Happiness and Government:
The Role of Public Spending and Public Governance

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Abstract

We explain total life satisfaction using Wave 5 of World Value Survey data covering 58 countries/jurisdictions with a regression to estimate optimal government spending for healthcare, education, and total government spending by maximizing wellbeing. We find that the average of total public spending for countries of good public governance is almost identical to the average of estimates of optimal total public spending, which stands at 36.85% of GDP. We also find significant over-spending or under-spending for individual countries. Optimal spending on healthcare and education increases with population aging. Per capita GDP reduces optimal healthcare spending but increases optimal education spending as a percentage of GDP.

1. **Introduction:**

Governments affect people's lives. But do they enhance or undermine people's quality of life? Countering arguments that governments usually interfere with free markets and create inefficiency, Benjamin Radcliff (2013) presented evidence that bigger governments, particularly those that offer generous social safety nets, free people from anxiety and make them happier. Ott (2015) found his statistical evidence convincing, in line with an earlier result from Blanchflower and Oswald (2007) who discovered that while in the US the well-being of successive birth-cohorts had gradually fallen through time, in Europe, where the social safety net is far more comprehensive and where tuition fees at colleges are mostly non-existent, newer birth-cohorts were happier. Blanchflower and Oswald noted that cohort effects were not only statistically significant, but also big quantitatively.

But Radcliff studied only 21 traditional member states of the OECD. All of these countries have relatively high government quality, as indicated by the World Bank's public governance indicators. Radcliff's positive results need not apply to countries with low-quality governments. The quality of government and the type of government spending may well have a far greater impact on citizen welfare than the quantity of spending. In particular, governments with good governance are more accountable to people and therefore more likely to direct public spending to serve their citizens. We expect, in general, that people have more trust in governments with good governance. Optimal spending tends to be higher with such governments. In this paper, we will estimate the optimal total government spending, optimal public sector healthcare and education spending based on the maximization of total life satisfaction, and show that this is indeed the case.

Ott (2010) extends the work of Helliwell and Huang (2008) and found that for his dataset for

127 countries, "technical quality" of governments, which is based on Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption, correlates with happiness across all countries, while "democratic quality," which is based on "Voice and Accountability" and "Political Stability", only correlates with happiness in richer nations.[2] This is similar to what Helliwell *et al.* (2014) found in a more recent study. Helliwell *et.al.* (2014), using Gallup World Poll data on 157 countries from 2005-2012, showed that changes in the technical quality of government, but not "democratic quality", are significantly and positively correlated with changes in well-being.[3] Like Ott, they also found that democratic quality does have a positive and significant effect on life evaluations for rich countries. For poor countries, the effect of democratic quality is not noticeable.[4]

Kim and Kim (2012) found that small and good-quality government is the most preferred form of government. The next preferred is "good and big government," followed by "bad and small government," while the worst is "big and bad government." We find evidence that these conclusions are about right: a government can be too big, even for one that is of high quality.

While some authors (e.g., Bjornskov et al., 2007) pointed to the disadvantage of government consumption, Ng (2000) pointed to the possible disadvantage of private consumption: inefficiency could arise because of relative competition, materialistic bias, and environmental damage caused by most production and consumption (cf. Frank 2008, Wendner & Goulder 2008). In general, even if government spending brings benefits, it must be funded and therefore involves costs. Based on diminishing returns of spending and the rising marginal cost of revenue, theory suggests that after controlling for the quality of government an optimal

[2] These are sub-indices of the World Bank's Worldwide Governance Indicator. See http://info.worldbank.org/governance/WGI/index.aspx#home

[3] Technical quality is reflected in "delivery quality of government services" which is measured by the average of separate measures for government effectives, regulatory quality, rule of law and control of corruption.

[4] They defined poor countries as those with a per-capita GDP less than a quarter of the US level and rich countries as those above that level.

spending level would exist. Moreover, optimal government spending is expected to vary from country to country, depending on such things as demography, stage of development, etc. We will try to identify how optimal government spending varies with such and other factors.[5]

In order to correctly identify the effects of government spending on welfare, we build a statistical model that controls for the quality of government, as well as a host of other factors, such as relative incomes (income deciles) and demographics.[6] Moreover, given that total life satisfaction is in part affected by people's disposition, we test the effects of mental quality by introducing variables that can proxy "mental capital." Mental capital refers to people's psychological disposition, which is the joint result of genetic, cultural and educational influences, in particular mental habits formed over the years.[7](Cooper, 2009, Weehuizen, 2008) In the psychological literature, compassionate love, wisdom, resilience, and purposeful living have been shown to be positively associated with wellbeing (Kim and Hatfield, 2004; Le, 2010; Mayordomo, *et.al.,* 2016; and Reker, *et.al*., 1987). Given that both "intrinsic" and "extrinsic" factors determine a person's subjective well-being (Ho, 2014), a statistical model that ignores the intrinsic factors is subject to misspecification. Since culture does have systematic effects on people's dispositions and lifestyles, conceptually mental quality variables should outperform country dummies in explaining total life satisfaction. While countries by virtue of their shared cultures and heritages will also have systematic effects on people's dispositions, people's dispositions are not completely determined by country-based cultures and heritages. As is shown in **Tables 1 & 2**, although the Adjusted R Square improved after adding country dummies, the effect of health spending/education spending is reversed and it is not possible to

[5] This point was raised by John Helliwell in a communication.
[6] Easterlin(2001) shows that material goods enhance subjective well-being at least partly through perceptions of relative well-being formed by "social comparison."(p.480) Our empirical results consistently show that indeed income deciles have significant effects on subjective well-being.(Easterlin, 1973, 1974).
[7] For a discussion of mental habits in psychology, please see this article and the references thereof in *Psychology Today*: https://www.psychologytoday.com/blog/the-mindful-self-express/201509/6-mental-habits-will-wear-you-down

generate optimal spending.

Section 2 outlines the theory and methodology of the estimations. **Section 3** describes the dataset that we use. **Section 4** presents the results of the estimations. **Section 5** presents the Monte Carlo simulation results that offer estimates of the confidence intervals of our estimates. Finally, **Section 6** offers further discussions and conclusions. In the Appendix, **Table 11** compares actual with estimated optimal health, education, and total spending for the sampled countries. As we can see, there are significant variations of optimal spending levels from country to country and significant deviations of actual from optimal spending for many countries.

2. The Theory and the Methodology

Most empirical studies on the determination of subjective wellbeing take happiness as dependent on uncontrollable circumstances and other uncontrollable factors such as genetics (Blanchflower and Oswald, 2007; Blanchflower and Oswald, 2011, Kim and Kim, 2012, Minkov & Bond, 2016). However, researchers are generally aware of the effects of voluntary factors on happiness. Martin Seligman, for example, proposed his now well-known formula for happiness: H=S+C+V, where H, the "Enduring level of Happiness", depends on S, the "Set range", which defines the range within which a person's happiness generally rises or falls and which is largely inherited; C, which represents life Circumstances; and V, which represents factors under Voluntary control. But notwithstanding a large literature testifying how life satisfaction can be enhanced by kicking bad habits and developing good ones (Duhigg, 2014, Jast, 2016), voluntary factors are seldom incorporated into empirical happiness studies. A well-known UK study (Government Office for Science, UK, 2008), defines mental capital as "the totality of an individual's cognitive and emotional resources." "It includes their cognitive ability, how flexible and efficient they are at learning, and their 'emotional intelligence', such

as their social skills and resilience in the face of stress. It therefore conditions how well an individual is able to contribute effectively to society, and also to experience a high personal quality of life."[8] By implication, this will affect a person's happiness. Habit formation is evidently linked to cultures, as people from the same culture often follow similar ways of life and share many similar habits. Srivastava, et.al. (2003) also confirmed that personality traits can change. The Foresight Report has recommended "five ways to mental wellbeing and they all relate to good habit formation[9]. Ho (2013) suggests that love, wisdom, resilience, and purposeful living are all related to habit formation, and in this sense constitute part of mental capital that is crucial for mental health and wellbeing. An interesting question is: if mental health and mental capital are so important to happiness, why not let governments focus on nurturing this ability instead of focusing on optimal government spending. While investing in mental health and nurturing mental capital is indeed important, the law of diminishing returns still applies. There does therefore still exist an optimal level on every kind of spending, given whichever level of spending on promoting mental health. Thus the search for what constitutes optimal government spending remains pertinent and important.

We propose to identify the formula for optimal government spending using the econometric method and mathematical optimization. We first regress subjective well-being, as measured by total life satisfaction, against three categories of variables: (a) mental capital variables, (b) socio-economic and demographic variables, and finally (c) government quality and government spending variables (total government spending, government healthcare spending, and government education spending). Country dummies are generally included to control country "fixed effects" in all 2 Stage Least Square estimations, for which we use the dependency ratio as the Instrumental Variable to control for possible endogeneity effects. In addition, we also

[8] *Foresight Report: Mental Capital and Well-being*, Government Office for Science UK, Executive Summary, 2008, p.10.
[9] The five include "Connect, Be Active, Take Notice, Keep Learning, and Give."

attempted OLS estimations, and we found that for OLS regressions, including mental capital variables and dropping the country dummies often allows us to get very reasonable results, including the result that optimal healthcare (government) spending will increase with a higher percentage of elderly in the population. This effect is statistically significant, but for the 2SLS regression, a key interactive variable involving the elderly ratio is incompatible with our Instrumental Variable and had to be dropped.

We estimate optimal government spending (expressed as a percentage of the GDP[10]) by maximizing total life satisfaction (equation [1]) with respect to various types of government spending including total government spending.[11] The variable *share* is the government spending share in the GDP, *mage* is the median age of the population, *gdppc* is the per capita GDP, and *WGI* is World Bank's Worldwide Governance Indicator, we can write:

$$TLS = a + b\,share + c\,share^2 + d\,share.mage + e\,share.gdppc + f\,share.WGI + \boldsymbol{x}.\mathbf{X} + u \qquad [1]$$

where *TLS* is the Total Life Satisfaction of each respondent, **X** is a vector of control variables including the mental capital variables and the socio-economic variables other than government spending, and *u* is the random error.

To maximize TLS, the first-order condition is that the first derivative of equation [1] with respect to *share* has to be equal to zero. The second-order condition is that the second derivative should be negative. This means b should be positive and c should be negative if optimal spending exists. If the second-order condition is satisfied, from the first-order condition we

[10] 5% will be expessed as 0.05.

[11] We thank Avinash Dixit for suggesting this method, which is more neat than the iterative method that the first author first used. Altunc, O.Faruk and Celil Aydin (2013) also used this method, but the dependent variable was GDP growth and not subjective well-being.

have:

$$b + 2c\ share + d\ mage + e\ gdppc + f\ WGI = 0$$

Transposing, we derive optimal share as:

$$-b/2c - (d/2c)\ mage - (e/2c)gdppc - (f/2c)WGI. \qquad [2]$$

For finding optimal (government) healthcare spending, we add the interactive variables *health.edu* (interact with government spending on education), *health.mage* (interact with median age of the population), *lifeexpectancy* (interact with the life expectancy of the population), *health.elderly* (interact with the percentage of elderly over 65 in the population), *health.gdppc* (interact with per capita GDP) as well as *health.WGI* (interact with the World Bank governance index) to the Total Life Satisfaction equation:

$$TLS = a + b\ health + c\ health^2 + d\ health.mage + e\ health.lifeexpectancy + f\ health.elderly + g\ health.gdppc + h\ health.WGI + i\ health.edu + \boldsymbol{x}.\mathbf{X} + u \qquad [1']$$

so optimal healthcare spending is calculated as:

$$health* = -b/2c - (d/2c)\ mage - (e/2c)\ health.lifeexpectancy - (f/2c)\ health.elderly - (g/2c)\ health.gddppc - (h/2c)WGI. - (i/2c)\ edu \qquad [2']$$

The interpretation of the meanings of the coefficients will be given full discussion in Section 6

In line with Ott (2010), Helliwell and Huang (2008), Helliwell *et.al.*(2014) and Frey *et.al*. (2001, 2002, 2004) we expect h to be positive. This reflects the positive effects of good governance on trust and wellbeing. A government with a high governance score has people's trust to spend more. It is possible though perhaps not so likely, however, that with better governance government spending may be more efficient so h may be negative. We generally would expect optimal health spending (public) (as a % of GDP) to rise with aging because older people will need more healthcare and more social services. However, it turns out that the median age of the population in a country may not be a good indicator of aging, as the average of the median age in our sample is a mere 30.1. An increase in the median age is therefore more like more people moving into prime age. So d is likely to be negative. A better indicator of aging would be the percentage of elderly aged 65 and above in the population and life expectancy, since a population with low life expectancy will not have many truly old in the population. So we include the interactives *health.elderly* as well as *health.lifeexpectancy* and expect both of their coefficients should be positive. If public education spending (*edu*) reduces optimal healthcare spending, the coefficient on *health.edu* would be negative, but if education makes people value health more, the effect may be positive. The interactive variable for health spending with per capita GDP will test the effect of the stage of economic development on healthcare spending. Again the coefficient could be positive or negative. It would be positive if people with higher incomes value health more and prefer higher government spending on healthcare (a "superior good" effect). It would be negative if the effect of 1% of higher income being absolutely much higher than 1% of lower income dominates the "superior good" effect.

Similarly, we will optimize the share of education public spending and the share of overall public spending[12] in turn. It is not possible to obtain meaningful results if all these three "share"

[12] We use public spending and government spending interchangeably, even though some jurisdictions

variables are included in one equation.

3. **The Data**

In this paper, we use data from the 5th wave of the World Value Survey (2005-2009). This data may seem outdated, but we have little choice as data on key mental variables are not available for the more recent waves. We use the individually reported life satisfaction score (scale 1 to 10) in WVS as the dependent variable. We only include countries in the top 75% of the WGI ranking, largely because countries with very low WGI often suffer from multiple problems, to the extent that the data may not even be reliable because sampling could be problematic.

To capture the effects of a person's mental disposition on happiness, we select some variables from the WVS that may reflect and proxy aspects of mental capital and have been shown to correlate strongly with subjective well-being in previous studies (Ho, 2012, 2014). The signs of the estimated coefficients of these mental capital variables are all correct and statistically significant. Making the assumption that people's wellbeing is affected by the cumulative effects of government spending, we take the average spending ratio over the years of conducting relevant survey (2004-2009 for wave 5).

The World Bank provides Worldwide Governance Indicators (WGI) which cover six domains of governance including control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law, and accountability. We rescale the WGI to 0 to 5. We treat all public spending as government spending,[13] and this is expressed as a percentage of GDP. Data sources and variable definitions are listed in **Table 9** (World

differentiate the two, with government spending excluding spending by non-government public bodies.

[13] In some jurisdictions agencies outside the civil service framework take charge of specified spending, yet the funding comes from the government.

Value Survey data) and **Table 10** (all other variables).

In addition, among explanatory variables, we include age (and the square of age, to capture non-linear effects of age), gender, education attainment, marital status (married, divorced, separated, or widowed, against the benchmark of being single), employment status (part-time employed, self-employed, retired, housewife, or student, against the benchmark of being in full-time employment), income decile, subjective financial satisfaction.

4. Results:

As explained above, we first included country dummies along with all the other control variables, but we discovered that including country dummy variables could confound the effects of key explanatory variables, and the sign requirements for the key variables in order to identify optimal spending may be violated. In the end we dropped all country dummies, which is justified under the consideration that mental quality variables are included, since cultural and value differences from country to country are key components of the fixed effects. Given that within each country mental quality variables may still vary from person to person, we argue that including the mental quality variables is actually superior to using country dummies. Our regression results support this conjecture.

Let us first look at **Table 1**, which includes the estimated coefficients of key variables that matter to optimal healthcare spending. This is an OLS estimation. As column 3 and column 4 show, when country dummies are included the first order condition for maximization is violated. We observe that adding mental variables does not make much difference to the estimated coefficients as well as the optimal healthcare spending estimated at the mean values of the key parameters in the algebraic expression, which is 6.2% or 6.3% of the GDP. In both cases, the quality of governance is positive for healthcare spending by the government. An increase in

the median age reduces optimal healthcare spending, but an increase in the elderly population ratio raises it. Given that the average value of median population age is only about 30, an increase in the median age in our sample probably depicts an increase in the prime age population. An increase in life expectancy increases optimal healthcare spending because the absolute number of elderly people who need medical care will increase.

Table 1: Key Coefficients in OLS Regression on Total Life Satisfaction (wgi top 75% sample) To Estimate Optimal Public Spending on Healthcare

	Only Socio Economic and Demographic Variables	**Col.1+Mental Capital Variables Only**	Col.1+Mental Capital Variables +Country Dummies	Col.1 + Country Dummies Only
	(1)	**(2)**	(3)	(4)
Adjusted R Square	0.343	**0.337**	0.368	0.369
health	42.69533***	**33.85459*** **	-676.008***	-425.7426***
	(9.44)	**(6.60)**	(-18.03)	(-14.24)
health2	-495.6282***	**-458.294*** **	2002.608***	1037.806***
	(-16.25)	**(-13.17)**	(10.70)	(8.03)
health.wgi	3.097429***	**3.383047*** **	103.2262***	66.51776***
	(4.24)	**(3.77)**	(17.15)	(12.76)
health.mage	-2.190169***	**-2.201599*** **	6.196588***	3.766159***
	(-13.66)	**(-11.96)**	(12.45)	(8.35)
health.life_expectancy	1.011772***	**1.019595*** **	2.785479***	2.061276***
	(17.24)	**(15.12)**	(9.54)	(7.85)
health.elderly_population	48.10464**	**89.90769*** **	-1108.677***	-795.0763***
	(2.75)	**(4.65)**	(-17.98)	(-14.52)
health.edu	2.366105	**7.346916**	-1966.3***	-652.4154***
	(0.10)	**(0.28)**	(-16.31)	(-10.11)
health.gdppc	-0.0000206	**-.0000684***	-.002048***	-.0017241***
	(-0.90)	**(-2.48)**	(-15.79)	(-14.19)
Optimal Spending estimated at the mean values of the key parameters	6.2%	**6.3%**	N.A.	N.A.

Table 2: Key Coefficients in 2SLS Regression on Total Life Satisfaction (top 75% for *wgi* sample) To Estimate Optimal Public Spending on Healthcare				
	Only Socio Economic and Demographic Variables (1)	**Col.1+Mental Capital Variables Only (2)**	**Col.1+Mental Capital Variables +Country Dummies (3)**	**Col.1 + Country Dummies Only (4)**
Adjusted R Square	0.318	0.303	0.345	0.351
health	113.1479***	109.4097***	278.1963***	283.0144***
	(14.36)	(11.83)	(10.97)	(12.95)
health2	-483.1018***	-242.3083	-1810.044***	-1826.766***
	(-5.75)	(-1.82)	(-10.88)	(-13.19)
health.wgi	-9.463168***	-12.1709***	-55.1943***	-53.19549***
	(-5.70)	(-5.20)	(-8.01)	(-9.10)
health.mage	-2.871601***	-3.163548***	-2.212307***	-2.53916***
	(-13.39)	(-11.87)	(-6.37)	(-7.57)
health.life_expectancy	1.855432***	2.103776***	2.127705***	2.15516***
	(20.54)	(16.15)	(10.11)	(10.74)
health.elderly_population	-131.3472***	-129.5286***	Dropped by Computer system	Dropped by Computer system
	(-4.35)	(-3.98)		
health.edu	-357.3505***	-392.985***	-25.60137	-97.1478
	(-7.77)	(-7.28)	(-0.24)	(-1.10)
health.gdppc	.0000249	-.0000802	.0009551***	.001015***
	(0.78)	(-1.80)	(7.58)	(9.17)
Optimal Spending estimated at the mean values of the key parameters	10.4%	19.5%	5.8%	5.8%

Note: Coefficients printed in RED indicate wrong sign or unreasonable estimates.

Table 2 presents the results for optimal health spending using 2 Stage Least Squares, with the young dependency ratio as the Instrumental Variable. Both first order and second order conditions for the maximization are all satisfied in all four models. However, the results are quite unreasonable, suggesting that the 2SLS specification may be problematic. We observe first that the estimated optimal healthcare public spending is more than 10% if we do not include country dummies. By including country dummies, adding or dropping the mental capital proxies will not make any difference to the estimated optimal spending, which is 5.8%, estimated at the mean values of the key parameters. But better public governance is associated

with smaller optimal healthcare spending, which is difficult to explain. What is most unacceptable is that the elderly population ratio & healthcare spending interactive variable has to be dropped due to multicollinearity. This is not acceptable, as we do need to identify how population aging affects optimal healthcare spending. We propose to opt for the OLS results for healthcare spending.

Unlike healthcare spending, for Education Spending and Total Government Spending, we found that 2SLS results are noticeably better than OLS results, which all violated the first order conditions. We will present first the 2SLS results for estimating optimal Education Public Spending in **Table 3**.

Table 3 : 2SLS Regression on Total Life Satisfaction(wgi top 75% sample) To Estimate Optimal Education Public Spending

	Only Socio Economic and Demographic Variables **(1)**	**Col.1+Mental Capital Variables Only** **(2)**	**Col.1+Mental Capital Variables +Country Dummies** **(3)**	**Col.1 + Country Dummies Only** **(4)**
Adjust R Square	N.A.	**N.A.**	0.361	0.366
eduspending	2614.755***	**814.8714*** **	6.683227	12.68045
	(5.52)	**(9.06)**	(0.10)	(0.23)
eduspending2	-31896.7***	**-9992.856*** **	-1857.195***	-1913.047***
	(-5.55)	**(-9.37)**	(-4.33)	(-4.88)
edu.wgi	47.0008***	**10.58553*** **	31.97097***	32.56882***
	(5.81)	**(8.79)**	(4.28)	(5.15)
edu.mage	-18.83886***	**-5.285446*** **	.1428929	.0777204
	(-5.53)	**(-8.79)**	(0.55)	(0.31)
edu.life_expectancy	1.055899***	**.5383584*** **	.9399081*	.9307215**
	(6.33)	**(8.19)**	(2.38)	(2.73)
edu.elderly_population	1298.427***	**400.7447*** **	-173.3558	-192.29*
	(5.29)	**(7.60)**	(-1.66)	(-2.31)
edu.gdppc	.0038536***	**.0013524*** **	-.0007924***	-.0007756***
	(5.32)	**(8.04)**	(-4.28)	(-4.98)
Optimal Spending	3.8%	**3.9%**	3.9%	3.9%

Note: Red indicates coefficients with unacceptable statistical significance or coefficients with unreasonable signs.

Since both first order and second order conditions are all satisfied, optimal education public spending can be estimated, and they are all very similar, at 3.8% or 3.9%. With country dummies added, unfortunately, the coefficient on education public spending is statistically insignificant for both Model 3 and Model 4, while adding mental capital variables improve the statistical significance of all estimated coefficients. We naturally opt for Model 2, i.e., dropping country dummies but adding mental capital variables.

Table 4 : 2SLS Regression on Total Life Satisfaction(wgi top 75% sample) To Estimate Optimal Total Public Spending				
	Only Socio-Economic and Demographic Variables (1)	**Col.1+Mental Capital Variables Only (2)**	**Col.1+Mental Capital Variables +Country Dummies (3)**	**Col.1 + Country Dummies Only (4)**
Adjust R Square	0.321	0.321	0.363	0.368
govt	15.11135***	**14.56165*** **	-10.41283**	-7.919909*
	(9.10)	**(7.46)**	(-2.83)	(-2.22)
govt2	-34.22214***	**-31.63582*** **	-12.60668***	-14.06563***
	(-10.33)	**(-8.64)**	(-3.50)	(-3.94)
govt.WGI	1.916636***	**2.023118*** **	4.159368***	4.164512***
	(15.48)	**(13.21)**	(9.43)	(10.06)
govt.mage	-.016885	**.0061139**	.2718468***	.2567445***
	(-0.67)	**(0.27)**	(6.39)	(6.41)
govt.life_expectancy	.0878512***	**.0730991*** **	.1023157***	.090238***
	(11.93)	**(9.15)**	(4.10)	(3.83)
govt.elderly_population	-16.49204***	**-20.92893*** **	-60.40283***	-60.17465***
	(-3.63)	**(-5.62)**	(-10.86)	(-11.44)
govt.gdppc	-.0000401***	**-.0000482*** **	-.000129***	-.0001246***
	(-10.75)	**(-10.73)**	(-14.04)	(-14.62)
Optimal Spending	35.7%	**36.8%**	N.A.	N.A.

Notes: t statistics of estimated coefficients are in parentheses. Models 3 and 4 with country dummies fail to meet the first order condition. *** p<0.01 ** p<0.05, * p<0.1.

Table 4 shows the results of a TLS regression designed to estimate optimal total government spending. Whereas adding country dummies rendered the coefficient on education public spending insignificant while retaining the correct sign needed for optimization, in the equation with total government spending as an explanatory variable, the first order condition for optimization is violated. The coefficient estimates with and without the mental variables are not that different, and the estimates for optimal total government are also quite close. Given that in the regression to estimate optimal education spending, adding the mental variables greatly improved the statistical significance of the estimates, for coherence we would take Model 2, with the Mental Capital Proxies included.

Now that we have identified the statistical models for the estimation of optimal spending, we present the corresponding full results on the respective regressions. **Table 5** corresponds to **Table 1**. **Table 6** corresponds to **Table 3**. **Table 7** corresponds to **Table 4**. We can see that all the mental capital proxy variables carry the expected signs and are always statistically significant. The mental capital proxies are picked from the WVS Wave 5 questionnaire according to the framework discussed in Ho (2014), namely following the Love, Insight, Fortitude, and Engagement framework. Under Love are variables that indicate taking family as important, taking friends as important, and taking caring for others as important. Under Insight are variables that indicate one's attitude toward money, which is only a means and not an end and therefore treating being rich as not so important; and that indicates acknowledging the importance of looking after the environment and thus understanding the need for sustainable development. Under Fortitude are two variables, with F_Workhard indicating a belief that working hard will pay in the long run, and F_Faith indicating a faith that one can shape one's future in the long run. Under Engagement are two variables, with E_Creative indicating that one is actively seeking to be creative and E_Lifegoal indicating one has clear life goals. One aspect of wisdom is humility. Given that the WVS questionnaire does not have a question

directly related to humility, ***God_Important*** is taken as a proxy to reflect whether or not the respondent understands his limitations and realizes that one has to be humble.

Table 5: OLS Regression on Total Life Satisfaction to Identify Optimal Public Spending on Healthcare (full regression results)

		Coefficient	t	P>|t|	Statistical Diagnostics	
Public Spending and Interactive Variables	***health***	33.85459	6.6	0	Number of obs	44,528
	health2	-458.294	-13.17	0	F-statistic	721.6
	health.wgi	3.383047	3.77	0	R Squared	0.3417
	health.mage	-2.201599	-11.96	0	Adjusted R-squared	0.3412
	health.life_expectancy	1.019595	15.12	0	Mean of Dep Var.	6.866
	health.elderly_population	89.90769	4.65	0	S.D. Dep. Variable	2.231
	health.edu	7.346916	0.28	0.78	SE of regression	1.8112
	health.gdppc	-0.0000684	-2.48	0.013	Sum squared resid.	221716.66
Mental Capital Variables Of Each Individual	***L_FamImp***	0.052925	5.93	0		
	L_FriImp	0.016419	3.97	0		
	L_Help	0.0359412	7.44	0		
	I_rich_unimportant	0.0258993	7.16	0		
	I_EnvirImp	0.0159106	3.54	0		
	F_Workhard	0.0093694	2.93	0.003		
	F_Faith	0.0568835	18.02	0		
	E_Creative	0.0351187	8.66	0		
	E_Lifegoal	0.0179894	3.98	0		
	God_Important	0.0303139	8.68	0		
Social-economic Variables Of Each Individual	***healthstatus***	0.2090577	41.28	0		
	age	-0.0160044	-4.65	0		
	agesq	0.0001747	4.79	0		
	edu	-0.0133014	-3.22	0.001		
	female	0.054342	2.84	0.004		
	married	0.2314216	8.85	0		
	DSorW	0.0314091	0.87	0.387		
	retired	0.0735363	2.01	0.044		
	partself	0.0698539	2.8	0.005		
	housewife	0.1218235	3.88	0		
	student	0.1036479	2.44	0.014		
	unemployed	-0.1252035	-3.85	0		
	finsat	0.3741895	92.45	0		
	incomedecile	0.033452	7.48	0		

Table 6: 2SLS Regression on Total Life Satisfaction

to Identify Optimal Public Spending on Education (full regression results)

		Coefficient	z	P>z	Statistical Diagnostics	
Public Spending and Interactive Variables	***eduspending***	814.8714	9.06	0	Number of obs	44,528
	eduspending2	-9992.856	-9.37	0	Wald chi2(30)	13464.46
	edu.WGI	10.58553	8.79	0	R Squared	N.A.
	edu.mage	-5.285446	-8.79	0	Adjusted R-squared	N.A.
	edu.life_expectancy	0.5383584	8.19	0	Mean of Dep Var.	6.866
	edu.elderly_population	400.7447	7.6	0	S.D. Dep. Variable	2.2315
	edu.gdppc	0.0013524	8.04	0	SE of regression	2.3592
Mental Capital Variables Of Each Individual	***L_FamImp***	0.0471082	4.04	0	Sum squared resid.	221716.657
	L_FriImp	0.0141706	2.6	0.009		
	L_Help	0.0661155	9.24	0		
	I_rich_unimportant	0.0069401	1.13	0.258		
	I_EnvirImp	0.041545	6.05	0		
	F_Workhard	0.00037	0.09	0.931		
	F_Faith	0.091184	18.39	0		
	E_Creative	0.0682226	11.26	0		
	E_Lifegoal	0.0558299	6.97	0		
	God_Import~t	0.0193406	3.87	0		
Social-economic Variables Of Each Individual	***healthstatus***	0.1881409	26.85	0		
	age	-0.0219171	-4.84	0		
	agesq	0.0001636	3.44	0.001		
	edu	-0.0414138	-5.93	0		
	female	0.158829	5.66	0		
	married	0.2411099	7.04	0		
	DSorW	0.1234638	2.56	0.01		
	retired	0.098849	2.06	0.039		
	partself	0.125252	3.78	0		
	housewife	-0.4790189	-5.92	0		
	student	0.3542164	5.7	0		
	unemployed	0.030519	0.68	0.497		
	finsat	0.3500817	58.98	0		
	incomedecile	0.0700573	9.31	0		

Table 7: 2SLS Regression on Total Life Satisfaction to Identify Optimal Total Government Spending (full regression results)

		Coefficient	z	P>z	Statistical Diagnostics	
Public Spending and Interactive Variables	***govt***	14.56165	7.46	0	Number of obs	44,528
	govt2	-31.63582	-8.64	0	Wald chi2(30)	22195.0401
	govt.wgi	2.023118	13.21	0	R Squared	0.3219
	govt.mage	0.0061139	0.27	0.789	Adjusted R-squared	0.3214
	govt.life_expectancy	0.0730991	9.15	0	Mean of Dep Variable	6.866
	govt.elderly_population	-20.92893	-5.62	0	S.D. Dep. Variable	2.2315
	govt.gdppc	-0.0000482	-10.73	0	SE of regression	1.8375
Mental Capital Variables Of Each Individual	***L_FamImp***	0.0493065	5.4	0	Sum squared residuals	221716.656
	L_FriImp	-0.0034016	-0.8	0.424		
	L_Help	0.037049	7.49	0		
	I_rich_unimportant	0.0291093	7.88	0		
	I_EnvirImp	0.0105993	2.25	0.024		
	F_Workhard	0.0074424	2.28	0.023		
	F_Faith	0.073565	21.57	0		
	E_Creative	0.0344617	8.22	0		
	E_Lifegoal	0.018115	3.84	0		
	God_Import~t	0.0207961	5.44	0		
Social-economic Variables Of Each Individual	***healthstatus***	0.2020076	38.92	0		
	age	-0.0172423	-4.92	0		
	agesq	0.0001922	5.12	0		
	edu	-0.0188116	-4.09	0		
	female	0.0752082	3.86	0		
	married	0.2200812	8.22	0		
	DSorW	0.020554	0.55	0.582		
	retired	0.0321113	0.82	0.41		
	partself	0.1738219	6.08	0		
	housewife	0.0373256	1.16	0.248		
	student	0.1881159	4.31	0		
	unemployed	-0.0635517	-1.9	0.057		
	finsat	0.3755832	90.71	0		
	incomedecile	0.0328627	7.2	0		

The optimal spending on healthcare based on OLS and average values of the key parameters is estimated at 6.3%. Those for education spending and total government spending, estimated using 2SLS and with the overall dependency ratio as the Instrumental Variable are respectively 3.9% and 36.8%. All regressions include mental capital proxies, and none of the regressions include country dummies, which appear to be incompatible with the optimization requirements.

5. Monte Carlo Simulations: Searching for Confidence Intervals

Using the Derivative Method, we obtain estimates of optimal spending based on an equation with coefficients that are not independently estimated. It is therefore not possible to derive analytic approximations of the variance of these estimated optimal spending figures calculated from the regression results. Numerical methods have to be used.

Stata generates the means vector *m* and the covariance matrix *sigma* of coefficients for each equation that we estimated. We then generate a large number (1 million) of random vectors chosen from the multivariate normal distribution with mean *m* and covariance matrix *sigma*. Then a 1,000,000-by-5 matrix (or 1,000,000-by-6 for the equation to identify optimal healthcare expenditures) containing the random numbers is created. For each of the 1,000,000 trials we calculate the optimal public spending according to the formula, and thus derive 1 million possible optimal values. A histogram is drawn and the distribution of these simulated values is found to be close to normal. We then calculate mean, variance, standard deviation, t statistics, and finally derive the confidence intervals.

Table 8 presents the simulation results and the confidence intervals. The results suggest that the estimates are statistically significant and that the confidence intervals are sufficiently narrow for them to be meaningful.

Table 8: Results of Monte Carlo Simulation
To Identify Confidence Intervals for Estimates of Optimal Spending

	Mean	Variance	Standard Deviation	t	Confidence Interval	
Optimal government Healthcare Spending (Mental Variable Included)	0.0614123	6.19E-06	0.0024878	-640	0.0614074	0.0614171
(The above is based on OLS estimates based on Table 5 while the following is based on 2SLS estimates as per Table 6 and 7)						
Optimal government Education Spending	0.0391834	4.70E-08	0.0002168	846.0097	0.039183	0.0391838
Optimal Total Government Spending	0.3676566	2.27E-04	0.0150794	2200.00	0.3676271	0.3676862

Note: t for the estimate of optimal healthcare spending is negative as the mean of actual spending is smaller (6.1%) than the estimated optimal spending (6.3%).

6. Discussions and Conclusions

The inclusion of mental quality variables in a well-being regression on government spending and other control variables is novel. The fact that including mental capital proxies provides more reasonable regression results may not be obvious with the results for healthcare spending as listed in **Table 1,** which shows that with or without the mental capital proxies the estimate for optimal healthcare public spending is almost identical, at 6.2% and 6.3% pf the GDP respectively for including only socio-economic variables and for including also the mental capital proxies respectively. If country dummies are added, however, the first order condition for maximization is violated. **Table 2** attempts to use the young independency ratio as Instrumental Variable to control for possible endogeneity effects. However the estimates for optimal healthcare spending under Model 1 and Model 2 are both unreasonably large. The estimates under Model 3 and Model 4 look reasonable, but we deem that since the programme

drops the elderly to population ratio interactive variable, and generates an unreasonable result for the public governance interactive variable, we decide that the 2SLS specification is unacceptable.

Table 3 presents the key results from the 2SLS regression designed for the estimation of public spending on education. While all four models using OLS failed to meet the requirements for maximization, 2SLS does yield reasonable good results with the exception of **Model 3** and **Model 4,** which cannot be accepted because the coefficient on public sector education spending turns out to be statistically insignificant. Between **Model 1** and **Model 2**, **Model 2** is clearly superior, as including the mental capital proxies improves the statistical significance for ALL the estimated coefficients.

Table 4 presents the key results from 2SLS regression for total government spending, Once again **Model 3** and **Model 4** both failed the first order conditions for maximization. Thus we have to drop country dummies. Between **Model 1** and **Model 2**, it turns out that the estimate for optimal government spending under Model 2, at 36.8% of GDP, is slightly higher than that under Model 1, which stands at 35.7%. We cannot say definitively whether **Model 1** or **Model 2** is superior, but given that almost all mental capital proxy variables carry the expected signs, and that coherence in modeling is desirable, we stick to the **Model 2** that includes mental capital proxy variables in addition to socio-economic variables.

Our investigation of optimal healthcare spending, education spending, and total spending in the public sector has produced interesting results. In particular, we identified an estimate of "optimal government spending" for countries with governance in the top 75% ***WGI*** ranking. China was not in this sample based on its ***WGI***. It is included because we anticipate a lot of interest about whether China spends above or below the optimal levels. We simply plug in China's key parameters using the key algebraic equations to estimate the three kinds of optimal spending.

The use of interactive variables appears to be particularly illuminating in a number of ways. First it confirms that optimal spending rises with the quality of public governance. Optimal healthcare spending is found to rise with population aging and longevity, as expected. One might expect education spending would reduce the need for healthcare spending, as education is known to help promote preventive care. However, educated people also value health more than uneducated people. So these opposite effects need to play out to see which effect dominates. The sign on the coefficient therefore has to be left to empirical testing. Higher GDP per capita would raise the optimal healthcare spending but has negligible impact on optimal education spending.

A big surprise is that optimal education spending is found to rise with population aging. This puzzling result can be easily explained. First there is a need to enhance the productivity of a shrinking labour force in the face of a rise in the elderly dependency ratio. Moreover, if a longer lifespan increases the length of productive life, educational investment will become more rewarding as the higher productivity applies for a longer period. Moreover, since education may also make better informed consumers and thus increase the utility of consumption, when people live longer the rewards to education through higher consumption-utility will also be higher.

Our results as presented in **Table 11** show that actual public spending on healthcare appears to be on average much less than optimal (3.8 <6.2), while actual public spending on education spending appears to be clearly more than optimal (4.3 >3.9).[14] A possible factor to consider is the relative competition effect—competition for relative standing. As shown by Wilkinson (1997), relative-income effects are very important in determining health outcomes. This has

[14] In favour of space considerations, these estimates are not provided here but are available from the authors upon request.

probably to do with the psychosocial effects of social position. Thus, even with higher absolute incomes and better healthcare, the relatively poor persons in an advanced country are typically less healthy than the relatively rich persons in a poor country. Thus relative economic position affects not only general well-being, but also health outcomes. This may require somewhat more health spending to deal with the impaired health outcomes arising from inequality. In education, the importance of relative competition is even much more important to the extent that much education spending is explicitly aimed at improving relative positions. A number of factors are involved. Admission to good educational institutions typically depends on relative educational outcomes. The top university gets the best (relatively) high school graduates. Employers also select employees at least partly based on relative education outcomes. Thus, relative education outcome will affect one's income-earning capacity. Moreover, relative education outcomes are also valued as such over and above the earnings implication. As a result, families, and also governments in response to popular demand, invest a lot: in money, time, and effort, to secure higher educational outcomes. However, investment in education to improve relative standing at the individual level may be socially wasteful as, on average, relative position cannot be improved at the social level, no matter how much effort and resources are spent. Thus, if education inputs increase, and even if effectively in pushing up the relative positions of some people, the net results on the welfare of the people have to be discounted much more by the mutually offsetting effects of relative competition. This is unlikely to be fully appreciated at the family level. In addition, people may be caught in a prisoner-dilemma situation. This may partly explain the result of excessive spending on education at the social level. On the other hand, health spending is rarely aimed at improving relative position per se. If health is improved, people are likely made better off. Inadequate spending on healthcare could be partly due to the inadequate appreciation of the benefits due to the long-term nature and uncertainty of results, and partly due to the squeeze from excessive spending on education.

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Appendix 1:

Table 9. Variables from the World Value Surveys			
Question in Survey, Variable Used in Paper	**Question in Survey**	**Role of the Variable in the Model**	**Scale**
V4	Would you say Family is: very important, rather important, not very important, or not at all important.	To reflect if the respondent loves his or her family.	Scale 1- 4 converted to 1- 10 and reversed.
L_FamImp*			
V5	Would you say Friends are: very important, rather important, not very important, or not at all important.	To reflect if the respondent cares for his or her friends.	Scale 1- 4 converted to 1- 10 and reversed.
L_FriImp*			
V84	It is important to this person to help the people nearby, to care for their well-being.	To reflect if the person is a caring, loving person.	Scale 1- 6 converted to 1- 10 and reversed.
L_HelpOthers*			
V81	Important to this person to be rich: Very much like me , Like me, Somewhat like me ,A little like me, Not like me and Not at all like me.		Scale 1- 6 converted to 1- 10.
L_rich_unimportant*			
v88	Important to this person looking after environment Very much like me, like me, somewhat like me, A little like me. , Not like me, and Not at all like me.		Scale 1- 6 converted to 1- 10 and reversed.
I_nature*			
V120	Hard work 1.- In the long run, hard work usually brings a better generally bring success or Hard work doesn´t generally bring success.		Scale 1-10 and reversed
F_Workhard*			
v122	Fate versus control: Everything is determined by fate or People shape their fate themselves.		Scale 1- 10, 10 being people shape their own fates
F_Faith*			
V80	It is important to this person to think up new ideas and be creative; to do things one's own way: Very much like me, like me, somewhat like me, A little like me, Not like me, not at all like me.		Scale 1- 6 converted to 1- 10 and reversed.
E_Creative*			
v67	I decide my goals in life by myself: Agree strongly, Agree, Disagree, strongly disagree.		Scale 1-4 converted to 1- 10 and reversed.
E_LifeGoal*			

V192	How important is god in your life: Not at all or Very?		Scale 1-10, 10 being most important
God_Important*			
V22(5)	All things considered, how satisfied are you with your life as a whole these days? Using this card on which 1 means you are "completely dissatisfied" and 10 means you are "completely satisfied" where would you put your satisfaction with your life as a whole?	This is the key subjective well-being question the answer to which becomes our dependent variable.	Scale 1 to 10, 10 being most satisfied.
TLS*			
V237	Interviewees' age	To reflect the influence of age	Scale 15 to 99
age			
agesq	Age squared	To reflect non-linearity	
V235	Code respondent's sex by observation	To reflect the influence of gender	Dummy variable, 1 =female and 0=male
female			
V238(5)	What is the highest educational level that you have attained?	To reflect the influence of education level	1-9, 1=no formal education, 9=University-level
edu			
V55	Marital status 1.- Married 2.- Living together as married 3.- Divorced 4.- Separated 5.- Widowed 6.- Single/Never married	To reflect the influence of being married/divorced/separated/widowed.	Dummy variable, 1=married or living together, 0=otherwise
married***			
DSorW***			Dummy variable, 1=divorced, separated or widowed, 0=otherwise
V241	Employment status 1.- Full time employee (30 hours a week or more) 2.- Part time employee (less than 30 hours a week) 3.- Self-employed 4.- Retired/ pensioned 5.- Housewife not otherwise employed 6.- Student 7.- Unemployed 8.- Other	To reflect the influence of being a part time employee or self-employed/a housewife/a student/unemployed	Dummy variable, 1=part time employee or self-employed, 0=otherwise
partself*****			
retired*****			Dummy variable, 1=retired/pensioned, 0=otherwise
housewife*****			Dummy variable, 1=housewife, 0=otherwise
student*****			Dummy variable, 1=student, 0=otherwise
unemployed*****			Dummy variable, 1=unemployed, 0=otherwise
V68			

finsat	How satisfied are you with the financial situation of your household?	To reflect subjective assessment of financial status.	Scale 1 to 10, 10 most satisfied
V253	We would like to know in what group your household is. Please, specify the appropriate number, counting all wages, salaries, pensions and other incomes that come in.	To reflect income level	Scale 1 to 10, 10 being highest group
Incomedecile			

* These variables are rescaled to 0 to 10 in the regressions in order to facilitate comparison of the magnitudes of their influences.

**The original options are: 1=A religious person, 2=Not a religious person, 3=An atheist.

***The original options are: 1=Married, 2=Living together as married, 3=Divorced, 4=Separated, 5=Widowed, 6=Single.

****The original options are: 1=Full time employee, 2=Part time employee, 3=Self-employed, 4=Retired/pensioned, 5=Housewife not otherwise employed, 6=Student, 7=Unemployed, 8=Other.

Appendix 2:

Table 10: Other Variables			
Variable Used in Paper	**Definition**	**Expected Effect on subjective well-being**	**Source**
WGI	Aggregate governance indicators for 215 countries and territories for six dimensions of governance.Year 2005 data. The variable is rescaled to 0-5.	Positive	www.govindicators.org
gdppc	Gross domestic product based on purchasing-power-parity (PPP) per capita GDP (Current US dollar). Year 2005 data.	Positive	http://data.worldbank.org/
elderly population	Population ages 65 and above (% of total population)	Positive	https://data.worldbank.org/
life_expectancy	Life expectancy at birth, total (years)	Positive	https://data.worldbank.org/
mage	Median age of population in 2005	Positive	https://population.un.org/wpp/Download/Standard/Population/
health		Positive	http://data.worldbank.org/;

	Public sector health expenditure as % of GDP, average of year 2004-2008.		https://countryeconomy.com
health2	***health*** squared	Negative	By calculation
health.WGI	***health*WGI***	Positive	By calculation
health.mage	***health***median age	Positive	By calculation
health.elder_population	***health*elder_population***	Positive	By calculation
health.life_expectancy	***health*life_expectancy***	Positive	By calculation
health.gdppc	***health***GDP per capita	To be determined	By calculation
health.edu	***health*edu***	Negative	By calculation
edu	Education expenditure by the government as % of GDP, average of year 2004-2008.	Positive	http://data.worldbank.org/ https://countryeconomy.com
edu2	***edu*** squared	Negative	By calculation
edu.WGI	***edu*WGI***	Positive	By calculation
edu.mage	e***du***median age	To be determined	By calculation
edu.gdppc	***edu***GDP per capita	To be determined	By calculation
govt	Total government expenditure as % of GDP, average of year 2004-2008.	Positive	https://www.imf.org/external/datamapper/exp@FPP/USA/FRA/JPN/GBR/SWE/ESP/ITA/ZAF/IND https://countryeconomy.com
govt2	*govt* squared	Negative	By calculation
govt.WGI	*govt*WGI	Positive	By calculation

govt.mage	*govt**median age	Positive	By calculation
govt.gdppc	*govt**GDP per capita	Positive	By calculation
Youth_dependency*	The ratio of younger dependents(people younger than 15) to the working-age population(those ages 15-64).	Positive on spending variables	http://data.worldbank.org/
	average of year 2003-2007		Hong Kong data from :https://www.socialindicators.org.hk/chi/indicators/children/29.3; Taiwan data from : https://pop-proj.ndc.gov.tw/chart.aspx?c=11&uid=67&pid=60
yd2*	Youth_dependency squared		By calculation
y.mage*	Youth_dependency ratio *mage		By calculation
y.wgi*	Youth_dependency ratio *wgi		By calculation
y.gdppc*	Youth_dependency ratio *gdppc		By calculation
y.edu*	Youth_dependency ratio *edu		By calculation
y.life*	Youth_dependency ratio *life		By calculation
y.elderly*	Youth_dependency ratio *elderly		By calculation
Dependency **	Overall dependency ratio of the country	Positive on spending variables	http://data.worldbank.org/
	average of year 2003-2007;		
Dependency2	Dependency squared		By calculation
d.mage**	Overall dependency ratio*median age		By calculation
d.wgi**	Overall dependency ratio*wgi		By calculation

d.edu	Overall dependency ratio*education spending		By calculation
d.gdppc	Overall dependency ratio*gdppc		By calculation
d.life	Overall dependency ratio*life_expectancy		By calculation
Notes: *:Only used in 2SLS estimation of Public Health Spending model. **: Only used in 2SLS estimation of Public Education Spending model and Total Public Spending model.			

Data Source: wave 5 data: 2004-2009 (spending data recorded:2003-2005); wave6: 2010-2014 (spending data recorded:2008-2010).

The public sector health spending of Hong Kong is from Food and Health Bureau of Hong Kong SAR: https://www.fhb.gov.hk/statistics/download/dha/en/table2_1920.pdf. The public sector health spending of Taiwan is from Ministry of Health and Welfare, Taiwan. The public sector education spending of Taiwan is from https://stats.moe.gov.tw files/brief/近年教育經費及平均每生分攤經費概況.pdf.The public sector education spending of China is from Bureau of Statistics of the People's Republic of China: http://www.stats.gov.cn/english/statisticaldata/AnnualData/.

Appendix 2

Table 11: Actual and Optimal Spending (% of GDP) (Optimal Spending Estimated using OLS/2SLS Top 75% WGI Sample)
Based on Estimates of Table 5, 6 and 7.

Country or Jurisdiction	Healthcare Public Spending (average of 2004~2008)	Updated Healthcare Public Spending (2019)	Optimal Health Public Spending Based on OLS	Education Public Spending (average of 2004~2008)	Updated Education Public Spending (2019)	Optimal Total Education Spending Based on 2SLS	Total Public Spending (average of 2004~2008)	Updated Total Public Spending (2019)	Optimal Total Public Spending Based on 2SLS
Andorra	3.4	4.7	6.1	2.1	3.2	4.1	25.8	35.7	37.1
Argentina	4.1	5.9	6.9	4.2	4.7	3.9	26.9	37.7	35.6
Australia	5.8	7.1	6.4	4.7	5.1	4.0	34.4	39.0	38.9
Brazil	3.5	3.9	6.6	4.7	6.0	3.8	38.4	37.4	37.0
Bulgaria	3.8	4.2	4.5	3.6	4.2	3.7	33.6	35.9	34.6
Canada	6.6	7.6	5.8	4.7	4.8	4.0	38.7	40.7	38.5
Chile	2.7	4.8	7.2	3.4	5.6	3.9	20.2	26.5	40.9
China*	1.4	3.0	5.5	2.8	3.5	3.7	19.0	34.2	35.4
Taiwan	3.1	6.5	6.0	4.1	3.6	3.9	20.1	17.3	38.6
Cyprus	2.3	3.9	6.6	6.3	5.3	4.0	38.6	38.4	37.9
Finland	6.4	7.3	5.5	5.9	6.4	4.0	48.1	53.3	38.3
France	7.4	8.3	6.0	5.1	5.4	4.0	53.1	55.4	36.6
Georgia	1.2	2.7	5.1	2.8	3.8	3.7	24.5	28.9	33.2
Germany	7.7	9.1	5.4	4.4	5.1	4.0	45.4	45.0	36.4
Ghana	1.4	1.4	6.9	6.3	3.9	3.9	15.9	21.1	36.9
Hong Kong	2.5	3.4	5.8	3.8	3.8	3.9	16.4	21.0	39.5
Hungary	5.2	4.3	5.1	5.2	4.2	3.8	49.7	46.0	36.7
India	0.8	1	6.5	3.2	4.4	3.8	27.2	27.4	36.5
Italy	6.4	6.4	5.4	4.3	4.1	4.0	48.0	48.5	34.0
Japan	6.3	9	5.5	3.3	3.2	4.0	33.5	37.3	35.3
Jordan	4.3	3.9	8.1	4.6	3.0	3.9	36.0	30.3	38.4
Korea, Rep.	2.8	4.9	5.9	2.9	4.7	3.9	19.4	22.6	38.4
Malaysia	1.5	2	7.4	4.7	4.2	3.9	25.8	23.6	39.4
Mali	1.2	1.3	6.8	3.6	3.5	4.0	21.2	23.2	35.6
Mexico	2.5	2.7	7.4	4.8	4.3	3.9	23.5	26.0	37.0
Morocco	1.7	2.1	6.7	5.3	5.9	3.9	26.8	27.4	35.8
Netherlands	6.3	6.7	5.7	5.0	5.2	4.0	45.6	42.0	38.0

New Zealand	6.6	7.4	6.5	6.0	5.2	4.0	37.4	38.7	40.0
Norway	6.9	9	5.9	6.7	7.9	4.3	41.9	50.7	36.1
Peru	2.3	3.3	7.3	2.8	3.8	3.9	19.5	21.1	36.3
Poland	4.1	4.6	5.6	5.2	4.7	3.8	43.8	41.8	36.9
Romania	4.1	4.6	5.1	3.9	3.6	3.8	33.9	33.8	34.3
Vietnam	1.5	2.3	6.9	4.9	4.1	3.8	20.9	20.1	36.0
Slovenia	5.6	6.2	5.3	5.4	4.9	3.8	45.4	43.2	36.9
South Africa	3.4	5.4	5.4	4.5	5.9	3.9	24.6	31.5	36.8
Spain	5.7	6.4	6.0	4.3	4.2	4.0	39.3	42.3	36.6
Sweden	6.7	9.2	5.9	6.4	7.6	4.1	51.0	48.1	37.1
Switzerland	3.0	3.6	5.7	4.9	5.1	4.2	33.9	32.0	36.6
Thailand	2.3	2.7	5.7	3.8	3.0	3.7	19.4	21.8	36.9
Trinidad and Tobago	1.9	3.2	6.0	3.7	3.7	3.9	27.8	30.6	36.9
Turkey	1.7	3.4	7.0	2.9	4.4	3.9	33.7	35.7	37.0
Egypt	1.6	1.3	7.1	4.2	2.6	3.9	31.8	26.9	35.8
United Kingdom	7.0	8.1	5.8	4.9	5.2	4.1	44.6	38.2	36.5
United States	6.8	8.5	5.9	5.3	5.0	4.1	34.6	35.7	36.9
Burkina Faso	1.4	2.3	6.6	4.0	5.7	3.9	20.8	23.5	35.3
Uruguay	4.0	6.2	6.8	2.7	4.7	3.9	26.7	31.1	37.4
Zambia	1.5	2.1	6.3	1.6	4.5	3.9	21.0	29.9	34.6
Average	**3.8**	**4.8**	**6.2**	**4.3**	**4.6**	**3.9**	**32.1**	**34.0**	**36.8**

Note: Optimal Spending estimates are provided only for jurisdictions with WGI above 75%. *China is not in the top 75% and we estimate optimal spending based on estimated parameters of the sample. Total Government Spending data is sourced by IMF Data, and other spending data is sourced by World Bank Data.