Life Satisfaction: Absolute versus Relative Income

A Study Using the Canadian General Social Survey

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Abstract

In this paper, I seek to understand the importance of absolute (personal) income versus income relative to one's neighbours in determining the level of one's life satisfaction. For this purpose, I use sample data of 9,482 individuals with incomes higher than $5,000 from the 2005 Canadian General Social Survey. I find that personal income is positively associated with one's level of life satisfaction whereas the income of neighbours (relative income) has the opposite effect and to a larger extent. My findings indicate that increasing income of Canadians from the current levels may not provide additional improvements to life satisfaction. A possible policy implication may be that raising taxes may have no negative effect on life satisfaction of Canadians.

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Section 1: Introduction

The Economics of Happiness is a branch of economics whose main objective is to investigate the characteristics, conditions, and circumstances of people's *subjective overall well-being.*

In neoclassical microeconomics, well-being, happiness, or level of satisfaction is defined through the abstract concept of *utility*. An individual uses her income to consume goods in order to maximize her utility. Utility cannot be measured directly but is inferred through one's market behaviour. It is assumed that a consumer is rational, makes fully informed decisions, and that increasing her income allows her to increase her levels of utility. In other words, income buys utility; see for example chapters 1 – 3, Mas-Colell et al. (1995).

Since income (tangible) is assumed to be very closely associated to utility (intangible), and since it can be measured objectively, a large part of economics is concerned with *economic growth* (Barro and Sala-i-Martin 2004, p. 6) which essentially refers to real income growth. Economic growth has become a major objective for governments around the world. In fact, the Gross Domestic Product (GDP) has become the most closely watched indicator of a country's economic performance (Mankiw et al. 2006, p. 94).

The assumption that income buys utility leads to an elegant mathematical description of human behavior in the neoclassical microeconomic model. But despite its elegance, this model may be too simplistic to provide an adequate representation of the link between

human behavior and utility. To illustrate, when representing an individual, this model does not take into consideration the following factors:

(i) Relativism

(ii) Adaptation

(iii) Irrational behavior

(iv) Partial information

Relativism refers to the fact that a person makes comparisons when assessing her level of utility. Relativism comes primarily in two forms. It may occur towards others: a person's satisfaction often depends on how well she *ranks* relative to others (Easterlin 1974, Clark and Oswald 1996, Luttmer 2005). It may also occur towards one's own past experiences: past successes often tend to increase one's expectations (Stutzer 2004).

Adaptation means that one's level of satisfaction tends to return to some previous state, despite the initial "excitement" from acquiring a new good (Kahneman and Thaler 1991, Stutzer 2004). Adaptation acknowledges that a person's satisfaction varies with time.

Irrational behaviour occurs when a person chooses to satisfy an immediate craving knowing well that it is detrimental to her health and overall well-being (Ahuvia 2008). For example a drug or gambling addict is often incapable of rationally controlling her behavior and may seek external sources for help such as medication or counseling.

Partial information means that a person is not fully informed when making an economic choice such as purchasing a good (Ahuvia 2008).

These four important elements are largely neglected by neoclassical microeconomic models for the sake of simplicity. However, in practice, they influence decision making and hence, utility. Thus, instead of inferring utility from a person's behavior, an alternative approach would be to ask directly how an individual rates her *own* level of utility, for example, by asking how she rates her overall *life satisfaction*. This is the approach taken by Happiness Economics: a subjective approach.

Analyzing subjective data is important as it provides valuable insights on human well-being. The subjective approach can be seen as complementary to the objective (behavioral) approach in this study. Moreover, the subjective approach may give insights on the extent to which basic microeconomic assumptions are representative of human nature.

In this paper, I focus on the importance of relativism towards others on utility. More precisely, I attempt to understand to what extent absolute (personal) and relative income matter to *self-assessed* life satisfaction of Canadians. My study is based on data of adult Canadians from Cycle 19 of the General Social Survey taken in 2005. I measure relativism based on the average income of a neighbourhood to which an individual belongs.

I find that at current levels of income, the average income of neighbours matters more to self-reported life satisfaction than one's own personal income. As one will see later, my model predicts that an increase of everyone's income by the same proportion would

decrease the levels of satisfaction of the population. Thus, relativism towards others is a very important factor related to one's level of utility or satisfaction. My study gives an insight on how Canadians assess their life satisfaction based on comparison with the incomes of their physical neighbours. To the best of my knowledge, a study of the importance of relative income of Canadians based on physical neighbourhoods has not been conducted before so it would be interesting to see what conclusions one may extract in the Canadian context on this subject. I consider this study important for two reasons. Firstly, comparing the results of a Canadian study on life satisfaction to studies performed in other countries allows understanding the similarities and differences between the various populations. Secondly, any Canadian policy which uses life satisfaction research needs results from Canadian data.

The next section provides a review of the literature related to life satisfaction, and in particular, relativism. Section 3 describes the data used, some of its basic characteristics, and provides details about the construction of the variables. Section 4 discusses the model; Section 5 examines the results; Section 6 examines some sensitivity of the conclusions to change in scale of the dependent variable, life satisfaction; Section 7 examines the results under a different definition of neighbourhoods: provinces; while Section 8 analyzes an expanded model which includes working-hours predictor variables.

Section 2: Literature Review

Happiness economics is generally interested in the variables and conditions which correlate with or affect *self-assessed* happiness or life satisfaction. Some concerns have

been raised as to whether self-assessed life satisfaction accurately measures levels of utility. For example, individuals may tend to provide socially acceptable answers in an attempt to look good in front of an interviewer (Di Tella and MacCulloch 2006, Wilkinson 2007). Despite such concerns, answers to questions on subjective life satisfaction appear to provide robust and reliable indicators of how an individual truly feels about her life (Dolan and White 2007). Such indicators have been generally trusted and used for many years by psychologists (Diener et al 1999).

In this study, I focus on the relationship between absolute (personal) income, relative income with respect to neighbours, and self-assessed life satisfaction.

Richard Easterlin (1974) was the first economist to empirically study levels of self-reported life satisfaction over time in his classic "*Does Economic Growth Improve the Human Lot? Some Empirical Evidence*". He examines time-series data from the United States between 1946 and 1970 and concluded that, despite a steady GDP increase over this period, people's self-reported life satisfaction had not improved. As a possible explanation, Easterlin suggested that, beyond the satisfaction of basic needs, people's relative income is a more important determinant of life satisfaction than their absolute income. Following Easterlin's observation, economists have gradually become interested in testing whether relative income with respect to a reference group influences individual life satisfaction. I now examine several recent studies which specifically address the question of relative income.

The study by Clark and Oswald (1996) examines the hypothesis that utility depends on income relative to a reference level. They consider cross-sectional data of 5,000 British workers, using the question: "*all things considered, how satisfied are you with your present job overall, using the same 1 – 7 scale*?" They collect data on personal income, and construct a relative income variable based on the predicted conventional earnings for an individual based on her characteristics (education level, age, gender, etc.). The relative income variable is constructed using both the survey data and also using external data, in order to test stability of the conclusions. Using an order probit estimation, they conclude that relative income based on other individuals with similar characteristics is significantly and negatively correlated with satisfaction at work. It is mentioned that ordinary least squares (OLS) estimation yields essentially the same conclusions as ordered probit.

The study by Ferrer-i-Carbonell (2005) examines German panel data of 16,000 individuals to test the importance of absolute income and income relative to a reference group, using the question: "*And finally, we would like to ask you about your satisfaction with your life in general. Please answer using the following scale, in which 0 means totally unhappy, and 10 means totally happy. How happy are you at present with your life as a whole?*" In this study, absolute income refers to family income, and relative income is constructed as the average income of a reference group, consisting of all individuals living in the same region (of a total of 50) and belonging to the same age bracket (of a total of 6). The study uses ordered probit estimation and includes time effects to take into account the panel nature of the data. It concludes that relative income has a significant and negative effect on life satisfaction to about the same magnitude as absolute family

income. In particular, increasing everyone's income by the same proportion is predicted to have no net effect on the average life satisfaction of the population.

The study by Luttmer (2005) examines panel data of 10,000 married individuals (including both spouses) to test whether people's relative income matters in the assessment of their own life satisfaction. Life satisfaction is measured on a scale of 1 – 7, and is based on the question: "*Next are some questions about how you see yourself and your life. First taking all things all together, how would you say things are these days?*" The study constructs relative income based on the average earnings of neighbours, estimated using external data sources. The neighbourhoods are relatively small geographical regions containing 150,000 inhabitants on average. Both OLS and ordered probit estimates are used, incorporating the answers of both spouses. The study concludes that higher earnings of neighbours are significantly and negatively associated with self-reported life satisfaction. Moreover, a variety of different estimations are used, for example including and excluding various characteristics, to ensure stability of the conclusions.

Other studies such as the ones conducted by McBride (2001) and Stutzer (2004) also indicate that life satisfaction is strongly influenced by relative income. Generally, all the cross-sectional or panel studies that I have encountered on relative income and self-reported life satisfaction contain significant differences: in the types of data used, in the phrasing of the life-satisfaction question, in the scale of life-satisfaction, and in the construction of the relative income variable. Nevertheless, these studies also have some

key common feature: they all use the *log* of absolute and relative incomes, they all suggest that ordered probit and OLS estimation yield essentially the same conclusions, and they all report that relative income with respect to a reference group has a significant and negative impact on self-reported life satisfaction.

The conclusion that relative income is important on life satisfaction is also supported by some laboratory experiments and questionnaires. For example, Oswald and Zizzo (2001) conduct an experiment where participants independently receive unequal amounts of money either through betting or through undeserved (computer generated) gifts. At a later stage, participants are given the possibility to reduce the incomes of others by "burning" some of their own money. The experiment finds that two thirds of the subjects spend, at one time or another, parts of their own money to decrease the incomes of others.

On a similar note, Layard et al. (2009) reports of a survey performed among a group of graduate students at Harvard. The survey asks whether they prefer living in a world where they get $50,000 per year while others get $25,000, or in a world where they get $50,000 while others get $100,000, all prices kept constant. The majority of respondents prefer living in the first type of world.

The studies and experiments above seem to clearly indicate that relative income is an important factor in assessing one's own life satisfaction. However, there have also been studies which appear to contradict these conclusions. Deaton (2008), and Wolfers and Stevenson (2008) argue that if relative income were more important than absolute

income, then poor countries would be as satisfied as rich ones. Performing large cross-sectional studies using average country data, these studies indicate that richer countries are clearly more satisfied than poorer ones, suggesting that absolute rather than relative income increases the level of life satisfaction.

The type of data used, personal or country, seems to strongly influence the conclusions in the above studies. Studies suggesting that relative income is very important for life satisfaction only consider data from developed countries (typically UK, USA and Germany). While those suggesting that absolute income matters most consider data from a wide spectrum of countries, both rich and poor and use country averages to support their conclusions.

In this review, I have examined some literature related to absolute income, relative income and life satisfaction. In the remaining part of the text, I include some additional references related to variables other than income. These are not included in the current review.

Section 3: Data

The data for this study is taken from the Canadian General Social Survey (GSS). The GSS is conducted by Statistics Canada to gather data on social topics in order to track changes in the living conditions and well-being of Canadians over time. Cycles from different years cover specific topics such as Personal Risks (Cycle 3), Social and Community Support (Cycle 11), Aging and Social Support (Cycle 16) and Family

Transitions (Cycle 20). For this investigation, I use data from the GSS Cycle 19 on Time Use which was conducted in Canada from January through December 2005.[1] The target population for Cycle 19 was non-institutionalized individuals aged 15 and above, living in the ten provinces, excluding the residents of Yukon, the Northwest Territories and Nunavut. Despite the exclusion of these three regions, the sample is still a good representation of the Canadian adult population since only approximately 0.32% of the Canadian population belongs to these areas.[2] The overall response rate for GSS Cycle 19 was 58.6% (GSS Cycle 19 User's Guide, p. 11).

I chose the GSS Cycle 19 because it is one of the most recent datasets available and relevant if one would develop policies meaningful to current trends. Moreover, it contains information on life satisfaction, income, other personal characteristics, and most importantly neighbourhood information in the form of postal codes. Other surveys in the GSS cycles are missing vital variables, notably life satisfaction and postal codes. Due to the scarcity of postal-code and life-satisfaction information, I focus my study only on one data set: the GSS Cycle 19.

I now describe the variables used in my study. The dependent variable is life satisfaction, and the regressors of interest are: log of personal income, log of the average income of the neighbours, gender, age, marital status and education. The restrictions placed on these

[1] The specific data used in my analysis was taken from the confidential files of Statistics Canada and required the agency's permission and approval for use.
[2] This figure is calculated from the data available from the 2006 Statistics Canada Census which took place only a year after the GSS cycle 19 was executed.

variables, leading to my effective sample, are given at the end of Section 3. Descriptive statistics of these variables are summarized in Table 1.

Life Satisfaction is the dependent variable and is my measure of subjective well being. It is the response to the question: "*Using the same scale, how do you feel about your life as a whole right now?*" (GSS Cycle 19 User's Guide, p. 502). Life satisfaction is ordered from 1 to 10 with 1 indicating very dissatisfied and 10 indicating very satisfied. Figure 1 shows a histogram of the self-reported life satisfaction of Canadians in my effective sample.

Figure 1: Life Satisfaction of Canadians on a scale 1 – 10

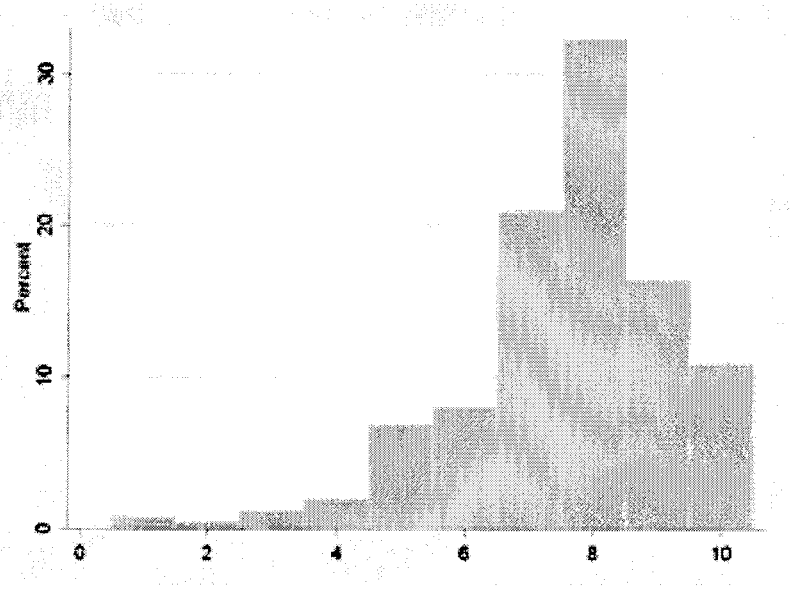

Figure 1 shows that Canadians appear to be overall satisfied with their lives, with only a small proportion (less than 20%) reporting a value smaller than 7. The average reported value for life satisfaction is 7.58 with standard deviation of 1.66.

Absolute income, or ***personal income***, is a continuous independent variable denoting the total annual income, from all sources, of respondents from $0 to $1,000,000 (GSS Cycle 19 User's Guide, p. 272). The cap is reasonable in that individuals having extremely high incomes are rare. This cap is also less likely to distort results due to outliers. The reported average value in the effective sample is $45,114 with standard deviation of $41,022.

My choice of income variable is by no means the only valid approach to this study. Another type of income which may be appropriate is household income. For example, if one spouse of a household earns a very high salary, the other spouse may choose to work less and earn less without affecting her levels of life satisfaction. In such cases, using household income may appear more appropriate. Despite some advantages over personal income, household income also introduces many additional complications such as the challenge of properly treating or defining the household size inside the model: Many divorced parents share custody of their children. Is there a difference in life satisfaction between a spouse who works and a spouse who doesn't? To avoid all these additional complications, I choose to conduct my study using personal income. This is the simplest and most straightforward income measure.

Most studies on subjective well being, such as the ones by Luttmer (2005), and Layard et al. (2009), work with the *log of income* rather than income itself because the log of income is a better predictor than the unmodified variable. This comes from the observation that the slope of life satisfaction plotted against income decreases as income increases. This behaviour occurs in all studies that I encountered and can also be observed in Table 1. It is possible that *log* is not the perfect modeling variable.

Nevertheless, it captures the decrease of the slope, it is easy to interpret, and it allows extracting meaningful conclusions. Thus, I use the log of income for my analysis. The regression coefficient of log of income indicates how a percentage change in income would modify the expectation of the life satisfaction variable in absolute terms.

Average Income of a Reference Group denotes the average income corresponding to a reference group in which an individual belongs and with respect to which she is likely to compare herself. Reference groups may be constructed based on various characteristics such as gender, age, level of education, and physical neighborhoods. In this study, I consider only one type of reference group based on *physical neighborhoods* as performed in Luttmer (2005). My purpose is to understand the extent to which physical neighbours influence individual life satisfaction.

To construct a physical neighborhood, I extract the postal code for each individual. The Canadian postal code consists of 6 characters. The first character divides Canada into regions; the second one divides each region into further sub-regions and so on. To illustrate, postal codes beginning with 'T' correspond to the province of Alberta; postal codes beginning with 'T5' or 'T6' correspond to Edmonton, Alberta; postal codes beginning with 'T5J' correspond to North Downtown, Edmonton, Alberta.

I only consider neighborhoods based on the first two characters of the postal code. These correspond to large geographical regions for rural areas and small regions for urban areas. For example, the city of Ottawa is divided into 5 different sections according to the first

two digits of the postal code. There are 190 neighborhoods in Canada according to this criterion. Such a grouping yields small enough neighborhoods to provide a likely reference point for individuals, while being large enough relative to my sample size of 9,482 (which is discussed later). To construct a meaningful relative income of the neighbours each neighbourhood needs to have at least two respondents. There are 134 neighbourhoods (from the total of 190) that satisfy this criterion and only these are considered. The average number of respondents in the considered neighborhoods is 135. Groups based on the first 3 digits of the postal code yield too small neighborhoods relative to my sample size, whereas groups based on the first digit alone are too large, roughly comparable to province-sized areas.

For each respondent, I construct relative income of reference group as the average personal income of all her postal-code neighbours. The calculation excludes the income of the respondent herself. In my analysis, I use the *log* of this variable, as in the case of the personal income variable. This allows me to understand how a percentage change of the income of neighbours affects an individual level of satisfaction in absolute terms. This also allows to readily compare the effects of personal income and relative income of neighbours on life satisfaction.

I now examine the control variables related to some important characteristics of the population which are likely to influence life satisfaction.

Gender is split into males and females (GSS Cycle 19 User's Guide, p. 308). There are slightly more females than males in our sample (Table 1). Females reported a barely higher life satisfaction than males (Table 1), but it is unclear before performing regressions whether the difference is significant.

Age is categorized into 4 groups corresponding to 10 year interval blocks (GSS Cycle 19 User's Guide, p. 307). I only consider individuals from 25 to 64 years old because this is the age range corresponding to the Canadian working population. Young individuals as well as those in retirement tend to have somewhat different characteristics from the rest of the working adults and may not be preoccupied much by income. Table 1 indicates that each of the 4 groups is well represented. Moreover the relationship between life satisfaction and age appears to be U-shaped: individuals aged 25 – 34 and 55 – 64 are more satisfied than those in the middle-aged groups.

Marital status is represented in 6 different categories: married, common-law, widowed, separated, divorced, and single (GSS Cycle 19 User's Guide, p. 308). For the purpose of my study, I did not distinguish between married and common-law couples, as well as between divorced and separated individuals. I combined these groupings as they are highly likely to exhibit similar characteristics. Table 1 shows a large variability in the proportions of each group, with married or common-law individuals forming the largest group by far. Nevertheless, each category has enough representatives to give meaningful results. From Table 1, married and common-law respondents report the highest life

satisfaction, with an average value of 7.85, while separated or divorced individuals report the lowest, with an average value of 6.98.

Education denotes the level of education of an individual in one of five categories (GSS Cycle 19 User's Guide, p. 532). *Some school* refers to individuals who have done little or no schooling and have not obtained a high school diploma. *High school diploma* refers to individuals who have obtained a high school diploma but have not done any further studies. *College diploma* refers to individuals who have obtained a degree from a college. *Some university or college* refers to individuals who have done some college or university but have no college or university diploma. Finally, *bachelor or masters or Ph.D.* refers to individuals who have obtained a university diploma. Table 1 lists each of the five categories, indicating that each is well represented in the sample. Individuals with a higher completed degree report higher life satisfaction. However, individuals with uncompleted degrees are associated with a lower life satisfaction. For instance, those with a high-school diploma are more satisfied than those who tried going further without completing their higher degree.

Other variables may also be relevant to this study. I discuss some of these in Section 8. Generally, if a missing variable is not correlated with life satisfaction (dependent variable) or not correlated with log of income, it will not change my conclusions in any way. On the other hand, if a missing variable is correlated to both life satisfaction and log of income, then my current results might be biased.

Effective Sample

The effective sample corresponds to individuals who responded to all questions in my study together with several other restrictions. For my analysis, I only consider individuals aged 25 – 64 with incomes above $5,000 because I am mostly interested in the working population for whom income is an important variable related to life satisfaction. Preliminary experimentation shows that individuals with incomes below $5,000 report a higher average life satisfaction (7.65) than those with incomes above $5,000 (7.58). Thus, individuals with very low incomes are in fact slightly more satisfied than the rest. This indicates that their personal incomes are probably supplemented by other sources and do not play a significant role in determining their life satisfaction. This group could comprise of students, people on maternity leave, and others who are not mainly preoccupied by work or income. For people having very low personal incomes, log of income does not appear to be positively correlated to life satisfaction. Also, $\log(0) = -\infty$, and, generally, the *log* function is sensitive for values of income close to zero. Thus I have decided to remove from my sample individuals whose income is close to zero. The value $5,000 may seem somewhat arbitrary, but it was chosen since it corresponds to the lowest positive income grouping of the categorical income classification of the GSS Cycle 19.

Furthermore, I remove all individuals who did not respond to any one of the variables discussed above. Almost all of the non-response (more than 90%) comes from missing the income variable which is not surprising due to the sensitivity of the question. Finally, I eliminate all individuals (13 in total) who are the only respondents in their respective

physical neighborhoods because it is impossible to construct an average income of neighbours for them.

Summarizing, the total number of respondents in the age group 25 – 64 is 13,519. From these, 910 are removed because they belong to the group with annual income $5,000 or less: 702 having zero income and 208 having positive annual income up to $5,000. From the remaining group, 2,835 individuals are removed because they did not respond to the income variable and another 61 individuals are removed because they did not answer to marital status, education or life satisfaction. The effective sample I work with due to the restrictions and non-response described above is 9,482. This corresponds to 70.1% of the respondents in the age group 25-64. From now on, the word "sample" will refer to my effective sample of 9,482 respondents.

Table 1 in Appendix A presents some descriptive statistics of the variables in my study for my effective sample.

Section 4: The Model

To analyze the impact of absolute and relative incomes on self-reported life satisfaction, I use the following model:

$$\textbf{Life Satisfaction} = \alpha_0 + \alpha_Y \log(Y) + \alpha_R \log(Y_R) + X\beta + \varepsilon. \qquad (1)$$

I omit indices from (1) for simplicity. For an individual, log(Y) represents the log of her absolute income, $\log(Y_R)$ denotes the log of the average income of her neighbours, while

X contains her other general characteristics: gender, age group, marital status, and level of education. The α terms are scalar coefficients whereas β is a vector of coefficients corresponding to the general characteristics.

To analyze (1) I use an ordinary least squares approach (OLS) as done in studies by Stutzer (2004), Luttmer (2005) and others. Since the dependent variable is ordered and categorical, the ordered probit model may be more appropriate as it takes better account of the possible non-linear relationship between predictors and dependent variable. Nevertheless, I use the linear regression model because it allows me to more easily interpret the results and appears sufficient for the analysis. Running an ordered probit model does not appear to give additional insights into my conclusions.

The general characteristics of a respondent are described by categorical variables which I represent by dummies. The reference groups are: *male* for gender, *25 – 34* for age, *single* for marital status, and *some schooling* for education. In the analysis of (1), I examine several sub-models to see if the coefficients of absolute and relative income exhibit large changes as I build the model progressively. I look at the following:

- Model (1a): considers log(Y) and $\log(Y_R)$ alone
- Model (1b): considers log(Y), $\log(Y_R)$, gender, age, education
- Model (1c): log(Y), $\log(Y_R)$, gender, age, education, marital status (full model)

I also tried expanding model (1) by including interaction terms (female with log(Y), and female with $\log(Y_R)$), but these yield insignificant coefficient estimates and do not

improve the predictability power of the model (R-squared). Thus I do not report the results.

In Sections 6, 7, and 8, I investigate some variations of Model (1) to ensure that my conclusions are not too sensitive to some changes in the manipulation of data. For the interested reader, Appendix B provides additional regression results. Note that all observations are not weighted since adding weights is not likely to make my estimates more representative of the Canadian population due to the restrictions made.

Section 5: Results and Discussion

The results from the OLS analysis on models (1a), (1b) and (1c) are given in Table 2. To indicate the importance of each variable in the regression, I use the usual notion of statistical significance at 10%, 5% and 1%, occasionally accompanied by specific p-values. Sometimes, I also use the complementary measure of *effect size* as an indication of the strength of relationship between a given predictor and life satisfaction, with values of 0.2, 0.5 and 0.8 indicating small, medium, and large effect sizes respectively (Kenny 1987). Since the standard deviation of life satisfaction of my sample is 1.66 (given in Table 1), small, medium and large effect sizes are given by 0.33, 0.83 and 1.33 respectively. The p-values and effect sizes are given only in the main text.

General Characteristics

The full Model (1c) in Table 2 gives a coefficient for the female dummy of 0.240 which is significant even at the 1% level. This means that a female is predicted to have a higher

level of life satisfaction by an expected amount of 0.240 than a male, all other characteristics being equal. Although this coefficient is highly statistically significant, the effect size is small. The conclusion that women are more satisfied than men appears clear in my sample although the literature that I have encountered provides contradictory evidence on the effect of gender on life satisfaction. For example, Alesina et al. (2004) report that women are more satisfied than men, Clark and Oswald (1994) report the opposite, while Luis and Zhao (2002) report no gender differences.

Age also appears to be associated to life satisfaction with all groups having significant coefficients, although the effect size is again small. This relationship between age and life satisfaction appears U-shaped: as an individual moves from the reference age group 25 – 34 to the next, her life satisfaction decreases with the lowest point at age group 45 – 54 and finally, life satisfaction increases at age over 55. This U-shaped relationship is consistent with the findings of Gerdtham and Johannesson (2001), and Blanchflower and Oswald (2004a).

The results on education are somewhat surprising. They indicate that educated individuals are not much more satisfied than ones with little or no schooling. For example, those with high school or college diplomas give respective coefficients of 0.143 and 0.119 which are only significant at the 5% level, whereas those who have pursued university studies either without completion or with bachelor, masters or PhD are not significantly more satisfied than individuals with little or no schooling. My findings are consistent with the study of Stutzer (2004) which indicates that middle levels of

education report highest life satisfaction. However, this conclusion is not unanimous in the literature since other studies, such as the one by Blanchflower and Oswald (2004b), have found that life satisfaction increases with education.

The results for marital status suggest that married or common law individuals have the highest levels of life satisfaction, followed by singles and widowed individuals, while separated or divorced are least satisfied of all. For example, the coefficient of married individuals in Model (1c) in Table 2 is 0.562 and is significant even at the 1% level. This indicates that as an individual's marital status changes from single to married her predicted life satisfaction increases by 0.562, all other characteristics being equal. Similarly, a separation or divorce predicts a change of life satisfaction of -0.278 relative to the single marital status; while a widowed status predicts essentially the same life satisfaction as the single status. Effect sizes for marital status groups are higher than those for gender, age or education. My results on the relationship between marital status and life satisfaction are consistent with the findings of Blanchflower and Oswald (2004a).

It is interesting to note that the coefficients of gender, age and education do not vary much from Model (1b) to Model (1c) indicating that the models are somewhat stable relative to these control variables.

Income

From Table 2, α_Y is positive and highly significant whereas α_R is negative and highly significant in all three models, with modest effect sizes (small to medium). These results

indicate that although higher income increases one's life satisfaction, higher income of one's neighbours yields the opposite effect. For example in Model (1c), $\alpha_Y = 0.341$ and $\alpha_R = -0.534$, both significant at the 1% level. Thus a 10% increase of personal income predicts an expected change of life satisfaction of $0.341*\log(1+10\%) \approx 0.341*10\% = 0.0341$ whereas an increase in the neighbours' average income by 10% predicts a change of life satisfaction of $-0.534*10\% = -0.0534$. My findings indicate that the income of neighbours is an important determinant for one's life satisfaction. These findings are consistent with the study by Luttmer (2005).

The coefficients α_Y and α_R and their standard errors are very similar in magnitude in Models (1a) – (1c) of Table 2. That is, these values are not much influenced by the other control variables in the regression indicating stability of the coefficients α_Y and α_R.
Observe that α_R has a larger magnitude than α_Y in all models of Table 2. This has the following interesting implication: if one changed the income of all individuals in the sample by a small percentage p, then log(Y) would become

$$\log((1+p)Y) = \log(1+p) + \log(Y)$$

and $\log(Y_R)$ would become

$$\log((1+p)Y_R) = \log(1+p) + \log(Y_R).$$

Thus personal income would change life satisfaction of an individual by $\alpha_Y \log(1+p)$, whereas income of neighbours would change life satisfaction by $\alpha_R \log(1+p)$. Therefore

the new predicted value for life satisfaction using for the coefficients from Model (1c) would change by

$$\Delta \text{ Life Satisfaction} = (\alpha_Y + \alpha_R) \log(1+p) \approx (\alpha_Y + \alpha_R)p = -0.193p \qquad (2)$$

where the approximate equality follows from the Taylor series expansion (with error at most $(\alpha_Y + \alpha_R)p^2/2$). The expression $(\alpha_Y + \alpha_R)$ represents the effect of changing income of the whole population on individual life satisfaction. A hypothesis test on $(\alpha_Y + \alpha_R)$ against zero reveals that this estimator is negative with p-value of 0.02. Therefore I consider the value -0.193 to be statistically significant.

As an example, if all incomes in the population are increased by p=10%, the model predicts an expected change of life satisfaction of -0.193*10% = -0.0193 for each individual. This means that at current levels of income, increasing everyone's income simultaneously by the same proportion would yield an overall negative effect on life satisfaction of the population. That is, relative income appears to be more important than absolute income at current levels. Conversely, decreasing everyone's income simultaneously by the same proportion predicts a positive effect on life satisfaction of the population. Could this mean that individuals are willing to pay to reduce the incomes of others around? My findings seem to suggest so. This conclusion, although contrary to economic intuition, is consistent with experimental lab findings by Oswald and Zizzo (2001). A possible policy implication could be that increasing income taxes simultaneously by the same proportion would increase overall life satisfaction of the Canadian population!

Section 6: Sensitivity to Change in Scale of Life Satisfaction

In this section, I seek to understand whether a different scaling of the dependent variable, life satisfaction, might change some of the conclusions from Section 5. I perform the same analysis as for Model (1) but only considering two levels of life satisfaction. I denote this by Model (2) and split it into parts (a), (b) and (c) in the same way as Model (1). Since the median value of life satisfaction is 8, I take values of 1 – 7 as ***unsatisfied*** and values 8 – 10 as ***satisfied***. For descriptive purposes, I include the proportion of satisfied individuals for each control group in the last column of Table 1.

The results from the OLS analysis on models (2a), (2b) and (2c) are given in Table 3. I briefly discuss the results of the full model (2c). The coefficient for females is 0.056, significant at the 1% level, indicating that, all other characteristics kept equal, a female is predicted to have a higher life satisfaction than a male by an *expected* value of 0.056 on the binary 0 – 1 (unsatisfied – satisfied) scale. Another interpretation of this coefficient for the binary scale is that a female is 5.6% more likely to report being satisfied than a male, all other characteristics being equal. The coefficients of all other control variables may be interpreted in a similar fashion. Table 3 shows the U-shaped curve relating age and life satisfaction, with the middle-aged groups 35 – 44 and 45 – 54 exhibiting lower life satisfaction than the extreme groups 25 – 34 (reference) and 55 – 64. For education, those with high-school or college diplomas are more satisfied than those with little or no schooling (reference) and those having pursued university studies. Finally, Table 3 shows that married individuals are most satisfied of all marital-status groups, followed by singles (reference) and widowed, followed by separated or divorced.

Concerning income, the last column of Table 3 gives $\alpha_Y = 0.077$ and $\alpha_R = -0.132$, both values significant at the 1% level. Also $\alpha_Y + \alpha_R = -0.055$ also highly significant with p-value of 2.8%, from hypothesis testing, indicating that a proportional overall increase in income of the population predicts a decrease in the expected life satisfaction for this population. In other words, a proportional overall increase in income of the population decreases the probability that an individual would report being satisfied. The results of Table 3 yield essentially the same conclusions as those of the original model in Table 2, although the scale of the dependent variable is different. Therefore, the discussion and conclusions which I gave for my original Model (1), in Section 5, appear to be stable to a change of scale in the dependent variable: life satisfaction.

Section 7: Sensitivity to Changes in Neighbourhood Information

In this section, I examine the sensitivity of my previous conclusions as the information about neighbourhoods changes. For this purpose, I look at two models. Firstly, I look at a model where the neighbourhood information is *completely missing*. Secondly, I look at a model where a neighborhood is defined by a *province* rather than by a two-digit postal code.

Model (3) is identical to my original Model (1), except that neighbourhood information is excluded. The results of the OLS regression are given in Table 4. Comparing tables 2 and 4 shows that the coefficients of the full models (1c) and (3c) do not vary by much in value or significance. For example, the coefficient for female in Model (1c) is 0.240, while the corresponding coefficient in Model (3c) is 0.226, both significant to the 1%

level; a similar observation can be made for all the general individual characteristics. Concerning income, $\alpha_Y = 0.341$ in Model (1c) is not too different from $\alpha_Y = 0.310$ in Model (3c), both significant at the 1% level. Thus, including neighbourhood information in the model improves predictability of life satisfaction but has almost no affect on the rest of the coefficients in the regression. In particular, absolute and relative income appear to have a somewhat independent effect on life satisfaction.

Model (4) is identical to the original Model (1), except that neighbourhood information is now defined with respect to provinces rather than postal codes. The results of the OLS regression are provided in Table 5. Comparing tables 2 and 5 shows that the coefficients of the general individual characteristics do not change very much for the full models (1c). For example, the coefficient of females takes the value 0.240 in Model (1c) and 0.238 in Model (4c), while the coefficient of married takes the value 0.562 in Model (1c) and 0.564 in Model (4c), all significant at the 1% level. The coefficients of all general characteristics are very close to each other, both in value and significance for models (1c) and (4c). Moreover, $\alpha_Y = 0.341$ in Model (1c) is extremely close to $\alpha_Y = 0.347$ in Model (4c), both significant at the 1% level.

The only major difference between the two regressions is the coefficient corresponding to income of neighbours. In Model (1c), $\alpha_R = - 0.534$, whereas in Model (4c), $\alpha_R = - 1.128$. The value of α_R in Model (4c) confirms that income of neighbours is important for assessing one's level of life satisfaction. However, I find the magnitude of the α_R in Model (4c) surprisingly high. One would expect that large regions such as provinces

provide only a crude point of neighbourhood comparison, so that relativity should not be as important as for small regions such as those given by two-digit postal codes. Hence, I find the results in Table 5 counterintuitive. In my study, taking provinces as neighbourhoods appears to magnify the importance of income relativity.

Summarizing, relative income measured with respect to neighbours seems to be an important determinant for life satisfaction, but the coefficient of relativity appears to be sensitive to the definition or perhaps the size of neighbourhoods. Media might be contributing to making large neighbourhoods appear small. In Canada, provinces may constitute natural neighbourhoods because they are somewhat segregated by ethnicity make-up, language, ideology, culture, government policies and taxation. Further investigation is needed to understand how to define a "good" neighbourhood in Canada.

Section 8: Including Working Hours to the Model

In this section, I examine the effect of adding personal working hours, as well as working hours of neighbours to my OLS model for life satisfaction. Model (5) discussed below is identical to Model (1) but with the addition of these two regressors: working hours and working hours of neighbours. ***Working hours*** is the amount of time per day that an individual spends at her main job, while ***working hours of neighbours*** is the average daily working time of those in the neighbourhood, defined by two-digit postal codes. In Model (5), I consider the *log* of both variables. The sample size in this new model consists only of 5,094 individuals which is smaller than the original size of 9,482. This

difference occurs because I now consider people having a job whereas in the original sample I considered those having any type of income.

The results of the OLS regression on Model (5) are given in Table 6. Comparing tables 2 and 6 shows that Models (1c) and (5c) the coefficients corresponding to the general characteristics take somewhat similar values but occasionally exhibit differences, often in terms of significance. For example, the coefficient of females takes the value of 0.240 in Model (1c) and the value 0.160 in Model (5c) which is a little different, although both are significant to 1%. As another example, the coefficient of age group 35 – 44 takes the value -0.164 in Model (1c), significant to 1%, whereas it takes the value -0.090 in Model (5c), insignificant even at the 10% level. For this age group, although the sign is the same and the magnitudes somewhat close, the significance appears to be lost as one moves from Model (1c) to Model (5c). These slight differences in coefficients are due both to the inclusion of working-hours variables, and also to the fact that the regression is now done on a subsample of the original one. In particular, the loss of significance in some of the variables in Model (5c) is largely due to the smaller sample size. I observe this by performing a regression on Model (1c) using the smaller sample size of 5,094.

Concerning income, $\alpha_Y = 0.341$ in Model (1c) while $\alpha_Y = 0.266$ in Model (5c). Again, the small difference in coefficient is due to the inclusion of the working-hours variable and also to the smaller sample size in Model (5c). In any case the values of the coefficients are reasonably close to each other and are still significant at the 1% level. In regards to relative income, $\alpha_R = -0.534$ in Model (1c) and $\alpha_R = -0.561$ in Model (5c). Hence the

coefficient of income of neighbours seems almost unaffected by the addition of working hours and by the change in the sample size. Model (5c) confirms our conclusions from sections 5 – 7 that relative income of neighbours is an important determinant for life satisfaction, even more so than absolute (personal) income, as far as the models are concerned.

Finally, the coefficient corresponding to personal working hours in Model (5c) is -0.081. This negative value indicates that increasing one's own working hours decreases the predicted life satisfaction, all other factors kept equal. Quantitatively, an increase of working hours by 10%, predicts a change of individual life satisfaction by approximately -0.081*10% = -0.0081. This coefficient is only significant at the 10% level (p-value 6.3%), and has a very small effect size. On the other hand the coefficient corresponding to average working hours of neighbours is insignificant even at the 10% level (p-value 19.2%). But it is also interesting to note that its value, 0.47, is somewhat large and that the statistical insignificance is really due to the large standard deviation. It is therefore not clear whether this variable is a relevant predictor. Perhaps increasing the sample size would give a better indication whether this variable is important in the model. In any case, including working hours does not change my previous findings that relative income is a more important determinant of life satisfaction than absolute income.

Conclusion

In this paper, I examined the effects of absolute (personal) income and relative income of neighbours on self-reported life satisfaction for a sample of 9,482 Canadians from 2005.

My models suggest that income of neighbours is important for assessing one's own life satisfaction: at current levels, even more important than one's absolute income. According to all models examined here, increasing the income of the entire population by the same proportion would yield a net decrease of the life satisfaction of the population. One could interpret this situation by saying that Canadians are willing to pay to reduce the incomes of their neighbours. A possible policy implication could be that raising taxes by the same proportion on all Canadians, for example federal taxes, would improve life satisfaction of Canadians (while potentially decreasing the budget deficit).

My regression results appear stable to changes in scaling of the life satisfaction variable, but seem sensitive to the definition of neighbourhoods. In particular, changing neighbourhoods from two-digit postal codes to provinces accentuates the importance of relative income of neighbours. This is somewhat surprising but it may be an indication that provinces provide natural neighbourhood boundaries, despite being physically larger in size. Further investigation is needed to understand the meaning of a "good" neighbourhood in Canada.

I see several possible weaknesses of my study. Firstly, I may have omitted some variables relevant to life satisfaction. For example, I have not considered individual racial information; there are indications that subjective life satisfaction varies across races (Luttmer 2005), though not largely. Unfortunately, the GSS Cycle 19 does not include any racial information. Health is another important variable which appears to affect life satisfaction. In my study, I decided to exclude health because it is also subjective and

self-reported. On a side note, including the health variable to Model (1c) gives coefficients of 0.183 for the log of absolute income and -0.484 for the log of relative income which is still consistent with conclusions.

Secondly, there could be a problem of reverse causality. In our models, it is implicitly assumed that absolute and relative incomes are exogenous variables. It is not clear to what extent this assumption is true. If this assumption is incorrect, it is unclear whether and how the conclusions of this study would be affected. From the existing literature on Happiness Economics, I see no clear way yet of how to detect possible reverse causality and how to handle it.

Lastly, the non-response rate of 2,835 individuals from a starting restricted sample of 12,609 (considering age restriction and removal of individuals earning at most $5,000 annually) is not insignificant. The troubling issue is that almost the entire non-response rate is related to my key independent variable of interest: income. At this stage, I see no way how to deal with the non-response issue or whether it is a problem at all.

Despite some of the short comings mentioned above, my models and regressions produce clear and significant results. Looking into the future, it would be interesting to examine data from other years and compare results and conclusions across time. I am hoping that as survey questionnaires become standardized such comparisons will be made easier in the future.

Appendix A: Regression Tables

Table 1: Some Descriptive Statistics

Control Variables	Proportion of participants in each control group	Mean Life Satisfaction of participants in each control group	Proportion of Satisfied in each control group
Full Sample	1.00	7.58 (1.66)	0.60
Personal Income			
$5,000 – $19,999	0.18	7.18 (2.08)	0.51
$20,000 – $39,999	0.33	7.51 (1.68)	0.57
$40,000 – $59,999	0.25	7.78 (1.45)	0.64
$60,000 – $79,999	0.13	7.78 (1.42)	0.65
$80,000 – $99,999	0.05	7.75 (1.41)	0.65
$100,000 plus	0.06	7.82 (1.44)	0.70
Gender			
Male	0.48	7.57 (1.63)	0.60
Female	0.52	7.59 (1.69)	0.60
Age			
Age 25 to 34	0.24	7.63 (1.56)	0.61
Age 35 to 44	0.29	7.54 (1.59)	0.58
Age 45 to 54	0.27	7.49 (1.72)	0.57
Age 55 to 64	0.20	7.71 (1.82)	0.65
Marital Status			
Single	0.21	7.23 (1.72)	0.50
Marrried/Common Law	0.62	7.85 (1.51)	0.67
Widowed	0.03	7.33 (1.96)	0.53
Separated	0.14	6.98 (1.89)	0.45
Education			
Some school	0.11	7.34 (2.06)	0.54
High school diploma	0.15	7.58 (1.74)	0.59
College diploma	0.30	7.60 (1.64)	0.61
Some university/college	0.14	7.49 (1.71)	0.57
Bachelor/Master/PhD	0.30	7.70 (1.44)	0.62

Number of observations: 9,482

Note 1: The numbers in parentheses denote standard deviations.
Note 2: In the last column, "satisfied" denotes the individuals who reported a life-satisfaction value of 8 or above.

Table 2: OLS coefficients of Model (1), Postal Codes

Predictor Variables	Model (1a)	Model (1b)	Model (1c)
Log income (α_Y)	0.346***	0.390***	0.341***
	(0.024)	(0.028)	(0.027)
Log average income neighbours (α_R)	-0.511***	-0.561***	-0.534***
	(0.085)	(0.085)	(0.084)
Gender			
Female		0.182***	0.240***
		(0.036)	(0.035)
Age			
Age 35 to 44		-0.142***	-0.164***
		(0.047)	(0.046)
Age 45 to 54		-0.203***	-0.189***
		(0.048)	(0.048)
Age 55 to 64		0.091*	0.122**
		(0.052)	(0.053)
Education			
High school diploma		0.169**	0.143**
		(0.068)	(0.066)
College diploma		0.132**	0.119**
		(0.061)	(0.060)
Some university/college		0.065	0.053
		(0.069)	(0.068)
Bachelor/Master/PhD		0.117*	0.102
		(0.065)	(0.063)
Marital Status			
Married/Common Law			0.562***
			(0.043)
Widowed			-0.072
			(0.110)
Separated			-0.278***
			(0.059)
Constant Term	9.433***	9.373***	9.280***
	(0.888)	(0.903)	(0.884)
R-squared	**0.022**	**0.030**	**0.070**
Number of observations	**9,482**	**9,482**	**9,482**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

Table 3: OLS coefficients of Model (2), Binary LS

Predictor Variables	Model (2a)	Model (2b)	Model (2c)
Log income (α_Y)	0.079***	0.090***	0.077***
	(0.007)	(0.008)	(0.008)
Log average income neighbours (α_R)	-0.131***	-0.139***	-0.132***
	(0.025)	(0.025)	(0.025)
Gender			
Female		0.041***	0.056***
		(0.011)	(0.011)
Age			
Age 35 to 44		-0.038***	-0.044***
		(0.014)	(0.012)
Age 45 to 54		-0.044***	-0.041***
		(0.014)	(0.014)
Age 55 to 64		0.051***	0.059***
		(0.015)	(0.016)
Education			
High school diploma		0.039**	0.032*
		(0.020)	(0.020)
College diploma		0.041**	0.038**
		(0.018)	(0.018)
Some university/college		0.016	0.012
		(0.021)	(0.020)
Bachelor/Master/PhD		0.023	0.019
		(0.019)	(0.019)
Marital Status			
Married/Common Law			0.150***
			(0.013)
Widowed			-0.024
			(0.033)
Separated			-0.069***
			(0.018)
Constant Term	1.178***	1.099***	1.074***
	(0.263)	(0.268)	(0.263)
R-squared	**0.013**	**0.021**	**0.053**
Number of observations	**9,482**	**9,482**	**9,482**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

Table 4: OLS coefficients of Model (3), No Neighbourhoods

Predictor Variables	Model (3a)	Model (3b)	Model (3c)
Log income (α_Y)	0.314***	0.359***	0.310***
	(0.024)	(0.027)	(0.026)
Gender			
Female		0.168***	0.226***
		(0.036)	(0.035)
Age			
Age 35 to 44		-0.136***	-0.160***
		(0.047)	(0.047)
Age 45 to 54		-0.190***	-0.178***
		(0.048)	(0.048)
Age 55 to 64		0.102**	0.131**
		(0.052)	(0.053)
Education			
High school diploma		0.153**	0.127*
		(0.068)	(0.066)
College diploma		0.112*	0.100*
		(0.061)	(0.060)
Some university/college		0.035	0.025
		(0.069)	(0.068)
Bachelor/Master/PhD		0.076	0.063
		(0.064)	(0.063)
Marital Status			
Married/Common Law			0.569***
			(0.043)
Widowed			-0.061
			(0.110)
Separated			-0.274***
			(0.059)
Constant Term	4.292***	3.729***	3.907***
	(0.250)	(0.278)	(0.273)
R-squared	**0.018**	**0.025**	**0.066**
Number of observations	**9,482**	**9,482**	**9,482**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

Table 5: OLS coefficients of Model (4), Provinces

Predictor Variables	Model (4a)	Model (4b)	Model (4c)
Log income (α_Y)	0.350***	0.396***	0.347***
	(0.024)	(0.027)	(0.027)
Log average income neighbours (α_R)	-1.121***	-1.173***	-1.128***
	(0.128)	(0.128)	(0.126)
Gender			
Female		0.182***	0.238***
		(0.036)	(0.035)
Age			
Age 35 to 44		-0.147***	-0.170***
		(0.047)	(0.046)
Age 45 to 54		-0.209***	-0.196***
		(0.048)	(0.048)
Age 55 to 64		0.089*	0.118**
		(0.052)	(0.053)
Education			
High school diploma		0.167**	0.141**
		(0.068)	(0.066)
College diploma		0.122**	0.110*
		(0.061)	(0.060)
Some university/college		0.074	0.062
		(0.069)	(0.068)
Bachelor/Master/PhD		0.101	0.087
		(0.064)	(0.063)
Marital Status			
Married/Common Law			0.564***
			(0.043)
Widowed			-0.061
			(0.109)
Separated			-0.273***
			(0.058)
Constant Term	15.918***	15.875***	15.590***
	(1.351)	(1.356)	(1.329)
R-squared	**0.026**	**0.034**	**0.074**
Number of observations	**9,482**	**9,482**	**9,482**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

Table 6: OLS coefficients of Model (5), Working Hours

Predictor Variables	Model (5a)	Model (5b)	Model (5c)
Log income (α_Y)	0.274***	0.303***	0.266***
	(0.035)	(0.039)	(0.039)
Log average income neighbours (α_R)	-0.585***	-0.587***	-0.561***
	(0.106)	(0.107)	(0.106)
Log work hours	-0.106**	-0.097**	-0.081*
	(0.044)	(0.044)	(0.044)
Log average work hours neighbours	0.614*	0.581	0.470
	(0.365)	(0.365)	(0.360)
Gender			
Female		0.100**	0.160***
		(0.046)	(0.046)
Age			
Age 35 to 44		-0.067	-0.090
		(0.058)	(0.058)
Age 45 to 54		-0.104*	-0.106*
		(0.060)	(0.061)
Age 55 to 64		0.148**	0.169**
		(0.074)	(0.075)
Education			
High school diploma		-0.028	-0.015
		(0.092)	(0.091)
College diploma		-0.035	-0.020
		(0.084)	(0.083)
Some university/college		-0.128	-0.119
		(0.094)	(0.093)
Bachelor/Master/PhD		-0.058	-0.042
		(0.087)	(0.086)
Marital Status			
Married/Common Law			0.459***
			(0.055)
Widowed			-0.241
			(0.173)
Separated			-0.205***
			(0.077)
Constant Term	9.177***	8.998***	9.170***
	(1.790)	(1.797)	(1.771)
R-squared	**0.016**	**0.020**	**0.049**
Number of observations	**5,094**	**5,094**	**5,094**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

Appendix B: Regression Tables from Additional Experiments

This appendix gives the OLS tables of several additional regression experiments. In all tables, the coefficient of absolute income α_Y is positive while the coefficient of relative income of neighbours α_R is negative. Both coefficients are always highly significant, even at the 1% level, and α_R is always larger in magnitude than α_Y. I do not give discussions for any of these tables because I can extract no further conclusions than the ones already given in Sections 5 – 8. I only include these tables because they might be of interest to some readers, for example as further evidence supporting the already given conclusions. Otherwise they are optional.

In Table 7, Model (6), I exclude neighbourhood information and use a binary scale life satisfaction, where 0 corresponds to unsatisfied (original response 1 – 7) and 1 corresponds to satisfied (original response 8 – 10).

Table 7: OLS coefficients Model (6), No Neighbourhoods, Binary LS

Predictor Variables	Model (6a)	Model (6b)	Model (6c)
Log income (α_Y)	0.071***	0.083***	0.070***
	(0.007)	(0.008)	(0.008)
Gender			
Female		0.037***	0.052***
		(0.011)	(0.011)
Age			
Age 35 to 44		-0.036***	-0.043***
		(0.014)	(0.014)
Age 45 to 54		-0.041***	-0.038***
		(0.014)	(0.014)
Age 55 to 64		0.053***	0.061***
		(0.015)	(0.016)
Education			
High school diploma		0.035*	0.029
		(0.020)	(0.020)
College diploma		0.036**	0.033*
		(0.018)	(0.018)
Some university/college		0.008	0.005
		(0.021)	(0.020)
Bachelor/Master/PhD		0.012	0.009
		(0.019)	(0.019)
Marital Status			
Married/Common Law			0.152***
			(0.013)
Widowed			-0.022
			(0.033)
Separated			-0.068***
			(0.017)
Constant Term	-0.142*	-0.298***	-0.252***
	(0.074)	(0.082)	(0.081)
R-squared	**0.011**	**0.017**	**0.050**
Number of observations	**9,482**	**9,482**	**9,482**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

In Table 8, Model (7), I use provinces as neighbourhood information and use a binary scale life satisfaction, where 0 corresponds to unsatisfied (original response 1 – 7) and 1 corresponds to satisfied (original response 8 – 10).

Table 8: OLS coefficients Model (7), Provinces, Binary LS

Predictor Variables	Model (1)	Model (2)	Model (3)
Log income (α_Y)	0.080***	0.093***	0.080***
	(0.007)	(0.008)	(0.008)
Log average income neighbours (α_R)	-0.307***	-0.316***	-0.304***
	(0.038)	(0.038)	(0.037)
Gender			
Female		0.041***	0.056***
		(0.011)	(0.010)
Age			
Age 35 to 44		-0.039***	-0.045***
		(0.014)	(0.014)
Age 45 to 54		-0.046***	-0.043***
		(0.014)	(0.014)
Age 55 to 64		0.050***	0.057***
		(0.015)	(0.016)
Education			
High school diploma		0.039**	0.032*
		(0.020)	(0.020)
College diploma		0.039**	0.036**
		(0.018)	(0.018)
Some university/college		0.019	0.015
		(0.020)	(0.020)
Bachelor/Master/PhD		0.019	0.016
		(0.019)	(0.019)
Marital Status			
Married/Common Law			0.150***
			(0.013)
Widowed			-0.022
			(0.033)
Separated			-0.068***
			(0.018)
Constant Term	3.043***	2.971***	2.900***
	(0.400)	(0.402)	(0.396)
R-squared	**0.017**	**0.025**	**0.056**
Number of observations	**9,482**	**9,482**	**9,482**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

In Table 9, Model (8), I use two-digit postal codes as neighbourhood information, include two working-hours variables, and use a binary scale life satisfaction, where 0 corresponds to unsatisfied (responses 1 – 7) and 1 corresponds to satisfied (responses 8 – 10).

Table 9: OLS Coefficients Model (8), Work Hours, Binary LS

Predictor Variables	Model (8a)	Model (8b)	Model (8c)
Log income (α_Y)	0.072***	0.081***	0.070***
	(0.011)	(0.012)	(0.012)
Log average income neighbours (α_R)	-0.148***	-0.147***	-0.139***
	(0.033)	(0.034)	(0.033)
Log work hours	-0.019	-0.015	-0.011
	(0.014)	(0.014)	(0.014)
Log average work hours neighbours	0.184	0.173	0.143
	(0.115)	(0.115)	(0.113)
Gender			
Female		0.031**	0.047***
		(0.015)	(0.015)
Age			
Age 35 to 44		-0.030*	-0.037**
		(0.018)	(0.018)
Age 45 to 54		-0.028	-0.028
		(0.019)	(0.019)
Age 55 to 64		0.069***	0.072***
		(0.023)	(0.024)
Education			
High school diploma		-0.007	-0.003
		(0.029)	(0.029)
College diploma		0.008	0.013
		(0.026)	(0.026)
Some university/college		-0.039	-0.036
		(0.030)	(0.029)
Bachelor/Master/PhD		-0.014	-0.009
		(0.027)	(0.027)
Marital Status			
Married/Common Law			0.130***
			(0.017)
Widowed			-0.007
			(0.055)
Separated			-0.063***
			(0.024)
Constant Term	0.804	0.723	0.763
	(0.563)	(0.564)	(0.558)
R-squared	**0.011**	**0.017**	**0.040**
Number of observations	**5,094**	**5,094**	**5,094**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

In Table 10, Model (9), I use provinces as neighbourhood information, include the two working-hours variables, and use the original 1 – 10 scale for life satisfaction.

Table 10: OLS Coefficients Model (9), Province, Work Hours

Predictor Variables	Model (9a)	Model (9b)	Model (9c)
Log income (α_Y)	0.289***	0.325***	0.287***
	(0.034)	(0.039)	(0.038)
Log average income neighbours (α_R)	-1.455***	-1.463***	-1.416***
	(0.167)	(0.168)	(0.165)
Log work hours	-0.108**	-0.098**	-0.083*
	(0.044)	(0.044)	(0.043)
Log average work hours neighbours	0.221	0.067	-0.056
	(0.902)	(0.902)	(0.889)
Gender			
Female		0.108**	0.167***
		(0.046)	(0.046)
Age			
Age 35 to 44		-0.076	-0.100*
		(0.058)	(0.058)
Age 45 to 54		-0.119**	-0.122**
		(0.060)	(0.061)
Age 55 to 64		0.137*	0.155**
		(0.074)	(0.075)
Education			
High school diploma		-0.017	-0.003
		(0.092)	(0.090)
College diploma		-0.038	-0.021
		(0.084)	(0.083)
Some university/college		-0.118	-0.109
		(0.094)	(0.093)
Bachelor/Master/PhD		-0.071	-0.053
		(0.087)	(0.086)
Marital Status			
Married/Common Law			0.459***
			(0.055)
Widowed			-0.199
			(0.172)
Separated			-0.200***
			(0.077)
Constant Term	20.039***	20.357***	20.358***
	(3.931)	(3.929)	(3.873)
R-squared	**0.024**	**0.028**	**0.057**
Number of observations	**5,094**	**5,094**	**5,094**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

In Table 11, Model (10), I use provinces as neighbourhood information, include the two working-hours variables, and use a binary scale life satisfaction, where 0 corresponds to unsatisfied (responses 1 – 7) and 1 corresponds to satisfied (responses 8 – 10).

Table 11: OLS Coeff. Model (10), Provinces, Work Hrs, Binary LS

Predictor Variables	Model (2a)	Model (2b)	Model (2c)
Log income (α_Y)	0.077***	0.088***	0.077***
	(0.011)	(0.012)	(0.012)
Log average income neighbours (α_R)	-0.424***	-0.425***	-0.412***
	(0.053)	(0.053)	(0.052)
Log work hours	-0.020	-0.016	-0.012
	(0.014)	(0.014)	(0.014)
Log average work hours neighbours	0.237	0.184	0.143
	(0.284)	(0.283)	(0.280)
Gender			
Female		0.033**	0.049***
		(0.015)	(0.014)
Age			
Age 35 to 44		-0.033*	-0.040**
		(0.018)	(0.018)
Age 45 to 54		-0.032*	-0.033*
		(0.019)	(0.019)
Age 55 to 64		0.067***	0.068***
		(0.023)	(0.024)
Education			
High school diploma		-0.003	0.001
		(0.029)	(0.028)
College diploma		0.008	0.013
		(0.026)	(0.026)
Some university/college		-0.035	-0.032
		(0.029)	(0.029)
Bachelor/Master/PhD		-0.016	-0.011
		(0.027)	(0.027)
Marital Status			
Married/Common Law			0.130***
			(0.017)
Widowed			0.004
			(0.054)
Separated			-0.062**
			(0.024)
Constant Term	3.516***	3.599***	3.642***
	(1.236)	(1.234)	(1.220)
R-squared	**0.019**	**0.025**	**0.049**
Number of observations	**5,094**	**5,094**	**5,094**

Note 1: Standard deviations are given in parentheses.
Note 2: Here, * means significant at 10%, ** means significant at 5%, and *** means significant at 1%.
Note 3: The reference group for the gender is male, 25-34 for age, single for marital status and some schooling for education.

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