

DO REGIONAL CHARACTERISTICS MODERATE THE EFFECT OF CONTEXTUAL
INCOME ON LIFE SATISFACTION?

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ABSTRACT

DO REGIONAL CHARACTERISTICS MODERATE THE EFFECT OF CONTEXTUAL INCOME ON LIFE SATISFACTION?

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Previous research has shown that both absolute and relative levels of income independently predict subjective well-being. Specifically, the income of proximal or salient comparison standards is negatively associated with life satisfaction, even controlling for personal income. Social comparison – the evaluation of one’s standings relative to one’s peers – is one mechanism through which relative income might influence life satisfaction. The purpose of the current study was to examine the social comparison effect of county income and its moderators. Multilevel analyses were conducted on a sample of over 1.7 million Americans. Average county income was negatively associated with life satisfaction after controlling for personal income. In addition, the size and population density of the counties (variables that reflect entitativity) and income inequality moderated this effect. The current study provides evidence for social comparison as an explanation of the association between income and well-being.

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TABLE OF CONTENTS

LIST OF TABLES	v
LIST OF FIGURES	vi
INTRODUCTION	1
The Role of Relative Income	4
Relative Income and the Role of Social Comparison	6
Potential Moderators of Social Comparison	7
The Current Study	9
Purposes of the Current Study	12
METHODS	14
Participants	14
Measures	14
Analytical Procedure	17
The Main Effect Model	17
The Interaction Models	18
RESULTS	19
The Main Effect Model	19
The Interaction Models	19
Robustness Check	22
Income	22
Population Density and County Size	24
DISCUSSION	25
Strengths and Limitations	28
Future Directions	29
Conclusion	30
APPENDIX	31
REFERENCES	39

LIST OF TABLES

Table 1. Correlations between Predictors and Life Satisfaction	71
Table 2. Estimates and Standard Errors of the Interaction Models	72
Table 3. Estimates and Standard Errors of the Main Effect and Interaction Models Using Household Income Adjust for Household Size (log).....	73
Table 4. Estimates and Standard Errors of the Main Effect and Interaction Models Using Raw Household Income and County Median Income	74
Table 5. Estimates and Standard Errors of the Main Effect and Interaction Models Using Raw Household Income Adjusted for Household Size.....	75
Table 6. Estimates and Standard Errors of the Interaction Models Using Raw and Logarithmically Transformed Population Density and County Size.....	76

LIST OF FIGURES

Figure 1. The association between county income and life satisfaction was moderated by a) population density, b) county area, c) Gini coefficient, d) percent of White population, e) percent of English speaking population, and f) percent of foreign born population. High and low level of variables were defined as 1 SD above or below the means	80
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INTRODUCTION

Life satisfaction refers to the subjective judgment of whether one is happy, content, and satisfied with one's life. Research shows that people who are high in well-being also have many other positive outcomes in their lives, such as better social relationships (see Lyubomirsky, King, & Diener, 2005 for review) and better health (see Pressman & Cohen, 2005 for review). One of the most studied and most robust findings in well-being research concerns the small to moderate positive association between income and life satisfaction (e.g., Blanchflower & Oswald, 2004; Boes & Winkelmann, 2010; Caporale, Georgellis, Tsitsianis, & Yin, 2009; Diener, Ng, Harter, & Arora, 2010; Jorgensen, Jamieson, & Martin, 2010; Kahneman & Deaton, 2010; Lelkes, 2006; Luhmann, Schimmack, & Eid, 2011; Shields & Price, 2005; Tao & Chiu, 2009). Unfortunately, the mechanisms underlying this association are not clear. Money certainly buys things that could lead to happiness, and thus, income may have a direct effect on the satisfaction that people experience. However, evidence also suggests that absolute levels of income may not always drive the association. Instead, relative income—whether a person has more or less income than others—may be at least as important as, if not more important than, absolute income when predicting life satisfaction. This paper addresses issues related to this relative income effect.

Numerous cross-sectional studies have documented the positive association between income and life satisfaction (e.g., Caporale, Georgellis, Tsitsianis, & Yin, 2009; Diener, Ng, Harter, & Arora, 2010; Jorgensen, Jamieson, & Martin, 2010; Schyns, 1998, 2002). For example, Diener and his colleagues (2010), drawing from a representative sample of the entire planet, showed that household income was positively associated with life satisfaction. Multiple reviews (Clark, Frijters, Shields, 2008; Diener & Biswas-Diener, 2002; Howell & Howell, 2008; Lucas & Dyrenforth, 2006; Piquart & Sorensen, 2000) have also shown that the positive association

between income and life satisfaction is robust and replicable. Howell and Howell (2008) meta-analytically combined 56 studies that included 111 independent samples from 54 different countries and concluded that economic status (e.g., household income, personal income, etc.) was positively related to life satisfaction. They estimated the effect size of the relation between economic status and life satisfaction to be .18 - .20.

The studies described above were cross-sectional, and thus, the causal direction between income and life satisfaction is not completely clear. For this reason, researchers have often turned to longitudinal or quasi-experimental designs to disentangle the relation between income and life satisfaction. For instance, Gardner and Oswald (2007) tested whether income change, in the form of lottery prize, was associated with change in well-being. Using a sample from the British Household Panel Study, they found that participants who won medium-size prizes (i.e., over £1000) reported significantly higher levels of well-being two years after the win compared to two years before the win. This increase in well-being among those with medium-size wins was greater than that for participants with no win and participants with small wins (less than £1000). Although this study provided evidence for the causal influence of income and well-being, it may have limited generalizability because winning a medium-size lottery is rather uncommon. In other words, this study provides little evidence for whether other forms of income change are causally related to well-being.

To test the effect of more common forms of income change, longitudinal studies have examined whether fluctuations in income are associated with well-being. Luhman, Schimmack, and Eid (2011) and Cheung and Lucas (2013) distinguished between the within-person effect and the between-person effect of income. The within-person effect refers to whether changes in income over time are associated with changes in life satisfaction, whereas the between-person

effect refers to whether individuals with higher income tend to be happier. Both studies found significant within-person effects of income across three panel studies, yet the within-person effects were weaker compared to the between-person effects.

Although the association between income and life satisfaction is robust, its small size and the discrepancy between within- and between-person effects have led researchers to investigate additional phenomena that might influence this effect. First, the association between income and life satisfaction might be moderated by additional factors, which can reduce the overall association. Howell and Howell's (2008) meta-analysis showed that the association was strongest in developing countries and in samples with less education, and it was weakest in more developed countries and samples with high education. The basic need perspective (Veenhoven, 1991) suggests that in developing countries, increases in income allow people to acquire resources that are essential and improve safety and security, which in turn increase their life satisfaction. Moreover, age also moderates the association between income and life satisfaction (Cheung & Lucas, 2013). Consistent across three nationally representative panel studies, the association between income and life satisfaction was moderated by age. Specifically, income significantly predicted life satisfaction for individuals aged 25-59, but this association was significantly weaker for individuals under 25 or over 60.

Second, personality factors have also been found to moderate the association between income and life satisfaction. Soto and Luhman (2012) examined the Big Five personality factors as moderators of the association between income and life satisfaction in three large-scale panel studies: the British Household Panel Study, the German Socio-Economic Panel Study, and the Household Income and Labour Dynamics in Australia Survey. They found evidence that neuroticism moderated the association between income and life satisfaction across all three

samples. Thus, this research suggests that individual differences in the association between income and life satisfaction exist; and income is associated with life satisfaction to a greater degree for certain individuals.

Finally, the small correlation between income and life satisfaction may be due to the effect of relative income. Some researchers (e.g., Clark & Oswald, 1996; Hagerty, 2000; Luttmer, 2005) have proposed that income in absolute terms may not matter as much as relative income (i.e., income compared to a standard or a reference group). This idea can be traced back to the pioneering work of Easterlin. Easterlin (1995) showed that although cross-sectional analyses within nations consistently result in small to medium associations between life satisfaction, dramatic increases in gross domestic product (GDP) within nations over time are not associated with corresponding increases in national well-being. Easterlin showed that this pattern of result is consistent across 11 countries. This finding is recently replicated by Easterlin, Morgan, Switek, and Wang (2012) who examined whether the rapid economic growth in China is associated with change in life satisfaction. They showed that despite China's growth in GDP, there is no evidence that life satisfaction increased over time, replicating earlier results. Based on these results, Easterlin suggested that absolute income plays a minimal role in one's life satisfaction. Instead, he proposed, relative income is the primary cause of well-being. This line of work has led to what is now known as the Easterlin Paradox: Broad-based increases in income within a population may not lead to increases in happiness for that population.

The Role of Relative Income

In the years since Easterlin (1974) published his influential paper, numerous studies have been conducted to examine the extent to which relative income is linked to well-being. Research

in this area has generally produced consistent results, which typically show that income relative to a standard or a social comparison group is significantly associated with life satisfaction. Prior research that examined relative income has operationalized relative income in various ways. Some have defined relative income as the average income of a geographical region, such as countries (Di Tella and MacCulloch, 2003), public use microdata areas (which consist of counties or cities that are aggregated or subdivided to contain at least 100,000 individuals; Luttmer, 2005), or states (Blanchflower & Oswald, 2004). Recently, Boyce, Brown, and Moore (2010) conceptualized relative income as rank of income relative to similar others and examined the link between this rank and life satisfaction using a nationally representative sample of British households. In three separate analyses, the authors ranked participants based on their income relative to 1) other participants that lived in the same geographical region, 2) other participants that had similar gender and education, and 3) other participants that were at a similar age. They found consistent results across the three analyses and showed that participants' income rank was a significant predictor of their self-reported life satisfaction. This effect has been replicated recently in the Germany Socio-economic Panel dataset (Budria & Ferrer-i-Carbonell, 2012).

Taken together, research in this area has shown that relative income plays an important role in well-being. Moreover, studies that compared the effect of relative income and absolute income (Boyce, Brown, & Moore, 2010; Budria & Ferrer-i-Carbonell, 2012) provided evidence that the association between relative income and life satisfaction was stronger than the association between absolute income and life satisfaction. The implication from research on relative income is that the link between income and well-being cannot be explained purely by economic factors, such as the idea that higher income allows one to purchase more material goods. Rather, social factors should also be considered when explaining the link between income

and well-being. Research on relative income suggested that the income of others can have an impact on one's well-being.

Relative income and the role of social comparison. One of the mechanisms that has been proposed to link relative income to well-being is social comparison—the idea that individuals evaluate themselves by comparing themselves with another individual or a social group (e.g., Luttmer, 2005). This idea is perhaps best captured by the common phrase “keeping up with the Joneses,” which refers to the tendency for people to compare with one's neighbors, especially in a monetary or materialistic sense. In the literature on income and well-being, the social comparison effect is best exemplified by the *reference income hypothesis*.

The reference income hypothesis refers to the idea that one's well-being is partially determined by the comparison of one's income to a reference income (often times the average income of a social comparison group). For example, Luttmer (2005) conducted a study to assess the association between neighborhood income and life satisfaction. After controlling for personal income and other demographics (such as, race, gender, and age), Luttmer found that neighborhood income *negatively* predicted life satisfaction. The social comparison explanation of this finding suggests that if two people earn the same amount of income, the person who lives in a neighborhood with lower average income may compare more favorably to her neighbors than the person who lives in a neighborhood with a higher average income, thus resulting in a higher level of life satisfaction.

Although the effect of contextual income (i.e., the negative association between neighborhood income and well-being) is consistently found (e.g., Blanchflower & Oswald, 2004; Boyce, Brown, & Moore, 2010; Budria & Ferrer-i-Carbonell, 2012; Di Tella and MacCulloch,

2003; Luttmer, 2005), whether this effect is caused by a social comparison process is less clear given that most studies have taken a correlational approach. Previous studies (e.g., Luttmer, 2005) attempted to establish the social comparison effect as the cause of the effect of relative income by ruling out alternative explanations based on controlling for different variables. For instance, Luttmer (2005) statistically controlled for local housing price to account for the alternative explanation that higher housing prices in richer neighborhood might lead to lower life satisfaction. In addition, Luttmer included state dummy variables to control for state fixed effects. This procedure ruled out the possibility that richer neighborhood might be associated with certain state-level characteristics (e.g., state policy, climate, etc) that lead to lower life satisfaction. In sum, existing evidence provided some evidence for social comparison as the cause of the effect of contextual income.

If the effect of contextual income is caused by social comparison, then prior research on social comparison can be used to predict when the effect of relative income should be stronger or weaker. That is, drawing from past research on social comparison, predictions can be made on what kinds of factors would moderate the effect of relative income. The current study explored potential moderators of the effect of contextual income.

Potential Moderators of Social Comparison

Groups differ from each other on a wide array of attributes. Groups differ in size, similarity of group members, goals, physical and psychological distances between members, and distribution of power and resources among members. For example, compared to a religious group, a family is likely to be smaller, closer to each other, consist of a more homogeneous

group of individuals, among many other variables. These attributes might affect the comparisons people make.

Researchers (Campbell, 1958; Hamilton & Sherman, 1996) have suggested that entitativity – the extent to which an aggregate of individuals (group) is perceived as a cohesive entity – is an important attribute that is shared among all groups. Drawing from research on Gestalt psychology, Campbell (1958) postulated that a group's entitativity is influenced by factors such as common-fate, similarity, and proximity. When applied to a group, common-fate refers to the extent to which group members experience the same events or have the same outcome, similarity refers to the extent to which group members are a homogeneous group, and proximity refers to the physical distance between group members. For instance, a perceiver may view students from the same fraternity as an entity because they go to the same parties (common-fate), wear the same outfit that features the Greek letters that represent their fraternity (similarity), and live in the same fraternity house (proximity). Entitativity is an important factor to consider in the current study because previous research (Pickett, 2001; Pickett & Perrott, 2004) found that perceived group entitativity led to faster and stronger intragroup comparison. Thus, based on previous research on entitativity and social comparison, I hypothesized that characteristics (such as physical distances among group member) that might signal different levels of entitativity will moderate the effect of contextual income.

In addition to group entitativity, the salience of income inequality may also moderate the effect of contextual income. Income inequality has been linked to physical as well as psychological well-being (e.g., Kawachi & Kennedy, 1999; Kennedy et al., 1998). Economist Juliet Schor (1997) argued that a mechanism through which income inequality contributes to dissatisfaction is through social comparison. Her research suggested that the increase in income

inequality has bred a culture of upward comparison, in which people make status-oriented purchases to “keep up” with their neighbors. Relatedly, Oishi, Kesebir, and Diener (2011) found that the link between income equality and happiness was explained by perceived unfairness and lack of trust. Likewise, contemporary events, such as Occupying Wall Streets and the slogan “We are the 99%,” also pointed to the possibility that higher level of income inequality may increase the salience of the discrepancy in income among people. Taken together, it is plausible that income inequality increases the salience of income, which in turn leads to higher levels of upward social comparison (Schor, 1997), perceived unfairness, and lack of trust (Oishi, Kesebir, & Diener, 2011), resulting in lower levels of life satisfaction. Thus, the current study explored income inequality as a moderator of the effect of contextual income.

The Current Study

The current study employed secondary data analysis to examine the effect of contextual income and its moderators. Previous research (e.g., Blanchflower & Oswald, 2004; Boyce, Brown, & Moore, 2010; Budria & Ferrer-i-Carbonell, 2012; Di Tella and MacCulloch, 2003; Luttmer, 2005) found that contextual income is negatively related to life satisfaction controlling for personal income. The current study examined this effect and its potential moderators. Past research on entitativity (Campbell, 1958; Pickett, 2001; Pickett & Perrott, 2004) showed that higher entitativity leads to stronger social comparison. Thus, the current study looked at whether variables that signal entitativity moderate the association between contextual income and life satisfaction. Based on previous research on income inequality (Oishi, Kesebir, & Diener, 2011; Schor, 1997), the current study also explored income inequality as a potential moderator.

Prior research that examined the effect of relative income has operationalized relative income in various ways. Some have focused on the average income of a geographical region, such as countries (Di Tella and MacCulloch, 2003), public use microdata areas (which, as described above, are aggregates of counties that contain at least 100,000 individuals; Luttmer, 2005), or states (Blanchflower & Oswald, 2004). Others have defined relative income as the average income of similar others (people with the same age, education, gender, occupation, or a combination of similar demographic characteristics; Boyce, Brown, & Moore, 2010; Clark, Frijters, and Shields, 2008; Ferrer-i-Carbonell, 2005).

The current study operationalized relative income as county income for several reasons. First, counties are named geographical regions, unlike public use microdata areas. Named geographical regions, such as states, counties, and cities, might be more meaningful to survey respondents than geographical regions that are not named. In everyday life, laypeople are more likely to know which county they live in compared to which public use microdata areas they live in. Second, county income, compared to state income, allowed for a more detailed analysis of the association between neighborhood characteristics and life satisfaction. More importantly, recent research (Zell & Alicke, 2010) showed that when multiple comparison groups are present, individuals tend to compare with the most local comparison group – an effect termed the local dominance effect. Thus, according to the local dominance effect, when state income and county income are available, individuals are likely to use county income as the referent income because it is more local than state income. Third, although the analyses should ideally be conducted at an even more detailed level (at the level of zip-code or city), existing datasets do not contain such information. Thus, examining the association between reference income and life satisfaction at the county level was the most detailed approach based on the availability of the existing data.

Reference income was operationalized as county income as opposed to the income of similar others for several reasons. In studies where researchers posited that individuals compare their income to similar others, the income of similar others was often estimated using regression analyses, predicting income from age, gender, education, among other variables. That is, the reference groups were created for the purpose of those studies and need not have mundane realism. The variables that were included to estimate the reference income also depend largely on the researchers' opinion on the importance of different demographic variables. In contrast, analyzing the reference income hypothesis at the county level allowed for the use of objective characteristics of counties (such as population density and county income) as predictors. The same cannot be said if we defined reference income as the estimated income of individuals that share similar characteristics because such reference groups are hypothetical in nature.

Based on previous research, entitativity was hypothesized to moderate the effect of contextual income. Entitativity should ideally be measured by asking participants about their perception about the cohesiveness of a comparison group. Unfortunately, existing datasets do not contain information about perceived entitativity. Nonetheless, certain objective measures in existing datasets may serve as indicators of entitativity. County population density and size were tested as potential moderators of the effect of contextual income. Population density – the average number of people residing per square mile – represented an index of physical proximity, and thus entitativity. In dense areas, people tend to have more exposure to what other people are doing, which might allow for more comparisons. In addition, county physical size may relate to common-fate – the idea that members of the same group experience share similar experiences and outcomes. People living in smaller counties are more likely to visit the same restaurants, work in the same places, or participate in the same community events compared to people living

in larger counties. Based on prior research that showed that higher degree of entitativity led to stronger social comparison effects, the effect of contextual income was hypothesized to be moderated by population density and size, such that the association between county income and life satisfaction would be greater in smaller, more densely populated counties than in larger, less densely populated counties.

In addition, past research showed that similarity among group members is positively associated with entitativity (e.g., Brewer & Harasty, 1996; McGarty, Haslam, Hutchinson, & Grace, 1995). Although existing data provided no direct measure of similarity, state characteristics, such as racial composition, percent of foreign born population, and percent of English speaking families, reflected degree of similarity among members living in the same county. Thus, these state characteristics were tested as potential moderators of the effect of relative income.

Finally, the current study tested income inequality as a potential moderator of the effect of contextual income, and the Gini coefficient was used as a measure of income inequality. The Gini coefficient is the most commonly used metric of income inequality (e.g., Alesina, Di Tella, & MacCulloch, 2004; Oishi, Kesebir, & Diener, 2011). The Gini coefficient represents the degree to which income is equally distributed in a county. It ranges from 0 (where everyone in a county has the same income) to 1 (where one person has all the money and the rest does not have any money). As income inequality may be related to the salience of the discrepancy of income among individuals, I hypothesized that the effect of contextual income will be stronger in counties with higher Gini coefficient.

Purposes of the current study. The current study addressed several questions regarding the effect of contextual income and social comparison. First, the current study attempted to

replicate the negative association between contextual income and life satisfaction using an extremely large sample. Second, the current study tested the moderating effect of entitativity and income inequality on the effect of contextual income. Third, the current study tested the external validity of prior research on entitativity in a naturalistic setting using an extremely large sample. Although precise measure of entitativity is absent from existing datasets, there are reasons to believe that certain county characteristics (e.g., population density, percent of foreign born population) will tap into the construct of entitativity.

To summarize, the current study examined the association between neighborhood income and life satisfaction and tested whether this association is moderated by the entitativity and income inequality of the neighborhood. I hypothesized that 1) controlling for personal income, county income will predict life satisfaction, suggesting that social comparison processes affect life satisfaction judgments, 2) the effect of contextual income will be stronger in counties with higher level of entitativity, and 3) the effect of contextual income will be stronger in counties with higher level of income inequality.

METHODS

Participants

The Behavioral Risk Factor Surveillance System (BRFSS) is an on-going telephone survey conducted by the Center of Disease Control and Prevention and states' health departments (Center of Disease Control and Prevention, 2005 – 2010). Its purpose is to track health information and risk behaviors in the United State, including all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and the Guam. Although the BRFSS started in 1986, life satisfaction measure was not introduced until 2005, and thus, only waves 2005 – 2010 were included in the current study.

County income data were drawn from the American Community Survey (ACS; details regarding ACS are included in a following section). However, county income data was missing for the U.S. Virgin Islands and the Guam, and thus only participants from the 50 states, the District of Columbia, and Puerto Rico were included. Furthermore, participants were excluded if they did not report which county they lived in or if existing datasets did not contain information for the county they resided. As a result, 1,770,125 participants (out of a total of 2,440,925 participants) were matched with county information, and statistical analyses were conducted on this group of participants. Participants (61% females) had a mean age of 53.70 ($SD = 16.32$). The sample consisted of 91.2% high school graduate, and 36.1% of participants completed college. The majority (56.6%) of participants were married.

Measures

Life satisfaction was measured in the BRFSS with an item that read “In general, how satisfied are you with your life.” It used a 4-point scale with 1 being *Very Satisfied*, 2 being

Satisfied, 3 being *Dissatisfied*, and 4 being *Very dissatisfied*. This item was reverse coded such that higher numerical values represented higher level of life satisfaction. Because life satisfaction was measured by a single-item measure, reliability could not be estimated for the BRFSS sample. However, previous research has shown that similar single-item measures perform well psychometrically. For example, Lucas and Donnellan (2012) estimated the reliability of the single-item life satisfaction scale using four national representative panel studies, and their results showed that the reliability estimates ranged from .68 - .74.

Participants reported their household income as part of the BRFSS survey. The response scale for the income question used income brackets, with 1 being “Less than \$10,000,” 2 being “\$10,000 to less than \$15,000,” 3 being “\$15,000 to less than \$20,000,” 4 being “\$20,000 to less than \$25,000,” 5 being “\$25,000 to less than \$35,000,” 6 being “\$35,000 to less than \$50,000,” 7 being “\$50,000 to less than \$75,000,” and 8 being “\$75,000 or more.” To compare the income brackets to county income, the income brackets were translated into raw income by averaging the two ends of each bracket, except for participants who reported an income of \$75,000 or over. For example, a participant who answered 5 would have a translated income of \$30,000. For households with an annual income over \$75,000, the median household income for this subgroup falls in the range of \$110,000 to \$114,999 based on the Current Population Survey conducted by the Census Bureau. Thus, the midpoint of the range (i.e., \$112,500) was used as an estimate of the income for participants with over \$75,000 annual household income. Prior research has used similar procedures to estimate income based on income brackets (e.g., Cattaneo & DeLoveh, 2008; Dowd, Palermo, & Aiello, 2012; Hargerty, 2000). These translated incomes then underwent a logarithmic transformation to be compared with county income (which is also

logarithmically transformed because the distribution of county income is positively skewed; for county income, $S = .82$, $SE = 0.002$).

County income and Gini coefficients were retrieved from the 2010 ACS 5-year estimates. The ACS is an on-going annual survey conducted by the Census Bureau. Similar to the Census, the ACS collects information regarding a wide range of variables, such as population and housing characteristics. In addition to releasing data of the annual survey, the Census Bureau also released a 5-year estimates that utilized information from 2006 – 2010 to provide more reliable and precise data than the estimates based on one year of data (U.S. Census Bureau, 2008). More importantly, the ACS 5-year estimates contain county income data for most of the counties in the US, compared to the ACS 1-year estimate in which county income is only available for counties with populations of more than 65,000 people. As a major purpose of the current study was to study the association between regional income and life satisfaction, including as many counties as possible was paramount to provide a good test of the effect of contextual income.

In order to study the moderating effect of entitativity and income inequality, county population density, county size, percent of White population, percent of foreign born population, and percent of English speaking families were obtained from the Census 2010. As the Census surveyed the entire U.S. population (as opposed to a sample in the ACS), the Census 2010 is likely to be the most reliable, accurate, and precise source for county information. Population density was measured in population per square mile of land area. County size was defined as number of square miles of land area. Because of the skewness of the distribution of population density ($S = 11.87$, $SE = 0.002$) and county size ($S = 4.71$, $SE = 0.002$), a logarithmic transformation was performed on these variables. Participants from the BRFSS were matched to

county information based on the Federal Information Processing Standard codes that were present in the BRFSS, Census 2010, and the 2010 ACS 5-year estimates.

Analytical Procedure

Statistical analyses based on a multilevel modeling framework were conducted using the lme4 package in the R statistical program (R Developmental Core Team, 2010). The main goal of the current study was to examine the association between county income and life satisfaction and factors that moderate this association. In order to disentangle the association between household income and life satisfaction and the association between county income and life satisfaction, household income and county income were centered around the grand means of household income and county income, respectively. This centering procedure allowed for the estimation of the association between county income and life satisfaction *controlling* for household income (Enders & Tofighi, 2007). In addition, the potential moderators (population density, percent of African American population, percent of Hispanic population, percent of foreign born population, percent of English speaking families, and Gini coefficients) were centered around their respective grand means. This procedure improved the interpretability of the intercept (which represented the grand mean of life satisfaction in the sample).

The Main Effect Model. To test the reference income hypothesis, I entered life satisfaction as the outcome variable, household income as an individual-level (Level-1) predictor, and county income as a county-level (Level-2) predictor. In each of the models, county was used as the grouping variable, and a random intercept was modeled to account for the interdependence of the observations that came from the same county. Other predictors were treated as fixed.

The Interaction Models. The moderating effect of county population density, county size, percent of White population, percent of foreign born population, percent of English speaking families, and Gini coefficients were tested using six separate models. Similar to the model that was used to test the effect of contextual income, life satisfaction was the outcome variable, household income was the individual-level (Level-1) predictor, and county income and one of the six moderators were the county-level (Level-2) predictors. County was used as a grouping variable, and a random intercept was modeled. Other predictors were treated as fixed. In addition, in each of the six models, an interaction between one of the moderators and county income was also included, and this interaction tested whether a moderating relationship was evidenced. Moderation is often tested as the interaction between a predictor and a moderator, and a significant interaction indicates a moderating effect. For example, if the current study found a significant positive interaction between county income and population density, it would suggest that the association between county income and life satisfaction would be more positive when population density was higher.

RESULTS

All inferential statistics reported are significant at .05 levels unless otherwise noted.

Table 1 presents the bivariate correlations for the predictors and the outcome variable. It is noteworthy that county-level variables, such as population density and Gini coefficients, were significantly correlated with life satisfaction, replicating earlier research on regional predictors of life satisfaction (e.g., Lawless & Lucas, 2011; Lucas, Cheung, & Lawless, 2013).

The Main Effect Model

As a first step, I tested a main effect model that assessed the main effects of household income and county income, ignoring the moderators. Higher household income was significantly associated with higher level of life satisfaction ($B = .54$, $SE = .0029$). This is consistent with a large body of research (e.g., Howell & Howell, 2008). Controlling for household income, county income was negatively associated with life satisfaction ($B = -.17$, $SE = .0091$), replicating past research on the effect of neighborhood income (e.g., Luttmer, 2005). Based on this model, people living in richer counties (1SD above mean) would have to earn about \$7,200 more in order to match the levels of life satisfaction of people living in poorer counties (1SD below mean). All similar interpretations reported hereafter are comparing 1SD above and below means of variables.

The Interaction Models

Next, I tested six interaction models to assess whether the association between county income and life satisfaction varies depending on county-level variables. Table 2 presents the results on the interaction models. Consistent across the six models, household income and county income were significantly associated with life satisfaction in the predicted directions. Main effects of county-level variables were also found. Specifically, county size, percent of White

population, and percent of English speaking population were positively associated with life satisfaction, whereas county population density and percent of foreign born population were negatively associated with life satisfaction. The association between Gini coefficient and life satisfaction was not significant once county income was controlled ($B = .02$, $SE = .035$, $p = .55$).

Figure 1 illustrates the moderating relationship between county income and life satisfaction by the six moderators. Consistent with the prediction that higher level of entitativity should moderate the effect of contextual income, the results showed that population density and county size both moderated the association between county income and life satisfaction, such that higher population density and smaller size were associated with a stronger negative association between county income and life satisfaction. The regression coefficient for the association between county income and life satisfaction increased in magnitude from $B = -0.06$ in counties with low population density to $B = -0.22$ in counties with high population density. Among counties with lower population density, people living in richer counties would have to earn about \$2,400 more in order to match the levels of life satisfaction of people living in poorer counties. Among counties with higher population density, people living in richer counties would have to earn roughly \$9,500 more in order to match the levels of life satisfaction of people living in poorer counties. The regression coefficient for the association between county income and life satisfaction increased in magnitude from $B = -0.06$ in large counties to $B = -0.20$ in small counties. Among larger counties, people living in richer counties would have to earn about \$2,300 more in order to match the levels of life satisfaction of people living in poorer counties. Among smaller counties, people living in richer counties would have to earn about \$8,800 more in order to match the levels of life satisfaction of people living in poorer counties. These results supported population density and county size as moderators of the effect of contextual income.

Income inequality was hypothesized to moderate the effect of contextual income. Consistent with this hypothesis, Gini coefficients significantly moderated the association between county income and life satisfaction, such that higher level of Gini coefficients was associated with a stronger negative association between county income and life satisfaction. The regression coefficient for the association between county income and life satisfaction increased in magnitude from $B=-0.09$ in counties with low population density to $B=-0.21$ in counties with high population density. Among counties with lower level of income inequality, people living in richer counties would have to earn about \$3,900 more in order to match the levels of life satisfaction of people living in poorer counties. Among smaller counties, people living in richer counties would have to earn about \$8,900 more in order to match the levels of life satisfaction of people living in poorer counties. These results suggested that income inequality moderates the contextual effect of income, and the difference in the association between county income and life satisfaction in counties with high income inequality and counties with low income translates into a significant amount of income.

Although percent of White population, percent of English speaking population, and percent of foreign born population significantly moderated the association between county income and life satisfaction, the moderation was not in the predicted direction. Higher percent of White population, higher percent of English speaking population, and lower percent of foreign born population were associated with a weaker negative association between county income and life satisfaction. A close examination of Table 1 revealed that percent of White population and percent of English speaking population were negatively correlated with Gini coefficient and population density and positively correlated with county size, all of which were associated with a weaker association between county income and life satisfaction. Similarly, lower percent of

foreign born population was associated with lower population density and lower Gini coefficient, which were also associated with a weaker association between county income and life satisfaction. That is, it is plausible that the moderating effect of Gini coefficient, population density, and county size overwhelmed any similarity effect percent of White population, percent of English speaking population, and percent of foreign born population had.

To test this possibility, three additional analyses were conducted to test percent of White population, percent of English speaking population, and percent of foreign born population as moderators of the association between county income and life satisfaction *controlling* for population density, county size, Gini coefficient, and the interactions of these variables with county income. The interaction between county income and percent of White population was not statistically significant ($B=-0.001$, $SE=0.052$, $p=0.98$). The interaction between county income and percent of English speaking population ($B=0.36$, $SE=0.085$) and the interaction between county income and percent of foreign born population ($B=-0.68$, $SE=0.15$) were statistically significant, but not in the predicted direction.

Robustness Check

To ensure the above results were not a result of a specific operationalization of the predictor variables, additional statistical analyses were conducted as robustness check. The following analyses were conducted to address concerns with different operationalizations of income, population density, and county size.

Income. There are multiple ways to operationalize household income, and one may argue that household size needs to be taken into account when considering household income. For two households with the same amount of income, members of the household with fewer household members might enjoy a larger share of the financial resources compared to members of the

household with more household members. To address this concern, the same models tested above were run with household income adjusted for household size. The results were very similar, and there was no difference in statistical significance between the models that adjusted for household size and the models that did not adjust for household size. Table 3 presents the results for the main effect model and the interaction models using household income adjusted for number of household members. Compared to the results based on household income unadjusted for household size, the coefficients for the association between county income and life satisfaction became slightly, but consistently smaller in magnitude, whereas the coefficients for the interaction between county income and the moderator became slightly, but consistently larger in magnitude.

One may also argue that people compare their raw household income (which is probably more cognitively accessible than the logarithm of household income for laypeople) with income of others. Thus, I also replicated the analyses using raw (rather than logarithmically-transformed) household and county income. Raw household income and county income were divided by 10,000 before entering into the models. This procedure improved interpretability of the coefficients by reducing the number of decimal places. Table 4 presents the results for the main effect model and the interaction models using raw household income and county income. The differences in the magnitudes of the associations between the models using raw income and logarithmically-transformed income were hard to interpret given the difference in units. Importantly, the effect of contextual income and all moderating relationships were replicated. Table 5 presents the results for the main effect model and the interaction models using raw household income adjusted for household size. Similarly, the effect of contextual income was replicated in the main effect model, and all moderating relationships were replicated. These

robustness checks suggest that the pattern of results was not a result of idiosyncrasies inherited in a specific operationalization of income.

Population Density and County Size. Given the skewness in population density and county size, these variables were logarithmically-transformed and tested for moderation in the results reported earlier (see Table 2). However, it is also possible to test raw (rather than logarithmically-transformed) population density and county size as moderators. Population density and county size were divided by 10,000 before entering into the models. This procedure improved interpretability of the coefficients by reducing the number of decimal places. Table 6 compares the results for the interaction models using logarithmically-transformed and raw population density and county size. Lower level of population density and larger county size were associated with higher level of life satisfaction, replicating the main effects of logarithmically-transformed population density and county size. Notably, raw population density and county size did *not* moderate the association between county income and life satisfaction. However, due to the skewness in population density ($S = 11.87$, $SE = 0.002$) and county size ($S = 4.71$, $SE = 0.002$), the results on the logarithmically-transformed population density and county size were likely to be more reliable.

DISCUSSION

The association between income and life satisfaction is one of the most studied areas in the field of subjective well-being, yet the mechanism through which income influences life satisfaction remains unclear. Some researchers have proposed that one's income relative to others is important to one's well-being because social comparison of income, rather than income per se, influences one's evaluation of one's life. Past studies (e.g., Blanchflower & Oswald, 2004; Di Tella & MacCulloch, 2003; Luttmer, 2005) have consistently shown the effect of contextual income – the finding that controlling for personal income, income of others is associated with one's life satisfaction. However, the extent to which the effect of contextual income reflects social comparison remains unclear. If the effect of contextual income indeed reflects social comparison, it should be moderated by entitativity (Pickett, 2001; Pickett & Perrott, 2004) and the salience of income. The goals of this paper were to 1) replicate the effect of contextual income in US counties and 2) test what factors moderate the effect of contextual income. Five general findings emerged from the current study.

First, consistent with prior research, the current study demonstrated that controlling for household income, county income was negative associated with life satisfaction. The current study contributed to the literature by replicating the effect of contextual income using an extremely large sample with over 1.7 million participants. Moreover, the current study replicated the effect using county as the level of analysis, and county is a more detailed level of analysis compared to prior studies on PUMAs (Luttmer, 2005), states (Blanchflower & Oswald, 2004), and countries (Di Tella & MacCulloch, 2003).

Second, the effect of contextual income on life satisfaction was moderated by population density and county size, variables that were used as proxies of entitativity. Specifically, higher

population density and smaller county size were associated with a stronger negative association between county income and life satisfaction. People living in a densely populated neighborhood tend to live closer to their neighbors compared to people living in a less densely populated neighborhood. Thus, they are more likely to be exposed to what new purchase their neighbors make or what kind of life style their neighbors endorse, which allow for more opportunities to compare. People living in smaller neighborhoods (e.g., the New York county, also known as Manhattan, which spans 22.83 square miles) may be more likely to go to the same places for entertainment (e.g., Madison Square Garden), work in the same area (e.g., Wall Street), or participate in the same community events (e.g., the New York City Marathon) compared to people living in larger counties (e.g., San Bernardino county, CA, which spans over 20,000 square miles). Thus, people living in smaller counties may have more opportunities to compare with others through these shared experiences. These shared experiences suggest a high level of common-fate, which should also lead to stronger social comparison. In short, the moderating relationships of population density and county size suggested a social comparison process is at play.

Third, income inequality (which may affect the salience of income and income comparison standards) was found to moderate the effect of contextual income. The negative association between county income and life satisfaction was stronger in counties with higher level of income inequality compared to counties with lower level of income inequality. Past research (e.g., Kawachi & Kennedy, 1999; Kennedy et al., 1998) has shown that income inequality is associated with physical as well as psychological well-being. Schor (1997) suggested that income inequality leads to lower level of psychological well-being because increased income inequality was associated with more upward comparison. The current finding

that income inequality was associated with a stronger negative association between contextual income and life satisfaction is consistent with this explanation.

Fourth, although racial composition, percent of English speaking population, and percent of foreign born population were hypothesized as indicators of similarity and thus should moderate the association between contextual income and life satisfaction, the current study failed to find evidence supporting this hypothesis. One possibility is that these variables are not good proxies of similarity. Take percent of English speaking population as an example. It is plausible for a county with low percent of English speaking population to have a high level of similarity, if people speaking the same language live in clusters within the county. Unfortunately, the current study was limited by the availability of data that would allow for more fine-grained analyses. Using a secondary data analysis approach meant that the author has no control over variables that are included in existing datasets. To better test the effect of similarity, I encourage future studies to investigate the degree of segregation in counties. Segregation index is likely to be a better measure of similarity among individuals living in a neighborhood compared to variables used in the current study. Although the current study did not provide evidence that similarity moderates the effect of contextual income, it is plausible that the results could be different if better measures of similarity were used.

Fifth, the results showed that county-level characteristics were associated with life satisfaction. For example, life satisfaction was negatively correlated with county population density and positively correlated with county median income. These findings have important implications because in recent years, different nations and organizations have shown an increased interest in measuring life satisfaction in the broader populations, and the current study

provided evidence that life satisfaction measure is sensitive to objective regional characteristics. These findings added to the growing literature on regional correlates of life satisfaction.

Strengths and Limitations

A series of analyses were conducted as robustness check to test the generalizability of the above findings. Although the magnitude of the effects differed slightly, the findings from the current study remain statistically significant across different definitions of income. These robustness checks demonstrated that the findings were not limited to a specific definition of income.

Importantly, the current study generalized prior laboratory findings on entitativity and social comparison into a real-world setting. Past studies on entitativity have mostly adopted an experimental approach (e.g., Pickett, 2001; Pickett & Perrott, 2004) or used college sample (e.g., Dasgupta, Banaji, & Abelson, 1999; McConnell, Sherman, & Hamilton, 1997; Spencer-Rodgers, Hamilton, & Sherman, 2007). Methodologists have long called for extending research on student samples to more naturalistic setting. Henrich and his colleagues (2010) convincingly showed that student samples can be substantially different from the human population in general. Thus, it is important to test whether findings on entitativity based mostly on student samples can be generalized to a more diverse and representative sample. The current study was able to conceptually replicate the finding that higher entitativity led to stronger social comparison using an extremely large and diverse non-student sample.

A potential concern of the current study is that life satisfaction was measured using a single item measure, and thus, reliability of life satisfaction cannot be computed. As noted in the method section, Lucas and Donnellan (2012) have estimated the reliability of the single item life satisfaction measures using four national representative panel studies, and the reliability

estimates of single item life satisfaction measure ranged from .68 - .74. Past studies have repeatedly showed that single item measures of life satisfaction are associated with many different variables, such as regional correlates (e.g., Lawless & Lucas, 2011) and important life events (e.g., Lucas, 2005). In sum, a large body of literature supports the validity of single item measure of life satisfaction.

Future Directions

The current findings provided evidence that warrants future research to examine the effect of contextual income using more precise measures. For instance, entitativity should ideally be measured by asking participants to report how much they perceive their comparison group as a cohesive group. Future research should also collect data on individual differences. Soto and Luhman (2012) recently showed the association between income and life satisfaction is particularly strong for individuals higher in neuroticism. Personality factors may also moderate the effect of contextual income. Future research with more precise measures of more variables will provide a more complete understanding of the processes responsible for the effect of contextual income.

The current study suggested that residing in a poorer county may be associated with higher level of life satisfaction for certain individuals. However, past research showed that living in economically disadvantaged neighborhoods has been associated with mostly negative outcomes, such as worse physical health (Pickett & Pearl, 2001), higher level of depression (Ross, 2000), and higher level of drug use (Boardman, Finch, Ellison, Williams, & Jackson, 2001). Thus, the economic status of a neighborhood seems to be linked with both positive and negative outcomes. Future research should further examine what processes account for the relationships between neighborhood and different life outcomes.

Conclusion

The current study replicated the effect of contextual income in a large US sample and provided further evidence for social comparison as an explanation of this effect. The results showed that the effect of contextual income was moderated by entitativity and salience of income, suggesting that people are more likely to compare with others when living in smaller, more densely populated counties with higher level of income inequality. To conclude, social factors need to be taken into account when explaining the association between income and life satisfaction.

APPENDIX

Table 1

Correlations between Predictors and Life Satisfaction

	1	2	3	4	5	6	7	8	9
1. Life Satisfaction		0.04	0.27	-0.02	0.01	-0.01	0.01	0.01	-0.01
2. County Income (log)			0.26	0.37	0.05	-0.26	0.01	0.02	0.41
3. Household Income (log)				0.10	0.01	-0.05	0.01	0.04	0.09
4. Population Density (log)					-0.54	0.41	-0.42	-0.36	0.54
5. Size (log)						-0.26	0.11	0.02	0.01
6. Gini							-0.40	-0.33	0.28
7. % White								0.35	-0.46
8. % English Speaking									-0.71
9. % Foreign Born									
Mean	3.39	4.70	4.57	2.42	2.92	0.44	0.76	0.85	0.09
Standard Deviation	0.63	0.11	0.32	0.75	0.42	0.04	0.17	0.13	0.08

Note: All correlation coefficients were significant at $p < .001$.

Table 2

Estimates and Standard Errors of the Interaction Models

	Interaction Models											
	Pop. Den. (log)		Size (log)		Gini		% White		% English		% Foreign	
	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE
Intercept	3.39*	.001	3.40*	.001	3.39*	.001	3.39*	.001	3.39*	.001	3.39*	.001
Household Income (log)	0.54*	.003	0.54*	.003	0.54*	.003	0.54*	.003	0.55*	.003	0.55*	.003
County Income (log)	-0.14*	.009	-0.13*	.011	-0.15*	.010	-0.17*	.009	-0.12*	.010	-0.11*	.011
Main Effect of Moderator	-0.02*	.002	0.022*	.003	0.02	.035	0.025*	.008	0.049*	.010	-0.10*	.017
Moderator * County Income (log)	-0.11*	.012	0.17*	.017	-1.44*	.018	0.20*	.052	0.46*	.073	-0.51*	.12

Note: * = $p < .05$

Table 3

Estimates and Standard Errors of the Main Effect and Interaction Models Using Household Income Adjusted for Household Size (log)

	Main Effect Model		Interaction Models											
			Pop. Den. (log)		Size (log)		Gini		% White		% English		% Foreign	
	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE
Intercept	3.40*	.001	3.39*	.001	3.40*	.001	3.39*	.001	3.39*	.001	3.40*	.001	3.39*	.001
Household Income (log)	0.49*	.003	0.49*	.003	0.49*	.003	0.49*	.003	0.49*	.003	0.50*	.003	0.50*	.003
County Income (log)	-0.11*	.010	-0.08*	.001	-0.05*	.011	-0.08*	.011	-0.11*	.010	-0.05*	.010	-0.03*	.011
Main Effect of Moderator			-0.02*	.002	0.02*	.003	-0.03	.036	0.03*	.008	0.05*	.011	-0.11*	.018
Moderator * County Income (log)			-0.12*	.013	0.20*	.018	-2.02*	.019	0.24*	.054	0.54*	.076	-0.60*	.13

Note: * = $p < .05$

Table 4

Estimates and Standard Errors of the Main Effect and Interaction Models Using Raw Household Income and County Median Income

	Main Effect Model		Interaction Models											
			Pop. Den. (log)		Size (log)		Gini		% White		% English		% Foreign	
	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE
Intercept	3.40*	.001	3.40*	.001	3.40*	.001	3.39*	.001	3.40*	.001	3.40*	.001	3.40*	.001
Household Income	0.07*	.001	0.07*	.001	0.07*	.001	0.07*	.003	0.07*	.003	0.07*	.001	0.07*	.001
County Income	-0.02*	.001	-0.01*	.001	-0.01*	.001	-0.02*	.001	-0.02*	.001	-0.01*	.001	-0.01*	.001
Main Effect of Moderator			-0.02*	.002	0.02*	.003	-0.03	.034	0.04*	.008	0.06*	.010	-0.13*	.018
Moderator * County Income			-0.01*	.013	0.01*	.002	-0.16*	.018	0.03*	.005	0.04*	.006	-0.04*	.001

Note: * = $p < .05$

Table 5

Estimates and Standard Errors of the Main Effect and Interaction Models Using Raw Household Income Adjusted for Household Size

	Main Effect Model		Interaction Models											
			Pop. Den. (log)		Size (log)		Gini		% White		% English		% Foreign	
	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE
Intercept	3.40*	.001	3.40*	.001	3.40*	.001	3.40*	.001	3.40*	.001	3.40*	.001	3.40*	.001
Household Income	0.08*	.001	0.07*	.001	0.08*	.001	0.08*	.001	0.08*	.001	0.08*	.001	0.08*	.001
County Income	-0.02*	.001	-0.01*	.001	-0.01*	.001	-0.01*	.001	-0.01*	.001	-0.002	.001	0.001	.001
Main Effect of Moderator			-0.02*	.002	0.02*	.003	-0.08*	.036	0.04*	.008	0.06*	.011	-0.14*	.018
Moderator * County Income			-0.01*	.013	0.02*	.002	-0.19*	.019	0.03*	.005	0.05*	.007	-0.04*	.010

Note: * = $p < .05$

Table 6

Estimates and Standard Errors of the Interaction Models Using Raw and Logarithmically Transformed Population Density and County Size

	Logarithmically Transformed				Raw			
	Pop. Den. (log)		Size (log)		Pop. Den.		Size	
	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE	<i>B</i>	SE
Intercept	3.39*	.001	3.40*	.001	3.39*	.001	3.39*	.001
Household Income (log)	0.54*	.003	0.54*	.003	0.54*	.002	0.54*	.002
County Income (log)	-0.14*	.009	-0.13*	.011	-0.16*	.009	-0.17*	.010
Main Effect of Moderator	-0.02*	.002	0.02*	.003	-0.04*	.004	0.02*	.007
Moderator * County Income (log)	-0.11*	.012	0.17*	.017	0.06	.003	0.05	.068

Note: * = $p < .05$

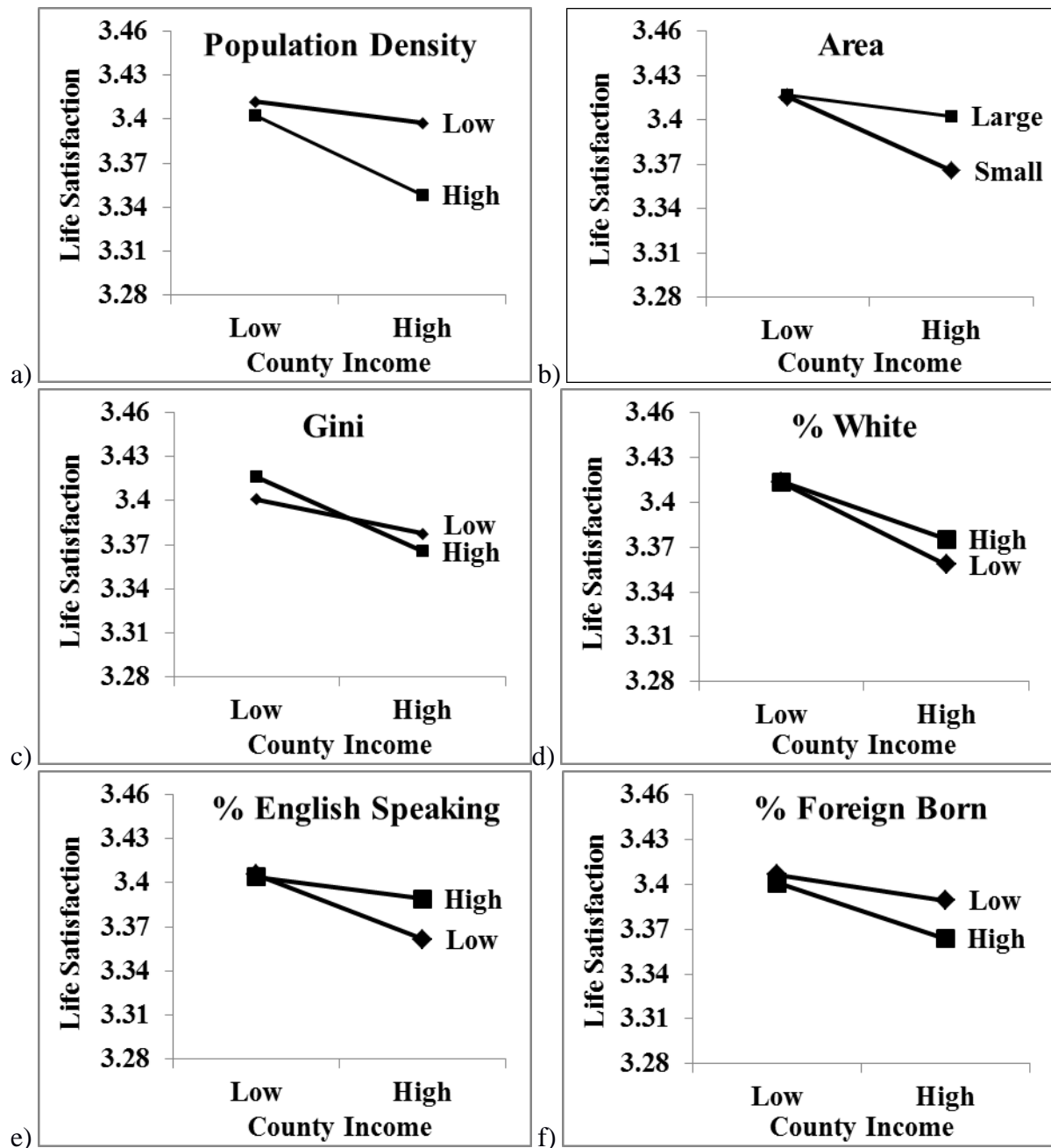


Figure 1. The association between county income and life satisfaction was moderated by a) population density, b) county area, c) Gini coefficient, d) percent of White population, e) percent of English speaking population, and f) percent of foreign born population. High and low level of variables were defined as 1 SD above or below the means.

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