



# How does Monetary Policy affect welfare?

Some new estimates using data  
on life evaluation and emotional  
well-being

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**Abstract**

Models on the optimal design of monetary policy typically rely on a social welfare loss function defined over inflation and unemployment. Our estimates of such a function use measures of two different dimensions of well-being that have been distinguished by recent research. The first is Cantril's 'ladder-of-life' question. The second captures the emotional quality of everyday experiences. Our Gallup World Poll sample includes one million people in 138 nations over 12 years. Unemployment and inflation reduce well-being, although the ratio of the size of the effect varies dramatically between 2 and 4.6, depending upon which dimension of well-being is chosen.

**JEL codes**

E24, E31, E52, I31.

**Keywords**

Social welfare; well-being; inflation; unemployment.

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# 1 Introduction

Many Central Banks have enacted legislation that ties their ultimate purpose to promoting the welfare or well-being of their countries.<sup>1</sup> For example, the Reserve Bank of Australia Act (1959) states that *“it is the duty of the Reserve Bank Board ... to ensure that the monetary and banking policy of the Bank is directed to ... the economic prosperity and welfare of the people of Australia”*.<sup>2</sup> In addition, whilst the primary objective of the European Central Bank is to maintain price stability, its broader aim is to support *“the achievement of the objectives of the European Union”* which includes promoting *“the well-being of its peoples”*.<sup>3</sup> In another context, the Central Bank of the Russian Federation links its conduct of monetary policy to the purpose of achieving *“stable well-being of Russian people”*.<sup>4</sup> Furthermore, the Reserve Bank of New Zealand Monetary Policy Amendment Act (2018) gives it a (new) aim of promoting *“the prosperity and well-being of New Zealanders ...”* via the implementation of monetary policy directed at *“achieving and maintaining stability in the general level of prices ... and supporting maximum sustainable employment”*.

The present paper addresses the question of how to estimate a social welfare function defined over inflation and unemployment that can help inform the policy decisions of central banks by providing a way to measure the well-being costs arising from macroeconomic fluctuations. Consider the case of a central bank seeking to achieve price stability in an economy which currently has a high inflation rate. It faces a decision regarding how much to increase interest rates. The more it increases rates, the more unemployment may be pushed up and the quicker inflation may be reduced, at least in the short-run, according to the Phillip’s curve trade-off.

Consequently it is desirable to try to derive the welfare losses that stem from changes in unemployment compared to inflation. One way to do so is by obtaining direct measurements of individual subjective well-being from survey questions. These data can subsequently be correlated with unemployment and inflation rates in order to estimate the relative costs of these variables.

An example of a direct measure of well-being is the “Cantril Ladder-of-Life” question which asks each respondent to evaluate their life on a scale in which 0 is *“the worst possible life”* and 10 is *“the best possible life”*. This question is regarded as capturing the thoughts that people have about their life as a whole when they think about it. A related survey question with a similar type of broad focus asks individuals to evaluate whether, *“on the whole”*, they are *“satisfied with the life they lead”*, which was used by Blanchflower, Bell, Montagnoli and Moro (2014).

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<sup>1</sup> See Mishkin (2007).

<sup>2</sup> See Section 10(2).

<sup>3</sup> For the ECB’s enacting legislation, see [https://www.ecb.europa.eu/ecb/legal/pdf/oj\\_c\\_2016\\_202\\_full\\_en\\_txt.pdf](https://www.ecb.europa.eu/ecb/legal/pdf/oj_c_2016_202_full_en_txt.pdf).

<sup>4</sup> See [https://www.cbr.ru/eng/DKP/about\\_monetary\\_policy/main-objective-and-principles/](https://www.cbr.ru/eng/DKP/about_monetary_policy/main-objective-and-principles/).

On the other hand, there is another dimension of well-being that relates more to the emotional quality of an individual's everyday experience that has been distinguished by recent research. Deaton and Kahneman (2010) find that life evaluation rises steadily with log income whereas there is no further progress in emotional well-being beyond an annual income of US \$75,000. The emotions include the frequency and intensity of a person's experiences of joy, affection, sadness and anger which make one's day-to-day life either pleasant or unpleasant.<sup>5</sup> This dimension is regarded as being associated with one's instantaneous, or momentary, level of well-being and has a shorter term focus. The evaluation-of-life questions referred to above, by contrast, are regarded as being more associated with a longer time horizon. Consequently, we raise the question of whether inflation and unemployment affect well-being differently across these different dimensions of well-being.

The paper is organized as follows. In the next section we show how the literature on the costs of macroeconomic fluctuations can be used to estimate a welfare function defined over inflation and unemployment. In section 3 survey data on well-being from the Gallup World Poll is correlated with these variables. The coefficients can be used to determine the welfare costs of unemployment compared to inflation. This exercise yields a different set of estimates to those often used by economists who analyze monetary policy. Section 4 discusses the question of which measure of well-being should be used and section 5 explains how our results may affect the design of an optimal disinflationary path. It also addresses the issue of how macroeconomic fluctuations may affect the well-being of different people in different ways, which may create differing views about the optimal monetary policy response to shocks. Section 6 concludes.

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<sup>5</sup> These pleasant and unpleasant emotions are sometimes also referred to as "positive" and "negative" affect when constructing measures of well-being (see, for example, Myers and Diener, 1994).

## 2 The costs of inflation and unemployment: some theory

Central banks often emphasize many different types of costs of inflation in their publications. First, inflation may induce people to spend additional time and mental energy on reducing their holdings of cash, rather than on more productive activities. Second, it can cause firms to incur greater 'menu costs'. Third, since tax laws are mostly not indexed, inflation may raise effective tax rates and reduce economic growth. Fourth, it can make economic calculations harder since the currency becomes less reliable as a yardstick for measuring value. Fifth, because unexpected changes in prices redistribute real wealth between debtors and creditors, volatile inflation may create risks, making the use of long-term contracts using money as the unit of account less tenable. Sixth, when price adjustments are staggered, inflation can introduce spurious volatility in some prices relative to others, reducing a market system's ability to allocate resources efficiently.<sup>6</sup>

These different channels vary in terms of importance. For example, since holdings of cash are usually quite small, they are unlikely to justify the observed focus on keeping inflation low.<sup>7</sup> Instead, attempts to derive high costs of inflation have been more influential when focusing on the extent to which inflation reduces the price system's ability to allocate resources efficiently.<sup>8</sup>

In addition to the above "standard costs" of inflation, other types of costs stemming from the psychological processes of individuals have also been described by behavioural economics. As an example, Shiller (1997) shows that when asked direct questions about inflation, people report 'unconventional' problems, like exploitation, lower national prestige and a loss of morale. One reason may be that the fairness of the existing income distribution becomes harder to justify when there is confusion over prices due to high inflation. For example, if speculation is more common when relative price changes occur more frequently, then one may find it harder to claim that the economy is rewarding effort more than luck. People may also experience regret that they didn't buy when prices were lower and get angry about price rises.<sup>9</sup>

With respect to the costs of unemployment, in spite of a long tradition studying macro-economic fluctuations, there remains disagreement among economists about the seriousness of their effects. The welfare costs of recessions in classical economics arise from the lost output that occurs when actual output falls below potential. This approach is sometimes adopted by real-business-cycle theorists, who assume that individuals are optimizing and recessions are

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<sup>6</sup> Fischer and Modigliani (1978) was one of the first papers to outline the different costs of inflation.

<sup>7</sup> See Friedman (1969).

<sup>8</sup> This is the approach taken by Rotemberg and Woodford (1997).

<sup>9</sup> See Rotemberg (2005, 2009).

desirable adjustments to productivity shocks. This means that the costs of business cycles are small - perhaps only 0.1 percent of total consumption in the US.<sup>10</sup>

By contrast, and along similar lines to better understanding the costs of inflation, there may also be potential for behavioural economics to improve our knowledge of the different kinds of costs associated with recessions. Substantial work in psychology and sociology indicates that there are emotional costs to those who lose their jobs that far exceed the monetary costs. For example, the unemployed may experience a loss of social status and self-esteem. They can find themselves deprived of personal relationships which they gained through their job and lose the disciplining time-structure that comes through being bound to a workplace. In addition, the unemployed may suffer a stigma due to being labelled as lazy, as well as face blame for their situation and find it hard to get back to work. Importantly, the *employed* may suffer from fear and anxiety due to the possibility that they may also incur these kinds of costs should they lose their jobs.<sup>11</sup>

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<sup>10</sup> See, for example, Lucas (2003) and Atkeson and Phelan (1994).

<sup>11</sup> The size of the psychic costs of unemployment are broadly comparable across nations (e.g., see Di Tella, MacCulloch and Oswald, 2003, Frey and Stutzer, 2013). A core assumption of "Keynesian economics" is that unemployment is a malady and not caused by efficient market responses to unattractive opportunities.



### 3 Estimating a social welfare function

When it comes to formulating monetary policy, knowing the effects on the welfare of a society of both inflation and unemployment is of first order importance. However due, in particular, to the potentially many different psychological costs that may occur when these variables change, as outlined above, identifying the total cost becomes difficult.

We remain a long way from having useful estimates that can help guide policy-makers. The direct questions about the costs of inflation that were used by Shiller (1997) are subject to some notable criticisms. Diamond and Hausman (1994), for example, argue that there can be strategic manipulation of answers in contingent valuation studies of environmental costs which use a similar style of question. Much may also depend on the respondent's ability to understand difficult issues (such as the workings of the economy or state of the environment).

Another approach is to ask people about their own personal level of well-being and then correlate the answers with our variables of interest (i.e., inflation and unemployment). This imposes fewer informational demands, as presumably it is easier to know about one's own situation, than about how the economy works.<sup>12</sup>

In other words, our approach is to estimate a welfare function for society of the following form:

$$\text{Social Welfare} = g(\text{Unemployment}, \text{Inflation}) \quad (1)$$

The task of theoretically deriving a function of this type was undertaken by Rotemberg and Woodford (1997) who ground their structural relations in the context of optimizing behavior of individuals and of firms that must temporarily keep their prices fixed, resulting in relative price distortions when inflation rises.<sup>13</sup> Their key assumptions are *a)* a summary measure of utility exists; *b)* all channels through which inflation and unemployment matter can be reduced to consumption and leisure; *c)* there is a representative agent. The advantage of determining welfare losses arising from changes in the inflation and unemployment rates in the same model is that one can then directly compare their relative size. Obtaining such estimates is important

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<sup>12</sup> Note that well-being research does not have to rely on subjective data. For an example that uses suicides as a proxy for mental distress, see Stevenson and Wolfers (2006).

<sup>13</sup> On the one hand, prices change more often so forfeiting a purchase decision in favor of more search becomes riskier. On the other hand, the fact that there are relative price oscillations means there are potentially more bargains out there, so search becomes more valuable.

for central banks when seeking to reduce inflation by raising interest rates (which may cause unemployment to rise in the short-run) since it helps to pin down the optimal adjustment path.<sup>14</sup>

One way of estimating a welfare function of the type given in equation (1) is by running a regression of the following form:

$$\text{Self-reported well-being}_{ntj} = \alpha \text{Unemployment}_{nt} + \beta \text{Inflation}_{nt} + \delta \Omega_{nt} + \gamma_n + \eta_t + \mu_{ntj} \quad (2)$$

for a sample of individuals,  $j$ , living in nation,  $n$ , in year,  $t$ , where  $\Omega$  represents macro-economic control variables, such as GDP per capita, measured in constant 2011 US dollars, adjusted for Purchasing Power Parity,  $\gamma$  are country fixed effects,  $\eta$  are year fixed effects and  $\mu$  is the error.

### 3.1 Estimating a Social Welfare Function using Life Evaluation Data

Our first measure of self-reported well-being is called the “ladder-of-life”. It comes from the Gallup World Poll survey question that asks, *“Please imagine a ladder/mountain with steps numbered from zero at the bottom to ten at the top. Suppose we say that the top of the ladder/mountain represents the best possible life for you and the bottom of the ladder/mountain represents the worst possible life for you. If the top step is ten and the bottom step is zero, on which step of the ladder/mountain do you feel you personally stand at the present time?”* The response categories are shown to individuals as options from which to choose.

The bottom category (“0”) is labelled the *“Worst possible”* life whereas the top category (“10”) is labelled the *“Best possible”* life. In addition to these survey data, *Inflation* is measured by the rate of change in the Consumer Price Index and *Unemployment* is the share of the labor force without work but available for - and seeking employment - as a proportion of the total labor force.

Our Gallup World Poll data is comprised of repeated cross-sections of around 1,000 individuals living in 138 countries between 2005 and 2016, making up a sample size of 1,035,809 individuals. Table A in the Appendix lists the names of these countries and reports summary statistics for our regression variables.<sup>15</sup> Although the “ladder-of-life” question has many response categories, the Gallup Poll data on daily emotions, like enjoyment and sadness,

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<sup>14</sup> Even assuming that no long-run trade-off between inflation and unemployment exists, the presence of a short-run trade-off means that knowing the relative costs of these two variables is still valuable when it comes to setting interest rates. Woodford (2001) explains how the Taylor rule incorporates several features of an optimal monetary policy from the standpoint of an objective function that defines welfare in terms of inflation and the output gap.

<sup>15</sup> These data come from [World Development Indicators \(2018\)](#) who draw their unemployment data from the International Labour Organization’s ILOSTAT database, their inflation data from the International Monetary Fund’s [International Financial Statistics](#) and their GDP per capita data from the [World Bank National Accounts](#), as well as [OECD National Accounts](#) files.

which we use in the next section, have only two categories. The Gallup Poll methodology states that most of their survey questions have “*a simple dichotomous (“yes or no”) response set to minimize contamination of data because of cultural differences in response styles and to facilitate cross-cultural comparisons*”. To help ensure comparability across our different measures of well-being, we define our dependent variable, *Ladder of Life*, to equal 0 if the individual response lies in categories “0-4” and 1 if it is in categories “5-10”.<sup>16</sup>

In short, we run simple probit regressions for all of our specifications, using a dichotomous dependent variable.<sup>17</sup> We follow a similar methodology to Deaton and Kahnemann (2010) who use this same type of data (to determine how income affects well-being).

The coefficients on inflation and unemployment estimated by equation (2) provide a way to aggregate all of the costs and benefits of macro-economic fluctuations. In other words, the regression patterns map out a welfare function, unbeknown to the respondents completing their well-being survey score sheets.

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<sup>16</sup> We use the maximum amount of available data from the Gallup World Poll to focus on how different measures of individual well-being are correlated with aggregate-level macro-economic variables. Nearly 40% of our sample does not have a complete set of observations on a range of other individual-level characteristics (e.g., education, marital status). We also ran regressions that included these kinds of explanatory variables as controls, as well as estimated our “ladder-of-life” regressions using all 11 categories, by way of robustness checks. Results available on request.

<sup>17</sup> Our dichotomous dependent variable also avoids issues associated with using ordered probit regressions that are run on well-being response data with three or more categories (for example, see Bond and Lang, 2019).

Table 1:

How the “Ladder-of-Life” Varies with Inflation and Unemployment: 138 nations, 2005 to 2016.

Dependent variable	(1) <i>Ladder of Life</i>	(2) <i>Ladder of Life</i>	(3) <i>Ladder of Life</i>	(4) <i>Ladder of Life</i>
Macroeconomic Variables				
<i>Unemployment rate</i>	-0.67*** (0.17)	-0.54*** (0.17)	-0.70*** (0.12)	-0.52*** (0.17)
<i>Inflation rate</i>	-0.12** (0.05)	-0.12*** (0.05)	-0.10* (0.06)	-0.12** (0.05)
<i>GDP per capita</i>		0.05*** (0.02)		0.06*** (0.02)
<i>Country Dummies</i>	Yes	Yes	Yes	Yes
<i>Year Dummies</i>	No	No	Yes	Yes
No. of Observations	1,035,809	1,030,494	1,035,809	1,030,494
Country-year clusters	843	840	843	840
Pseudo R <sup>2</sup>	0.11	0.11	0.11	0.11

**Note:** Probit regressions with marginal effects are reported. Robust standard errors in parentheses, with country level clustering. Dependent variable is the individual response to the Gallup World Poll question, “Please imagine a ladder/mountain with steps numbered from zero at the bottom to ten at the top. Suppose we say that the top of the ladder/mountain represents the best possible life for you and the bottom of the ladder/mountain represents the worst possible life for you. If the top step is ten and the bottom step is zero, on which step of the ladder/mountain do you feel you personally stand at the present time?” We define *Ladder of Life* to equal 0 if a response lies in categories 0 - 4 and 1 if it is in categories 5 - 10. *GDP per capita* is real GDP per capita, measured in 2011 US dollars, adjusted for Purchasing Power Parity, and scaled down by a factor of 10,000 for reporting purposes.

The first column in Table 1 presents the results when country fixed effects are included.

Marginal probabilities are reported for all our regressions. It shows that the coefficients on unemployment and inflation are both negative and significant at the 1 percent and 5 percent levels, respectively.

In order to see the size of the effects, an increase in the unemployment rate of 10 percentage points reduces the probability of reporting oneself as being in the top “ladder-of-life” categories

by 6.7 percentage points.<sup>18</sup> Likewise, an increase in the inflation rate of 10 percentage points reduces the chances of being in the top categories by 1.2 percentage points.

Much variation exists across the nations and years of our Gallup World Poll sample in terms of their macro-economic characteristics. The averages of the unemployment and inflation rates are 8.2% and 4.8%, whereas their standard deviations are 6.2% and 5.8%, respectively. As examples, the unemployment rate reached 48% in Kosovo in 2008, whereas inflation was 59% in Belarus in 2012. Meanwhile, in the poorest country, Burundi, GDP per capita was only \$706 in 2012 whereas in the richest country, Qatar, it was \$124,025 (both measured in 2011 US dollars).

Consequently, column (2) controls for a measure of economic development, namely GDP per capita. The unemployment and inflation rates both retain their negative and significant effects on the “ladder-of-life”, at the 1 percent level. The size of each of these effects also remains similar. By contrast, GDP per capita has a positive effect on this measure of well-being, at the 1 per cent level. An increase in GDP per capita of \$US 10,000 increases the probability of being in the top “ladder-of-life” categories by 5.1 percentage points.

As a further check on robustness, columns (3-4) include year fixed effects as controls. They once more find that high rates of unemployment and inflation significantly reduce the likelihood of feeling close to the “*best possible life*”. In particular, using the coefficients in the last column, the effect of a one percentage point rise in the unemployment rate on the “ladder-of-life” is 4.3 times larger than compared to the same increase in the rate of inflation ( $=-0.52/-0.12$ ).<sup>19</sup>

A related measure of well-being is captured by the question: “*On the whole, are you satisfied with the life you lead?*” Most surveys provide four possible answers, such as ‘*not at all satisfied*’, ‘*not very satisfied*’, ‘*fairly satisfied*’ and ‘*very satisfied*’. One study that used this question on European data is Blanchflower et al (2014) who find that a one percentage point rise in the unemployment rate lowers life satisfaction by five times as much as a one percentage point rise in the inflation rate.<sup>20</sup>

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<sup>18</sup> Note that the coefficient on the unemployment rate in Table 1 reflects how the *average* person changes their score when unemployment rises. We can interpret this as a ‘fear effect’, namely that as unemployment rises, the chances of an employed person losing their job rises. For cross-sectional evidence on the relation between the “ladder-of-life” and economic fluctuations, see Gandelman and Hernández-Murillo (2009) who use one wave of the Gallup Poll.

<sup>19</sup> Svensson (2002) converts these estimates into a trade-off between the output gap and inflation using Okun’s Law. He states “*a simple version of Okun’s Law is that a change of the unemployment rate of one percentage point corresponds to a change of the output gap of 2 to 2.5 percentage points*”. Hence a one percentage point reduction in the output gap causes between 1.7 ( $=4.3/2.5$ ) and 2.2 ( $=4.3/2$ ) times as much of a reduction in well-being as an additional percentage point of inflation.

<sup>20</sup> Their data come from the Euro-barometer Survey Series (see also Di Tella et al, 2001, 2003, Di Tella and MacCulloch, 2009, and Wolfers, 2003). By contrast, the World Values Survey, which asks the same life satisfaction question but for a larger sample of countries, uses ten categories of possible answers.

### 3.2 Estimating a Social Welfare Function using Data on the Emotions

Whilst both the “ladder-of-life” and “life satisfaction” questions refer to the judgments people make when they think about their overall life, psychologists often distinguish these evaluations from the day-to-day feelings that they encounter as they live it.<sup>21</sup> The latter refer to the emotional quality of an individual’s everyday experience - the frequency and intensity of experiences of joy, affection, anxiety and sadness that make one’s life either pleasant or unpleasant.<sup>22</sup>

A natural question, given such a multiplicity of emotions, is whether measures appropriate for empirical analyses are available to produce more comprehensive tests. The Gallup World Poll, which was designed with the assistance of psychologists, does indeed collect data on this second aspect of well-being. It allows us to investigate whether macro-economic fluctuations influence people’s day-to-day feelings (in addition to their life evaluations).

In particular, we use two measures of “positive affect” and two measures of “negative affect” to capture the self-reported well-being of individuals under this shorter time horizon. With respect to the former, the first measure that we take is the answer to the question, *“Did you experience the following feelings during a lot of the day yesterday? How about enjoyment?”*, and the second is the answer to the question, *“Now, please think about yesterday, from the morning until the end of the day. Think about where you were, what you were doing, who you were with, and how you felt ... Did you smile or laugh a lot yesterday?”* In each of these cases we define a dichotomous dependent variable based on the either “yes” or “no” responses of individuals.<sup>23</sup>

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<sup>21</sup> Kahneman and Krueger (2006) argue that life evaluation measures are best viewed as *“a global retrospective judgment, which in most cases is constructed only when asked and is determined in part by the respondent’s current mood and memory, and by the immediate context.”* They recount the dime experiment of Schwarz (1987), whereby subjects “accidentally” find a dime before filling out a questionnaire. The lucky half of the sample reports higher levels of life satisfaction.

<sup>22</sup> See, for example, Hager and Ekman (1983).

<sup>23</sup> An alternative possibility is to measure the proportion of time people spend in an unpleasant emotional state which allows us to construct an index that is based on an ordinal measure of feelings at the episode level that reduces the impact of individual variability in the use of scales of well-being used (see Kahneman and Krueger, 2006).

Table 2:

How “Enjoyment” and “Smile or Laughter” vary with Inflation and Unemployment: 138 Nations, 2005 to 2016.

Dependent variable	(1) <i>Enjoyment</i>	(2) <i>Enjoyment</i>	(3) <i>Smile or Laughter</i>	(4) <i>Smile or Laughter</i>
Macroeconomic Variables				
<i>Unemployment rate</i>	-0.22*** (0.07)	-0.26*** (0.09)	-0.28*** (0.08)	-0.31*** (0.12)
<i>Inflation rate</i>	-0.11*** (0.04)	-0.13*** (0.04)	-0.15** (0.06)	-0.15** (0.06)
<i>GDP per capita</i>		-3.0e-4 (0.02)		-0.01 (0.02)
<i>Country Dummies</i>	Yes	Yes	Yes	Yes
<i>Year Dummies</i>	Yes	Yes	Yes	Yes
No. of Observations	991,818	986,560	964,981	961,708
Country-year clusters	842	839	837	834
Pseudo R <sup>2</sup>	0.04	0.04	0.05	0.05

**Note:** Probit regressions with marginal effects are reported. Robust standard errors in parentheses, with country level clustering. Dependent variable in columns (1-2) is the individual response to the Gallup World Poll question, “Did you experience the following feelings during a lot of the day yesterday? How about enjoyment?” We define *Enjoyment* to equal 1 if the response is “yes” and 0 if it is “no”. Dependent variable in columns (3-4) is the individual response to the question, “Now, please think about yesterday, from the morning until the end of the day. Think about where you were, what you were doing, who you were with, and how you felt ... Did you smile or laugh a lot yesterday?” We define *Smile or Laugh* to equal 1 if the response is “yes” and 0 if it is “no”. *GDP per capita* is real GDP per capita, measured in 2011 US dollars, adjusted for Purchasing Power Parity, and scaled down by a factor of 10,000 for reporting purposes.

Columns (1-2) of Table 2 show the “enjoyment” results. These regressions all control for country and year fixed effects. A higher unemployment rate and a higher inflation rate both reduce the chances of experiencing enjoyment, at the 1 percent level of significance. The relative size of the effect of unemployment, compared to inflation, however, decreases compared to Table 1. Using the coefficients in column (2), a one percentage point rise in the unemployment rate now has twice as large an effect on enjoyment as a one percentage point rise in inflation ( $=-0.26/-0.13$ ). These results are robust to adding a control for GDP per capita.

Columns (3-4) show how the unemployment and inflation rates affect the extent to which people

“smile or laugh a lot”. Column (3) shows that both of these variables reduce this measure of well-being at the 1 and 5 percent levels, respectively, including when GDP per capita is added as a control. In column (4) the ratio of the size of the marginal effect of the unemployment rate compared to the inflation rate is equal to 2.1 ( $=-0.31/-0.15$ ).

With respect to “negative affect”, we also take two measures. The first is the answer to the question, “Did you experience the following feelings during a lot of the day yesterday? How about sadness?”, and the second is the answer to the question, “Did you experience the following feelings during a lot of the day yesterday? How about physical pain?” In both cases we again define a dichotomous dependent variable based on the either “yes” or “no” response of each individual.

Table 3:

How “Sadness” and “Pain” vary with Inflation and Unemployment: 138 Nations, 2005 to 2016.

<b>Dependent variable</b>	(1) <i>Sadness</i>	(2) <i>Sadness</i>	(3) <i>Pain</i>	(4) <i>Pain</i>
Macroeconomic Variables				
<i>Unemployment rate</i>	0.39*** (0.06)	0.32*** (0.08)	0.16** (0.08)	0.15* (0.09)
<i>Inflation rate</i>	0.06 (0.04)	0.07* (0.04)	0.07* (0.04)	0.07 (0.04)
<i>GDP per capita</i>		-0.02** (0.01)		-8.0e-4 (0.01)
<i>Country Dummies</i>	Yes	Yes	Yes	Yes
<i>Year Dummies</i>	Yes	Yes	Yes	Yes
No. of Observations	988,641	984,352	991,991	987,669
Country-year clusters	839	836	839	836
Pseudo R <sup>2</sup>	0.03	0.03	0.02	0.02

**Note:** Probit regressions with marginal effects are reported. Robust standard errors in parentheses, with country level clustering. Dependent variable in columns (1-2) is the individual response to the Gallup World Poll question, “Did you experience the following feelings during a lot of the day yesterday? How about sadness?” We define *Sadness* to equal 1 if the response is “yes” and 0 if it is “no”. Dependent variable in columns (3-4) is the individual response to the question, “Did you experience the following feelings during a lot of the day yesterday? How about physical pain?” We define *Pain* to equal 1 if the response is “yes” and 0 if it is “no”. *GDP per capita* is real GDP per capita, measured in 2011 US dollars, adjusted for Purchasing Power Parity, and scaled down by a factor of 10,000 for reporting purposes.



Columns (1-2) of Table 3 present the “sadness” results. Higher unemployment and inflation rates both *increase* the chances of feeling this negative emotion. In the second column, which controls for GDP per capita, the effect of unemployment is significant at the 1 percent level and inflation at the 10 percent level. A one percentage point rise in the unemployment rate has 4.6 times as large an effect on sadness as a one percentage point rise in inflation ( $=0.32/0.07$ ).

Meanwhile, columns (3-4) show how macroeconomic fluctuations affect the extent to which people experience “pain”. The impacts of unemployment and inflation are again both positive. The ratio of the size of the effects is now equal to 2.1 ( $=0.15/0.07$ ).

## 4 Well-being as an ultimate goal of central banks

### 4.1 Which Well-being Measure Should a Central Bank Use?

Economists have built their theories of monetary policy around the concept of utility. On the other hand, psychologists tend to believe there are many different dimensions, or components, of well-being that cannot necessarily be aggregated into a single summary measure. This is a question on which psychologists and economists do not agree, leaving us with an open question. Namely, which dimension of well-being is the “best” one for central banks to use?

Of particular concern is the time horizon that is relevant to policy-makers. Ambiguity regarding this issue poses a problem for applications of well-being data, particularly in macroeconomics. For example, note that the unemployment-inflation welfare trade-off, as measured by the relative size of the coefficient on these two variables in equation (2), is equal to 4.3 when well-being is measured using the “ladder-of-life” question, although drops to 2.0 and rises to 4.6 when using the “enjoyment” and “sadness” questions, respectively. Consequently, the optimal disinflationary path may differ depending on which measure is used for policy purposes.

The ultimate objectives of many central banks do not refer to specific time frames. For example, the Bank of England’s founding charter in 1694 states that its purpose is simply to “*promote the public good and benefit of our people*”. On the other hand, as noted earlier, the purpose of the RBNZ is to “*to promote the prosperity and well-being of New Zealanders and contribute to a sustainable and productive economy*” whereas the Central Bank of the Russian Federation emphasizes “*stable well-being*”. In such cases, the inclusion of words like “*sustainable*” and “*stable*” may be taken to suggest a focus not so much on immediate day-to-day emotions, but more on longer term well-being.

We take the (reasonable) position that survey questions related to life evaluation capture, to some degree, the past and future. If so, then the “*ladder of life*” and “*life satisfaction*” questions may be better proxies for an overall measure of welfare than ones asking about a person’s momentary (pleasant or unpleasant) feelings on a particular day.

However, a complication is that evaluation of life measures can be quite stable whereas day-to-day emotions may fluctuate significantly in many realistic settings. Politicians that enact legislation defining well-being in terms of life evaluation may lose office to others who propose alternative policies which give people a positive experience right now, at this moment in time. The success of many populist political platforms is one indicator of their appeal and power.

An example of relevance to central banks concerns asset bubbles. Investors often enter markets that have experienced large increases in prices, even when those increases may not be supported by the fundamentals. One explanation is that people become “irrationally exuberant”.<sup>24</sup> Another possibility is that they are trying to minimize the emotion of “regret”. In other words, they don’t want to miss out on the boom. The cost of a lost opportunity looms larger in their minds than the fear of losing money in the event of a collapse of a bubble.

A reason for this asymmetry may be that ‘missing out’ is a lonelier experience. By contrast, if everyone takes part in buying up during a bubble that subsequently collapses, then the misery is experienced collectively.<sup>25</sup> As a result, a central bank using life evaluation scores for policy purposes instead of ‘regret’ may be criticized by those economists who worry about phenomena like asset price bubbles.

## 4.2 Validity Tests of Well-being Data

A natural reaction to survey responses of a person’s well-being is to dismiss them as unreliable. As a result, researchers have sought to establish a connection between these kinds of data and objectively measured variables that can plausibly be associated with true utility. For example, numerous studies reveal that unemployed individuals tend to report low levels of well-being.<sup>26</sup> This association is important since (objective) factors like addiction, depression and violence

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<sup>24</sup> For example, people sometimes keep buying houses even though they become overvalued in terms of price-to-earnings ratios and debt defaults start rising. “*Irrational exuberance*” is a phrase that was used by Federal Reserve Board Chair, Alan Greenspan, in a speech to the American Enterprise Institute during the dot-com bubble of the 1990s.

<sup>25</sup> In addition, inferences about one’s own ability are harsher in the “missing out” scenario than when one feels that lots of other people made the same mistake.

<sup>26</sup> See, for example, Clark and Oswald (1994), Clark (2003) and Stutzer and LaLive (2004). Falling unemployed is associated with large drops in well-being, even after controlling for income losses associated with job loss. The size of the effect is similar to the well-being difference reported by people at opposite ends of the income distribution. Such estimates reject the approach used by real business cycle theorists to measure the costs of business cycles.

(that may negatively affect well-being) are often linked to unemployment. A positive connection has also been found to exist between well-being scores and (observed) good health outcomes.<sup>27</sup>

## 5 Discussion: Optimal Disinflationary Paths, Crises and Differences across Groups

One interpretation of our results is that individuals find both high inflation and unemployment costly. This view follows standard practice in macroeconomics and assumes that a representative agent exists. The more negative size of the regression coefficient on the unemployment rate, compared to the coefficient on the inflation rate, has implications for the optimal disinflationary path followed by central banks seeking to achieve price stability. For example, if inflation is high and needs to be cut over the medium to long term, then a smaller increase in interest rates may be justified in order to minimize the significant well-being costs coming from a rise in unemployment in the short-run.

Aside from the inflation-unemployment welfare trade-off, central banks are appearing to be increasingly concerned about the well-being effects of financial crises. In the context of its review of the level of capital which is considered prudent for banks to hold, the Reserve Bank of New Zealand states *“banking crises can have large and long-lasting impacts on an economy, beyond the initial economic downturn that may have precipitated them. In addition to the cost of lost economic output, broader societal costs of crisis events include impacts on health, mental wellbeing and social cohesion”* (see RBNZ, 2019). There has already been some recent work trying to determine the well-being costs of such crises. For example, Montagnoli and Moro (2018) find that financial crises lead to *“major, widespread and lasting psychological losses”*, above and beyond that which can be attributed to lower output and higher unemployment rates.

A natural future step for central banks is to move beyond the representative agent paradigm and estimate the impact of fluctuations on well-being across groups. For example, business cycles and banking crises may affect different people in different ways. Consequently, there may be differing views about the optimal response to shocks. One dimension of interest concerns different partisan (left versus right) political beliefs. As an example, the Euro-Barometer Survey Series asks: *“In political matters, people talk of ‘the left’ and ‘the right’. How would you place your*

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<sup>27</sup> On the relation between well-being and hypertension, see Blanchflower and Oswald (2008). Meanwhile, Helliwell (2003) and Deaton (2008) find positive correlations between well-being and variables associated with high utility, like trust. Well-being regressions, where the explanatory variables are demographic characteristics, have similar structures across nations (see Di Tella *et al*, 2003). Other researchers have repeated their estimates using questions with different wordings as robustness checks (Wolfers, 2003, and Blanchflower and Oswald, 2004). Well-being survey responses are correlated with left frontal brain activity, which appears to be connected to what we call “true utility”.

own views on this [1-10] scale?" Di Tella and MacCulloch (2005) estimate "life satisfaction" regression equations separately for sub-samples that are selected on the basis of political beliefs in order to test whether the unemployment/inflation ratio,  $\alpha/\beta$ , is higher for left-wingers than right-wingers.<sup>28</sup>

One can also focus on the sub-group of the unemployed. As an example, Di Tella *et al* (2003) show that the cost of becoming unemployed is ameliorated by the welfare state, as measured by the generosity of unemployment benefits. This result may help explain the observed negative correlation between inflation and the welfare state (since when unemployment is less costly to people then central banks may be more inclined to raise interest rates to keep inflation low).<sup>29</sup>

Another reason central banks may wish to focus on groups of people, rather than on individuals, is that the chances of systematic differential reporting biases when comparing groups containing many individuals may become small. For example, consider the finding that well-being is positively correlated with income across a sample of individuals. Since optimistic people who look on the bright side of things may also tend to work harder, it is likely that the error term is correlated with income. A possible solution to this problem is to correlate measures of well-being with economic variables like income and unemployment rates, all aggregated at the regional, state, or national level. When people are measured in groups, their overall well-being scores are more likely to reveal useful information that can be used to make comparisons about social welfare.<sup>30</sup>

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<sup>28</sup> See Alesina (1987). In addition, Alesina *et al* (2004) and Di Tella and MacCulloch (2005) find that income inequality has different effects across the US and Europe, and across people with different ideological inclinations. Another dimension of interest is based on income. Hibbs (1987) cites Paul Samuelson as saying, "*Democrats constitute people, by and large, who are around the median incomes or below. These are the ones whom Republicans want to pay the price and burden of fighting inflation. Democrats are willing to run some inflation (to increase employment); the Republicans are not*" (p. 213).

<sup>29</sup> See Di Tella and MacCulloch (2004) who provide evidence that more generous benefits are associated with lower inflation rates in a panel of OECD countries from 1961-1992, controlling for country and time fixed effects, country specific time trends and using different measures of benefit generosity (e.g., duration of unemployment benefits).

<sup>30</sup> The question of whether well-being measures can be compared across cultures can be studied using vignettes as anchors (see King *et al*, 2003).

## 6 Conclusion

This paper shows that data on self-reports of individual well-being are negatively correlated with the unemployment rate and inflation rate. Our contribution is to use two different types of survey questions that recent research has identified as capturing distinct aspects of subjective well-being. The first focusses on overall life evaluation, as measured by Cantril's "ladder-of-life" question. The second captures the quality of an individual's (either pleasant or unpleasant) day-to-day experiences, such as joy or sadness. Whereas the former has a long-time horizon, the latter's focus is more on the short-term. Both measures are obtained from the Gallup World Poll which includes over 1 million people surveyed across 138 countries and over 12 years.

In terms of the models traditionally adopted in the design of monetary policy, our estimates can be seen as a way of obtaining the weights in a social welfare function. Consequently, they can help central banks to understand the trade-offs that people are willing to accept in terms of unemployment for inflation. The evidence suggests that reasonable proxies for what economists call "utility" are significantly affected by aggregate-level economic fluctuations.

Our approach yields a different set of welfare weights on the unemployment and inflation rates to those often used by economists who analyze monetary policy, which typically place much less weight on the costs of unemployment. However, the weights depend significantly on which measure of "well-being" is adopted. Depending on whether one measures well-being by Cantril's "ladder-of-life", or instead by questions that capture the emotional quality of an individual's everyday experiences, the ratio of the weighting on unemployment compared to inflation varies in a range between 2 and 4.6.

As a result, we believe that there is a justification for central banks to focus more of their research efforts on collecting and analyzing these kinds of data. In particular, the data should be sufficiently refined to enable one to distinguish between the potentially differing effects of monetary and banking policies across different groups of people. At the same time, governments also face a challenge in terms of better defining precisely what aspect of well-being they would like central banks to promote.

# Appendix

## Gallup's World Poll Methodology Overview

Gallup's World Poll continually surveys residents in more than 150 countries, representing more than 99% of the world's adult population, using randomly selected, nationally representative samples. Gallup typically surveys 1,000 individuals in each country, using a standard set of core questions that has been translated into the major languages of the respective country. In some regions, supplemental questions are asked in addition to core questions. Face-to-face interviews are approximately 1 hour, while telephone interviews are about 30 minutes.

With some exceptions, all samples are probability based and nationally representative of the resident population aged 15 and older. The coverage area is the entire country including rural areas, and the sampling frame represents the entire civilian, non-institutionalized, aged 15 and older population of the entire country.

The typical Gallup World Poll survey includes at least 1,000 surveys of individuals. Most items have a simple dichotomous ("yes or no") response set to minimize contamination of data because of cultural differences in response styles and to facilitate cross-cultural comparisons.

### List of Countries in the Sample

Afghanistan, Albania, Algeria, Angola, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bhutan, Bolivia, Bosnia Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chile, China, Colombia, Congo Brazzaville, Congo Kinshasa, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kosovo, Kuwait, Kyrgyzstan, Latvia, Lebanon, Liberia, Libya, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Palestine, Panama, Paraguay, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syria, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe.

Appendix Table 1:

Summary Statistics: Gallup World Poll, 138 Countries, 2005 to 2016.

<b>Dependent variable</b>	<i>Number of Observations</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Minimum</i>	<i>Maximum</i>
<i>Ladder of Life</i>	1,035,809	0.75	0.43	0	1
<i>Enjoyment</i>	991,818	0.72	0.45	0	1
<i>Smile or Laugh</i>	964,981	0.72	0.45	0	1
<i>Sadness</i>	988,641	0.22	0.41	0	1
<i>Pain</i>	991,991	0.28	0.45	0	1
<i>Unemployment rate</i>	843	0.08	0.06	0.002	0.48
<i>Inflation rate</i>	843	0.05	0.06	-0.31	0.59
<i>GDP per capita</i>	840	22,301	18,962	706	124,025

**Note:** *GDP per capita* is real GDP per capita, measured in 2011 US dollars, adjusted for Purchasing Power Parity, It is scaled down by a factor of 10,000 when reporting the regression coefficients in Tables 1-3.

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