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Human development and the optimal size of government

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ABSTRACT

Previous studies have found evidence for an optimal size of government with respect to GDP growth. In this paper, I look at the impact of the size of government consumption expenditures on social welfare as measured by the Human Development Index. Utilizing dynamic GMM estimation in a panel data framework, I find that evidence for an optimal size of government with respect to social welfare.
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1. Introduction

Armey (1995) popularized the existence of an optimal size of government as depicted by the Armey curve. Whereas the Laffer (2004) curve illustrates the existence of a tax rate that maximizes tax revenue, the Armey curve illustrates the existence of a government share of GDP that maximizes GDP growth. Previous studies into the optimal size of government with respect to GDP or GDP growth has focused on the size of federal government spending in the U.S. for 1947–1997 (Vedder and Gallaway, 1998), the size of federal, state, and local taxes in the U.S. for 1929–1989 (Scully, 1994), the size of government spending in Canada for 1929–1996 (Chao and Grubel, 1998), the size of government spending in the U.S. in 1983 (Grossman, 1988), and the size of overall government spending in the U.S. for 1929–1986 (Peden, 1991). Heitger (2001) distinguishes between government consumption spending, which he claims has a negative impact on growth, and government investment spending, which he claims has a positive impact on growth. Yavas (1998) shows that increases in the size of government increase output if the output is low, but decrease output if output is high. Yavas argues that, because developing economies frequently lack necessary infrastructure and government services, these economies benefit more from increases in government spending than do developed countries.

In this paper, I expand on the previous literature by (1) shifting the criterion for optimal government size from productivity to social welfare by employing the United Nations' Development Programme's Human Development Index (HDI) as the outcome variable, and (2) generalizing from single country studies by employing panel data techniques to a data set of 154 countries over the period 1975 through 2002. In the next section, I present an overview of the differential impact of trade on longevity and education across developed and developing countries. In Section 3, I develop a panel data model aimed at measuring the impact of the size of government on the Human Development Index. In Section 4, I offer some concluding remarks and suggestions for future research.

2. The criterion for good government

Discussion of the role of government in the economy frequently focuses on GDP and/or GDP growth as the criterion for "good government." Following the work of Davies and Quinlivan (2006), I alter the focus of the discussion by utilizing social development as the criterion for good government. I use the United Nations Development Programme's Human Development Index (HDI) as the measure of social development. While per-capita GDP is correlated

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with, though does not directly measure, longevity and education, the HDI directly measures per-capita income, longevity, and education. Further, while GDP measures productivity in the aggregate, the HDI reflects the types of goods and services that constitute GDP. According to Amartya Sen, a major contributor to the HDI's development, the HDI is "...the most widely accepted measure of comparative international welfare," (Wallace, 2004). Thus, unlike per-capita GDP, the HDI is able to distinguish between standard of living and income. For example, "...a country with a very high GDP per-capita such as Kuwait has a lower HDI rank because of a relatively lower level of educational attainment. Uruguay has roughly half the GDP per-capita of Kuwait but has a higher HDI rank."[1]

Approximately every 5 years, the UNDP calculates indices for every country measuring various social outcomes. The indices employed in the calculation of the HDI are: life expectancy index, education index, and GDP index. Calculations employed in the 2004 HDI publication are:

$$\text{Life Expectancy Index (LEI)} = \frac{\text{Life Expectancy} - 25}{85 - 25} \tag{1}$$

$$\text{Education Index (EI)} = \left(\frac{2}{3}\right)(\text{Adult literacy rate}) + \left(\frac{1}{3}\right)(\text{Gross enrollment ratio}) \tag{2}$$

$$\text{GDP Index (GDPI)} = \frac{\ln(\text{GDP}) - \ln(\text{Minimum GDP})}{\ln(\text{Maximum GDP}) - \ln(\text{Minimum GDP})} \tag{3}$$

$$\text{HDI} = \left(\frac{1}{3}\right)(\text{LEI}) + \left(\frac{1}{3}\right)(\text{EI}) + \left(\frac{1}{3}\right)(\text{GDPI}) \tag{4}$$

Index calculations are based on a priori standards of what constitutes "maximum" and "minimum" attainable levels. As these standards can change over time, HDI figures are not directly comparable across publication years. To achieve consistency across time, for each publication year, the UNDP recalculates the HDI for all countries from the inception of the HDI to the current year using the current year's index calculations.

With respect to GDP growth as the outcome criterion, the standard argument for an optimal size of government is that, starting from a size of zero, increases in the size of government are associated with increases in GDP growth as the government establishes protections of property rights, provision of public goods, standardization, and the rule of law—functions that are better suited to the public versus the private sector. However, as the size of government continues to grow, the government begins to take on functions that are better performed by the private sector. From this point, increases in the size of government begin to have negative impact on GDP growth.

The argument with respect to HDI as the outcome criterion is analogous. However, it is reasonable to assume that the size of government that maximizes GDP growth will be different from the optimal size of government that maximizes the HDI. Maximizing the HDI requires improved education and life expectancy—neither one of which contributes to *current* GDP. We can expect that improved education will contribute to future GDP, though at the expense of current GDP. Depending on the state of the economy, and the political and social climate, increased life expectancy may contribute to increased GDP, and may or may not contribute to a decline in per-capita GDP. In short, what is considered "good" with respect to GDP is not necessarily good with respect to the HDI.

3. Criticisms of the HDI

Criticisms of the HDI fall into three groups: criticisms of the conceptual definition of human development, criticisms of the specific equations that generate the HDI, and criticisms of the quality of the data used in the HDI calculations. Data that feed into the components that comprise the HDI are subject to the usual issues of measurement errors (Srinivasan, 1994a), biases (Behrman and Rosenzweig, 1994), and incomplete coverage (Chamie, 1994) that plague most cross-country macroeconomic data. In addition, authors have pointed to shortcomings in the HDI as a measure of quality of life. Sagar and Najam (1998) claim that the HDI ignores ecological measures and that its treatment of GDP in (3) undervalues increases in income. Neumayer (2001) points out that, in cases where a country's capital depreciation exceeds investment, a given level of the HDI might be unsustainable and therefore misleading as a measure of longer-term well-being. Hicks (1997) argues that the HDI should account for income inequality within countries. Finally, authors have taken issue with the manner in which the index is calculated. Chowdhury and Squire (2006) argue that (1) the assignment of weights in (4) is arbitrary and that a better assignment would reflect the impact of each component on the phenomenon the HDI intends to measure, and (2) whatever the correct weighting scheme is, it is likely not (as the HDI assumes) uniform across countries.[2] Desai (1991) points out that Eq. (4) implies that the three components are perfect substitutes. Srinivasan (1994b) and others suggest that the HDI is subject to double-counting as per-capita income is correlated with education and longevity. Anand and Amartya (2000) offer the rejoinder that the income component of the HDI is intended to serve as an indirect measure of capabilities not captured by longevity and education—a residual catch-all intended to serve as a proxy for "command over resources to enjoy a decent standard of living."[3]

In addition to the HDI, the United Nations Development Programme's Human Development Reports include other measures of well-being. The Gender Empowerment Measure (GEM) attempts to measure political and economic power held by women versus men. The Gender Development Index (GDI) is the HDI adjusted for gender inequality. The Human Poverty Index (HPI) measures deprivation in longevity, education, and life necessities.

4. The size of government and human development

Let H_{it} be the Human Development Index (as reported in the Human Development Report, 2004) for country *i* at year *t*. Because the HDI is calculated every 5 years (approximately), the data set covers the years 1975, 1980, 1985, 1990, 1995, 2000, and 2002 (*t* ranging from 1 through 7, respectively). The data set includes 154 countries. The number of countries in each year varies from a low of 101 to a high of 135. After adjusting for missing data, 136 countries appear at least once, 121 countries appear in at least half of the years, and 77 countries appear in every year. All other data come from International Financial Statistics, September 2005, published by the International Monetary Fund.

Following Heitger (2001), I treat government consumption expenditures and government investment expenditures separately.

[1] www.undp.org/hdr2001/faqs.html.

[2] They admit that finding the correct weights, while theoretically appealing, is not possible. As an intermediate solution, they argue, the weights should be constructed as the average across weights assigned by a panel of experts.

[3] United Nations Development and Programme, 1990, 2001, p. 1.

Let C_{it} and I_{it} be government consumption expenditures as a share of GDP and government investment expenditures as a share of GDP for country i at year t, respectively.[4] We have

$$C_{it} = \frac{\text{Government consumption expenditures}_{it}}{\text{GDP}_{it}} \quad (5)$$

$$I_{it} = \frac{\text{Government investment expenditures}_{it}}{\text{GDP}_{it}} \quad (6)$$

where $i = [1,154]$, and $t = [1,7]$. Missing data results in an unbalanced panel. Accounting for missing data and using 2002 HDI's, approximately 35% of the observations come from "high development" countries (HDI ≥ 0.8), 45% come from "medium development" countries (0.5 ≤ HDI < 0.8), and 20% come from "low development" countries (HDI < 0.5).[5] The distribution among levels of development represented in the non-missing data approximately matches the distribution of levels of development among the 154 countries (33%, 48%, and 19%, respectively).

We would expect a country's current HDI to be similar to its previous HDI.[6] Following Yavas (1998), we might also expect to find a differential impact of government spending on HDI for low-income versus high-income countries. Taking these factors into account and allowing for a (possible) quadratic impact of government spending on HDI, I estimate, independently, the following models:

$$H_{it} = \alpha + \beta_1 C_{it} + \beta_2 C_{it}^2 + \gamma_1 C_{it} D_{it} + \gamma_2 (C_{it} D_{it})^2 + \lambda H_{i,t-1} + u_{it} \quad (7)$$

$$H_{it} = \alpha + \beta_1 I_{it} + \beta_2 I_{it}^2 + \gamma_1 I_{it} D_{it} + \gamma_2 (I_{it} D_{it})^2 + \lambda H_{i,t-1} + u_{it} \quad (8)$$

where D_{it} is defined as

$$D_{it} = \begin{cases} 1, & \text{if } \dfrac{\text{RGDP}_{it}}{\text{Population}_{it}} < \text{median}_t \left(\dfrac{\text{RGDP}_{it}}{\text{Population}_{it}} \right) \\ 0, & \text{otherwise} \end{cases} \quad (9)$$

Due to the panel data and the presence of a lagged dependent variable on the right hand sides of the equations, I employ GMM with individual fixed effects. As instruments for lagged HDI, I use GDP, lagged GDP, population, lagged population, per-capita GDP, and lagged per-capita GDP. Results are shown in Table 1.

The results indicate that, over all countries, the estimated level of government consumption expenditures that is associated with maximal improvement in the HDI is 17% and is given by

$$E(\Delta H_{it}|_{H_{i,t-1}}) = 0.262 C_{it} - 0.773 C_{it}^2 \quad (10)$$

For countries with per-capita GDP below the median, the estimated level of government consumption expenditures that is associated with minimal improvement in the HDI is 1.5% and is given by

$$E(\Delta H_{it}|_{H_{i,t-1}}) = -0.013 C_{it} + 0.444 C_{it}^2 \quad (11)$$

Utilizing government investment expenditures in place of government consumption expenditures yields different results. Over all countries, the estimated level of government investment expenditures that is associated with maximal improvement in the HDI is 13% and is given by

$$E(\Delta H_{it}|_{H_{i,t-1}}) = 0.221 I_{it} - 0.862 I_{it}^2 \quad (12)$$

For countries with per-capita GDP below the median, the estimated level of government investment expenditures that is associated with minimal improvement in the HDI is 20% and is given by

$$E(\Delta H_{it}|_{H_{i,t-1}}) = -0.208 I_{it} + 0.513 I_{it}^2 \quad (13)$$

These results are depicted in Fig. 1. Notice that, for low-income countries, government consumption expenditures have a positive impact on the HDI from (virtually) 0% share of GDP onward. In contrast, government investment expenditures have a negative impact on the HDI until investment expenditures reach (approximately) 40% of GDP.

For the years and countries in the data set, government consumption's share of GDP exceeds the estimated optimal in 44% of the cases, and government investment's share of GDP exceeds the estimated optimal in 42% of the cases. The shares of government consumption for each country and year are shown in the histogram in Fig. 2.

While the outcome criterion employed here is the HDI, it is interesting to compare these results with previous studies that utilized growth in GDP as the outcome criterion The optimal size of 30% (government consumption and investment combined) is

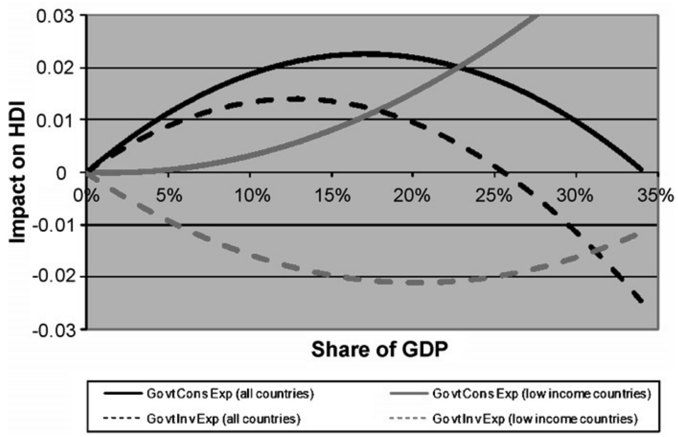

Fig. 1.

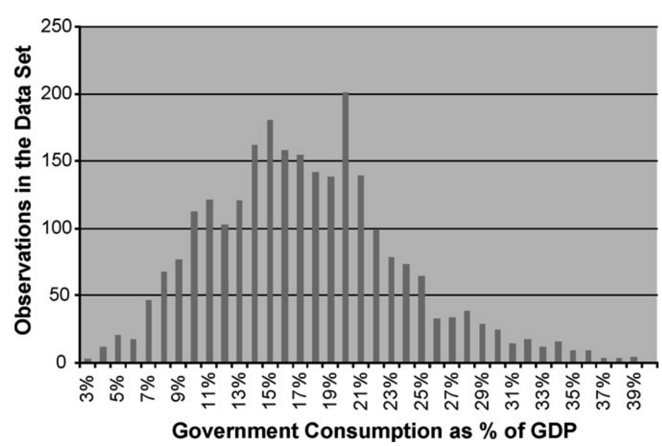

Fig. 2.

[4] Government consumption and investment expenditures consist of explicit and imputed expenditures incurred by the general government on both individual and collective consumption and investment (respectively) goods and services. Imputed expenditures are those which it is desirable to include in the accounts and do not take place in money terms.

[5] These are the definitions of "high-," "medium-," and "low-development" countries used by the United Nations Development Programme.

[6] Tests for unit roots indicate that the HDI and government's share of GDP are non-stationary. However, as they are both bounded by zero and one, the series are stationary. For discussion of stationary series that fail stationarity tests, see Cavaliere (2005) and Kazakevicius and Leipus (2002).

Table 1
The impacts of government consumption and investment expenditures on the HDI

	β_1	β_2	γ_1	γ_2	λ
$H_{it} = \alpha + \beta_1 C_{it} + \beta_2 C_{it}^2 + \gamma_1 C_{it} D_{it} + \gamma_2 (C_{it} D_{it})^2 + \lambda H_{i,t-1} + u_{it}$					
Estimate	0.262	−0.773	−0.275	1.216	0.757
Standard Error	0.050	0.102	0.052	0.259	0.015
p-value	0.000	0.000	0.000	0.000	0.000
R^2 = 0.209					
$H_{it} = \alpha + \beta_1 I_{it} + \beta_2 I_{it}^2 + \gamma_1 I_{it} D_{it} + \gamma_2 (I_{it} D_{it})^2 + \lambda H_{i,t-1} + u_{it}$					
Estimate	0.221	−0.862	−0.429	1.374	0.800
Standard Error	0.113	0.374	0.168	0.686	0.032
p-value	0.053	0.023	0.012	0.047	0.000
R^2 = 0.070					

approximately the same as the 27% found by Chao and Grubel (1998), but significantly more than the 17.5% found by Vedder and Gallaway (1998), the 20% found by Peden (1991), and the 22–23% found by Scully (1994). The difference in results may simply be due to the different outcome measure (HDI versus GDP). In addition, not only did these studies cover different time periods than that covered in this paper, but the studies also focused on single countries rather than a panel of many countries. Fig. 3 shows total government expenditures (consumption plus investment) for each country and year in the data set.

5. Geometric lag interpretation

Because one-period lagged HDI appears on the right hand sides of (7) and (8), we can interpret these as geometric lag models. Following the standard procedure for modeling geometric lags, the regression model in (7) is equivalent to:

$$H_{it} = \alpha + \sum_{k=0}^{t} \lambda^k (\beta_1 C_{i,t-k} + \beta_2 C_{i,t-k}^2 + \gamma_1 C_{i,t-k} D_{i,t-k} + \gamma_2 (C_{i,t-k} D_{i,t-k})^2) + u_{it} \quad (14)$$

From our estimates for λ, we can compute the median and mean geometric lags for the impact of a change in government consumption expenditures as

$$\text{Median lag} = \frac{\ln 0.5}{\ln \lambda} = 2.49 \qquad \text{Mean lag} = \frac{\lambda}{1-\lambda} = 3.12 \quad (15)$$

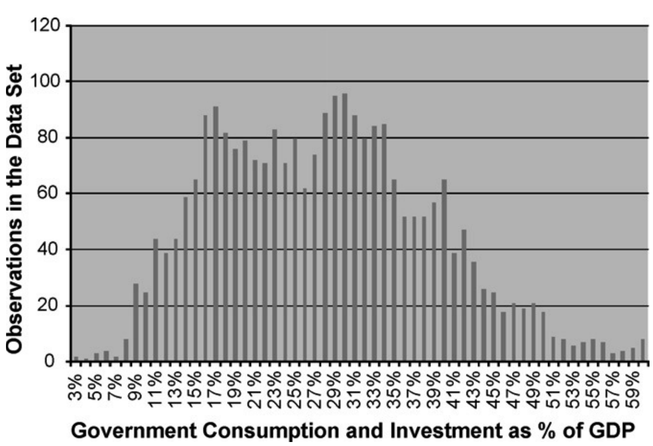

Fig. 3.

and for the impact of a change in government investment expenditures as

$$\text{Median lag} = \frac{\ln 0.5}{\ln \lambda} = 3.10 \qquad \text{Mean lag} = \frac{\lambda}{1-\lambda} = 4.00 \quad (16)$$

These results suggest that the impact of a change in government investment expenditures takes longer to be fully realized than does the impact of a change in government consumption expenditures. Because the average interval between time periods is 4.5 years, half of the full impact of a change in government consumption expenditures on HDI is realized within 11 years, and half of the full impact of a change in government investment expenditures is realized within 14 years. This is consistent with the earlier supposition that the benefit of government spending on HDI plays out over the long run via (for example) improved health and education, which, in turn, lead to increased productivity and income in the long run.

6. Conclusions

This paper offers evidence, within the context of a multi-country, multi-year panel data analysis, suggesting that the optimal size of government with respect to human development measures is significantly larger than the optimal size of government with respect to GDP measures. While this study begins to scratch the surface of the impact of government size on social welfare, the results point to some areas that beg further study before the HDI can become useful as a tool for policy analysis. For example: the UN Development Programme constructs additional measures of social welfare such as the Human Poverty Index (HPI), the Gender-Related Development Index (GDI), and the Gender Empowerment Measure (GEM). Similar analyses of these measures may point to differences in the impact of government size on alternate social welfare measures, and/or a common "propagation path" in which alterations in size encourage a similar sequence of improvements across countries—for example, improved size is followed by improved per-capita income, which is followed by improved literacy, which is followed by improved longevity, etc. In addition, by employing techniques in spatial analysis, and subject to data availability, further research may be able to illuminate the manner in which improvements in social welfare propagate across countries with strong economic ties.

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