Variable	Δ Creative Class, (2001-2011)		Δ Log Creative Class, (2001-2011)		Δ Creative Class, (2006-2011)		Δ Log Creative Class, (2006-2011)	
Independent Variables	coef	t-value	coef	t-value	coef	t-value	coef	t-value
Ancestry Diversity	4.078	1.657	-0.251	-1.967	-8.438	-5.889	-0.865	-8.94
Migrant Diversity	6.567	4.462	0.381	4.985	6.089	5.761	0.248	3.482
Linguistic Diversity	-2.014	-1.912	-0.041	-0.741	0.401	0.622	0.205	4.703
Religious Diversity	-5.421	-4.019	-0.213	-3.044	-4.193	-3.843	-0.165	-2.237
Tolerance	2.549	5.431	0.082	3.373	1.24	4.345	0.044	2.288
Creative Class	-0.215	-11.715	-0.006	-6.418	-0.158	-11.009	-0.008	-8.634
Foreign-Born								
Education	0.117	7.339	0.003	3.158	0.073	6.218	0.004	4.91
Population Density	0.001	3.577	0.000	1.872	0.000	3.353	0.000	1.484
Workforce	0.061	3.893	0.001	1.24	0.031	2.373	0.002	2.131
Intercept	-1.698	-1.035	0.235	2.761	7.604	7.799	0.69	10.481
R2	0.187		0.065		0.145		0.166	

Source: Author's calculations using ABS data.

In all instances (particularly for the decade log change) the goodness of fit, as measured by the coefficient of determination (r^2), indicates that the models fit poorly. Thus, in general, the results indicate that both over the five-year and ten-year periods, changes in the proportion of creative workers in any given SLA cannot be explained by diversity. As previously stated, the inclusion of other variables to address the poor fit would be an important consideration for any future research agenda.

The results are consistent for most of the variables across periods, with the notable exception being ancestry diversity, which was not significant (and positive for the change in the creative class) for the 2001-2011 period, while negative and significant for both the change and growth for the 2006-2011 period. Consistently, across both periods, there was a significant negative association between the creative class and religious diversity and a positive association was evident between the creative class and tolerance (apart from growth in 2006-2011). Although migrant diversity shows a positive significant association, tolerance levels are too low to have explanatory power.

To explore the associations further, quantile regressions are considered and the results are presented in Table 9 with the coefficient estimates of the diversity variables presented in Figure 2. For the 2001-2011 period, in most cases the OLS result is representative of all SLAs, which is in contrast to the 2006-2011 period where the OLS result corresponded to

all SLAs for tolerance only. In the few cases where the OLS result varies from the quantile result, this generally occurs in the lower percentile ranges – affecting SLAs that experienced either a negative change in their creative class and in the case of growth, also very minor increases in their creative class.

Table 9. 2001-2011 Quantile Regression Results for the Change and Log Change in the Creative Class.

Quantile Coefficients for Δ Creative Class										
		10	20	30	40	50	60	70	80	90
Δ Creative Class		-1.74%	-0.57%	0.15%	0.71%	1.25%	1.83%	2.49%	3.35%	4.74%
	OLS Coefficients									
Ancestry Diversity	3.99	31.987**	26.555**	16.115**	13.176**	10.246	5.334	1.460	0.175	-3.801
Migrant Diversity	7.326	30.460**	23.569**	-12.992	-6.75	0.258	6.518	12.658	15.652**	26.235**
Linguistic Diversity	-1.982	-15.195**	-10.279**	-6.754**	-5.366**	-4.545**	-2.263	-0.243	0.173	3.905
Religious Diversity	-5.448**	-7.394**	-5.499**	-2.972**	-2.582**	-3.132**	-1.853	-2.378	-2.118	-2.115
Tolerance	2.538**	1.6	2.737**	2.570**	1.801**	2.392**	2.278**	2.727**	3.614**	3.677**
Quantile Coefficients for Δ Log Creative Class										
		10	20	30	40	50	60	70	80	90
Δ Log Creative Class		-0.09%	-0.03%	0.01%	0.03%	0.06%	0.08%	0.10%	0.14%	0.19%
	OLS Coefficients									
Ancestry Diversity	-0.26**	2.671**	1.071**	0.879**	0.565**	0.541**	0.457	0.040	-0.086	-0.805
Migrant Diversity	0.455	-1.266**	-0.54	-0.398	-0.075	0.132	0.212	0.648**	0.691**	1.420**
Linguistic Diversity	-0.037	-0.922**	-0.343**	-0.298**	-0.233**	-0.192**	-0.153	-0.022	0.038	0.305
Religious Diversity	-0.216**	-0.407**	-0.223**	-0.146**	-0.127**	-0.136**	-0.095	-0.054	-0.110	-0.102
Tolerance	0.081**	0.053	0.047	0.068**	0.057**	0.060**	0.063**	0.073**	0.092**	0.057

Note: The size of the change (and log change) associated with each percentile range is stated directly beneath the related percentile. **Significant at the 5%. Source: Author's calculations using ABS data.

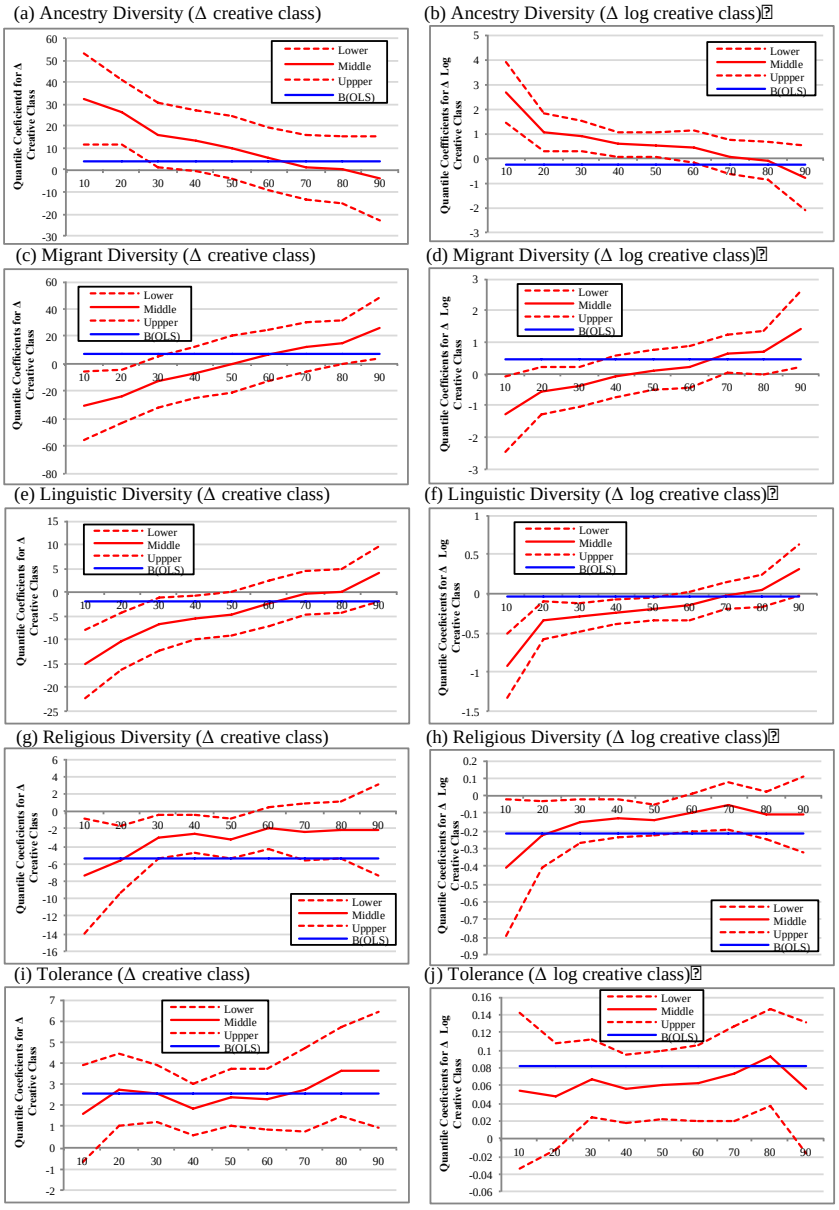

Figure 2. 2001-2011 Estimated Quantile Regression Coefficients with 95% Bootstrap Confidence Bands: Diversity.

Note: solid blue line is the OLS estimate for the independent variable, the solid red line represents the coefficient estimates for each percentile and the dotted red lines represent the upper and lower 95% confidence intervals. Source: Author's calculations using ABS data.

5. CONCLUSION

The results of an assessment of the representativeness of the Florida hypothesis applied to Australia were presented in this paper. Using census data from three time periods we assessed whether a creatives decision to locate in a particular area can be explained by its degree of diversity and tolerance.

Whilst there were some factors that may have influenced a creatives' decision to locate, there was no general support for Florida's hypothesis- this was indicated by the poor fit of the models. Importantly, this conclusion is consistent across each of the time periods considered and was also reflected in the quantile regression results.

Despite the lack of general support for the hypothesis that creatives are attracted to areas with more openness and tolerance, some interesting associations, albeit very weak ones, were observed. These include a positive association between changes in the creative class and tolerance as measured by the proportion of residents in a same-sex relationship. The influence of diversity appears to be less clear. Although the correlation coefficients hinted at some positive non-linear associations, the regression results do not (in general) support that creatives are drawn to areas with relatively higher diversity.

Interestingly, our results indicate that the different forms of diversities and tolerance are not necessarily regarded equally. For example, our results for ancestry and religious diversity show negative associations while migrant diversity and tolerance show positive associations with mixed results for linguistic diversity. However, even these are not consistent for all SLAs as indicated by the quantile regressions.

We also note that coefficients relating to the lower end of the (change in) creatives distribution are different (in some instances) to the results from the high-end of the distribution (e.g. ancestry and linguistic diversity). Importantly, results from the quantile regression demonstrate that the traditional linear approach depicting the *average* relationship (estimated using OLS) is not indicative for all situations.

Given that this study is the first of its type it would be interesting, once 2001 and 2006 data becomes available, to assess the representativeness of the Florida hypothesis on smaller spatial (SA2) units. A comparison with Florida's broader definition of creatives is also a potential direction for future research, as is an exploration of further dimensions of diversity.

In summary the results of our analysis suggest that the Florida hypothesis does not explain the locational choice of creatives. This

suggests other factors should be considered when investigating this phenomenon into the future, these may include the socio-economic status of the area, the cost of housing, employment issues and amenities.

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APPENDIX

Table 10. 2011 Creative Class Correlation Matrix.

		Creative Class (%)	Ancestry Diversity	Migrant Diversity	Linguistic Diversity	Religious Diversity	Tolerance (%)	Popn Density	Foreign-Born (%)	Born Parent(s)	Education (%)
Ancestry Diversity	Pearson	.499**									
	Spearman's rho	.741**									
Migrant Diversity	Pearson	.632**	.732**								
	Spearman's rho	.699**	.891**								
Linguistic Diversity	Pearson	.420**	.345**	.704**							
	Spearman's rho	.606**	.806**	.752**							
Religious Diversity	Pearson	.529**	.599**	.744**	.509**						
	Spearman's rho	.557**	.670**	.728**	.612**						
Tolerance (%)	Pearson	.537**	.321**	.391**	.256**	.414**					
	Spearman's rho	.637**	.547**	.509**	.381**	.481**					
Popn Density	Pearson	.659**	.491**	.660**	.557**	.507**	.581**				
	Spearman's rho	.773**	.794**	.741**	.666**	.542**	.588**				
Foreign-Born (%)	Pearson	.602**	.700**	.990**	.736**	.726**	.363**	.654**			
	Spearman's rho	.702**	.888**	.997**	.746**	.721**	.507**	.747**			
Foreign-Born Parent(s) (%)	Pearson	.624**	.724**	.960**	.690**	.725**	.348**	.639**	.957**		
	Spearman's rho	.706**	.876**	.967**	.739**	.721**	.497**	.753**	.972**		
Education (%)	Pearson	.862**	.492**	.609**	.445**	.545**	.515**	.644**	.598**	.598**	
	Spearman's rho	.889**	.737**	.674**	.552**	.572**	.623**	.720**	.679**	.696**	
Workforce (%)	Pearson	.468**	.514**	.336**	.002	.274**	.343**	.332**	.297**	.343**	.450**
	Spearman's rho	.514**	.391**	.344**	.187**	.270**	.365**	.318**	.347**	.367**	.577**

Note: **Correlation is significant at the 0.01 level (2-tailed). Source: Author's calculations using ABS data.