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# **Subjective wellbeing impacts of national and subnational fiscal policies**

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## **Abstract**

We study the association between fiscal policy and subjective wellbeing using fiscal data on 35 countries and 130 country-years, combined with over 170,000 people's subjective wellbeing scores. While past research has found that 'distortionary taxes' (e.g. income taxes) are associated with slow growth relative to 'non-distortionary' taxes (GST/VAT), we find that distortionary taxes are associated with higher levels of subjective wellbeing than non-distortionary taxes. This relationship holds when we control for macro-economic variables and country fixed effects. If this relationship is causal, it would offer an explanation as to why governments pursue these policies even when they harm economic growth. We find that richer people's subjective wellbeing is less harmed by indirect taxes than for people with lower incomes, while "unproductive expenditure" is associated with higher wellbeing for the middle class relative to others, possibly reflecting middle class capture. We see little evidence for differential effects of fiscal policy on people living in different sized settlements. Devolving a portion of expenditure to subnational government is associated with higher subjective wellbeing but devolving tax collection to subnational government is associated with monotonically lower subjective wellbeing.

## **JEL codes**

D60, E62, H50, H70, O57

## **Keywords**

Subjective wellbeing; Fiscal policy; Decentralised government

## **Summary haiku**

Fiscal policy

balances growth, wellbeing.

What is best for whom?

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# 1 Introduction

Beginning with Barro (1990), there have been a number of endogenous growth models that attempt to understand the impacts of fiscal policy on both growth and wellbeing. Many researchers have attempted to empirically test the model's predictions for economic growth, but economic growth is only a means to an end – the end being greater wellbeing. Despite this, far less attention has gone to testing the endogenous growth model's implications for wellbeing. We help to fill this gap by connecting the fiscal policy and growth literature to the subjective wellbeing (SWB) literature.

To the best of our knowledge this study is the first in the SWB literature to explicitly consider the government budget constraint, the first to consider SWB within the context of endogenous growth theory, one of few (including within the growth literature) to use the IMF's higher quality general (rather than central) government fiscal data, and the first to examine regional and subnational dimensions of the relationship of fiscal policies with subjective wellbeing.

While previous literature has argued that 'non-distortionary' indirect (sales) taxes are good for economic growth relative to 'distortionary' taxes, we find that distortionary taxes are associated with relatively higher levels of subjective wellbeing than are non-distortionary taxes. This result is robust to several different specifications. In addition, we find some indication that indirect taxes hurt the poor more than the rich, and we find the opposite relationship for distortionary taxation. As Alesina and Rodrik's (1994) model predicts, we find evidence that productive expenditures benefit the poor relatively more than the rich. This result is not driven by people's political ideology, supporting the idea that fiscal policies affect wellbeing through effects on the real economy. "Unproductive expenditure" appears to benefit the middle class by more than it benefits the rich or poor, consistent with middle class capture as predicted by the median voter model.

We also study the impacts on subjective wellbeing of devolving government expenditure and taxation to subnational government. We find devolution of taxation is associated with lower subjective wellbeing, while partial devolution of expenditure is associated with higher subjective wellbeing. This is consistent with subnational authorities having better information on their constituents' wants and thus better ability to target resources. Taxation may be more simply administered by central government and the advantages to being better informed by constituents may be outweighed by economies of scale.

We find little variation when we interact fiscal policies with settlement size variables. Thus rural residents apparently have similar subjective wellbeing reactions to alternative fiscal policies as their urban counterparts.

We control for many unobservable and observable factors that affect fiscal policy and subjective wellbeing; importantly we control for country fixed effects, survey wave (i.e. time)

fixed effects, personal characteristics, and country-specific, time-varying macroeconomic conditions. Our results can be interpreted causally if, aside from the variables that we already control for (including our macroeconomic controls), there are no other country-specific, time-varying factors that affect both fiscal policy and subjective wellbeing or any reverse causality from subjective wellbeing to fiscal policy. This is known as the parallel trends assumption.<sup>1</sup> We find it plausible that trends are parallel, especially after controlling for macro-economic variables, since we have not identified other country-specific, time-varying omitted factors that would bias our results. There is also no obvious reason why there would be reverse causality. However fiscal policy is chosen by countries (rather than randomly allocated) in part to reflect their changing circumstances, so we cannot completely rule out that these decisions depend on some unobserved time-varying, country-specific variables that also affect subjective wellbeing.<sup>2</sup> We leave it to future research to analyse further the causal pathways that may underpin the relationships that we estimate.

Section 2 of the paper reviews the relevant theory. We discuss our data in Section 3, describe our methodology in Section 4, present our results in Section 5, and conclude in Section 6.

## 2 Theoretical framework

### 2.1 The Barro framework

Barro (1990) examined the role of fiscal policy within an endogenous growth framework – extending the previous work of Lucas (1988), Rebelo (1991), Romer (1986), and Romer (1988). Barro sets up a simple infinitely-lived representative agent model with lifetime utility,  $U$ , given by (1).

$$U = \int_0^{\infty} u_t(c_t, h_t) e^{-\rho t} dt \quad (1)$$

where  $\rho > 0$  is the rate of time preference and  $u_t$  is instantaneous utility. Crucially instantaneous utility,  $u_t$ , depends on both private consumption,  $c_t$ , and government consumption services  $h_t$ . Because  $h_t$  enters the utility function directly and not the production function it has been termed unproductive expenditure in the successive literature (e.g. Kneller, Bleaney, and Gemmell (1999); Bleaney, Gemmell, and Kneller (2001); Angelopoulos, Economides, and Kamas (2007)).

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<sup>1</sup> In any study, even a randomised control trial, the counterfactual – in our case what would have happened to subjective wellbeing in the absence of fiscal policy change – is unobserved and hence the parallel trends assumption can never be directly tested. For a formal treatment of this issue see chapter 2 of Angrist and Pischke (2008).

<sup>2</sup> Clearly a randomised trial is not feasible for fiscal policy research.



In addition to providing consumption services, the government also funds productive expenditures,  $g_t$ , that enter the production function alongside private capital ( $k_t$ ):

$$y_t = \Phi(k_t, g_t) \quad (2)$$

where  $y_t$  is aggregate output. As is standard in endogenous growth theory,  $\Phi$  exhibits constant (or increasing) returns to scale. The full detail of the model is spelled out in Barro (1990). One of Barro's key results is that an increase in the share of output devoted to unproductive expenditure ( $\frac{h_t}{y_t}$  in the notation above) reduces growth of output, capital and consumption, but potentially increases lifetime utility. As Barro and Sala-i-Martin put it in a later paper: "An increase in  $\left[\frac{h_t}{y_t}\right]$  can be consistent with an increase in utility that accompanies a decrease in the growth rate" (Barro and Sala-i-Martin 1992, 651).<sup>3</sup> The growth slowdown occurs because the increase in income taxes lowers the private marginal product of capital, discouraging private investment; however, if the additional tax revenue is used to provide public services valued by households ( $h_t$ ), overall utility may be raised.

The Barro model only includes income taxes and lump sum taxes. Labour supply is treated as perfectly inelastic and so consumption taxes are equivalent to a lump-sum tax. This has led to the potentially confusing convention of referring to consumption, sales, and value-added taxes (i.e. indirect taxes) as non-distortionary taxation in the subsequent empirical literature –again see, for example, (Bleaney, Gemmell, and Kneller 2001; Kneller, Bleaney, and Gemmell 1999; Angelopoulos, Economides, and Kamas 2007). With endogenous labour supply, such consumption taxes are distortionary. With this qualification noted, we will continue with the terminology of previous authors so as to make our analysis comparable with theirs.

In the Barro model, with a representative agent, the socially optimal outcome cannot be obtained by income taxation as it distorts private incentives to save. Meanwhile lump-sum taxes produce a higher level of growth than income taxes but they too can fail to generate the socially optimal output level, as the optimum requires getting the government size just right.<sup>4</sup> With heterogeneous agents who value unproductive expenditures differently, the simple results from this model with regard to fiscal categories may no longer hold.

There have been many extensions to the basic Barro model. Misch *et al.* (2013) and also Baier and Glomm (2001) show that optimal fiscal policy depends on the degree of complementarity between  $g$  and  $k$ : a high degree of complementarity results in a larger optimum government size and an optimal growth rate that is lower than the growth-maximising one.<sup>5</sup> The importance of

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<sup>3</sup> We have modified the notation to match that used above.

<sup>4</sup> Extra government expenditure on  $g_t$  always increases each of the private marginal product of capital, savings and growth. If  $g_t$  is financed through distortionary taxation, this acts as a countervailing force decreasing the private return to capital so that growth first increases and then decreases with  $g_t$ . In the case of lump-sum taxation there is no such countervailing force and so growth increases monotonically in  $g_t$ .

<sup>5</sup> This result holds even though Misch *et al.* did not include government consumption services,  $h_t$ . As Barro had already shown, the presence of these services also leads to a non-maximal optimal growth rate.

transitional dynamics is shown both by Baier and Glomm and Futagami *et al.* (1993). Turnovsky (2000) adds endogenous labour supply, demonstrating that an equilibrium growth path may not even exist. With endogenous labour-leisure trade-offs, consumption taxes become distortionary unlike in Barro (1990). This additional literature demonstrates that welfare maximising fiscal policy is complex: the optimal policy setting depends on the exact model and is therefore an empirical question.

One last model, especially relevant to our work, is that of Alesina and Rodrik (1994). Alesina and Rodrik take the Barro framework and introduce variation in people's ownership of capital. In this model, the welfare of a pure capitalist – someone whose income is entirely from capital – is maximised when the growth rate is maximised, but all others prefer higher taxation and lower growth (and the lower their share of capital relative to labour income, the higher taxes they desire). The higher taxes are useful to labourers not through direct cash transfers, but because government-provided capital increases labour productivity. We test – and find some support for – the hypothesis that productive expenditure disproportionately benefits the poor.<sup>6</sup>

## 2.2 Theory meets empirics

Nijkamp and Poot (2004) conducted a meta-analysis of 93 empirical journal articles on the effects of fiscal policies on growth, finding mixed results for these effects. A key problem with many of the early papers that they reviewed is that the papers rarely gave due consideration to the government's budget constraint. For example, papers tested for the effects of taxation without controlling for how revenues are spent, or tested for the effects of government spending without controlling for how the revenues are raised. One exception is Bleaney, Gemmell, and Kneller (2001), whose methodology we adapt for subjective wellbeing. We outline their approach in our methodology section.

## 2.3 SWB and fiscal policy literature

There is only a small and recent literature on the effects of fiscal policies on subjective wellbeing. The results are mixed. For example, several papers look at the relationship between the size of government consumption and subjective wellbeing. Results include finding a negative relationship (Bjørnskov, Dreher, and Fischer 2007; Oishi, Schimmack, and Diener 2011), finding no relationship (Ram 2009), finding a positive relationship Flavin *et al.* (2011; 2014), and finding an inverse U pattern (Hessami 2010). Other papers have looked at taxation with Flavin *et*

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<sup>6</sup> One qualification is that our data is on relative income rank rather than capital wealth rank. However, a) higher income is correlated with higher wealth, and b) Alesina and Rodrik state: "When we use the term capital, for example, what we have in mind are all growth-producing assets, including physical capital, human capital, and proprietary technology. Labor, in turn, stands for *unskilled* labor." (Alesina and Rodrik (1994). In light of a) and b), low-income earners seem to be a reasonable proxy for their unskilled labourers, and high income earners seem a reasonable proxy for their capitalists.

*al.* (2011) and (2014) finding higher taxation associated with higher SWB. Oishi *et al.* (2011) find more progressive tax systems are correlated with higher SWB. Veenhoven (2000) examines social security generosity and finds no relationship with SWB.

Most of these papers are cross sectional. Only Flavin *et al.* (2011; 2014) and Veenhoven (2000) estimate country fixed effects, despite the obvious importance of country effects for both SWB (e.g. through culture) and fiscal policy (again possibly through culture, or through circumstances like natural resource endowments).<sup>7</sup> None of these papers takes into account the structure of taxation or how government consumption is financed, and none of these papers uses the high quality IMF general government data.

### *2.3.1 SWB validation*

SWB has become increasingly recognized as an important area of study as research has validated it as an informative measure of wellbeing. SWB is highly correlated in test-retest comparisons of the same individual a short time apart (e.g. see Diener *et al.* (2013) ). While some studies have shown that SWB can be influenced by seemingly arbitrary factors (e.g. Schwarz (1987)), on average these vicissitudes will wash out in large samples such as ours. Many studies show a good correlation between SWB and other subjective and objective measures of wellbeing. For example, within a given country those who are richer are more satisfied with their lives, and across countries, developing countries are less satisfied than developed ones. Stevenson and Wolfers (2008) show that these cross-sectional relationships remain robust when considered in a time series context unlike the earlier findings of Easterlin (1974). Stevenson and Wolfers emphasise the log-linear rather than linear nature of the relationship between GDP per capita and SWB. They also emphasise that the positive point estimate for the relationship is robust even if its statistical significance is less so in some subsamples.<sup>8</sup> Helliwell and Huang (2008) show that life satisfaction is closely correlated with many of the World Bank's measures of good government. Di Tella *et al.* (2003) find that recessions lower SWB. Finally studies in other fields have found evidence that SWB correlates with other measures of people's welfare.<sup>9</sup>

Several studies have found differences in rural versus urban SWB (Easterlin, Angelescu, and Zweig 2011; Morrison 2011; Berry and Okulicz-Kozaryn 2011; Berry and Okulicz-Kozaryn 2009;

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<sup>7</sup> Even here the country panels are short, with Veenhoven (2000) only having two time periods to work with and hence just running a regression on the within country changes in SWB and social security generosity.

<sup>8</sup> Easterlin (2010) and Helliwell *et al.* (2012) are not convinced by these results with the latter pointing to the importance of the countries that are included in the analysis as well as which control variables are included. Clearly the debate is not yet settled.

<sup>9</sup> Studies in psychology have shown links between brain scans known to be associated with happiness and higher SWB (Urry *et al.* 2004). People who are more satisfied with their lives appear to live longer (Diener and Chan 2011). Early studies showed lower SWB predicted suicide (J. F. Helliwell 2007; Daly and Wilson 2009; Daly, Wilson, and Johnson 2013; Layard 2005, 71), but a recent study by Case and Deaton (2015) found more mixed results.

Veenhoven 1994).<sup>10</sup> For these reasons we include controls for settlement size and test whether relationships differ across large versus small settlements.

## 3 Data

### 3.1 Fiscal Variables

The majority of our fiscal data is sourced from the IMF Government Finance Statistics database (International Monetary Fund (IMF) 2014), supplemented with OECD data where IMF data is missing (OECD 2014). Unlike almost all previous studies (in both the SWB and growth literature), we make use of general government as well as central government data: the former provides us with a more complete picture of a nation's fiscal policy settings, while the latter has better coverage. The use of both datasets together allows us to explore the SWB effects of decentralisation of fiscal policy.

Following the Barro model, we split each of expenditure and taxation into two main categories: distortionary and non-distortionary taxation, and productive and unproductive expenditure. We also include two residual categories, "other revenue", *OR*, and "other expenditure", *OE*, plus the budget surplus (*BS*). Our taxonomy is the same as in much of the empirical growth literature; specifically we use the definitions of Bleaney, Gemmell, and Kneller (2001) to make our results for the effects of fiscal policy on SWB directly comparable with their results for the effects on growth. These category definitions are described in detail in Table 1. Broadly speaking, non-distortionary taxation, *NDT*, is defined as indirect taxes on goods and services (i.e. GST/VAT), while distortionary taxation, *DT*, is taxation on income, social security contributions, and property taxes. Productive expenditures, *PE*, include education, health, housing, transport, defence and general public services. Unproductive expenditures, *UE*, include social security and welfare, recreation and economic services. Each of these variables is expressed as a percentage of the country's GDP.<sup>11</sup> Summary statistics of these, and other country-level variables, can be found in Table 2. More details about our data cleaning process can be found in the Appendix, as well as in our Stata code.

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<sup>10</sup> It appears that in developing countries people are more satisfied living in cities, while in developed countries there appears to be either no difference or the opposite relationship (Grimes and Reinhardt 2015).

<sup>11</sup> We use GDP data from the UN. The UN has several different nominal GDP series available reflecting definitional issues and currency changes. Where possible we use one consistent series for each country in the same currency as the fiscal data. When this is not possible, we splice overlapping series to form one longer series.

### 3.2 Subjective wellbeing and personal controls

We use data on subjective wellbeing (SWB) from the World Values Survey (World Values Survey Association 2014) and the European Values Survey (EVS 2011). Subjective wellbeing is asked (in the local language) as:

All things considered, how satisfied are you with your life as a whole these days?  
Please use this card to help with your answer. 'Dissatisfied' 1 2 3 4 5 6 7 8 9 10  
'Satisfied'.

SWB is tightly distributed in all countries. Mean SWB is approximately 7.3 with a standard deviation of approximately 2 across all the individuals in our analysis. Appendix Figure 1 shows the distribution of country means and standard deviations within different country-years,<sup>12</sup> while Appendix Figure 2 provides a histogram of SWB scores. Because of SWB's tight distribution, even numerically small changes in SWB can be economically meaningful. For example Clark *et al.* (2008, 241) find that marriage increases SWB by about 0.3-0.4 after one year, and the largest shock they studied – widowhood – decreases SWB by about 1 unit. Across OECD countries the standard deviation is about 0.6, with a difference in average SWB of just 0.5 separating the 15<sup>th</sup> and 5<sup>th</sup> best position.<sup>13</sup>

Both WVS and EVS include information on people's age, gender, education, settlement size, and political orientation. Table 3 provides summary statistics for key variables. We include age in six categories,<sup>14</sup> education in eight categories,<sup>15</sup> and settlement size in four categories.<sup>16</sup> Political orientation and income are measured on a 10 point scale, entered in our regressions as categorical variables.<sup>17</sup> For each of these variables we include two extra categories for missing information: missing because the question was not asked in the survey, and missing for other reasons.<sup>18</sup> Finally we include a dummy variable to distinguish between the WVS and the EVS.

Donnelly and Pop-Eleches (2012) criticize the WVS and EVS measures of income. They point out that the income distributions associated with these 10 categories are not usually

<sup>12</sup> Appendix Figure 1 should not be interpreted as showing a meaningful correlation between mean SWB in a country and that country's s.d. of SWB. Because SWB is bounded above, a DGP with a high mean will generate a disproportionate number of 10s and thus mechanically have a lower s.d. than a DGP with a mean of 5.

<sup>13</sup> Here we are comparing the (unweighted) average SWB of OECD countries using each country's latest measure of SWB from either the EVS or WVS.

<sup>14</sup> Under 19, 19 – 24, 25 – 34, 35 – 49, 50 – 64, and 65+.

<sup>15</sup> The categories, as per the world values data labels, are: "Inadequately completed elementary education", "Completed (compulsory) elementary education", "Incomplete secondary school: technical/vocational", "Complete secondary school: technical/vocational", "Incomplete secondary: university-preparation", "Complete secondary: university-preparation", "Some university without degree/Higher education", "University with degree/Higher education".

<sup>16</sup> Less than 5000, 5000 – 20,000/25,000, 20,000/25,000 – 100,000 and 100,000+. The reason for the blur between town populations of 20 and 25 thousand is because of changing survey definitions over time. Settlements in that interval are included in one category or the other, not both.

<sup>17</sup> In 1982 in the United States income was put on an 11 point scale, with 102 people coded as 11. We recode these people as 10.

<sup>18</sup> In practice it is common for several question to be omitted at once, so in these cases we cannot estimate separate coefficients for each missing category due to perfect multicollinearity among these categories. In this case only one coefficient is estimated capturing missing responses.

interpretable as deciles, as some researchers have interpreted them, and that the method used to record income varies. In the vast majority of surveys (210 out of 245), respondents are asked to place themselves in one of 10 income brackets (e.g. \$0 - \$1,000 , \$1,000 – \$5000 etc.), where the brackets available were pre-determined by WVS/EVS, though 58 of these countries are missing documentation on the exact brackets used (Donnelly and Pop-Eleches 2012, 3). These brackets often do not generate uniform decile distributions of income. In other cases, respondents are asked to subjectively place themselves on a ten point scale where 1 represents the first decile and 10 the highest. In such cases, most people respond with a middle number: for example 84% of Americans in the 2006 wave claim they are in one of the middle 5 deciles (deciles 3-7). Finally in some cases respondents are asked to write down their income, whereby WVS/EVS later recode it onto a ten point scale, in some cases to match pre-determined brackets, in other cases to perfectly split the data into ten equally populated deciles.

Because of these survey inconsistencies we interpret income purely as an ordinal variable within a given country year: i.e. if somebody is on a higher income step than someone else in the same country-year they likely earn more, but we do not know the cardinal relationships between categories.

### 3.3 Macroeconomic controls

In most specifications we include controls for real PPP-adjusted GDP per capita (current and lagged three years), unemployment, investment, and inflation. We calculate real GDP per capita as real PPP-adjusted GDP per capita divided by population, with both figures coming from the Penn World Tables, version 8.1 (Feenstra, Inklaar, and Timmer 2015) except in the case of 2012 data, where we use data from the World Bank (The World Bank 2015a).<sup>19</sup> Our primary source of data on unemployment is from the Annual Macro Economics Database (“AMECO” 2015). For countries where we do not have AMECO data we use the World Bank development indicators data, (The World Bank 2015c) spliced, where necessary, with UN unemployment data (The United Nations 2015).<sup>20</sup> We source inflation data for all but three countries from the World Bank development indicators.<sup>21</sup> All investment data is from the World Bank development indicators (The World Bank 2015a; The World Bank 2015c).<sup>22</sup> Table 4 lists the countries used in each of our regressions.

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<sup>19</sup> This is because the Penn World Tables v8.1 do not extend to 2012. The World Bank data is spliced multiplicatively with the PWT data.

<sup>20</sup> The splicing occurs when the World Bank data do not go back far enough. The splicing method we use here differs from the multiplicative method we use to splice GDP together. For unemployment our splice method is: First, find the first year the World Bank and United Nation’s series overlap. Second, calculate the difference between these two series at this point, denoted  $U_{WB} - U_{UN}$ . Third, for all points earlier than this overlap, where World Bank data is missing, we define unemployment to be the United Nations rate plus  $U_{WB} - U_{UN}$ .

<sup>21</sup> We use OECD inflation data for Chile and the United Kingdom, and we use FRED data (which is itself originally from the World Bank) for Argentina, accessed on 10 November 2015 (The World Bank 2015b).

<sup>22</sup> The investment data (“Gross capital formation as percent of GDP” series code = ne.gdi.totl.zs) is the 14th of October 2015 version of the World Bank development indicators (accessed on the 12th of November 2015), except for

## 4 Methodology

Equation (3) illustrates our baseline equation. We estimate subjective wellbeing for individual  $i$  in country  $c$  at time  $t$  as a function of our fiscal variables,  $\mathbf{F}$ , a vector of personal controls,  $\mathbf{X}$ , a vector of macro controls,  $\mathbf{M}$ , country fixed effects,  $\lambda_c$ , and survey wave (time) fixed effects,  $\lambda_w$ .

$$SWB_{i,c,t} = \beta_0 + \beta_F \mathbf{F} + \beta_2 \mathbf{X} + \beta_3 \mathbf{M} + \lambda_w + \lambda_c + \epsilon \quad (3)$$

where

$$\beta_F \mathbf{F} = \beta_{NDT} \cdot NDT + \beta_{DT} \cdot DT + \beta_{PE} PE + \beta_{UE} \cdot UE + \beta_{OR} \cdot OR + \beta_{OE} \cdot OE$$

with the budget surplus  $BS$  omitted to avoid perfect multicollinearity. In other specifications we make some modifications to Equation 3, e.g. removing the macro controls, including an interaction of our fiscal variables with income and political affiliation, and including the proportion of each fiscal category which is spent subnationally.

Our analysis includes countries only if we observe them in more than one year. This allows us to estimate country fixed effects  $\lambda_c$ . Researchers have worried about whether the SWB question is understood the same way across different countries. Separately, different cultures may have different average levels of subjective wellbeing. In both cases, failure to control for these could bias our estimate of  $\beta_F$ . Country fixed effects allow us to control for, among other things, constant cultural effects over time.<sup>23</sup>

In addition to country fixed effects, we control for survey wave fixed effects,  $\lambda_w$ . The survey waves are: 1981-84, 1989-93, 1994-98, 1999-04, 2005-09, 2010-12.<sup>24</sup> These are important as they allow us to control for any changes in survey practices across survey wave. For example the order of question and types of questions elsewhere in the survey can change, possibly affecting people's responses. The wave fixed effects will also pick up global shocks to macro and other variables (for example global recessions such as the global financial crisis which may affect both SWB and our fiscal variables).

The government's budget constraint requires that in each year all taxes be spent or saved, and that all expenditure be funded by taxation or borrowing. Formally:

$$DT_t + NDT_t + OR_t = PE_t + UE_t + OE_t + BS_t \quad 4$$

As Bleaney, Gemmell, and Kneller (2001) emphasise, it is vital to recognise the government's budget constraint when analysing the effects of fiscal policy. Fiscal policy does not occur in a vacuum: expenditure must be financed, and taxes must be spent or saved. If one looks at a variable in isolation, say productive expenditure, then one cannot obtain a clear picture of its

Lithuania, where we use the 14 April 2015 release of the indicators (accessed 26 June 2015) because the October release does not include data for Lithuania prior to 2004.

<sup>23</sup> Other factors controlled for by fixed effects include, *inter alia*, climate and geography.

<sup>24</sup> We prefer wave effects (i.e. groups of years) to the finer grained year effects as we sometimes only observe one or two countries' SWB in a given year. Including year effects would effectively remove these observations from our analysis.

impact on wellbeing because its effect on wellbeing will depend on whether it is funded from reducing unproductive expenditure, increasing distortionary or non-distortionary taxes, or by borrowing the funds.

Because of the perfect collinearity described in Equation (4) one category must be omitted when we estimate Equation (3). The coefficients on each fiscal variable are then interpreted as the effect of increasing that variable by one unit financed by changing the omitted category. In our regressions we omit the budget surplus, so that for an increase in an expenditure variable the assumption is that the surplus is reduced, while for taxation variables the assumption is that the surplus is increased.

After estimating Equation (3) with the surplus omitted, it is trivial to compute the associations relative to an alternative financing assumption. One simply adds or subtracts the coefficients estimated in Equation (3); for example, to find the effect of increasing  $PE$  by one percent of GDP funded by increasing  $DT$  one should add  $\widehat{\beta}_{PE}$  and  $\widehat{\beta}_{DT}$ . If the increase in  $PE$  were instead funded by reducing  $UE$ , then one should subtract  $\widehat{\beta}_{UE}$  from  $\widehat{\beta}_{PE}$ .

The effects of fiscal policies could be nonlinear. For example, perhaps a small amount of non-distortionary taxation is beneficial for SWB, while too much is detrimental. One way of dealing with such nonlinearities would be to include polynomials into the specification. However, given the complication of the government's budget constraint, marginal effects would then become difficult to interpret. Whether, say, more distortionary taxation funded from a reduction in non-distortionary taxation was beneficial for SWB would depend on the existing amount of *both* distortionary and non-distortionary taxation. In addition to the issues of interpretation, we are wary of overfitting the model, and picking up outliers, if we were to estimate such nonlinearities. The same problems present themselves for the fiscal policy and growth literature (discussed above) and we are not aware of papers that deal with both the government's budget constraint and nonlinearities in fiscal policy. Given the difficulties in adequately dealing with these issues we leave analysis of the impacts of such nonlinearities for separate research.

All our equations are estimated using OLS with two-way fixed effects and a suite of personal and macroeconomic controls. As discussed above, fiscal policies are chosen, rather than being randomly assigned. One can think of isolated cases where a shock to most individuals' wellbeing is correlated with shocks to one or more fiscal variables. For instance, even in the absence of any macroeconomic effects, a terrorist attack may lower SWB while raising defence expenditure. Intuitively, however, such examples appear to be isolated, especially once any conduits through macroeconomic conditions are controlled for. At a practical level randomisation of fiscal policy is off the table, and suitable instruments for fiscal policy variables are hard to come by since most variables that are correlated with fiscal policy could also directly affect SWB. Even if one could find instruments that satisfy the exclusion restriction, they would need to be strong, and no strong instruments present themselves. While our study is at least as well identified as the fiscal



policy and growth literature, we still speak of associations or relationships rather than causal connections because we cannot definitively rule out violations of parallel trends.

## 5 Results

As emphasised in the previous section, when estimating the effects of fiscal categories on wellbeing (or growth), none of the fiscal coefficients can be interpreted in isolation. To aid comparisons of coefficients with each other, we plot the estimated coefficients graphically together with their 90% confidence intervals. Detailed regression tables for Figure 1 and Figure 5 can be found in the appendix.<sup>25</sup>

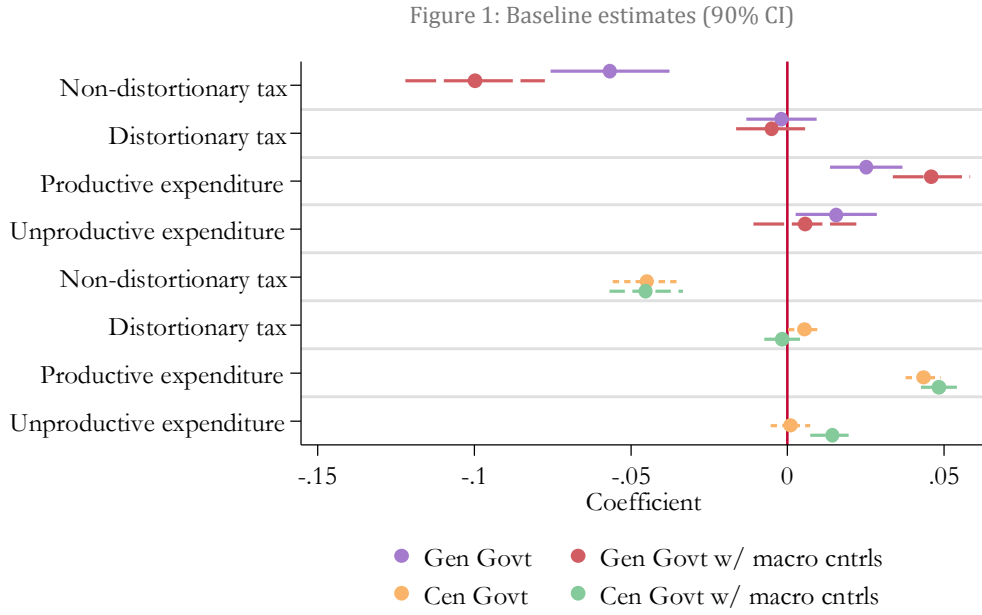
### 5.1 Baseline Results

Figure 1 plots the coefficients from four different regressions. The top set of results (i.e. the first four listed fiscal categories) uses the general government data as our fiscal variables,  $F$ , whilst the bottom set of results use the central government data. A coefficient of zero implies that an increase in that variable has the same effect on SWB as the omitted category – the surplus. For each regression, we present results without macroeconomic controls (the upper of each pair) and with the inclusion of macroeconomic controls to show whether results are sensitive to their inclusion. All regressions contain the controls for personal characteristics.

In all four regressions, distortionary taxes are associated with higher subjective wellbeing than non-distortionary taxation, and productive expenditures are associated with higher subjective wellbeing than unproductive expenditures. Adding macro controls makes very little difference to the results: non-distortionary taxation appears to be worse for SWB when macro controls are added to the general government regression, but the effect is imprecisely estimated (as evidenced by the wide confidence intervals), and the point estimate hardly changes when macro controls are added to the central government regression.

The magnitude of the coefficients shows the SWB effect of a 1 percentage point-sized change in the fiscal variable (funded by changing the surplus) as a proportion of GDP. The differences between different tax and expenditure estimates are economically meaningful. For example, reducing distortionary taxation by 10 percent of GDP funded by a same sized rise in non-distortionary taxation is associated with an approximate 0.6 unit rise in SWB, about 25% of a standard deviation. This effect is larger than the (transitory) effect of getting married found in Clark *et al.* (2008), and it is enough to move a country's subjective wellbeing rank from around 15<sup>th</sup> out of the 34 OECD countries to about 5<sup>th</sup>.

<sup>25</sup> The non-parametric estimates in Figure 2-Figure 4 have too many coefficients to be usefully presented in a table; the coefficients and p-values for the linear interaction terms are shown within the figures.



## 5.2 Differential effects of fiscal policy

We examine whether the impacts of fiscal policy on SWB vary according to income and political persuasion. Noting the similarity of results above using central and general government definitions, and given the larger sample size afforded by the central government dataset, we estimate these equations based on the central government data. All results in this section include all macro and personal controls.

### 5.2.1 Income

With progressive income taxes, higher income earners pay a higher percentage of their income in income tax than low income earners, while under consumption taxes poorer people pay a higher percentage of their income than high income earners (assuming that poorer people save less). Given these differences in incidence, we explore whether people at different parts of the income spectrum have different SWB responses to the various fiscal categories.

We examine these effects in two ways. First, we treat income as a continuous variable and interact it linearly with each fiscal category. Second, we treat income as a categorical variable and interact each income category with each of the four main fiscal policies  $F_M$  as in equation (5):<sup>26</sup>

<sup>26</sup> Recall, as discussed in Section 3.2, that our income variable is an ordinal measure of a person's relative income within the country and year that they were surveyed.

$$SWB_{i,c,t} = \beta_0 + \beta_2 X + \beta_3 M + \lambda_w + \lambda_c + \lambda_{inc} + \beta_F F + \beta_{int}(\lambda_{inc} \times F_M) + \epsilon \quad (5)$$

This non-parametric approach does not impose any functional form assumption, but has the drawback of decreasing the precision of our estimates.

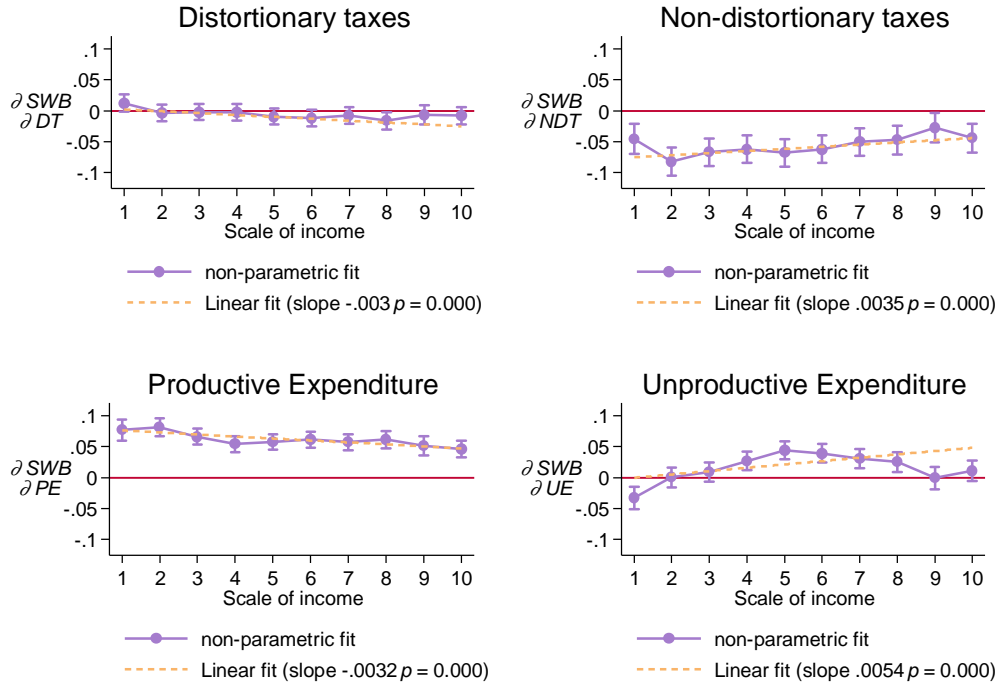
Figure 2 plots the marginal effects of our fiscal variables from both specifications across the ten income ranks.<sup>27</sup> The dashed lines present the marginal effects of the linearly interacted variable, with the slope estimate and its associated p-value displayed beneath each graph. The solid line links the non-parametric estimates (with associated 90% confidence intervals). As expected, our results indicate that distortionary taxation has a more negative effect for higher income earners, and non-distortionary taxation has a more negative effect on lower income earners. Productive expenditure also appears to be favoured by poorer individuals, consistent with Alesina and Rodrik (1994), where productive expenditure especially improves the welfare of unskilled labourers (see Section 2).

The results for unproductive expenditure, which mainly comprises social welfare spending, is found to have most benefit for the middle class and least benefit for poorer people. Indeed, the point estimate for the poorest people is negative. This result is consistent with middle class capture, as in median voter models.<sup>28</sup> An alternative explanation is that this result could reflect the countercyclical nature of unproductive expenditure combined with an assumption that business cycles affect the poor the most and the middle class the least. To minimise this potential source of bias, our estimates include controls for unemployment, investment, inflation, current GDP and lagged GDP, so this alternative explanation would require that these variables do not sufficiently control for the business cycle.

<sup>27</sup> The omitted category is again the surplus. We do not interact the (residual) other revenue or other expenditure categories, though we do continue to include them as controls without interactions.

<sup>28</sup> In median voter models the median voter determines policy. See Hotelling (1929), Black (1948), and Bowen (1943) for the original papers developing the theory. See the section on majority voting in chapter 6 of Stiglitz (1988) for a modern textbook introduction.

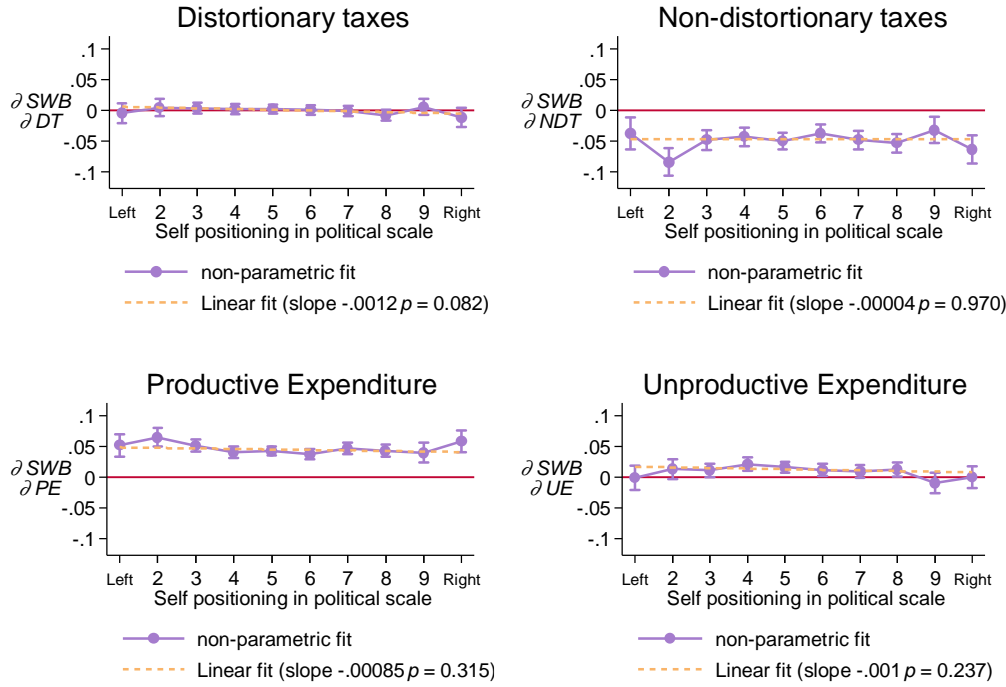
Figure 2: Marginal effects by income group (90% CI)



### 5.2.2 Political orientation

It is possible that fiscal policy affects utility directly through political preferences (ideologies) instead of through the fiscal policy's influence on the real economy ( $h$  and  $c$ ). We examine whether this may be the case. If such a phenomenon were driving our results, we would expect to see different effects of fiscal policy depending on political orientation. We repeat the same interaction procedures as described above for income, but replacing income with people's political orientation. As can be seen from Figure 3, we find the same effect of fiscal policies for people of different political orientations: the slope estimates are smaller than for the income interactions and none are significant at the 5% level (though the interaction with distortionary taxation is significant at the 10% level), while the non-parametric fits reveal no discernible trend.

Figure 3: Marginal effects by self-expressed political orientation (90% CI)



### 5.3 Regions: Heterogeneous settlement size and subnational effects

Our prior results all control for the settlement size of the individual respondent but do not allow the fiscal impacts to vary by settlement size, nor do they test whether national versus subnational fiscal policies have differential effects on SWB. In addition, fiscal policy may affect wealthier countries differently to less wealthy ones and this effect may differ by town size. Here we test each of these region-related aspects.

#### 5.3.1 Settlement size and country income

We investigate whether fiscal policies affect people living in different sized towns and cities in different ways. To do so, we interact the size of a person's settlement with the fiscal policy variables. We test whether these effects may differ according to the wealth of countries by creating a dummy variable (richer/poorer), which splits our sample roughly in half, based on 1990 GDP per capita (using PWT 8.1 definitions of GDP and population). We stress here that our sample does not include developing countries, and that generally the 'poorer' countries are at least middle income.<sup>29</sup> We then interact our rich/poor variable with both fiscal policy and town

<sup>29</sup> 'Poorer' countries in our sample are: Chile, Cyprus, Czech Republic, Estonia, Greece, Hungary, Ireland, Lithuania, Malta, Poland, Portugal, Slovenia, Spain, and the Ukraine. Richer countries in our sample are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Luxembourg, Netherlands, Norway, Sweden, Switzerland, United Kingdom, and the United States.

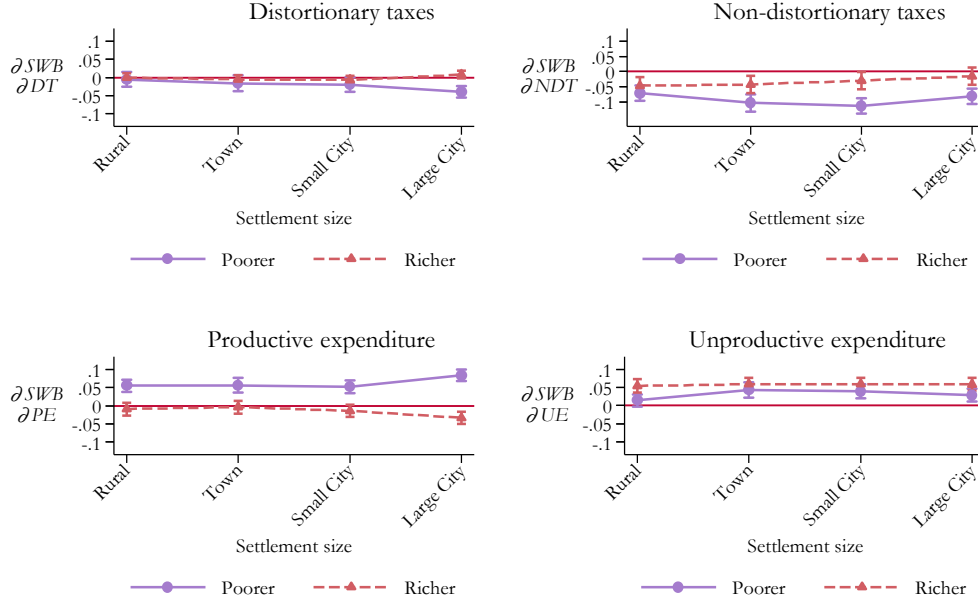
size. This allows the effect of each fiscal variable to differ across the 8 different combinations of country wealth and town size.

The results (again using the central government definitions) are presented in Figure 4. (Linear interactions are not included given the non-linear definitions of settlement size in the data.)

Productive expenditure appears to be more beneficial for SWB in poorer countries, while there is some evidence that non-distortionary taxes are more detrimental in poorer countries. Distortionary taxation appears to have similar effects in both rich and poor countries. Unproductive expenditure has a similar effect on SWB in both rich and poor countries, with only weak evidence for more positive effects in richer countries.

Turning to differences in fiscal policy's influence across town size (i.e. the slope of the lines in Figure 4) we find little variation, with the 90% confidence intervals largely overlapping. There is, perhaps, some evidence for differences in effects of distortionary taxes, and productive expenditure in cities with more than 100,000 people ('large cities'), but care should be taken here for several reasons. Firstly the results differ for wealthier and less wealthy countries; in richer countries the effects of productive expenditure deteriorate in the larger settlements, while in poorer countries the effects of productive expenditure improve in larger settlements. *A priori*, we have no strong reason to suppose this. Relatedly, given the multiple comparisons being made here, deviations like this may occur from chance alone (i.e. a false positive). Finally, the relative incomes of people within a country (rather than the across country differences) are correlated with settlement size, so it is possible that the estimated association found here is driven not by the size of the town *per se* but by the differences in incomes of the people living in these towns.

Figure 4: Marginal effects by settlement size and richer/poorer countries (90% CI)



### 5.3.2 Devolution of fiscal policy to subnational government

We examine the relationship to wellbeing of differences in the degree to which fiscal expenditures and revenues are centralised or decentralised to subnational government. Subnational government is taken to comprise all levels of government below central government (i.e. including both state and municipal governments).

For each fiscal category, we calculated the proportion of general government taxation or expenditure that occurs at the subnational level. The proportion that is subnational is defined as  $1 - \frac{var_{CG}}{var_{GG}}$ , where  $var_{CG}$  is the amount of the fiscal variable reported at the central government level and  $var_{GG}$  the amount reported at the general government level. We investigated other definitions but consider this definition to be the most reliable of those available. For example, we had measures of local and regional government fiscal variables from an alternative data source, which we added to form an estimate of the subnational component,  $var_{SN}$ , allowing us to estimate the proportion subnational as  $\frac{var_{SN}}{var_{CG} + var_{SN}}$  for each fiscal variable. Unfortunately these estimates of subnational government were often implausible (most probably due to double counting of taxes and expenditures in the subnational categories) and, as a result, the corresponding results differ to those presented below.<sup>30</sup> The measure of subnational government that we use has deficiencies as a result of drawing data from different sources that

<sup>30</sup> Our definition of subnational government,  $var_{CG} = 1 - \frac{var_{CG}}{var_{GG}}$ , could also be affected by double counting in the central government variable (i.e.  $var_{CG}$  is overestimated due to part of  $var_{CG}$  truly being subnational). To the extent this is the case it means our estimate of subnational government is too low, and hence our coefficients on  $var_{SN}$  too large in absolute magnitude.

may have slightly different fiscal definitions to each other (and which could include some double counting), explaining why we have isolated country examples where central government is greater than general government within a particular fiscal category. For these reasons, while we have used the best available data, our results in this section should be interpreted with some caution.

We estimated Equation 6, being our baseline equation modified to include terms for the proportion of each variable that is subnational (denoted by the vector  $\mathbf{S}$ ). A non-linear relationship is implied if the optimal level of subnational government is neither 0% nor 100%. We find that a cubic specification best fits the data.<sup>31</sup> Hence our baseline estimation includes  $\mathbf{S}^2$  and  $\mathbf{S}^3$ , vectors whose elements are the squares and cubes of the elements in  $\mathbf{S}$ .

$$SWB_{i,c,t} = \beta_0 + \beta_1 \mathbf{F} + \alpha_1 \mathbf{S} + \alpha_2 \mathbf{S}^2 + \alpha_3 \mathbf{S}^3 + \beta_2 \mathbf{X} + \beta_3 \mathbf{M} + \lambda_w + \lambda_c + \epsilon \quad (6)$$

Figure 5 plots the predicted values from the regression in (6), as each subnational proportion variable is varied between 0 and its 90<sup>th</sup> percentile in the regression sample. For each plot, all other variables are evaluated at their sample means.

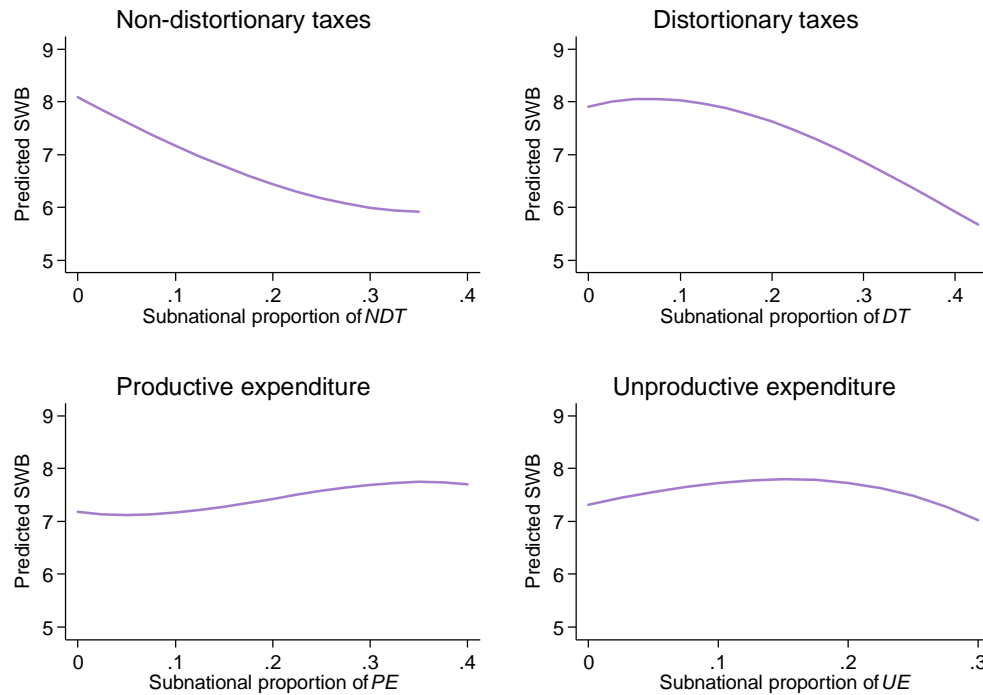
The results suggest that taxation is best done centrally, while expenditure is best done by a combination of central and subnational government. This is consistent with economies of scale being important for revenue raising, and with local knowledge being important for expenditure. In other words, it appears optimal to keep taxation systems simple and centralised, and to allow fiscal expenditures some latitude to reflect local complexities.

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<sup>31</sup> In addition to the cubic specification we estimated the equation with a quadratic specification, as well as linearly. The Akaike criterion, Bayesian information criterion, and adjusted R-square all preferred the cubic specification (see Table 2). All of the cubic terms were significant at the 1% level except for the coefficient on subnational non-distortionary tax, which was significant at the 10% level.



Figure 5: Predicted effects of varying subnational fiscal proportions



## 6 Conclusions

Economic growth is not an end in itself, but instead is a means to greater utility or wellbeing. While the empirical literature on the effects of fiscal policy has hitherto focussed on GDP growth, we have focused on subjective wellbeing – an important measure of people’s overall wellbeing. Our evidence on the relationships between fiscal policy and subjective wellbeing can feed into the decisions of policymakers who have policy goals that extend beyond economic growth.

The small prior literature relating to fiscal policy and wellbeing has focussed on the overall size of government, without addressing how government is financed. We adapt the methodology used in Bleaney, Gemmell and Kneller’s (2001) GDP growth study to explicitly control for the government budget constraint, estimating the relationship between wellbeing and taxation and expenditure shares. In line with the Barro endogenous growth framework and the approach taken by Bleaney, Gemmell and Kneller, we distinguish between the effects of four broad fiscal categories: “productive expenditure”, or government-provided capital; “unproductive expenditure”, or government-provided consumption; “distortionary taxation” such as income taxes and social security contributions; and “non-distortionary taxation” such as VAT. We retain their definitions of these variables to enable comparisons with the prior literature. This study is, to the best of our knowledge, the first in the SWB literature to explicitly consider the

government budget constraint, the first to consider SWB within the context of endogenous growth theory, and the first to examine regional and subnational dimensions of the relationship of fiscal policies with subjective wellbeing.

We use fiscal data from the IMF Government Finance Statistics and the OECD, for 35 countries and 130 country-years. Unlike almost all previous studies, we make use of general government as well as central government data. We combine our fiscal data with over 170,000 individual responses from the World Values Survey and European Values Study and with macroeconomic data from various sources.

We find a number of important relationships, even after including country fixed effects and a suite of macroeconomic and personal controls. First, we find a positive association between SWB and a decrease in non-distortionary taxes funded by an increase in distortionary taxation. Second, we find a positive association between SWB and an increase in productive expenditures funded by a decrease in unproductive expenditures. While we find no material differences across the political spectrum, we do find differences in associations across people of different incomes: Richer people are hurt more by distortionary taxation and less by non-distortionary taxation than poorer people. They also benefit less than poorer people from productive expenditures. The middle class appear to benefit the most from unproductive expenditures, consistent with a theory of middle class capture.

In examining regional issues, we find no material differences in the effects of fiscal policy across people living in different-sized settlements. However, we do uncover important patterns related to subnational versus central government fiscal policies. Most notably, we find a positive association, up to a point, between SWB and an increase in the share of expenditures that are spent subnationally. Additionally, we find a negative association between SWB and an increase in the share of tax revenue raised subnationally. Thus our findings support taxation being a central government function while fiscal expenditures appear to be best provided by a combination of central and subnational governments.

Our estimates control for personal characteristics of the over 170,000 individuals in our sample and control for a suite of macroeconomic circumstances that could independently affect wellbeing. We see no strong reason to expect material reverse causality from subjective wellbeing to fiscal policies or to expect any major sources of omitted variables bias, especially given that we have controlled for macroeconomic conditions. Nevertheless, future research could further examine the extent to which the relationships that we establish are causal and examine the causal pathways through which these relationships act. In particular, our findings regarding the optimal roles for subnational versus central government fiscal policies could prove a fruitful area for further research with an emphasis on uncovering particular categories of expenditures (and taxes) that are best retained at the central government level and those that are best devolved to subnational government.

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# Appendix

## Data

We cleaned the IMF and OECD fiscal data to remove unreliable observations. We explain the most important parts of this cleaning here. Full detail can be found in our code which we have placed on the Motu website ([www.motu.org.nz](http://www.motu.org.nz)).

## Modern vs. Historical GFS

The IMF data from 1972 – 1989 is classified using the ‘historical’ 1986 definitions while the data from 1990 onwards are classified using the ‘modern’ 2001 format. We followed the IMF’s guidelines for reclassifying data from 1986 to 2001 format. The key differences between the historical and modern format is that the historical outlays include gross purchases of capital assets in the relevant COFOG category, while modern only reports *net* purchases of capital in the functional categories. There is no way to convert 1986 expenditure data exactly to the 2001 definition because there is no information to allocate sales of capital assets to the various functions. There are also issues with how revenues of government enterprises and social contributions for government employees are reported. Finally environmental protection is a new category in GFS2001.

In addition the modern IMF GFS statistics include both accrual and cash based definitions of fiscal variables – with neither versions of the variables offering complete coverage. For this reason we use the cash data where possible, and then for the remainder we use the accrual data – modified to be more comparable to the cash data. The modification process is as follows: first we look at cases where we have both the accrual and cash data. Then we calculate the 10% trimmed mean of the ratio of cash to accrual (separately for each variable). Finally the accrual data is multiplied by this (variable specific) ratio.

The OECD data and IMF fiscal data appear to be compiled differently. To make them comparable we use the same method as we did for converting accrual to cash data.

## Dropping of countries with unreliable data

We inspected the fiscal data for all countries in our analysis. Where the data looked unreliable that country was dropped – at least for the period where the data looked unstable. In particular we included most countries where none of their key fiscal variables changed by more than 7 percentage points since last observed (usually the previous year). For countries that had changes larger than 7 percentage points we inspected to see if these changes plausibly reflected real changes rather than just questionable data. For example, our data showed Iceland’s

unproductive expenditure increased by over 10 percentage points of GDP in 2008, but given their massive banking failure that year, such variation is to be expected, and so Iceland is included in our analysis. On the hand, the 15 percentage point increase in NZ productive expenditure as a share of GDP from 2007 to 2009 is judged to be inaccurate data, and so New Zealand is excluded from our analysis. We limit our focus to high and middle income countries excluding low income countries such as India.

## Tables and Figures:

Table 1: Fiscal variable classifications

Symbol	THEORETICAL CATEGORY	IMF FUNCTIONAL CATEGORY
$DT$	Distortionary taxation	Taxation on income and profit Social security contributions Taxation on payroll and manpower Taxation on property
$NDT$	Non-distortionary taxation	Taxes on goods and services
$PE$	Productive expenditures	General public services Defence Education Health Housing Transport and communication
$UE$	Unproductive expenditures	Social security and welfare Recreation Economic services
$OR$	Other revenues	
$OE$	Other expenditure	
$BS$	Budget surplus	We <i>define</i> this as the residual: $DT_t + NDT_t + OR_t - PE_t - UE_t - OE_t \equiv BS_t$

Table 2: Country-level variable summary statistics

	Mean	Median	s.d	Min	Max	Number country-year obs
<i>General Government definitions†</i>						
Distortionary taxation	24.91	24.80	5.92	7.36	37.62	79
Non-distortionary taxation	10.74	11.26	2.73	4.01	15.91	79
Productive expenditures	21.60	22.07	3.58	10.37	29.79	79
Unproductive expenditures	19.39	19.94	4.88	3.09	29.44	79
Other revenues	7.05	6.62	2.79	3.54	18.37	79
Other expenditures	0.12	0.08	0.49	-0.62	3.32	79
<i>Central Government definition††</i>						
Distortionary taxation	18.46	19.06	6.05	4.30	32.10	129
Non-distortionary taxation	9.58	10.58	3.79	0.61	18.74	129
Productive expenditures	17.14	16.65	4.85	5.05	28.47	129
Unproductive expenditures	17.04	17.38	5.23	3.09	31.16	129
Other revenues	4.63	4.16	2.90	1.36	23.12	129
Other expenditures	-0.12	0.00	0.95	-6.11	2.01	129
<i>Macro controls ††</i>						
Inflation (% p.a.)	5.87	3.27	9.14	-1.82	83.99	129
Investment	23.48	23.42	3.64	14.64	32.69	128
Unemployment (% p.a.)	7.58	7.10	3.73	1.70	21.40	127
<i>Proportion of fiscal variable that is subnational government†††</i>						
Non-distortionary taxation	0.12	0.05	0.17	-0.05	0.62	69
Distortionary taxation	0.19	0.15	0.16	0.00	0.54	69
Productive expenditures	0.15	0.13	0.18	-0.18	0.64	69
Unproductive expenditures	0.13	0.13	0.14	-0.31	0.42	69

Notes: The fiscal variables (first two panels) are expressed as a percentage of GDP. Investment is also expressed as a percentage of GDP. All figures rounded to 2 d.p. Figures are based on the country-years that are included in (certain) regressions. † Based on general government sample. †† Based on central government sample. ††† Based on proportion government sample.



Table 3: Individual level variables summary statistics

	mean	median	sd	min	max	N
<i>Subjective wellbeing</i>						
SWB - Central government sample	7.26	8.00	2.05	1	10	110,659
SWB - General government sample	7.26	8.00	2.07	1	10	171,804
SWB - Proportion subnational sample	7.33	8.00	1.98	1	10	93,280
<i>Income scale</i>						
Income - Central government sample	4.83	5.00	2.43	1	10	65,595
Income - General government sample	5.03	5.00	2.53	1	10	110,780
Income - Proportion subnational sample	4.87	5.00	2.39	1	10	51,416
<i>Political scale - 1 = left ;10 = right</i>						
Political scale - Central government sample	5.31	5.00	2.08	1	10	89,527
Political scale - General government sample	5.38	5.00	2.06	1	10	137,087
Political scale - Proportion subnational sample	5.27	5.00	2.03	1	10	74,624
<i>Gender</i>						
Female - Central government sample	0.54	1.00	0.50	0	1	110,617
Female - General government sample	0.54	1.00	0.50	0	1	171,696
Female - Proportion subnational sample	0.54	1.00	0.50	0	1	93,240
<i>EVS vs. WVS</i>						
WVS - Central government sample	0.51	1.00	0.50	0	1	110,659
WVS - General government sample	0.44	0.00	0.50	0	1	171,804
WVS - Proportion subnational sample	0.43	0.00	0.50	0	1	93,280
<i>Age</i>						
Age - Central government sample	46.52	45.00	17.65	15	108	110,378
Age - General government sample	45.56	44.00	17.71	14	108	169,876
Age - Proportion subnational sample	46.94	46.00	17.76	15	108	93,020

Note: Education, and settlement size are also included as controls in our regressions, though (because they are categorical and cumbersome to summarize) they are not included in this table. Age is summarised here as a continuous variable but included in bins in the analysis (see Section 3.2 for details). The N in the last column refers to the number of non-missing observations for that variable, but people with missing values for these personal controls are included in the analysis (with separate missing categories for each variable, again refer to Section 3.2 for more detail).

Table 4: List of countries included in regressions

Country	Central government regression	General government regression	Subnational proportion regression
Australia	1	1	1
Austria	1	1	1
Belgium	1	1	1
Canada	1	1	1
Denmark	1	1	1
Estonia	1	1	1
Finland	1	1	1
France	1	1	1
Germany	1	1	1
Great Britain	1	1	1
Greece	1	1	1
Hungary	1	1	1
Iceland	1	1	1
Italy	1	1	1
Luxembourg	1	1	1
Malta	1	1	1
Netherlands	1	1	1
Norway	1	1	1
Poland	1	1	1
Portugal	1	1	1
Singapore	1	1	1
Slovenia	1	1	1
Spain	1	1	1
Sweden	1	1	1
Switzerland	1	1	1
Cyprus (T)	1	1	0
Japan	1	1	0
United States	1	1	0
South Africa	0	1	0
Argentina	1	0	0
Chile	1	0	0
Czech Rep.	1	0	0
Ireland	1	0	0
Lithuania	1	0	0
Ukraine	1	0	0

Table 5: Baseline regressions

Fiscal definition:	Central Government	Central Government	General Government	General Government
Non-distortionary taxes GG			-0.057*** (0.012)	-0.100*** (0.014)
Distortionary taxes GG			-0.002 (0.007)	-0.005 (0.007)
Productive exp. GG			0.025*** (0.007)	0.046*** (0.008)
Unproductive exp.GG			0.016** (0.008)	0.006 (0.010)
Other rev. GG			0.039*** (0.010)	0.028** (0.011)
Other exp. GG			0.156*** (0.023)	0.159*** (0.024)
Non-distortionary taxes CG	-0.045*** (0.007)	-0.045*** (0.007)		
Distortionary taxes CG	0.005* (0.003)	-0.002 (0.003)		
Productive exp. CG	0.043*** (0.003)	0.048*** (0.003)		
Unproductive exp. CG	0.001 (0.004)	0.015*** (0.004)		
Other rev. CG	-0.005 (0.005)	-0.010* (0.006)		
Other exp. CG	0.009 (0.008)	0.021** (0.008)		
ln_gdppc	1.041*** (0.066)	1.260*** (0.115)	0.758*** (0.140)	0.635*** (0.237)
ln_gdppc (t - 3)		-0.405*** (0.091)		-0.026 (0.240)
inflation		0.002 (0.001)		-0.052*** (0.007)
investment		0.008** (0.003)		0.036*** (0.006)
unemployment		-0.007* (0.003)		0.007 (0.006)
N	171,804	169,900	110,659	110,659
No. of countries	34	34	29	29
No. of country-time obs.	129	127	79	79
Personal controls	YES	YES	YES	YES
Survey wave fixed effects	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES
R squared	0.122	0.124	0.113	0.114

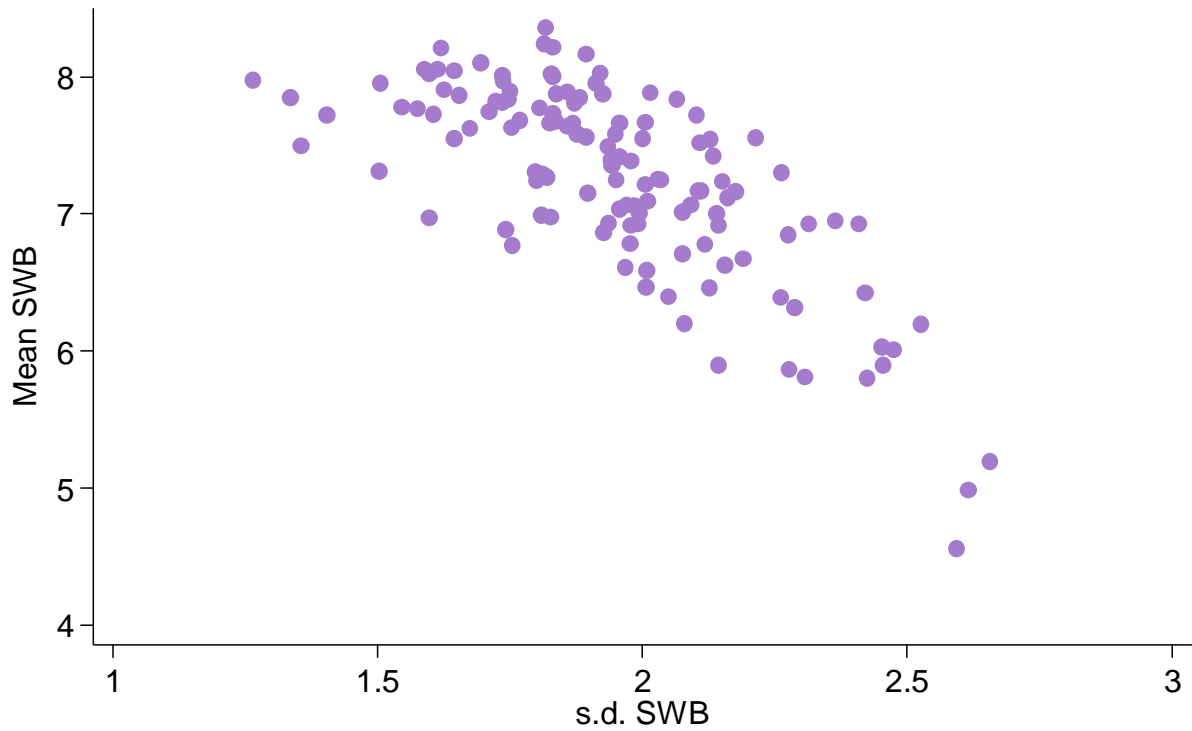
Notes: Robust standard errors in parentheses. Omitted fiscal category is the budget surplus, and hence the statistical significance reported by the stars refer to statistical difference from the surplus. Dependent variable is an individual's subjective wellbeing in all regressions. ln\_gdppc is the natural log of GDP per capita. ln\_gdppc (t - 3) is the natural log of GDP per capita 3 years ago. Personal controls are: age, education, gender, income (as a scale), political orientation, a dummy for survey type, and settlement size (see section 3.2 and Table 3 for more details on these). Stars denote: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 6: Subnational government regressions

	(1)	(2)	(3)
Non-distortionary taxes GG	-0.166*** (0.021)	-0.143*** (0.022)	-0.140*** (0.024)
Distortionary taxes GG	0.023** (0.010)	0.031*** (0.010)	0.038*** (0.012)
Productive exp. GG	0.041*** (0.010)	0.021** (0.010)	0.018 (0.011)
Unproductive exp.GG	0.005 (0.013)	0.047*** (0.015)	0.037** (0.017)
Other rev. GG	0.030* (0.016)	0.090*** (0.019)	0.082*** (0.020)
Other exp. GG	0.258** (0.114)	0.285** (0.116)	0.291** (0.124)
subnational proportion of <i>NDT</i>	-1.148*** (0.304)	-6.275*** (0.870)	-9.737*** (1.520)
(subnational proportion of <i>NDT</i> )^2		8.768*** (1.256)	4.038 (7.152)
(subnational proportion of <i>NDT</i> )^3			17.348* (9.214)
subnational proportion of <i>DT</i>	0.535 (0.518)	0.695 (1.138)	4.413* (2.273)
(subnational proportion of <i>DT</i> )^2		-3.905** (1.785)	-34.953*** (8.923)
(subnational proportion of <i>DT</i> )^3			28.685*** (10.326)
subnational proportion of <i>PE</i>	0.195 (0.368)	-1.040** (0.490)	-2.362*** (0.522)
(subnational proportion of <i>PE</i> )^2		0.187 (1.418)	26.730*** (3.504)
(subnational proportion of <i>PE</i> )^3			-43.822*** (5.347)
subnational proportion of <i>UE</i>	-0.77 (0.487)	-0.291 (0.551)	5.118*** (0.953)
(subnational proportion of <i>UE</i> )^2		-4.346** (1.766)	-5.275*** (2.041)
(subnational proportion of <i>UE</i> )^3			-50.205*** (7.628)
N	93,280	93,280	93,280
No. of countries	25	25	25
No. of country-time obs.	69	69	69
Macro controls	YES	YES	YES
Personal controls	YES	YES	YES
Survey wave fixed effects	YES	YES	YES
Country fixed effects	YES	YES	YES
R squared	0.103	0.104	0.105
Adjusted R squared	0.102	0.103	0.104
Akaike information criterion	382,521	382,479	382,400
Bayesian information criterion	383,342	383,338	383,297

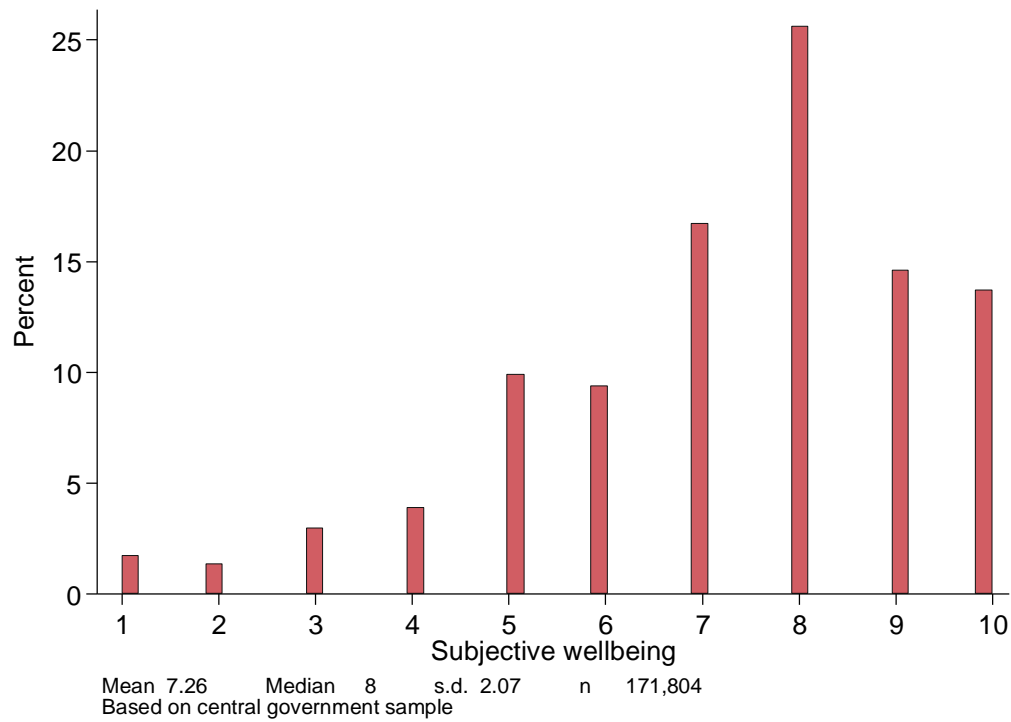
See notes to Table 1.

Appendix Figure 1: Scatter plot of mean SWB vs. s.d. SWB



Each point represents a country-year observation.  
Only plots country-year observations used in base central government regression.

Appendix Figure 2: Histogram of SWB



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