1 Introduction

Recent studies in the field of happiness economics suggest that creating a more egalitarian society and increasing the absolute level of personal income can promote a happier society. Yet, as Okun (1975) pointed out, fairly dividing the pie and raising the living standards are to a great extent mutually exclusive. While the US economy has grown, on average, 2.8 percent per year since the 1970s, income inequality has rapidly increased too. Figure 1 shows the evolution of top income shares in the US from 1920 to 2010.[1] The share of national income concentrated in the top 1 percent of the US population, for example, has increased from less than 8 percent in the late 1970s to almost 19 percent in 2008. This level of income inequality is the highest level since the creation of the federal income tax in 1913[2]. Parallel with this trend, resentment over economic inequality has also grown more vocal, culminating in the Occupy Wall Street movement in 2011.[3] Are Americans better off today, then, as a result of the growth in national income, even if this growth has come at the expense of its more equal distribution? Or is the growing gap between the rich and the poor one of the reasons that can explain the stagnating happiness levels of Americans, which, as Stevenson and Wolfers (2008) point out, remain a "puzzling outlier"?

To shed light on these questions, we use subjective well-being data from the General Social Survey (GSS) to estimate the parameter of inequality aversion, ε, within a neo-utilitarian framework of social welfare analysis (Atkinson, 1970). This allows us to calculate the Atkinson index of inequality and compare how social welfare has evolved over time while accounting for inequality aversion that is inherent in the concavity of the utility function. While this approach has its limitations, it is one possible way to evaluate the evolution of the trade-off between economic grwoth and inequality. The results suggest that economic growth in the United States has been sufficient to raise average happiness since the 1970s despite the rising level of income inequality.

[1] Piketty and Saez (2003) provide one of the most comprehensive studies on the topic in which they document the pattern of income inequality in the US from 1913 to 2002 (while the actual paper covers the period from 1913-1998, updated series can be found on the website of Emmanuel Saez, Table A.3).

[2] With the exception of 1928 when the share of income concentrated in the top 1 percent of the population reached 28 percent.

[3] Figure 3 shows that the number of books written on the topic of income inequality has more than tripled since the 1970s.

2 Theoretical Considerations

2.1 Economic Growth and Happiness

2.1.1 The Income-Happiness Paradox

The question whether economic growth leads to greater happiness has been widely debated in the economic literature. One popular view, expressed by Easterlin (1974), is that economic growth does not improve the subjective well-being of individuals. This view is based on the empirical observation that although real incomes have substantially increased over the past fifty years, there have been no corresponding gains in reported levels of happiness. In his earlier work, Easterlin (1974, 1995) showed that this relationship holds for a list of developed nations including the United States, Japan, and nine developed countries in Europe. His most recent work (Easterlin *et al.*, 2010), however, points out that is also true for a large number of less developed countries in Asia, Latin America, and some transitional economies in Europe. Short-run gains in happiness are possible, but over the longer run, usually more than 10 years, both rich and poor are stuck on a "hedonic treadmill." In the United States, happiness levels have stagnated since the 1970s despite of the fact that real income per capita has almost doubled (Figure 2).

One argument explaining this observation is that beyond some "subsistence" level of income, money does not buy happiness. Frey and Stutzer (2002) find this "subsistence" level to be as low as $10,000 while Kahneman and Deaton (2010), using data from the US, find it to be close to $75,000.[4] Beyond $75,000, Kahneman and Deaton argue, "higher income is neither the road to experienced happiness nor the road to the relief of unhappiness or stress, although higher income continues to improve individuals life evaluations" (Kahneman and Deaton, 2010).

Yet, a large body of economic literature shows that income is one of the strongest determinants of happiness within and across countries. For example, panel studies that control for country specific fixed-effects find that the level of self-reported happiness moves predictably with macroeconomic variables such as GDP per capita (Di Tella *et al.*, 2003). In addition, panel studies that control for unobserved individual fixed-effects (such as different personality traits) find that the income variable

[4] It is important to note that Kahneman and Deaton (2010) acknowledge that happiness is multi-dimensional and differentiate between emotional well-being, or *hedonic experiences*, and life-satisfaction, or *life evaluation*. Although money is not a good predictor of emotional happiness beyond $75,000 of annual household income, it is significantly and positively correlated with higher life satisfaction even beyond this level of earnings.

is positively correlated with life-satisfaction. All of these findings, which seem inconsistent with the observations made by Easterlin, suggest that income plays an important role in determining individual happiness. Hence, a great deal of the happiness literature in the past couple of decades has been dedicated to solving this income-happiness paradox.

2.1.2 Income Comparisons and Adaptation

An answer to the income-happiness paradox that is also consistent with the findings of the above literature comes from Clark *et al.* (2008). The authors reconcile both views using the notion of *income comparisons*. For example, consider the following utility function, which is an adaptation of Clark's model:

$$U = U(u_1(y), u_2(y/y^*), u_3(Z)) \tag{1}$$

where total utility, U, is determined by the combinations of the sub-utilities u_1, u_2, and u_3. In this function, y is individual income, and $u_1(y)$ is the classic textbook utility function, which is increasing, but at a decreasing rate. Thus, depending on the concavity of $u_1(y)$, additional income brings gradually less additional happiness. It is often assumed in the happiness literature that the relationship between U and y is log-linear. This implies, for example, that a person with \$10,000 of income will experience five times more utility from an additional dollar of earnings than someone with an income of \$50,000. The second subutility function $u_2(y/y^*)$ reflects the idea of income comparisons. In this function y^* is often called the "reference group," and the ratio y/y^* is known as "relative income." The reference can be internal, e.g., to one's own past or expected income (adaptation), or external, e.g., to the income of some specific demographic group (social comparison). In the latter case, $u_2(y/y^*)$ is called the "status return" from income (or the consumption of some positional good). The early economists Adam Smith, John Stuart Mill, Karl Marx, and Thorstein Veblen all emphasized the social nature of consumption. Finally, the sub-utility function $u_3(Z)$ picks up the effect of leisure and other socioeconomic and demographic variables.

The empirical implementation of this function is:

$$U_i = \beta_1 lny_i + \beta_2(y_i/y_i^*) + Z_i^{'}\gamma + \varepsilon_i \tag{2}$$

where y_i is some measure of real income, y_i^* is a reference group (usually median country income), and $Z_i^{'}$ is a vector of demographic variables.

An important characteristic of $u_2(y/y^*)$ is that it is homogeneous of degree zero, i.e. $u_2(ay/ay^*)$=$u_2(y/y^*)$, which implies that status is unaffected by proportional increases in y and y^*. The main implication of this model is that the gradient between income and happiness will be steeper in a country at a point in time than over time. This is because status does not have an effect on the aggregate level of happiness in a country – it is a zero sum game, i.e. what individuals with above average income growth gain in status happiness is lost by those with below average income growth. At a point in time, then, those individuals within a country that have higher incomes enjoy higher status and are happier, but over time, as everyone becomes richer, and the amount of status is fixed, the only benefit to the country is from higher consumption, which approaches zero as countries become richer.

2.1.3 The Importance of Absolute Income

Diener *et al.* (2006), however, show that the happiness of some people can and does change over time. Sacks *et al.* (2010) find that within a given country richer individuals report higher levels of life-satisfaction, across countries richer ones have higher levels of life satisfaction, and as countries become richer the aggregate level of happiness tends to go up. Their estimations reveal that the gradient of the relationship between income and happiness is roughly the same across all three comparisons, which indicates that absolute income plays a large role in determining subjective well-being and that social comparisons alone cannot explain the Easterlin paradox.

Inglehart *et al.* (2008) show that economic development, democratization, and increase in social tolerance over the past thirty years have increased the subjective well-being of millions of people around the world. It is true that as society becomes richer, economic gains have decreasing importance to human happiness. Economic growth, however, is important even beyond some basic level of development because it allows people to maximize their free choice in other realms of life:

> Under conditions of scarcity, people focus on survival needs, giving top priority to economic and physical security. Economic development increases people's sense of existential security, leading them to shift their emphasis from survival values toward self-expression values and free choice which is a more direct way to maximize happiness and life satisfaction. This model proposes that human development shifts emphasis from the pursuit of happiness through economic means toward a broader pursuit of happiness by maximizing free choice in all realms of life (Inglehart et al, 2008, p.266).

If absolute income plays an important role in determining life satisfaction, yet no corresponding gains in happiness have been experienced in the United States, then the observation that average happiness in the United States have stayed flat remains a puzzle.

An implicit assumption of the model in (1) is that economic growth affects only consumption levels and has no effect on the distribution of income. Yet, if economic growth causes inequalities in income, then as inequality in a country increases, the aggregate level of happiness can decrease. This follows directly from the concavity of utility function. For example, consider Figure 4 where W is the social welfare function (or one can think of it as the aggregate level of happiness), which is determined by the sum of individual utility functions, so that $W = \frac{1}{n}\sum u_i(y_i)$. If the marginal utility of income is declining with one's earnings, i.e., richer people gain less utility from an additional dollar of income than poorer people, then the social welfare function (W) will be concave. In this case, it is possible for mean national income to increase and average happiness to decline if most of the income gains go to the people at the top of the income distribution and those at the bottom are made worse off. Figure 4 presents one such possible scenario in which the gains from additional income at the top of the income distribution will be more than offset by the loses of income (and happiness) at the bottom of the income distribution. Thus, the aggregate level of happiness will depend on the relationship between economic growth and income inequality. Most income gains in the United States have been to the top income quintile with real incomes declining for the bottom 40 percent of income earners, and stagnating for those in the middle of the income distribution (Figure 5).

2.1.4 Inequality Aversion

Since Adam Smith's *Wealth of Nations* (1776), the idea that self-interest is the primary drive of human action has become the cornerstone of economic theory. But in the *Theory of Moral Sentiments*, Smith (1759) also points out that there are a multitude of psychological motives, such as compassion for others and a sense of propriety, that are also inherent in human nature:

> How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortunes of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it. Of this kind is pity or compassion, the emotion we feel for the misery of others, when we either see it, or are made to conceive it in a very lively manner. That we often derive sorrow from the sorrows of others, is a matter of fact too obvious to require any instances to prove it; for this sentiment, like all the other original passions of human nature, is by no means confined to the virtuous or the humane, though they perhaps may feel it with the most exquisite sensibility. The greatest ruffian, the most hardened violator of the laws of society, is not altogether without it (Smith, 1759, p.1).

A vast amount of experimental and empirical literature since Smith provides evidence that people are not only driven by selfish motives, but are often concerned for the well-being of others. Formal theories have been developed that take into consideration these preferences. Within this literature, one of the most popular is the theory of inequality aversion(Bolton and Ockenfels, 2000; Fehr and Schmidt, 2003). One conclusion from this literature is that individuals are often willing to sacrifice some of their income to obtain a more equitable distribution. Another implication is that additional income may bring less utility if it comes at the cost of higher inequality. Thus, inherent in the concavity of the utility function is the direct effect of inequality aversion. A possible explanation comes from Aknin *et al.* (2009). In making judgments about the ideal income distribution, people draw not only on their moral instincts about right and wrong, but also on their intuition about the relationship between income and happiness. Most people realize that increases in income at the top of the income ladder are not going to provide as much happiness as equal increases at the bottom.

Perhaps not surprisingly, as income inequality in the US has increased over the past 40 years, resentment over economic inequality has become more vocal. The recent Occupy Wall Street

movement has seen millions of Americans protest on the street with the campaign slogan "We are the 99%," which expresses the popular discontent with the current level of inequality in the US. These observations are consistent with survey data that examines attitudes toward economic inequality. A recent study by Norton and Ariely (2011), for example, finds that most Americans, regardless of their political affiliation and wealth status, prefer to live in a country with a far more equitable distribution of wealth than the one that characterizes the current state of affairs.

2.2 Theoretical Model

Our goal is to evaluate the equity efficiency trade-off in the US from the early 1970s to 2012. Measures such as the mean level of income ignore the problem of economic inequality and measures such as the Gini coefficient do not consider the importance of personal income.[5] This makes it difficult to evaluate different states of socio-economic development which may embody a trade-off between economic growth and equality.

We turn to a neo-utilitarian social welfare analysis which was developed by Atkinson (1970). In particular, we are interested in estimating the Atkinson Index of inequality which takes into consideration the trade-off between income and inequality. The index is related to a class of additive social welfare functions:

$$W = \frac{1}{n} \sum u_i(y_i) \tag{3}$$

where social welfare, W, is aggregate utility, a function of personal income, y_i.[6] To incorporate the idea that additional income may bring greater marginal utility to poorer people, we use an iso-elastic utility function, which assigns weights to different levels of income:

$$u_i = \begin{cases} \dfrac{y_i^{1-\varepsilon} - 1}{1-\varepsilon} & \text{if} \quad \varepsilon \neq 1 \\ log(y_i) & \text{if} \quad \varepsilon = 1 \end{cases} \tag{4}$$

[5] For example, two societies may have the same level of general inequality and thus the same Gini coefficient, but one of them could be far richer and its citizens enjoying greater consumption and welfare.

[6] Deaton (1997, p.135) provides a useful definition of the social welfare function: "[The social welfare function] should be seen as a statistical 'aggregator' that turns distribution into a single number that provides overall judgment on that distribution and that forces us to think coherently about welfare and its distribution. Whatever our view of the policy making process, it is always useful to think about policy in terms of its effects on efficiency and equity, and the social welfare function should be thought of as a tool for organizing our thoughts in a coherent way."

where ε is the parameter of inequality aversion, or the negative elasticity of marginal income (Layard *et al.*, 2008). Conceptually this function is equivalent to a constant relative risk aversion function (CRRA). When $\varepsilon = 0$ (zero inequality aversion), then the social welfare function collapses to:

$$W = \frac{1}{n} \sum u_i(y_i) \rightarrow Utilitarian. \tag{5}$$

In this case society does not care about inequality at all, and social welfare is determined only by the level of average income. There is no trade-off between the size of the cake and how it is sliced. Both rich and poor receive the same utility from an additional dollar. This particular functional form is often referred to as "utilitarian" because the only thing that matters is maximizing total consumption and as long as consumption increases it does not really matter who receives the largest share.

On the other hand, when $\varepsilon \rightarrow \infty$ the social welfare function turns into:

$$W = min(u_i(y_i)) \rightarrow Rawlsian. \tag{6}$$

Since society is infinitely averse to inequality, social welfare now is equivalent with the welfare of the poorest. There is a maximum trade-off between the size of the cake and how it is sliced. The optimal world is one in which income is divided equally and the primary goal of social policy should be to improve the condition of the poorest. This functional form is known as "Rawlsian" because in his *Theory of Justice*, John Rawls (1971) argues that inequality is acceptable only if it is to the advantage of those who are worst-off.

Finally, when the value of ε is between these two polar cases, the social welfare function has an iso-elastic form:

$$W = \frac{1}{n} \sum \frac{y_i^{1-\varepsilon} - 1}{1 - \varepsilon} \rightarrow Iso - elastic. \tag{7}$$

This function is increasing with income:

$$\frac{\partial W}{\partial y_i} = \frac{y_i^{-\varepsilon}}{n} > 0 \tag{8}$$

but at a decreasing rate:

$$\frac{\partial^2 W}{\partial y_i^2} = -\varepsilon \frac{y_i^{-\varepsilon-1}}{n} < 0 \tag{9}$$

so that as ε increases, lower incomes are given relatively more weight in producing social welfare, i.e., the welfare (and utility) function is concave. A nice property is that the ratio of the marginal social utilities of two individuals is equal to:

$$\frac{\partial W/\partial y_A}{\partial W/\partial y_B} = \left(\frac{y_B}{y_A}\right)^{\varepsilon}. \tag{10}$$

Thus, when $\varepsilon = 1$, and $u_i = logy_i$, the marginal utilities are inversely proportional so that somebody with an income of \$10,000 will derive ten times more utility from an additional dollar than someone with an income of \$100,000. Most studies in the happiness economics literature use the log-linear specification and thus make the implicit assumption that $\varepsilon = 1$, i.e., the marginal utilities are inversely proportional.

Within this framework of analysis, the Atkinson (1970) index of inequality is defined as:

$$A(\varepsilon) = 1 - \left(\frac{1}{n}\sum (y_i/\mu)^{1-\varepsilon}\right)^{1/1-\varepsilon} \tag{11}$$

where μ is the mean level of income. When $\varepsilon = 1$, the Atkinson index has the multiplicative form:

$$A(\varepsilon) = 1 - \prod (y_i/\mu)^{1/n}. \tag{12}$$

The core idea of the Atkinson index is that there exists a level of income, ξ, which is received by all members of society, such that $W(\xi) = W(y_i)$. Intuitively, this index tells us how much society is willing to give up in terms of the size of the cake in order to achieve an egalitarian distribution of income.

Figure 6 demonstrates this concept for a society of two individuals. The x axis shows the income of person A, and the y axis shows the income of person B. Let's assume that the income distribution is at point A where $y_A < y_B$. If $\varepsilon = 0$ (zero inequality aversion), then the social welfare function (SFW) will be utilitarian (a straight line between A, B ,and C). Thus, anywhere along the straight line social welfare will be maximized regardless of the distribution of income. Any reduction of

the overall level of income, however, will make society worse off (even if the cake is divided more equally).

When $0 < \varepsilon < \infty$, then the SWF will be convex reflecting a trade-off between equality and income. Thus, there is a point E where incomes are equally divided with both A and B receiving ξ, such that the welfare of society is unchanged, i.e., $W(\xi) = W(y_i)$. This level of income is known as the equally distributed equivalent (EDE). Due to the convexity of the SWF, $\xi < \mu$ is always true. Even though total income is lower at E compared to A, the social welfare that is lost due to a decline of total income is compensated for by the gain in equality. This is to say that society is willing to pay a price to achieve a more equal distribution of total income.

Since equality is measured by the ratio OC/OE, or equivalently between ξ/μ, then a society with an egalitarian distribution will have $\xi/\mu = 1$. The Atkinson index of inequality then can be expressed as:

$$A(\varepsilon) = 1 - \frac{\xi}{\mu}. \tag{13}$$

In order to find an expression for ξ, we observe that by virtue of (4):

$$u(\xi) = \frac{\xi^{1-\varepsilon} - 1}{1 - \varepsilon} \tag{14}$$

and from (7) we get:

$$W = \frac{1}{n} \sum \frac{y_i^{1-\varepsilon} - 1}{1 - \varepsilon} = \frac{1}{n} n \frac{\xi^{1-\varepsilon} - 1}{1 - \varepsilon}. \tag{15}$$

Thus, from the definition of ξ we can directly express it as:

$$\xi(y_i) = \frac{1}{n} \left(\sum y_i^{1-\varepsilon} \right)^{1/1-\varepsilon}. \tag{16}$$

Given any income distribution, then, we can calculate ξ. Of course ξ will depend on the level of inequality aversion, ε. For $\varepsilon = 0$, ξ will simply be the the average level of income. For $\varepsilon > 0$, ξ will be lower than the average income, μ, and will decrease as ε grows larger, reflecting a greater cost of inequality. Finally, we can derive a social welfare function in abbreviated terms by solving

equation (4) for ξ (16):

$$W(\mu, A(\xi)) = \mu(1 - A(\xi)). \tag{17}$$

Since social welfare increases with μ, it is possible to have an increase in welfare and an increase in inequality simultaneously when μ increases. The overall change in social welfare will ultimately depend on the concavity of the social welfare function which is determined by the level of inequality aversion, or the the value of ε. Usually, determining ε is a value judgment. The Census Bureau, for example, reports ε for arbitrary values of 0.25, 0.5 and 0.75. The goal of this analysis is to estimate parametrically the value of ε using subjective well-being data from the GSS (the exact procedure is outlined in section 3.2). Once we estimate the value of ε, we can then calculate the value of $A(\varepsilon)$, $\xi(\varepsilon)$, and $W(\varepsilon)$ to determine whether economic growth in the US has been sufficient to compensate for the growing level of income inequality.

3 Data

Data on personal characteristics and subjective well-being were collected from the nationally representative General Social Survey (GSS) conducted by the National Opinion Research Center at the University of Chicago. Macroeconomic variables were collected from variety of sources. Table 1 provides description and sources for all variables, and Table 2 shows summary statistics. The data is cross section and includes a pool of American citizens from 1972 to 2012.

3.1 Subjective Well-Being

The dependent variable in this study is the self-reported level of happiness, which was collected using the following question: "*Taken all together, how would you say things are these days – would you say that you are very happy, pretty happy, or not too happy?*"[7] The data was then recoded so that the answers correspond to the following numerical values: (1) 'not too happy', (2) 'pretty happy', and (3) 'very happy'. For justification of using subjective well-being data see Frey and Stutzer (2002); Kahneman and Krueger (2006); Di Tella *et al.* (2003). These studies argue

[7] A small fraction of responses "Don't know" and "No answer" are ignored by the analysis.

that subjective well-being data passes different validation tests and moves predictably with other external variables (such as income, marriage, and unemployment or growth in GDP) and is thus valid, reliable, and comparable.

3.2 Personal Income

The independent variable on income from the GSS, *conrinc*, is constructed from categorical data, and represents inflation adjusted personal income before taxes (in constant 2005 dollars).[8] This variable has been widely used in the social sciences and previous research has successfully applied it in estimating the return from college education with results that do not deviate significantly from what hundreds of other studies on this topic uncover Card (1999).

3.3 Background Variables

The GSS dataset also provides a number of background variables at the individual level. The ones that are used as controls in this study are well known in the happiness literature to affect the individual level of subjective well-being, and include age, gender, race, educational level, marital status, and personal unemployment.

4 Estimating the Parameter of Inequality Aversion ε

There is a large literature that estimates the parameter on inequality aversion, ε. Since ε is conceptually the same as the risk-aversion parameter in a CRRA utility function, the majority of previous estimates are based on the behavioral theory of choice under uncertainty. As Layard *et al.* (2008) point out, however, these estimates have been highly inconsistent, ranging from 0 to 10.[9] One problem is that previous studies rely on indirect measures of utility and involve a large number of extraneous assumptions. A second problem is that these estimates are based on expected utility, not experienced utility. Yet, as Kahneman *et al.* (1999) points out, most of the time people make erroneous forecasts about their true utility. In this study, we are interested in estimating ε based on a direct measurement of experienced utility.

[8] For details refer to GSS Methodological Report No. 101 (Holt, 2004)
[9] For a survey of the literature see Hartley *et al.* (2006).

We estimating the parameter on inequality aversion, ε, with the following specification:

$$u_i = \alpha \left(\frac{y_i^{1-\varepsilon} - 1}{1 - \varepsilon} \right) + \sum \beta' \mathbf{X} + \nu_i \tag{18}$$

where y_i is individual income, $\mathbf{X}$ is a vector of personal characteristics that includes age, age squared, sex, race, marital status, and level of education, and ν_i is random error. In this specification, ε captures the concavity of the utility function with respect to income or the negative elasticity of the marginal utility of income. The coefficient α is assumed to be the same for all people. We use a Box-Cox transformation on the income variable so that:

$$u_i = \alpha \left(\frac{y_i^{\lambda} - 1}{\lambda} \right) + \sum \beta' \mathbf{X} + \nu_i \tag{19}$$

where $\lambda = 1 - \varepsilon$.

Since true utility is not observed, we follow Layard *et al.* (2008) and make the following assumptions:

1. Reported happiness, h_i, is linked to true utility, u_i via a fixed transformation such that:

$$h_i = f_i(u_i) = f(u_i) + \mu_i \tag{20}$$

so that f_i is common to all individuals up to a random additive term μ_i, which is independent of the circumstances affecting true utility.

2. In addition, the transformation is assumed to be linear:

$$h_i = u_i + \mu_i \tag{21}$$

Thus, my final model is given by:

$$h_i = \alpha \left(\frac{y_i^{\lambda} - 1}{\lambda} \right) + \sum \beta' \mathbf{X} + \epsilon_i \tag{22}$$

where $\epsilon = \nu_i + \mu_i$

A significant body of literature exists to justify the assumptions above. First, reports on happiness tend to be consistent with other measures of well-being. For example, Diener & Suh (1999)

show that the level of self-reported happiness is correlated with reports made by a third-party (e.g., a friend of the subject). Second, happiness data tend to move in a predictable way with external factors such as unemployment and marriage. For example, income increases predicted happiness, unemployment decreases it, etc. (Kahneman *et al.*, 1999). Finally, studies in neuropsychology suggest that answers to happiness reports are correlated in a consistent manner with the activity in different areas of the brain associated with positive and negative experiences (Davidson, 1992, 2000). However, it is important to note that due to data limitations we are not able to control for individual heterogeneity, which can bias our results.

Table 3 presents the main results from the Box-Cox regressions. The inequality aversion parameter, ε, is found to be 0.50 for the overall sample. We further estimate ε for a variety of subgroups and over time. The parameter shows consistency across groups with values ranging from 0.29 (strong Republicans) to 0.97 (people with graduate degrees). Interestingly, ε increased over time from 0.19 in the 1970s to 0.65 in the 2000s. This is consistent with the growing public resentment over the increasing gap between the rich and the poor which culminated with the Occupy Wall Street movement in recent years. These observations are also consistent with economic and social theory. Republicans, for instance, share more conservative values that emphasize the importance of personal independence, hard work and meritocracy. Thus, they are less inclined to believe that society has an obligation to reduce social inequalities.

4.1 Calculating A(ε), $\xi(\varepsilon)$, and W(ε), 1974-2012

Next, we calculate the Atkinson index of inequality, A(ε), the equivalently distributed income, $\xi(\varepsilon)$, and social welfare, W(ε), based on the value of $\varepsilon = 0.5$ found in the previous section. Since ε has increased over time and differs across subgroups of the population, we also include the same calculations for $\varepsilon = 1$. We use this value of the inequality aversion parameter because it corresponds to the log-linear form of the utility function that is a standard assumption in the happiness literature.

The main results are presented in Table 4 and cover the period from 1974 to 2012. In 1974, for example, mean income in the GSS sample was $29,852 (column 2). If we assume that the value of $\varepsilon = 0.5$, then such levels and distribution of income correspond to an Atkinson index of inequality of .16 percentage points (column 3). This number suggests that if incomes were equally

distributed, the same level of social welfare could be achieved with only 84 percent of the national income in 1974, i.e., 16 percent of national income can be sacrificed to achieved an egalitarian income distribution and at the same time preserve the same level of national happiness. Column (4) shows that this is equivalent to \$24,977 – the equivalent distributed income, ξ. Finally, column (5) calculates the welfare of society using equation 7. This number by itself does not have any meaning. It is useful, however, in comparing different distributions to each other and in this case to track the evolution of welfare over time. For instance, the results in this column suggest that social welfare slightly increased from 316 in 1974 to 329 in 2012. The increasing value of the Atkinson index of inequality in column (3), A(ε=0.5), however, indicates that society is willing to pay an increasing portion of total income to divide the pie into more equal slices. In 1974 the same level of social welfare could have been obtained if everybody received an income of \$24,977 (the equivalently distributed income, $\xi(\varepsilon = 0.5)$), i.e., this was equivalent to a reduction of 16 percent of total income. By 2010, $A(\varepsilon)$ increased by more than half, indicating that the same level of welfare could have been obtained if society gave up 26 percent of total income to achieve an equal distribution of income where everybody earned \$27,060.

The results, of course, are sensitive to the value of ε. Thus, the last three columns of Table 5 repeat the same exercise but for a value of the inequality aversion parameter of $\varepsilon = 1$. At this level of inequality aversion, society has experienced no gains in social welfare since the 1974 (column 8). As expected, greater inequality aversion is associated with a much higher trade-off between equity and efficiency. According to the results in column (7), society could have achieved the same level of welfare in 2012 if everybody received an income of \$19,399 (47 percent reduction in total income).

5 Discussion

Economic growth in the United State since the 1970's has not benefited all income classes equally. Most income gains have gone to the top income quintile while the real wages of the majority of Americans have stagnated and, in the case of the poorest 40 percent, declined. This study shows that the rising level of income inequality alone cannot explain the stagnating happiness of Americans in the past several decades.

A neo-utilitarian framework of analysis is used to evaluate the equality-efficiency trade-off in the

United States since the 1970s. Using SWB data from the GSS, the parameter of inequality aversion, ε , is estimated, which allows the calculation of the Atkinson index of inequality. Although the estimates suggest that Americans have become increasingly more inequality averse over time, the results also suggest that the concavity of the utility function cannot alone explain the stagnating happiness of Americans.

The results should be taken with caution due to several methodological problems. First, due to data availability we are not able to control for individual heterogeneity, which can bias the results (Ferrer-i Carbonell and Frijters, 2004). However, to the best of our knowledge, no longitudial dataset exists for the US that offers consistent data for the period of interest in this study. Second, the Atkinson index of inequality could be interpreted as capturing a value judgement on inequality aversion in social evaluations. This value judgement may indeed take the concavity of the utility function into account, but also many other things such as fairness considerations. It is possible, for example, that in a world in which everybody has linear utility function, for people to still care about fairness and inequality. Thus the results in section 4 should be viewed as estimating a lower bound of the inequality aversion, rather than inequality aversion itself. Finally, happiness is measured on a 3 point categorical scale. Thus, the respondents in the survey are likely facing scaling effects over a 30 year period. If they care about income and income growth, they have no other option but to recalibrate the scale downard over the time period. Nevertheless, the empirical exercise in this paper provides a way to examine the equaity-efficiency trade-off using SWB data as an alternative to more standard measures of socio-economic progress such as the Gini coefficient or economic growth that, at least, take into account the idea of inequality aversion.

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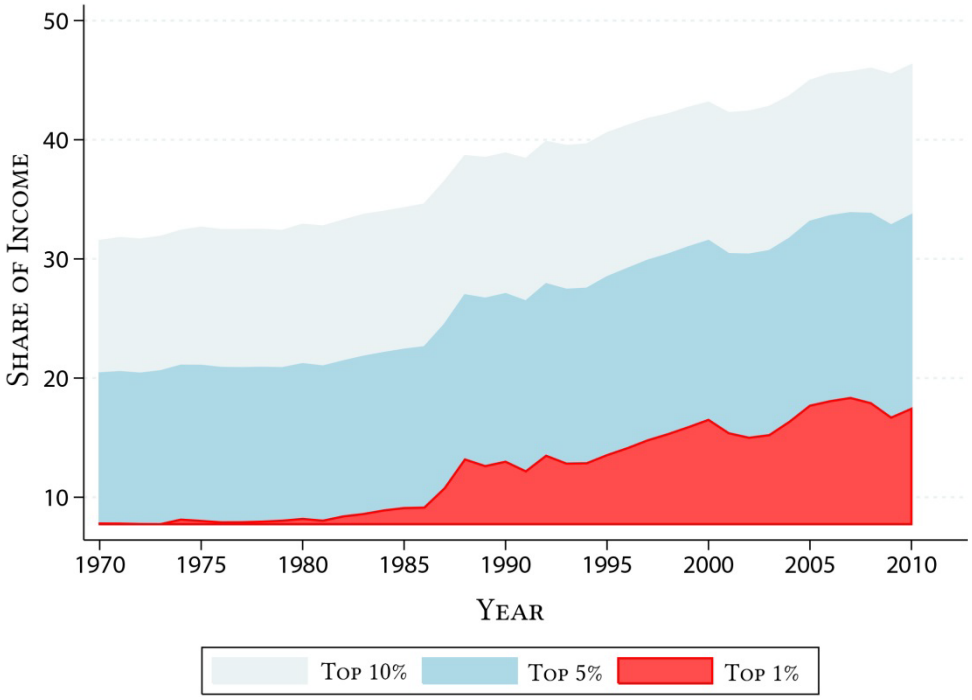
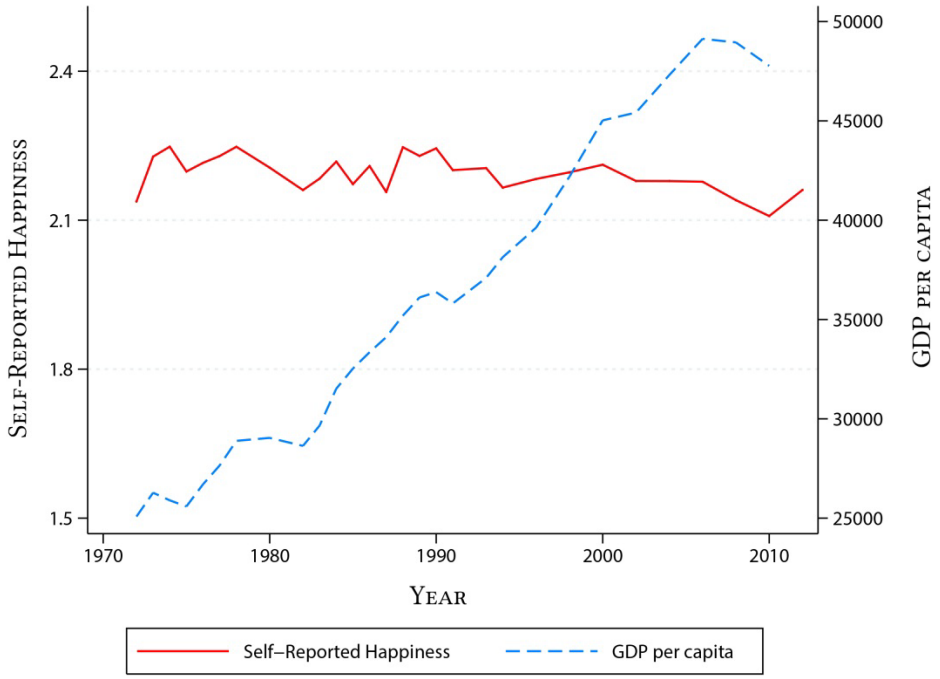
Appendix

Figure 1: Evolution of Top Income Shares in the US, 1970-2010



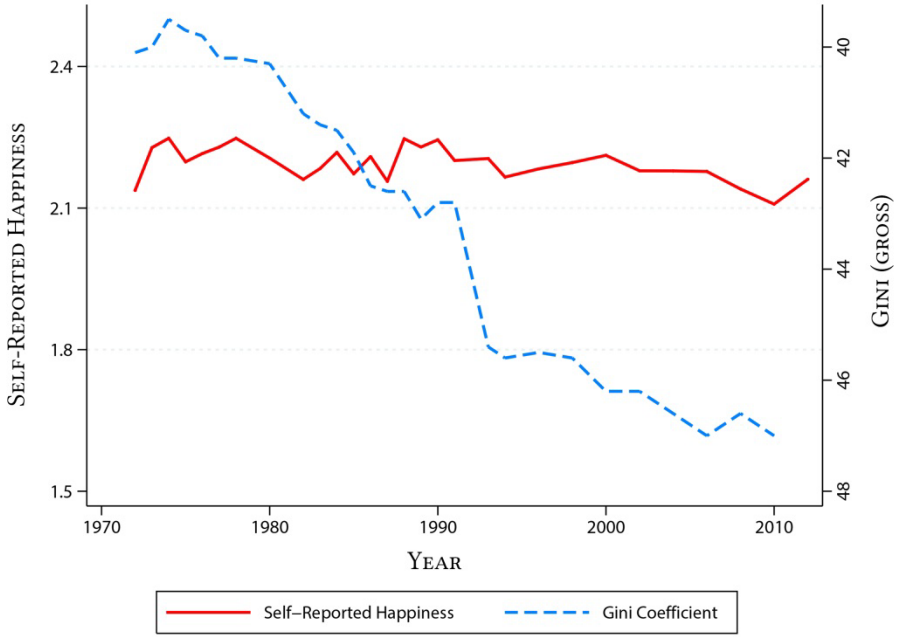
Source: Picketty and Saez (2003). Updated data series covering the period 1920-2010 can be found on the website of Emanuel Saez, Table A.3. Website: http://elsa.berkeley.edu/~saez/#income

Figure 2: Self-Reported Level of Happiness and GDP per capita in the US, 1970-2010



Note: Data on self-reported level of happiness came from the General Social Survey (GSS variable: ***happy***). Self-reported happiness represent yearly averages to the question: "Taken all together, how would you say things are these days would you say that you are very happy [3], pretty happy [2], or not too happy [1]?" Data on GDP per capita was obtained from the Bureau of Labor Statistics and represents constant 2011 dollars.

Figure 3: Self-Reported Level of Happiness and Inequality in the US, 1970-2010



Note: Data on self-reported level of happiness came from the General Social Survey (GSS variable: ***happy***). Self-reported happiness represent yearly averages to the question: "Taken all together, how would you say things are these days would you say that you are very happy [3], pretty happy [2], or not too happy [1]?" Data on GDP per capita was obtained from the Bureau of Labor Statistics and represents constant 2011 dollars. Gini represents gross gini ratios for households (all races). Data was obtained from the U.S. Department of Commerce: http://www.census.gov/hhes/www/income/data/historical/inequality/ Table H-4).

Figure 4: Mean Income, Income Inequality and Social Welfare

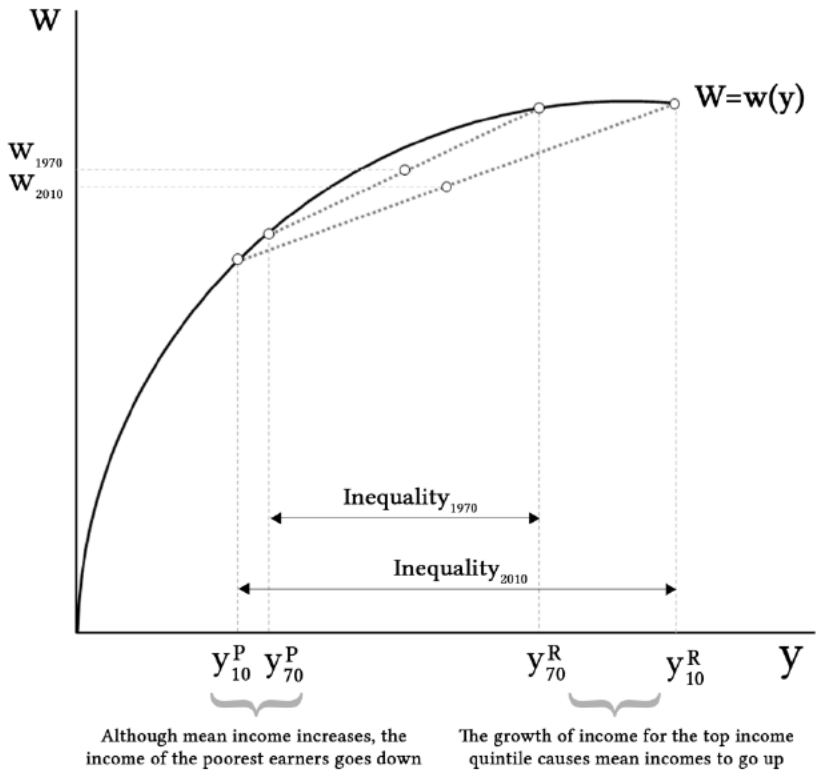
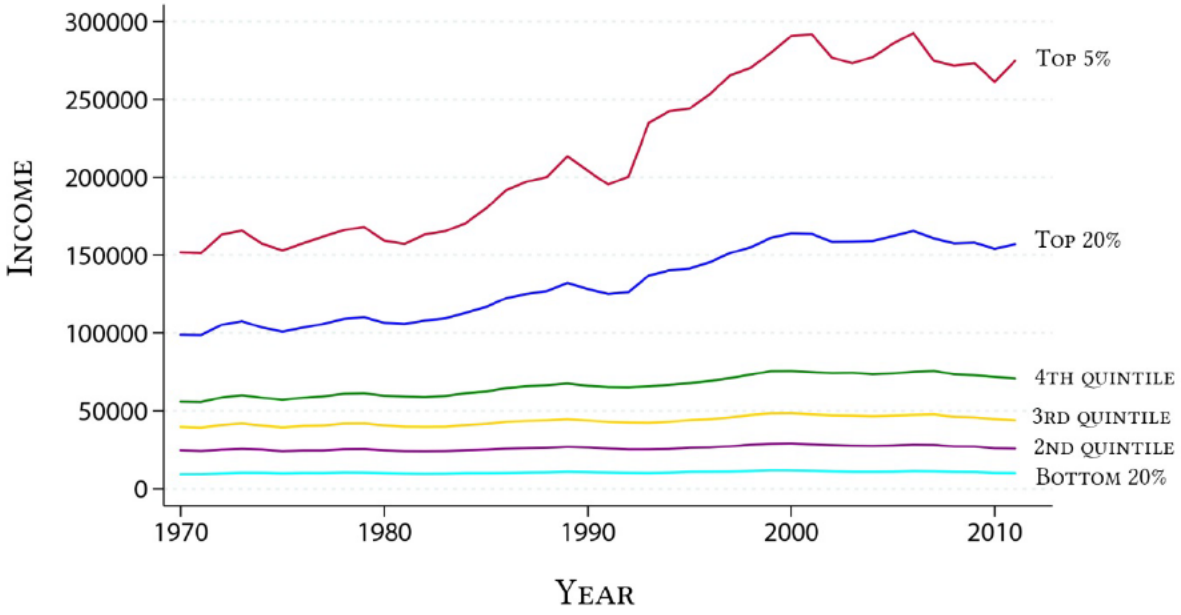


Figure 5: Mean Household Income Received by Each Quintile and the Top Five Percent



Note: "Income" represents mean quintile income. Data was obtained from the U.S. Department of Commerce: http://www.census.gov/hhes/www/income/data/historical/inequality/ Table H-3:All Races).

Figure 6: The Trade-off between Equality and Mean Income

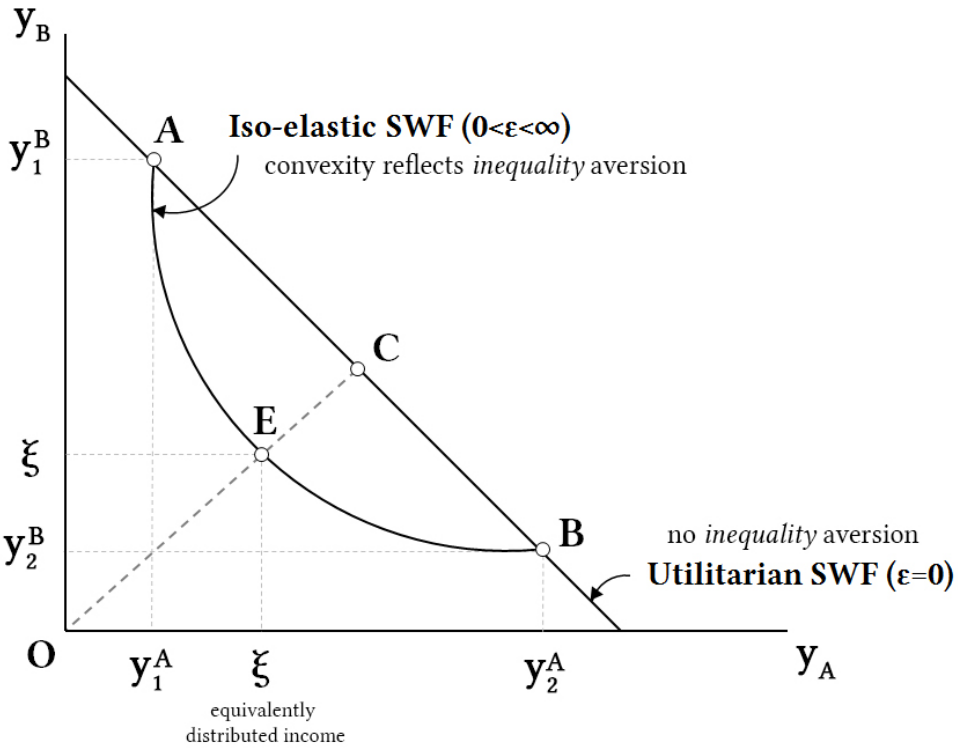


Table 1: Description and Sources of Main Variables

Micro Variables		
Happy	Data was collected with the question: "***Taken all together, how would you say things are these days would you say that you are very happy, pretty happy, or not too happy?***" (1 'not too happy', 2 'pretty happy', 3 'very happy')	General Social Survey (GSS variable: ***happy***) http://www3.norc.org/gss+website/
Income	Respondent's income (in 2005 constant dollars)	GSS variable: ***conrinc***
Trust	Data was collected with the question: "***Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people***?" (0 'can trust', 1 'cannot trust')	GSS variable: ***trust***
Fairness	***"Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair? (***0 'take advantage' and 1 'fair')	GSS variable: ***fair***
Age	Age in years	GSS variable: ***age***
Sex	Gender dummy with 0 'male' and 1 'female'	GSS variable: ***sex***
Race	Race dummy with 0 'white' and 1 'black'	GSS variable: ***race***
Marital Status	Dummies for divorced, separated, and widowed (married is the base category)	GSS variable: ***marital***
Educational Level	Dummies for high school, college, graduate school (less than high school is the base category)	GSS variable: ***degree***
Employment Status	Dummy for unemployed	GSS variable: ***wrkstat***

Table 2: Summary Statistics for Microeconomic Variables

Micro Variables	Observations	Mean	St. Dev.	Min	Max
Happiness	52321	2.19	0.64	1	3
Income	33365	31770	32367	383	434612
Log Income	33365	9.92	1.09	5.95	12.98
Relative Income (y/y*)	33365	1.27	1.29	0.02	17.38
Relative Position $(y-y^*)^2$	33365	1.09E+09	6.63E+09	0.00E+00	1.66E+11
Age	56859	45.70	17.47	18.00	89.00
Age squared	56859	2394	1761	324	7921
Female (Male is base)	57061	0.56	0.50	0	1
Black (White is base)	57061	0.14	0.35	0	1
Marital (Married is base)					
Widowed	57041	0.10	0.30	0	1
Divorced	57041	0.12	0.33	0	1
Separated	57041	0.03	0.18	0	1
Never Married	57041	0.20	0.40	0	1
Education (Less than HS is base)					
High School	56896	0.51	0.50	0	1
Junior High	56896	0.05	0.23	0	1
College	56896	0.14	0.35	0	1
Graduate School	56896	0.07	0.25	0	1
Trust	37493	0.58	0.49	0	1
Fairness	35713	0.56	0.50	0	1

Note: y^* represents the median income in the sample by year.

Table 3: Estimates for ε using a Box-Cox transformation

Subgroup	λ			Observations	ε
All subjects	0.50	(.0791)	***	30398	0.50
Women	0.49	(.0913)	***	15473	0.51
Men	0.44	(.1783)	**	14925	0.56
White	0.49	(.0791)	***	24882	0.51
Black	0.60	(.3060)	**	3965	0.40
Strong Democrats	0.50	(.1425)	***	6554	0.50
Strong Republicans	0.71	(.2427)	***	444	0.29
Age>40	0.47	(.1176)	***	13822	0.53
Married	0.43	(.1074)	***	16687	0.57
Divorced	0.59	(.1741)	***	4300	0.41
Protestant	0.47	(.0767)	***	17216	0.53
No Religion	0.65	(.1589)	***	3697	0.35
High School	0.64	(.1137)	***	16366	0.36
College	0.66	(.1753)	***	5139	0.34
Graduate School	0.03	(.1991)	***	2549	0.97
Year ≤1980	0.81	(.1917)	***	5293	0.19
1980 <Year ≤1990	0.61	(.1306)	***	8782	0.39
1990 <Year ≤2000	0.52	(.1297)	***	9427	0.48
Year > 2000	0.35	(.0928)	***	6934	0.65

Table 4: Atkinson Inequality, Equivalent Income, and Social Welfare for selected values of ε, 1974-2012

(1) Year	(2) Mean Income	(3) A (ε=.5)	(4) ξ (ε=.5)	(5) W (ε=.5)	(6) A (ε=1)	(7) ξ (ε=1)	(8) W (ε=1)
1974	$29,852	0.16	$24,977	316	0.34	$19,757	9.89
1975	$25,522	0.16	$21,407	293	0.34	$16,773	9.73
1976	$27,567	0.16	$23,208	305	0.33	$18,489	9.82
1977	$29,580	0.17	$24,492	313	0.34	$19,495	9.88
1978	$27,927	0.18	$22,997	303	0.36	$17,773	9.79
1980	$31,868	0.17	$26,317	324	0.35	$20,590	9.93
1982	$26,095	0.16	$21,903	296	0.34	$17,290	9.76
1983	$27,604	0.16	$23,175	304	0.34	$18,205	9.81
1984	$27,528	0.17	$22,911	303	0.35	$17,850	9.79
1985	$29,997	0.18	$24,727	314	0.36	$19,081	9.86
1986	$28,475	0.17	$23,744	308	0.35	$18,505	9.83
1987	$28,389	0.16	$23,757	308	0.35	$18,532	9.83
1988	$29,001	0.16	$24,461	313	0.33	$19,287	9.87
1989	$29,476	0.15	$24,987	316	0.33	$19,790	9.89
1990	$29,386	0.16	$24,686	314	0.33	$19,613	9.88
1991	$28,896	0.16	$24,242	311	0.34	$18,962	9.85
1993	$32,663	0.17	$27,067	329	0.35	$21,237	9.96
1994	$30,347	0.15	$25,776	321	0.32	$20,636	9.93
1996	$31,592	0.15	$26,923	328	0.31	$21,787	9.99
1998	$32,877	0.16	$27,633	332	0.33	$22,152	10.01
2000	$33,188	0.16	$27,781	333	0.34	$22,016	10.00
2002	$37,350	0.21	$29,345	343	0.41	$22,035	10.00
2004	$37,610	0.18	$30,807	351	0.37	$23,681	10.07
2006	$35,212	0.18	$28,889	340	0.36	$22,366	10.02
2008	$41,897	0.27	$30,740	351	0.47	$22,389	10.02
2010	$31,632	0.19	$25,523	320	0.40	$18,966	9.85
2012	$36,692	0.26	$27,060	329	0.47	$19,399	9.87