

DOES RESIDENTIAL DIVERSITY ATTRACT WORKERS IN CREATIVE OCCUPATIONS?

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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 *et al.*, 1998; 1995; Andersson *et al.*, 2011; Florida, 2002, 2012; Currid-Halkett and Stolarick, 2013). In recent times, discussion has centered 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*¹ 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

¹ Florida (2002, 2012) defines the creative class by the occupations people have using the Standard Occupation Classification (SOC) System. His Creative Class consists of two component classes, the Super-Creative Core and Creative Professionals. The five SOC major occupation groups that are part of the Super Creative Core Class are computer and mathematical occupations; architecture and engineering occupations; life, physical, and social science occupations; education, training, and library occupations; and arts, design, entertainment, sports, and media occupations. Another five SOC major occupation groups are part of the Creative Professionals Class – management occupations; business and financial operations occupations; legal occupations, healthcare practitioners and technical occupations; and high-end sales management which is a component group of the sales and related occupations major group.

on the Bohemian class) and how it pertains to a 'Creative Australia'. Other studies have focused on creatives in different ways including 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 favor 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 find some evidence (albeit weak) of association between both diversity and tolerance and creatives, although not always in the direction anticipated and not necessary consistent across regions. Overall however there is 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 are considered: ancestry, migrant, linguistic, and religious. Tolerance is 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 are included. These include: a population density variable² and the existing size of the creative class, capturing whether a critical mass factor is present; and education and workforce variables³ 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 is 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 level⁴ is used. Previous studies have shown that SLAs are ‘likely to be

² Studies suggest there is a link between highly skilled, creative individuals and city-regions, thus population density (Jacobs, 1969; Lucas, 1988; Martin and Sunley, 1998; Orlando and Verba, 2005; Duranton and Puga, 2000; Knudsen *et al.*, 2008), therefore, creative class individuals may be drawn to these areas of greater density.

³ The education refers to the proportion of the resident population aged 25 and over with a completed degree qualification or higher. The workforce variable is defined as the proportion of the resident population that is part of the workforce.

⁴ 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

socially and economically relevant to their residents' (Turrell *et al.*, 1997) 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 are 1389 SLAs, however not all SLAs can be used as major geographical reallocations have occurred as well as some recording zero measures. This has resulted in SLAs being dropped from analysis⁵.

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 consists of 316 categories for respondents' classification of their ethnic background⁶, while the migrant diversity index is 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 is 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

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.

⁵ Many SLAs were 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. Further detail is available upon request.

⁶ The Census Guide advised respondents to 'Consider the origins of the person's parents and grandparents....', and report up to two ancestries

four-digit levels.⁷ Religious affiliation at the one-digit level uses 7 categories - Buddhism, Christianity, Hinduism, Islam, Judaism, Other Religions, and No Religion.

To examine the degree of tolerance in Australia, the percentage of residents in a same-sex relationship is considered, following previous studies including Qian (2013). The percentage of same-sex couples is based on self-identification and the census only counts 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)⁸. It excludes from the original Florida measure many occupations with low creativity requirements and those involved primarily in economic reproduction. Creative class occupations include 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

⁷ It is noted various branches of Christianity dominate religious groupings at the higher digit level.

⁸ McGranahan and Wojan (2007) 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 reduces the Florida's creative class by omitting occupations that require relatively little creativity and those that are involved in economic reproduction and are 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). Further detail of the process is available upon request.

mean and medians. The relative proximities of these four descriptives summarise the typical values, 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 relative dispersion of the variables.

	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

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

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 km²; 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.

According to the means and medians approximately one quarter of the workforce in each SLA belong 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 have a creative class component of less than 16 percent. Interesting, only 25 percent of SLAs have a creative class of greater than 31 percent. The ratio statistic of 1.98 indicates that the top 25 percent of SLAs ranked

according to the percentage of individuals belonging to the creative class have at least double the proportion of creatives when compared to the lowest ranked SLAs. This indicates that there are vast differences in the creative class across SLAs and hints there may be some clustering occurring⁹.

Ancestry diversity is consistently high for most Australian SLAs compared with the other diversity indices in the study, with over 95 percent of SLAs falling within the 0.65 to 0.95-index range. Ancestry diversity is only 1.12 times greater in the most diverse SLAs¹⁰ compared with the least diverse SLAs¹¹, On average, Australian residents' ancestry diversity is high with mean index values of 0.778. Even the least diverse SLAs in Australia are relatively heterogeneous with an average ancestry diversity of 0.744. Only 5.4% of SLAs have an ancestry diversity index below 0.7, suggesting that there is relatively little variability between most SLAs in regard to their high ancestry diversity.

In contrast, there is substantially more variability in migrant and linguistic diversity between regions. Some Australian SLAs consist of only Australian-born residents, while in others, over 50 percent of residents are foreign-born. Likewise, there are regions with only English-speaking households and other SLAs in which over 50 percent of residents do not speak English at home. On average, however, migrant and linguistic diversity in Australian SLAs is low (0.330 and 0.211 respectively) with most households speaking English at home and the

⁹ The spacial distribution of the creative class is available upon request.

¹⁰ The highest 25 percent of SLAs with the highest ancestry index diversity values.

¹¹ The lowest 25 percent of SLAs with the lowest ancestry index diversity values.

majority of residents born in Australia. Migrant diversity is 2.6 times larger and linguistic diversity is 5.2 times larger in the most diverse SLAs relative to the least diverse SLAs.

Religious diversity is 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 SLA is 0.435, rising to an average of 0.552 for the most religiously diverse SLAs¹².

Reported same-sex couples ranges from zero to five percent 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 is 3.5 times greater in the most '*tolerant*' SLAs relative to the least '*tolerant*'.

The descriptives of the control variables indicate that population density varies considerably as does the proportion of residents with degree and higher qualifications. Population density range from 0.001 person per square kilometer to 8,166 people. The average is 795 people per

¹² The three and four digit religious indices have minimums of 0.142 and 0.149 respectively and maximums of 0.880 and 0.881, and thus higher averages of 0.780 and 0.787, reflecting the increased religious categories in these indices. The range for all three indices is very similar; 0.746 for the one-digit index and dropping to 0.738 and 0.732 for the three and four-digit indices because of their higher minimum values potentially reflecting variability in Christianity rather than overall religious diversity.

square kilometer but this is exacerbated by the outliers as evident from the median of only 172 and a ratio of 595.245 (Table 1)¹³.

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 differs 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 is presented. The first considers whether creatives have been drawn to areas of relatively more diversity and tolerance over a five-year period. The second replicates the approach for a ten-year period¹⁴. In each case two types of regression are 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 percent of households moving at least once every five years (Long, 1991). Consistent with this observation a relatively more recent study

¹³ Over 90 percent of the SLAs where there is less than one resident per square kilometer is categorised as outer regional, remote or very remote, while all regions with a population density of 3,000 and higher are all major city SLAs.

¹⁴ To further test for robustness, the regressions were rerun for the SLAs based on their remoteness structure. There is little variation in these results and therefore they are not reproduced in this paper but are available upon request.

(ABS, 2009) indicates that 43 percent of people aged 15 years and over had been living in their current residence for less than 5 years and 19.4 percent 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.

4.1 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 are 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 examines whether the levels of diversity and tolerance in 2006 explain the change in creativity from 2006 to 2011. The first regression uses the change in creativity as the dependent variable

whilst the second uses the change in the natural logarithm of the creative class¹⁵. In both cases the set of control variables identified earlier are fitted. Formally, where y_i denotes the change¹⁶ in creativity for Statistical Local Area (SLA) 'i', the model is defined as:

$$y_i = \alpha + \sum_{j=1}^k \beta_j X_{i,j} + \sum_{h=1}^m \delta_h Z_{i,h} + \varepsilon_i, \quad \varepsilon_i \sim N(0, \sigma^2) \quad i = 1 \dots N.$$

Terms $X_{i,j}$ and $Z_{i,h}$ denote diversity measures and control variables respectively. The term β_j and δ_h represents the degree and direction of influence of each diversity measure and control variable respectively. In total there are 1331 SLAs. 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.

¹⁵ The suggestion of strong non-linear associations is the motive of behind fitting the second type of regression model.

¹⁶ It is important to note that the dependent variable considered here is the change in creative 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.

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

Table 2: Explanatory Variables and Expected Association Directions

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.

There are several control variables employed. The first of these is population density. This is included to take into account whether individuals of the creative class are attracted to areas of higher population density. According to Florida (2002, 2012), creative class workers are expected to be more inclined 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 workforce¹⁷ 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) is negative, while the association with linguistic diversity is positive. The association with migrant diversity (also with sexual-orientation diversity) is 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

¹⁷ The proportion of residents in the workforce in the base year was added as a measure of socio-economic status.

correlations suggest that SLA diversity and tolerance is only a minor consideration for location decisions of the individuals belonging to the creative class.

4.2 FIVE-YEAR RESULTS

The results of the regression models are presented in Table 4. 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. 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.

		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**

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

Source: Author's calculations using ABS data.

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 affects 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 is significant and positive for both the change and growth in the creative class, its tolerance¹⁸ 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 relationship with religious diversity is 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 results in the same significant negative relationship between the change and growth in the creative class and religious diversity.

Results for tolerance and linguistic diversity are mixed, suggesting limited appeal to the creative class in their decision to settle in a particular area. Interestingly, tolerance is 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 is significant only for the growth variable. Both however indicate a positive association.

¹⁸ Tolerance 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 percentage of foreign-born residents is significant and negative for both sets of regressions fitted although the tolerance¹⁹ values are very small; suggesting that in reality its explanatory power is likely to be insignificant.

Dependent Variable	Δ Creative Class, (2006-2011)		Δ Log Creative Class, (2006-2011)	
	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	-11.621	-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	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	

Table 4: 2006-2011 Regression Results for the Change and Log Change in the Creative Class. Source: Author's calculations using ABS data.

Looking at the control variables, the only consistently significant relationship is between the level of education and the creative class²⁰, confirming that the socio-economic environment is likely to be important when considering residency in an SLA. Population density and workforce on the other hand do not appear to be important influences on locational decisions for the creative class.

¹⁹ 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.

²⁰ Although the size of the creative class in the region is significant for all regressions fitted, the tolerance levels are 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.

The unexpected results could be explained by examining the differences in the diversity variables. The average value for ancestry diversity is high (average of 0.767, and median of 0.769) as it takes account of the very diverse background of Australians. This is 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. This may suggest 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.

4.3 FIVE-YEAR QUANTILE REGRESSIONS

Florida’s creative class hypothesis states that the creatives are more attracted to areas that are more tolerant and diverse. In the previous section the validity of this belief was tested using 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 is only evident for migrant diversity (although the relationship appears to be exceptionally weak with a tolerance value of only 0.009²¹) and tolerance. When focusing on growth, a positive association emerges for linguistic diversity but tolerance is no longer significance. Ancestry and religious diversity are

²¹ Tolerance variables available upon request.

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 are 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 are remarkably different from the previous analysis suggesting that the original OLS results are 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 varies over different percentiles²² as seen in Table 5. 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 percent or a decrease in the growth of the creative class of 0.07 percent. In most instances the OLS result applies to those regions that experienced a moderate amount of positive change over the period.

²² 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.

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

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

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 percentile²³ (Table 5). The dotted red lines represent the lower and upper 95 percent 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.²⁴ In contrast, if the solid blue line is outside the upper and lower boundaries these are considered significantly different from the OLS estimate.

²³ Points estimates were calculated at the {10, 20, ... 80, 90} percentiles. The joining of these points is a straight-line extrapolation.

²⁴ 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.

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 are not representative for all SLAs, varying 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 very slight increase (coinciding with the 10th to 40th 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 differ 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 percent (70th percentile).

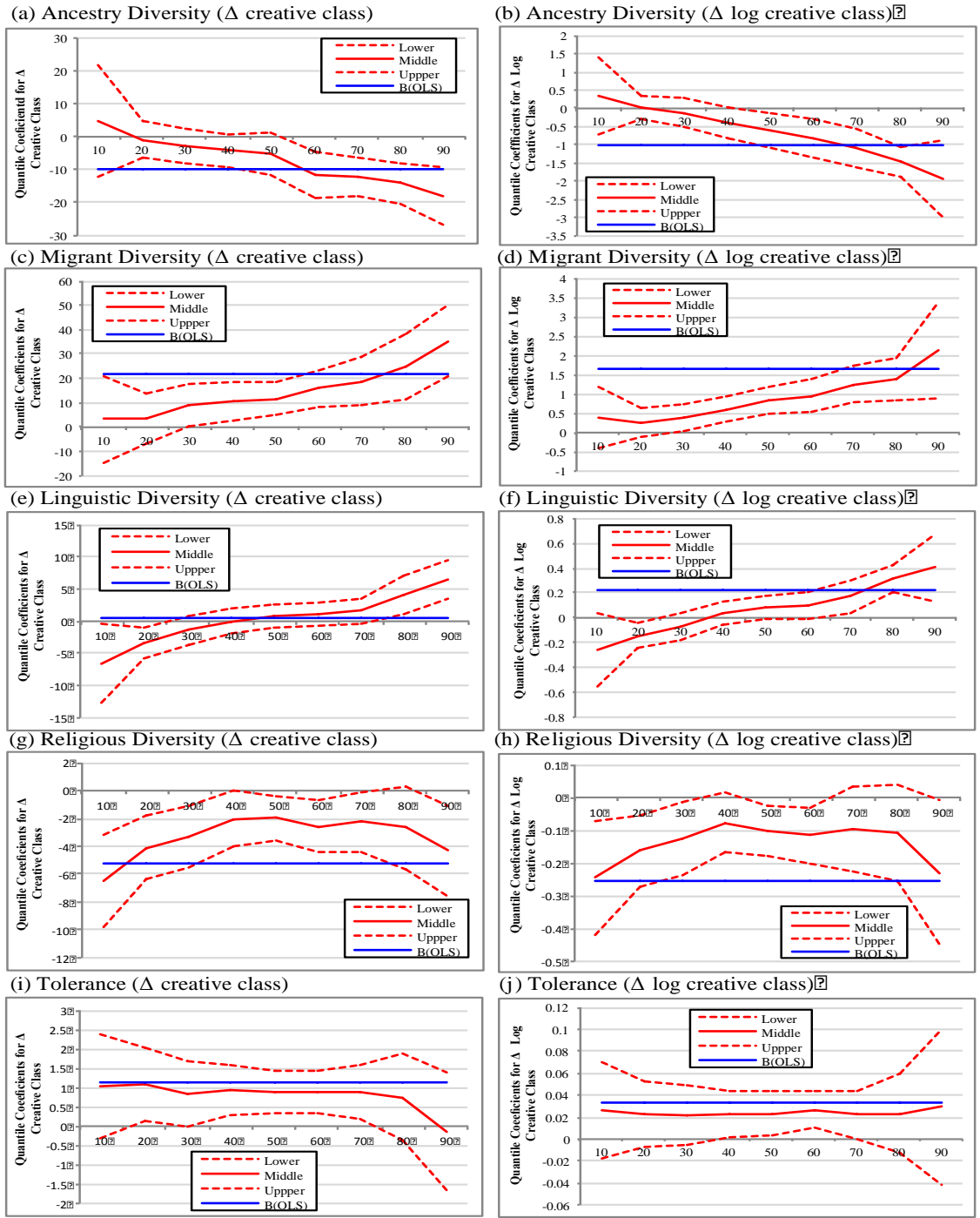


Figure 1: 2006-2011 Estimated Quantile Regression Coefficients with 95% Bootstrap Confidence Bands: Diversity

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 is 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.

4.4 EXPLAINING MEDIUM-RUN CHANGES IN THE CREATIVE CLASS

The previous regressions are refitted to determine whether a ten-year period changes the relationship between the creative class and diversity. Once more, each regression considers whether the levels of diversity (this time in 2001) explain the change in creativity from 2001 to 2011. The first regression uses the change in creativity as the dependent variable whilst the second uses 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 consists of 1389 SLAs. Regression analysis uses 1219 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 and 22 are 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.

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 the change and the second set to when it is growth.

Dependent Variable	Δ Creative Class, (2001-2011)		Δ Log Creative Class, (2001-2011)		Δ Creative Class, (2006-2011)		Δ Log Creative Class, (2006-2011)	
	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
R ²	0.187		0.255		0.153		0.18	

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

Source: Author's calculations using ABS data.

		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**

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

Source: Author's calculations using ABS data.

Dependent Variable	Δ Creative Class, (2001-2011)		Δ Log Creative Class, (2001-2011)		Δ Creative Class, (2006-2011)		Δ Log Creative Class, (2006-2011)	
	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	

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

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 is 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 is a significant negative association between the creative class and religious diversity and a positive association is seen 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.

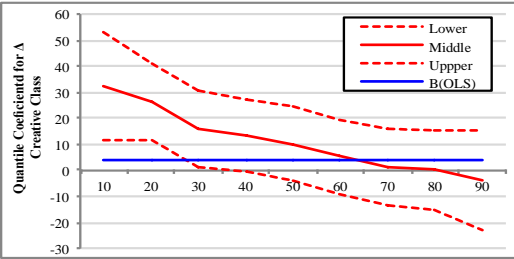
To explore the associations further, quantile regressions are considered and the results are presented in Table 9 with the coefficient estimates of the diversity variables presented in Figure 2. For the 2001-2011 period, in most cases the OLS result is representative of all SLAs, which is in contrast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

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

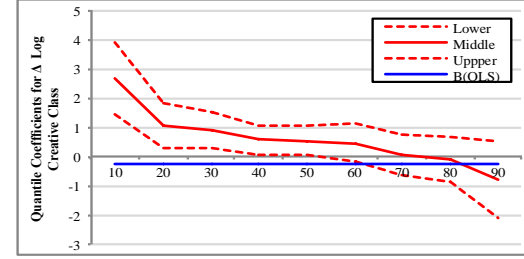
Table 9: 2001-2011 Quantile Regression Results for the Change and Log Change in the Creative Class.

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.

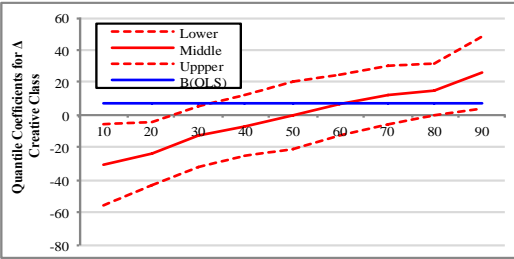
(a) Ancestry Diversity (Δ creative class)



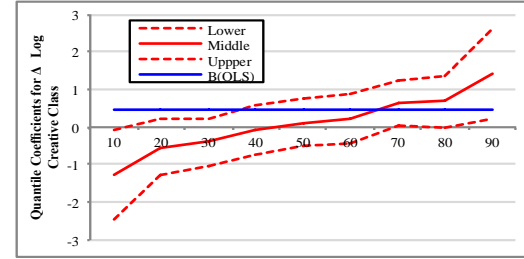
(b) Ancestry Diversity (Δ log creative class)



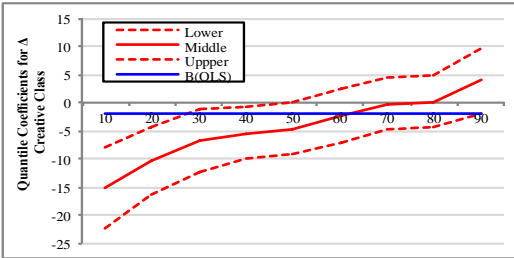
(c) Migrant Diversity (Δ creative class)



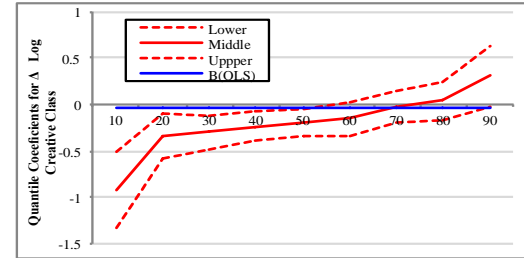
(d) Migrant Diversity (Δ log creative class)



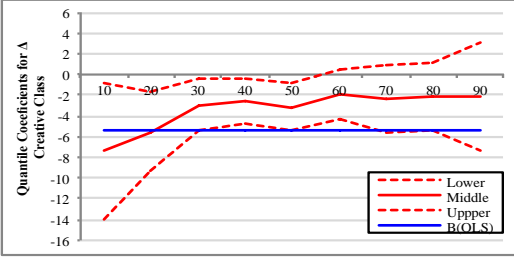
(e) Linguistic Diversity (Δ creative class)



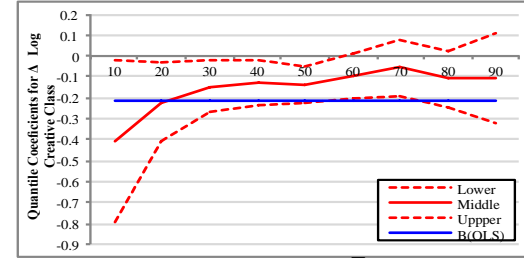
(f) Linguistic Diversity (Δ log creative class)



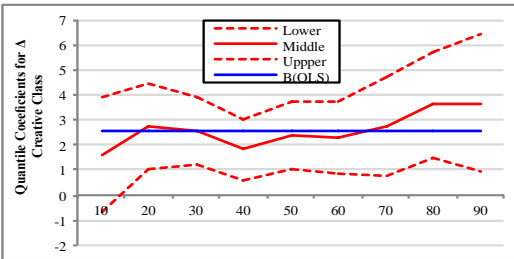
(g) Religious Diversity (Δ creative class)



(h) Religious Diversity (Δ log creative class)



(i) Tolerance (Δ creative class)



(j) Tolerance (Δ log creative class)

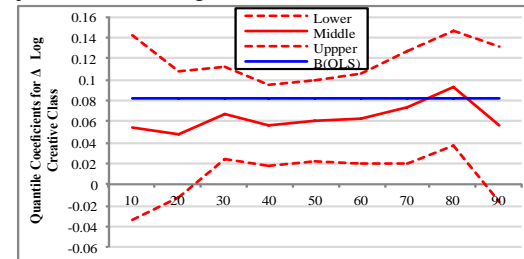


Figure 2: 2001-2011 Estimated Quantile Regression Coefficients with 95% Bootstrap Confidence Bands: Diversity.

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 and tolerance show positive associations with mixed

results for linguistic, but 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) with 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 creative. This suggests other factors should be considered when investigating this phenomenon into the future, this may include the socio-economic status of the area, the cost of housing, employment issues and amenities.

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Appendix

		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**

Table 10: 2011 Creative Class Correlation Matrix. Note: **Correlation is significant at the 0.01 level (2-tailed).

Source: Author's calculations using ABS data.

