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ABSTRACT

We show that data on satisfaction with life from over 600,000 Europeans are negatively correlated with the unemployment rate and the inflation rate. Our preferred interpretation is that this shows that emotions are affected by macroeconomic fluctuations. Contentment is, at a minimum, one of the important emotions that central banks should focus on. More ambitiously, contentment might be considered one of the components of utility. The results may help central banks understand the tradeoffs that the public is willing to accept in terms of unemployment for inflation, at least in terms of keeping the average level of one particular emotion (contentment) constant. An alternative use of these data is to study the particular channels through which macroeconomics affects emotions. Finally, work in economics on the design of monetary policy makes several assumptions (e.g., a representative agent, a summary measure of emotions akin to utility exists and that individuals only care about income and leisure) that can be used to interpret our results as weights in a social loss function.

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Doctors sometimes ask their patients questions such as, "does it hurt?" Upon hearing these words, reasonable patients do not throw a fit, accuse the doctor of unscientific reliance on interpersonal comparisons of pain and leave the hospital in disappointment. Presumably, they think these questions help doctors do their job. In contrast, economists are suspicious of such questions. Welfare also occupies a central role in their profession, with most papers making some reference to individual utility. However, in their applied work, measures of utility (or of the emotions that are related to utility) are not common. One reason is that economists think that utility can be inferred through actions. For example, if the patient buys a banana rather than an apple, when both are available at similar prices and conditions, we make the inference that the patient likes bananas more than apples. Economists say that preferences have been "revealed" to them. In contrast to standard economics, happiness research takes the position that such an indirect approach to measuring utility is not necessarily always superior to an approach based on direct measures of utility or, more precisely, direct measures of the emotions that are related to utility.

Several direct measures of these emotions can be constructed. One that appears promising and which has received some attention by economists is well-being data (sometimes loosely called "happiness data"). Examples include data on happiness (current mood), often captured by the answers to a simple survey question such as "Are you happy?" and data on contentment (a global judgment on how close we are to "the good life"), often captured by the answers to a survey question such as "Overall, are you satisfied with your life?". Large data sets, covering many countries and years, are widely available. Of course there are limitations to such data, so the question of how fruitful the approach is will typically depend on the context. In this paper we discuss some uses of well-being data for Central Banks.

Before continuing it is worth pointing out that there are (at least) two different broad interpretations of well being data. To economists trained to focus on utility, the natural interpretation is that well being data are a proxy for utility. Indeed, this is the interpretation we follow in this paper. On the other hand, to a psychologist who is trained to focus on a multiplicity of emotions, the data are likely to refer to specific positive emotions that are relevant to particular aspects of human existence, with no particular connection to an overall assessment

of welfare such as utility.[1] Note that economists have suggested an approach which allows individuals to experience many different mental states (regret, anxiety, excitement, etc) and relate them to a person's summary measure of utility (see Caplin and Leahy, 2001, and Elster and Loewenstein, 1992, for discussions). In this paper we focus on proxies for contentment and note that they are one possible instrument for Central Banks interested in exploring policy evaluation without the restrictions arising when welfare can only be evaluated through revealed preference.

The main objective of this chapter is to illustrate how direct data on emotions - in particular, data on contentment - can be used by Central Banks. The basic exercise involves the inflation-unemployment trade-off, a ratio that is important in several models of the macroeconomy. Of course, a reasonable position is also to question several of the assumptions made in these models, so that a second focus of the paper is to use contentment data to explore the validity of these assumptions. For example, one could question the assumption that people care exclusively about money (and leisure).[2] Beyond its' lack of plausibility, such an assumption forces economists to translate complex effects of changes in prices and business fluctuations into a monetary value, which also seems hard. Or one could also question the standard assumption in macroeconomic models that consider the existence of only one type of (representative) agent. A third and final application where contentment data might be helpful is to verify some (broad) channels through which inflation is assumed to affect welfare.

In section I we introduce the issues by briefly describing the literature on the costs of macroeconomic fluctuations and the literature suggesting that well being data can be interpreted as capturing (at least some component of) utility.

In section II we present the main exercise: estimating the correlation between contentment and two basic macroeconomic variables (inflation and unemployment). In particular we focus on data on overall satisfaction with life as our measure of positive emotions. Under some assumptions, the coefficients can be used to get one estimate of the welfare costs of inflation relative to those of unemployment. This simple exercise yields a different set of estimates to those typically used

[1] One area where utility is a poor predictor of choice is moral decisions (see, for example, Green *et al,* 2001). Even more narrowly, one can distinguish between positive and negative affect when constructing measures of emotions (see, for example, Watson and Tellegen, 1985, and Myers and Diener, 1994).
[2] See Akerlof (2007) for a discussion of subjectivity and models with more realistic motivation in macroeconomics.

by economists analyzing the conduct of monetary policy (see, for example, the numerical analysis in Woodford, 2001, drawing on Rotemberg and Woodford, 1997). The section discusses some possible interpretations of the basic results, both in terms of a narrow read of the previous literature and the role of behavioral channels. The section includes a discussion on how to relax the assumptions regarding interpersonal comparisons of utility that have to be made with the help of direct data on emotions. It also presents a discussion of some limitations that arise because we are unsure about the intertemporal content of contentment data. And finally, it includes a discussion of the appropriate interpretation of our results when contentment is just one of the emotions that make up utility.

In section III, we discuss some ways to use contentment data to construct tests useful to those interested in understanding the channels through which macro fluctuations matter, including the available evidence on non-linearities and adaptation. Section IV explores the question of which emotion a Central Bank should target. Section V concludes.

I. Some Theory and Well Being Data

I.a. Theoretical Costs of Macroeconomic Fluctuations

Economists have emphasized two important costs of inflation. First, inflation induces people to spend time and mental energy to save on holdings of money rather than on more productive uses. And second, when price adjustments are staggered, inflation induces spurious volatility in the prices of some firms relative to others, reducing the price system's ability to allocate resources efficiently.[3] The first problem is typically seen as small, as money balances are small (see, for example, Bailey, 1956, Friedman, 1969 and Lucas, 2000) so this channel is unlikely to justify the observed preoccupation with keeping inflation low. The efforts to derive high costs of inflation

[3] Mankiw (2001) outlines four other costs of inflation: (1) Inflation induces firms to incur more 'menu costs' (2) Because the tax laws are not indexed, inflation raises the effective tax on capital income and thereby discourages capital accumulation and economic growth. (3) Inflation makes economic calculation more difficult, because the currency is less reliable as a yardstick for measuring value. (4) Because unexpected changes in prices redistributes real wealth between debtors and creditors, volatile inflation creates risks that people seek to avoid and makes the use of long term contracts using money as the unit of account less tenable (see pp. 8-9). Fischer and Modigliani (1978) is a classic paper outlining the costs of inflation.

are more successful in the approach followed by Benabou and Gertner (1993) and Rotemberg and Woodford (1997), who focus on the second channel.

A similarly mixed picture emerges with respect to the costs of unemployment. Indeed, in spite of a long tradition studying aggregate economic fluctuations, there is 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 output. The welfare cost can be approximated by the area of a Harberger triangle, which is proportional to the square of the size of the gap. This approach is sometimes adopted by real-business-cycle theorists, who assume that individuals are optimizing and recessions are 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.[4] Even when market imperfections are introduced, the costs rise by only a factor of five, and they are significantly lower if borrowing is allowed. As downturns typically follow booms, business cycles do not affect the average level of economic activity. Consequently, these economists have turned their attention to economic growth and away from fluctuations (see Lucas, 2003, for a discussion).

Given that one approach to cool down an overheated economy is often to raise interest rates, which might increase the unemployment rate, there has been particular interest in deriving the welfare losses that arise from changes in the unemployment and the inflation rate in the same model so as to be able to compare them.[5] This difficult task was undertaken in Rotemberg and Woodford (1997), who develop a model where structural relations are grounded in optimizing individual behavior and where firms must occasionally keep their prices fixed, resulting in substantial relative price distortions when inflation increases (more on this below).[6] As discussed in Woodford (2001), their estimates for the United States imply a value for the costs of inflation relative to the output gap of the order of 20, if the gap is measured in percentage points and

[4] See Atkeson and Phelan (1994). A different approach to measuring the costs of business cycles using asset prices is developed in Alvarez and Jermann (1999).

[5] Note that such an exercise is of interest even if one believes that there is no trade-off between inflation and unemployment in the long run because there might still exist shocks and there is the question of how draconian to be during the adjustment path.

[6] Broadly, on the one hand, prices change more often so forfeiting a purchase decision in favor of more search is risky because prices might change. On the other, the fact that there are relative price oscillations means that there are potentially more bargains out there, so search is more valuable. For a discussion of the role of markups, see Benabou and Gertner (1993).

inflation is measured at an annualized percentage rate. That is, the weight on inflation is 20 times the weight on the output gap in society's welfare.[7] This is a much higher emphasis on inflation than in the literature on the evaluation of monetary policy which often gives equal weight to inflation and output as stabilization objectives (for examples of discussions, see Rudebusch and Svensson, 1999, and Williams, 2003). One advantage of the approach, as Rotemberg and Woodford explain, is that *"Demanding that one's structural relations be derived from individual optimization also has the advantage that evidence from other sources about the nature of the problems that individuals face can be used to corroborate the quantitative specifications that are used to explain the relations among aggregate time series. Ultimately, this is the only way in which the 'observational equivalence' of a multitude of alternative possible structural interpretations of the co-movements of aggregate series can be resolved."*

Answers to direct questions about why inflation matters are also one natural source to draw upon when studying the nature of the problems that individuals face.[8] Interestingly, such answers point towards a completely different source of difficulties when inflation rises. The survey evidence presented in Robert Shiller (1997), for example, shows that when asked directly about inflation, individuals report a number of unconventional costs, like exploitation, national prestige or loss of morale. It is likely that the confusion with prices when inflation picks up makes the status quo in the income distribution harder to justify. For example, if relative price oscillations make speculation more profitable, then people will find it hard to claim that effort pays. This change in beliefs will particularly affect right wingers (left wingers already believe that luck, rather than effort, determines income).

Rotemberg (2007) discusses a range of evidence supporting the idea that there are behavioral costs of inflation relating to factors like an individual's price knowledge and awareness, paying too much attention when facing a menu of price choices and regret and anger about price changes. However, we have only a few models to interpret these empirical findings, with the exception of Rotemberg (2005) and, perhaps, adaptation of work in labor economics on the fair

[7] While the loss measures derived depend on several details (in particular the assumptions about the timing of the pricing decisions), the point remains that stabilizing the price level (and not just making expected inflation equal to actual inflation) eliminates the main source of the costs of inflation, namely relative price distortions.

[8] Economists have long been aware that their approach would be seen as slightly odd by other people: *"we shall see that standard characterisations of the policy-maker's objective function put more weight on the costs of inflation than is suggested by our understanding of the effects of inflation; in doing so, they probably reflect political realities and the heavy political costs of high inflation."* (pp. 567-8, Blanchard and Fischer, 1989).

wage hypothesis (see Akerlof and Yellen, 1990). Research on these issues seems to be in its' infancy, despite the enormous interest on behavioral economics and the central role of prices in the economics profession.

Similarly, there seems to be enormous potential for behavioral economics to improve our understanding of the potential costs of recessions. Substantial work in psychology and sociology indicate that there are emotional costs to those who lose their jobs that far exceed the monetary costs (see, for example, Clark and Oswald, 1994, Winkelmann and Winkelmann, 1998, Helliwell, 2003, Blanchflower and Oswald, 2004). This large loss is broadly comparable across many countries (see Di Tella *et al*, 2003). And there may be emotional costs from knowing that fellow humans are experiencing low utility, perhaps amplified by beliefs concerning the source of unemployment (for example, those believing that unemployment follows lack of effort versus those believing it follows bad luck).[9] Given that such beliefs differ across countries (for example, Alesina *et al*, 2001, report that 60% of Americans - yet only 26% of Europeans - believe the poor are lazy as opposed to unlucky) the "costs" of unemployment will also differ. This will have consequences both for the "correct" response to inflation shocks (see the discussion in section IV) and to unemployment shocks in terms of the optimal amount of unemployment insurance (see, for example, Di Tella and MacCulloch, 2006b).

Importantly, it seems that we are still quite far away from having estimates of the costs of inflation that are potentially useful in formulating monetary policy, both because there is little behavior-based research and because there is no easy way of deciding which of the many psychological costs that are theoretically plausible exist in practice, or what weight to give each one of them when an aggregate measure of welfare is derived.

Note that a behavior based approach also introduces the difficulty that people often mis-predict utility (Gilbert *et al*, 1998). If this is a generalized phenomenon, calculating the welfare costs of particular events properly is going to be extremely difficult, in part because taking a position on whether there is a "right to be wrong" is controversial (for a discussion see, Oderberg, 2000).

[9] In that case, one would expect that income inequality would have different effects across the US and Europe, or across people with different ideological inclinations. See, for example, Alesina *et al* (2004) and Di Tella and MacCulloch (2005).

I.b. Data on Positive Emotions and the Connection to Utility

The direct questions about inflation that Shiller (1997) used are subject to potential criticisms. Diamond and Hausman (1994), for example, worry about strategic manipulation of the answers in contingent valuation studies of environmental costs that use similar style of questions and that a lot depends on the subject's ability to understand difficult issues (such as the workings of the economy or the state of the environment). An alternative to that approach is to ask subjects about a particular emotion, for example, how happy or satisfied they feel with their life, and then correlate the answers with the variables of interest (in our case, inflation and unemployment). This imposes fewer informational demands, as presumably it is easier to know how one feels than how the economy works.[10]

A natural reaction to data on well being (and other emotions) is to dismiss them as hopelessly noisy. Thus, a first task for the approach we present is to establish some connection between the answers to happiness questionnaires and true utility. The general strategy used by researchers in the field is to correlate happiness and life satisfaction scores with some variable that we can plausibly claim is associated with what an economist would call "true utility". Note that, traditionally, it has been quite hard to discern true utility accurately. For example, presumably smiling reflects some positive emotion. Yet, in some situations and cultures smiling occurs in settings that do not appear to involve high enjoyment or utility. In one famous experiment in psychology, Landis (1924) photographed students while they listened to music, looked at pornographic material, smelled ammonia or observed him decapitate a live rat. Third party observers were unable to predict the activity by looking at the photographs.

However, more recent research shows that this inability results from a failure to distinguish between different types of smiles. Researchers in this field, particularly Paul Ekman, emphasize the distinction between the smile which mainly reveals teeth (the "Pan American smile" after the famous American airline of the 1960's) and the Duchenne smile, a type of smiling that involves a

[10] Conceptually, happiness research need not have to rely on subjective data. For example, economists who want to focus on actions could study suicide rates or hypertension under the assumption that these phenomena are correlated with true internal happiness. See Stevenson and Wolfers (2006) and Blanchflower and Oswald (2007) for examples of work along these lines. For a register of happiness surveys across 112 nations, visit the World Data Base of Happiness: http://www1.eur.nl/fsw/happiness/. For a discussion of happiness malleability, see Seligman (2004).

muscle near the eye (called *orbicularis oculi, pars laterali*) which can indeed capture true enjoyment. Importantly for us, Duchenne smiles are correlated with self-reported happiness (Ekman, Friesen and O'Sullivan, 1988; Ekman, Davidson and Friesen, 1990). Happiness answers (and Duchenne smiles) are also correlated with left frontal brain activity, which in turn appears to be connected to different forms of what we are calling true utility. Fox and Davidson (1982), for example, show that 10-month old infants exhibit greater activation of the left-frontal than the right-frontal area of the brain in response to videotapes of an actress generating happy facial expressions. In contrast, asymmetry in other parts of the brain failed to discriminate between the conditions. See Urry *et al* (2004) for more recent evidence on the neural correlates of well being. Useful starting points in the literature on happiness written by non-economists include Diener, Suh, Lucas and Smith (1999) and Veenhoven (1993) as well as the recent reviews by Di Tella and MacCulloch (2006a) and Clark *et al* (2007).

Another argument that has been made to justify a connection between happiness scores and utility is that cross-sectional and panel studies (some of them cited above) reveal that unemployed individuals tend to report low happiness scores. The connection occurs because we think that other "bads" like divorce, addiction, depression and violence are correlated with unemployment. Using large samples across many countries, Helliwell (2003) and Deaton (2007) find happiness measures to be positively related to variables that are expected to be associated with high utility like trust and income. Helliwell (2003) and Blanchflower and Oswald (2007) find a positive connection between happiness scores and good health. A related point is that "well being equations" (where happiness and life satisfaction scores are correlated with the demographic characteristics of the respondents) are broadly "similar" across countries, an unlikely outcome if the data contained just noise (see, for example, Di Tella *et al*, 2003).

To be sure, there are findings in the literature that do not fit our standard economic models, including that conjoined twins are relatively happy, or that money doesn't buy happiness in the long run (see for example, Gilbert, 2006, and Easterlin, 1974).[11] Ultimately, "happiness research" takes the view that happiness and life satisfaction scores are related to true internal utility with

[11] In our own estimates of adaptation to income using the German panel we find adaptation to income over 3-4 years. The process of adaptation to income is stronger for left than for right-wingers (see Di Tella *et al*, 2006).

some noise, but that the signal to noise ratio in the data is sufficiently high to make empirical research productive.

II. Contentment and Macroeconomic Fluctuations

II.a. The Contentment Costs of Inflation and Unemployment: Basic Estimates

Once the approach is accepted as potentially fruitful, we run a regression of the form:

$$Life\ Satisfaction_{ntj} = \alpha\ Unemployment_{nt} + \beta\ Inflation_{nt} + \delta\,\Omega_{ntj} + \gamma_n + \eta_t + \mu_{ntj} \qquad (1)$$

where $Life\ Satisfaction_{ntj}$ is our proxy for a component of utility of individual, *j*, living in nation, *n*, in year, *t*, derived from the survey question that asks, *"On the whole, are you satisfied with the life you lead?"*. The four possible answers are '*not at all satisfied*'; '*not very satisfied*'; '*fairly satisfied*' and '*very satisfied*'. It comes from the Eurobarometer survey series, it is a repeated cross section, and this particular question is administered towards the early part of the questionnaire (for more description, see Di Tella *et al*, 2003). $Inflation_{nt}$ is measured by the rate of change in the Consumer Price Index.[12] Ω_{ntj} is a vector of personal characteristics (e.g., employment status - including self employed, retired, keeping home or in school, income position, marital status, education, city size, gender, age and age squared) and potentially other macroeconomic controls (like GDP or hours). γ_n are country fixed effects and η_t are year fixed effects. μ_{ntj} is the error term. The standard interpretation (i.e., one given by somebody who adheres to the assumption of a representative agent, that a summary measure of utility exists and that agents only care about income) is that equation (1) is a reduced form of a welfare loss function (whereby inflation and unemployment are assumed to affect utility only through their effect on income - and maybe future income).

Finally, several factors conspire against a full treatment of causality. The first is that this is a chapter about the left-hand side variable (an emotion). Thus, even if we use several pages to

[12] There are also indicators of 'perceived inflation' that give quite different answers to the official CPI measures. Conceptually we should be able to test whether it is actual inflation rates or perceived inflation rates that matter most to consumers using happiness data.

convince the reader that we have clever instruments, most of them will still be wondering what it is that we are estimating. Second, it is hard to think about instruments when the theoretical literature has done so little to isolate convincing forces that reduce utility when there are macroeconomic fluctuations. Indeed, the most convincing effects involve behavioral costs that have not yet been fully modeled. Thus, specifying what are the omitted variables in equation (1) is a daunting task until macroeconomists produce better models of the costs of macroeconomic fluctuations (see also the discussion of the results in Table 5 below). Fourth, we report some evidence concerning how unemployment arising due to plant closures in Germany is associated with drops in contentment (see Figure 2A, taken from Di Tella *et al*, 2006). This evidence, whilst obviously incomplete for some of our purposes, at least confirms that there is a causal negative effect through which macroeconomic fluctuations affect positive emotions. Finally, we produce some tests that are identified within the context of the Rotemberg and Woodford (1997) model, although we are aware that reasonable people will perhaps see this as too narrow a test.

<Insert Table 1 about here>

Column (1) in Table 1 presents the results when equation (1) is estimated as an ordered probit, which show that the coefficients on unemployment and inflation are both negative and significant. Column (2) repeats the exercise controlling for country specific time trends, finding similar results. They are similar to the estimates presented in previous work by Di Tella *et al* (2001, 2003) and Wolfers (2003). In order to see the size of the effect note that a 10 percentage point increase in unemployment reduces average life satisfaction by 0.32 standard deviations. A 10 percentage point increase in inflation reduces average life satisfaction by 0.24 standard deviations. Figure 1 illustrates our results graphically. In the base scenario, the cut points leave 3.9% of the population in the lowest life satisfaction category, 12.7% in the second to last, 55.5% in the next one up and 27.9% in the top category. The first scenario shows that when unemployment increases 10 percentage points, the median person is as satisfied as the person at the 43rd percentile in the base scenario (when unemployment and inflation are at their average level in the sample). And when inflation increases by 10 percentage points, the median person is as satisfied as the person at the 45th percentile in the life satisfaction distribution in the base scenario. In an attempt to provide another metric for these changes, Wolfers focuses on the top categories. The standard deviations of unemployment and inflation for the Euro-Barometer

surveys are 0.035 and 0.045, respectively. Finally, it is worth noting that the 90% interval for the ratio of the coefficients on unemployment to inflation is 0.5 to 2.1 which implies a likelihood of more weight on unemployment than on inflation.

We can repeat the exercise with World Values Survey data (see Helliwell, 2003). There are four waves and a larger sample of countries (total of 145 country-year clusters), and a similar set of demographics available. The contentment data also come from a Life Satisfaction question, but with answers coded on a 1-10 scale, so that presumably fewer people are restricted by the limited number of categories available in the construction of the answer key (still, the top category has almost 14% of the sample).[13] We group the answers into four categories, yielding similar proportions to the Euro-Barometer sample (although no substantive conclusion depends on this). The coefficient on inflation is negative and significant, whereas that on unemployment is positive and marginally significant. The sample includes former socialist countries. When the inflation and unemployment coefficients are allowed to take a different value in the former socialist countries, the coefficient on inflation becomes more negative (almost three times in absolute value) and more precisely estimated, while that on unemployment becomes negative (but insignificant). Given that the sample includes countries with very unequal characteristics (different levels of income, of informal family insurance, etc) it might be advisable to include the log of GDP as a control, which yields similar results. The standard deviations of unemployment and inflation for the World Values surveys are 0.06 and 1.00, respectively. Given this, once the actual variation in inflation is taken into account, the size of the inflation coefficient is comparable to the coefficient in equation (1).

In the European sample the estimate that a percentage point of unemployment causes at least as much discontent as a percentage point of inflation seems robust, although the precise multiple varies in different studies.[14] Note that the coefficient on the unemployment rate in Table 1

[13] There is a potential problem when life satisfaction scores are at the top of a certain measurement scale, so that they cannot rise higher, or at the bottom of the scale, so that they cannot fall lower. This is more serious in surveys with few categorical answers (the Eurobarometer has four, whereas most new surveys offer a 10 point scale). These bounds can also make it appear that marginal utility is diminishing as consumption increases, when in fact the scores are hitting the top of the scale and for that reason becoming less responsive to rising true utility.

[14] Svensson (2002) converts these estimates to a trade-off between the output gap and inflation using Okun's Law. He states that "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 some 2 to 2.5 percentage points". That is,

reflects how the *average* person changes their score when unemployment changes. But the average person is not unemployed. Since the contentment regression in Table 1 also includes a control variable for whether each person is unemployed (in the set of personal characteristics) the coefficient on this variable measures the direct cost to those falling unemployed. Therefore to calculate the total cost of unemployment, the cost must be increased by adding the individual cost to the unemployed.

II.b. A Narrow View: Aggregating all Social Costs of Inflation and Unemployment

Adding up the total costs of inflation and unemployment (outlined in section I.a.) can be quite difficult, especially when we know so little about them (particularly the psychic costs suggested by behavioral economics). One can take a narrow view and take the models developed in the previous literature literally. For example, consider the first paper to derive a social loss function with both inflation and the output gap, Rotemberg and Woodford (1997).[15] They start by assuming a utility function with both consumption and leisure as arguments. Firms only occasionally get a chance to change their prices and staggered price adjustments lead to oscillations in relative prices. There are two costs of inflation. On the one hand, such oscillations result in direct misallocation of resources, reducing income (consumption). And because there are diminishing returns, the volatility in production means that productivity falls (so more labor input - less leisure - is needed for the same output). This means that if we estimate a social loss function on the output gap (or unemployment) with the hope of capturing the costs of lower consumption we are missing out on the possibility that sometimes the same level of consumption requires more labor input (due to higher inflation). Thus, societies' loss function has the output gap and hours (or inflation) as arguments. A narrow prediction of this model is that, controlling for the output gap (proxied by the unemployment rate) and leisure (proxied by average weekly hours worked), inflation should have no effect on an instantaneous measure of welfare. A test of

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Output Gap = - $\varkappa$ *Unemployment*

where $\varkappa \in (2, 2.5)$ and both the output gap and unemployment are measured in percentage points. Consequently a one percentage point reduction in the output gap would cause between 0.4 (=1/2.5) and 1 (=2/2) times as much of a reduction in contentment as an additional percentage point of inflation.

[15] Some question the desire to require the central bank correct all macroeconomic distortions (even when they are aggregate in nature). As a justification, Gali (2002) invokes the principle of division of labor and suggests that *"other branches of government are likely to have more suitable tools than those under the control of the central bank to handle many of those distortions. Hence, it would seem desirable to assign the central bank with the task of correcting the distortions of a monetary nature."* He then assumes that the monetary authority's mandate is to correct the distortion associated with the presence of staggered price setting (see also Rotemberg and Woodford, 1999, and Gali and Monachelli, 2005).

this is presented in columns (3-4) in Table 1. It seems that inflation matters to people, even after controlling for the channels that are assumed in the Rotemberg and Woodford (1997) model.

Of course, one can take the plausible position that contentment captures, at least in part, the future somehow. In this case, inflation may enter because it is capturing future values of leisure. One could see if this is indeed the case by checking if future leisure is really predicted by inflation today, once current leisure, income and unemployment are included (it is not). But perhaps the main point we are making is that simple tests relevant to central banks can be constructed with these data.

In brief, a narrow reading of the literature suggests that with several assumptions (including that *a)* a summary measure of utility exists, *b)* all channels through which inflation and unemployment matter can be reduced to consumption and leisure, and *c)* there is a representative agent), the welfare loss function of society can be written as:

$$\textit{Social Welfare Loss} = g\,(\textit{Unemployment}, \textit{Inflation}) \qquad (2)$$

Conditional on accepting these assumptions, the coefficients in equation (1) provide a way to aggregate all the relevant costs and benefits of macroeconomic fluctuations. In this view, the regression patterns detected in equation (1) turn out - unknown to the respondents completing their contentment score sheets - to trace out a welfare loss function defined over inflation and unemployment as described in (2).

It is tempting to claim that, even when people mispredict utility (as in Gilbert *et al*, 1998) the coefficients in (1) adequately capture the costs of inflation and unemployment. Although it is possible that they capture all instantaneous costs, there is still the problem that macro-fluctuations may affect planning, and hence future utility (and that these cost only register at a later date).[16]

[16] An example illustrates: consider the hypothesis that inflation only matters because it makes people think that they enjoy money more than they do. A one shot increase in prices at time *t* leads to plans for excessive work hours in the future being made. However, at time *t* people would not tick down their happiness scores.

II.c. Cardinal Interpretation

One straightforward interpretation of the coefficients is that they reveal that individuals find inflation and unemployment costly. This conclusion involves comparing contentment scores of different people and at different points in time. Reliance on the interpersonal comparability of contentment scores, however, is non-standard for economists. As Hammond (1991) puts it: *"Following [Lionel] Robbins, it became fashionable for economists to eschew interpersonal comparisons of utility, apparently in an attempt to be scientific."* He also states: *"And where interpersonal comparisons really have to be made, because the gainers from a change were not going to compensate the losers, the monetary comparisons that result from valuing all individuals' dollars equally still seem to be the most popular among economists, who then wonder why their policy advice does not receive wider acceptance."*

One possibility is to follow standard practice in macroeconomics and assume that a representative agent exists, with the contentment measures as repeated attempts at getting a reading of his/her utility. Staying with this assumption would be convenient given that it is obviously quite difficult to interpret differences in contentment scores between just two individuals.[17] Consider the question of the importance of income, and the finding that contentment is positively correlated with income in the cross-section. Since energetic/optimistic people tend to work hard (earning high income) and also tend to see the bright side of things, it is implausible that the error term is uncorrelated with income. Although one could theoretically calculate bounds (where exaggeration needs to fall in order to affect the qualitative conclusions) or even find ways to control for exaggeration (maybe through questions concerning a fixed objective circumstance, as in some vignettes) this problem need not reduce Central Banks' interest in contentment data. The reason is that several interesting estimates in macroeconomics involve comparing large groups of people. Some of these exercises still require strong assumptions to allow interpretations but others do not. Specifically, in the finding that contentment scores are lower with high inflation, the unit is the country (in a particular year) and it is reasonable to assume that exaggeration and modesty have similar distributions across countries. Importantly, such distribution is unlikely to be correlated with the inflation rate.

[17] The question of whether well being measures can be compared across cultures can be studied using vignettes as anchors, as in King *et al* (2003). Helliwell and Huang (2005) use population shares above particular numerical life satisfaction cut-off scores, as alternative dependent variables.

Note also that even when cultural differences make the assumption of a similar distribution of "exaggerators" questionable, one could focus on changes over time within countries. Indeed, panel estimates like equation (1) have the advantage of correlating changes in Life Satisfaction reports with changes in the inflation rate. It is unlikely that countries enter into bouts of collective of exaggeration, disconnected from hedonic fundamentals. Of course, booms have an element of collective euphoria. But this is typically genuine (i.e., it is unlikely that it results in large groups of people ticking up their scores even when they themselves are not experiencing higher true utility). It is worth noting that another potential interest of equation (1) is the ratio, α/β. In this particular case, even when temporal swings in exaggeration divorced from hedonic fundamentals do take place, the ratio would be unaffected to the extent that these swings are uncorrelated with macroeconomic performance (and instead with variables like the weather) or are correlated in the same way with both of our indicators of macroeconomic performance (unemployment and inflation).

To test the validity of these assumptions it is possible to estimate regressions separately for different groups. For example, if left-wing individuals use language differently to right-wingers it might be important to estimate these two groups separately. Conveniently, in the Euro-Barometer Survey Series respondents are asked: *"In political matters, people talk of 'the left' and 'the right'. How would you place your own views on this scale?"* (from 1 to 10). In Di Tella and MacCulloch (2005), respondents were classified as being 'left-wing' if their response was in categories 1 to 3 and as 'right-wing' if they answered categories 8 to 10.[18] The main exercise in that paper is to estimate the basic regression in equation (1) separately for the two sub-samples. If left-wingers are assumed to use language similarly, and right-wingers are also assumed to use language similarly, the α/β ratio in each regression does not have a problem of interpersonal comparability. A natural alternative is poor and rich individuals.

One prominent application in macroeconomics involves the comparison of the ratio, α/β, across different groups (e.g., left versus right, or poor versus rich) as in Alesina (1987). The estimation exercise in Di Tella and MacCulloch (2005) is extremely unlikely to be affected by temporal

[18] It is interesting to note that 36% of right wing individuals declare to be at the top life satisfaction category (compared with almost 22% of left wingers). A second definition based on answers to the question: "*If an election were to be held tomorrow, which party would you vote for?"* (and the subsequent classification of these parties into left and right by political scientists) yields similar results.

swings in exaggeration that cause some form of measurement error in the contentment data, since these swings would have to be correlated with unemployment and inflation differentially across the two groups in order to affect our results. See also the discussion in section III.

Finally, it is worth noting that some of the limitations in these data are not inherent problems with direct measures of utility or its' components and that considerable progress could be made if some resources went into designing new measures. For example, Hsee and Tang (2007) have recently proposed asking about happiness in a way that fixes the values at the end of the scales across people (by providing descriptions). Another interesting possibility, particularly for economists, is described by Kahneman and Krueger (2006). They discuss how a focus on the proportion of time people spend in an unpleasant emotional state would allow 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. One reason that such a formulation is significant is because it shows that, in principle, it would be possible to derive direct measures of utility or its' components without giving up too much in terms of strict assumptions about interpersonal comparability.

II.d. Time Horizons: Instantaneous versus Life-time Effects

A serious difficulty for the approach we are discussing, at least for applications in macroeconomics, is that ambiguity remains concerning the time horizon used by individuals in framing their answers to the Life Satisfaction question. When researchers have the ability to design the questions they have opted to capture what economists would call instantaneous utility. Kahneman and Krueger (2006) have recently argued that well-being measures are best described 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 then describe the famous dime experiment of Schwarz (1987), whereby subjects "accidentally" find a dime before filling out a Life Satisfaction questionnaire. The lucky half of the sample reports substantially higher levels of satisfaction with life.

On the other hand, one would expect that such small shocks can be treated as noise in regression analyses. And we know that contentment data react to other shocks in a way that is consistent with standard economic models. As an illustration consider the Life Satisfaction response to two

shocks that have been observed to have large well-being impacts in cross-sectional studies, namely unemployment (a negative correlation) and retirement (a positive correlation). Using the German Socioeconomic Panel we can follow a sample of West Germans before and after an unanticipated shock (unemployment arising from a plant closure) and the anticipated shock of retirement (see Figure 2). As we are using a balanced panel the same people are being surveyed in the period before and after the shock has occurred which means that some of those who lost their job due to plant closure may be rehired subsequently whilst others may not. Note the large, but temporary, satisfaction drop associated with the plant closing, in spite of the few long-term problems that are revealed by this shock (which is presumably exogenous to the individual), in a country with a generous system of unemployment insurance and with a relatively low unemployment rate.[19] In comparison, retirement is associated with no detectable changes in Life Satisfaction.

This ambiguity in time horizon has been a serious problem for applications of contentment data, particularly in macroeconomics. Most researchers have opted for showing high correlations, or repeating their estimates using questions with slightly different wordings, and claim robustness (see Di Tella *et al*, 2001, 2003, Wolfers, 2003, and Blanchflower and Oswald, 2004). Given that this seems an important weakness for the data presently available, we now provide some preliminary but suggestive evidence bearing on this issue. Our strategy is to exploit the fact that, before 1987 most Euro-Barometers included (besides the question on Life Satisfaction described in section II.a.) a question administered towards the end of the survey of the form: *"Taking all things together, how would you say things are these days—would you say you're very happy, fairly happy, or not too happy these days?"* (small *"don't know"* and *"no answer"* categories are not studied here). Let the variable, Happiness, be defined as follows: 1=*"not too happy"*, 2=*"fairly happy"* and 3=*"very happy"*.

Life Satisfaction and Happiness are strongly positively correlated (Pearson's correlation coefficient equals 0.56). In Table 2 we test to see whether the future is also a part of what is being captured in the Life Satisfaction responses in comparison with the Happiness responses by repeating the basic regression using just the sample for which we have both sets of data available and also including the future levels of unemployment and inflation. Although we have less than

[19] Note that such a large drop seems inconsistent with the small difference between the lifetime expected utility of the employed and the unemployed in some models (e.g., Shapiro and Stiglitz, 1984).

half the sample (as Happiness data are available up to 1986 only) columns (1-2) show that whereas the coefficients on future inflation are similar, future unemployment is uncorrelated with Happiness data but strongly correlated with Life Satisfaction data. The difference between the coefficients on the future unemployment rates in the two columns of Table 2 is significant at the 5 per cent level. One interpretation is that macroeconomics matters beyond the moment (perhaps even beyond six months) and that Life Satisfaction, with its reference to *"the life you lead"* (as opposed to *"happy these days"*) introduces a longer horizon.[20]

This ambiguity about the interpretation of these different measures is, perhaps, natural given that they were not developed for macroeconomic applications where intertemporal matters are so important.[21] It does not, however, seem like an insurmountable problem if some energy went into designing questions that can make the distinction. For new measurement strategies see, for example, Kahneman *et al*, 2004, and Kimball and Willis, 2006.

Although these are relatively new (and not yet available across many countries and years), they do remind us that the measurement of emotions in economics is still in its infancy as a research area, and that it is hard to predict how effective this research program will be in the long run, particularly relative to longstanding programs (e.g., national accounts) in which economists have convinced society to spend considerable amounts of money. One natural (and cheap) starting point for macroeconomists would be to include two questions, asked in succession one after the other, with appropriate differential emphasis on the future and the present. We do not know of any questionnaires available at present designed to deal effectively with this problem across countries and years.[22]

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[20] One can presumably reject the hypothesis that the answers to the Happiness question are themselves just noise because they are strongly correlated with Life Satisfaction answers.

[21] Note that one can still push the idea that this ambiguity does not affect the relative coefficients on inflation and unemployment (or comparisons across sub-groups of the population) under the assumption that changes in these macroeconomic variables elicit a reaction of similar aspects of life satisfaction, and provided that both inflation and unemployment are governed by similar stochastic processes so that both coefficients in a life satisfaction regression are scaled up or down in the same proportion. However, there are many applications in macroeconomics that require more precision in the interpretation.

[22] Although, within the US, the University of Michigan monthly consumer survey has recently included the question *"Now think about the past week and the feelings you've experienced. Please tell me if each of the following was true for you much of the time this past week: You were happy. You felt sad. You enjoyed life, You felt depressed."* People are asked to give 'yes-no' answers to each of those four questions.

II.e. Contentment versus Other Emotions

As mentioned in the introduction, there is the possibility that contentment is just one of the components of utility. For illustration purposes, assume that only contentment and regret make up utility. In that case, we have:

$$Utility = Contentment - \beta\ regret + \varepsilon \tag{3}$$

where β>0 and we normalize the coefficient on Contentment to equal 1. Assume also that we are interested in estimating:

$$Utility = -A\ Unemployment - B\ Inflation + \sigma \tag{4}$$

which implies that:

$$Contentment = -A\ Unemployment - B\ Inflation + \beta\ regret - \varepsilon + \sigma \tag{5}$$

where A>0 and B>0. We maintain the assumption that shocks to inflation and unemployment are uncorrelated with σ. Now assume that we try to estimate the following regression equation (mistakenly believing that Life Satisfaction scores, which measure contentment, are also a good proxy for utility):

$$Life\ Satisfacton_{ntj} = -a\ Unemployment_{nt} - b\ Inflation_{nt} + \psi_{ntj} \tag{6}$$

Then the error term contains the other elements of what we are calling true utility:

$$\psi_{ntj} = \beta\ regret_{ntj} - \varepsilon_{ntj} + \sigma_{ntj} \tag{7}$$

Let the expected values of the point estimates of the coefficients on unemployment and inflation obtained from estimating equation (6) be equal to $-\hat{a}$ and $-\hat{b}$, respectively. We have the following possibilities:

1. If $correlation(\psi, Unemployment) = 0$ and $correlation(\psi, Inflation) = 0$ then the estimates we obtain reveal the true size of the effect of unemployment and inflation on true utility, even in levels. In other words, we have $\hat{a} = A$ and $\hat{b} = B$.
2. If $correlation(\psi, Unemployment) \neq 0$ and $correlation(\psi, Inflation) \neq 0$ then the main coefficients of interest are biased. An example illustrates. If regret plays an important role and is raised by inflation, as suggested by Rotemberg (this volume), then our coefficient on *Inflation* might underestimate the true effect of inflation on true utility, $|\hat{a}| < |A|$. Indeed, in Rotemberg's theory of regret, $correlation(\psi, Inflation) > 0$, so that when inflation goes up, true utility is going to be falling more than Life Satisfaction (due to the extra effects of regret).

This is of course a simple illustration as the bias is hard to pin down, particularly when other emotions discussed by psychologists are included (besides regret). A natural question, with a multiplicity of emotions, is whether measures appropriate for empirical analyses can be constructed to produce better tests as outlined above. It seems so. A simple theoretical position, for example, is to view emotional expressions as a basic by-product of emotional experience.[23] If emotional expressions provide a guide for the actual experiences, then the expressions themselves are one indicator of the range of emotions available in humans. A large amount of work in this area is due to Paul Ekman (see, for example, Ekman et al, 1969, Hager and Ekman, 1983). Facial analysis has been facilitated by a method for coding emotions (called the Facial Action Coding System, 'FACS'). The following is taken from Hager and Ekman (1983).

<Insert Figure 3 about here>

Six different types of faces appear to be the most robust and are often described, namely happy, sad, anger, fear, disgust and surprise. It seems possible to argue that other emotions can be reduced to versions of these, although there is some contention about contempt (which is arguably a version of disgust), shame and startle. The facial coding system and these faces are described in: http://face-and-emotion.com/dataface/emotion/expression.jsp

[23] An alternative, which originates in Charles Darwin, is to view emotional expressions as signals in communication games. See the work of Irenäus Eibl-Eibesfeld.

<Insert Figure 4 about here>

III. Other Contentment Tests in Macroeconomics

Further tests can be informative. First, a natural step is to move beyond the representative agent paradigm and estimate the impact of macroeconomic fluctuations on contentment across groups. This has intrinsic interest (e.g., in partisan political economy models) and is also relevant to the discussions in sections II.b. and II.c. above (it is one solution when there are groups that are suspected of using language differently in ways that may affect the estimates in equation (1) in Table 1). Second, we can also use contentment data to help identify some of the channels through which macro-fluctuations matter. And finally, it is possible to study how macro fluctuations matter, in particular whether there is a significant role for non-linearities. These three kinds of contentment tests are the focus of the present section, and we address each one in turn.

There has been some interest amongst macroeconomists in studying the costs of business cycles for different groups. In some cases, such differences might even explain different views about the optimal response to shocks, and hence, differences in the experience under policymakers of different color (see, for example, Hibbs, 1987; Alesina, 1987). One dimension that has received particular interest is income. Hibbs (1987) cites Paul Samuelson as saying, *"We tend to get our recessions during Republican administrations. .... The difference between the Democrats and the Republicans is the difference in their constituencies. It's a class difference. .... The Democrats constitute the people, by and large, who are around the median incomes or below. These are the ones whom the Republicans want to pay the price and burden of fighting inflation. The Democrats are willing to run some inflation (to increase employment); the Republicans are not"* (p. 213).

Contentment data can be used to study these questions. Table 3 shows how inflation and unemployment affect life satisfaction responses, by demographic groups. In column (1) we present the results for inflation, and note that those on low income display the biggest reductions in life satisfaction. The negative coefficient on *Inflation* is monotonically smaller (in absolute value) as we go up the income quartiles, although the effect is not significant. This is consistent with Di Tella and MacCulloch (2005). It is also quite intriguing that the employed (the omitted

category) are significantly more adversely affected by inflation compared to the self-employed, and those "at home". Males are less affected by inflation than females and those with little education (less than 15 years, the base category) are more affected by inflation than those with high levels (more than 18 years) and in particular those with intermediate levels of education (between 15 and 18 years). There are fewer detectable changes in the basic patterns in column (2), which studies the effect of unemployment across the different groups. The biggest effects are that recessions are particularly costly in contentment terms to those coming of age (see also Bechetti *et al*, 2006) and those with intermediate and high levels of education.

An alternative is to focus on different partisan (i.e., left versus right) political beliefs. In several estimates based on contentment regressions, we found weaker differences between these groups than those found in Di Tella and MacCulloch (2005), which focuses on a smaller sample of countries and years (up to 1992) and finds that the unemployment/inflation ratio is higher for left-wingers than for right-wingers.

A second possible use of contentment data is to test the relevance of some of the channels suggested in the theoretical literature. For example, in all of the papers in the literature that we know, falling unemployed is associated with large emotional costs, even after controlling for the income losses associated with loosing a job (see, for example, Clark and Oswald, 1994). The coefficients typically imply very large costs, approximately similar to the well being difference reported by individuals at the opposite ends of the income distribution (in the sample). Assuming these estimates to reflect causal forces, they reject the approach used by real business cycle theorists to measure the costs of business cycles, if only because jobless but insured individuals would presumably experience smaller downturns in utility. One could still force a classic interpretation by thinking that these are simply people with unrealistic aspirations about what jobs they can get. However, Clark (2003) presents panel evidence showing that the well being drop associated with becoming unemployed is smaller the higher is the unemployment rate in this person's reference group (see also Stutzer and LaLive, 2004).[24]

[24] Another potential application of well being data in the labor market concerns the gains from better matching (see Luechinger *et al*, 2007).

Some general information on these channels can be obtained by looking at the effect of unemployment and inflation across different groups in Table 3. Column (2) finds that the coefficient on being unemployed becomes more negative at higher unemployment rates, although it is imprecisely estimated (and does not use the unemployment rate in the reference group). Di Tella *et al* (2003) test the hypothesis that the welfare state has made life too easy for the unemployed. They find a strong, positive relationship between the reported life satisfaction of the unemployed and the generosity of unemployment insurance in panel regressions (see, for example, column (2) in Table 12 in that paper).

Finally, another possible use of data on emotions is in answering the question of whether non-linearities exist in the welfare loss function. This is important for answering the question of whether it is more important for the Central Bank to produce low inflation or stable inflation. Mankiw (2001) notes that *"if low average inflation is the goal then the monetary policymakers of the 1990s [in the United States] can be given only an average grade. But if stable inflation is the goal, then they go to the top of the class"*. He mentions that there is *"little direct evidence of convexity in the costs of inflation. As a result, it is hard to compare quantitatively the benefits of low inflation with the benefits of stable inflation."* (pp. 9-10).

The assumed quadratic welfare loss function is given by:

$$Social\ Welfare\ Loss = \alpha(Output\ \ Gap)^2 + \beta(Inflation)^2 \qquad (3)$$

Di Tella *et al* (2001) do not detect non-linear effects of inflation using life satisfaction surveys. Wolfers (2003) presents a full set of tests for the presence of non-linearities on both macro variables. He finds that convexities exist with respect to unemployment but are "less easy to detect" with respect to inflation. Consequently his paper finds that *"eliminating unemployment volatility would raise well-being by an amount roughly equal to that from lowering the average level of unemployment by a quarter of a percentage point"* (see pg 1).

Table 4 explores the evidence on non-linearities by extending the basic estimates using squared terms. We find evidence of a non-linearity with respect to unemployment but not with respect to inflation. However, unlike the Euro-Barometer data, no evidence of a non-linearity with respect to unemployment is found using World Values Survey data, although given the informal nature

of the labor market in some of the countries in the (cross-sectionally) larger data set, unemployment may not be the best indicator of the state of the economy. [25]

Note that non-linearities could be coming from a quirk in the reporting function. Although we may estimate a Life Satisfaction regression that appears to be non-linear in unemployment, this implies that there is a non-linear relationship between unemployment and true internal utility only given the (sufficient) condition that the mapping between internal utility and an individual's self-reported satisfaction is linear. However, when the mapping, *g*, is non-linear:

$$Life\ Satisfaction = g(True\ Internal\ Utility) = g(\alpha\ Unemployment + \beta\ Inflation) = \alpha(Unemployment)^2 + \beta\ (Inflation)$$

then the (true) linear relationship between internal utility and unemployment will not be detected in our Life Satisfaction regression. Evidence on the form of the reporting function is limited and may also pose problems when undertaking interpersonal comparisons of contentment, particularly when there is habituation (see below).

Finally, it is possible to use the data to explore the question of adaptation to high inflation and high unemployment. We test for the presence of these effects by including a lagged term. Then we can calculate the long-term effect of a shock in, say, unemployment, by adding the current and lagged coefficients. Table 5 illustrates and finds adaptation to unemployment while little adaptation to inflation. The long run coefficient on unemployment is only 34% of the short run estimate {0.34=(-4.4+2.9)/-4.4}. One complication in the interpretation of these effects is that the issue of causality becomes particularly relevant. Indeed, positive theories of inflation predict that Central Banks may be more tempted to inflate to reduce unemployment when the costs of unemployment are higher or the costs of inflation are lower. What could give rise to these differences? One simple answer is the historical experience (which trains the mind to deal with such uncertainties) and the institutions designed by societies to deal with such shocks. For example, differences in the strength of informal insurance networks, or differences in the welfare state may affect the costs of falling unemployed. Or differences in mental training under high inflation or historical experience with indexation institutions may affect the costs of inflation.

[25] There were no episodes of deflation in the sample so there is no dummy variable defined to capture this state. However conceptually we should be able to measure whether there are asymmetric costs to deflations versus inflations using contentment data.

The appendix develops an example. Note that if humans design these institutions to deal with macro policy, then societies might benefit from the joint design of monetary policy and (say) the welfare state and indexation laws.

Di Tella and MacCulloch (2004) provide evidence of a negative relationship between inflation and the welfare state using a panel of 20 OECD countries over the period 1961-92, controlling for country and time fixed effects, country specific time trends, other co-variates and using different measures of benefit generosity (for example the length of time over which unemployed people can claim benefits).

A recent paper by Becchetti *et al* (2006) studies employment protection legislation and the age structure of the population with the objective of separating countries with different well being costs of macrofluctuations. They find that the relative cost of unemployment is higher in intermediate age cohorts and in low job protection countries. They point out that this might explain the difference in objectives for the US Federal Reserve (price stability and employment) versus the European Central Bank (price stability only) and their actual experiences with inflation.

IV. Which Emotion Should a Central Bank Target?

Economists build their models of monetary policy around the concept of utility. Perhaps the role of this concept is instrumental (allowing researchers to structure their thoughts) rather than descriptive. But two natural questions that arise are:

1. Is there an emotion that is in fact close to utility?
2. Is this the correct emotion to target?

On the first question, psychologists have described several positive emotions, including happiness and contentment. Two survey measures seem particularly relevant: the answers to the questions "Are you happy?" and to "Are you satisfied with your life?". The evidence that we presented in Section II.d suggests that the former may better capture instantaneous mood whereas the latter has a larger intertemporal component. If we take the plausible position that contentment captures, to some degree, the future, then life satisfaction may be our best available proxy for an overall measure of welfare. Importantly there are large samples of people that have

been asked about their satisfaction with life. Validation studies, in particular involving smiles and fMri data briefly discussed in section I.b., suggest that they are indeed related to the economist's concept of utility, so the answer to the first question is yes. Before proceeding, we note that a separate question on which psychologists and economists do not agree is whether any of these two measures can in fact be considered a summary of other emotions, or they are themselves a component of utility.

The second question is harder to answer. In brief, we believe that it is reasonable to target contentment (for example, as captured in the answer to a life satisfaction question). This is relatively uncontroversial for the implausible case that other emotions are constant. How can we oppose policies that will lead to the "good life"? The complication is that contentment can be quite stable while happiness may be going down in many realistic settings. It is likely that politicians that target contentment will be forced out of office by those that propose policies that raise happiness. The success of populist platforms is one indicator of their appeal.

A more serious problem is that many actors appear to be actively managing other emotions. One example is voters controlling their anger after observing a corrupt privatization (see Di Tella and MacCulloch, 2002). Another example, closer to the issues of concern to Central Banks, concerns asset bubbles. Indeed, investors often enter markets that have experienced large increases in prices, even when fundamentals do not appear to be changing (in a positive direction). For example, people kept on buying houses in the US even though negative news kept coming in (about the existence of a war and the deterioration of the current account, etc). One possible explanation is that investors in this market are also trying to minimize regret, as in Rotemberg (this volume). Thus, they enter the market after price increases because the likelihood of "missing out" on the boom and the cost of experiencing regret at the lost opportunity looms larger in their minds than the fear of losing money in a collapse of the bubble. One likely contributor to this asymmetry is the fact that when missing out on the opportunity, the misfortune is experienced in solitude (while the rest are happy). In contrast, when the bubble collapses, the misery is collectively experienced. One hesitates to add that inferences about one's own ability/identity are harsher in the first scenario than if one can convince one-self that the problems were so tough that even a large collection of people made the same mistake. A Central Bank focusing on contentment may leave interest rates unchanged while asset prices rise with the justification that

contentment had not moved, making economists who worry about bubbles less impressed with contentment as a target for policy.

In summary, a question for future research is to discover which emotion is the most relevant one for economists, in terms of whether it affects market prices and whether it affects (or should affect) government policy choices.

VI. Conclusion

We show that direct data on contentment, measured as self-reported overall satisfaction with life for over 600,000 Europeans, are negatively correlated with the unemployment rate and the inflation rate. There are several possible uses of this result. Our preferred interpretation is that they show that an emotion that is close to utility is affected by macroeconomic fluctuations. This can be a powerful complement to studies restricted to look at revealed preference. Even if one takes the view that contentment is just one of many emotions that need to be studied, it seems that it is also possible to construct direct empirical measures of these other emotions.

We discuss two broad applications of our results. They may help central banks understand what the tradeoffs are that the public is willing to accept in terms of unemployment for inflation, at least in terms of keeping the average level of one particular emotion (contentment) constant. Of course we will need more work in terms of making sure that we are identifying the causal effects of these variables on emotions, but we believe that the idea of central banks focusing their research efforts on direct measures of emotions as an outcome variable is justified. An alternative use of these data is to study the channels through which macroeconomics affects emotions.

Finally, economists who are attached to the models typically used in the design of monetary policy might see the results presented as an initial step at obtaining the weights in a social loss function that they can compare with those obtained in more traditional models that dominate the design of monetary policy (e.g., Eichenbaum, 1992; Rotemberg and Woodford, 1997). Some of the assumptions that have to be made for using our results in this context (representative agent, a

summary measure of emotions akin to utility in fact exists and individuals only care about income and leisure) will not sound extreme to those trained in this area.

The approach we discuss has limitations, but we suspect that several of them arise because so few researchers with experience in macroeconomic policy have studied these data, and because so few resources have gone into perfecting the measures. For example, we still do not know if the contentment data that we have available for large samples of individuals refer to instantaneous utility or it is an intertemporal measure (although several results appear similar when we use data on happiness -which is arguably closer to an instantaneous measure). The problem, however, does not seem insurmountable as it can be addressed by developing better measures of contentment.

Figure 1: Distribution of Life Satisfaction in three scenarios.

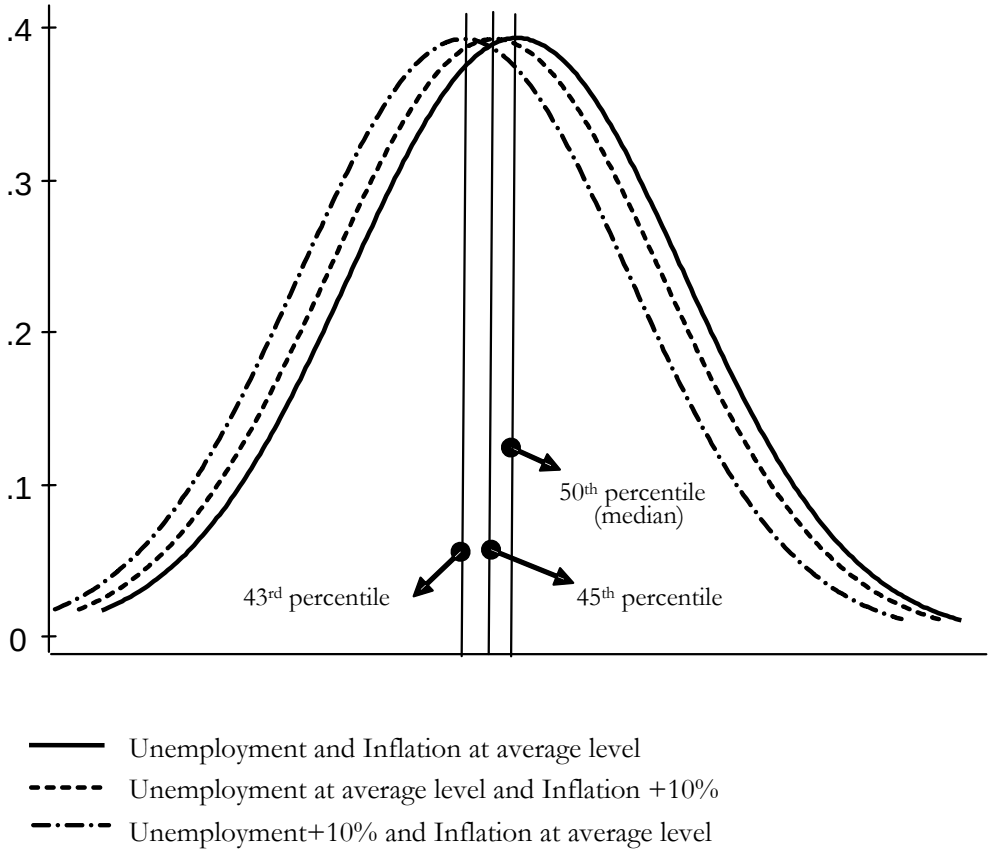


Figure 2A: Life Satisfaction Effect of an Unexpected Job Loss Shock Due to a Factory Closing: Four Years Before and After

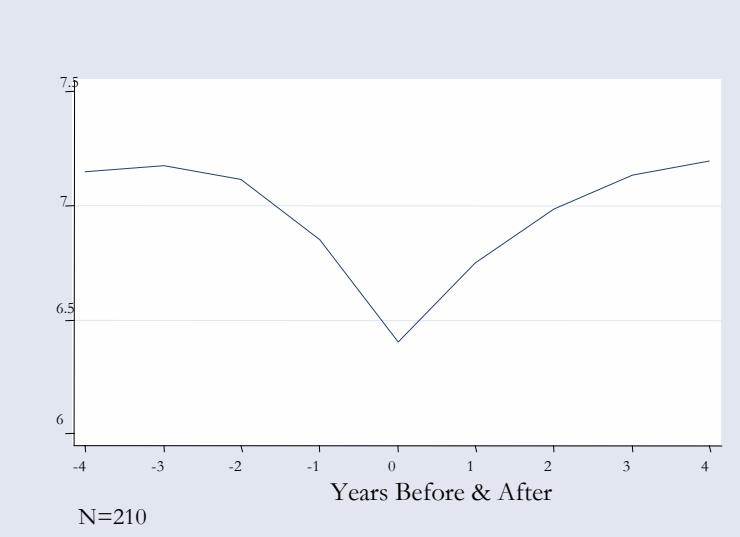


Figure 2B: Life Satisfaction Effect of an Expected Job Loss Shock Due to Retirement:

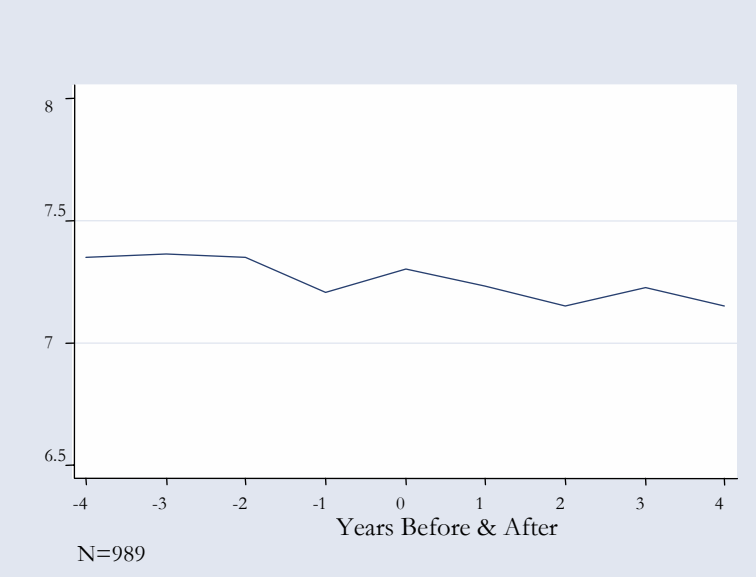


Figure 3: The three FAC (Facial Action Coding) units in the brow area and their combinations are illustrated. AU 1 (action of inner frontalis) raises the inner corners of the eyebrows, forming wrinkles in the medial part of the brow. AU 2 (action of the outer frontalis) raises the outer portion of the eyebrows, forming wrinkles In the lateral part of the brow. AU 4 (action of procerus, corrugators, and depressor supercilii) pulls the eyebrows down and together, forming vertical wrinkles between them and horizontal wrinkles near the nasion. The combinations of AUS show how these AUs can act together to form composites of the appearances each produces separately.

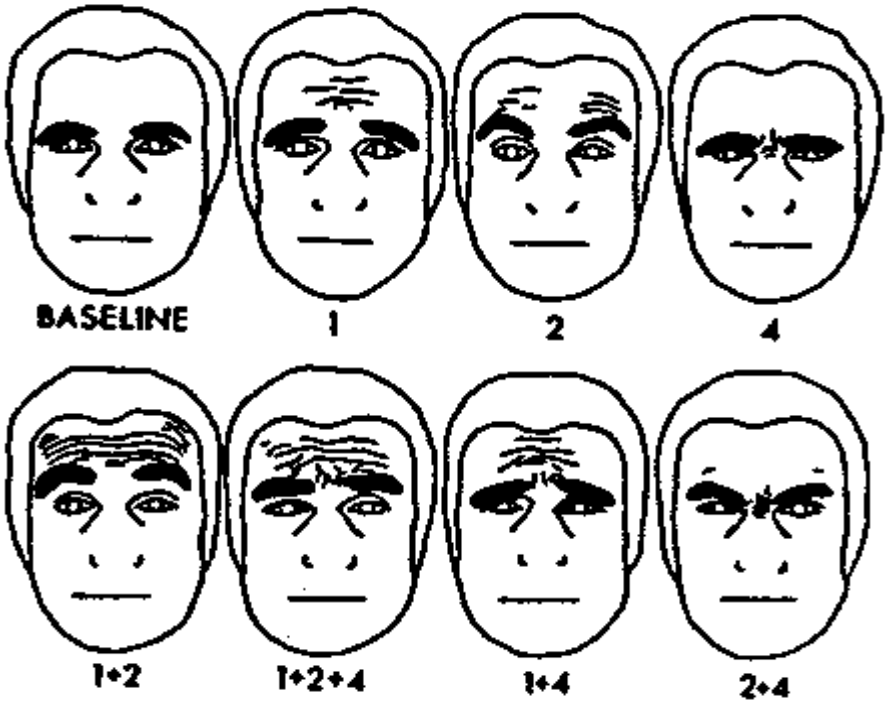
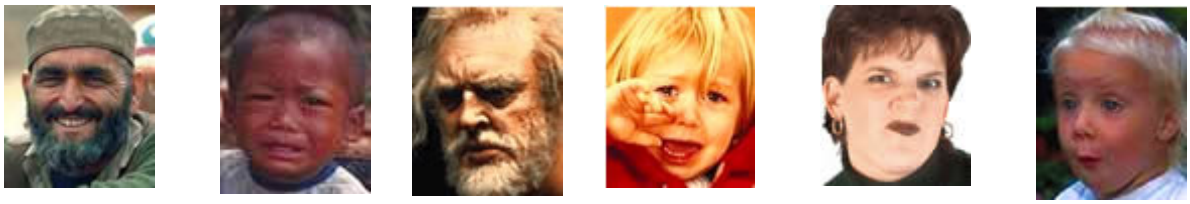


Figure 4: Ekman's six expressions: Happy, Sad, Anger, Fear, Disgust and Surprise.



Happy Sad Anger Fear Disgust Surprise

Table 1: How Life Satisfaction Scores Vary with Inflation & Unemployment, 16 OECD Countries, 1973 to 2002.

Dependent variable:	*Life Satisfaction*	*Life Satisfaction*	*Life Satisfaction*	*Life Satisfaction*
Macroeconomic Variables				
Unemployment rate	-1.6	-2.3	-1.2	-1.1
	(0.4)	(0.6)	(0.4)	(0.4)
Inflation rate	-1.2	-1.9	-1.9	-2.0
	(0.3)	(0.5)	(0.4)	(0.4)
GDP per capita			0.09	0.07
			(0.02)	(0.04)
Hours				-0.03
				(0.01)
Personal Characteristics	Yes	Yes	Yes	Yes
Country & Year Dummies	Yes	Yes	Yes	Yes
Country Specific Time Trends	No	Yes	No	No
Unemployment Inflation Trade-off (standard error)	1.3 (0.4)	1.2 (0.4)	0.7 (0.2)	0.6 (0.2)
No. of Observations	609,243	609,243	607,467	607,467
Country-year clusters	309	309	306	306
Pseudo R^2	0.09	0.09	0.09	0.09

Note: All regressions include controls for personal characteristics, including employment status (including self employed, retired, keeping home or in school), income, marital status, education, gender, age and age squared. Ordered probit regressions with robust standard errors in parentheses, clustered at the country year level. The regressions use as dependent variable the answer to the Euro-barometer question, *"On the whole, are you satisfied with the life you lead?"*. The four possible answers are: *"not at all satisfied"; "not very satisfied"; "fairly satisfied"; "very satisfied"*. *GDP per capita* is real GDP per capita in the country, measured in US dollars. *Hours* is the average weekly hours worked per capita.

Table 2: How Life Satisfaction & Happiness Scores Vary with Current + Future Inflation & Unemployment Rates, 16 OECD Countries, 1973 to 1986.

Dependent variable:	*Life Satisfaction*	*Happiness*
Macroeconomic Variables		
Unemployment rate	-2.2	-2.2
	(1.3)	(1.6)
Unemployment rate t + 1	-3.1	0.8
	(1.2)	(1.3)
Inflation rate	0.4	0.4
	(0.5)	(0.5)
Inflation rate t + 1	-3.4	-3.3
	(0.5)	(0.5)
Personal Characteristics	Yes	Yes
Dummy Variables	Country and Year	Country and Year
No. of Observations	128,722	128,722
Country-year clusters	99	99
Pseudo R^2	0.08	0.08

Note: Ordered probit regressions with robust standard errors in parentheses, clustered at the country year level. Personal characteristics include employment status (including self employed, retired, keeping home or in school), income, marital status, education, gender, age and age squared. The dependent variable in column (1) is the answer to the Euro-barometer question, *"On the whole, are you satisfied with the life you lead?"* The four possible answers are: *"not at all satisfied"; "not very satisfied"; "fairly satisfied"; "very satisfied"*. The dependent variable in column (2) is the response to the Euro-barometer question, *"Taking all things together, how would you say things are these days -would you say you're very happy, fairly happy, or not too happy these days?"* (1=*"not too happy"*, 2=*"fairly happy"* and 3=*"very happy"*). *Unemployment rate t+1* and *Inflation rate t+1* are the unemployment and inflation rates one year into the future.

Table 3: The Determinants of Life Satisfaction, Interacting Unemployment & Inflation Rates with Personal Characteristics, 16 OECD Countries, 1973 to 2002.

Dependent variable:	(1)		(2)	
Life Satisfaction	Coefficient	** Inflation*	Coefficient	**Unemployment*
Unemployment rate	-2.0		-3.2	
	(0.4)		(1.5)	
Inflation rate	-2.1		-1.0	
	(0.8)		(0.4)	
Unemployed	-0.5	0.3	-0.4	-1.2
	(0.02)	(0.3)	(0.04)	(0.5)
Self-employed	-0.001	0.3	0.01	0.08
	(0.01)	(0.1)	(0.02)	(0.2)
Retired	-0.01	0.2	-0.04	0.5
	(0.01)	(0.2)	(0.03)	(0.3)
Keep Home	-0.03	0.6	0.008	-0.02
	(0.01)	(0.1)	(0.02)	(0.2)
In school	0.1	-0.01	0.1	-0.3
	(0.01)	(0.2)	(0.02)	(0.2)
Male	-0.08	0.3	-0.07	0.06
	(0.01)	(0.1)	(0.01)	(0.2)
Age	-0.03	-0.03	-0.02	-0.1
	(0.001)	(0.02)	(0.002)	(0.03)
Age Squared	2.9e-4	2.9e-4	2.1e-4	0.001
	(1.5e-5)	(2.0e-4)	(2.5e-5)	(2.4e-4)
Income 2	0.05	0.1	0.07	-0.09
	(0.01)	(0.2)	(0.02)	(0.2)
Income 3	0.2	0.1	0.2	-0.5
	(0.01)	(0.2)	(0.02)	(0.2)
Income 4 (top)	0.3	0.2	0.4	-0.6
	(0.01)	(0.2)	(0.02)	(0.3)
Education 15-18 years old	0.07	0.4	0.05	0.5
	(0.01)	(0.1)	(0.02)	(0.2)
Education >18 years old	0.2	0.2	0.09	1.1
	(0.01)	(0.1)	(0.02)	(0.2)
Married	0.2	-0.3	0.2	-0.6
	(0.01)	(0.2)	(0.02)	(0.2)
Divorced	-0.2	-0.8	-0.2	-0.2
	(0.02)	(0.3)	(0.04)	(0.5)
Separated	-0.3	-0.5	-0.3	-0.5
	(0.03)	(0.6)	(0.05)	(0.6)
Widow	-0.1	-0.3	-0.2	0.2
	(0.01)	(0.2)	(0.02)	(0.3)
No. of Observations	609,243		609,243	
Pseudo R^2	0.09		0.09	

Note: Ordered probit regressions with robust standard errors in parentheses, clustered at the country year level (309 clusters), including country and year dummies. Dependent variable is the answer to the Euro-barometer question: *"On the whole, are you satisfied with the life you lead?"*. The four possible answers are: *"not at all satisfied"; "not very satisfied"; "fairly satisfied"; "very satisfied"*.

Table 4: How Life Satisfaction Scores Vary with Inflation & Unemployment, Testing for Non-Linearities, 16 OECD Countries, 1973 to 2002.

Dependent variable:	*Life Satisfaction*
Macroeconomic Variables	
Unemployment rate	0.8
	(1.0)
(Unemployment rate) ²	-12.4
	(4.6)
Inflation rate	-1.8
	(0.7)
(Inflation rate) ²	3.1
	(3.2)
Personal Characteristics	Yes
Dummy Variables	Country and Year
No. of Observations	609,243
Country-year clusters	309
Pseudo R^2	0.09

Note: Ordered probit regressions with robust standard errors in parentheses, clustered at the country year level. Personal characteristics include employment status (including self employed, retired, keeping home or in school), income, marital status, education, gender, age and age squared. The dependent variable is the answer to the Euro-barometer question, *"On the whole, are you satisfied with the life you lead?"*. The four possible answers are *"not at all satisfied"; "not very satisfied"; "fairly satisfied"; "very satisfied"*.

Table 5: Adaptation in Macroeconomics- How Life Satisfaction Scores Vary with Current and Past Inflation and Unemployment Rates, 16 OECD Countries, 1973-2002.

Dependent variable:	*Life Satisfaction*
Macroeconomic Variables	
Unemployment rate	-4.4
	(0.9)
Unemployment rate t - 1	2.9
	(0.9)
Inflation rate	-0.4
	(0.6)
Inflation rate t – 1	-1.0
	(0.5)
Personal Characteristics	Yes
Dummy Variables	Country and Year
No. of Observations	597,433
Country-year clusters	302
Pseudo R^2	0.09

Note: Ordered probit regressions with robust standard errors in parentheses, clustered at the country year level. Personal characteristics include employment status (including self employed, retired, keeping home or in school), income, marital status, education, gender, age and age squared. The dependent variable is the answer to the Euro-barometer question, *"On the whole, are you satisfied with the life you lead?"*. The four possible answers are: *"not at all satisfied"; "not very satisfied"; "fairly satisfied"; "very satisfied. Unemployment rate t-1* and *Inflation rate t-1* are the unemployment and inflation rates lagged one year into the past.

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