Welfare Indicators and GDP

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Abstract

The clamor for indicators of well-being after the recession of 2008 was predicated on the idea that Gross Domestic Product (GDP) was an insufficient measure of an economy's overall performance. Though GDP measure was not designed to serve as a measure of welfare, it can be shown to be informative about well-being. This paper examines the relationship between a set of Organisation for Economic Co-operation and Development (OECD) well-being indicators and household income. Our data consists of 12 years of submissions of well-being indicators by 44 OECD countries and we have approximately 520 observations for each indicator.

We use entropy measures to assess dependency. We find that Mutual Information and Conditional entropy generally show dependency between household income and each of the 18 indicators. For example, the entropy of the subjective indicator "Feeling Safe at Night" is 4.02 bits (of information) and this value derives from the indicator values submitted by countries to the OECD, which reflects the views of their populations. The mutual information between household (HH) income and this indicator is 1.3 bits or 32% of the information about the indicator and the conditional entropy of 2.72 bits, 68% of the total entropy, is the uncertainty remaining. Whether 32% of the information is sufficient is determined by the intended user and should consider the acquisition cost of the remaining 68%. For context, the correlation in this case is 0.69, a moderately strong linear relationship between this indicator and HH income. The important difference between the two perspectives is that the entropy measures are nonnegative, nonlinear, and not constrained by the need to have matched pairs.

Keywords GDP, Well-being, Mutual Information

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1. Introduction

The clamor for indicators of well-being after the recession of 2008 was predicated on the idea that Gross Domestic Product (GDP) was an insufficient measure of an economy's overall performance. It was maintained, primarily in the Stiglitz et. al (2009) report, that the focus on GDP growth prior to the recession not only led to the financial market difficulties but also failed to consider that the benefits of the preceding growth were not being widely shared throughout the economy.

Aside from the Stiglitz et. al (2009) report, studies such as Easterlin (1974) and Deaton (2008) examined the relationship between income and well-being through the use of survey data.[2] As discussed in Durand (2015), the Organisation for Economic Co-operation and Development (OECD) essentially took a non-survey-based approach and developed specific metrics of well-being that comprise their How's Life initiative.[3] More specifically, the OECD effort was devoted to creating indicators of well-being/welfare that measured dimensions of society not included in measured GDP growth.[4] Some national statistical offices such as the UK's Office of National Statistics also provides a suite of measures that gauge well-being.

Though the GDP measure was not designed to serve as a measure of welfare, production is accompanied by income and consumption and the latter two are crucial components of individual and household welfare.[5] In contrast to the general approaches mentioned above, we take a different and more concentrated look at the relationship between GDP and well-being and show that GDP can be shown to be informative about well-being in specific ways. First, instead of relying solely on subjective measures of well-being, we use a set of OECD welfare indicators whose underlying data come from national statistics, administrative data and subjective measures—though the last form a small part of the 18 indicators that we use. Second, instead of relying on linear measures of dependence, correlation or regression, we use an information-based metric, Mutual Information (MI). This measure captures nonlinear relationships, is not influenced by outliers, and does not assume that the data are normally distributed. MI measures the strength of a dependency, is nonnegative, and doesn't indicate direction, while correlation, because it provides a value between -1 and 1, measures both the strength and direction of a relationship. MI can detect any kind of statistical dependence, while correlation might miss some forms of dependency.

Our data consists of well-being indicators submitted by OECD countries over a 12-year period starting in 2007. In principle, the core consists of 44 countries submitting data for 18 indicators yielding approximately 520 observations for each indicator. Since all countries do not submit data in every year,

[2] Because the income and expenditure approaches to measuring aggregate economic activity are in principle identical, the income and GDP are viewed as synonymous.

[3] As Diane Coyle (2014) put it on page 102, "The most sophisticated dashboard at present is the OECD's Better Life Index, which is a visualization of countries' relative rankings depending on eleven components, ranging from income to work-life balance, housing to the environment."

[4] For more information, visit the OECD "How's Life? 2020" website.

[5] There is a large literature about GDP not being a measure of welfare. Oulton (2012) presents the arguments. A main point of his paper is that while GDP is not a welfare measure it is an indicator of welfare. Our view is similar but more expansive because we show how GDP is related to specific indicators of well-being, as described in section 4.

the number of observations per indicator varies and we classify our data by the number of submissions. We show that the relationship between household (HH) income (GDP) and well-being is positive in the sense that the dependency can be established using an information-based metric. Household income is chosen over aggregate income as it is deemed more relevant to household members than an abstract concept of national income.[6] Easterlin (1974) finds a statistically insignificant link between aggregate income and happiness/subjective well-being—happiness and subjective well-being are treated synonymously. This finding is within countries and across countries. Some studies have found evidence to the contrary, (see for example Stevenson and Wolfers 2008) using the same type of data—subjective well-being measures and national income as does Deaton (2008). These studies examined the link between income and well-being and used correlations or regression analysis. Our use of MI is a complement to correlation/regression analysis. Notably, if the relationship is nonlinear or asymmetric over the support of the variables then MI should indicate a relationship while the correlation may get swamped by offsetting parts in the support. We compare a Pearson correlation coefficient to a much used normalization of MI, the Information Quality Ratio (IQR).[7]

Sims (2003) used MI in his discussion of rational inattention, which posits that individuals cannot realistically process or analyze the vast amount of information available, and so choose to focus their attention on the most relevant and important data for their decision-making purposes.[8] Analogously, because policymakers must evaluate many measures of well-being, subjective and objective, we argue that the MI framework may allow them to limit their attention to income. Limiting the attention to income is especially important because for many of the indicators there is no clear policy choice—policies to affect the movement in the indicator are arguable and so knowing that there is a dependency between income and well-being helps policymaking by reducing the information that has to be processed by the policymaker.

2. Data

Our data are taken from country submissions to the OECD. The dataset consists of 12 years of submissions (2006–2017) of well-being indicators and household income. Household income is chosen over aggregate income as it is deemed more relevant to household members than an abstract concept of national income.[9] Table 1 shows the indicators and the number of observations in each year. For our core set of indicators, the United States and European Union countries rank the highest in submissions, generally submitting data every year.

[6] For completeness in appendix 2 we examine the relationship using per capita Gross National Income (GNI) and show that there is no qualitative difference.

[7] We use the correlation coefficient instead of regression methods because the latter is beset by multicollinearity.

[8] See also Maćkowiak et. al. (2021) "Rational Inattention: A Review."

[9] For completeness in appendix 2 we examine the relationship using per capita gross national income and show that there is no qualitative difference.

2.1. Descriptions of Indicators and Income

The OECD How's Life indicator set is part of their Better Life initiative. It is a combination of administrative data, official statistics, and subjective well-being statistics. The last are a minority of the indicators. In our most complete panel, for example, there are 18 indicators and only 4 are based on surveys that ask subjective questions. To simplify the analysis, we classify the indicators as being either judgmental or nonjudgmental. The judgmental category is restricted to those indicators that are completely reliant on survey responses to questions about "feelings." Indicators that are based on time use surveys are not considered subjective and are therefore placed in the nonjudgmental category. The left hand side of table 1 shows the classification of the indicators. Appendix 1 provides a full description of the indicators and their data sources.[10]

The judgmental OECD well-being indicators are based on surveys of individuals that ask questions like, how safe do you feel at night? These surveys are conducted by the Gallup World Poll or by the OECD (the subjective well-being surveys). The Gallup World Poll has been used by researchers to establish the link between income and well-being. See, for example, Deaton (2008).

The nonjudgmental category is further divided into economic and noneconomic indicators. The noneconomic indicators do not involve income and are based on administrative data—for example, homicide rates. The economic indicators are related to income such as earnings. The income variables come from country official statistics. They are per-capita averages.

2.2. Description of Sample

Our data consists of country yearly submissions over the 12 years from 2006 to 2018 and are categorized by the total number of observations. The most complete set of observations, that is the least number of nonsubmissions, is labeled the "Core." As mentioned, the United States and EU countries rank the highest in the total number of submissions. Extension 1 is the indicator set with the next fewer number of nonsubmissions. Extension 2 is the indicator set with even more nonsubmissions.

As table 1 shows, the number of observations per indicator varies over the years. Generally, the Core consists of 35 countries submitting 12 years of data, 2006–2017, for 18 indicators and therefore there is cross-country variation in each indicator over the 12-year period. For example, in the Core we have 492 observations for Feeling Safe at Night. The second and third parts in table 1 show the number of observations for indicators by year in Extensions 1 and 2. Note that the number of observations in the far-right column is far less in Extension 2 than in Extension 1 and that there are many zeros in both extensions. Further note that both extensions have only one judgmental indicator.

[10] Appendix 1 comes from the OECD—OECD How's Life? Well-being Database Definitions and Metadata.

3. Method of Analysis

The relationship between income and the suite of How's Life (HL) variables is examined in two ways. First, we calculate the pairwise Pearson correlation coefficient of each HL variable with income. Correlation is a well-known summary statistic, defined as the ratio of covariance and the product of standard deviations, and allows us to assess a relationship's direction and magnitude under certain conditions. In a pairwise fashion, over the support of the relevant variables, this turns out to be a linear accounting of association between the two variables. The pairwise feature reduces the observation count from those in table 1 by 13% on average. Consequently MI is robust because it uses all of the observations available. Alternatively, we also calculate the pairwise mutual information and information quality ratio for each variable. Unlike the correlation coefficient, mutual information does not indicate direction or magnitude on its own. Rather, mutual information—commonly measured in bits—is a measure of overlapping information between two random variables. To be specific, joint entropy (or information) between two variables, with a bit of abuse of notation, is defined as,

$$H(X,Y) \leq H(X) + H(Y) - I(X,Y) \tag{1}$$

where $H(\cdot)$ represents entropy and for a single, discrete variable is defined as,

$$H(X) := -\sum p(x) \log_b p(x). \tag{2}$$

Mutual information is overlapping information between the two variables and can be expressed as,

$$\begin{aligned} I(X,Y) &= H(X) + H(Y) - H(X,Y) \\ &= \sum \sum p(x,y) \log_b \frac{p(x,y)}{p(x)p(y)} \end{aligned} \tag{3}$$

Moreover, it is important to note that $I(x,y) \in [0, \min(H(X), H(Y))]$. If I $(X,Y) = 0$ then X and Y share no information and are independent. On the other hand, suppose $H(Y) < H(X)$ and $I(X,Y) = H(Y)$, this tells you that observing Y is superfluous in terms of information. It told you nothing more than X did by itself.

Analogous to the correlation coefficient, the information quality ratio (IQR) is a ratio of mutual information and joint entropy,

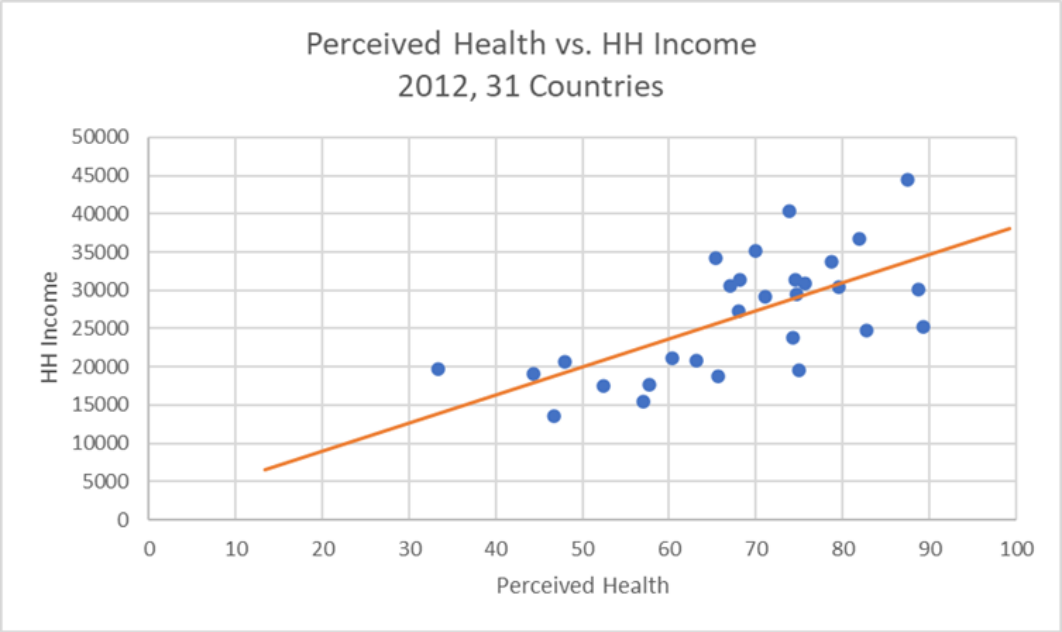
$$IQR(X,Y) = \frac{I(X,Y)}{H(X,Y)}, \tag{4}$$

with

$$IQR \in [0, \frac{min(H(X), H(Y))}{H(X,Y)}], \tag{5}$$

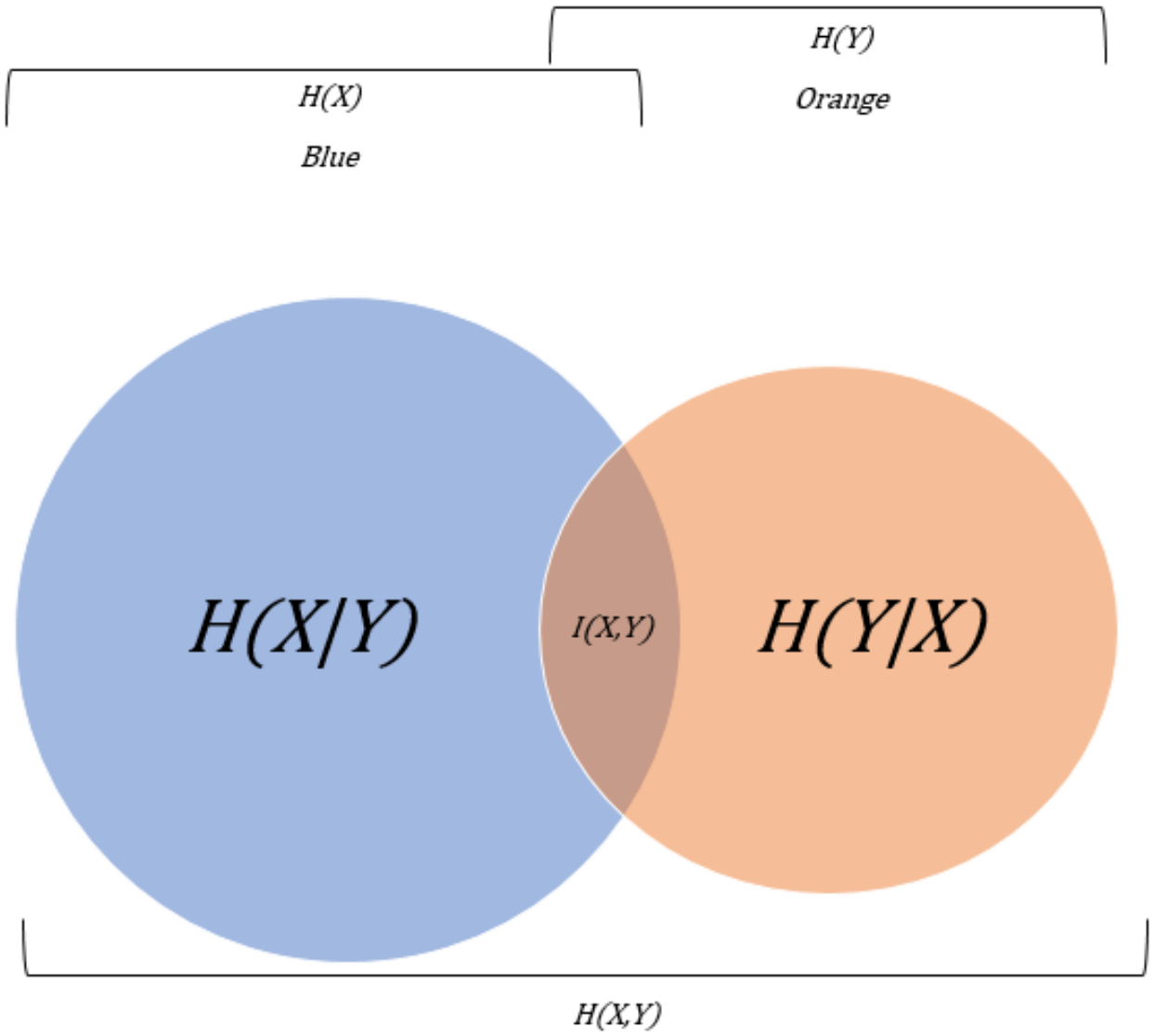
and like the correlation coefficient is a useful summary statistic; though unlike its counterpart, IQR is nonnegative and nonlinear. An IQR near zero indicates that *the random variables* share little or no information and thus observing one tells you little about the position of the other.

For example, in our context a near-zero IQR between household income and homicide rates tells us that knowing the level of income gives us no information, linear or otherwise, about the level of homicide rates. Conversely, if those two variables produced a high IQR value then knowing household income conveys significant information, up to and including complete information, about homicide rates. Again, it is important to note that IQR is not a linear measure of association, rather it is a measure of information content unconstrained by linearity, and as a result may provide insight one would otherwise miss by examining a purely linear measure of association such as correlation. To illustrate the difference between MI and correlation, the chart below shows that observations on Perceived Health and HH income and the regression line between them; the MI metric captures the nonlinearity of the relationship.



As an information measure, MI is grounded in the entropy of the variables, where entropy means the uncertainty of the variable measured in bits of information. Consider the Venn diagram below for two random variables X and Y in which $H(X)$ is the entropy of X, $H(Y)$ the entropy of Y, $H(X,Y)$ is their joint entropy, $H(X|Y)$ is the conditional entropy of X given Y, $H(Y|X)$ is the conditional entropy of Y given X, and $I(X,Y)$ is the overlap or shared information and is the definition of MI. Each conditional entropy measures the information available for each variable after accounting for the overlapping information.

Venn Diagram of Mutual Information and Entropy



Formally, MI is defined as:

$$I(X,Y) = H(X) - H(X|Y) \tag{6}$$
$$= H(Y) - H(Y|X) \tag{7}$$
$$= H(X) + H(Y) - H(X,Y) \tag{8}$$
$$= \sum\sum p(x,y) \log_2 \frac{p(x,y)}{p(x)p(y)} \tag{9}$$

Where $I()$ is the MI statistic, $H()$ is the individual entropy, $H(X|Y)$ and $H(Y|X)$ are the conditional entropies, $H(X,Y)$ is the joint entropy, $p(x,y)$ is the joint distribution of x and y, and $p(x)$ and $p(y)$ are the marginal distributions. From the last equation above we can see that if x and y are independent of each other, then $p(x,y) = p(x)p(y)$. This would lead to the second term in the equation being equal

to 0, since $\log \frac{x}{x} = \log 1 = 0$. [11]

The intuition underlying MI can be illustrated by the example below. Consider two fair coins that are each flipped. The possible outcomes are {heads, heads}, {heads, tails}, {tails, heads}, and {tails, tails}. The table below contains the marginal and joint probabilities for the two coins.

		X: Coin 1		
		H	T	Total
Y: Coin 2	H	0.25	0.25	0.5
	T	0.25	0.25	0.5
	Total	0.5	0.5	1

From the table above we can insert the marginal and joint probabilities into the individual and joint entropy formulas, which can then be used to compute MI.

$$H(X) = -\sum p(x) \log_2 p(x) = -(0.5 \log_2 0.5 + 0.5 \log_2 0.5) = 1 \tag{10}$$

$$H(Y) = -\sum p(y) \log_2 p(y) = -(0.5 \log_2 0.5 + 0.5 \log_2 0.5) = 1 \tag{11}$$

$$H(X,Y) = -\sum \sum p(x,y) \log_2 p(x,y) \tag{12}$$

$$= -(0.25 \log_2 0.25 + 0.25 \log_2 0.25 + 0.25 \log_2 0.25 + 0.25 \log_2 0.25) = 2 \tag{13}$$

$$I(X,Y) = H(X) + H(Y) - H(X,Y) = 1 + 1 - 2 = 0 \tag{14}$$

$H(X)$ and $H(Y)$ both equal 1, the maximum entropy value for this system ($\log_2 n = max\ entropy$, where n is the number of states for the probability distribution and equal to 2 in this example, $\log_2 2 = 1$). The MI value, $I(X,Y) = 0$, shows that observing the flips of Coin 1 or Coin 2 provide no information about the outcome of the other coin. In other words, Coin 1 and Coin 2 are independent of each other.

The implementation of MI requires the data to be discretized, or binned, before running the MI calculation. In determining the number of bins to use, we chose the widely used $\sqrt{n}$ (Tukey (1977), p543) where n is the number of observations. For the time series, this n is not constant over years or among variables. We chose to set n to the average number of observations across the variables and across years. For instance, in the Core group of variables we took the average of observations in 2006, 2007,. . . , 2017 and then took an average of those years to get a single value of *n*. The benefit of holding the number of bins constant over time is that we can compare the magnitude of the MI statistics over time and among variables. In the section 4.2 time series analysis, the value of *n* was computed in much the same way but without the need to average over years.

[11] This definition of MI shows that MI is the expectation of the logarithmic difference between the joint distribution and the product of the marginal distributions.

Because the MI statistic and the correlation coefficient are inherently different, we seek to ascertain their coherence/similarity. To do so, we define a coherence score that is a normalization of each time series for an indicator n_i:

$$coherence(n_i^t) = \frac{n_i^t - min(n_1^1 : n_n^{12})}{max(n_1^1 : n_n^{12}) - min(n_1^1 : n_n^{12})}, \tag{15}$$

This method provides a number in the interval [0,1] for all n_i^t.[12]

4. Results

Results are presented in two ways. First, we present the panel dependency metrics for the Core and two Extensions and then evaluate the similarity between countries. Second, we present the time series for the Core—the relationship between HH income and the indicator at points over the period. Indicators are divided into judgmental and nonjudgmental. The latter category is further divided into economic and noneconomic.

Table 2 gives the entropy for each indicator, the mutual information with HH income, which can be characterized as the overlap or redundant information, and the conditional entropy, which is the remaining information after accounting for the information provided by HH. For example, the entropy of Feeling Safe at Night is 4.02 bits and this value derives from the indicator values submitted by countries to the OECD, which reflects the views of their populations. The mutual information between HH income and this indicator is 1.3 bits or 32% of the information about the indicator and the conditional entropy of 2.72 bits, 68% of the total entropy, is the uncertainty remaining.

Recall that the underlying premise of the criticism of GDP as a welfare indicator is that income does not provide sufficient information about well-being and so a policymaker's pursuit of increasing economic growth does not necessarily coincide with increasing well-being. Here, we provide some quantification that yields insight to the policy choice. Policymakers face a quandary—there are many indicators of well-being and the polices needed to increase well-being are arguable. This quandary ties to the notion of rational inattention, in which the inability to process all the uncertainties can be overcome by concentrating on fewer variables. Consider the case of "Feeling Safe at Night" where the question is whether 32% of the information overlap between HH and "Feeling Safe at Night" is sufficient for policymaking or in terms of the IQR measure which says that MI provides 20% of the information from both HH income and Feeling Safe at Night. Whether 32% or 20% of the information is sufficient is up to the user and must be balanced by the cost of acquiring the remaining 70–80% of the information. Now suppose policymakers want to increase "Feeling Safe at Night." Though one can conceive of several policies that might achieve that goal, the uncertainty of the causal link between an action and the desired outcome makes the policy choice unclear. Two policies that come to mind are installing CCTV cameras and increasing police presence. The relationship between either of these and Feeling Safe at Night is not precisely known and so there would be a cost to finding out how implementing either of these affects Feeling Safe at Night.

[12] See Zhang et. al (2018) and Patro and Sahu (2015) for the association of the normalization formula with coherence.

Our result shows that the policymaker knows that HH income provides nearly a third of the information about Feeling Safe at Night and given the cost of acquiring additional information about the impact of the two policies may decide that knowledge is sufficient.

The argument above applies to all the indicators in table 2. It is a different perspective than one takes when looking at correlation values, which are provided in the first column and in this case presents the correlation coefficient and, in this case, indicates a moderately strong linear relationship between this indicator and HH income.

4.1. Core

4.1.1. Judgmental Indicators

For the judgmental indicators, the absolute value of the correlation coefficient is at least 0.57 with a high of 0.72. This indicates a moderate to strong linear relationship. For IQR the values are around 0.2. This means that HH income provides around 20% of the information about the movements in the companion indicator. Bear in mind that IQR and the correlation coefficient are not comparable.

4.1.2. Nonjudgmental Indicators: Noneconomic

The absolute value of correlations ranges from 0.30 to 0.66 and can be considered weak to moderate. The IQR metric goes from 0.10 to 0.21. The low value occurs with "households with internet access at home." First, it should be noted that the indicator measures the share of households with broadband access at home, which means it does not account for households with lower speed access. Second, its relation to HH income may be diluted because of government subsidies.

4.1.3. Nonjudgmental Indicators: Economic

For these indicators, the absolute value of correlations ranges from 0.27 to 0.93, which can be thought of as moderate to strong. The IQR ranges from 0.17 to 0.33.

A good example of the difference in interpretation in this category can be seen with HH income and earnings. Earnings is measured as the average annual earnings of employees, which is computed from a national account total of wages and salaries divided by the number of full-time equivalent employees. HH income is measured by summing all the (gross) income flows (earnings, self-employment and capital income, and current transfers received from other sectors) paid to the household sector (as defined by the *System of National Accounts*) and then subtracting current transfers (such as taxes on income and wealth) paid by households to other sectors of the economy. HH income is further adjusted by including social transfers in-kind (such as education and health care services) that households receive from government. As expected, there is a strong relationship between HH income and earnings, as indicated by a high correlation. The dependency metrics are correlation 0.93 and IQR 0.33. IQR does not inherently include the information in a correlation coefficient as these are general measures of mutual independence and not a measure of the linear relationship between the two variables. Thus, this example shows that one cannot draw inferences about the relationship between the variables by comparing IQR

and correlation.

It is also interesting to point out that for housing affordability and the gender wage gap, the absolute value of the correlations is close to zero and yet IQR shows some mutual dependence between HH income and these indicators.

4.2. Extensions

Though the two extensions arise from missing observations, there are sufficient observations to expand the set of indicators considered. The observation table shows that Extension 1 has far fewer observations than the Core but more observations than Extension 2. Extension 1 includes one additional judgmental variable and four nonjudgmental variables—three noneconomic and one economic. The additional judgmental indicator, Negative Affect Balance, is a composite indicator assessing the emotional state of respondents regarding such emotions as anger, sadness, and enjoyment. (See appendix 1) The absolute value of the correlation coefficient is 0.47 while IQR is 0.20. Note that even with fewer observations, the strength of the relationships is comparable to those in the core. Also note that the housing cost indicator has a near-zero correlation but IQR says that there is some mutual dependence between HH income and this indicator.

At first blush, it seems counterintuitive that housing cost overburden would not have a strong correlation with HH income. However, from appendix 1 one can see that the housing cost overburden refers to the share of households in the bottom 40% of the income distribution devoting more than 40% of their disposable income to housing costs, where the latter 40% threshold is based on the methodology used by Eurostat for EU member countries. Thus, the lack of correlation might be due to the indicator being a relative measure and therefore not associating income with actual expenditures on housing.

Extension 2 includes an additional judgmental indicator and seven nonjudgmental indicators—of which six are noneconomic. In this extension, perhaps the most revealing indicator for household well-being is life satisfaction. The correlation coefficient is strongly positive and both IQR and correlation are relatively high, indicating that there is significant information provided by one variable about the other. However, it should be noted that there are only 44 total observations, as shown in table 1, which is substantially less than some of the indicators in the Core.

It is surprising that an effort geared toward assessing well-being has so few country submissions for an indicator titled life satisfaction. From 2006–2012 there are either zero or one country submissions and these are bunched; the zeros are in the first 3 years and then there is a series of ones. In 2013 the submissions jump to 28. After 2013 there are five submissions or less. This indicator is based on a survey where respondents are asked to assign a value from 0 to 10 that indicates their overall life satisfaction. The question slightly varies across OECD countries. It is not clear why 2013 is a huge outlier nor is it clear why the other years have so few submissions.

One possible explanation is that there was a competing survey in 2013. The Gallup World Poll produces a Better Life Index which is used in Deaton (2008) and other studies and there was a 2013 edition to

the survey. There is some overlap between the Better Life Index and the How's Life indicators; in fact, the OECD Better Life program contains the OECD How's Life program. Though the life satisfaction questions in the two programs are different, it could be the case that countries substituted the Better Life Index indicator results for the How's Life indicator.

4.3. Similarity Analysis of the Core

The Core contains data with both a time series and cross-sectional dimension that examines the relationship between household income and the indicators. It is informative to examine how similar each country's income series is to an indicator series, in short concentrating on the cross-sectional dimension over time. We examine similarity by standardizing each series (subtracting the mean of the series from each observation and dividing by the standard deviation) and then take the Euclidean distance between two series. Euclidean distance provides a geometric measure of similarity while one can say that MI provides an information-based measure of similarity.[13]

Before examining the income-indicator similarity we look at the similarity of country incomes by taking the Euclidean distance between the U.S. income series and each country's income series. The number of observations used for the Euclidean distance computation differ on average by 18% from the observation count in table 1 because we only use countries that have 12 observations for the variable and household income. Chart 1 displays these Euclidean distances by country. If the threshold between similar and dissimilar is set at the median of the distances, then one can say that the 17 countries having a Euclidean distance of about 2 are more similar to the U.S. then the 14 countries that have a Euclidean distance greater than 2; the closer the Euclidean distance is to zero the more similar and so Germany is the most similar and Greece is the most dissimilar. The analysis is roughly the same if the threshold is the mean—as shown in the chart. (By implication, the same qualitative result would be obtained if another country were selected as the standard.) Because table 2 shows that there is considerable variability in the statistical dependence metrics for each indicator we simplify the analysis by selecting a set of six indicators that seemed most pertinent to the well-being of households—note that there is a mix of judgmental and nonjudgmental indicators. The approach described above is applied in each of the six panels of chart 2. Consider panel A that looks at the Feeling Safe at Night indicator. Table 2 provides evidence in terms of IQR (and correlation) that there is a statistical relationship, or moderate similarity, between this indicator and HH income. Panel A shows how similar HH income is to the Feeling Safe at Night indicator across countries over our period. Using the median as the threshold, there are 18 countries for which these series are below the median and 14 above; Switzerland is the most similar and Mexico the most dissimilar. Generally, we can say that the panel provides evidence of informational sharing or moderate similarity between the two series, while the Euclidean distance for each country provides evidence that there are distinct country-specific features between the series.

In addition to the judgmental indicator Feeling Safe at Night, panels B, C and D illustrate the Euclidean distances between HH income and three other judgmental indicators, Perceived Health, Difficulty Making

[13] See Greenacre (2017) and Diewert (2009).

Ends Meet, and Social Support. Interestingly the IQR metrics for these indicators are around 2, while the absolute values of their correlation vary from 0.57 to 0.72. The median Euclidean distance varies from a little over 2 to a little over 5. Looking at the number of countries above and below the median Euclidean distance, Feeling Safe at Night has the largest number of countries with small distances while Social Support has the highest Euclidean distance and the most countries above the median—indicating that the level of dissimilarity is the greatest. Note that using the mean distance as the threshold would not qualitatively alter the result.

Panel E shows the similarity between Life Expectancy, a nonjudgmental noneconomic indicator, and HH income. The IQR is 0.21, indicating moderate information sharing and similarity, and the median Euclidean distance is a little over 2, indicating that series exhibit distinct features. There are 18 countries below the median with 7 countries having a distance of 1 or lower (Sweden and Canada having the lowest), indicating high degree of similarity. On the other hand, 13 countries have a distance higher than the median with Greece and Italy having the greatest distance and thus the greatest dissimilarity. Note that the mean is significantly above the median and if that were used as the threshold more countries would be classified as similar.

Panel F shows the similarity between Housing Affordability, a nonjudgmental economic indicator, and HH income. The IQR is 0.14, indicating a relatively low level of information and similarity; note that it is higher than the correlation of 0.04. The median Euclidean distance is about 3 and there are 16 countries below the median, with 5 of them having a distance of 1 or less (Italy and Sweden being the lowest), and 14 countries having a distance greater than the median (Lithuania and Australia being the highest).

The four judgmental indicators represent specific dimensions of subjective well-being, and we find that these indicators are similar to HH income both in terms of information sharing and the respective Euclidean distances between the series. Intuitively, similarity measures capture how close or alike two variables within some conceptual context are, or it can be viewed as quantifying how closely related or comparable two variables or objects are. Thus, polices that affect HH income will affect these indicators.

We also find the same qualitative result for the nonjudgmental indicators. Observe that even Housing Affordability, the economic indicator, is not more similar to HH income than the other indicators.

4.4. Time Series Analysis of the Core

We now examine the time series dimensions of the relationship between household income and the well-being indicators. For this analysis we only look at the Core. Table 3 provides the time series of the measures for the Core and is supplemented by appendix 3, which provides the time series for the underlying entropy measures.

To simplify the analysis, chart 3 has six panels that show the movement in the levels of the same six indicators used above in the similarity analysis. For the most part, they are relatively stable over time. Chart 4 shows that household income levels have steadily increased and, for comparison, the Gross National Income (GNI) per capita is included.

As stated at the outset, we chose HH income over GNI per capita because it is most directly related to the well-being of households, but we recognize that GNI per capita is used in some studies of well-being. Chart 4 shows that the trends are very similar.

Chart 5 has six panels that show the relationship between HH income and the six indicators. Because the three dependence metrics are not comparable, we use the coherence metric defined in equation (2), which allows a comparison of movements. Recall that for each year, we have roughly 35 country observations on the indicator value and household income. For example, the blue lines in the charts represent the trend of the coherence of absolute value of the correlation coefficient. This coherence can be compared to the coherence of IQR.

The bottom panel in chart 5 shows the trend in the entropy measures for each indicator. Generally, MI is below the conditional entropy but sometimes MI is above as in the case of Life Expectancy and Difficulty in Making Ends Meet. Consider the two indicators, Feeling Safe at Night and Housing Affordability. Regarding the former, panel A.1 shows that the trends in the dependency metrics are consistent and panel A.2 shows that the information metrics are stable. Regarding the latter, panel F.1 shows that there are periods where the correlation is below IQR and in some years the correlation is near zero while the IQR is positive, a distinct difference in measured dependence and panel 2 shows that IQR is generally rising.

4.5. Using Log Income

It has been argued that using log income provides a different perspective on the relationship to well-being than does the level of income. In fact, Easterlin addressed his critiques by arguing that his results were valid if one used log income instead of income. More specifically, he used log income (GDP) to analyze the relationship between economic growth and average happiness levels over time. In both cross- and within-country examinations, the use of log income was to capture the impact of relative income positions.

Table 2a shows that using log of average HH income instead of HH income does not qualitatively affect the measures of dependence between income and the well-being indicators. It is interesting to note that Stevenson and Wolfers (2008) use the log of GDP per capita in their critical reassessment of the Easterlin paradox.

4.6. Using Actual Individual Consumption

In as much as consumption is often preferred to income in poverty measurement, we examine the relationship between consumption and our set of well-being indicators. For the same OECD countries, we use the reported Actual Individual Consumption, which is related to HH consumption.[14]

Table 2b replicates the core panel in table 2 and provides a comparison between the metrics in both

[14] Actual Individual Consumption includes consumer goods purchased by households (Household Consumption), as well as services provided by nonprofit institutions and government for individual consumption.

tables—the MI/Individual Entropy ratio, IQR and correlation. The individual entropy measure for an indicator does not change. Generally, the values for consumption are lower than they are for income for the information-based metrics; some are substantially lower. For correlation, the differences are mixed. As a result, consumption does not provide more information about the well-being indicators than income.

5. Summary

We set out to compare the relationships between well-being indicators and household income in a novel way—one that is not restricted by the assumed linearity in the correlation/regression analysis that is usually conducted. Some have argued, for example Lucas (1988), that pursuing economic growth is the fundamental way to enhance well-being. The counterargument is that the multidimensionality, complexity, and subjectivity of well-being are missed by a concentration on income. (See for example, Dalziel et. al (2018)). In this paper we show that income provides information about a set of indicators that capture multiple features of well-being. We do so by using the measure Mutual Information, which is a more general measure of dependence than correlation. For example, we show that income provides 20–30% of the information about Feeling Safe At Night, one of our judgmental indicators that is clearly a subjective indicator of well-being. This result is consistent with the correlation between the two measures but not constrained by the presumed linear relationship between the two measures. For our entire set of judgmental indicators that provide metrics for different dimensions of subjective well-being, we have shown that HH income provides information about them. We further show that our results our robust when: gross national income is used instead of HH income; log income is used; and Actual Individual Consumption is used instead of income.[15] By implication this extends to GDP and its movements. Thus, in the spirit of Oulton (2012), GDP can be viewed as an indicator of well-being. Our results also support the findings of Stevenson and Wolfers (2008) and Deaton (2008) that income affects subject well-being.

Maćkowiak et. al (2021) describe rational inattention as "the idea, proposed by Christopher Sims, that economic decision makers cannot absorb all available information but can choose which pieces of information to process." Because well-being involves the consideration of many indicators, a policymaker confronts an information processing problem. Our result that there is information sharing between well-being indicators and HH income is buttressed by our finding that there is broad similarity between HH income and a representative set of indicators, as measured by their Euclidean distances; the degree of similarity varies by country and indicator. Accordingly, policymakers desiring to enhance well-being can rationally direct their attention to economic growth.

[15] In the SNA, GNI is GDP less net taxes on production and imports, less compensation of employees and property income payable to the rest of the world, plus the corresponding items receivable from the rest of the world. Table 2 is reproduced in appendix 2 using GNI per capita.

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7. Charts

Chart 1

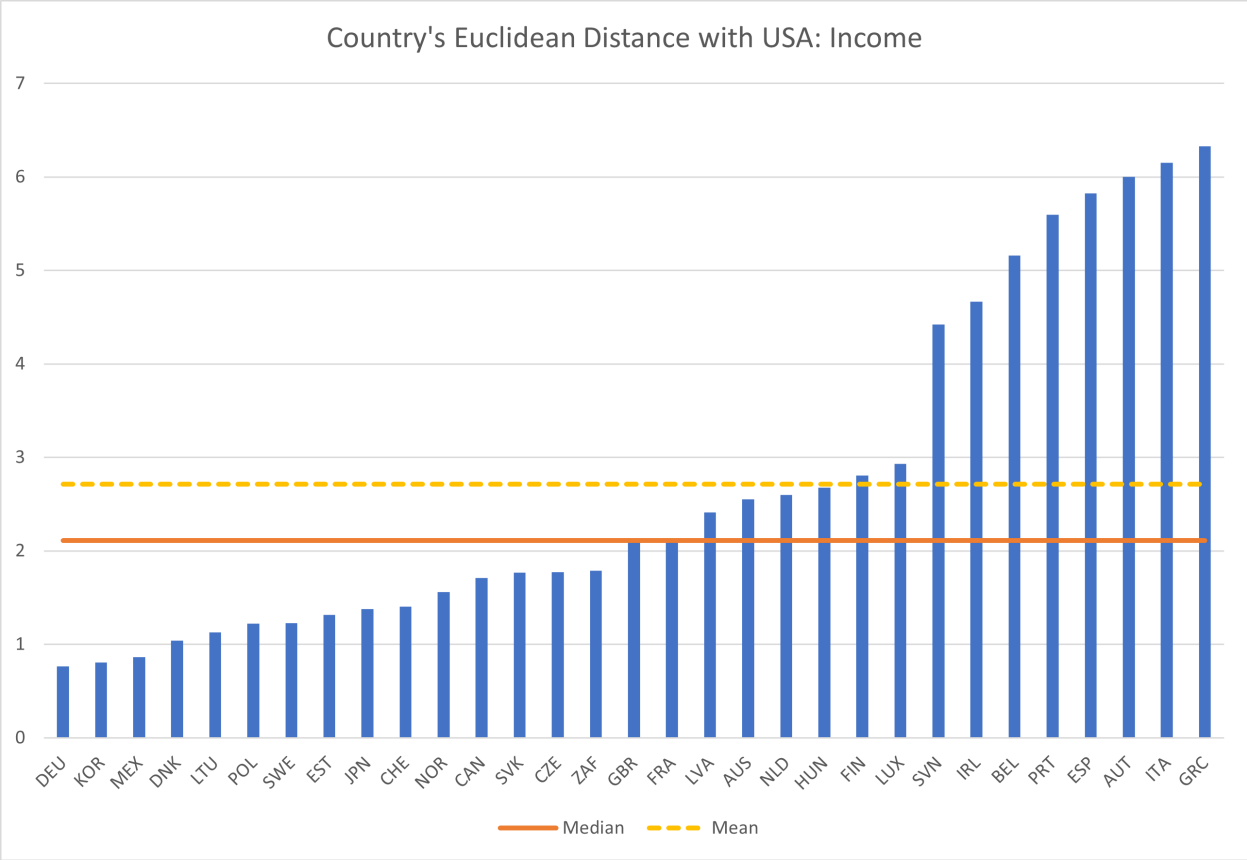


Chart 2

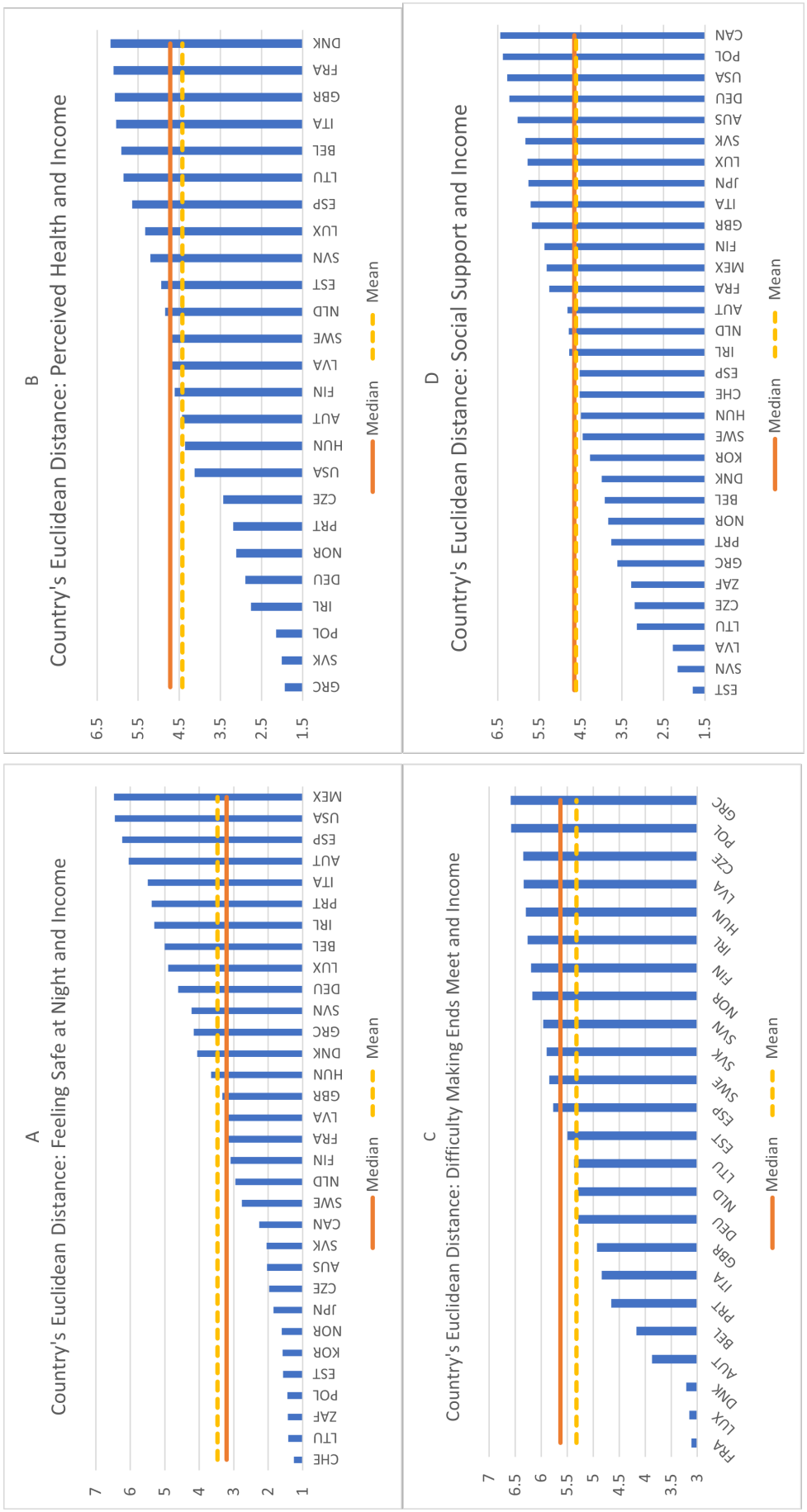

A
Country's Euclidean Distance: Feeling Safe at Night and Income
Median
Mean
B
Country's Euclidean Distance: Perceived Health and Income
Median
Mean
C
Country's Euclidean Distance: Difficulty Making Ends Meet and Income
Median
Mean
D
Country's Euclidean Distance: Social Support and Income
Median
Mean

Chart 2 – continued

Chart 3

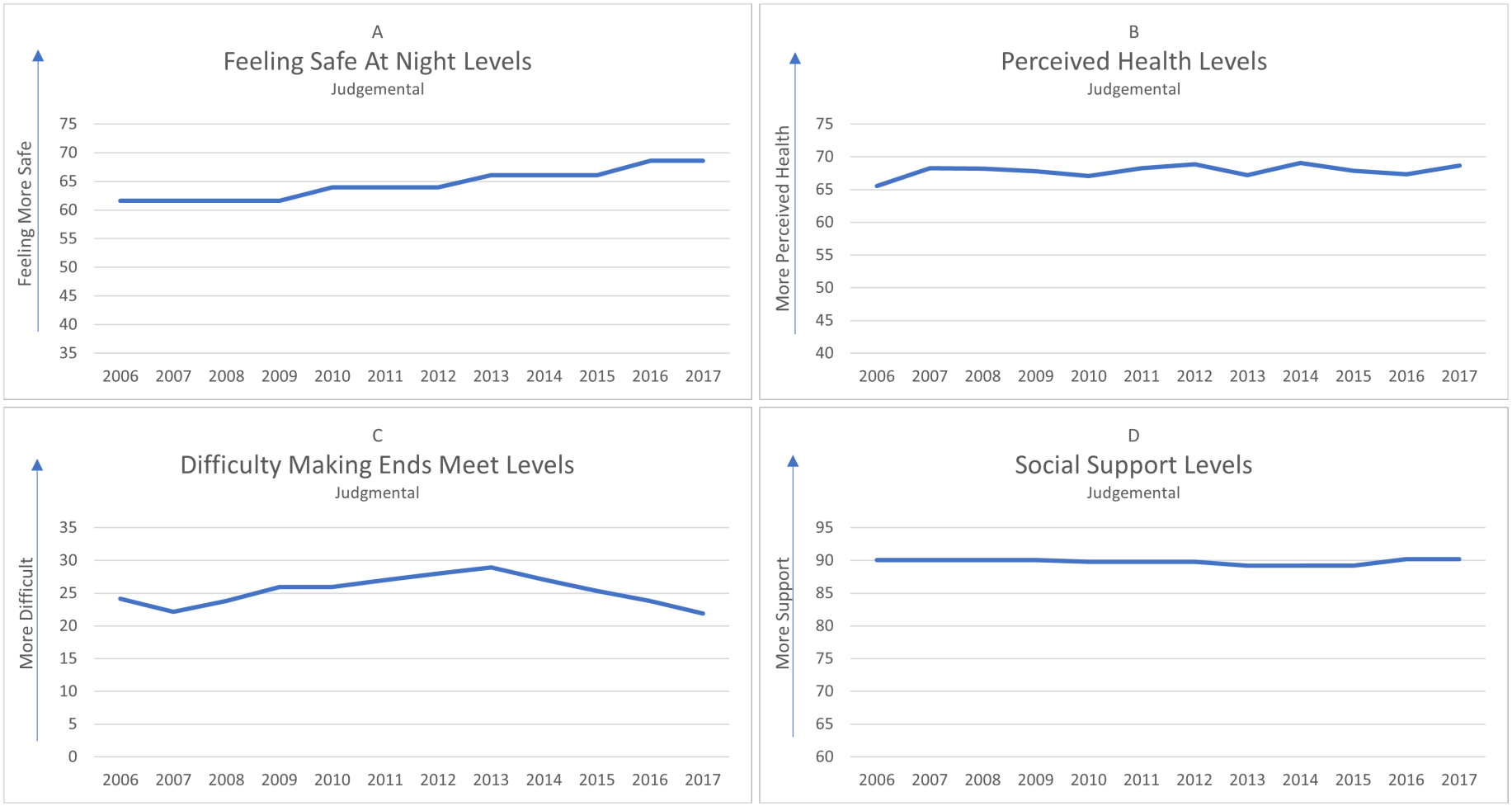

A
Feeling Safe At Night Levels
Judgemental
Feeling More Safe
75
70
65
60
55
50
45
40
35
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
B
Perceived Health Levels
Judgemental
More Perceived Health
75
70
65
60
55
50
45
40
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
C
Difficulty Making Ends Meet Levels
Judgmental
More Difficult
35
30
25
20
15
10
5
0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
D
Social Support Levels
Judgemental
More Support
95
90
85
80
75
70
65
60
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017

Chart 3 – continued

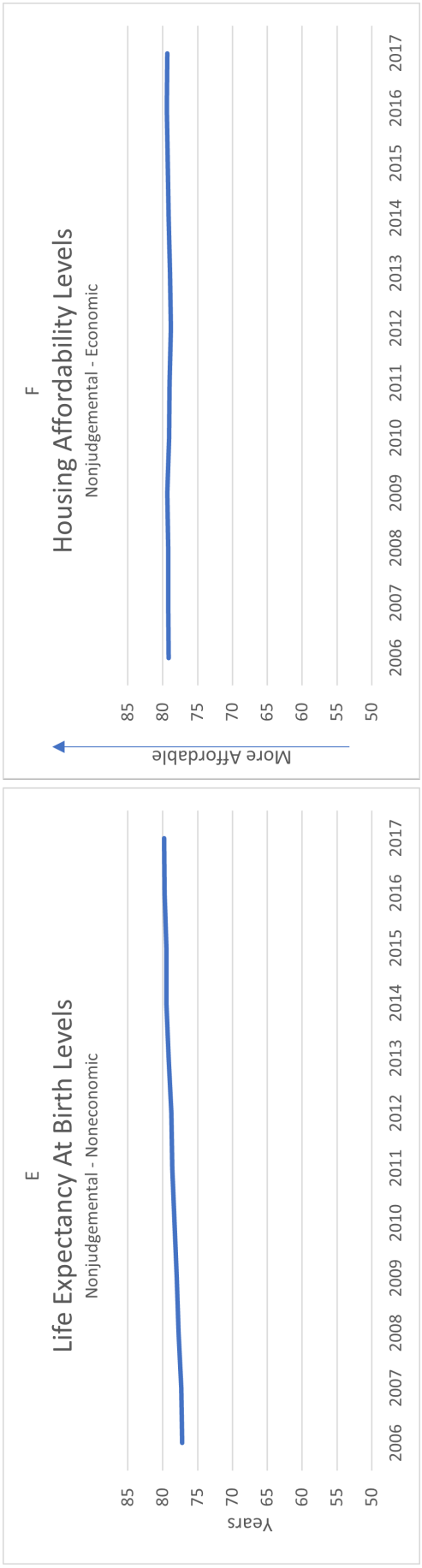


Chart 4

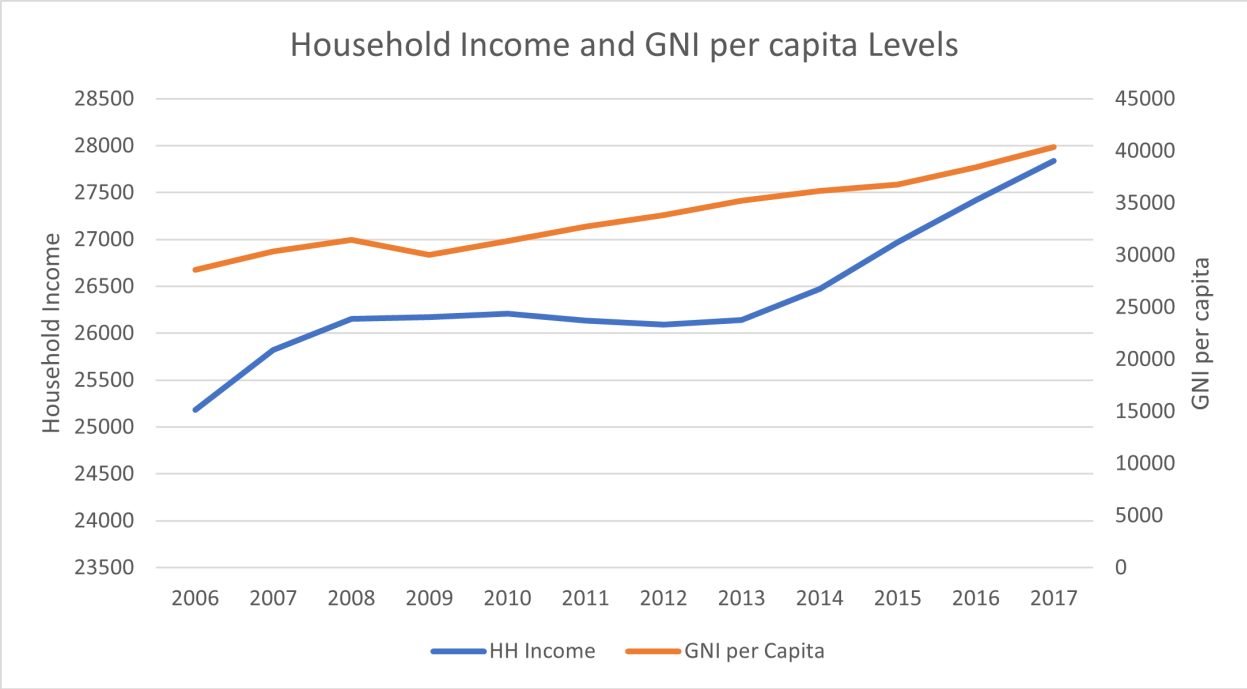
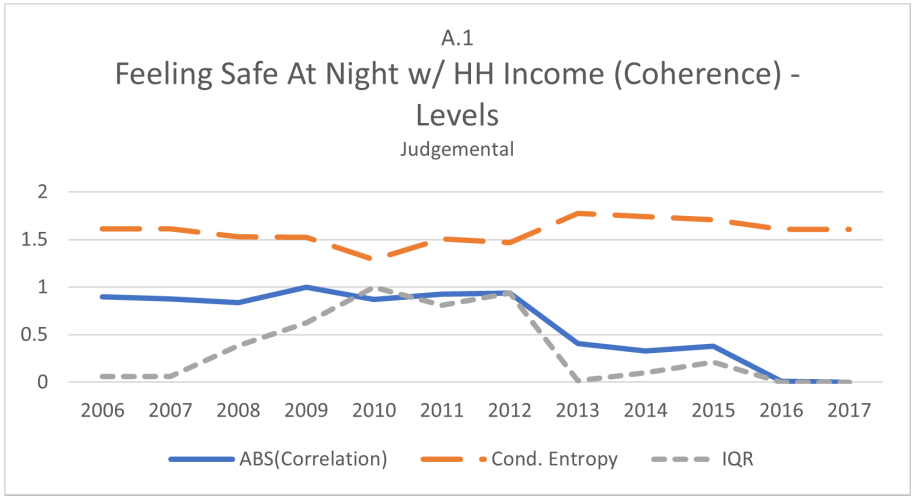
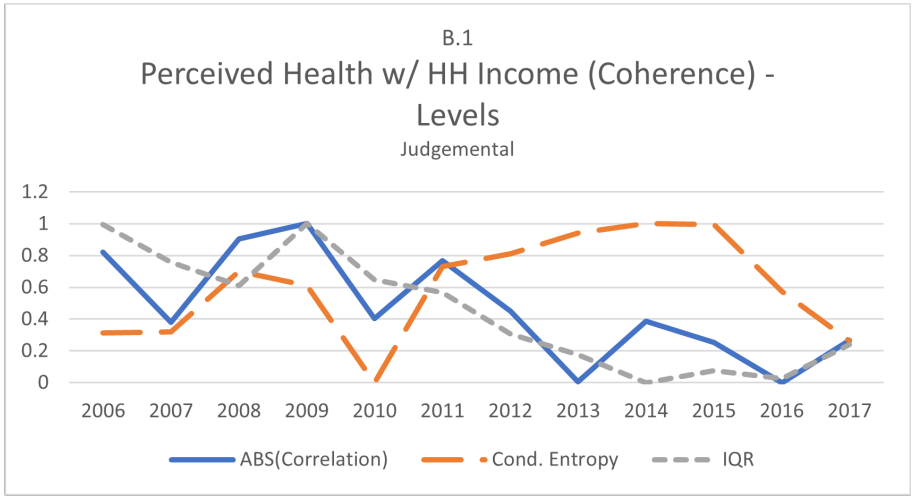
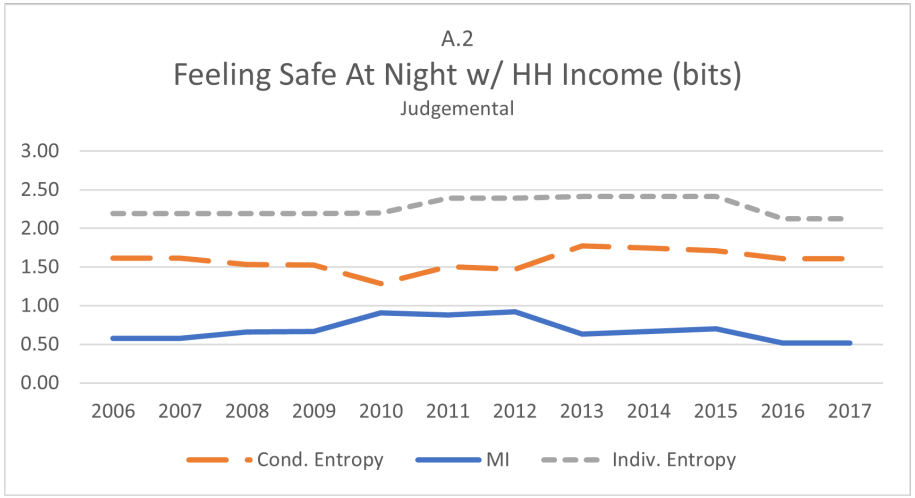

Household Income and GNI per capita Levels
Household Income
GNI per capita
28500
28000
27500
27000
26500
26000
25500
25000
24500
24000
23500
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
HH Income
GNI per Capita

Chart 5


A.1
Feeling Safe At Night w/ HH Income (Coherence) - Levels
Judgemental
2
1.5
1
0.5
0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
ABS(Correlation)
Cond. Entropy
IQR


B.1
Perceived Health w/ HH Income (Coherence) - Levels
Judgemental
1.2
1
0.8
0.6
0.4
0.2
0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
ABS(Correlation)
Cond. Entropy
IQR


A.2
Feeling Safe At Night w/ HH Income (bits)
Judgemental
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
Cond. Entropy
MI
Indiv. Entropy

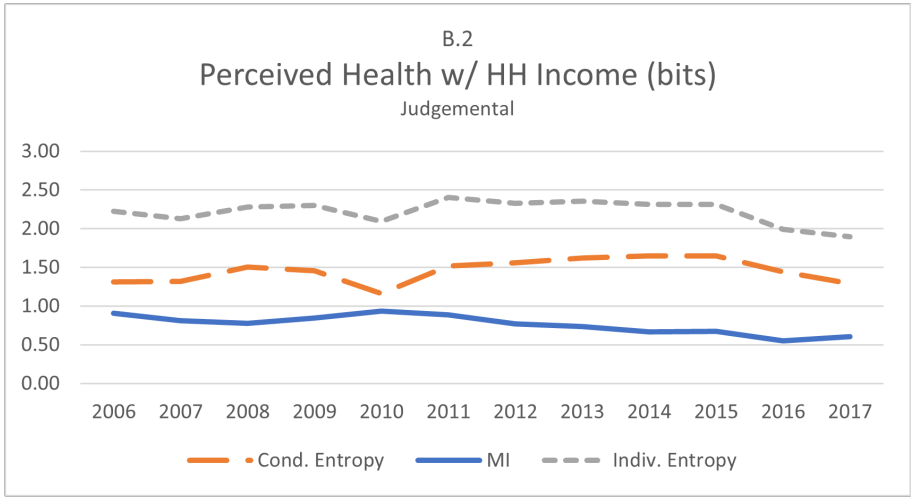
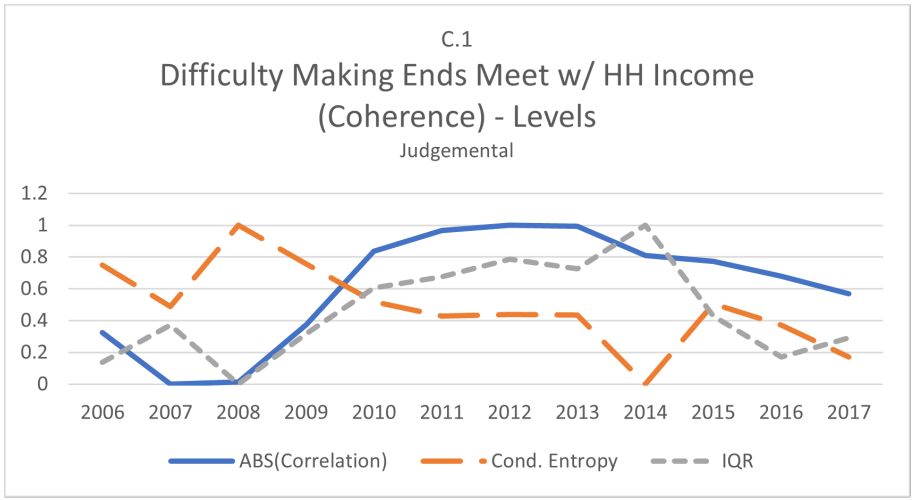
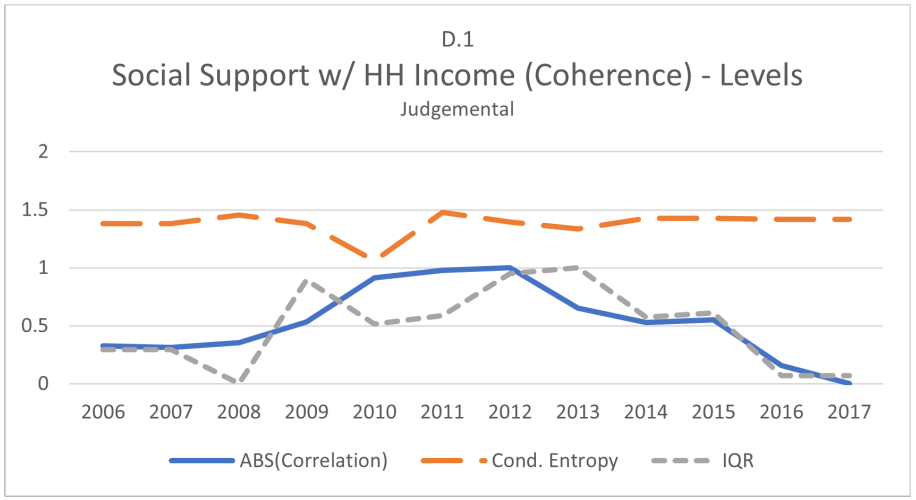
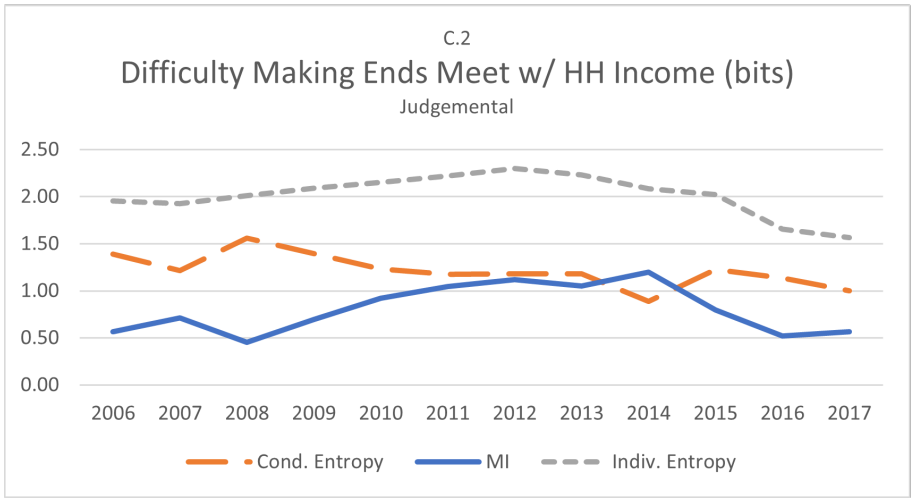

B.2
Perceived Health w/ HH Income (bits)
Judgemental
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
Cond. Entropy
MI
Indiv. Entropy

Chart 5 – continued







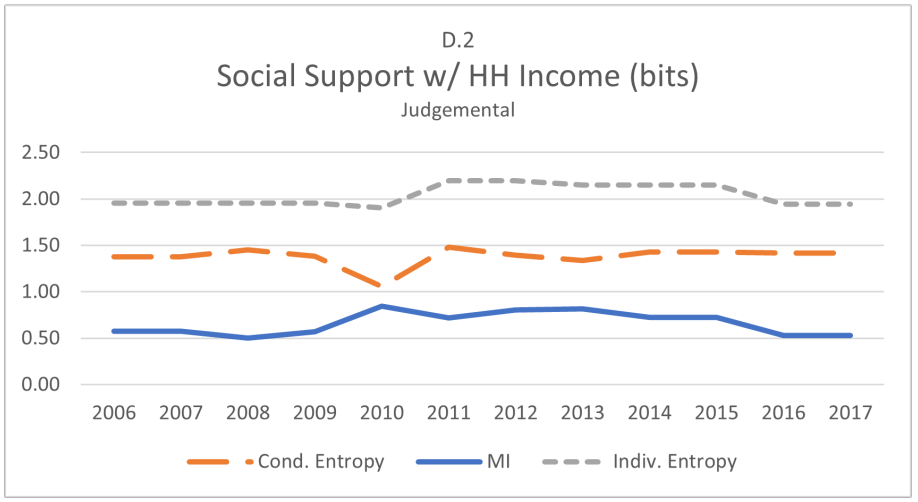
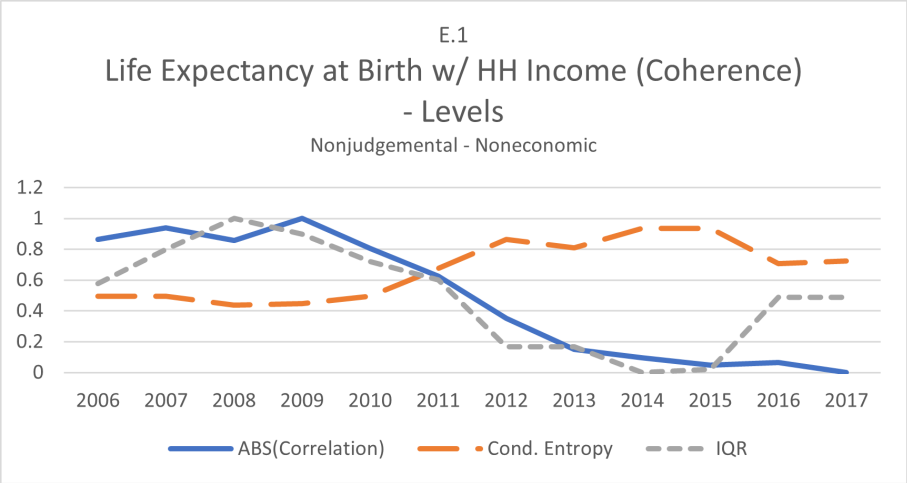
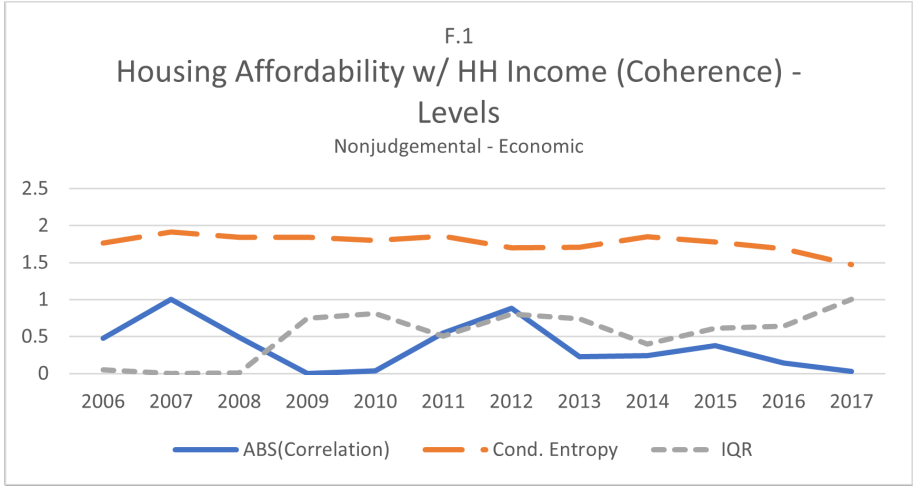
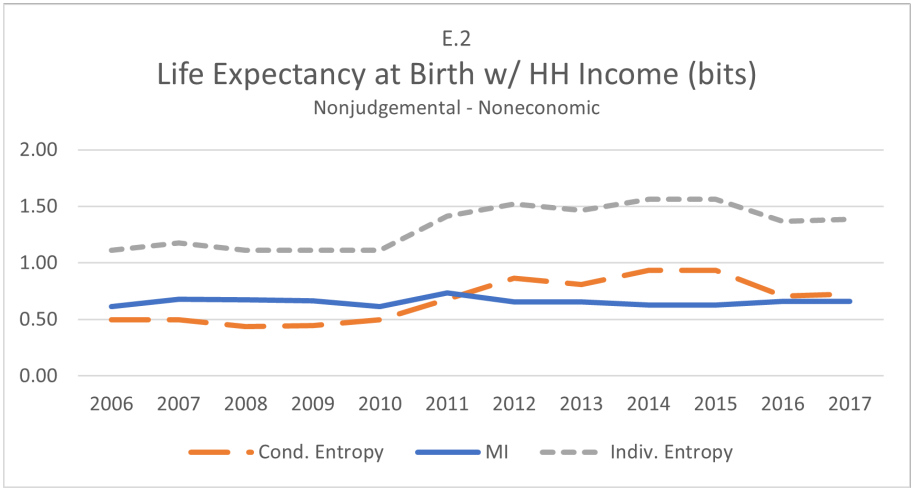


Chart 5 – continued







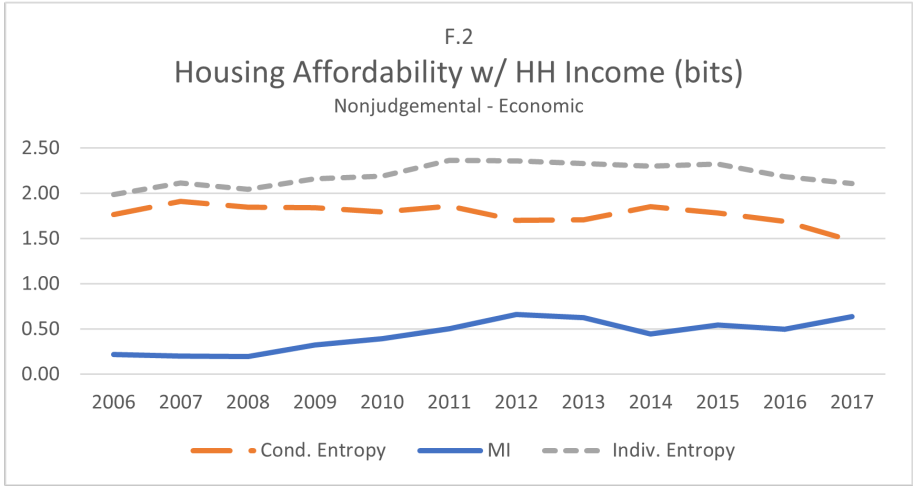


Table 1. Observation count

		Indicator	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
		Core													
Judgmental		Feeling safe at night_AVERAGE	41	41	41	41	41	41	41	41	41	41	41	41	492
Judgmental		Perceived health_AVERAGE	30	33	31	32	32	32	32	34	33	33	33	33	388
Judgmental		Social support_AVERAGE	41	41	41	41	41	41	41	41	41	41	41	41	492
Judgmental		Difficulty making ends meet_DEP	26	27	27	27	26	27	27	27	27	27	28	27	323
Nonjudgmental	Noneconomic	Road deaths_AVERAGE	31	31	31	31	31	31	31	31	31	31	31	31	372
Nonjudgmental	Noneconomic	Youth not in employment, education or training_DEP	33	34	34	35	33	34	32	37	36	37	35	38	418
Nonjudgmental	Noneconomic	Homicides_AVERAGE	38	39	40	41	41	40	41	41	41	37	27	5	431
Nonjudgmental	Noneconomic	Households with internet access at home _AVERAGE	33	34	33	35	32	31	34	32	31	30	29	31	385
Nonjudgmental	Noneconomic	Life expectancy at birth_AVERAGE	41	41	41	41	41	41	41	41	41	41	41	40	491
Nonjudgmental	Economic	Long hours in paid work_DEP	34	35	36	36	36	37	37	37	37	37	37	37	436
Nonjudgmental	Economic	Earnings_AVERAGE	35	35	35	35	35	35	35	35	35	35	35	35	420
Nonjudgmental	Economic	Employment rate_AVERAGE	40	41	41	41	40	41	41	41	41	41	41	41	490
Nonjudgmental	Economic	Household income_AVERAGE	33	33	33	33	33	33	33	33	33	33	32	32	394
Nonjudgmental	Economic	Housing affordability_AVERAGE	33	33	33	34	34	35	36	37	36	35	32	31	409
Nonjudgmental	Economic	Labour market insecurity_AVERAGE	0	34	34	34	34	35	35	35	35	35	35	0	346
Nonjudgmental	Economic	Long-term unemployment rate_DEP	36	38	38	38	38	38	39	39	39	39	39	39	460
Nonjudgmental	Economic	Relative income poverty _DEP	22	21	23	25	23	32	33	33	34	35	31	10	322
Nonjudgmental	Economic	Gender wage gap_HOR	36	26	28	27	36	27	27	25	36	25	26	21	340
		GNI_Per	39	39	39	40	40	40	40	40	40	40	40	40	477
		Extension 1													
Judg.		Negative affect balance_AVERAGE	0	0	0	0	41	41	41	41	41	41	41	41	328
Non-Judg.		Air pollution_AVERAGE	0	0	0	0	40	40	40	40	40	40	40	40	320
Non-Judg.		Housing cost overburden_DEP	0	0	0	0	25	22	29	26	28	29	29	25	213
Non-Judg.		Overcrowding rate_DEP	0	0	0	0	29	22	29	26	28	29	29	25	219
Non-Judg.		Poor households without access to basic sanitary facilities_DEP	0	0	0	0	27	26	28	27	28	28	29	26	219

Continued on next page

Table 1 – *continued from previous page*

	Indicator	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
	Extension 2													
Judg.	Life satisfication_AVERAGE	0	0	0	1	1	1	1	29	5	2	3	2	45
Nonjudgmental	Long unpaid working hours_AVERAGE	0	0	0	1	3	1	0	1	3	1	1	0	11
	Student skills (maths)_AVERAGE	37	0	0	37	0	0	37	0	0	37	0	0	148
	Student skills (reading)_AVERAGE	36	0	0	37	0	0	37	0	0	37	0	0	147
	Student skills (science)_AVERAGE	37	0	0	37	0	0	37	0	0	37	0	0	148
	Time off_AVERAGE	1	0	0	2	9	2	1	4	3	1	2	1	26
	Time spent in social interactions_AVERAGE	2	0	1	8	4	1	3	3	3	1	2	1	29
	Voter turnout_AVERAGE	0	0	0	0	13	12	10	10	12	12	7	10	86

End of table

Table 2. Core variables with Household Income

		Indicator	MI	Cond.Ent.	Indiv.Ent.	MI/Indiv.Ent.	IQR	Corr
		Core	bits					
Judgmental		Feeling safe at night	1.30	2.72	4.02	0.32	0.20	0.69
		Perceived health	1.38	2.58	3.97	0.35	0.22	0.65
		Social support	1.24	2.56	3.80	0.33	0.20	0.57
		Difficulty making ends meet_DEP	1.26	2.50	3.76	0.33	0.21	-0.72
Nonjudgmental	Noneconomic	Road deaths	0.82	2.51	3.32	0.25	0.13	-0.30
		Youth not in employment, education or training_DEP	0.70	2.66	3.36	0.21	0.11	-0.42
		Homicides	0.66	1.08	1.74	0.38	0.15	-0.45
		Households with internet access at home	0.73	3.31	4.04	0.18	0.10	0.37
		Life expectancy at birth	1.15	1.79	2.94	0.39	0.21	0.66
	Economic	Long hours in paid work_DEP	0.93	2.26	3.18	0.29	0.17	-0.27
		Earnings	1.95	2.13	4.08	0.48	0.33	0.93
		Employment rate	1.02	2.63	3.64	0.28	0.16	0.53
		Housing affordability	0.96	2.97	3.93	0.24	0.14	0.04
		Labour market insecurity	1.10	2.18	3.28	0.34	0.19	-0.53
		Long-term unemployment rate_DEP	0.91	2.10	3.01	0.30	0.15	-0.48
		Relative income poverty _DEP	0.98	2.73	3.71	0.26	0.16	-0.21
		Gender wage gap_HOR	0.93	2.77	3.70	0.25	0.14	-0.01
		GNI_Per	1.70	2.20	3.90	0.44	0.28	0.89
		Extension 1						
Judg.		Negative affect balance	1.18	2.41	3.59	0.33	0.20	-0.47
Non-Judg.		Air pollution	0.92	1.79	2.72	0.34	0.17	-0.32
		Housing cost overburden_DEP	1.12	2.62	3.74	0.30	0.18	0.09
		Overcrowding rate_DEP	1.32	2.06	3.38	0.39	0.23	-0.66
		Poor households without access to basic sanitary facilities_DEP	0.66	0.86	1.52	0.43	0.15	-0.58

Continued on next page

Table 2 – *continued from previous page*

	Indicator	MI	Cond.Ent.	Indiv.Ent.	MI/Indiv.Ent.	IQR	Corr
	Extension 2	bits					
Judg.	Life satisfaction	1.83	1.43	3.26	0.56	0.41	0.65
Nonjudgmental	Long unpaid working hours	1.92	0.92	2.85	0.68	0.66	-0.16
	Student skills (maths)	0.68	2.45	3.13	0.22	0.13	0.24
	Student skills (reading)	0.85	2.26	3.11	0.27	0.16	0.27
	Student skills (science)	0.64	2.48	3.12	0.20	0.12	0.22
	Time off	2.00	1.32	3.32	0.60	0.46	-0.03
	Time spent in social interactions	1.93	1.48	3.41	0.57	0.44	0.12
	Voter turnout	1.56	2.08	3.64	0.43	0.29	0.47

End of table

Table 2a. Core variables with Log(Household Income)

		Indicator	MI	Cond.Ent.	Indiv.Ent.	MI/Indiv.Ent.	IQR	Corr.	Obs.
		Core	bits						
Judgmental		Feeling safe at night	1.26	2.76	4.02	0.31	0.20	0.75	477
		Perceived health	1.37	2.59	3.97	0.35	0.22	0.67	374
		Social support	1.25	2.56	3.80	0.33	0.20	0.58	477
		Difficulty making ends meet_DEP	1.29	2.47	3.76	0.34	0.22	-0.72	309
Nonjudgmental	Noneconomic	Road deaths	0.77	2.56	3.32	0.23	0.13	-0.36	360
		Youth not in employment, education or training_DEP	0.64	2.72	3.36	0.19	0.11	-0.45	404
		Homicides	0.65	1.09	1.74	0.37	0.15	-0.55	419
		Households with internet access at home	0.76	3.28	4.04	0.19	0.11	0.39	373
		Life expectancy at birth	1.13	1.81	2.94	0.38	0.21	0.79	476
	Economic	Long hours in paid work_DEP	0.87	2.31	3.18	0.27	0.16	-0.35	433
		Earnings	1.85	2.23	4.08	0.45	0.32	0.93	408
		Employment rate	1.00	2.65	3.64	0.27	0.16	0.59	475
		Housing affordability	0.91	3.02	3.93	0.23	0.13	0.00	409
		Labour market insecurity	1.04	2.24	3.28	0.32	0.18	-0.53	334
		Long-term unemployment rate_DEP	0.88	2.13	3.01	0.29	0.15	-0.53	445
		Relative income poverty _DEP	0.98	2.73	3.71	0.26	0.16	-0.25	312
		Gender wage gap_HOR	0.90	2.79	3.70	0.24	0.14	-0.02	329
		AIC_Per	1.70	2.24	3.94	0.43	0.29	0.94	423

	Household Income			Log(Household Income)		
Indicator	MI/Indiv.Ent.	IQR	Corr.	MI/Indiv.Ent.	IQR	Corr.
Feeling safe at night	0.32	0.20	0.69	0.31	0.20	0.75
Perceived health	0.35	0.22	0.65	0.35	0.22	0.67
Social support	0.33	0.20	0.57	0.33	0.20	0.58
Difficulty making ends meet_DEP	0.33	0.21	-0.72	0.34	0.22	-0.72
Life expectancy at birth	0.39	0.21	0.66	0.38	0.21	0.79
Housing affordability	0.24	0.14	0.04	0.23	0.13	0.00

Table 2b. Core variables with Actual Individual Consumption

		Indicator	MI	Cond.Ent.	Indiv.Ent.	MI/Indiv.Ent.	IQR	Corr.	Obs.
		Core		bits					
Judgmental		Feeling safe at night	1.16	2.86	4.02	0.29	0.18	0.71	477
		Perceived health	1.11	2.86	3.97	0.28	0.16	0.58	374
		Social support	1.04	2.76	3.80	0.27	0.16	0.57	477
		Difficulty making ends meet_DEP	1.15	2.61	3.76	0.31	0.18	-0.68	309
Nonjudgmental	Noneconomic	Road deaths	0.86	2.46	3.32	0.26	0.14	-0.41	360
		Youth not in employment, education or training_DEP	0.69	2.67	3.36	0.21	0.11	-0.51	404
		Homicides	0.45	1.29	1.74	0.26	0.10	-0.38	419
		Households with internet access at home	1.02	3.02	4.04	0.25	0.15	0.56	373
		Life expectancy at birth	0.84	2.10	2.94	0.29	0.15	0.67	476
	Economic	Long hours in paid work_DEP	0.76	2.42	3.18	0.24	0.12	-0.40	433
		Earnings	1.51	2.57	4.08	0.37	0.24	0.90	408
		Employment rate	0.79	2.85	3.64	0.22	0.12	0.50	475
		Housing affordability	0.82	3.11	3.93	0.21	0.12	0.02	409
		Labour market insecurity	0.84	2.43	3.28	0.26	0.13	-0.50	334
		Long-term unemployment rate_DEP	0.52	2.48	3.01	0.17	0.08	-0.26	445
		Relative income poverty _DEP	0.89	2.82	3.71	0.24	0.13	-0.28	312
		Gender wage gap_HOR	0.80	2.89	3.70	0.22	0.12	-0.02	329
		GNI_Per	2.01	1.90	3.90	0.51	0.35	0.94	477
		Household Income	1.74	2.13	3.87	0.45	0.29	0.95	394

	Household Income			Actual Individual Consumption		
Indicator	MI/Indiv.Ent.	IQR	Corr.	MI/Indiv.Ent.	IQR	Corr.
Feeling safe at night	0.32	0.20	0.69	0.29	0.18	0.71
Perceived health	0.35	0.22	0.65	0.28	0.16	0.58
Social support	0.33	0.20	0.57	0.27	0.16	0.57
Difficulty making ends meet_DEP	0.33	0.21	-0.72	0.31	0.18	-0.68
Life expectancy at birth	0.39	0.21	0.66	0.29	0.15	0.67
Housing affordability	0.24	0.14	0.04	0.21	0.12	0.02

Table 3. Core time series measures with Household Income (2006-2017)

	2006						2007						2008					
Indicator	Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR	
Core	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.
Difficulty Making Ends Meet	1.39	0.75	0.67	0.33	0.17	0.14	1.21	0.49	0.61	0	0.23	0.37	1.56	1	0.61	0.01	0.14	0
Earnings	1.20	0.61	0.93	0.94	0.32	0.33	1.20	0.61	0.93	0.54	0.32	0.33	1.13	0.32	0.92	0	0.36	0.96
Employment Rate	1.62	0.91	0.39	0	0.05	0	1.60	0.88	0.41	0.10	0.05	0.00	1.46	0.55	0.41	0.10	0.09	0.21
Feeling Safe At Night	1.62	0.67	0.73	0.90	0.16	0.06	1.62	0.67	0.73	0.88	0.16	0.06	1.53	0.49	0.72	0.84	0.19	0.38
Gender Wage Gap	1.43	0.45	0.06	0.33	0.12	0.30	1.40	0.38	0.10	0.66	0.09	0	1.40	0.38	0.01	0	0.12	0.28
Homicides	0.40	0.63	0.58	1	0.22	1	0.45	0.71	0.56	0.93	0.21	0.97	0.55	0.88	0.52	0.82	0.16	0.60
HHs w/Internet Access at Home	1.57	1	0.36	0	0.13	0	1.43	0.60	0.41	0.17	0.18	0.49	1.50	0.79	0.48	0.36	0.20	0.65
Houseing Affordability	1.77	0.67	0.06	0.48	0.06	0.05	1.91	1	0.12	1	0.05	0	1.85	0.85	0.06	0.49	0.05	0.00
Labour Market Insecurity	NA	NA	NA	NA	NA	NA	1.38	0.90	0.52	0.34	0.13	0.12	1.41	0.94	0.53	0.36	0.11	0
Life Expectancy At Birth	0.50	0.12	0.69	0.86	0.26	0.58	0.50	0.12	0.69	0.94	0.28	0.80	0.44	0	0.69	0.86	0.29	1
Long Hours In Paid Work	0.88	0	0.27	0.22	0.13	0.60	1.05	0.29	0.25	0.11	0.10	0.18	1.07	0.32	0.39	1	0.14	0.84
Long Term Unemployment	1.15	0.78	0.46	0.28	0.11	0.26	0.90	0.20	0.43	0.11	0.09	0.06	0.81	0	0.41	0	0.09	0.10
Perceived Health	1.31	0.31	0.74	0.82	0.27	0.99	1.32	0.32	0.64	0.38	0.25	0.76	1.50	0.70	0.76	0.90	0.23	0.61
Relative Income Poverty	1.33	0.40	0.18	0.13	0.12	0.14	1.34	0.41	0.20	0.24	0.22	0.39	1.70	0.80	0.21	0.28	0.10	0.09
Road Deaths	1.10	0.21	0.43	0.89	0.21	0.20	0.96	0	0.47	1	0.26	0.57	1.55	0.87	0.45	0.94	0.18	0
Social Support	1.38	0.76	0.56	0.33	0.17	0.30	1.38	0.76	0.55	0.31	0.17	0.30	1.45	0.94	0.56	0.36	0.15	0
Youth Not In Employment, Education or Training	1.15	0.04	0.35	0.22	0.08	0.09	1.19	0.09	0.34	0.22	0.07	0	1.13	0	0.28	0	0.09	0.15

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Table 3. – *continued from previous page*

Indicator	2009						2010						2011					
	Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR	
Core	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.
Difficulty Making Ends Meet	1.39	0.75	0.68	0.37	0.22	0.32	1.23	0.52	0.76	0.84	0.29	0.61	1.17	0.43	0.78	0.97	0.31	0.68
Earnings	1.07	0.08	0.93	0.32	0.37	1	1.06	0	0.93	0.59	0.32	0.34	1.28	0.99	0.93	0.50	0.33	0.57
Employment Rate	1.21	0	0.55	0.65	0.17	0.72	1.38	0.39	0.64	1	0.21	0.91	1.56	0.78	0.60	0.85	0.16	0.65
Feeling Safe At Night	1.53	0.49	0.75	1	0.22	0.63	1.29	0	0.73	0.87	0.26	1	1.51	0.45	0.74	0.93	0.24	0.81
Gender Wage Gap	1.31	0.13	0.05	0.26	0.14	0.45	1.43	0.45	0.06	0.37	0.10	0.12	1.50	0.64	0.10	0.62	0.09	0.03
Homicides	0.57	0.92	0.51	0.78	0.11	0.20	0.62	1	0.44	0.55	0.08	0	0.61	0.99	0.44	0.55	0.08	0.04
HHs w/Internet Access at Home	1.48	0.75	0.45	0.26	0.21	0.75	1.42	0.58	0.52	0.48	0.24	1	1.45	0.66	0.50	0.43	0.22	0.79
Houseing Affordability	1.84	0.84	0.00	0	0.15	0.74	1.80	0.74	0.01	0.04	0.16	0.81	1.86	0.88	0.07	0.55	0.12	0.50
Labour Market Insecurity	1.45	1	0.61	0.67	0.24	0.62	1.29	0.78	0.70	1	0.30	0.88	1.45	0.99	0.67	0.87	0.23	0.58
Life Expectancy At Birth	0.45	0.02	0.70	1	0.28	0.90	0.50	0.12	0.68	0.81	0.27	0.72	0.68	0.48	0.67	0.63	0.26	0.60
Long Hours In Paid Work	1.00	0.21	0.30	0.43	0.14	0.88	1.09	0.35	0.26	0.15	0.11	0.37	1.40	0.88	0.25	0.07	0.10	0.20
Long Term Unemployment	1.01	0.47	0.49	0.45	0.12	0.29	1.15	0.78	0.57	0.93	0.14	0.46	1.24	1	0.59	1	0.17	0.63
Perceived Health	1.46	0.61	0.78	1	0.27	1	1.16	0	0.64	0.40	0.24	0.65	1.52	0.73	0.73	0.77	0.23	0.57
Relative Income Poverty	1.70	0.80	0.14	0	0.13	0.15	1.51	0.60	0.26	0.46	0.07	0	1.88	1	0.28	0.54	0.12	0.15
Road Deaths	1.32	0.53	0.32	0.57	0.32	1	1.50	0.80	0.36	0.69	0.22	0.28	1.64	1	0.35	0.64	0.18	0.01
Social Support	1.38	0.77	0.58	0.53	0.22	0.89	1.06	0	0.62	0.91	0.19	0.51	1.48	1	0.63	0.98	0.19	0.59
Youth Not In Employment, Education or Training	1.42	0.39	0.41	0.44	0.09	0.16	1.33	0.27	0.44	0.54	0.12	0.45	1.65	0.68	0.46	0.60	0.11	0.41

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Table 3. – *continued from previous page*

Indicator	2012						2013						2014					
	Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR	
Core	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.
Difficulty Making Ends Meet	1.18	0.44	0.79	1	0.33	0.78	1.18	0.43	0.79	1.00	0.32	0.73	0.89	0	0.75	0.81	0.39	1
Earnings	1.24	0.82	0.93	0.75	0.35	0.76	1.26	0.91	0.93	0.99	0.34	0.66	1.26	0.89	0.93	0.93	0.35	0.73
Employment Rate	1.49	0.64	0.60	0.86	0.20	0.86	1.44	0.52	0.58	0.80	0.22	1	1.57	0.81	0.56	0.70	0.19	0.78
Feeling Safe At Night	1.47	0.37	0.74	0.94	0.25	0.94	1.78	1	0.67	0.41	0.16	0.02	1.74	0.93	0.66	0.33	0.17	0.10
Gender Wage Gap	1.45	0.51	0.07	0.44	0.12	0.29	1.32	0.15	0.02	0.09	0.17	0.74	1.63	1	0.15	1	0.13	0.38
Homicides	0.46	0.73	0.42	0.50	0.18	0.72	0.46	0.73	0.43	0.53	0.18	0.72	0.54	0.88	0.43	0.51	0.20	0.83
HHs w/Internet Access at Home	1.49	0.77	0.45	0.29	0.21	0.73	1.39	0.50	0.49	0.40	0.24	1.00	1.39	0.48	0.64	0.82	0.21	0.76
Houseing Affordability	1.70	0.52	0.10	0.88	0.16	0.80	1.70	0.53	0.03	0.23	0.15	0.74	1.85	0.87	0.03	0.24	0.10	0.40
Labour Market Insecurity	0.98	0.35	0.63	0.75	0.33	1	1.11	0.52	0.56	0.49	0.22	0.50	0.73	0	0.48	0.17	0.24	0.60
Life Expectancy At Birth	0.86	0.85	0.65	0.35	0.22	0.17	0.81	0.74	0.64	0.15	0.22	0.17	0.94	1.00	0.63	0.10	0.20	0
Long Hours In Paid Work	1.47	1	0.24	0	0.09	0	1.45	0.96	0.26	0.13	0.10	0.24	1.37	0.84	0.26	0.16	0.10	0.23
Long Term Unemployment	1.13	0.74	0.56	0.82	0.22	0.98	1.09	0.65	0.52	0.64	0.17	0.65	0.88	0.15	0.49	0.43	0.22	1
Perceived Health	1.56	0.81	0.65	0.45	0.20	0.31	1.62	0.94	0.56	0.01	0.19	0.18	1.65	1	0.64	0.39	0.17	0
Relative Income Poverty	1.68	0.78	0.35	0.80	0.16	0.24	1.70	0.80	0.19	0.19	0.18	0.30	1.54	0.62	0.26	0.46	0.21	0.38
Road Deaths	1.48	0.76	0.25	0.39	0.19	0.11	1.42	0.67	0.18	0.19	0.24	0.46	1.56	0.89	0.23	0.32	0.20	0.15
Social Support	1.39	0.80	0.63	1	0.22	0.95	1.34	0.66	0.59	0.65	0.22	1	1.43	0.88	0.58	0.53	0.19	0.58
Youth Not In Employment, Education or Training	1.72	0.77	0.47	0.65	0.17	0.91	1.89	1	0.46	0.63	0.11	0.37	1.65	0.68	0.44	0.54	0.13	0.53

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Table 3. – *continued from previous page*

Indicator	2015						2016						2017					
	Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR		Cond. Entropy		Correlation (Abs)		IQR	
Core	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.	Raw	Coh.
Difficulty Making Ends Meet	1.23	0.51	0.75	0.77	0.25	0.43	1.14	0.37	0.73	0.68	0.18	0.17	1.00	0.17	0.71	0.57	0.21	0.29
Earnings	1.23	0.76	0.93	0.71	0.36	0.95	1.28	1	0.93	0.61	0.29	0	1.15	0.43	0.93	1	0.33	0.57
Employment Rate	1.66	1	0.52	0.54	0.15	0.55	1.37	0.37	0.53	0.57	0.17	0.69	1.36	0.35	0.50	0.43	0.16	0.65
Feeling Safe At Night	1.71	0.86	0.67	0.38	0.18	0.21	1.61	0.66	0.62	0.01	0.16	0	1.61	0.66	0.62	0	0.16	0
Gender Wage Gap	1.45	0.52	0.05	0.28	0.12	0.24	1.27	0.03	0.04	0.23	0.16	0.62	1.26	0	0.10	0.64	0.20	1
Homicides	0.47	0.75	0.44	0.55	0.18	0.73	0.03	0	0.27	0	0.20	0.87	NA	NA	NA	NA	NA	NA
HHs w/Internet Access at Home	1.34	0.36	0.49	0.39	0.22	0.86	1.22	0	0.70	1	0.20	0.68	1.29	0.21	0.53	0.51	0.14	0.05
Houseing Affordability	1.78	0.70	0.05	0.37	0.13	0.61	1.69	0.49	0.02	0.15	0.14	0.64	1.47	0	0.00	0.03	0.19	1
Labour Market Insecurity	0.76	0.04	0.45	0.07	0.24	0.63	0.89	0.22	0.43	0	0.13	0.12	NA	NA	NA	NA	NA	NA
Life Expectancy At Birth	0.94	1	0.63	0.05	0.21	0.02	0.71	0.54	0.63	0.06	0.25	0.49	0.73	0.58	0.63	0	0.25	0.49
Long Hours In Paid Work	1.38	0.85	0.26	0.16	0.12	0.47	1.13	0.42	0.27	0.23	0.14	0.83	1.06	0.31	0.25	0.10	0.15	1
Long Term Unemployment	0.94	0.29	0.49	0.43	0.17	0.64	0.92	0.26	0.50	0.49	0.10	0.15	0.83	0.05	0.50	0.47	0.08	0
Perceived Health	1.65	1.00	0.61	0.25	0.18	0.08	1.44	0.57	0.56	0	0.17	0.02	1.29	0.26	0.61	0.27	0.19	0.24
Relative Income Poverty	1.71	0.81	0.40	1	0.14	0.18	1.83	0.95	0.18	0.17	0.08	0.02	0.98	0	0.21	0.27	0.45	1
Road Deaths	1.36	0.59	0.16	0.12	0.25	0.52	1.20	0.35	0.12	0.01	0.22	0.30	1.22	0.38	0.12	0	0.26	0.58
Social Support	1.43	0.88	0.58	0.55	0.19	0.61	1.42	0.85	0.54	0.16	0.15	0.07	1.42	0.85	0.52	0	0.15	0.07
Youth Not In Employment, Education or Training	1.69	0.74	0.44	0.55	0.18	1	1.48	0.46	0.37	0.33	0.13	0.52	1.44	0.41	0.57	1	0.11	0.39

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A. Definitions

Taken directly from OECD How's Life? Well-being Database: Definitions and Metadata

Core Indicators

Feeling safe at night

- **Indicator and unit of measurement:** Share of people declaring that they feel safe when walking alone at night in the city or area where they live.
- **Type of indicator:** Country average, deprivation, and horizontal inequality (data by sex, education and age [young=15–29 years, middle-aged=30–49 years, and old=50+ years]).
- **Definition:** Feeling safe at night is measured by the share of people answering "yes" to a (yes/no) question: "Do you feel safe walking alone at night in the city or area where you live?". The source for these data is the Gallup World Poll, which samples around 1,000 people per country, per year. The sample is ex ante designed to be nationally representative of the population aged 15 or over (including rural areas). Due to the low sample size, data for horizontal inequalities (differences between population groups) refer to pooled averages from 2010 to 2022. For horizontal inequalities by age, data for young people (15–29 years) include less than 1,000 observations for Australia, Finland, Iceland, Japan, and Switzerland. For horizontal inequalities by education, the following countries have a sample size lower than 1,000 observations for primary education: Belgium, France, Germany, Ireland, Luxembourg, Norway, Slovenia, and Sweden; for secondary education: Iceland; and for tertiary education: Slovenia.
- **Source:** *Gallup World Poll*.

Perceived health

- **Indicator and unit of measurement:** Share of the population 16 years or over reporting "good" or "very good" health.
- **Type of indicator:** Country average, deprivation, and horizontal inequality (data by sex, education and age [young=15–24 years, middle-aged=25–64 years and old=65+ years]).
- **Definition:** Perceived health refers to people's overall self-reported health status. Averages in perceived health refer to the share of adults reporting "good" or "very good" health. Data are based on general household surveys or on more detailed health interviews. The indicator is based on questions such as: "How is your health in general?", with answers usually classified as "very good," "good," "not very good," and "poor"—although in some non-European countries (Australia, Canada, Chile, Israel, New Zealand, the United States) different response

scales are used, which may lead to an upward bias in the estimates. In the OECD Health Status database, the response categories from different surveys are rescored to fit into three broad categories of "good/very good" (all positive response categories), "fair" (neither good nor bad), "bad/very bad" (all negative response categories). Respondents are generally 16 years or over, though the specific age range varies across countries. Data are based on general household surveys or on more detailed health interviews.

– **Source:** *OECD Health Status (database).*

Social support

– **Indicator and unit of measurement:** Share of people who report having friends or relatives whom they can count on in times of trouble.

– **Type of indicator:** Country average, deprivation, and horizontal inequality (data by sex, education and age [young=15–29 years, middle-aged=30–49 years, and old=50+ years]).

– **Definition:** Social support is measured by the share of people answering "yes" to a (yes/no) question: "If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?". The source for these data is the Gallup World Poll, which samples around 1,000 people per country, per year. The sample is ex ante designed to be nationally representative of the population aged 15 or over (including rural areas).
Due to the low sample size, data for horizontal inequalities (differences between population groups) refer to pooled averages from 2010 to 2022. For horizontal inequalities by age, data for young people (15–29 years) include less than 1,000 observations for Australia, Finland, Iceland, Japan, and Switzerland. For horizontal inequalities by education, the following countries have a sample size lower than 1,000 observations for primary education: Belgium, France, Ireland, Luxembourg, Norway, Slovakia, and Slovenia; for secondary education: Iceland; and for tertiary education: Spain, Slovenia, and South Africa.

– **Source:** *Gallup World Poll*.

Difficulty making ends meet

– **Indicator and unit of measurement:** Share of individuals who declare to have "difficulty" or "great difficulty" to make ends meet.

– **Type of indicator:** Deprivation.

– **Definition:** Difficulty in making ends meet refers to the share of people who report having difficulty or great difficulty in making ends meet. The question is asked to the household reference person, and the information is available at household level only. Data come from

estimates provided by national statistical offices and the European Union Statistics on Income and Living Conditions, a nationally representative survey with large samples (from around 4,000 individuals in the smallest member states, to around 16,000 in the largest) covering all members of private households aged 16 or older and available for EU countries, as well as Norway and Switzerland.

- **Source:** *European Union Statistics on Income and Living Conditions (EU-SILC) (database)*; and estimates provided by National Statistical Offices.

Road deaths

- **Indicator and unit of measurement:** Road deaths, rate per 100,000 population.
- **Type of indicator:** Country average.
- **Definition:** Road deaths (rate per 100,000 population) refers to persons killed immediately or dying within 30 days because of a road accident, excluding suicides.
- **Source:** *International Traffic Safety Data and Analysis Group (IRTAD) (database)*.

Youth not in employment, education, or training

- **Indicator and unit of measurement:** Share of youth (aged 15–24) not in employment, education, or training.
- **Type of indicator:** Deprivation and horizontal inequality (data by sex).
- **Definition:** Youth not in employment, education, or training refers to the number of youth (i.e. people aged 15–24) who are not in employment, education, or training, as a share of the population of the same age. The transition of younger individuals from education to working life varies with educational opportunities and social and economic contexts. In low-income countries, this indicator should be analysed in combination with the share of youth in vulnerable and informal jobs to better grasp the marginalisation of young people on the labour market. Education and training refer to courses currently being attended in the regular educational system, either during the previous four weeks or over a shorter period. Some OECD countries may include some people who are not classified as being in formal education, but who are in training (or education) for employment or for tertiary entrance examinations. The data are compiled from National Labour Force Surveys by the OECD Labour Market and Social Outcomes of Learning Network though an annual questionnaire.
- **Source:** *OECD Transition from School to Work (database)*.

Homicides

- **Indicator and unit of measurement:** Death due to assault, age-standardised rate, per 100,000 population.
- **Type of indicator:** Country average and horizontal inequality (data by sex).
- **Definition:** Homicides refer to deaths due to assault (rate per 100,000 population). Data come from civil registration systems, compiled by national authorities, and are collated by the World Health Organization. Only medically certified causes of death are included.
- **Source:** *OECD Health Status (database).*

Households with high-speed internet

- **Indicator and unit of measurement:** Share of households with broadband internet subscription at home.
- **Type of indicator:** Country average.
- **Definition:** Broadband internet is defined as subscriptions with a download speed of at least 256 Kbit/s.
- **Source:** *OECD ICT Access and Usage by Households and Individuals (database).*

Life expectancy

- **Indicator and unit of measurement:** Life expectancy at birth, years.
- **Type of indicator:** Country average and horizontal inequality (data by sex, and sex and education combined).
- **Definition:** Life expectancy at birth is a summary measure of mortality rates, and refers to the number of years a child born today could expect to live based on the age-specific death rates currently prevailing. It is only an estimate of the expected life span of a given cohort, as the age-specific death rates of a particular birth cohort cannot be known in advance.
- **Source:** Data for the country average and by sex are drawn from the *OECD Health Status (database).* Data by sex and education are obtained from: Murtin, F. and C. Lübker (2022), "Educational inequalities in longevity among OECD countries around 2016", OECD Papers on Well-being and Inequalities, No. 8, OECD Publishing, Paris, https://doi.org/10.1787/5faaa751-en, and Murtin, F., et al. (2017), "Inequalities in longevity by education in OECD countries: Insights from new OECD estimates", OECD Statistics Working Papers, No. 2017/02, OECD Publishing, Paris, https://doi.org/10.1787/6b64d9cf-en.

Long hours in paid work

- **Indicator and unit of measurement:** Share of employees aged 15+ usually working 50+ hours per week.
- **Type of indicator:** Deprivation and horizontal inequality (data by sex and age [young=15-24 years, middle-age=25-54 years and old=65+ years]).
- **Definition:** Long hours in paid work refers to the share of employees (aged 15+) whose usual working hours are 50 hours or more per week. The threshold is set at 50 hours because, after commuting, unpaid work and basic needs (such as sleeping and eating) are taken into account, workers routinely working more than 50 hours per week are likely to be left with very few hours (one or two per day) for other activities. Moreover, in countries where there is a regulation on maximum working time, this is generally limited to 48 hours per week.
- **Source:** *OECD Labour Force Statistics (database).*

Earnings

- **Indicator and unit of measurement:** Average annual gross earnings per full-time employee, USD at 2020 PPPs.
- **Type of indicator:** Country average, deprivation and vertical inequality.
- **Definition:** Earnings refer to the average gross annual earnings of employees working in all sectors of the economy and in all types of dependent employment, expressed on a full-time and full-year equivalent basis. The earnings concept used, which is sourced from the National Accounts, includes employees' gross remuneration (i.e. including employers' social security contributions) before any deductions are made by the employer in respect of taxes, contributions to social security and pension schemes, life insurance premiums, union dues and other employee obligations. This value ("Wages and salaries") is divided by the number of full-time equivalent employees in the economy (obtained by multiplying data on the number of employees by the ratio of hours worked by all employees and by those working full-time, in order to correct for the prevalence of part-time work). This indicator hence combines data from the OECD National Accounts Database, the OECD Earnings Distribution Database and the OECD Average Annual Earnings per Full-time and Full-year Equivalent Dependent Employee Database, which are based on data from the National Accounts, Labour Force Surveys, establishment/employer surveys, household income surveys and administrative registers from tax files. Earnings are expressed in U.S. dollars (USD) using purchasing power parities (PPPs) for private consumption and are deflated using a price deflator for private final consumption expenditures in 2020 prices.

- **Source:** *OECD Average Annual Wages (database).*

Employment rate

- **Indicator and unit of measurement:** Employed people aged 25-64, as a share of the population of the same age.
- **Type of indicator:** Country average and horizontal inequality (data by sex, education level and age [young=15-24 years, middle-aged=25-54, and old=55-64]).
- **Definition:** The employment rate refers to the share of the adult population (people aged 25 to 64) who report having worked in gainful employment for at least one hour in the previous week. It also includes persons who, having already worked in their present job, were temporarily absent from work during the reference period of the survey while having retained a formal attachment to their job (e.g. due to parental leave, sickness, or annual leave). The data come from national Labour Force Surveys (LFSs) as compiled in the OECD Annual Labour Force Statistics (ALFS) Database, and are consistent with the standards set by the International Conference of Labour Statisticians.
- **Source:** *OECD Labour Force Statistics (database).*

Housing affordability

- **Indicator and unit of measurement:** Share of household gross adjusted disposable income remaining, after deductions for housing rents and maintenance.
- **Type of indicator:** Country average.
- **Definition:** Housing affordability refers to the share of household gross adjusted disposable income that remains available to the household after deducting housing costs. Housing costs include rent (including imputed rentals for housing held by owner-occupiers) and maintenance (expenditure on the repair of the dwelling, including miscellaneous services, water supply, electricity, gas and other fuels, as well as expenditure on furniture, furnishings, household equipment and goods and services for routine home maintenance). Data are sourced from the OECD National Accounts database, and refer to both households and nonprofit institutions serving households. For Chile, Mexico, Denmark, the Netherlands and the United States no information on subsidized tenants due to data limitations. In Chile, Mexico, Korea and the United States gross income is used due to data limitations.
- **Source:** Calculations based on *OECD National Accounts (database).*

Labour market insecurity

- **Indicator and unit of measurement:** Average expected monetary loss associated with becoming and staying unemployed, as a share of previous earnings.
- **Type of indicator:** Country average and horizontal inequality (data by sex, education level and age [young=15-29 years, middle-aged=30-49 years and old=50-64 years]).
- **Definition:** Labour market insecurity refers to the average expected monetary loss that an employed person would incur upon becoming and staying unemployed, expressed as a share of previous earnings. This loss depends on the risk of becoming unemployed, the expected duration of unemployment and the mitigation against these losses provided by unemployment benefits (effective insurance). Data on unemployment duration are used to measure the probability of entering unemployment (people who report having been unemployed for 1 month or less are assumed to have been employed in the previous month), as well as the average expected duration of completed unemployment spells (in months). Unemployment insurance is calculated as the product of the coverage of unemployment insurance/assistance (the share of the unemployed who declare receiving an unemployment benefit) and (model-based estimates of) the replacement rates (the ratio of public transfers received by recipients of unemployment benefits and previous earnings). These replacement rates include benefits from unemployment insurance and unemployment assistance but exclude social assistance benefits; they are computed by averaging replacement rates for different configurations of earnings levels and family types. The indicator combines data from the OECD Unemployment Duration Database, the OECD Benefit Recipients Database, the OECD Labour Market Programmes Database and the OECD Taxes and Benefits Database.
- **Source:** *OECD Job Quality (database).*

Long-term unemployment rate

- **Indicator and unit of measurement:** Share of the labour force unemployed for one year or more.
- **Type of indicator:** Deprivation and horizontal inequality (data by sex, education level and age [young=15-24 years, middle-aged=25-54, and old=55-64]).
- **Definition:** The long-term unemployment rate refers to the number of people who have been unemployed for one year or more, as a share of the labour force (i.e. the sum of employed and unemployed persons). Unemployed persons are those who did not perform any paid work in the survey reference week, but who actively searched for work within the last 4 weeks, and would be available to start work within the next 2 weeks. The data are drawn from national Labour Force Surveys, as available in the OECD Employment Outlook Database, and are

consistent with the standards set by the International Conference of Labour Statisticians.

- **Source:** *OECD Labour Force Statistics (database).*

Relative income poverty

- **Indicator and unit of measurement:** Share of individuals with household disposable income below the relative income poverty line, set at 50% of the national median income.
- **Type of indicator:** Deprivation.
- **Definition:** This indicator is based on the concept of household disposable income, as measured in microdata – i.e. the market income received by all household members (gross earnings, self-employment income, capital income), plus current cash transfers received, net of income and wealth taxes and social security contributions paid by workers, and net of current transfers paid to other households. Household disposable income is "adjusted" by an equivalence scale that divides household income by the square root of household size, to account for economies of scale in household needs (i.e. the notion that any additional household member needs less than a proportionate increase of household income in order to maintain a given level of welfare). Data are drawn from the OECD Income Distribution Database, which relies on estimates supplied by National Statistical Offices and other producers of official statistics (based on household surveys or tax and administrative records), or produced by the OECD based on public use data from the European Union Statistics on Income and Living Conditions (EU-SILC). The data comply as much as possible with the 2011 Canberra Handbook. Negative household income values are set to zero, through special treatments as described in the Terms of Reference of the OECD Income Distribution Database. Survey data can suffer from under-coverage and underreporting at both ends of the distribution.
- **Source:** *OECD Income Distribution Database*.

Gender wage gap

- **Indicator and unit of measurement:** Difference between male and female median wages expressed as a share of male wages.
- **Type of indicator:** Horizontal inequality.
- **Definition:** This indicator is calculated for full-time employees (not in full-year equivalent terms, as the indicator on earnings).
- **Source:** *OECD Indicators of Gender Equality in Employment (database).*

Household income

- **Indicator and unit of measurement:** Household net adjusted disposable income, measured in USD at 2015 PPPs per capita.
- **Type of indicator:** Country average.
- **Definition:** Household net adjusted disposable income is obtained by summing all the (gross) income flows (earnings, self-employment and capital income, current transfers received from other sectors) paid to the (SNA) household sector and then subtracting current transfers (such as taxes on income and wealth) paid by households to other sectors of the economy. The term "adjusted", in National Accounts vocabulary, denotes the inclusion of the social transfers in-kind (such as education and health care services) that households receive from government. The measure used here also takes into account the amount needed to replace the capital assets of households (i.e. dwellings and equipment of unincorporated enterprises), which is deducted from their income.
- **Source:** OECD calculations based on the *OECD National Accounts (database)*.

Extension 1 Indicators

Negative affect balance

- **Indicator and unit of measurement:** Share of population reporting more negative than positive feelings and states in a typical day.
- **Type of indicator:** Deprivation and horizontal inequality (data by sex, education and age [young=15-29 years, middle-aged=30-49 years and old=50+]).
- **Definition:** Negative affect balance is measured through a battery of items, to which respondents indicate "yes" or "no" to having felt a lot of each emotion or state on the previous day. The negative items considered here relate to anger, sadness and worry, and the positive affect items to enjoyment, feeling well-rested and laughing or smiling. The indicator refers to the share respondents who report more negative than positive feelings or states on the previous day. Data are sourced from the Gallup World Poll, which samples around 1 000 people per country, each year. The sample is ex ante designed to be nationally representative of the population aged 15 and over (including rural areas); the sample data are weighted to the population using weights supplied by Gallup. Due to the low sample size, data for the horizontal inequalities (differences between population groups) refer to pooled averages from 2010 to 2022. For horizontal inequalities by age, data for young people (15-29 years) include less than 1 000 observations for Iceland. For horizontal inequalities by education, the following countries have a sample size lower than 1 000 observations for

primary education: Belgium, France, Ireland, Luxembourg, Norway, the Slovak Republic and Slovenia; for secondary education: Iceland; and for tertiary education: Spain, Slovenia and South Africa.

– **Source:** *Gallup World Poll*.

Exposure to outdoor air pollution

– **Indicator and unit of measurement:** Share of population exposed to more than $10\mu g/m^3$ of $PM^{2.5}$

– **Type of indicator:** Country average.

– **Definition:** Exposure to outdoor air pollution refers to the share of the population exposed to more than 10 $\mu g/m^3$ of $PM^{2.5}$, i.e. living in areas with annual concentrations of fine particulate matter less than 2.5 microns in diameter exceeding the WHO Air Quality Guideline value of 10 micrograms per cubic metre.

– **Source:** *OECD Exposure to $PM^{2.5}$ in countries and regions (database)*.

Housing cost overburden

– **Indicator and unit of measurement:** Share of households in the bottom 40% of the income distribution spending more than 40% of their disposable income on housing costs.

– **Type of indicator:** Deprivation.

– **Definition:** Housing cost overburden refers to the share of households in the bottom 40% of the income distribution devoting more than 40% of their disposable income to housing costs, where the latter 40% threshold is based on the methodology used by Eurostat for EU member countries. Housing costs include actual rents and mortgage costs (both principal repayment and mortgage interest); in contrast to the housing affordability measure sourced from National Accounts, no imputed rentals for owner-occupied homes are included. No data on mortgage principal repayments are available for Denmark. For Chile, Mexico, Korea and the United States, gross income instead of disposable income is used. Data are drawn from the OECD Affordable Housing Database, which is sourced from household survey data.

– **Source:** *OECD Affordable Housing (database)*.

Overcrowding rate

– **Indicator and unit of measurement:** Share of households living in overcrowded conditions.

- **Type of indicator:** Deprivation.
- **Definition:** The overcrowding rate (the share of households living in overcrowded conditions) adopts the EU-agreed definition, which takes into account different needs for living space according to the age and gender composition of the household. A household is considered as living in overcrowded conditions if less than one room is available in each household: for each couple in the household; for each single person aged 18 or more; for each pair of people of the same gender between 12 and 17; for each single person between 12 and 17 not included in the previous category; and for each pair of children under age 12. Data are sourced from the OECD Affordable Housing Database, which uses household survey data.
- **Source:** *OECD Affordable Housing (database).*

Poor households without access to sanitary facilities

- **Indicator and unit of measurement:** Share of households below 50% of median equivalised disposable household income without indoor flushing toilet for the sole use of their household.
- **Type of indicator:** Deprivation.
- **Definition:** Poor households lacking access to basic sanitary facilities refers to the share of households with equivalised disposable household income below 50% of the national median without an indoor flushing toilet for the sole use of the household. Flushing toilets exclude toilets outside the dwelling, but include flushing toilets in a room where there is also a shower unit or a bath. For Chile, Mexico, Korea and the United States, gross income instead of disposable income is used. Data for Korea refer to a flushing toilet regardless of the type of toilet (Asian or European style). Data are drawn from the OECD Affordable Housing Database, which is sourced from household survey data.
- **Source:** *OECD Affordable Housing (database).*

Extension 2 Indicators

Life satisfaction

- **Indicator and unit of measurement:** Mean values on an 11-point scale, with responses ranging from 0 (not at all satisfied) to 10 (fully satisfied).
- **Type of indicator:** Country average, deprivation, vertical and horizontal inequality (data by sex, education and age [young=16-29 years, middle-aged=30-49 years, and old=50+ years]).
- **Definition:** Life satisfaction is measured through survey questions concerning overall satisfaction with life. Averages refer to mean scores. Consistent with the OECD Guidelines on

Measuring Subjective Well-being, the question format typically used in OECD countries is: "Overall, how satisfied are you with your life as a whole these days?", with a response scale ranging from 0 to 10, anchored by 0 ("not at all satisfied") and 10 ("completely satisfied"). Despite progress in harmonization, there are minor differences in the question wording across OECD countries, such as the scale anchors used (e.g. "very dissatisfied" to "very satisfied" in Canada; "completely dissatisfied" and "completely satisfied" in New Zealand) as well as more substantial methodological differences (e.g. identification of the scale mid-point, 5, as "neutral" in Korea). Differences in the population sampled also limit comparability. In the majority of OECD countries, data refer to the population 16 years and older, with minor variations in Australia, Canada, Colombia and New Zealand (where data refer to those aged 15 and older), and Mexico (those aged 18 and older). In Korea, a significantly narrower age range (19-69 years) is considered.

– **Source:** *European Union Statistics on Income and Living Conditions (EU-SILC) (database)*; and estimates provided by National Statistical Offices.

Long unpaid working hours

– **Indicator and unit of measurement:** Share of the total working-age population who usually work more than 60 hours per week, of which at least 30 hours involve unpaid work.

– **Type of indicator:** Country average.

– **Definition:** Long unpaid working hours corresponds to the share of the working-age (15-64) population who usually work more than 60 hours in total (paid and unpaid work) per week, of which at least 30 hours is unpaid work. 60 hours per week is the equivalent of two full-time jobs when the lower bound definition of full-time employment is considered (30 hours per week). This indicator captures long unpaid working hours both for people whose primary activity is domestic production and for those who face a "double day" burden of both paid work and long unpaid working hours. Unpaid work includes routine housework, shopping for goods and services (mainly food, clothing and items related to accommodation), caring for household members (children and adults) and nonhousehold members, volunteering, travel related to household activities and other unpaid work. Paid work, on the other hand, includes time spent in all jobs and all commuting time. Time spent commuting to and from the workplace and to and from school could not be separated out in a number of countries, and thus time spent commuting includes both work- and school-related commuting.

– **Source:** OECD calculations based on public-use time use survey microdata when available; *Eurostat's Harmonised European Time Use Surveys (database)*; and estimates provided by National Statistical Offices.

Student skills (maths)

- **Indicator and unit of measurement:** Cognitive skills of 15-year-old students in maths (mean score).
- **Type of indicator:** Country average, deprivation, vertical and horizontal inequality (data by sex and education).
- **Definition:** Student cognitive skills are measured using the OECD Programme for International Student Assessment (PISA) test scores. PISA assessments are conducted once every three years, with the focal subject cycling between mathematics, reading and science. PISA assessments are normalised such that the OECD average is 500 points, with a standard deviation of 100 points. Normalisation is established in the first year a subject is a focal subject, implying that the value of the OECD average in any given year may not be equal to 500. Because PISA assessments are conducted within schools, they capture the cognitive ability only of 15-year-olds who are currently enrolled in school. These tests thus do not include drop-outs, or home-schooled students.
- **Source:** *OECD Programme for International Student Assessments (PISA)* in reading, mathematics and science, https://doi.org/10.1787/5f07c754-en.

Student skills (reading)

- **Indicator and unit of measurement:** Cognitive skills of 15-year-old students in reading (mean score).
- **Type of indicator:** Country average, deprivation, vertical and horizontal inequality (data by sex and education).
- **Definition:** Student cognitive skills are measured using the OECD Programme for International Student Assessment (PISA) test scores. PISA assessments are conducted once every three years, with the focal subject cycling between mathematics, reading and science. PISA assessments are normalised such that the OECD average is 500 points, with a standard deviation of 100 points. Normalisation is established in the first year a subject is a focal subject, implying that the value of the OECD average in any given year may not be equal to 500. Because PISA assessments are conducted within schools, they capture the cognitive ability only of 15-year-olds who are currently enrolled in school. These tests thus do not include drop-outs, or home-schooled students.
- **Source:** *OECD Programme for International Student Assessments (PISA)* in reading, mathematics and science, https://doi.org/10.1787/5f07c754-en.

Student skills (science)

- **Indicator and unit of measurement:** Cognitive skills of 15-year-old students in science (mean score).
- **Type of indicator:** Country average, deprivation, vertical and horizontal inequality (data by sex and education).
- **Definition:** Student cognitive skills are measured using the OECD Programme for International Student Assessment (PISA) test scores. PISA assessments are conducted once every three years, with the focal subject cycling between mathematics, reading and science. PISA assessments are normalised such that the OECD average is 500 points, with a standard deviation of 100 points. Normalisation is established in the first year a subject is a focal subject, implying that the value of the OECD average in any given year may not be equal to 500. Because PISA assessments are conducted within schools, they capture the cognitive ability only of 15-year-olds who are currently enrolled in school. These tests thus do not include drop-outs, or home-schooled students.
- **Source:** *OECD Programme for International Student Assessments (PISA)* in reading, mathematics and science, https://doi.org/10.1787/5f07c754-en.

Time off

- **Indicator and unit of measurement:** Time allocated to leisure and personal care, hours per day, people in full-time employment.
- **Type of indicator:** Country average and horizontal inequality (data by sex and age [young=15-29 years, middle-aged=30-49 years, and old=50+ years]).
- **Definition:** Time off is measured by hours per day and refers to people in full-time employment. It is the sum of personal care time (i.e. the amount of time spent sleeping, eating and drinking, on other personal care activities and on travel time associated with personal care) and leisure time (i.e. the amount of time spent practicing sports, interacting with friends and relatives, attending or participating in events, watching TV or listening to music, on other leisure activities, and on travel time associated with leisure). Only time spent on main or primary activities is included and as such, it is likely to underestimate especially the time spent on leisure activities, which are often performed in combination with other tasks (e.g. chatting on the phone with a friend while cooking). Time off is measured through Time Use Surveys (TUS), in which participants record, in a diary, the nature and the duration of the activities they have performed over 24 hours.
- **Source:** OECD calculations based on public-use time use survey microdata when available; *Eurostat's Harmonised European Time Use Surveys (database)*; and estimates provided by

National Statistical Offices.

Social interactions

- **Indicator and unit of measurement:** Time spent interacting with friends and family as primary activity, hours per week.
- **Type of indicator:** Country average and horizontal inequality (data by sex and age [young=15-29 years, middle-aged=30-49 years, and old=50+ years]).
- **Definition:** Time spent in social interactions refers to the average number of hours spent in social interactions per week. This includes the amount of time allocated to interacting with friends or relatives as a primary activity (e.g. talking with family members or going out with friends) in a typical day (the averages in this chapter were converted into weekly estimates). Therefore, country averages do not exclude people who did not spend any time in social interactions during the surveyed day. Since only the time spent interacting with family and friends as the main or primary activity is considered, time estimates presented in this chapter are likely to underestimate the total amount spent on social activities, as they exclude those interactions that occur alongside a primary activity (e.g. talking around the dinner table, or chatting on the phone while performing unpaid work).
- **Source:** OECD calculations based on public-use time use survey microdata when available; *Eurostat's Harmonised European Time Use Surveys (database)*; and estimates provided by National Statistical Offices.

Voter turnout

- **Indicator and unit of measurement:** Share of votes cast among the population registered to vote.
- **Type of indicator:** Country average and horizontal inequality (data by sex, education and age [young=16-24 years, middle-aged=25-54 years, and old=55+ years]).
- **Definition:** Voter turnout is measured as the number of votes cast, as a share of the population registered to vote (i.e. the number of people listed in the electoral register). This information is gathered from National Statistical Offices and electoral management bodies, compiled by the International Institute for Democracy and Electoral Assistance, and refers to major national elections. National elections refer to presidential elections in Chile, Colombia, France, Korea, Lithuania, Mexico, Poland, the Russian Federation, Türkiye, and the United States, and to parliamentary elections for other countries. Australia, Belgium, Brazil, Luxembourg and Türkiye enforce compulsory voting. Estimates of the distribution of

voter turnout by population group are obtained through post-election self-reported survey data from the Comparative Study of Electoral Systems. This is measured by the share of people answering "yes" to a (yes/no) question: "Did respondent cast a ballot (in current election)?". Australia, Belgium, Brazil, Luxembourg and Türkiye enforce compulsory voting.

– **Source:** For country average data: *Institute for Democracy and Electoral Assistance (IDEA) (database)*; and for horizontal inequality data: *Comparative Study of Electoral Systems (database)*.

B. Table 2 in terms of GNI per capita

		Indicator	MI	Cond.Ent.	Indiv.Ent.	MI/Indiv.Ent.	IQR	Corr
		Core	bits					
Judgmental		Feeling safe at night	1.33	2.69	4.02	0.33	0.20	0.79
		Perceived health	1.01	2.96	3.97	0.25	0.15	0.54
		Social support	1.05	2.75	3.80	0.28	0.16	0.51
		Difficulty making ends meet_DEP	1.18	2.58	3.76	0.31	0.19	-0.67
Nonjudgmental	Noneconomic	Road deaths	0.83	2.50	3.32	0.25	0.13	-0.51
		Youth not in employment, education or training_DEP	0.75	2.61	3.36	0.22	0.12	-0.56
		Homicides	0.74	1.00	1.74	0.42	0.15	-0.53
		Households with internet access at home	0.98	3.06	4.04	0.24	0.14	0.60
		Life expectancy at birth	0.93	2.01	2.94	0.32	0.16	0.63
	Economic	Long hours in paid work_DEP	0.88	2.31	3.18	0.27	0.14	-0.50
		Earnings	1.62	2.46	4.08	0.40	0.26	0.89
		Employment rate	0.77	2.88	3.64	0.21	0.12	0.52
		Housing affordability	0.73	3.20	3.93	0.19	0.10	0.04
		Labour market insecurity	0.86	2.41	3.28	0.26	0.14	-0.54
		Long-term unemployment rate_DEP	0.57	2.44	3.01	0.19	0.09	-0.33
		Relative income poverty _DEP	0.89	2.81	3.71	0.24	0.13	-0.41
		Gender wage gap_HOR	0.67	3.02	3.70	0.18	0.10	0.05
		Household Income	1.70	2.17	3.90	0.44	0.28	0.89
		Extension 1						
Judg.		Negative affect balance	1.01	2.57	3.59	0.28	0.16	-0.43
Non-Judg.		Air pollution	0.88	2.00	2.72	0.26	0.13	-0.38
		Housing cost overburden_DEP	0.88	2.86	3.74	0.24	0.14	-0.04
		Overcrowding rate_DEP	1.15	2.23	3.38	0.34	0.20	-0.62
		Poor households without access to basic sanitary facilities_DEP	0.59	0.93	1.52	0.39	0.13	-0.55

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	Indicator	MI	Cond.Ent.	Indiv.Ent.	MI/Indiv.Ent.	IQR	Corr
	Extension 2	bits					
Judg.	Life satisfaction	1.44	1.82	3.26	0.44	0.31	0.51
Nonjudgmental	Long unpaid working hours	1.98	0.86	2.85	0.70	0.57	0.12
	Student skills (maths)	0.83	2.31	3.13	0.26	0.15	0.49
	Student skills (reading)	0.79	2.32	3.11	0.26	0.14	0.48
	Student skills (science)	0.79	2.33	3.12	0.25	0.14	0.41
	Time off	1.70	1.62	3.32	0.51	0.38	0.04
	Time spent in social interactions	1.60	1.82	3.41	0.47	0.35	-0.04
	Voter turnout	1.33	2.31	3.64	0.37	0.24	0.39

End of table

C.

Core Time Series Measures with Household Income (2006-2017)

IQR = Mutual Info/Joint Entropy

Indicator	2006			2007			2008		
Core	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR
Difficulty Making Ends Meet	0.56	3.27	0.17	0.71	3.07	0.23	0.45	3.25	0.14
Earnings	1.02	3.23	0.32	1.02	3.23	0.32	1.12	3.08	0.36
Employment Rate	0.18	3.58	0.05	0.18	3.54	0.05	0.29	3.35	0.09
Feeling Safe At Night	0.57	3.56	0.16	0.57	3.56	0.16	0.66	3.41	0.19
Gender Wage Gap	0.42	3.44	0.12	0.30	3.29	0.09	0.40	3.29	0.12
Homicides	0.46	2.10	0.22	0.45	2.09	0.21	0.33	2.04	0.16
Households w/Internet Access At Home	0.45	3.49	0.13	0.62	3.39	0.18	0.65	3.22	0.20
Houseing Affordability	0.22	3.86	0.06	0.20	4.01	0.05	0.20	3.88	0.05
Labour Market Insecurity	NA	NA	NA	0.42	3.21	0.13	0.34	3.21	0.11
Life Expectancy At Birth	0.62	2.41	0.26	0.68	2.47	0.28	0.67	2.29	0.29
Long Hours In Paid Work	0.33	2.64	0.13	0.26	2.64	0.10	0.39	2.75	0.14
Long Term Unemployment	0.37	3.25	0.11	0.26	3.04	0.09	0.26	2.89	0.09
Negative Affect Balance	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perceived Health	0.91	3.32	0.27	0.81	3.27	0.25	0.78	3.34	0.23
Road Deaths	0.60	2.91	0.21	0.72	2.79	0.26	0.59	3.31	0.18
Social Support	0.57	3.37	0.17	0.57	3.37	0.17	0.50	3.38	0.15
Youth Not In Employment, Education or Training	0.23	2.88	0.08	0.20	2.82	0.07	0.24	2.74	0.09

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Core Time Series Measures with Household Income (2006-2017) – *continued from previous page*

Indicator	**2009**			**2010**			**2011**		
Core	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR
Difficulty Making Ends Meet	0.80	3.67	0.22	1.04	3.60	0.29	1.05	3.41	0.31
Earnings	1.22	3.33	0.37	1.13	3.58	0.32	1.19	3.55	0.33
Employment Rate	0.62	3.58	0.17	0.76	3.66	0.21	0.64	3.90	0.16
Feeling Safe At Night	0.79	3.62	0.22	0.94	3.70	0.26	0.88	3.74	0.24
Gender Wage Gap	0.49	3.50	0.14	0.40	3.85	0.10	0.34	3.68	0.09
Homicides	0.26	2.41	0.11	0.20	2.58	0.08	0.22	2.56	0.08
Households w/Internet Access At Home	0.75	3.54	0.21	0.85	3.56	0.24	0.78	3.65	0.22
Houseing Affordability	0.60	3.97	0.15	0.66	4.11	0.16	0.51	4.25	0.12
Labour Market Insecurity	0.85	3.49	0.24	1.06	3.56	0.30	0.88	3.74	0.23
Life Expectancy At Birth	0.77	2.69	0.28	0.76	2.82	0.27	0.74	2.85	0.26
Long Hours In Paid Work	0.44	3.02	0.14	0.36	3.21	0.11	0.33	3.22	0.10
Long Term Unemployment	0.42	3.55	0.12	0.55	3.80	0.14	0.62	3.70	0.17
Negative Affect Balance	NA	NA	NA	0.86	3.92	0.22	0.82	3.95	0.21
Perceived Health	1.00	3.63	0.27	0.90	3.81	0.24	0.89	3.88	0.23
Road Deaths	1.09	3.41	0.32	0.83	3.80	0.22	0.69	3.79	0.18
Social Support	0.79	3.66	0.22	0.71	3.78	0.19	0.72	3.74	0.19
Youth Not In Employment, Education or Training	0.30	3.45	0.09	0.44	3.68	0.12	0.42	3.66	0.11

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Core Time Series Measures with Household Income (2006-2017) – *continued from previous page*

Indicator	2012			2013			2014		
Core	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR
Difficulty Making Ends Meet	1.12	3.35	0.33	1.05	3.30	0.32	1.20	3.09	0.39
Earnings	1.24	3.54	0.35	1.22	3.56	0.34	1.25	3.62	0.35
Employment Rate	0.77	3.86	0.20	0.85	3.80	0.22	0.74	3.98	0.19
Feeling Safe At Night	0.92	3.70	0.25	0.63	4.03	0.16	0.67	4.03	0.17
Gender Wage Gap	0.46	3.75	0.12	0.62	3.65	0.17	0.52	3.95	0.13
Homicides	0.44	2.46	0.18	0.44	2.46	0.18	0.51	2.61	0.20
Households w/Internet Access At Home	0.75	3.60	0.21	0.82	3.45	0.24	0.76	3.61	0.21
Houseing Affordability	0.66	4.13	0.16	0.62	4.11	0.15	0.45	4.27	0.10
Labour Market Insecurity	1.08	3.32	0.33	0.75	3.48	0.22	0.73	3.07	0.24
Life Expectancy At Birth	0.66	3.00	0.22	0.66	3.00	0.22	0.63	3.08	0.20
Long Hours In Paid Work	0.29	3.32	0.09	0.35	3.38	0.10	0.35	3.41	0.10
Long Term Unemployment	0.81	3.69	0.22	0.62	3.62	0.17	0.76	3.44	0.22
Negative Affect Balance	0.88	3.88	0.23	0.66	3.59	0.18	0.76	3.53	0.21
Perceived Health	0.77	3.85	0.20	0.73	3.94	0.19	0.67	3.99	0.17
Road Deaths	0.70	3.62	0.19	0.84	3.45	0.24	0.73	3.67	0.20
Social Support	0.80	3.65	0.22	0.82	3.65	0.22	0.72	3.78	0.19
Youth Not In Employment, Education or Training	0.68	4.07	0.17	0.44	3.95	0.11	0.49	3.81	0.13

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Core Time Series Measures with Household Income (2006-2017) – *continued from previous page*

Indicator	2015			2016			2017		
Core	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR	Mutual Info	Joint Entropy	IQR
Difficulty Making Ends Meet	0.79	3.24	0.25	0.52	2.86	0.18	0.57	2.68	0.21
Earnings	1.28	3.53	0.36	0.93	3.21	0.29	1.02	3.06	0.33
Employment Rate	0.58	3.99	0.15	0.56	3.28	0.17	0.53	3.25	0.16
Feeling Safe At Night	0.70	3.96	0.18	0.51	3.30	0.16	0.51	3.30	0.16
Gender Wage Gap	0.44	3.75	0.12	0.51	3.21	0.16	0.65	3.29	0.20
Homicides	0.48	2.65	0.18	0.43	2.13	0.20	NA	NA	NA
Households w/Internet Access At Home	0.79	3.55	0.22	0.61	3.01	0.20	0.45	3.27	0.14
Houseing Affordability	0.54	4.07	0.13	0.50	3.61	0.14	0.64	3.42	0.19
Labour Market Insecurity	0.74	3.04	0.24	0.36	2.73	0.13	NA	NA	NA
Life Expectancy At Birth	0.63	3.04	0.21	0.66	2.67	0.25	0.66	2.67	0.25
Long Hours In Paid Work	0.40	3.39	0.12	0.39	2.79	0.14	0.41	2.70	0.15
Long Term Unemployment	0.59	3.47	0.17	0.30	3.11	0.10	0.23	3.01	0.08
Negative Affect Balance	0.80	3.45	0.23	0.69	3.26	0.21	0.69	3.26	0.21
Perceived Health	0.67	3.81	0.18	0.55	3.26	0.17	0.60	3.12	0.19
Road Deaths	0.88	3.50	0.25	0.65	2.94	0.22	0.76	2.92	0.26
Social Support	0.73	3.74	0.19	0.53	3.45	0.15	0.53	3.45	0.15
Youth Not In Employment, Education or Training	0.67	3.77	0.18	0.41	3.23	0.13	0.35	3.15	0.11

End of table