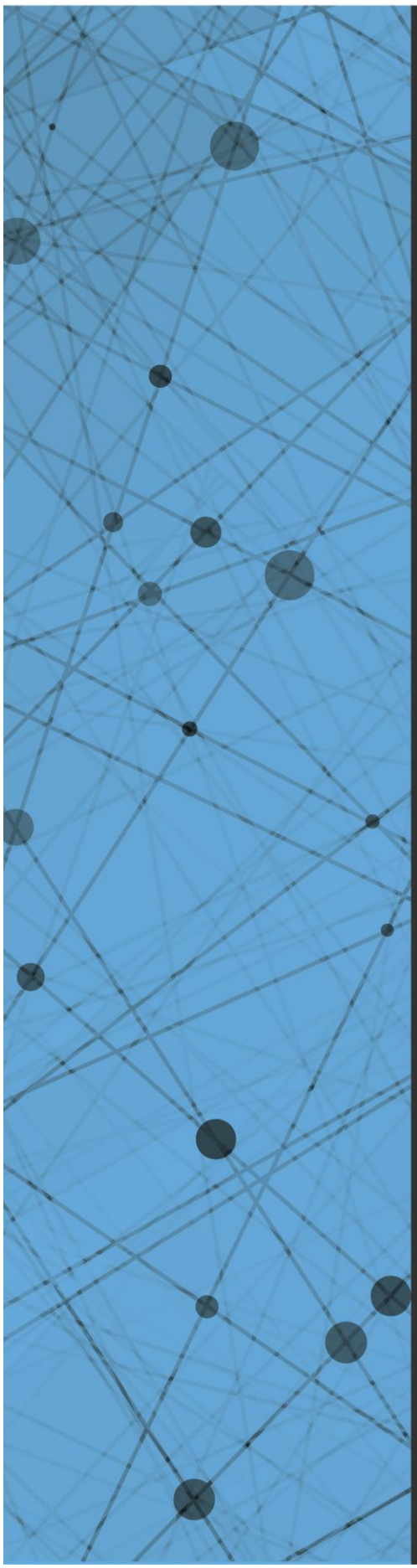

Income or consumption: Which better predicts subjective wellbeing?

Tom Carver and Arthur Grimes

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Author contact details

Tom Carver

Motu Economic and Public Policy Research

tom.carver.nz@gmail.com

Arthur Grimes

Motu Economic and Public Policy Research and Victoria University of Wellington

arthur.grimes@motu.org.nz

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Disclaimer

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Motu Economic and Public Policy Research

PO Box 24390 info@motu.org.nz +64 4 9394250

Wellington www.motu.org.nz

New Zealand

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Abstract

The positive relationship between income and subjective wellbeing has been well documented. However, work assessing the relationship of alternative material wellbeing metrics to subjective wellbeing is limited. Consistent with the permanent income hypothesis, we find that a consumption measure out-performs income in predicting subjective wellbeing. When objective measures of consumption are combined with self-assessments of a household's standard of living, income becomes insignificant altogether. We obtain our result utilising household-level data from Statistics New Zealand's 'New Zealand General Social Survey' which contains a measure of material wellbeing called the 'Economic Living Standard Index' that combines measures of consumption flows and self-assessments of material wellbeing.

JEL codes

D12, D63, E21, I31

Keywords

Life satisfaction, Subjective Wellbeing, Consumption, Permanent Income Hypothesis, Material Wellbeing

Summary haiku

How should we predict
wellbeing? Use consumption
rather than income.

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Tables and Figures

1 Introduction

> "The care of human life and happiness and not their destruction is the first and only legitimate object of good government."
>
> Thomas Jefferson to Maryland Republicans, 1809

The pursuit of higher living standards has driven humans for centuries. Consequently, policy-makers and others have focused strongly on increasing measures of national production, such as Gross Domestic Product (GDP) (Jaszi, 1986). In light of the quotation from Jefferson above, it is implicit that this pursuit is a means to an end rather than a goal in itself, the end goal being the improvement of the citizenry's wellbeing.

Since its inception, economics has attempted to understand the relationship between utility, or overall wellbeing (Bentham, 1843), with consumption and income. Adam Smith, for instance, posited that "consumption is the sole end and purpose of production" (Smith, 1776). Commonly, economists model utility *inter alia* as a function of either consumption (direct utility function) or income (indirect utility function); where the indirect utility function also requires information on prices and on inter-temporal income plus wealth. One lens through which to understand this study is as an evaluation of the relative efficacy of these two functions, through an examination of whether consumption or income better predicts subjective wellbeing (SWB).

Limitations of measures such as GDP as measures of wellbeing have been systemically documented (Stiglitz, Sen and Fitoussi, 2009; hereafter SSF) leading to increased interest in holistic measurements of wellbeing. SWB is one such conceptual framework for measuring quality of life. One set of SWB metrics is collected by directly asking individuals to evaluate their happiness / life satisfaction, either as a whole or in particular domains (e.g., health, work) (Boarini et al., 2006). Developments in psychology and behavioural economics have increased confidence in the use of such metrics (Kahneman et al., 1997). Many studies have presented supporting evidence demonstrating that SWB is a reliable and valid measurement of happiness (Layard, 2011; Helliwell et al., 2013). We follow much of the literature in focusing on evaluative wellbeing (life satisfaction) as our measure of SWB.

Our approach has been shaped by the recommendations of SSF for the measurement of wellbeing. Three of their key recommendations are: 1) to concentrate on consumption and wealth over production; 2) to emphasise the household perspective rather than the individual; and 3) to utilise subjective measures of wellbeing. The data contained within the New Zealand General Social Survey (hereafter NZGSS) enables us to pursue certain implications of these recommendations. Specifically, it contains a measure called the 'Economic Living Standard Index' (hereafter ELSI), a consumption-based measure of living standards. ELSI assesses a household's level of consumption and, to a lesser extent, wealth via a combination of objective and self-rated questions.

The central research question of this paper is to ascertain which of two measures of material wellbeing – household income or ELSI – better predicts subjective wellbeing. The correlation between life satisfaction and income is well established (Deaton & Kahneman, 2010). The novelty of our approach is to assess if a proxy for consumption (ELSI) is more informative. Two key theoretical reasons predict that ELSI may prove superior: First, Friedman's permanent income hypothesis postulates that current consumption is determined by lifetime resources[1], and thus current consumption should be a better indicator than current income of lifetime living standards (Friedman, 1957). Second, Deaton (amongst others) has demonstrated the veracity of self-rated measures of material wellbeing (Deaton, 2010 and 2016).

Over all samples and testing methods we find that ELSI is a more reliable and informative predictor of life satisfaction than is income. When both are included in the same regression, income is almost always insignificant, whilst ELSI is always significant. For some samples, this result is dependent on the presence of ELSI's self-rated components. When stripped out, and income is compared with the 'objective' (pure consumption) elements of ELSI, both consumption and income are significant, albeit not for all sub-samples. When the objective component of ELSI is included, the impact of income on happiness roughly halves (relative to when ELSI is excluded) for the aggregate sample. Furthermore, income remains an insignificant determinant of SWB for critical segments of the population including Māori[2], people aged under 30, and those on the lowest incomes.

Our results demonstrate that consumption adds considerable information to evaluations of wellbeing over and above merely focusing on income. When objective measures of consumption are combined with self-assessed questions about the household's standard of living, income becomes an insignificant determinant of SWB. The regressions in this paper control for other personal characteristics (e.g., age, gender, employment), and the estimated relationships between life satisfaction and these characteristics are consistent with the literature's consensus. Thus, our central result is unlikely to be caused by any anomalies within the NZGSS data.

The remainder of the paper is structured as follows. Section 2 reviews relevant literature, section 3 presents our methodology and hypotheses, while section 4 presents the data. Section 5 presents our core results and section 6 presents sensitivity analyses to test the robustness of the core results. Section 7 concludes.

1 Which comprises current net wealth, current income and discounted future earnings.
2 Māori are the indigenous population of New Zealand, comprising approximately 15% of the population.

2 Related Literature

2.1 Material Wellbeing

There is a growing body of literature that utilises consumption as an input for the construction of aggregate measures of wellbeing (Kahneman et al., 1997; Jones & Klenow, 2010; Attanasio et al., 2012; Young, 2012; Grimes & Hyland, 2015). These studies incorporate Friedman's insights arising from the permanent income hypothesis that highlight the closer link of current consumption than current income to an individual's utility. They demonstrate with empirical data that consumption-based measures of wellbeing correlate well with other objective measures of living standards such as GDP and life expectancy.

The ELSI metric, developed by New Zealand's Ministry of Social Development (MSD), is intended as a "broad spectrum measure [of living standards] for the whole population". It is based on consumption, household amenities and social activities rather than income (Jensen et al., 2005), including both objective and subjective components[3]. The inclusion of subjective elements is motivated by the idea that people are the best judge of their own circumstances. The reliability of these self-reported income assessments has been attested to in studies across a number of countries (Deaton, 2010 and 2016).

There is already a wealth of evidence confirming the positive cross-sectional relationship between income[4] and life satisfaction. This relationship holds for both intra- and inter-country comparisons (Easterlin, 1995; Diener & Biswas-Diener, 2002; Stevenson & Wolfers, 2008; Deaton & Kahneman, 2010). Between countries there is a strong correlation between GNI per capita and other measures of wellbeing such as life expectancy (Grimes et al., 2014). Thus, it is well accepted that people who earn more tend to have higher wellbeing, once other factors are controlled for. Relative income (as well as absolute income) may also be an important determinant of life satisfaction (Easterlin, 1974; 1995) and we explore one avenue by which this factor may affect our results.[5]

The permanent income (life-cycle) hypothesis is a cornerstone of work on the relationship between consumption and income. It postulates that consumption at a point in time is determined not only by current income, but also by current wealth and expected future income (Friedman, 1957). This helps explain how the current level of consumption can serve as a better indicator of life satisfaction than current income.

While standard measures of consumption may out-perform an income measure in explaining utility, neither market consumption nor income measures explicitly account for non-

3 The objective components (75% weighting) are direct assessments of consumption (e.g., does the house have a washing machine), whereas the subjective elements (25% weighting) focus on the perceived adequacy of the household's material situation.
4 Generally using the natural logarithm of income.
5 Given that we employ cross-sectional data, we do not delve into the inter-temporal relationship between life satisfaction and material wellbeing (Stevenson & Wolfers, 2008).

market activities (Stone, 1986). To address this shortcoming, there have been attempts to improve income measurement to incorporate taxation and government transfers (both cash and in kind) but the adjusted measures are still limited in adequately valuing government services. Moreover, they omit services produced by the household (or by friends and family), which may play an important role in providing the household with resources (SSF). The construction of ELSI avoids this difficulty by including non-market activities in its composition (Perry, 2015).

The ELSI measure focuses on the actual living standards that households are able to realise. The material wellbeing provided by an item is considered the same, irrespective of its (local) market price. Deaton (2008) and Grimes and Hyland (2015) emphasise the difficulties of making comparisons of real income between countries. Comparisons are exacerbated by the presence of disparate relative prices and complexities involved in the valuations of government and housing services, both internationally and inter-regionally. This regional issue is addressed in our research by testing our relationships across regions within New Zealand, so accounting for variations in the cost of living and relative prices of key items such as housing.

Grimes & Hyland (2015) established a cross country measure, the Material Wellbeing Index (MWI), based on the distribution of consumer durables. Whilst their metric has a different composition to ELSI and contains less information on services, its focus on consumption and wealth is a crucial similarity. They find that their MWI is positively associated with Gross National Disposable Income per capita and (at the household level) with household income. It has more predictive power than certain other macro indicators for some objective wellbeing outcomes whereas national income is better for others. Consistent with the importance of consumption smoothing, they find evidence that the effectiveness of credit facilitation affects the MWI for a given income level.

While having many positive features, no proxy of consumption will account perfectly for the nuances inherent in the utility functions and preference orderings of a diverse population. As such, the items that compose ELSI (and similar indices) are not a definitive list of a household's necessities and freedoms. They are intended as a balanced set of items to illuminate different levels of material wellbeing between households (Perry, 2015). Ideally however, they would be free from systemic biases. The two chief ways these can be introduced are either through the omission of key items or their incorrect calibration within an index.

Following the insights of Alesina and Giuliano (2015), Grimes et al. (2015) demonstrate that differences in economic values and beliefs exist between segments of New Zealand's population. Specifically, they find that Māori beliefs are "more aligned with giving importance to collectivism, non-materialism, the environment and kinship ties", compared to non-Māori. Accordingly, any measure that intends to assess the material wellbeing of Māori would need to account for these differences relative to non-Māori.

One approach to improving the representativeness of consumption metrics is to ask people what is important to them. Europe's 'EU-13' index, a 13-item material deprivation index which is similar in concept to ELSI, is informed by Mack & Lansley's (1985) "consensual approach to identify necessities". This index classifies a "socially perceived necessity" as any "item regarded as necessary by at least 50% of interviewees". In light of differences in valuations between segments of society, it is important that any index is tested not only for the entire population, but also for subsections within it. ELSI (and similar indices) was originally conceived as a means to compare levels of deprivation amongst poor households, given the inadequacy of income measures for this group. This deprivation focus could limit ELSI's applicability as a material wellbeing measure for upper income households (Perry, 2015). In spite of this, our core result still holds even when tested on the top quartile of materially well-off households and when tested across different ethnic groups, indicating that our results have general applicability and do not apply just to certain segments of society.

2.2 Subjective wellbeing

It is common to isolate three elements of SWB (OECD, 2013): *Life evaluation*, which captures a person's reflective assessment on their life or some aspect of it (e.g., financial situation, health status); *Affect,* which captures a person's feelings or emotional states (e.g., happiness, contentment, sadness, anger), generally with reference to a particular point in time; and *Eudaimonia*, which captures a person's sense of meaning and purpose in life, and more broadly their psychological wellbeing and good mental functioning.

We follow much of the economic literature in focusing on evaluative wellbeing as a holistic (and informative) measure of an individual's wellbeing (Kahneman et al., 1997 and 2006). A typical evaluative wellbeing question asks individuals to place themselves on a scale in relation to how they feel about their life as a whole. The importance of life satisfaction as an indicator of overall welfare is evident from responses regarding the OECD's Better Life Index (BLI). The BLI comprises 11 components intended to constitute aspects of overall welfare. Visitors to the BLI webpage are encouraged to rank these components in order of importance to them. After nearly 100,000 responses from dozens of nations, life satisfaction has emerged as the most important element of overall wellbeing. This is true also for responses from New Zealand (N=676).[6]

The notion that individuals are reliable evaluators of their own wellbeing has a long philosophical tradition (SSF, 2009) which has been reinforced by modern developments in psychology and behavioural economics (Kahneman et al., 1997; Frey & Stutzer, 2002; Kahneman & Krueger, 2006; Layard, 2011). A positive relationship has been established between life satisfaction and objective metrics. Deaton (2008) and Grimes & Hyland (2015) demonstrate the

6 See: http://www.oecdbetterlifeindex.org/responses/#. However, it is possible that these results may be biased due to self-selection effects.

positive relationship between life satisfaction and health. Similarly, for the United States, Oswald & Wu (2010) illustrate a significant relationship between objective measures of wellbeing across states and their average life satisfaction. Grimes et al. (2014) find that SWB is a significant factor in migration decisions, which links subjective wellbeing to a revealed preference outcome.[7] Nevertheless, as SFF stress, well-being is a multi-dimensional concept that depends on a broad range of objective conditions and capabilities (Sen, 1985) and we make no claim that life satisfaction is the only aspect of wellbeing that is relevant to individuals or society.

3 Methodology and Hypotheses

We first outline the estimation methods we use to test the relationships between SWB (life satisfaction) and two measures of objective welfare: ELSI and household income. We also outline the factors that we control for in our estimates, and discuss potential limitations imposed on our analysis due to the use of a cross-sectional dataset.

In the 2012 NZGSS, life satisfaction is recorded as the response to the question: "How do you feel about your life as a whole right now?" It is measured on a 5-point scale: 1 = very dissatisfied; 2 = dissatisfied; 3 = no feeling either way; 4 = satisfied; 5 = very satisfied.

Use of the scale implicitly assumes ordinal comparability for each individual, i.e., each respondent agrees that dissatisfied is better than very dissatisfied, etc. To employ an estimation technique such as Ordinary Least Squares (OLS), we need to further assume cardinal comparability, i.e., that the difference between 1 and 2 is the same as the difference between 4 and 5, which is more contentious. If this assumption is not made, an ordered logit (or probit) model is more appropriate. Ferrer-i-Carbonell & Frijters (2004) detail a theoretical basis for the cardinal comparability assumption. Furthermore, they find that OLS and ordered probit (and logit) models yield similar results in terms of coefficient signs and significance. Luttmer (2005) also obtains this result. Following their lead, we use OLS for our base model, but also test robustness by estimating ordered probit and ordered logit models, obtaining similar results in all cases.

One further assumption that we make (along with almost all other studies in this field) is that material wellbeing is not endogenous with respect to life satisfaction. Our data do not enable us to test this assumption and so our results should be interpreted as presenting an associative, rather than necessarily causal, relationship. However the associative nature of our results is all that is required to answer our question regarding which measure of material wellbeing better predicts subjective wellbeing.

[7] A separate set of studies addresses the reliability of SWB over time (e.g. Krueger and Schkade, 2008), concluding that life satisfaction's signal-to-noise ratio is sufficient to enable reliable empirical studies (Di Tella & MacCulloch, 2006).

We start with a relationship in which individual i's utility (U_i) is expressed as a function of the individual's consumption (C_i) and the individual's characteristics (α_i) plus a random term (ε_i):

$$U_i = u_i(C_{i,}\, \alpha_i) + \varepsilon_i \tag{1}$$

where $u_i(.)$ has the standard properties of a utility function. We break the characteristics vector, α, into four separate vectors: D, a vector of an individual's exogenous demographics (e.g., gender, age, ethnicity); X, a vector of observed individual chosen characteristics (e.g., employment, relationship status); Z, a vector of self-reported individual characteristics (e.g., assessment of health); and γ, a vector of non-measured individual characteristics (e.g., genetics). D, X and Z vary from characteristics considered to be exogenous for the individual (D) to those that may well be co-determined with life satisfaction (Z). We test our relationships by successively adding these characteristics vectors as a test for robustness.

Inclusion of D, X and Z limit the potential for omitted variable bias. With respect to Z, positive self-assessments (of health, job, living standards etc.) may correlate positively with life satisfaction, in part because they do contribute directly to life satisfaction and in part because they may reflect inherent optimism or pessimism of an individual; inclusion of these variables therefore serves as a mechanism to control for how innately positive (or negative) an individual is. As we are using cross-sectional data, we cannot estimate γ. Thus, there is the possibility that estimated coefficients are biased if elements of γ are correlated with other independent variables; however we have no reason to believe that this is the case here, particularly with the inclusion of the Z vector.

Note that equation (1) has no role for income since the budget constraint is already reflected in C_i. Typically in the literature, however, estimates of the determinants of life satisfaction include the logarithm of income, in the absence of consumption data (Diener & Biswas-Diener, 2002; Helliwell, 2002; Deaton, 2008). In our tests of the role of income, we follow the norm of using log (income), equivalised for household composition, though we also include tests using alternative functional forms for income, obtaining similar results. We estimate an encompassing equation in which life satisfaction (LS_i) is regressed against (log) income (y_i), consumption (with ELSI used to proxy C_i) and personal characteristics as shown in (2), where β_4, β_5 and β_6, are all vectors:

$$LS_i = \beta_1 + \beta_2 \ln(y_i) + \beta_3 C_i + \beta_4 D_i + \beta_5 X_i + \beta_6 Z_i + \varepsilon_i \tag{2}$$

Following our OLS regression of this equation, we undertake a battery of robustness checks that include: alternatively excluding the income and ELSI terms to test relationships independently as well as together; testing the relationship with different groups of control variables; running Ordered Probit and Ordered Logit regressions; running split sample regressions with splits according to age, ethnicity, region, ELSI quartiles and income quartiles;

varying the functional form of income; varying the household income equivalisation methodology; and splitting ELSI into its objective and its subjective components (both for the full sample and for split samples).

Our primary research question is to understand which objective measure of material wellbeing (either household income or ELSI) better predicts life satisfaction. First, we test the significance of ELSI when income is excluded, with the null (H_0) and alternative (H_1) hypotheses being:

$$H_0: \beta_3 = 0, \qquad H_1: \beta_3 > 0$$

Second, we test the significance of income when ELSI is excluded:

$$H_0: \beta_2 = 0, \qquad H_1: \beta_2 > 0$$

Third, we test whether ELSI is significant for improving individual happiness conditional on household income being included in the regression:

$$H_0: \beta_3 = 0, \qquad H_1: \beta_3 > 0 \quad | LS_i = f(y_i, \dots)$$

Fourth, we test whether household income is significant for improving individual happiness conditional on ELSI being included in the regression:

$$H_0: \beta_2 = 0, \qquad H_1: \beta_2 > 0 \quad | LS_i = f(C_i, \dots)$$

Our theoretical prior (reflecting the permanent income hypothesis and Deaton's findings) is that we should expect to reject $\beta_3 = 0$ but not to reject $\beta_2 = 0$. If this were the case, we could conclude that once consumption is controlled for, income has no impact on an individual's level of happiness.

To interpret the estimates that follow, we note that a one percent increase in income is associated with a $\beta_2/100$ increase in life satisfaction on the 5 point scale, whereas an increase of ELSI by one unit is associated with a β_3 increase in life satisfaction.[8]

4 Data

4.1 Data Source

The data source for our analysis is the 2012 wave of the New Zealand General Social Survey (NZGSS). Statistics New Zealand (SNZ) carries out this biennial cross-sectional survey of ~8500 individuals. The survey had a 78 percent response rate. It collects responses on a wide range of potential determinants of life satisfaction.[9] The data from the NZGSS comes to us as a confidentialised unit record file (CURF). SNZ have modified the raw data to protect the privacy

[8] The interpretation of β_3 is, however, complex given the disparate nature of its constituent elements (see section 4).
[9] There are inconsistencies across NZGSS waves, including for the life satisfaction question, that prevent us from performing time series analysis.

of respondents. The dataset thus either redacts some confidential details (e.g., location[10]), or assigns them to bands (e.g., income, age)[11].

4.2 Control Variables

Table 1 to Table 3 present the variables contained within the control variable vectors D, X and Z. They cover most of the commonly used determinants of life satisfaction that are included in related studies.

Table 1: Exogenous Control Variables (D)

Variable	Category	Construction
Māori	Ethnicity	DV = 1 if Māori
Pacific	Ethnicity	DV = 1 if Pacific
Asian	Ethnicity	DV = 1 if Asian
European / Pākehā*	Ethnicity	DV = 1 if European
Other	Ethnicity	DV = 1 if other
Male*	Gender	DV = 1 if male
Female	Gender	DV = 1 if female
Age 15-19	Age	DV = 1 if 15-19
Age 20-24	Age	DV = 1 if 20-24
Age 25-29	Age	DV = 1 if 25-29
Age 30-34	Age	DV = 1 if 30-34
Age 35-39	Age	DV = 1 if 35-39
Age 40-44	Age	DV = 1 if 40-44
Age 45-49	Age	DV = 1 if 45-49
Age 50-54	Age	DV = 1 if 50-54
Age 55-59*	Age	DV = 1 if 55-59
Age 60-64	Age	DV = 1 if 60-64
Age 65-69	Age	DV = 1 if 65-69
Age 70-74	Age	DV = 1 if 70-74
Age 75-79	Age	DV = 1 if 75-79
Age 80-84	Age	DV = 1 if 80-84
Age 85+	Age	DV = 1 if 85 and over
Raised by 'OneParent'	Upbringing	DV = 1 if raised by one parent
Raised by 'TwoParents'*	Upbringing	DV = 1 if raised by two parents
Raised by 'MultipleParents'	Upbringing	DV = 1 if raised by more than two parents
Raised by 'Institution'	Upbringing	DV = 1 if raised by institution

DV = 'Dummy Variable' *Omitted (base) variable

10 Location is grouped up into six broad regions.
11 See: http://www.stats.govt.nz/tools_and_services/microdata-access/confidentialised-unit-record-files.aspx.

In Table 2, NZDep (New Zealand deprivation), is an index of local area deprivation[12]. It assigns a deprivation score to each 'meshblock' in New Zealand. Meshblocks are geographical units defined by SNZ as containing a median of 87 people, akin to a city block in urban areas. It is presented as an ordinal scale from 1-10, where 1 = least deprived and 10 = most deprived. This effectively separates meshblocks into deciles of deprivation (e.g., a value of 1 is assigned to a meshblock in the least deprived 10% areas of New Zealand). The index is based on the proportion of people within the meshblock experiencing some degree of deprivation where inputs into its calculation include the proportion of people who are unemployed, have no qualifications, have no access to basics such as a telephone or a vehicle, or who are living below a given income threshold.

By including this variable in Equation (2) we are able to control for variations in material wellbeing within regions. This is especially useful given the broad nature of the 'region' category within the NZGSS. Its inclusion also enables us to make inferences about how an individual's living standard relative to close neighbours affects the individual's life satisfaction.

12 The NZGSS 2012 wave includes the 2006 census version of this index. See NZDep 2006 user manual: http://www.otago.ac.nz/wellington/otago020337.pdf.

Table 2: Objective / Observed Control Variables (X)

Variable	Category	Construction
NZDep	Regional deprivation	Measure of regional material deprivation (1 = least deprived; 10 = most deprived)
Employed*	Employment	DV = 1 if employed
Unemployed	Employment	DV = 1 if unemployed
Not in Labour Force	Employment	DV = 1 if not in the labour force
Auckland	Geography	DV = 1 if in Auckland
Wellington*	Geography	DV = 1 if in Wellington
Northland	Geography	DV = 1 if in Northland, Bay of Plenty and Gisborne
Rest of North Island	Geography	DV = 1 if in the rest of the North Island
Canterbury	Geography	DV = 1 if in Canterbury
Rest of South Island	Geography	DV = 1 if in the rest of the South Island
Born in NZ*	Birthplace	DV = 1 if born in New Zealand
Born Overseas	Birthplace	DV = 1 if born outside New Zealand
MainUrban	Geography	DV = 1 if living in 'main urban' area+
SecondUrban	Geography	DV = 1 if living in 'secondary urban' area
MinorUrban	Geography	DV = 1 if living in 'minor urban' area
Rural*	Geography	DV = 1 if living in 'rural' area
Partner*	Relationship	DV = 1 if has a partner
Single	Relationship	DV = 1 if is single
Smoker	Lifestyle	DV = 1 if smokes
NonSmoker*	Lifestyle	DV = 1 if doesn't smoke
CrimeVictum	Crime	DV = 1 if has been victim of crime in last 12 months
NoCrime*	Crime	DV = 1 if has not been victim of crime in last 12 months
Children	Family	DV = 1 if has at least one child
NoChildren*	Family	DV = 1 if has no children
No Qualification*	Education	DV = 1 if has no qualifications
Level 1 Certificate	Education	DV = 1 if has NCEA level 1 or equivalent
Level 2 Certificate	Education	DV = 1 if has NCEA level 2 or equivalent
Level 3 Certificate	Education	DV = 1 if has NCEA level 3 or equivalent
Level 4 Certificate	Education	DV = 1 if has NCEA level 4 or equivalent
Level 5 Diploma	Education	DV = 1 if has level 5 diploma or certificate
Level 6 Diploma	Education	DV = 1 if has level 5 diploma or certificate
Bachelor's / Level 7	Education	DV = 1 if has bachelor's degree or level 7 equivalent
Honours and Postgrad	Education	DV = 1 if has honours degree or postgraduate certificate
Masters and PHD	Education	DV = 1 if has masters or PHD
Overseas School	Education	DV = 1 if attended school overseas
Education Missing	Education	DV = 1 if highest level of education is missing

+ As defined by SNZ.

Table 3:Self-Reported / Subjective Control Variables (Z)

Variable	Category	Construction
Health Excellent	Health	DV = 1 if responds 'excellent' to question about health+
Health Very Good	Health	DV = 1 if responds 'very good' to question about health
Health Good*	Health	DV = 1 if responds 'good' to question about health
Health Fair	Health	DV = 1 if responds 'fair' to question about health
Health Poor	Health	DV = 1 if responds 'poor' to question about health
Housing Very Satisfied	Housing	DV = 1 if responds 'very satisfied' to question about housing^
Housing Satisfied*	Housing	DV = 1 if responds 'satisfied' to question about housing
Housing Neutral	Housing	DV = 1 if responds 'neutral' to question about housing
Housing Dissatisfied	Housing	DV = 1 if responds 'dissatisfied' to question about housing
Housing Very Dissatisfied	Housing	DV = 1 if responds 'very dissatisfied to question about housing
Support*	Community	DV = 1 if respondent believes they have someone they can reach out to in time of crisis
No Support	Community	DV = 1 if respondent believes they don't have anyone they can reach out to in time of crisis

+ Question on health is: "In general, would you say your health is excellent, very good, good, fair or poor?"
^ Question on housing is: "How do you feel about where you are currently living?"

4.3 Household Income

We perform two transformations on the raw NZGSS household income date (in addition to choosing the functional form for income). First, we convert income from a discrete 18 point scale to actual income values. Second, we equivalise household income based on the number and composition of its occupants.

The NZGSS household income question is: "In the last 12 months what was your total household income, before tax or anything else was taken out of it?" Responses are measured across 15 closed income bands and one open-ended upper income band (plus 'Don't Know' and 'Refused').13

We omit observations from our dataset where responses were for loss, zero income, don't know or refused.14 We then take the midpoint for all responses other than those in the top (open-ended) response category. Most studies have found that this is a reasonable approximation of the real data (Ligon, 1989) and we note that most of our bands are very narrow. For the open-

13 The 16 bands are: Loss; Zero income; $1 - $5,000; $5,001 - $10,000; $10,001 - $15,000; $15,001 - $20,000; $20,001 - $25,000; $25,001 - $30,000; $30,001 - $35,000; $35,001 - $40,000; $40,001 - $50,000; $50,001 - $60,000; $60,001 - $70,000; $70,001 - $100,000; $100,001 - $150,000; $150,001 or more. In 2012, the average NZ dollar to US dollar exchange rate was: 1 NZD = 0.81 USD.

14 We do this also for similar responses to other key questions (e.g., ELSI, age). This results in ~400 excluded respondents from our original dataset, leaving 8075 observations.

ended top response category, we follow Parker & Fenwick (1983) and utilise the Pareto Curve to estimate the median of the open ended category as $200,000.15

Once we have converted the household income bands into values, we control for the number and type of occupants within each household based on the 'Modified OECD scale' used by OECD and Eurostat (OECD, 2013). The 'Modified OECD scale' is designed to take into account economies of scale in household composition. It divides household income by a weighted sum of its inhabitants, assigning a weight of 1 to the first adult, 0.5 to subsequent adults and 0.3 to each child.

Three alternative equivalisation scales are sometimes used in other studies. These three approaches are: (1) The old OECD household income equivalisation method sometimes referred to as the "Oxford Scale". This is the same as the 'Modified' scale, except it places a higher weighting on every subsequent adult after the first occupant (0.7) and each child living in the house (0.5); (2) The Square Root method, where household income is divided by the square root of the number of occupants, regardless of their age. This method may be employed when there is no data on the age of household occupants (for example, Grimes & Hyland, 2015); and (3) The Per Person equivalisation method, where household income is divided by the total number of occupants. This method is relatively crude and employed less often. In section 6 we show that our results are robust regardless of the equivalisation methodology chosen.

4.4 Economic Living Standards Index (ELSI)

ELSI is an index created by New Zealand's Ministry of Social Development (MSD), designed to serve as a measure of a household's living standards. There are two versions of this index. The one used in the NZGSS is ELSI 'Short-form' which contains 15 fewer items than the full ELSI metric. Whenever we refer to ELSI in this paper we are referring to the 'short-form' version. In our description below, we draw heavily upon Jensen et al. (2005) and Perry (2015).

The index contains three key elements:

Essentials: This element, having a maximum score of 14, is an assessment of the forced lack of essentials for the household. Respondents receive 1 point for each item they possess or consume, and also receive 1 point if they do not possess or consume this item based on choice. They receive 0 points if cost has driven the lack of possession or consumption of the item.

[15] The actual result was $202,398, which we rounded to $200,000.

This section contains 14 items (7 goods, 7 services/activities):

1. Telephone
2. Washing machine
3. Heating available in all main rooms
4. A good pair of shoes
5. A best outfit for a special occasion
6. Personal computer
7. Home contents insurance
8. Give presents to family or friends on birthdays, Christmas or other special occasions
9. Visit the hairdresser once every three months
10. Have holidays away from home every year
11. Enough room for family to stay the night
12. Have a holiday overseas at least every three years
13. Have a night out at least once a fortnight
14. Have family or friends over for a meal at least once a month

Economising: This element, having a maximum score of 16, is an assessment of the extent to which a household has economised or cut back its expenditure. Respondents are asked: "have you done any of these things not at all, a little, or a lot?" They are given 2 points if they answer "not at all", 1 point for "a little" and 0 points for "a lot". They are presented with the following 8 common methods of economising household expenditure:

1. Gone without fresh fruit and vegetables to help keep down costs
2. Continued wearing clothing that was worn out because you couldn't afford a replacement
3. Put off buying clothes for as long as possible to help keep down costs
4. Stayed in bed longer to save on heating costs
5. Postponed or put off visits to the doctor to help keep down costs
6. Not picked up a prescription to help keep down costs
7. Spent less time on hobbies than you would like to help keep down costs
8. Done without or cut back on trips to the shops or other local places to help keep down costs

Self-assessments: In the third element, having a maximum score of 11, individuals are asked three self-assessment questions about their household income and standard of living. The questions are, with points per question given in parentheses:

1. Generally, how would you rate your material standard of living? Would you say that it is high, fairly high, medium, fairly low or low? (High = 4, Low = 0);
2. Generally, how satisfied are you with your current material standard of living? Would you say you were very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied or very dissatisfied? (Very satisfied = 4, Very dissatisfied = 0);
3. How well does your (and your partner's combined) total income meet your everyday needs for such things as accommodation, food, clothing and other necessities? Would you say you have not enough money, just enough money, enough money, or more than enough money? (More than enough = 3, Not enough = 0).

Responses to all the items are summed to form a total score. Any total score with a value less than 10 is set equal to 10 to truncate the outliers, and then 10 is subtracted from each respondent's total score. Respondents with the lowest possible standard of living have an ELSI score of 0 while the maximum possible ELSI score is 31 (=14+16+11-10).

We note the conformity of this measure to the recommendations of SSF. It is a measure of consumption and, to a lesser extent, wealth; it incorporates both subjective and objective assessments of wellbeing; and it focuses on the household perspective. In addition, as also recommended by SSF, it accounts for non-market activities and government services.[16]

When considering ELSI's composition it is helpful to combine the first two elements, comprising objective measures of household consumption, which we refer to as 'Objective ELSI'. The third element is a self-assessed (or subjective) standard of living ('Subjective ELSI'). It is not possible to directly observe the weighting between these two constituent components within a given ELSI score due to the final step in its calculation; however, generally the objective component comprises around 75% of the total score with the subjective element supplying the remaining 25%.

The objective items in ELSI represent both consumption flows (e.g. hairdresser appointments), and items that are part of a household's balance sheet (e.g., consumer durables and spare bedroom). They range from the most basic of needs (e.g., healthcare, housing, clothing), to 'freedoms' (e.g., vacations, hobbies), which helps ELSI serve as a broad spectrum measure of consumption that is relevant to wellbeing across households. The measure does not

16 MSD has recently replaced ELSI with a new measure, the Material Wellbeing Index (MWI). Similar to ELSI, this index is a full spectrum assessment of an individual's material wellbeing. The two key differences are: 1) MWI contains fewer items, the version in the NZGSS will contain 9 items whereas ELSI contains 25; and 2) MWI is designed to be more effective at tracking changes over time with a greater focus on 'freedoms' (desired non-essentials) (Perry, 2015).

account for quantity or quality which may differ between households[17]. The 'economising' section serves to partially offset this by allowing households to rank their degree of economising across a range of activities.

A key advantage of the objective section is its ability to go beyond a purely additive approach. In the 'essentials' section households are asked why they do not consume a given item. If it is simply not valued by the household, they still get the point for it. This provides a more accurate picture of 'true' demand (willingness and ability to pay) than simply accounting for whether the item is consumed or not.

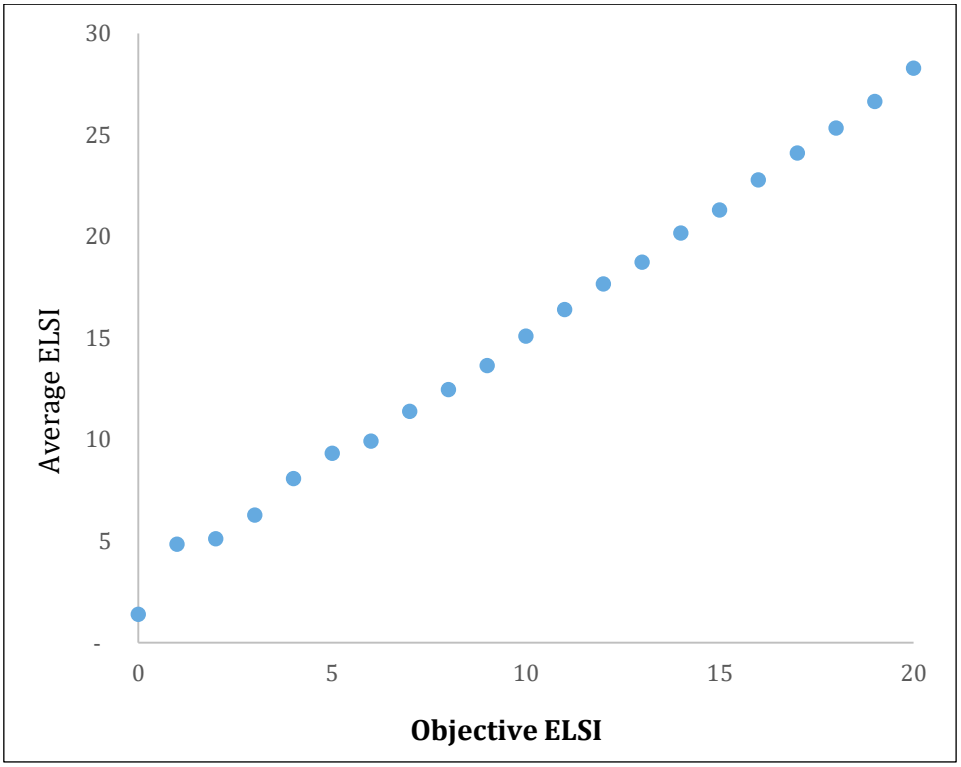
The inclusion of the self-assessed questions means that ELSI is not purely an objective consumption measure. To test Friedman's permanent income hypothesis more directly we deconstruct ELSI in section 6 and separately compare its two constituent parts alongside income.

The subjective elements of ELSI have theoretical advantages and disadvantages. One advantage is their focus on the adequacy of income and living standards rather than merely on measuring income. Thus a superannuitant (pensioner) who has low income but high wealth (having saved some of their previous income), may answer that they have an adequate income; whereas a 35 year old forming a household may have much higher income but may perceive this to be inadequate. As Deaton (2010) suggests, to judge material wellbeing it could be most effective to simply ask people to judge their own circumstances rather than compare objective income metrics. These two points favour the use of the full ELSI rather than the simpler but less complete objective ELSI. However the presence of a question on income adequacy may crowd out the impact of income from our regressions when the full ELSI is used.

To calculate Objective ELSI, we employ a comparable methodology as for full ELSI. Specifically, once the raw score is totalled, we control for outliers by setting raw scores that are less than 7 equal to 7 and then subtracting 7 from all scores to remove outliers[18]. Figure 1 demonstrates the strong, linear relationship between ELSI and Objective ELSI[19].

17 E.g. computers or international travel; Grimes and Hyland note similar issues with their measure.
18 As 30 is ~70% of 41 we set our outlier threshold to 70% of the Full ELSI level
19 When ELSI is regressed on Objective ELSI it has a coefficient of 1.3 with an R2 of 0.93.

Figure 1: Average 'Full' ELSI vs. 'Objective' ELSI



4.5 Key Descriptive Statistics

Table 4 presents descriptive statistics for our three key variables: life satisfaction, (full) ELSI and Ln(Income) where income is equivalised using the Modified OECD scale.

Table 4: Descriptive Statistics for Key Variables

	Life Satisfaction	ELSI	Ln(Income)
Mean	4.08	22.80	10.48
Median	4.00	25.00	10.51
Maximum	5.00	31.00	12.21
Minimum	1.00	0.00	6.83
Std. Dev.	0.85	6.43	0.69
Observations	8,048	8,048	8,048

Figure 2 and Figure 3 illustrate the raw relationship between our dependent variable (life satisfaction) and the two measures of material wellbeing (when both are plotted on a discrete scale from 0-31)[20]. In Figure 2, we observe a consistent linear relationship between ELSI and life satisfaction (albeit slightly noisy for lower levels of ELSI). Income on the other hand appears to

20 ELSI is a discrete variable reported on a scale of 0-31. Here, equivalised household income is placed into bands on a 0-31 scale with identical cumulative distribution to ELSI (e.g., if the first 2% of households have an ELSI score of 0, then the households with the lowest 2% of household income are given an income score of 0). Note that this is merely for graphical purposes. In regressions, the natural log of household income is a continuous variable.

have a more inconsistent relationship with life satisfaction. There appears to be a positive, but noisy, relationship when ln(y) is greater than ~9, but no relationship below this; however, we observe a number of high life satisfaction scores for individuals with low levels of income. These may represent superannuitants with moderate to high wealth or those with low reported incomes designed to minimise taxation. Purely on the basis of these naïve scatter plots, it is likely that the empirical tests will support our hypothesis of the superiority of ELSI to income in predicting life satisfaction.

Figure 2: Average life satisfaction vs. ELSI

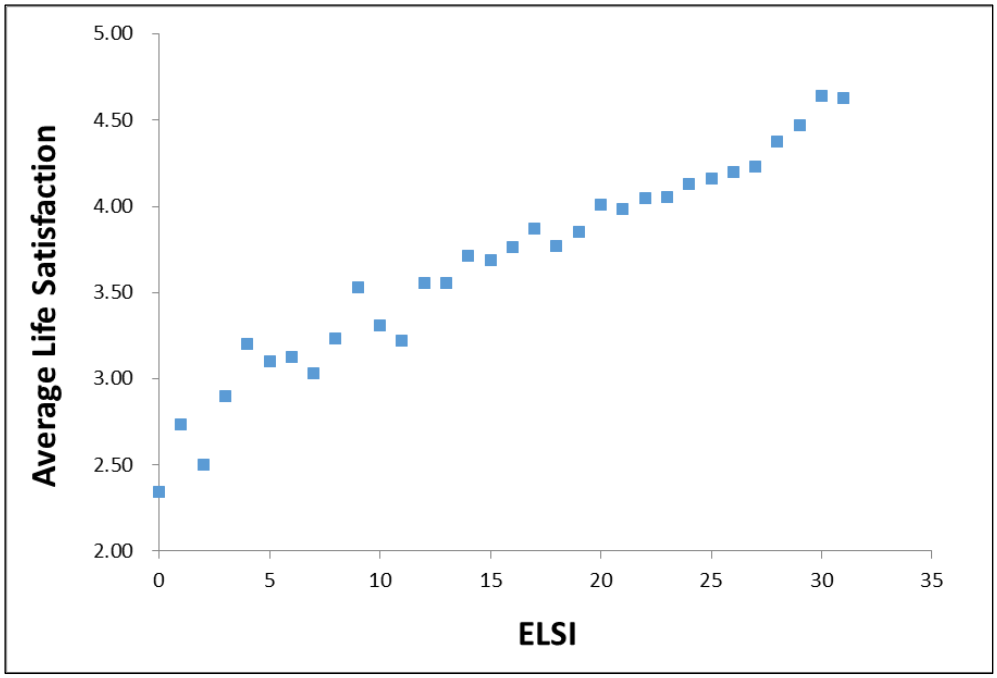
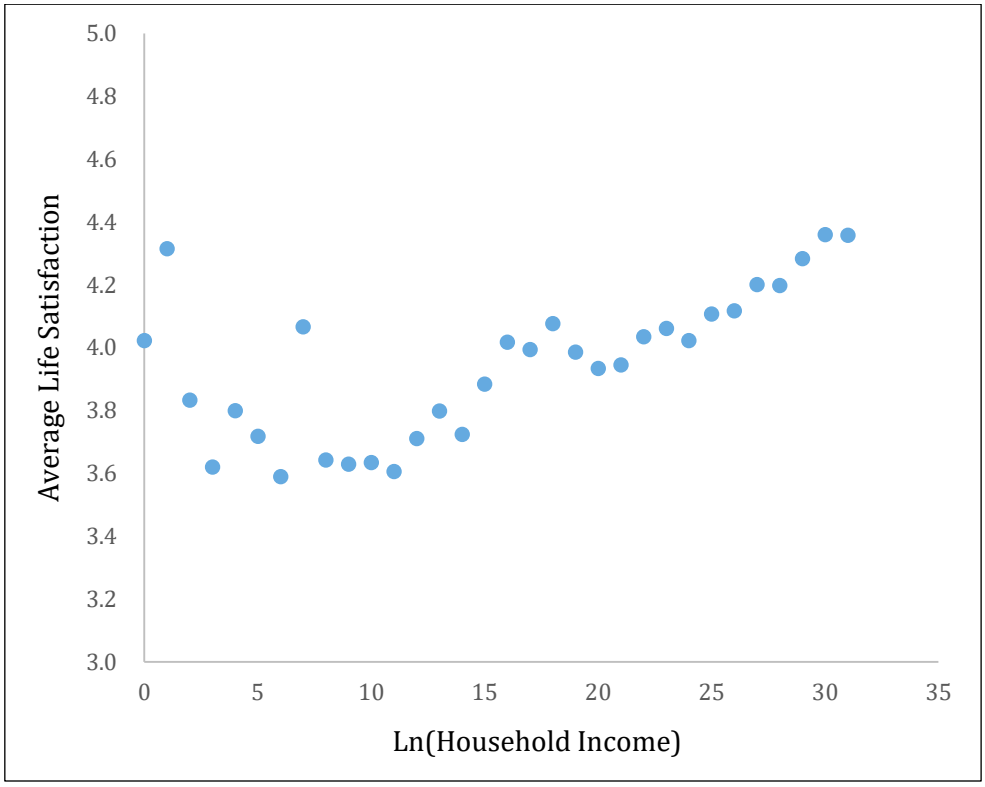
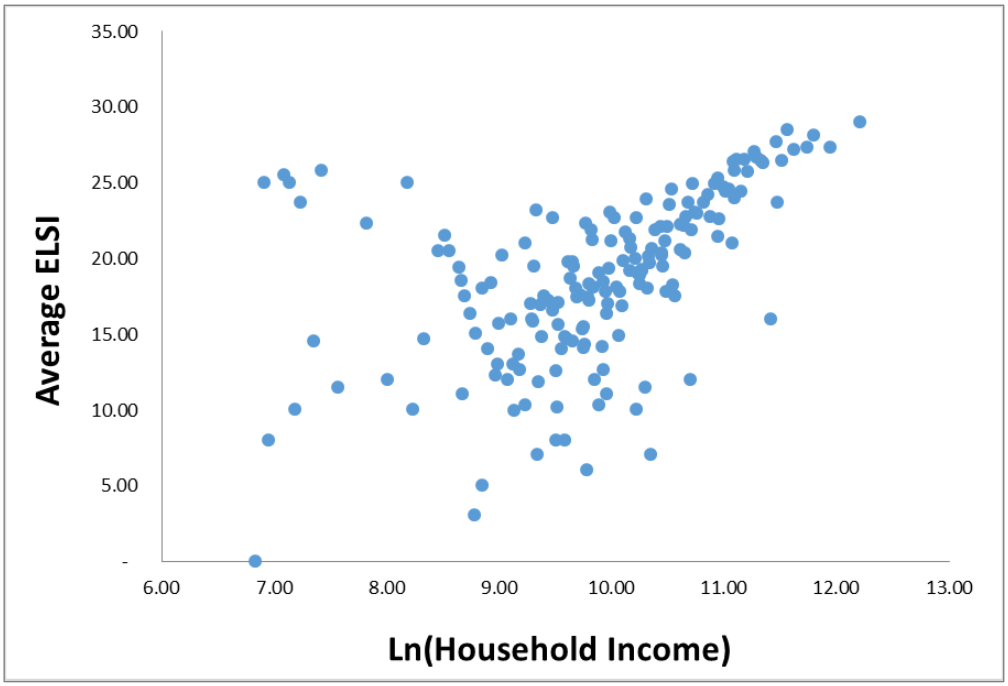


Figure 3: Average life satisfaction vs. income



For completeness, Figure 4 graphs ELSI against the log of income; the loose relationship between the two when income is moderate to low is clearly apparent.

Figure 4: Average ELSI vs. income



5 Core Results

5.1 Relationship of control variables to life satisfaction

Before directly addressing our hypotheses from section 3, we present our estimates – from estimation of (2) using OLS – for a number of well documented correlates of life satisfaction. These results are instructive both in themselves and are presented as a check that our data provide estimates for control variables that are consistent with those in comparable studies.

Table 5 details the coefficients on our age dummy variables[21] in two OLS regressions with life satisfaction as the dependent variable. The first ('Raw Relationship'), only has age dummy variables plus the constant term on the right hand side of the equation; the second (Full Equation (2)) is the full Equation (2) as detailed in section 3. Our results are consistent with the typical U-shaped relationship between age and life satisfaction as found in other research.

Table 5: Life satisfaction and Age

Variable	Raw relationship		Full Equation (2)	
	Coefficient	Standard Error	Coefficient	Standard Error
AGE1519	0.0727	0.0717	0.1490**	0.0679
AGE2024	0.0775	0.0511	0.1909***	0.0457
AGE2529	0.0848*	0.0487	0.1583***	0.0429
AGE3034	0.0311	0.0484	0.0381	0.0438
AGE3539	0.0735	0.0466	0.0631	0.0425
AGE4044	0.0344	0.0474	0.0115	0.0409
AGE4549	-0.0484	0.0492	-0.0211	0.0422
AGE5054	0.0143	0.0494	0.0533	0.0408
AGE6064	0.1340***	0.0492	0.0891**	0.0415
AGE6569	0.2362***	0.0494	0.1522***	0.0426
AGE7074	0.2916***	0.0485	0.1918***	0.0447
AGE7579	0.1772***	0.0559	0.1428***	0.0525
AGE8084	0.1743***	0.0568	0.1333**	0.0525
AGE85OVER	0.1656**	0.0672	0.1449**	0.0615

*** p<0.01, ** p<0.05, * p<0.1 Standard errors are White heteroskedasticity-consistent

In Table 6 we follow the same procedure except with the employment dummy variables 'unemployed' (UNEMP) and 'not in the labour force' (NILF). We obtain the well documented result that being unemployed is negatively correlated with life satisfaction.

21 'Age5559' (55-59 age bracket) is the excluded dummy variable.

Table 6: Life satisfaction and Employment

Variable	Raw relationship		Full Equation (2)	
	Coefficient	Standard Error	Coefficient	Standard Error
UNEMP	-0.4975***	0.0605	-0.1265**	0.0521
NILF	-0.1073***	0.0208	0.0213	0.0238

Row headings: 'UNEMP' is 'unemployed'; 'NILF' is 'not in the labour force'.

In Table 7 we assess the relationship between life satisfaction and the self-rated health dummy variables, ranging from 'excellent' to 'poor'.[22] Higher levels of self-assessed health correlate with higher levels of life satisfaction, which may occur for two reasons. First, healthier people are objectively more likely to be happier. Second, given the subjective (self-rated) element of this variable, generally positive (negative) individuals may be positive (negative) about both their health and about their overall life situation.

Table 7: Life satisfaction and Health

Variable	Raw relationship		Full Equation (2)	
	Coefficient	Standard Error	Coefficient	Standard Error
HEALTHEX	0.4667***	0.0247	0.3043***	0.0237
HEALTHVG	0.2709***	0.0214	0.1770***	0.0198
HEALTHFAIR	-0.2967***	0.0342	-0.2040***	0.0309
HEALTHPOOR	-0.8545***	0.0682	-0.5491***	0.0623
HEALTHMISS	-1.2048	0.7400	-0.6704	0.6005

Row headings: 'HEALTHEX' is 'excellent'; 'HEALTHVG' is 'very good'; 'HEALTHFAIR' is 'fair'; 'HEALTHPOOR' is 'poor'; and 'HEALTHMISS' is 'missing'.

In Table 8 we assess the relationship between life satisfaction and variables representing the respondent's highest level of educational attainment. These dummy variables range from 'NCEA level 1 / level 1 certificate'[23] to 'PHD', where 'No High School' (i.e. no qualification at all) is the omitted category. A positive correlation between life satisfaction and level of educational attainment is found in the naïve regression. Once other determinants of life satisfaction are controlled for, this effect largely disappears as found in many other studies (Boarini. et al., 2012).

22 Dummy variables correspond to individual's response to the question: "In general, would you say your health is excellent, very good, good, fair or poor?" The omitted variable is 'HEALTHGOOD' corresponding to 'good'.
23 I.e. the lowest level of high school diploma.

Table 8: Life satisfaction and Education

Variable	Raw Relationship		Full Equation (2)	
	Coefficient	Standard Error	Coefficient	Standard Error
LVL1CERT	0.1185***	0.0367	0.0026	0.0319
LVL2CERT	0.0375	0.0421	-0.0478	0.0371
LVL3CERT	0.1425***	0.0401	0.0257	0.0362
LVL4CERT	0.0747**	0.0347	-0.0113	0.0312
LVL5DIP	0.1599***	0.0432	0.0376	0.0380
LVL6DIP	0.2333***	0.0401	0.0065	0.0353
BACHLVL7	0.2443***	0.0347	0.0005	0.0342
HONANDPOST	0.3709***	0.0420	0.0897**	0.0378
MASTANDPHD	0.2789***	0.0513	-0.0004	0.0487
OVERSEAS	0.1488***	0.0538	0.0709	0.0468
MISSING	0.2066***	0.0458	0.0318	0.0401

Row headings: 'LVLXCERT' is 'Level X NCEA or equivalent'; 'LVLXDIP' is 'Level X Diploma or Trade equivalent'; 'BACHLVL7' is 'Bachelor's Degree or Level 7 equivalent'; 'HONANDPOST' is 'Honours and Postgraduate Certificate'; 'MASTANDPHD' is 'Masters and PHD'; 'OVERSEAS' is 'Overseas School'; and 'MISSING' is 'Missing education'

Using comparable methodology, we find results for other correlates that are again broadly consistent with the literature. For instance, we find that people in urban areas on average have lower levels of life satisfaction than those in rural regions. Once other factors are controlled for, this only remains significant at the 10% level for the 'Minor Urban'[24] category. We find also that once other factors have been controlled for, not having children is correlated with lower levels of life satisfaction. Being single is correlated with lower levels of life satisfaction than being in a couple relationship. This finding is significant at the 1% level regardless of the controls employed. People who identify as Māori or of Pacific Island heritage are on average less happy than Pākehā (European) New Zealanders. However, once other factors are controlled for, this difference is no longer significant. By contrast, once other factors are controlled for, we find that women are on average happier than men at the 1% level of significance. Being the victim of crime, having no support in a crisis, and smoking are all negatively correlated with life satisfaction. The fact that these results are all consistent with those documented by other studies gives confidence in the reliability of our more novel findings.

One other result is also worth highlighting. Using the measure of regional deprivation ('NZDep'), we find that once all factors are controlled for, living in a poorer community is correlated with higher levels of life satisfaction. This result is consistent with the common

24 'Minor Urban' is defined by SNZ as a small independent urban community.

finding that an individual's income *relative to their neighbours* is positively correlated with life satisfaction (Easterlin, 1995).[25] Thus both absolute and relative material wellbeing are seen to contribute to SWB.

5.2 Central Findings

In Table 9 we exclude the income term, and create equation (2) by incrementally adding more control variables in each column. We find that the coefficient on ELSI (β_3) is always positive and significant at the 1% level. Thus (in the absence of income) we conclude that higher levels of ELSI are positively correlated with levels of life satisfaction.

Table 9: Results with ELSI included; Income excluded

Variable	Coefficient	NC	D	D and X	D, X and Z
ELSI (C)	β_3	0.0577***	0.0598***	0.0558***	0.0388***
		(0.0016)	(0.0017)	(0.0018)	(0.0019)
Constant	β_0	2.7611***	2.5478***	2.7329***	2.8020***
		(0.0390)	(0.0551)	(0.0762)	(0.0800)
N		8048	8048	8048	8048
Adj-R^2		0.1900	0.1986	0.2188	0.2995
Std-err		0.7657	0.7616	0.7519	0.7121

Column headings: NC denotes that there are no control variables in the regression; D denotes that exogenous controls are included in regression; D and X denotes that exogenous and observed controls are included; D, X and Z denotes that exogenous, observed and reported controls are included.
Row headings: N is the number of observations in the sample; Adj-R^2 is the Adjusted R^2; 'Std-err' is the standard error of the regression.

In Table 10 we exclude the ELSI term, and again create equation (2) by incrementally adding control variables in each column of the table. The coefficient on income (β_2) is always positive and significant at the 1% level. Thus (in the absence of ELSI, and in keeping with the literature) we conclude that higher levels of household income are positively correlated with levels of life satisfaction. We note that in every case, the regressions with only ELSI included outperform those with only income included.[26]

25 Festinger's 'social comparison theory' (1954), indicates that common reference points are those who live nearby (Diener et al., 1993).
26 The adjusted R2 is higher and the standard error of the regression is lower. In addition, both the Schwarz and Akaike information criteria (not listed in the table) are lower.

Table 10: Results with Income included; ELSI excluded

Variable	Coefficient	NC	D	D and X	D, X and Z
Ln(y)	β_2	0.2265***	0.2655***	0.1588***	0.0984***
		(0.0144)	(0.0160)	(0.0180)	(0.0167)
Constant	β_0	1.7026***	1.1388***	2.4353***	2.6096***
		(0.1534)	(0.1800)	(0.2111)	(0.1985)
N		8048	8048	8048	8048
Adj-R^2		0.0338	0.0609	0.1058	0.2512
Std-err		0.8362	0.8244	0.8045	0.7362

Table 11 follows the same procedure as above, with both ELSI and the natural log of equivalised household income included in the regression. The coefficient on ELSI (β_3) is always positive and significant at the 1% level. With the inclusion of ELSI, we do not reject the null hypothesis that the coefficient on income (β_3), is zero (even at the 10% level). Thus, we conclude that once ELSI is included as a measure of material wellbeing, household income tells us nothing more about life satisfaction. This is the central result of this paper, and – as shown in subsequent robustness tests – is obtained regardless of which modelling methodology or split sample is employed.[27]

We caveat this result by noting that the finding is based on inclusion of the full ELSI and so depends both on the objective and subjective components within ELSI. For some (but not all) samples, both β_2 and β_3 are significant when income is included together with only the objective portion of ELSI in the regression. We explore this in more detail in section 6.

27 In one split sample (the middle two quartiles of income) we are able to accept the alternative hypothesis that $\beta_3 > 0$ at the 10% level, but not at the 5% level. This is the only instance in which we are able to do so. In all instances ELSI's coefficient, β_3, is greater than zero at the 1% significance level.

Table 11: Results with ELSI and Income Included

Variable	Coefficient	NC	D	D and X	D, X and Z
Ln(y)	β_2	0.0006	0.0052	-0.0214	-0.0146
		(0.0138)	(0.0154)	(0.0170)	(0.0165)
ELSI (C)	β_3	0.0577***	0.0596***	0.0565***	0.0393***
		(0.0017)	(0.0019)	(0.0019)	(0.0019)
Constant	β_0	2.7555***	2.4980***	2.9530***	2.9524***
		(0.1360)	(0.1590)	(0.1919)	(0.1805)
N		8048	8048	8048	8048
Adj-R^2		0.1899	0.1985	0.2189	0.2995
Std-err		0.7657	0.7617	0.7519	0.7121

6 Sensitivity Analysis

We explore the sensitivity of our central result to various alterations in our assumptions and estimation methodology. In each case, the reported regression includes all control variables. First, we compare the full sample results across OLS, ordered logit (Ologit) and ordered probit (Oprobit) models. Next, we split our sample by age, income, ELSI, ethnicity and region-type. We test our central hypothesis on each split sample. We then test the impact of different functional forms for household income and use of different household income equivalisation methods. In all cases we find that ELSI's coefficient (β_3), is positive and significant at the 1% level. Further, we are never able to accept the alternative hypothesis that the coefficient for household income (β_2), is greater than zero at the 5% significance level.

Finally, we test the impact of deconstructing ELSI into its 'objective' and 'subjective' components and testing these separately. Again we find that β_3 is positive and significant regardless of which component of ELSI is included. However, the income coefficient (β_2) is positive and significant at the 10% level for the full sample when included in a regression with objective ELSI (and excluding subjective ELSI).

6.1 Comparing OLS, OLogit and OProbit models

Table 12 reports results from estimating the full version of equation (2) using OLS, OLogit and OProbit estimation methods (hence the first column of Table 12 is identical to the final column of Table 11). We obtain qualitatively similar results for each model, with our central result from section 5 holding. ELSI is always positive and significant at the 1% level and income is never positive and significant even at the 10% level. This consistency is in accordance with the cited results of Luttmer and Ferrer-i-Carbonell & Frijters.

Table 12: OLS, ordered logit and ordered probit models

Variable	Coefficient	OLS	OLogit	OProbit
Ln(y)	β_2	-0.0146	-0.0287	-0.0078
		(0.0165)	(0.0441)	(0.0253)
ELSI (C)	β_3	0.0393***	0.1019***	0.0566***
		(0.0019)	(0.0049)	(0.0027)
Constant	β_0	2.9524***	-	-
		(0.1805)	-	-
N		8048	8048	8048
Adj-R^2		0.2995	0.1578	0.1541
Std-err		0.7121	-	-

OLS standard errors are White heteroskedasticity-consistent; logit/probit coefficient covariance computed using observed Hessian;
'Adj-R^2' is 'Puesdo-R^2' in case of ordered logit/probit models.

6.2 Split Samples

6.2.1 Age segments

In Table 13, we present OLS results with our sample split into three age categories: Young (15-29), Middle Aged (30-59) and Old (60+). Across all three categories our core result from section 5 holds.

Table 13: Results by age segment

Variable	Coefficient	Full sample	Young	Middle Aged	Old
Ln(y)	β_2	-0.0146	-0.0695*	-0.0195	0.0433
		(0.0165)	(0.0361)	(0.0212)	(0.0339)
ELSI (C)	β_3	0.0393***	0.0307***	0.0415***	0.0418***
		(0.0019)	(0.0044)	(0.0024)	(0.0049)
Constant	β_0	2.9524***	4.0200***	2.9656***	2.4513***
		(0.1805)	(0.4197)	(0.2416)	(0.3843)
N		8048	1189	4933	1926
Adj-R^2		0.2995	0.2378	0.3135	0.2755
Std-err		0.7121	0.6886	0.7308	0.6718

6.2.2 Income quartiles

Table 14 presents results where we split the sample into three categories based on the equivalised household income of the respondent: 'Bottom Quartile', 'Middle Two Quartiles' and 'Top Quartile'. Our results for the bottom and top income quartiles again reflect the central result from section 5. This is notable given the proposition that ELSI should be less effective at the top end of the income distribution (Perry, 2015).

One result to note is that for the middle two quartiles we are able to accept the alternative hypothesis that the coefficient on income (β_2), is greater than zero at the 10% level. This suggests that the poor relationship between life satisfaction and income (conditional on the inclusion of ELSI) is most apparent at the income extremes. Nevertheless, income remains insignificant at the 5% level, while ELSI remains positive and significant at the 1% level throughout.

Table 14: Results by income quartiles

Variable	Coefficient	Full sample	Bottom Q	Middle Qs	Top Q
Ln(y)	β_2	-0.0146	-0.0273	0.0712*	-0.0274
		(0.0165)	(0.0639)	(0.0424)	(0.0498)
ELSI (C)	β_3	0.0393***	0.0457***	0.0383***	0.0392***
		(0.0019)	(0.0052)	(0.0028)	(0.0036)
Constant	β_0	2.9524***	3.0895***	2.0563***	2.9832***
		(0.1805)	(0.7340)	(0.4572)	(0.5223)
N		8048	1907	4048	2093
Adj-R^2		0.2995	0.2400	0.2571	0.3379
Std-err		0.7121	0.6512	0.7007	0.7794

6.2.3 ELSI quartiles

In Table 15, we split the sample into three categories based on the ELSI score: 'Bottom Quartile', 'Middle Two Quartiles' and 'Top Quartile'. Our results for all quartiles again reflect the central result from section 5 with income being insignificant throughout (even at the 10% level).

Table 15: Results by ELSI quartiles

Variable	Coefficient	Full sample	Bottom Q	Middle Qs	Top Q
Ln(y)	β_2	-0.0146	-0.0075	-0.0066	-0.0522
		(0.0165)	(0.0267)	(0.0209)	(0.0431)
ELSI (C)	β_3	0.0393***	0.0650***	0.0270***	0.0436***
		(0.0019)	(0.0143)	(0.0060)	(0.0044)
Constant	β_0	2.9524***	2.2033***	3.0796***	3.3746***
		(0.1805)	(0.4945)	(0.2881)	(0.4700)
N		8048	1907	4048	2093
Adj-R^2		0.2995	0.2400	0.2571	0.3379
Std-err		0.7121	0.6512	0.7007	0.7794

6.2.4 Ethnicity

In Table 16, we detail results split by ethnicity (Māori, Pākehā, Pacific and Asian[28]). Again, we find that ELSI is always positive and significant at the 1% level while the coefficient for income is never positive and significant.

Table 16: Results by ethnicity

Variable	Coefficient	Māori	Pākehā	Pacific	Asian
Ln(y)	β_2	-0.0917	-0.0107	-0.1332*	0.0787
		(0.0613)	(0.0198)	(0.0790)	(0.0545)
ELSI (C)	β_3	0.0419***	0.0396***	0.0240***	0.0309***
		(0.0066)	(0.0024)	(0.0082)	(0.0069)
Constant	β_0	3.8296***	2.7997***	4.8378***	3.2629***
		(0.7188)	(0.2268)	(0.9006)	(0.6327)
N		617	5846	285	556
Adj-R^2		0.2889	0.3014	0.3249	0.2247
Std-err		0.8007	0.7036	0.6958	0.5995

28 These results exclude those who reported multiple ethnicities. We find the results still hold if these people are included in any of the ethnicity groups they identify with.

6.2.5 Urban / Rural Split

Housing makes up only a small portion of the overall ELSI calculation[29], yet it accounts for a significant level of household disposable income. Furthermore, this level varies greatly across the country. The ratio of house prices to income in Auckland is more than 50% above the national average and well over 100% higher than in some rural areas of New Zealand (Greenaway-McGrevy & Phillips, 2016). The importance of income relative to ELSI may therefore differ across region type.

In order to test whether this is the case, Table 17 splits the sample by urban status: 'Auckland urban', 'other urban' and 'rural'.[30] We again find that ELSI is always positive and significant at the 1% level whilst income is never significant at even the 10% level. Thus our central result is unaffected by the differing housing market conditions corresponding to these regional splits.

Table 17: Results by Region

Variable	Coefficient	Full sample	Auck Urban	Other Urban	Rural
Ln(y)	β_2	-0.0146	-0.0063	-0.0100	-0.0294
		(0.0165)	(0.0320)	(0.0238)	(0.0326)
ELSI (C)	β_3	0.0393***	0.0348***	0.0380***	0.0440***
		(0.0019)	(0.0041)	(0.0027)	(0.0037)
NZDep	β_4	0.0133***	-0.0012	0.0141***	0.0205***
		(0.0032)	(0.0065)	(0.0044)	(0.0068)
Constant	β_0	2.9524***	2.9657***	2.8522***	3.0692***
		(0.1805)	(0.3657)	(0.2689)	(0.3610)
N		8048	1766	4067	2203
Adj-R^2		0.2995	0.3120	0.3079	0.2955
Std-err		0.7121	0.6795	0.7175	0.7185

6.2.6 Life satisfaction and relative income

Table 17 also reports results across regional splits for the relationship between life satisfaction and relative material wellbeing using the NZ Deprivation Index as the measure of neighbours' material wellbeing. For the full sample, we find that living in a poorer community is associated with higher levels of life satisfaction, consistent with the underpinnings of the Easterlin paradox (Easterlin, 1995). When we split the sample into 'Auckland urban', 'other urban' and 'rural', we

29 ELSI only includes one question asking if respondents have enough room for a family to stay.
30 Auckland, with population of 1.4 million in 2013, is New Zealand's largest city comprising almost one-third of the country's population.

find that the magnitude of this relationship differs depending on region type. The effect is strongest in rural areas, less strong (but still significant) in other urban areas and disappears altogether in Auckland. This pattern is consistent with people in smaller communities having a greater degree of social capital than those in large areas (Roskruge et al., 2012). Thus people in small communities have a more accurate reference point for assessing their relative living standard than do those living in a large city (Luttmer, 2005).

6.2.7 Functional form of household income

We have followed the norm in the literature and used the natural logarithm of equivalised household income as our default functional form for income. This is to account for the well documented concave relationship between income and subjective-wellbeing. Deaton & Kahneman (2010) provide an exposition of the argument for employing a logarithmic transformation on income. The essence of this argument is that raising a CEO's pay by $100 is very different to a $100 raise for someone on the minimum wage, yet doubling their respective salaries may have a similar impact for both individuals[31].

In Table 18, we present results from altering the functional form for household income. In all cases, we employ a standard OLS model with all controls included using the full sample. We test three alternatives which have been considered in other studies in order to fine-tune the concavity of the relationship. The first alternative includes the natural log of household income and 'household income squared' in the same equation (Ln(y) & y^2). This was noted by Helliwell (2003) as the preferred functional form when tested on his set of data. Layard et al.(2008) also test this formulation, finding that the coefficient on the 'household income squared' term is negative, allowing them to establish that the relationship between happiness and income is more concave than implied by the log function alone. The second alternative includes household income and household income squared in the same equation (y & y^2). Again, this variation is designed to account for the concavity of the relationship between income and happiness. The third alternative includes household income, household income squared and 'household income cubed' in the same equation (y, y^2 & y^3). As shown in Table 18, we find that the choice of functional form has no discernible change on our core result.

31 Weber's Law, which states that the percentage change to quantitative dimensions is the important factor in influencing perception, provides the theoretical underpinnings (Deaton & Kahneman, 2010).

Table 18: Functional form of income

Variable	Coefficient	Ln(y)	Ln(y) & y^2	y & y^2	y, y^2 & y^3
Ln(y)	β_2	-0.0146	-0.0159	-	-
		(0.0165)	(0.0222)	-	-
Income	β_{2A}	-	-	-0.0000	-0.0000
		-	-	(0.0000)	(0.0000)
Income^2	β_{2B}	-	0.0000	0.0000	0.0000
		-	(0.0000)	(0.0000)	(0.0000)
Income^3	β_{2C}	-	-	-	-0.0000
		-	-	-	(0.0000)
ELSI (C)	β_3	0.0393***	0.0393***	0.0391***	0.0391***
		(0.0019)	(0.0019)	(0.0020)	(0.0020)
Wald Test		$\beta_2 = 0$	$\beta_2 = \beta_{2B} = 0$	$\beta_{2A} = \beta_{2B} = 0$	$\beta_{2A} = \beta_{2B} = \beta_{2C} = 0$
p-value		0.3764	0.4746	0.7846	0.2833
N		8048	8048	8048	8048
Adj-R^2		0.2995	0.2994	0.2993	0.2993
Std-err		0.7121	0.7121	0.7121	0.7121

OLS standard errors are White heteroskedasticity-consistent; Column headings denote the functional form of equivalised household income in Equation (2).

6.2.8 6.2.8 Alternative household income equivalisation methodologies

We assess the impact of altering the methodology for equivalising household income (again using OLS, all controls and the full sample). Table 19 reports the results for the Modified-OECD approach and for the old OECD household income equivalisation method ('Old'), the Square Root method ('Square Root'), and for the Per Person equivalisation method ('Per Person'). Again we find that our core result is robust against these variations.

Table 19: Household income equivalisation methodologies

Variable	Coefficient	Modified	Old	Square Root	Per Person
Ln(y)	β_2	-0.0146	-0.0141	-0.0129	-0.0127
		(0.0165)	(0.0164)	(0.0164)	(0.0160)
ELSI (C)	β_3	0.0393***	0.0393***	0.0392***	0.0392***
		(0.0019)	(0.0019)	(0.0019)	(0.0019)
N		8048	8048	8048	8048
Adj-R^2		0.2995	0.2994	0.2994	0.2994
Std-err		0.7121	0.7121	0.7121	0.7121

6.3 ELSI decomposition

As set out in section 4, ELSI is a composite index comprising objective and subjective elements, which we refer to as 'Objective ELSI' and 'Subjective ELSI' respectively. We test our results for the separate components, by replacing the full version of ELSI ('Full ELSI') with each element in turn. Table 20 presents these results (using OLS, all controls and the full sample).

The coefficient on income (β_2) is positive and significant at the 10% level when household income and Objective ELSI are included in the same regression with Subjective ELSI excluded. (This result holds across different estimation techniques.) Nevertheless, inclusion of Objective ELSI roughly halves β_2 compared with when ELSI is omitted from the regression altogether. Moreover, in a number of key samples (Māori, people under 30 and those on low incomes) β_2 is insignificant when objective ELSI is included in the regression[32]. This point is crucial as these are the segments of society for which ELSI was primarily designed as a measure of material wellbeing (Perry, 2015). Thus for these groups, which social policy (e.g. targeted social assistance) is most aimed at, income remains irrelevant in explaining SWB once Objective ELSI is included. Furthermore, when we split the sample by three region types (as in section 6.2.5) we find that income is not significant for any region type while Objective ELSI is positive and significant at the 1% level for each of the three region types.

We observe that β_2 is negative when only subjective ELSI is included in the regression (Table 20 final column), underlining the superiority of self-rated assessments of material wellbeing (relative to income) in explaining subjective wellbeing.

32 The full list of split samples where income is not positive and significant: Māori, Pacific, bottom income quartile, top income quartile, Auckland urban, other urban, rural, people under 30, and people between 31 and 64.

Table 20: ELSI decomposition with Income

Variable	Coefficient	Full ELSI	Objective ELSI	Subjective ELSI
Ln(y)	β_2	-0.0146	0.0307*	-0.0391**
		(0.0165)	(0.0166)	(0.0162)
ELSI (C)	β_3	0.0393***	0.0362***	0.1356***
		(0.0019)	(0.0025)	(0.0052)
Constant	β_0	2.9524***	2.6511***	3.2466***
		(0.1898)	(0.1938)	(0.1864)
N		8048	8048	8048
Adj-R^2		0.2995	0.2767	0.3232
Std-err		0.7121	0.7905	0.6999

When both Objective ELSI and Subjective ELSI are included in the same regression (Table 21), the coefficient on income is again negative. Both Objective ELSI and Subjective ELSI are positively and significantly related to life satisfaction (at the 1% level) when included in the same equation, with or without income included.

Table 21: Including both Objective and Subjective ELSI

Variable	Coefficient	Objective & Subjective ELSI (with income)	Objective & Subjective ELSI (without income)
Ln(y)	β_2	-0.0476***	-
		(0.0163)	-
Objective ELSI	β_3	0.0103***	0.0094***
		(0.0026)	(0.0026)
Subjective ELSI	β_3	0.1250***	0.1215***
		(0.0056)	(0.0055)
Constant	β_0	3.2085***	2.7220***
		(0.1872)	(0.0815)
N		8048	8048
Adj-R^2		0.3247	0.3240
Std-err		0.6991	0.6995

7 Discussion and Conclusions

Our central finding is that a consumption based measure of material wellbeing (ELSI) outperforms income in predicting an individual's life satisfaction. Despite its consistency with the theoretical literature, this finding is novel within the empirical literature.[33] The result does not, however, necessarily foreshadow the end to income's role in studies of wellbeing or in public policy designed to improve the wellbeing of individuals. If a consumption-based measure (such as ELSI) were unavailable, then our results confirm that a relationship between income and subjective wellbeing does still exist.

Furthermore, if policymakers were interested in raising material wellbeing (e.g. as measured by ELSI), they would have to consider the means to enable these ends. Inevitably, in many cases, the means will be through income of some form.[34] However our results show that income measures may sometimes be poor proxies for assessing poverty or SWB. Better material wellbeing proxies, more closely related to SWB outcomes, can be constructed and used. ELSI is one such tool, the EU-13 index is another.

Use of material wellbeing measures such as ELSI can be seen as unifying two parts of the material wellbeing literature. The first is Friedman's permanent income hypothesis which postulates that current consumption is determined by lifetime resources. The second is the philosophical approach (championed, *inter alia*, by Deaton) which postulates that people are the best judges of their own circumstances implying that weight should be placed on the veracity of their own self-assessments.

Over each of our samples and testing methods we find that ELSI is a more reliable and informative predictor of life satisfaction than income. When both are included in the same regression, income is almost always insignificant, whilst ELSI is always significant. The generality of this result is dependent on the inclusion of ELSI's self-rated elements. When stripped out, and income is compared with only the 'objective' elements of ELSI, both are significant, albeit income is only significant at the 10% level. Furthermore, for key segments of the population (e.g., Māori, people under 30, and those on the lowest incomes), income remains insignificant altogether when only objective ELSI is included. This point is crucial as these are the segments of society that ELSI was designed for (Perry, 2015) and for which most social policy is aimed. Thus, as a guide for social policy interventions, a consumption-based indicator such as ELSI should be preferred to an income indicator when assessing need and designing policy.

33 There are no papers that we are aware of that document or test each of these relationships.
34 We caveat this comment by noting our results show that relative material wellbeing is also important, consistent with aspects of the Easterlin paradox.

References:

Alesina, A. and P. Giuliano (2011). "Family Ties and Political Participation", *Journal of the European Economic Association*, 9(5), pp. 817-839.

Bentham, J. 1843. *The Works of Jeremy Bentham, published under the superintendence of... John Bowring*, 11 vols. (Edinburgh, 1838–43)

Boarini, R.; Johansson, A; and d'Ercole, M. (2006). *Alternative Measures of Well-Being*. OECD social, employment and migration working papers no. 33

Boarini, R. et al. (2012), "What Makes for a Better Life?: The Determinants of Subjective Well-Being in OECD Countries – Evidence from the Gallup World Poll", *OECD Statistics Working Papers*, 2012/03, OECD Publishing. http://dx.doi.org/10.1787/5k9b9ltjm937-en

Deaton, A. (2008). Income, health, and well-being around the world: Evidence from the gallup world poll. *Journal of Economic Perspectives*, 22(2), 53-72. doi:10.1257/jep.22.2.53

Deaton, A. (2010). Price indexes, inequality, and the measurement of world poverty. *American Economic Review, 100 (1),* 5–34.

Deaton, A. (2016). Measuring and understanding behaviour, welfare, and poverty. *American Economic Review, 106 (6),* 1221–1243.

Di Tella, R., MacCulloch, R. J., & Oswald, A. J. (2003). The macroeconomics of happiness. *The Review of Economics and Statistics*, 85(4), 809-827.

Diener, E., Sandvik, E., Seidlitz, L., & Diener, M. (1993). The relationship between income and subjective well-being: Relative or absolute? *Social Indicators Research*, 28(3), 195-223. doi:10.1007/BF01079018

Diener, E., & Diener, R. (2002). Will Money Increase Subjective Well-Being?: A Literature Review and Guide to Needed Research. *Social Indicators Research*, Vol. 57, No. 2 (Feb., 2002), pp. 119-16

Easterlin, R. A. (1974). Does economic growth improve the human lot? In M. Abramovitz, P. A. David & M. W. Reder (Eds.), *Nations and households in economic growth: Essays in honor of moses abramovitz ()*. New York: Academic Press.

Easterlin, R. A. (1995). Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior & Organization*, 27(1), 35-47. doi:http://dx.doi.org/10.1016/0167-2681(95)00003-B

Ferrer-i-Carbonell, A., & Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness?. *The Economic Journal*, 114(497), 641-659.

Frey, B. S., & Stutzer, A. (2002). What can economists learn from happiness research? *Journal of Economic Literature*, 40(2), 402-435. doi:10.1257/002205102320161320

Friedman, M. (1957). A theory of the consumption function. Princeton: Princeton University Press.

Greenaway-McGrevy, Ryan & Phillips, C.B. Peter (2016) Hot property in New Zealand: Empirical evidence of housing bubbles in the metropolitan centres, New Zealand Economic Papers, 50:1, 88-113, DOI: 10.1080/00779954.2015.1065903

Grimes, A., Oxley, L., & Tarrant, N. (2014). Does money buy me love? In D. McDaid, & C. L. Cooper (Eds.), *Wellbeing: A complete reference guide: Economics of wellbeing* (pp. 49) Wiley.

Grimes, A., Hyland, S.. (2015). *A new cross country measure of material wellbeing and inequality*. Motu working paper 15-09. Motu Economic and Public Policy Research; Wellington

Grimes, A., MacCulloch, R. and McKay, F. (2015). Indigenous belief in a just world: New Zealand Māori and other Ethnicities compared. Motu working paper 15-14. Motu Economic and Public Policy Research; Wellington

Helliwell, J., Layard, R., & Sachs, J. (2013). *World happiness report*. (). New York: UN Sustainable Development Solutions Network.

Helliwell, John F. "How's Life? Combining Individual And National Variables To Explain Subjective Well-Being," *Economic Modelling*, 2003, v20(2,Mar), 331-360.

Jaszi, George. 1986. "An Economic Accountant's Audit." *The American Economic Review*, Vol. 76, No. 2 (May): pps. 411-418.

Kahneman, Daniel; Wakker, Peter P.; and Sarin, Rakesh. "Back to Bentham? Explorations of Experienced Utility." *Quarterly Journal of Economics*, May 1997, 112(2), pp. 375-406.

Kahneman, Daniel and Deaton, Angus. "High Income Improves Evaluation of Life But Not Emotional Well-Being" *Proceedings of the National Academy of Sciences*, September 7 2010, 107(38) 16489-16493.

Kahneman, D., Krueger, A. B., Schkade, D., Schwarz, N., & Stone, A. A. (2006). Would you be happier if you were richer? A focusing illusion. *Science*, 312(5782), 1908-1910.

Kahneman, D., & Krueger, A. B. (2006). Developments in the measurement of subjective well-being. *Journal of Economic Perspectives*, 20(1), 3-24. doi:10.1257/089533006776526030

Krueger, A. B., & Schkade, D. A. (2008). The reliability of subjective well-being measures. *Journal of Public Economics*, 92(8-9), 1833-1845. doi:10.1016/j.jpubeco.2007.12.015 [doi]

Layard, R. (2011). *Happiness : Lessons from a new science* (2nd ed.). London: Penguin.

Ligon, Ethan, 1989. The Development and Use of a Consistent Income Measure for the General Social Survey. *GSS Methodological Report* No. 64. NORC, Chicago

Luttmer, E. F. P. (2005). Neighbors as negatives: Relative earnings and well-being. *The Quarterly Journal of Economics*, 120(3), 963-1002. doi:10.1093/qje/120.3.963

Jensen, John; Spittal, Matt; and Krishnan, Vasantha. (2005). *ELSI Short Form User Manual for a Direct*; Centre for Social Research and Evaluation Te Pokapü Rangahau Arotaki Hapori

Mack. J, and Lansley. S (1985). *Poor Britain*, London, George Allen & Unwin Ltd., London

OECD, 2013: Framework for Statistics on the Distribution of Household Income, Consumption and Wealth; Chapter 8, 2013; http://www.oecd.org/statistics/OECD-ICW-Framework-Chapter8.pdf

Oswald, A. J., & Wu, S. (2010). Objective confirmation of subjective measures of human weil-being: Evidence from the U.S.A. *Science*, 327(5965), 576-579.

Oswald, A., Proto, E., & Sgroi, D. (2014). Happiness and productivity. *Journal of Economic Literature*: https://www2.warwick.ac.uk/fac/soc/economics/staff/eproto/workingpapers/happinessproductivity.pdf

Parker, R. N. & Fenwick, R., "The Pareto Curve and its Utility for Open-Ended Income Distributions in Survey Research," *Social Forces* 61 872-885, 1983.

Perry, Bryan. 2015. *The material wellbeing of New Zealand households: trends and relativities using non-income measures, with international comparisons*; Ministry of Social Development Wellington

Roskruge, Matthew, Arthur Grimes, Philip McCann & Jacques Poot. 2012. "Social Capital and Regional Social Infrastructure Investment: Evidence from New Zealand", *International Regional Science Review*, 35(1), 3-25.

Sen, A. 1985. *Commodities and Capabilities*, Amsterdam: North-Holland

Smith, A. 1776. *The Wealth of Nations*. Edited by Edwin Cannan, 1904. Reprint edition 1937. New York, Modern Library

Statistics New Zealand, 2013: Geographic definitions; http://www.stats.govt.nz/Census/2013-census/info-about-2013-census-data/2013-census-definitions-forms/definitions/geographic.aspx#main-urban-area

Stevenson, B., & Wolfers, J. (2008). Economic growth and subjective well-being: Reassessing the easterlin paradox. *Brookings Papers on Economic Activity*, 2008, 1-87.

Stiglitz, J., Sen, A., & Fitoussi, J. (2009). *Report by the commission on the measurement of economic performance and social progress*. Paris: OECD.

Stone, Richard. "Nobel Memorial Lecture 1984: The Accounts of Society." *Journal of Applied Econometrics*, January 1986, 1(1), pp. 5-28.

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