Is Being Satisfied Making You Wealthy and Wise?
A Study of the Effects of Well-Being at the City-Level

by

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Submitted in Partial Fulfillment of the Requirements

for the Degree of

Master of Arts

in the

Economics

Program

YOUNGSTOWN STATE UNIVERSITY

December, 2011

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Abstract:

The study presented here researches subjective well-being, wages, educational attainment, and how well-being affects both wages and educational attainment through reverse causality. From Gallup-Healthways Well-Being Survey, a total of 187 metropolitan statistical areas were observed and 152 of these cities were used in our regression analysis for completeness reasons. This study adds to the literature of determinants of well-being, wage, and educational attainment, as well as the literature of approaches to endogeneity issues, and identifying and correcting reverse causality between variables in a system of equations through the use of two and three-stage-least-squares methods. We found that well-being had a significant, but negative, effect on wage and a significantly positive effect on educational attainment. From this result, we approached the well-being equation with a two-stage-least-squares method in order to determine if the relationship between wage, well-being, and educational attainment were causing biased results when using ordinary least squares methodology. It was found that there was bias and a two-stage-least-squares method was helpful in correcting for this issue. We suggest that further research into how well-being affects other variables is important and necessary.

I would like to take a moment to thank my advisor, Dr. Joseph Palardy, without his support and guidance this work would still be in the outlining stages. I'll never be able to thank you enough for your support through this process.

Also, I would like to thank my husband, Seth, for his never ending patience and support. You definitely are my better half and I'm so blessed to have you in my life.

To my mom, Debbie, I would like to say thank you for all always believing in me and my ability. I know that no matter what path I choose, you will always be there as my number one fan.

To my thesis readers, Dr. Albert Sumell and Dr. Tomi Ovaska, thank you for your time and helpful comments. I am so thankful to have had both of your inputs because they each brought a different perspective into my research which made it that much stronger.

Lastly, I want to thank my dad who, in his life and in his passing, has helped shape me into the person I am today.

Chapter 1: Preface

Section 1: Introduction

Determinants of subjective well-being have been studied extensively. Here we will focus less on how well-being is affected by other variables and more on how well-being affects the economic condition of an area.

We will first examine the happy-productive worker hypothesis (Wright and Staw, 1999). Are those workers with higher well-being more productive and therefore earning higher wages? There have been a few companies who have embraced this idea and strove to raise their workers well-being through amenities, work schedules, compensation, healthcare, etc. For instance, SAS, a software company was rated by FORBES as the best place to work for in 2011. People surveyed stated that they were very satisfied in their work place and that they felt valued and taken care of. Even in 2009 when the economy was quite dismal, SAS had increased sales and hired 237 new employees. The employees at SAS showed increased productivity which is partially attributed to higher well-being. According to the company website, SAS offers on-site health care and day care in addition to a gym that their employees can take advantage of at their Cary, NC headquarters. Further, Google, which is another one of the FORBES best work places and currently ranks 4th, offers free meals and shuttles to their employees. They also present the opportunity for tuition reimbursement, financial planning classes, and a lucrative retirement plan. Google increased their revenue by over

20% in 2010 and gave each of their employees a corresponding 10% raise in salary. These are just two examples of companies who have committed themselves to their employee's well-being and have been also increased profit during a recession. While the idea of well-being has been investigated at the company-level, the question now becomes: do we see this same effect at the metropolitan statistical area (MSA) level?

We will also look at how educational attainment is affected by well-being. Does higher well-being lead to higher educational attainment? Students who are more satisfied look more to the future and stay in school longer in order to earn a higher degree. Using experimental evidence from 5th graders, Quinn and Duckworth (2011) found that well-being predicted academic performance. Students who were happier tended to have higher GPA and reciprocally those who earned a higher GPA were happier. We explore the idea that people with differing well-being may also have differing discount rates which they apply to future earnings. Those who value future earnings at a high rate are more likely to forgo earnings in the present in order to attend school (Ifcher and Zarghamee, 2011).

While we will examine how well-being affects wages and educational attainment, it is very important to identify reverse causality, which much of the early research neglects to do. Using two-stage-least-squares and system of equations approach, we will simultaneously estimate the endogenous variables and then examine the determinants of well-being. Much research has been done using ordinary least squares and a small amount has been done using two-stage-least-squares; but this research will take these methodologies a step further and examine both how certain variables affect well-being but also how well-being in turn affects income and educational attainment. This paper is

organized as follows. We will specify the research questions examined and then give a detailed literature review on the subject of well-being. Next, we will give a detailed overview of the data used and continue with our methodology. Further, we examine each of the equations and their corresponding results with plausible interpretations. Lastly, we describe possible policy implications and conclusions.

Section 2: Research Questions

There are two main research questions that will be explored in this paper and a third supplemental question. First, we will look at what the effect of well-being is on wage. Are cities that have higher well-being more productive? Many papers have examined what affects well-being, but they neglect to look for the effect of well-being on other variables. It has been shown in other research that people who have higher well-being tend to have higher wages (Wright and Staw, 1999; Graham et. al., 2004), and it has been shown that high incomes lead to high levels of well-being (Clark et. al., 2008), but it has not been examined how these variables affect each other.

Second, we will ask, do cities that have higher well-being also have higher educational attainment? Like income, most well-being literature cites educational attainment as having a positive effect on well-being (Dolan et. al., 2008). There are a few papers which examine educational attainment and conclude that a person's happiness level contributes to their educational attainment (Quinn and Duckworth, 2011; Ifcher and Zarghamee, 2011; Oreopoulos, 2003). While separate papers suggest that each variable

contributes to the other, none have attempted to correct for this inherent endogeneity. We will attempt to correct for this and examine how each of these variables affects the other endogenous variables.

In addition to our two main research questions we will also examine whether or not the ordinary least squares estimators are biased. To check for endogeneity, we will perform a Hausman test and then examine our instruments to ensure they are valid and robust.

Chapter 2: Literature Review:

Section 3: Defining and Measuring Well-Being

At its most basic level, well-being is defined as a state characterized by health, happiness, and prosperity (Webster's Dictionary). Well-being, in this sense, should not be used completely interchangeably with happiness or optimism. These factors are a part of well-being as a whole, but are not synonyms for well-being. In this paper, we will use the words well-being or satisfaction. Other papers have used happiness to mean well-being and the term employed by the original authors will be used here when we are discussing their papers.

The idea of utility was brought to people's attention by John Stuart Mill in his essay entitled "Utilitarianism" (1861). Mill said that utilitarians regard actions that are right by the degree to which they promote happiness and actions were regarded as wrong by the proportion to which that caused the opposite of happiness. If a given choice will enhance the aggregate utility of all parties involved, then that decision should be made.

Historically, economists have used the word "utility" in order to measure a person's satisfaction. Utility was defined by Jeremy Bentham (1907) in the literature *An Introduction to the Principles of Morals and Legislation* as

> "that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness, (all this in the present case comes to the same thing) or (what comes again to the same thing) to prevent the happening of mischief, pain, evil, or unhappiness to the party whose interest is considered."

Kahneman and Thaler (2006) clarifies that Bentham was specifying experienced utility when Bentham spoke of the property of an object producing happiness. Utility possesses similar innate characteristics as well-being as it is defined in this research. Increases in utility or increases in well-being are synonymous with an increase in benefits to a group or individual. While utility and well-being share many important characteristics, researchers are presently attempting to directly measure utility through well-being surveys. Utility is an attribute of an item while well-being is a state of existence.

As it follows, early utilitarians such as John Stuart Mill and Jeremy Bentham in the 18th and 19th century were challenged by economist and philosopher John Rawls on the idea of fairness and justice. Rawls declared that instead of examining the aggregate outcome of a scenario, one should consider the benefits that the person who has the least satisfaction would receive (Rawls, 2001). For instance, consider a scenario in which the rich group has a utility of +500 and the poor group has +300 for an aggregate total of +800. Then consider another scenario where the rich group has +800 and the respective poor group has +200. This aggregates to +1000. Under Mill's doctrine, the second scenario which maximizes the group's utility should be chosen. Rawls poses the idea of a "veil of ignorance" in which no one in either group knows if they will be in the poor or rich demographic (Rawls, 2001). Under this requirement, rational people would look to maximize their worst possible outcome. The +300 choice is better than the +200

outcome, when focusing on the poor group's outcome. Therefore, using Rawls' "veil of ignorance," the group would choose the first scenario. These economists gave strong arguments and insightful observations that allowed future well-being researchers a strong basis to begin their investigation.

One specific question posed which relates Rawls and Mill's essays to the current research is as follows: Would a group be better off if they increased the proportion of citizens receiving bachelor's degrees, or by reducing the proportion of those who are living in poverty? While the bachelor's degrees may increase the group's overall well-being, more so than reducing poverty percentage; reducing the percentage of people in poverty will increase the well-being of those who initially have the lowest well-being.

A common utility function is concave in shape, which means that the utility line flattens as consumption increases. This illustrates the theory of diminishing marginal utility which was first defined in 1854 by the Prussian microeconomist, Hermann Gossen, in his book *Die Entwickelung der Gesetze des menschlichen Verkehrs, und der daraus fließenden Regeln für menschliches Handeln,* translated into English in 1983 (1983). As an illustration, imagine a child who enjoys riding roller coasters. When they first arrive at the amusement park and ride the first coaster, their utility increases dramatically. As the day progresses however, the child will only experience slight increases in utility from each additional roller coaster ride. This same concept can be applied to income, as well as educational attainment. As a person receives a higher and higher salary, or additional years of schooling, the utility, or well-being, derived from this will be smaller and smaller. Marginal well-being behaves very similarly to marginal utility. For instance,

even though our average income has increased drastically over the past decades, well-being hasn't increased by the same amount

Section 4: Measures of Well-Being

Well-being is difficult to quantify and measure. There have historically been two different methods of examining well-being, subjective and objective methods. Objective well-being utilizes data which can be observed such as time spent, income, demographics, and other socio-economic variables. Subjective measures of well-being are typically survey based, where a person is questioned about their day or the previous day and how they felt about different events. Historically, life satisfaction surveys and questions regarding happiness have been compiled to create subjective well-being measures (Kahneman et. al., 2004; Gallup 2010; Happy Planet Index; National Accounts of Well-Being; Canadian Index of Well-Being).

Kahneman et. al. (2004) theorizes that a person's gauge of well-being can be affected by previous questions about happy or sad memories as well as the framing of these questions. In addition, the idea of a hedonic treadmill suggests that a person's well-being improvement or depreciation to a fantastical life improvement or a devastating loss, respectively, will be slight. The term hedonic treadmill was first used by Brickman and Campbell (1971). The hypothesis is that when something very good or very bad happens to a person, such as a close family death or lottery winning, they will adjust to this new life and not show a great increase or decrease in satisfaction or hedonic value, much like

the way a person's body would adapt to an increase or decrease in a treadmill speed. They will adapt to this new shift relatively quickly and will not be significantly better or worse off than their counterparts in the long run (Brickman and Campbell, 1971).

Another idea of adaptation which can cause bias in subjective well-being was proposed by Kahneman et. al. (1999). This study presented an aspiration treadmill which showed that as people persist through a difficult or pleasurable situation their expectations toward that particular subject are replaced by neutrality. For example, the well-being effect on a person who loses their mate will, on average, persist for three years (Lucas et. al., 2003). Kahneman (2004) proposes the idea of removing this bias by taking into account the duration of a pleasurable or painful event.

In an attempt to remove bias from subjective questioning, Kahneman et. al. (2004) proposed a measure of well-being which takes into account the amount of time spent on an activity and the feelings associated with the activity. This approach utilizes methods called Experience Sampling Method (ESM) and Daily Reconstruction Method (DRM) (Stone and Shiffman, 1994; Kahneman et. al., 2004). The ESM allows a person to answer questions about their activities immediately prior to answering as well as their feelings and duration of the activity. DRM allows participants to fill out a diary that recounts the previous day and again asks for the activity, duration, and feelings. This effectively takes both and objective and subjective measures by weighting each feeling by the amount of time spent on a particular activity.

The research presented in this paper uses the Gallup-Healthways survey on well-being across metropolitan statistical areas, which is primarily an ESM method since it is

conducted via telephone. Gallup uses a questionnaire designed to cover six well-being sub-indices: Life Evaluation, Emotional Health, Physical Health, Healthy Behavior, Work Environment, and Basic Access are all encompassed in their survey. This survey is conducted 350 days out of the year and surveys no less than 1,000 adults per day. Gallup uses Kahneman's distinction between subjective and objective well-being as a foundation and inspiration for their study.

Section 5: Determinants of Subjective Well-Being

There is a vast array of variables which determine well-being. To begin, employment has a positive effect on subjective well-being, and unemployment has a negative effect (Dolan et. al., 2008). We have gathered employment data for each MSA because it gives a positive sense of purpose and source of income. Losing one's job can cause great unhappiness (Oswald, 1997).

Additionally, income is an important factor of well-being and there is a very elaborate network of research that has been done on this subject. The correlation with income diminishes as a person's income increases (Graham, 2008). Researchers have found that when people experience exceptional increases in income, they do not reap corresponding benefits in overall well-being. This is known as Easterlin's Paradox (1974). Clark et. al. (2008) reviewed this paradox and suggested that the reason the United States does not respond accordingly to increases in income or wages is because we are above "subsistence level." Subsistence level is a standard of living which

minimally supports life. When people are above subsistence level, their well-being begins to depend more on relationships with family and friends than monetary wealth (Clark et. al., 2008). Research has also found that individuals who report a higher happiness level tend to have higher incomes in five years (Graham et. al., 2004). The positive effect of income and well-being has been found to be reduced when controlling for latent variables such as personality characteristics which are unobservable but can impact both income and well-being (Ferrer-i-Carbonell and Frijters, 2004). Ferrer-i-Carbonell and Frijters (2004) found that the result of regressing well-being on income was negligible and it was more important to correctly account for these latent factors. Again, while income is a factor of well-being, it appears to become less important as income increases. This idea stems mainly from the suggestion of diminishing marginal utility proposed by Gossen (1983), which was discussed in an earlier section.

Other studies have included income inequality, or relative income in their examination of well-being determinants. Income inequality is the amount a person's income differs from their neighbor, or anyone with whom they can compare themselves. For instance, a family who is making less than their neighbors would have less well-being than the exact same family who believed their income was equal to their neighbors. The income inequality research has produced mixed findings at the cross-national level (Hagerty, 2000; Alesina et. al., 2004). Throughout the United States, income inequality has been found to have a negative effect on subjective well-being (Hagerty, 2000). Further, alternative research between Europe and the United States has shown that this negative effect is only significant for Americans who are considered rich (Alesina et. al., 2004). While this seems counterintuitive, Alesina et. al. (2004) argues that income

mobility in the United States is higher than in Europe. Since the United States has a higher perceived mobility, the rich feel that they are at a higher probability of moving down on the pay scale since they are near the top of the ladder.

Another variable which is very important in determining well-being is educational attainment. Findings have shown that the effect of education on well-being is, in general, positive, but that the significance and causality is difficult to determine (Dolan et. al., 2008). Graham and Pettinato (2001) found that subjective well-being in Latin America is positively affected by each year of additional schooling, but once background and mobility is controlled for, the effects become insignificant. Contrastingly, other research has found that citizens with average educational levels in the United States have the highest level of satisfaction response (Stutzer, 2004). Further, Oreopoulos (2003) found that over 90 percent of 15 year olds who had not left school reported being satisfied or very satisfied with their lives. Compared with 16 year olds who had left school, only 80 percent reported being satisfied with their lives. Therefore, this suggests that people who stay in school and have higher educational attainment also have a resulting higher life satisfaction.

Income aspirations have also been used to explain the lack of increased well-being through increased income (Stutzer, 2004). Those people who have experienced an increase in income over time and have a similar increase in income aspirations would show a little or no increase in subjective well-being.

Similarly, a desirable industry mix can have a positive effect on well-being. Industry mix refers to the balance of complementing and competing businesses.

Research has found that belonging to a union is beneficial to life satisfaction (Blanchflower and Oswald, 2004). This is contrasting to the findings that being self-employed does not make a person significantly happier than being employed by someone else (Blanchflower and Oswald, 2004). It has been shown that job insecurity, which can be correlated with the size of a city's manufacturing industry and corresponding layoffs, negatively affects well-being (Clark et. al., 2010). Other location quotients could be calculated and used in tandem with manufacturing.

Demographic differences between areas also play a role in well-being. Well-being clearly changes with age, and many studies find there is a positive correlation with the squared value of age (Dolan et. al., 2008). This indicates that people appear to have a higher subjective well-being when they are either young or old, once other factors are controlled for. Those who are middle aged, between 32 and 50 years old, appear to have the lowest well-being (Dolan et. al., 2008).

As a further extension of how demographics can affect well-being, we now look at foreign-born residents of an area. The percent of foreign citizens in an area leads to the city being more diverse and it tends to have higher subjective well-being. Lawless and Lucas (2010) hypothesize that this is because people are more open and accepting in an area where there is more diversity. Race is also a significant determinant of subjective well-being. In the United States, whites tend to have a higher well-being than blacks, ceteris paribus (Thoits and Hewitt, 2001). Luttmer (2005) on the other hand, finds that some other ethnicities, such as Hispanics, have higher subjective well-being than whites. In this research, the percentage of white citizens is used in our system of equations.

Other personal characteristics are also important variables when analyzing subjective well-being. For instance, exercise has been long known to release endorphins and cause people to feel better. Dolan et. al. (2008) states that because exercise promotes positive outcomes and helps to prevent negative ones; there is high policy implication potential regarding the correlation between exercise habits and well-being. In addition, it has been found that religion contributes to higher well-being (Dolan et. al. 2008). Marriage appears to have a positive effect on well-being, although being in a stable, committed relationship results in the same level of psychological well-being as those who are married (Brown, 2000). It is noted that Brown used depression to indicate levels of psychological well-being. This research does not utilize a clinical diagnosis to signify well-being levels, rather a person's answer to questions regarding their life and, in part, their mental health. Health in general is positively correlated with subjective well-being. Reviewing the previous literature, Dolan et. al. (2008) has shown that the effect of health on well-being is great enough that once reverse causality is accounted for health still has a lasting impact on well-being.

Weather has been shown to have a negligible effect on well-being; however, extreme weather is negatively correlated with subjective well-being. Rehdanz and Maddison (2003) conclude that northern countries would benefit from higher temperatures and those countries closer to the equator would suffer well-being loss if temperatures were to increase.

Section 6: Reverse Causality

While we have mentioned that wages affect well-being, we will now discuss how higher well-being can possibly lead to more productive workers and higher wages. Consistent with the happy-productive worker thesis, it has been shown that workers who are more pleasant received higher performance evaluations (Wright and Staw, 1999). The authors note that this result holds the possibility of being negated by having a customer rather than a supervisor rate the employee (Wright and Staw, 1999). For example, when the employees of SAS, a software company which was rated "Best Place to Work" by FORBES in 2011 were surveyed they stated that they were very satisfied in their work place, and that they felt valued and taken care of. We have not found any literature on this well-being topic at anything larger than firm level. The idea that well-being increases productivity which in turn increases wages is very important for corporations and other policy makers because it can give valuable advice to aid in economic decisions.

We have looked at how well-being is affected by educational attainment and we will now shift our focus to how educational attainment is affected by well-being. Educational attainment is a result of many factors which accumulate throughout a person's life and, well-being is a factor which can partially determine educational attainment. To elaborate, there is a random assignment experiment which explored how happiness affected people's time preference. Myopia implies that a person discounts the future at a higher rate and has been shown to lead to overconsumption and reduced

human capital accumulation (Ifcher and Zarghamee, 2011). Discount rates, d, are simply the inverse of the interest rate plus one, $d = \frac{1}{1+i}$. Therefore, a lower interest rate leads to a higher discount rate. A myopic person will value a payment, or salary, in the future much less than a payment made immediately (Ifcher and Zarghamee, 2011). From this fact, a person who would rather have a salary immediately will be less likely to continue their education. Conversely, a person who has "will power", which the authors describe as being the opposite of myopia, will be willing to forgo earnings now for additional years of schooling. The conclusion is a happier person, or a person with higher well-being, will have a lower discount rate for future payments which will lead to them having higher education levels. Consider a person with who discounts the future at an interest rate of 30% and another person who is more myopic and discounts the future at an interest rate of 5%. Shown below is the present value of a four year college degree to each person.

$$PV_{Will\ Power} = \frac{(\$50{,}000)}{1.3} + \frac{(\$50{,}000)}{(1.3)^2} + \frac{(\$50{,}000)}{(1.3)^3} + \frac{(\$50{,}000)}{(1.3)^4} = \$108{,}312.03$$

$$PV_{Myopic} = \frac{(\$50{,}000)}{1.05} + \frac{(\$50{,}000)}{(1.05)^2} + \frac{(\$50{,}000)}{(1.05)^3} + \frac{(\$50{,}000)}{(1.05)^4} = \$177{,}297.53$$

The individual with will power regards their lost wages as being valued at $108,312 which is approximately $68,985 less than the myopic person. Since the person with a lower discount rate, or higher interest rate, values their lost wages much lower than the person with myopia, this individual is more likely to forgo their future wages in order to have a higher education level. In simpler terms, people with higher well-being are more

likely to think in a long-term perspective while those who have myopic tendencies think in the short-term (Ifcher and Zarghamee, 2011).

Additionally, wages, or income, can partially explain educational attainment. Part of the determinants of school quality is the income of the area (Card and Kruger, 1992). The authors, Card and Kruger (1992), conclude that "success in the labor market is at least as important a yardstick for measuring the performance of the education system as success on standardized tests." Areas that have higher income imply that the area which are more affluent have the luxury of sending their students on to higher education. This hypothesis will be explored further in the results section.

Section 7: Data Dictionary and Descriptive Statistics

Table 1 **Data Dictionary**

	Description	Units
Well-Being	Gallup-Healthways Well-Being Index	0 - 100 Scale
Health		
Diabetes	Proportion of people who have diabetes	Decimal Percentage
Frequent Exercise	Proportion of people who exercise at least 30 minutes a day, 3 times per week	Decimal Percentage
Socio Economic		
Bachelors	Proportion of citizens holding a bachelor's degree or higher	Decimal Percentage
Population	Number of citizens in an MSA	Integer
White	Proportion of white only citizens	Decimal Percentage
Median Age	Median age of the MSA	Years
Married	Proportion of citizens who are married	Decimal Percentage
Foreign	Proportion of citizens who were born outside of the United States	Decimal Percentage
Female	Proportion of females in an MSA	Decimal Percentage
Economic		
Wage	2009 MSA hourly earnings	Dollars
PC Commute Time	Time to work per capita	Minutes
Poverty	Proportion of citizens below the poverty line	Decimal Percentage
Minimum Wage	Minimum wage for the state where the MSA resides	Dollars
Amenities		
January Temperature	Average temperature during January	°F
Universities	Number of universities in an MSA	Integer
Hospitals	Number of hospitals in an MSA	Integer
Franchise	Number of professional franchises in an MSA	Integer

The data used was collected from numerous sites. Primarily, the well-being indicator was extracted from the Gallup-Healthways Well-Being Survey for 2010. Here we will describe each of the six sub-indices in Gallup's survey. The life evaluation index

asks a question of how a person perceives their life now and how they anticipate their life in five years from now. The responses are recorded on a ladder scale from 0 to 10. From this ladder scale, the respondent is grouped in to one of three categories. They are considered thriving if they rate their life at 7 or higher and anticipate their life situation being 8 or higher in five years. A person is labeled as suffering if they responded with a present life outlook of 0 to 4. The last category a respondent can fall in to is labeled "struggling" which implies that they are neither thriving nor suffering and they rate their present life situation moderately. The emotional health index uses an array of questions regarding a person's different emotional state the previous day and a single question regarding a person's history of diagnosed depression. They are asked to think of who they were with, what they did, and how they felt for each of the emotion categories. A sample of the emotional states is; smiling, learning, worrying, and anger. The physical health index is comprised of questions regarding a person's level of physical pain, sick days in the past month, obesity, daily headaches, daily colds, and health problems that interfere with normal activities. Additionally, a Body Mass Index (BMI) estimate is calculated for the respondent. A healthy behavior index combines responses regarding lifestyle habits. Four items are questioned about smoking, healthy eating, and exercise. Four questions are asked in order to construct the work environment index. Respondents are asked if they are satisfied with their job, if they utilize their strengths each day at work, if their supervisor treats them as equals, and if their supervisor creates a trusting and open work environment. The final index, the basic access index, is comprised of 13 items which relate to a person's access to food, healthcare, shelter, and a safe place to live.

The data we use encompasses four of the six sub-indices, because of data availability. Optimism is calculated in the life evaluation index, Uninsured proportion is from the basic access index, proportion of people who eat produce and exercise frequently is gathered in the healthy behavior index and finally the proportion of those with diabetes is determined in the physical health index. Because the indices vary in the number of questions and topics they encompass, they are transformed into a uniform scale from 0 to 100. After each index is converted to the uniform scale a simple average is taken of the six indices in order to find the well-being index. Converting each index to a uniform scale allows for a simple average instead of a weighted average to be used.

Socio-economic variables used were gathered from the 2009 1-year American Community Survey. These variables are proportion of bachelor degree holders, population, proportion white citizens, median age, proportion married, proportion foreign-born, and proportion of female citizens.

Data regarding economic variables was gathered from two sources. The 2009 1-year American Community Survey provided the wage and aggregate commute time. Also, the 2009 Bureau of Labor Statistics supplied the data on the state-level minimum wage. The federal minimum wage is $7.25 and some states specify a higher minimum wage while others specify equivalent or lower minimum wage levels.

Amenity data was provided by a few different sources. Data on the number of universities and hospitals in an MSA were gathered from the Bureau of Labor Statistics. The data on the number of professional franchises in an MSA was gathered from the respective professional sport's websites. Data regarding average January

temperature was from the National Weather Service. These variables will be utilized in the two-stage-least-squares regression which will be explained below.

Table 2 **Metro Size Average Well-Being**

Average of Overall Well-Being		
Metro Size	**n**	**Total**
Large Metro	38	66.54
Medium Metro	90	66.18
Small Metro	24	66.62
Grand Total	**152**	**66.36**

ANOVA Test of Means

$H_o: \mu_1 = \mu_2 = \mu_3$

$H_a: \mu_1 \neq \mu_2 \neq \mu_3$

F(2,158) = 0.69233 [p-value = 0.5019]

Table 3 **Region Average Well-Being**

Average of Overall Well-Being		
Area	**n**	**Total**
Northeast	26	66.44
Northwest	27	66.19
Southeast	60	65.83
Southwest	39	67.24
Grand Total	**152**	**66.36**

ANOVA Test of Means

$H_o: \mu_1 = \mu_2 = \mu_3 = \mu_4$

$H_a: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$

F(3, 157) = 3.70007 [p-value = 0.0131]

Table 4 **Descriptive Statistics**

	Mean	Standard Deviation	Minimum	Maximum
Well-Being	66.35	2.2525	58.1	73.7
Health				
Diabetes	.11355	.025360	.047	.203
Frequent Exercise	.52146	.039649	.429	.652
Socio Economic				
Bachelors	0.27908	0.072958	0.121	0.579
Population	1,230,886.93	2,091,931.08	181,099.0	19,069,796.0
White	0.78302	0.12170	0.26849	0.96779
Median Age	36.990	3.8888	23.3	48.1
Married	0.51830	0.033796	0.4007	0.6111
Foreign	0.093744	0.071665	0.010587	0.37122
Female	0.50797	0.0088467	0.47778	0.52907
Economic				
Wage	16.851	2.5216	9.5156	25.036
PC Commute Time	10.100	1.6858	5.7462	16.640
Poverty	0.14229	0.036153	0.072946	0.35429
Minimum Wage	7.4568	0.55516	5.15	8.67
Amenities				
January Temperature	37.543	12.420	9.9	73.0
Universities	17.684	30.808	0.0	265.0
Hospitals	27.460	41.324	0.0	271.0
Sports Franchise	0.5936	1.318	0	9

The mean well-being score is 66.35, with the minimum score of 58.1 in Huntington – Ashland, WV-KY. The maximum well-being score of 73.7 was found in Boulder, CO. Further parsing the data into small, medium, and large metropolitan areas the average well-being score is presented in the Metro Size Average Well-Being table. The differences in average well-being across regions in the United States are shown in Region Average Well-Being table. There were 152 cities which had complete data and well-being observations.

Section 8: Correlation

Table 5 shows the correlation between each variable and the prospective dependent variables in our system equation approach. There were 152 MSA's which had data for each variable and therefore, those were used in the regression. Several studies have shown the correlation between the available variables in Table 4 and well-being (Lawless and Lucas, 2010; Rentfrow et. al., 2009). Shown below are results which are similar to the findings from these papers. As mentioned, bachelor degrees proportion had a strong positive correlation while proportion of diabetes had a strong negative correlation with well-being. The correlation between a city's education level and well-being could be showing the effect of people with higher education levels moving to areas which have higher levels of well-being. The other health variable, frequent exercise had a strong positive correlation with well-being. Surprisingly, the proportion of white citizens had a slight negative correlation; we expected a positive correlation. For the wage variable, the strongest correlation was with bachelor's degrees, which was consistent with our expectations. Also with strong positive correlations were commute time, universities, and well-being. Strong negative correlations were with poverty and diabetes. Diabetes was not a correlation that we expected to be relevant. For educational attainment, wage and well-being had the highest correlation values. Diabetes had a highly negative correlation, which is not surprising finding at the city level, given that health has been shown to affect educational attainment on an individual level (Chandola et. al., 2006).

Table 5 **Correlation Table**

	Well-Being	Wage	Bachelor's Degree or Higher
Well-Being	-	0.4167	0.6968
Health			
Diabetes	-0.6382	-0.4032	-0.6237
Frequent Exercise	0.4808	0.0582	0.2412
Socio Economic			
Bachelors	0.6968	0.7754	-
Population	0.0933	0.3851	0.2264
White	-0.1039	-0.1717	-0.0969
Median Age	-0.2896	0.2996	-0.0939
Married	-0.1144	-0.2515	-0.2973
Foreign	0.2674	0.3352	0.1930
Female	-0.2763	-0.0996	-0.0344
Economic			
Wage	0.4167	-	0.7754
PC Commute Time	0.3358	0.6185	0.4972
Poverty	-0.3063	-0.6151	-0.4578
Minimum Wage	0.1312	0.2619	0.1027
Amenities			
January Temperature	-0.0544	-0.0706	-0.1526
Universities	0.1496	0.4672	0.3037
Hospitals	0.0752	0.3569	0.2157
Sports Franchise	0.0927	0.3459	0.2428

Chapter 4: Methodology

Section 9: System of Equations Approach

Endogeneity occurs when the independent variable, X, is correlated with the error term, ε (Greene, 2011). While other papers have focused on how certain variables affect well-being, we are additionally focusing on how well-being affects endogenous variables. This stems from the fact that well-being is related to income and educational attainment and income is related to educational attainment and well-being. The equations will be estimated simultaneously using an instrumental variable approach in an attempt to determine causality while addressing the endogeneity issue between each dependent variable. We are interested in determining causality by using this combination of instrumental variables in a system of equations approach. Heckman (1978) gives a proof and requirements for a system equation approach when endogeneous variables are present in the regression equation. Consider first an equation which contains only one endogeneous variable.

$$Y_0 = \propto_0 + \propto_1 Y_1 + \propto_2 X + \varepsilon \qquad (1.1)$$

In order for this system to be considered endogeneous, Y_1 is found to be correlated with the error term, ε. This causes the ordinary least squares method to become biased and not consistent. Now consider a system of two equations, where again the independent

variable is correlated with the error term. This system will now have two equations with two endogeneous variables.

$$Y_0 = \propto_0 + \propto_1 Y_1 + \propto_2 X_1 + \varepsilon$$

$$Y_1 = \beta_0 + \beta_1 Y_0 + \beta X_2 + \gamma \qquad (1.2)$$

Then we can use a two-stage-least-squares approach in an attempt to take care of the innate endogeneity. From equations (1.1) and (1.2), we can identify X_1 and X_2 as instrumental variables. They are correlated with Y_0 and Y_1, respectively; but they are not correlated with Y_1 and Y_0, respectively. The key difference between using a two-stage-least-squares system equation approach versus a traditional two-stage-least-squares method is the appearance of the dependent variable as an independent variable in (1.2). Now we see that equation (1.2) must be solved using two-stage-least-squares. The computer software will acknowledge Y_0 as being instrumented by X_1. Additionally, in equation (1.1), the software will specify Y_1 as being instrumented by X_2. These two equations are then estimated simultaneously in order to get unbiased predictors.

Section 10: Instrumental Variables

First, if there are K independent variables in the primary regression equation, there must exist at least K instruments which have a correlation of zero with the error term of the primary regression and a correlation not equal to zero with the endogeneous

independent variable from the primary regression (Greene, 2011). The equation form of this is shown below:

$$\boldsymbol{Y} = \alpha + \beta \boldsymbol{X} + \delta \boldsymbol{V} + \boldsymbol{\varepsilon}$$

$$Cov(\boldsymbol{V}, \boldsymbol{\varepsilon}) = 0$$

$$Cov(\boldsymbol{X}, \boldsymbol{\varepsilon}) \neq 0$$

Since the covariance between **X** and **ε** is not zero, we must specify another equation which will utilize instruments, **Z**, that are useful in predicting **X**.

$$\boldsymbol{X} = \gamma + \pi \boldsymbol{Z} + \boldsymbol{\theta}$$

$$Cov(\boldsymbol{Z}, \boldsymbol{\varepsilon})$$

This instrument, **Z**, will allow us to estimate α, β, and δ consistently (Greene, 2011). Under two-stage-least-squares, those variables which are endogeneous are found by solving the second equation using the instruments. This predicted value, $\widehat{\boldsymbol{X}}$, is then used in the primary equation (Greene, 2011). This effectively makes the estimators consistent.

In order to determine if endogeneity exists in a panel regression model, the Hausman test can be applied (Greene, 2011). The null hypothesis of the Hausman test is that each predicted coefficient, β, is consistent and the slope coefficient for each independent variable is efficient. A predictor is considered efficient if the error term has a finite variance and is homoscedastic (Greene, 2011). Homoscedasticity is another way of saying that the variance of the error term does not depend on the corresponding X value. In other words, the correlation is zero. The alternative hypothesis is that at least one of the predictors is not consistent. If the test results show that the null hypothesis is

rejected, then this indicates an endogeneity problem (Greene, 2011). The statistical software utilized in this research also provides a test for over-identification called the Sargan over-identification test. The null hypothesis for this is that the instruments are all valid. Conversely, the alternative hypothesis is that at least one of the instruments is not valid.

Another issue with instrumental variables is choosing weak instruments. If the instruments chosen are weak then the relevance condition comes very close to being violated. The software utilized again provides a weak instrument test which calculates a first stage F-statistic. The null hypothesis is that the instruments are not significant and are not helpful in predicting the dependent variable, **X**.

For a valid two-stage-least-squares regression, the following conditions have to be met: the null hypothesis of the Hausman test for endogeneity is rejected and we conclude that there is a problem with endogeneity. Next, the null hypothesis of the Sargan over-identification test is not rejected and all of the instruments are valid. Finally, the weak instrument test would show a resulting F-statistic that is less than 10, which is only a rule of thumb, and we conclude that the instruments are helpful in predicting **X**.

Section 11: Model Specification

The model that we are examining has three main equations which are well-being, income, and educational attainment. Well-being determinants are grouped into four different categories: health, socio-economic, economic, and amenity variables. Likewise, the income equation is broken down into the following groups: education, demographics, previous income values, and productivity. Finally, educational attainment is determined by the following five groups. They are: well-being, income, previous generation's demographics, current demographics, and access. The equations for the system in question are as follows.

$$WellBeing = \propto +\beta_1 \boldsymbol{H} + \beta_2 \boldsymbol{S} + \beta_3 \boldsymbol{E} + \beta_4 \boldsymbol{A} + \boldsymbol{\varepsilon}$$

Where **H** is a vector of health related variables, **S** is a vector of socio-economic variables, **E** is a vector of economic variables, **A** is a vector of amenity variables, and β_i is the corresponding coefficient.

$$Income = \propto +\beta_1 \boldsymbol{S} + \beta_2 \boldsymbol{D} + \beta_3 \boldsymbol{P} + \beta_4 \boldsymbol{Y} + \boldsymbol{\varepsilon}$$

Where **S** is a vector of socio-economic variables, **D** is a vector of demographic variables, **P** is a vector of previous income variables, **Y** is a vector of productivity variables, and β_i is the corresponding coefficient.

$$Educational\ Attainment = \propto + \beta_1 \boldsymbol{W} + \beta_2 \boldsymbol{I} + \beta_3 \boldsymbol{D} + \beta_4 \boldsymbol{A} + \boldsymbol{\varepsilon}$$

Where **W** is a vector of well-being variables, **I** is a vector of income variables, **D** is a vector of demographic variables, **A** is a vector of education access variables, and β_i is the corresponding coefficient.

Chapter 5: Wage Equation

Section 12: Included Wage Equation Variables

Included in the wage equation was proportion of bachelor's degree and well-being, which are the main focus of our hypotheses. Additionally, the proportion of white citizens, female and foreign-born citizens are included for demographic reasons. State-level minimum wage data was also used as a potential measure of cost of living adjustment. Lastly, per capita commute time was included in order to examine the effect of the length of an area's commute and possibly another gauge of an area's cost of living. The Hausman test results in a p-value of 0.00005, which implies that we reject the null hypothesis and conclude that there is reverse causality in our equation. This suggests we should use a two-stage-least-squares method rather than ordinary least squares. The Sargan over-identification test returns a p-value of 0.00, which also implies that we reject the null hypothesis and conclude that our equation is over-identified.

Using a system of equations approach, it is usually difficult to find a set of variables which strike the balance between being useful but not over-identifying. In our system we found this same difficulty and decided to focus on the well-being equation. Our aim was to attempt to make this part of the system as not over-identified as possible.

Section 13: Results

Table 6

Wage Equation (Dependent Variable: Wage)		
	coefficient	**z-value**
Const	67.7793	3.831***
Bachelor	36.3963	7.026***
Well_Being	-0.7691	-4.689***
White	0.3045	0.2580
Female	-38.5320	-1.978**
Foreign	5.7012	2.451**
Min_Wage	0.6599	2.693***
PC_Commute	0.3786	3.434***
Adjusted R-squared	0.597012	
		n = 152
Hausman test -		
Null hypothesis: OLS estimates are consistent		
Asymptotic test statistic: Chi-square(2) =		19.6718
with p-value =		0.0000535
Sargan over-identification test -		
Null hypothesis: all instruments are valid		
Test statistic: LM =		41.0066
with p-value = P(Chi-square(7) > 40.9862) =		0.0000003

* - significant at the 10% level ** - significant at the 5% level

*** - significant at the 1% level

2-stage-least-squares result using robust standard errors

Section 14: Interpretation of Results and Research Question

We will first look at the proportion of bachelor degrees. We find that this is significant at the 1% level and has a positive relationship. For every 1% increase in the proportion of bachelor degree recipients, there is a $0.36 increase in a city's hourly wage, other things constant. This affirms findings of positive returns to education that other papers have found. Some have found that the returns to schooling are between 11 and 15% for each additional year (Turner et. al., 2007). Another paper found that American men with 16 years of schooling earned $5.90 per hour more than those who had only 12 years (Dougherty, 2005). Our data is on an aggregate level, not an individual level, which causes a discrepancy in comparing each of these results with our own.

Next, well-being is also significant at the 1% level, but has a negative relationship. This is contrary to our original hypothesis of higher well-being leading to higher wages. For every one unit increase in well-being, which is a large increase given our sample range of well-being scores, will result in a $0.77 decrease in a city's hourly wage rate. This result does not support the happy-productive worker hypothesis as we had originally thought. Instead, this result could possibly be showing a compensating wage differential. People might be willing to accept a lower wage in order to live in an area with higher well-being. Well-being and satisfaction may be important enough to some people that they will take a lower wage so they can reap high satisfaction benefits. In a simple city-level aggregate supply and demand model of labor, an increase in a city's

well-being could shift the labor supply curve to the right, leading to a lower equilibrium wage.

Additionally, the wage data presented here does not ultimately show precisely how productive a person may be. A satisfied worker may indeed be more productive but they are not compensated directly through wages. It is possible that they are compensated through other amenities that are not wage related. The companies we examined had increased productivity and satisfied workers, but nothing was mentioned about how high their salary was. For instance, healthcare is not encompassed in our wage variable. Having a great health plan, breakfast on Fridays, or flex time is not something that will be transparent if we examine only wage. A compensating wage differential or hidden amenities, could possibly explain this finding.

The proportion of females was significant at the 5% level and also had a negative relationship. For each 1% increase in proportion of females, wages decrease by $0.39. This may support the idea of a gender-wage gap, where men have a higher wage than women, or it may be the showing the effect that of areas with higher male proportions are younger, healthier, or have higher education.

The proportion of foreign-born citizens was significant at the 5% level and for every 1% increase in the foreign-born population would translate into a $0.06 increase in wages. This positive relationship suggests that areas which are more diverse have higher wages. This is a significant result and one that could prove to be quite interesting because the proportion of people who are foreign is small, but they have a distinct impact on wage. It would be interesting to examine the effect of diversity on wages in the

future, given the fact that such a small proportion of people could affect a city's wages in such a way.

State-level minimum wage was significant at the 1% level and had a positive relationship. Each $1.00 increase in minimum wage would result in a $0.65 increase in hourly wages. This variable was included as a possible measure of how expensive it is to live in a given city. Cost of living adjustment is helpful in explaining why cities such as New York City have a much higher wage than Youngstown, Ohio. It was found to be significant in determining wages, which was expected. As the minimum wage level increases, so does the average hourly wage of an area. To interpret this as a cost of living adjustment would be that as a city become more expensive, wages are increased accordingly.

Per capita commute time has a positive relationship with wages and is significant at the 1% level. Every minute increase in commute time will result in a $0.38 increase in wages. This shows and supports the idea that people live outside of the city and commute in to work every day. While this may be thought of as flight from blight, another interpretation is again a cost of living adjustment. Cities which require a longer commute times are more likely to be considered "expensive cities" to live in. This measure of cost affects wages in a positive manner, higher commute times lead to higher wages.

The proportion of white citizens was found to not be significant, which was an unexpected result. From earlier research, whites have been found to have a higher wages than other races (Zavodny, 2003; Smith, 1997). These results are on an individual level

which implies that our contrasting results could be a result of the level of data used. Our findings suggest that the proportion of white citizens does not have a significant impact on wages. Areas which have less diversity, or higher proportion of white citizens, do not translate this demographic trait into higher wages. It is also possible that our other variables are covering the race effect.

Chapter 6: Education Equation

Section 15: Included Education Equation Variables

In addition to both well-being and wage, race is another important determinant of educational attainment. Research tends to find that blacks and Hispanics have lower educational attainment than white citizens (Goldsmith, 2009). Students who are in schools that have a large proportion of black or Hispanic students tend to have lower overall education than comparable students in predominantly white schools (Goldsmith, 2009). Tomlinson (1991) showed that while minorities in English schools start with lower grades, they begin to "catch up" in the last two years of secondary school. Additionally, she found that Asian students were much more likely to pursue further education than West Indian or white students (Tomlinson, 1991).

Along with race, there is also the debate between educational attainment and gender. Thirty years ago, men were more likely to continue their education. Men were more confident, had higher test scores, and had higher expectations regarding scientific intensive fields than girls (Bevan, 1991). This could have led to girls not continuing on to higher education whereas boys will continue because of the extra encouragement and higher grades that they received (Bevan, 1991). Conversely, a more recent study of Scottish students showed that girls take school more seriously than boys and this attitude assists them in further studies (Tinklin, 2003). It appears that once the gender gap was identified, teaching methods changed in order to accommodate different learning styles,

such as the difference between visual, auditory, and physical learners. Women have since made large gains in the amount of education they receive.

The number of universities in an MSA was included in order to examine if easier access to higher education leads to higher levels of education. Lastly, median age was included to find if younger cities had higher education levels. We hypothesize that this will indeed be the case, that younger areas will have a higher proportion of people with bachelor's degrees.

As it can be seen from the Hausman test the null hypothesis that the ordinary least squares results are consist is rejected at the 10% level. This implies that there is an endogeneity issue and using two-stage-least-squares is a better approach than ordinary least squares. Further, the Sargan over-identification test also results in rejecting of the null hypothesis at the 5% level and concluding that the model is over-identified. In future research, other instruments should be chosen because our instruments mimic the bachelor and well-being variable too closely.

Section 16: Results

Table 7

Educational Attainment Equation (Dependent Variable: Proportion of Bachelor's Degrees)		
	coefficient	**z-value**
const	-1.8610	-6.975***
Wage	0.0251	7.638***
Well_Being	0.0138	4.565***
Female	1.9891	4.877***
Universities	0.0001	0.4623
White	0.0771	2.568**
Foreign	-0.1331	-2.442**
Median_Age	-0.0069	-4.379***
Adjusted R-squared	0.796603	
		n = 152
Hausman test -		
Null hypothesis: OLS estimates are consistent		
Asymptotic test statistic: Chi-square(2) =		4.67952
with p-value =		0.0963508
Sargan over-identification test -		
Null hypothesis: all instruments are valid		
Test statistic: LM =		16.4323
with p-value = P(Chi-square(5) > 2.15723) =		0.0214474

* - significant at the 10% level ** - significant at the 5% level

*** - significant at the 1% level

2-stage-least-squares result using robust standard errors

Section 17: Interpretation of Results and Research Question

As can be seen from the diagnostic tests that were run on the equation, the p-value for the Hausman test is 0.096, which we reject the null hypothesis that the ordinary least squares method is consistent at the 10% level. The wage coefficient, which is significant at the 1% level, of 0.0251 implies that for every dollar increase in wage, proportion of those who hold bachelor's degree or higher will increase by 2.51%. This results support the idea proposed by Card and Kruger (1992) that the income of an area is at least as important as standardized tests when rating school quality. This result supports the notion that areas with higher income are able to afford the luxury of sending their children on to further schooling and better colleges.

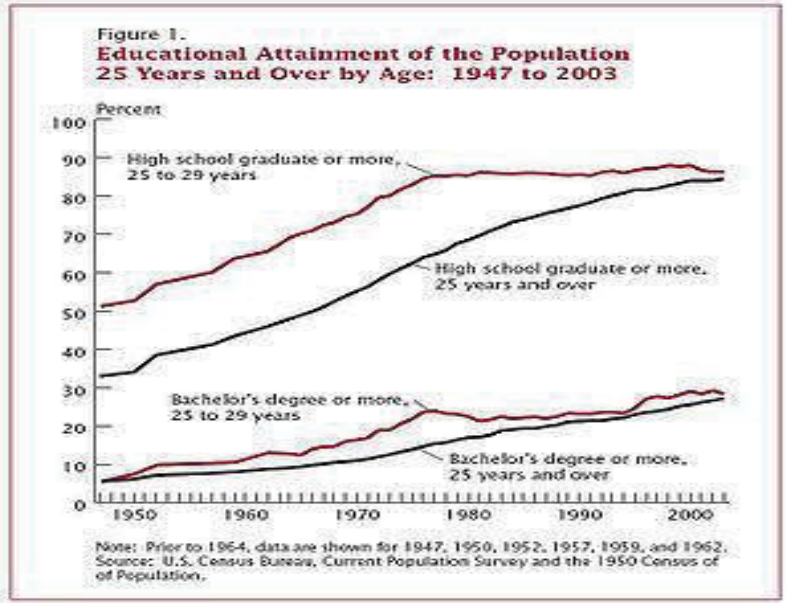
Additionally, the well-being coefficient of 0.0138 means that a one unit increase in well-being increases the proportion of bachelor's degree recipients in MSA's by 1.38%. A one unit increase in well-being is a significant change since the range of our well-being variable is 15.6 units. It is also significant at the 1% level. The Sargan over-identification test reveals a p-value of 0.02144, such that we reject the null hypothesis at the 5% level and conclude that the instruments used tend to over-identify the wage and well-being variables. To our knowledge, there are no studies which put a coefficient value on well-being's effect on educational attainment. Our result is consistent with those who show that students who are happier tend to stay in school longer (Oreopoulos, 2003). However, our result is at the city level, implying that areas which are more satisfied tend to have higher education levels. An alternative explanation could be that

places with higher levels of well-being tend to attract more educated and perhaps more mobile people. Without a large panel of data, it's difficult to determine which explanation is more likely.

Next, the proportion of white citizens was significant at the 5% level and the coefficient of 0.0771 implies that for every 1% increase in proportion of white citizens, this will lead to a 0.0771% increase in bachelor degree proportion. This is consistent with studies suggesting that white citizens have higher educational attainment than other races (Goldsmith, 2009).

The median age variable was significant at the 1% level and had a value of -0.0069, implying that when median age increases by one year, the proportion of bachelor degree holders decreases by 0.69%. Our data was skewed slightly toward smaller median age; in the future a more even distribution of median ages would be helpful. The figure below shows educational attainment between two different age groups, 25-29 year olds and 25 years old and higher. The data was gathered from the US census from 1947-2003.

Figure 1



Source: US Census Bureau

As it can be seen from the graph, educational attainment is consistently lower for the older age bracket. This supports our negative values for the coefficient of median age.

The proportion of foreign-born citizens is significant at the 1% level and has a value of -0.1331. This means that for every 1% increase in foreign-born citizens, educational attainment will decrease by 0.133%. This result, while significant, may be showing a difference in school quality rather than student aptitude. Tomlinson (2003) found that the difference between ethnicities on standardized exams was much smaller than the differences between schools.

The proportion of females in a city resulted in a coefficient of 1.989. This implies that for every 1% increase in female population, there will be a resulting 1.989% increase in proportion of those who hold a bachelor's degree or higher. This could be showing that areas with more females are more likely to have a higher education level, or it is also possible that areas with a higher proportion of females are more satisfied and healthier which could also contribute to higher education levels. This significance may be due to demographic transitions which have occurred in the past decades. College graduation rates have been higher for women than for men.

The number of universities was found to be insignificant, which is not unexpected given the importance of other variables. The access to higher education in the form of numerous universities did not have an impact on educational attainment.

Chapter 7: Well-Being Equation

Section 18: Results

Table 8

Well-Being Equation (Dependent Variable: Well-Being)		
	coefficient	**z-value**
const	70.4324	3.575***
Bachelor	29.9038	2.283**
Wage	0.0047	0.0125
White	-0.9917	-0.5096
Married	12.2193	2.59***
Foreign	0.2004	0.0628
Diabetes	8.0161	0.6920
Frequent_Exerci	11.7413	2.772***
Median_Age	-0.866602	-1.967**
sq_Median_Age	0.0104	1.769*
Female	-14.7237	-0.4618
Jan_Temp	0.0036	0.2452
Hospitals	-0.0002	-0.0287
Franchise	-0.1886	-0.9179
Adjusted R-squared	0.611692	
		n = 152
Hausman test -		
Null hypothesis: OLS estimates are consistent		
Asymptotic test statistic: Chi-square(2) =		8.0251
with p-value =		0.0180872
Sargan over-identification test -		
Null hypothesis: all instruments are valid		
Test statistic: LM =		0.12865
with p-value = P(Chi-square(1) > 0.12865) =		0.719836

* - significant at the 10% level ** - significant at the 5% level

*** - significant at the 1% level

2-stage-least-squares result using robust standard errors

Section 19: Interpretation of Results and Hypothesis

The Hausman test returns a p-value of 0.0181, which leads us to reject the null hypothesis at the 5% level and conclude that there is endogeneity in the regression equation. The two variables that are instrumented in this equation are bachelor degree proportion and wage. The Sargan over-identification test returns a p-value of 0.7198, such that we fail to reject the null hypothesis and conclude that our instruments are valid. This suggests that the instruments we have chosen predict both education and wage well enough that the error terms in the well-being equation are no longer significantly correlated with educational attainment and wages.

The coefficient of proportion of bachelor degrees is significant at the 5% level and has a positive relationship with well-being. A 1% increase in proportion of bachelor degree holders will result in a 0.299 unit increase in well-being. This is not an astronomical increase, but still significant because our range of well-being units is 15.6. For instance, our average well-being score of 65.4 implies that a 0.3 unit increase in well-being is only 0.4% increase from 65.4. Although, comparing this value to the range of well-being data, 15.6; that value of 0.3 is approximately 2% of that total range.

The wage variable is not significant which could support the idea that cities in the United States earns high enough wages that an area's well-being is not dependent on their income (Dolan et. al., 2008). At the aggregate level there may not be enough variability in wages within the United States to show a significant effect. We might expect to see a more significant effect with individual level data.

The proportion of married people is significant at the 1% level and has a value of 12.219. This means that a 1% increase in the married population will result in a 0.122 increase in well-being. This positive value supports the hypothesis that places with a higher percentage of married couples have a higher well-being than places that have a higher percentage of people who are divorced, single, or widowed (Brown, 2000).

Frequent exercise has a positive relationship and is significant at the 1% level. This health variable has a coefficient value of 11.74 which translates into a 0.1174 unit increase in well-being when the proportion of people who exercise frequently increases by 1%. Health variables have been found to be very important in determining well-being, therefore, this positive relationship and strong significance supports the literature on the health and well-being relationship (Dolan et. al. 2008). Healthier places tend to be places with higher well-being.

Median age and median age squared were significant at the 5% and 10% levels, respectively. The coefficient of -0.867 implies that for every additional year in median age, well-being decreases by 0.867 units. The squared value of median age is interpreted as every 1 squared year increase will result in a 0.01 increase in well-being. The combination of the negative median age and the positive median age squared coefficients leads us to the conclusion that the effect of median age on well-being is a positive quadratic, or a U-shape. Our data ranges from 23.3 years to 48.1 years. Younger MSA's did show higher well-being. Again, a more even distribution on median ages would be desirable in the future. It has been suggested by Dolan et. al. (2008) that the lowest well-being is during middle age and it is higher during younger and older years.

Overall, these results are not completely unexpected. Places with higher education levels and those which are younger and more active tend to have higher levels of well-being.

Using two-stage-least-squares method on the system provided a few enlightening results. Educational attainment's effect on well-being was underestimated through the ordinary least squares method. Further, median age and median age squared were insignificant under ordinary least squares. When using two-stage-least-squares, we find that the variables are significant at the 5 and 10% levels, respectively. While the ordinary least squares method underestimates the significance of these variables it also underestimates the value of the variables too. Median age variable shows a value of -0.557 under ordinary least squares, which is 0.31 less than the coefficient under two-stage-least-squares. The median age squared variable is 0.0068 under ordinary least squares, a 64% decrease in the value of the coefficient from the two-stage-least-squares method. Ordinary least squares method (see Appendix A for complete OLS results) returned a coefficient of 20.52 for educational attainment, which would lead us to believe that a 1% increase in bachelor degree proportion would result in a 0.2052 increase in well-being. This underestimates the effect of education on well-being.

The coefficient of proportion of people who are married was also greatly different between the two methods that were used. Under the ordinary least squares method, the proportion of those who are married was 7.406 while the two-stage-least-squares method returned a coefficient of 12.219. Additionally, two-stage-least-squares found that the proportion of people who were married was significant at the 1% level while ordinary least squares was only significant at the 10% level. These differing results lead us to

conclude that ordinary least squares method has bias in the results and two-stage-least-squares is a more effective method to use when estimating the regression coefficients.

Wage was found to be insignificant, which was not completely unexpected when considering the previous literature. It is possible that Americans value other variables when determining their life satisfaction more than their wage. For instance, relationships, such as marriage, as well as health and education were suggested to be more significant than wage when determining well-being in our analysis.

Further, race, gender, and amenities were also found to be insignificant in helping to determine well-being. Our other variables used were more helpful and effective in determining well-being than the proportion of white citizens, proportion of females, average January temperature, number of hospitals, and professional sports franchises.

Some variables had been mentioned in our review earlier but are not included in this regression. The reason for this is that some variables are strongly correlated with each other and produced a multicollinearity problem. For instance, employment and wage were highly correlated so we decided to only use one of the variables for simplicity and in an attempt to negate the multicollinearity issue.

Chapter 8: Policy Implications and Conclusion

Section 20: Policy Implications

The results offer a lot of interesting insights. To begin, in the wage equation we find that the happy-productive worker hypothesis is not supported by this data. Workers with higher well-being tend to have lower wages. This is contrary to our original hypothesis that places with higher well-being would have higher wages. It may be that these areas are more productive, but their workers are not reaping the benefits in wages. Many of the companies we see who have very satisfied workers have many enviable amenities. These amenities cost money and the company could forgo high wages in order to keep free gym memberships and on-site child care for their employees, which could in essence be more effective than monetary raises. The idea that highly satisfied companies or areas with amenities and benefits that cause residents to accept a lower wage is an interesting topic where potentially more thorough research could be performed. It is possible that people in these areas are more satisfied with their life and are willing to receive a lower wage in order to live and work in a particular city.

Secondly, MSA's with higher well-being translated into higher educational attainment. We hypothesize that cities with a higher well-being tend to have a population with a lower discount rate and they look to the future more. They value their education and the larger number jobs they have the opportunity to apply for at a higher rate than what they would value a job at the present time. While standardized examinations are

efficient, schools should begin to examine a student's well-being in order to gauge their educational aptitude, or desired attainment level. If a policy maker could focus on how to make students more committed to higher education through well-being initiatives, then it is possible that the proportion of those who hold a bachelor's degree in the area would begin to rise. The main goal of a policy would be to increase well-being, and the increase in educational attainment would be a nice extra benefit from this.

Further, using traditional ordinary least squares method in a well-being regression equation leads to bias and inefficiency. Instead, instrumenting the endogenous variables will lead to a more efficient and accurate result. Both well-being and the determinants of well-being are very important subjects which merit research. We should look at well-being and see how it affects the economic conditions of an area. In reality, well-being is a state which is subjective and can be altered through policies and other conditions. The policies and ideas suggested here are viable routes through which policy makers can increase an area's life satisfaction.

We will now examine a general example using our model. We know that well-being is positively correlated with health (Chandola et. al., 2006). Our model found that frequent exercise had a very significant and positive effect on well-being. We also have found from this study that well-being affects educational attainment. Consider an area which has an option to increase the amount of exercise that their students have throughout the day. We are going to say that this will increase the proportion of those who exercise frequently by 25%, ceteris paribus. From our well-being equation, a 25% increase in this variable will result in well-being increasing by approximately 2.94 units. From here, we use this information in our educational attainment equation to find that a

resulting 4.04% increase in proportion of citizens who hold bachelor degrees or higher. This is a very basic example of how a variable which changes an area's well-being will affect other economic variables as well. When the debate arises about healthier lunches and how important recess is during school, there is a platform for both how well-being is affected, but also how educational attainment is affected indirectly. From our results, we would recommend policies which promote health and committed relationships. For example, greater access to parks, community events that introduce people to their fellow residents, or affordable exercise programs are a few ideas which would promote well-being and indirectly affect educational attainment. As well-being changes, educational attainment and wages are also affected. Well-being is not just important as an end point for a discussion; the effect of well-being can be felt throughout other economic conditions, such as education and wages.

Section 21: Conclusion

The research above shows how well-being affects educational attainment and wage. In order to properly account for this effect, we used a system of equations which related well-being, wages, and educational attainment to each other. Limitations of this study are the narrow time frame and narrow dataset. Having access to a larger panel of data across many years would be more helpful in determining causality. Additionally, other variables could be used to explain well-being, educational attainment, and wages. Lastly, the aggregated data may have disguised some of our results

With these limitations in mind, it is also important to note that the research presented here is unique regarding the level of data gathered, as well as the system of equations approach used with the three separate but related regressions. Well-being studies have used individual level data as well as national level data, and our research uses city level data instead. Additionally, this research focuses on the effect well-being has on both wages and educational attainment. Many papers focus on the determinants of well-being, though we have chosen to examine how this variable may affect economic conditions.

The first question researched was the effect of well-being on wages. We found that well-being had a negative effect on wages, while we expected a positive relationship. The coefficient of well-being was -0.77 and very significant. While the effect is negative, it is a very slight effect. Next, the effect of well-being on educational attainment showed a positive result. Students who are more satisfied have higher educational attainment. The last question researched was the determinants of well-being when reverse causality of wages and educational attainment were accounted for. Primarily, the positive effect of educational attainment was slightly higher under two-stage-least-squares than ordinary least squares, and negative effect of wage was also much higher. This shows that ordinary least squares may underestimate the significance of wages in determining well-being. There has been research that concludes wage is not a significant factor in determining United States well-being because we are above subsistence level (Clark et. al., 2008). In this study we also suggest that Americans are less dependent on wages than other factors in bringing them satisfaction.

While we have examined the endogeneity issues between well-being, education, and income, there are other endogeneity issues which can be further researched. For instance, the relationship between income, educational attainment, and health has been shown to exist (Mantzavinis, 2006; Chandola, 2006), but the magnitude of the coefficients has not been determined using a method such as that presented here. Additionally, a larger or more specific panel of data would be helpful to support our conclusions at the metropolitan level. Future papers should be aware of any endogeneity issues that their data may have. As shown here, correcting for this endogeneity is important.

Appendix A

Ordinary Least Squares Results

Wage Equation		
	coefficient	**t-value**
const	22.9472	2.21 **
Bachelor	23.8235	10.43 ***
Well_Being	-0.2807	-3.858 ***
White	0.3109	0.3043
Female	-9.2346	-0.6089
Foreign	5.1870	2.578 **
Min_Wage	0.7214	3.401 ***
PC_Commute	0.4399	5.173 ***
Adjusted R-squared	0.66565	

* - significant at the 10% level ** - significant at the 5% level

*** - significant at the 1% level

Ordinary least squares result using robust standard errors

Educational Attainment Equation		
	coefficient	**t-value**
const	-1.72641	-7.692 ***
Wage	0.0230422	13.63 ***
Well_Being	0.013049	8.464 ***
Female	1.85254	4.724 ***
Universities	0.000130903	0.9157
White	0.073374	2.738 ***
Foreign	-0.123636	-2.302 **
Median_Age	-0.00647087	-6.178 ***
Adjusted R-squared	0.796998	

* - significant at the 10% level ** - significant at the 5% level

*** - significant at the 1% level

Ordinary least squares result using robust standard errors

Well-Being Equation		
	coefficient	**t-value**
const	73.0557	5.38 ***
Bachelor	20.5229	6.676 ***
Wage	-0.0792	-0.7555
White	-1.0339	-0.7900
Married	7.4056	1.911 *
Foreign	2.1577	0.8677
Diabetes	-8.7552	-1.4740
Frequent_Exerci	13.6639	4.079 ***
Median_Age	-0.5572	-1.4810
sq_Median_Age	0.0068	1.3210
Female	-17.3533	-0.9434
Jan_Temp	-0.0091	-0.7342
Hospitals	-0.0022	-0.3851
Franchise	-0.0370	-0.2086
Adjusted R-squared	0.650019	

* - significant at the 10% level ** - significant at the 5% level

*** - significant at the 1% level

Ordinary least squares result using robust standard errors

Appendix B

MSA Specific Well-Being Data

City	Overall Well-Being
Akron	65
Albany - Schenectady - Troy	66.4
Albuquerque	67.6
Allentown - Bethlehem - Easton	64.8
Amarillo	66.1
Anchorage	67.6
Ann Arbor	68.2
Asheville	64.7
Atlanta-Sandy Springs-Mariette	67.7
Augusta - Richmond County	66
Austin-Round Rock	69.8
Bakersfield	65.5
Baltimore - Towson	66.4
Baton Rouge	65.6
Beaumont - Port Arthur	61.1
Bellingham	68.7
Binghamton	64.3
Birmingham - Hoover	65.1
Boise City - Nampa	66.7
Boston-Cambridge-Quincy	68.9
Boulder	73.7
Bradenton - Sarasota - Venice	66.5
Bremerton- Silverdale	68.3
Buffalo - Niagara Falls	66
Burlington	69.2
Cape Coral - Fort Myers	65.2
Cedar Rapids	70.5
Charleston	64.2
Charleston-N Charleston-Summerville	69.2
Charlotte - Gastonia-Concord	67.6
Charlottesville	67.9
Chattanooga	66.8
Chico	65.1
Clarksville	64.1
Cleveland - Elyria - Mentor	64
Columbia	64.1

Columbus	65.6
Corpus Christi	64.1
Dayton	63.5
Deltona - Daytona Beach - Ormond Beach	64.3
Des Moines	66.9
Detroit - Warren - Livonia	64.2
Durham	68.6
El Paso	67.9
Erie	64.8
Eugene - Springfield	67.1
Evansville	63.4
Fayetteville	64
Fayetteville - Springdale - Rogers	65.2
Flint	64.7
Fort Collins	72.1
Fort Smith	61.8
Fort Wayne	64.8
Fresno	65.3
Gainesville	70.3
Grand Rapids-Wyoming	67.9
Greeley	64.1
Green Bay	65.5
Greensboro - High Point	64.7
Hagerstown - Martinsburg	65.3
Harrisburg - Carlisle	66.4
Hartford	68.3
Hickory - Lenoir - Morganton	61.9
Honolulu	71.6
Houston - Sugar Land - Baytown	66.7
Huntsville	67.2
Indianapolis - Carmel	65.9
Jackson	66.2
Jacksonville	65
Kalamazoo - Portage	66
Kansas City	67.5
Kennewick - Pasco - Richland	66.9
Killeen - Temple - Fort Hood	65.6
Kingsport -Bristol	63.9
Knoxville	63.8
Lakeland - Winter Haven	64.8
Lancaster	69.3
Lansing	67.9
Las Vegas - Paradise	64.2

Lexington - Fayette	65.8
Lincoln	72.8
Little Rock - Conway	67
Los Angeles - Long Beach - Santa Ana	67.1
Louisville - Jefferson County	63.5
Lynchburg	63.3
Madison	70.8
Manchester-Nashua	67.6
McAllen - Edinburg - Mission	66.6
Medford	66.4
Memphis	64.3
Miami - Fort Lauderdale - Pompano Beach	65.2
Milwaukee - Waukesha - West Allis	66.1
Mobile	63.2
Modesto	66.1
Montgomery	67.5
Naples - Marco Island	68
Nashville - Davidson - Murfreesboro - Franklin	66.7
New Haven - Milford	66.9
New Orleans - Metairie - Kenner	66.1
Norwich - New London	67
Ocala	66.1
Ogden - Clearfield	67.2
Olympia	68.8
Omaha - Council Bluffs	67.7
Orlando - Kissimmee	65.8
Pensacola - Ferry Pass - Brent	66.7
Phoenix - Mesa - Scottsdale	67
Pittsburgh	66.2
Portland - Vancouver - Beaverton	66.8
Portland- Biddeford	68
Poughkeepsie - Newburgh - Middletown	67.1
Providence - New Bedford - Fall River	64.9
Provo-Orem	71.7
Raleigh - Cary	68.7
Reading	65.3
Redding	61.5
Reno - Sparks	65.1
Riverside - San Bernardino - Ontario	65.2
Rochester	67.2
Sacramento - Arden - Arcade - Roseville	67
Salem	67.1
Salinas	67

Salt Lake City	66.9
San Antonio	67.2
San Diego- Carlsbad- San Marcos	68.7
San Francisco - Oakland Fremont	69.1
San Jose - Sunnyvale - Santa Clara	69.7
Santa Barbara - Santa Maria - Goleta	67.3
Savannah	67
Scranton - Wilkes Barre	64.1
Seattle - Tacoma - Bellevue	69.2
South Bend - Mishawaka	63.1
Greenville - Mauldin - Easley	62.2
Spokane	66.1
Springfield	65.2
Springfield	66.1
Stockton	64.6
Syracuse	65.2
Tallahassee	67.6
Tampa - St Petersburg - Clearwater	64.8
Toledo	63
Topeka	68.3
Trenton - Ewing	69.1
Tucson	66.3
Tulsa	64.8
Utica - Rome	62.6
Visalia - Porterville	65.6
Wichita	67.5
Wilmington	68.1
Worcester	66.4
York - Hanover	65.9
Youngstown - Warren - Boardman	61

Overall well-being data gathered from Gallup-Healthways 2010 Well-Being Survey

Appendix C

Data Sources

Data Sources		
Variable	Website Name	Website Address Homepage
Well-Being	Gallup-Healthways Well-Being Survey	www.well-beingindex.com
Proportion of Bachelor's Degrees	American Community Survey	www.census.gov
Wage	American Community Survey	www.census.gov
Proportion White	American Community Survey	www.census.gov
Proportion Married	American Community Survey	www.census.gov
Proportion Foreign-Born	American Community Survey	www.census.gov
Proportion of those with Diabetes	Gallup-Healthways Well-Being Survey	www.well-beingindex.com
Frequent Exercise	Gallup-Healthways Well-Being Survey	www.well-beingindex.com
Median Age	American Community Survey	www.census.gov
Proportion Female	American Community Survey	www.census.gov
Average January Temperature	National Weather Service	www.nws.noaa.gov
Number of Hospitals	Bureau of Labor Statistics	www.bls.gov
Number of Professional Sports Franchises	NFL, NBA, MLB, and NHL websites	nfl.com; nba.com; mlb.com; nhl.com
Number of Universities	Bureau of Labor Statistics	www.bls.gov
State Level Minimum Wage	Bureau of Labor Statistics	www.bls.gov
Per Capita Commute Time	American Community Survey	www.census.gov

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