NEGATIVE BEQUEST MOTIVES, TAX-SMOOTHING AND THE BUDGET DEFICIT

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This paper focuses on explaining the intertemporal and cross-country differences in budget deficits. In particular, it tests two prominent theories of budget deficits, namely the Barro (1979) tax-smoothing approach, and the still-untested theory of negative bequest motives advocated by Cukierman and Meltzer (1989). Results from country and time fixed-effects panel regressions, estimated from 1972 to 1992, find relatively stronger statistical support for the tax-smoothing approach among developing countries but not in developed countries. The existence of empirical evidence supporting the theory of negative bequest motives is indeterminate. This paper also finds that both theories perform very well at accounting for cross-country differences in budget surplus shares but are relatively weak in accounting for intertemporal changes in budget deficits.

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1. Introduction

The characteristic of the United States federal government budget in the 1950s and 1960s was that of small budget deficits alternated with occasional surpluses. The beginning of the 1970s saw the end to this trend, with the federal government running budget deficits that were not only persistently large, but also generally increasing as a share of GDP. This trend continued until 1986, after which the federal budget made the sudden recovery towards being balanced. This recovery has led to the fiscal year of 1998 to be somewhat historical, with the occurrence of the first budget surplus of the federal government budget in nearly thirty years.

Cross-country time series data surprisingly reveal that there are a substantial number of other developed and developing countries that have experienced a V-shaped trend in the central government budget surplus share that is very similar to that of the United States. However, there are also other countries that, in one way or another, did not conform to the above trend. The above brings one to ask the question that is central to this paper: what determines the size of deficits of national governments?

This paper focuses on empirically determining the significant factors that influence the size of government budget deficits. Possible factors that explain cross-country and intertemporal differences, will be both examined. In particular, it tests two prominent theories of budget deficits, namely the Barro (1979) tax-smoothing approach, and the still untested theory of negative bequest motives advocated by Cukierman and Meltzer (1989). Using a panel data set that includes 87 countries for the time period 1972 to 1992, fixed-effects panel regressions are estimated with the variables postulated by the two theories.

Cukierman and Meltzer (1989) developed a theory of budget deficits that focuses on the intergenerational redistributive aspect of government debt. They argue that there exist *bequest-constrained individuals* who would like to transfer resources from future generations to finance current consumption, via negative bequests. However, given that such negative bequests are not socially enforceable, bequest-constrained individuals will favor any fiscal policy that decreases current taxes without decreasing current government expenditures. Thus, in a democratic political system, the larger the share of bequest-constrained individuals in the population, the more likely is the government to run larger deficits. Based on this scenario, Cukierman and Meltzer postulate that increases in the expected rate of economic growth, the spread of the income distribution or expected longevity tends to increase the population share of bequest-constrained individuals, which will consequently lead to larger budget deficits.

Evidence from country and time fixed-effects panel regressions however, indicate that the expected per capita growth rate has a positive association with the budget deficit. This positive association was statistically significant for the developed countries, but not for the developing countries. An increase in the expected elderly life expectancy was found to increase the budget deficit but was not statistically significant. The Gini coefficient, on the other hand, did not have a consistent effect on the budget deficit. Thus, by way of statistical significance of the estimated coefficients, empirical data at best only offer partial support for the bequest motive theory of budget deficits.

The second model that this paper is concerned with is the tax-smoothing model advocated by Barro (1979). Barro argues that the dominant motive behind the running of budget deficits and surpluses by central governments is the minimization of the deadweight loss associated with tax collection, which requires keeping a constant tax rate for every period. He thus postulates that governments would run budget deficits in periods during which expenditures are unexpectedly high or when the economy is in recession, and vice versa.

The same country and time fixed-effects panel regressions show that the estimated coefficients for unanticipated changes in per capita government expenditure are always highly significant. However, unanticipated changes in per capita real GDP are highly statistically significant, only in the developing countries. As such, our empirical results indicate strong support to the tax-smoothing approach to budget deficits among developing countries.

Further, post regression analysis indicate the both theories of budget deficits are able to largely account for cross-country differences in budget surplus shares. The tax-smoothing approach can account for about 15 to 30 percent of budget surplus share differences, while the bequest motive variables are erratic with regard to the proportion of the differences they can account for. In contrast, both theories perform relatively poorly when attempting to account for intertemporal differences in budget surplus shares.

Following this introduction, Section 2 will briefly present the global trends in budget deficits since the 1950s. In doing so, it will highlight the interesting puzzles associated with the observed trends. Section 3 will then proceed on to introduce the Cukierman-Meltzer model of budget deficit and carry out the empirical testing of the model. Introduction of the theoretical framework and the empirical testing of the second model of budget deficits - the tax smoothing approach – will be detailed in Section 4. Section 5 of this paper will focus on briefly discussing the other factors that have been found to influence budget deficits in the literature. Section 6 uses both theories of budget

deficits to account for actual differences in budget surplus share across time as well as across countries. Section 7 will conclude with the main findings of this paper.

2. Patterns and Puzzles

What determines the deficits and debts of national governments? Why should they loom larger at some times and in some countries than in others? We have partial theories, some explaining changes over time and others addressing the international differences. Yet only now have enough data been gathered to allow global tests of the competing explanations.

Since the 1950s, an ever-growing number of countries have supplied data on government finances. Adjusting and assembling these data makes it possible for this paper to reveal some striking patterns in central-government budget balances and stocks of public debt. Most countries, as we shall see, conformed to some previously unnoted time trends in their government deficits and debts as a share of GDP. Yet the countries varied even more in their deficit shares and debt shares in any given period than the international averages varied over time. Both the revealed global movements over time and the differences between countries pose challenges for economic theory. The purpose of this section is to highlight the global trends and international differences in deficits and debt. Some of the patterns are more puzzling than others, but they all invite new tests of competing theories.

2.1 Patterns

2.1.1 Global Trends

The quickest way to grasp the global tendencies in government budget balances and debt is to follow simple averages of their shares of GDP over the second half of the twentieth century. Figures 2.1 and 2.2 plot these averages for different groups of countries supplying annual data for long periods.

The global tendencies between 1950 and 1996 divide into three clear eras, with a fourth era possibly starting since 1994.

1. From mid-century to 1973

The long initial postwar era was one in which deficits seemed to grow slowly larger on the average, though neither their average size nor the steepness of their trend is as striking as what was to follow. In this period before 1973 only 16 out of the 990 country-years of available data saw deficits

as great as 10 percent of GDP. Over the same period, those deficits were small enough in relation to GDP that central-government debt did not rise relative to annual GDP. On the average the debt/GDP ratio even declined slightly.

For the United States and the United Kingdom, at least, we know that pre-1950 trends also showed no large net deficits over the very long run. To judge from their experience since the late eighteenth century, the only sharp increases in the debt-output ratio came during wars or depressions. Between these sharp increases, the government would run budget surpluses to pay off the debt accumulated, leading to a decline of the debt-output ratio.

2. From 1973 to 1983

On the average, central government budgets dropped sharply into deficit from 1973 to 1975 and again from 1979 to 1983, with a slight plateau in between. These drops corresponded, of course, to the two oil shocks. At its worst, the 54-country average budget deficit nearly hit 6 percent of GDP in 1982. These budget deficits correspondingly led to the steady increase in the debt-GDP ratio during this period, from 39 percent of GDP to about 70 percent of GDP. This nearly 100 percent increase in the stock of debt to GDP ratio occurred despite the absence of wars or long-term recessions.

3. From 1983 to 1994

By contrast, this period saw a clear net reduction in deficit shares, with deceleration in the debt/GDP ratio. The recovery pattern was not even, however, with a presumably cyclical relapse into greater deficits between 1990 and 1992. Yet over the whole period, there was a clear reduction in the rate of deficit.

The years after 1994 might eventually be viewed as a continuation of the 1983-1994 recovery. So far the most recent data have brought some further reduction in deficits and an end to the rise of the debt/GDP ratio. Let us keep the post-1994 experience to one side, however, unto the data for these most recent years are completed.

2.1.2 International Differences

While sharing in the global movements, individual countries varied greatly in their deficits and debt growth. Countries departed from the global averages both in the timing of their turning points and in their average deficit and debt shares during any given time period.

For several countries, the chronology of turning points in the deficit share of GDP differed noticeably from that average pattern shown in Figure 2.1. Some countries did not follow the V-shaped budget trend at all. For example, Finland and Switzerland have been running small deficits since 1950 but then took a sudden dive in the early 1990s. France seems to be in a category on its own. From 1950 to 1973, it was moving slowly from deficits to surpluses, then it dropped into deficit along with the other countries during 1973-1983. It continued to run even deeper deficits to 1994, before tightening up in an attempt to conform to the Maastricht Treaty's call for deficits within 3 percent. Finland kept balanced budgets, more or less until 1990, then had deficits averaging 10 percent of GDP for the next five years, partly because it attempted to peg its currency to the German mark at exactly the wrong moment in history.

Apart from oddities of timing, some countries stood out over most of the period as having particularly deep deficits and soaring debt/GDP ratios. This was generally true of Belgium, Greece, Ireland, Italy, Israel, Jamaica, Morocco, Oman, Sri Lanka and Zambia, whose deficits were often over 10 percent of GDP. Why these countries and not others?

3. The Negative Bequest Motive Theory of Budget Deficits

In an attempt to account for the above mentioned intertemporal and cross-country differences in budget surplus shares, we turn to a prominent but still empirically untested model of budget deficits: the Cukierman-Meltzer (1989) political economy general equilibrium negative bequest motive theory of budget budgets.

3.1 The Theoretical Framework

Cukierman and Meltzer (1989), hypothesizing a political theory of government debt and using an overlapping generations model with bequests, attempted to identify the factors that determine the size of budget deficits by focusing only on the redistributive role of the government. By doing so, they abstract from the function of the government as a provider of public goods and also from issues that relate to the minimization of the deadweight loss of taxation over time[1].

[1] A model of budget deficits that has the minimization of intertemporal deadweight loss that is associated with taxation as the dominant concern will be presented in Section 4.

Main Assumptions of the Model

The economy is represented by an overlapping generations structure with bequests. The population is assumed to be stationary and the number of individuals in each generation, denoted by *N*, is identical across periods. Their model assumes there is no uncertainty, taxes are levied in a lump-sum fashion on the young, and the old receive Social Security benefits. Individuals work only when young and each supplies inelastically one unit of labor each period. There exists differences in ability and, consequently, in wage rates across individuals. The production function exhibits constant returns to scale technology.

Individuals are able to transfer wealth from the first to second period of life by means of savings either in the form of government bonds or capital investment. Familial intergenerational transfers, if any, are assumed to flow only from the parent to the child, that is, such transfers exist only in the form of bequests. The amount of bequests differs across individuals. As will be explained below, the position of each individual in the distribution of wealth, his wage rate and the wage rates he expects for future generations in his family determine his attitude toward the size of the budget deficit. Given individual preferences, majority rule determines the current period debt size and the current taxes chosen by voters. Government expenditure is financed by a combination of lump-sum taxes on the young and issuance of one-period government bonds that have to be repaid with interest in the next period.

Bequest Motives and Preferences over the Budget Deficit

Cukierman and Meltzer argue that Barro's (1974) government debt neutrality theorem does not hold when individuals differ in productivity, wage earnings, and also in their initial endowment. This is because these differences will give rise to some individuals who would like to leave a negative bequest to their descendants. However, such bequests cannot be discharged as there are no institutional arrangements that can obligate their descendants to do so. The minimum bequest is thus constrained to zero and individuals who desire to leave negative bequests are termed as *bequest-constrained individuals.*

Clearly, such bequest-constrained individuals will favor a fiscal policy that increases their lifetime income at the expense of future generations even when the present value of the tax change is zero. For example, increased Social Security benefits financed by debt issue shift taxes forward (that is, into the future) and allow bequest-constrained individuals to achieve a higher level of consumption. Thus, with such individuals, the issuance of government debt will not be neutral. All

other things equal, under a majority rule political system, this implies a larger share of the population that is bequest-constrained will tend to lead to a larger budget deficit.

Cukierman and Meltzer further argue that, in their general equilibrium framework, even an individual who is not bequest-constrained, and does not possess negative bequest motives, may still not be indifferent to a reallocation of resources over time that maintains present value. According to them, if there exist any bequest-constrained individuals in the economy, a present-value-preserving exchange of taxes for public debt will increase the consumption of those individuals. These bequest-constrained individuals must obtain the required resources for additional consumption from the non-bequest-constrained, who substitute bonds for real capital in their portfolios. While bonds and capital are perfect substitutes in portfolios, they are not perfect substitutes in production. The additional debt crowds out some capital[2], raising the return to capital and decreasing the return to labor. Consequently, individuals will favor a debt increase if their income is largely capital income and will be against a debt increase if their income is mainly labor income. As such, even non-bequest-constrained individuals may not be indifferent to such intertemporal reallocations of resources that maintain present value[3].

Given the above arguments, whether individuals favor a larger budget deficit depends on three factors :

1. the amount of benefits they receive from an intergenerational reallocation of resources (relevant only to bequest constrained individuals),
2. the magnitude of the increase in welfare they obtain from a higher return on assets, and
3. the magnitude of the decrease in welfare they experience from a decrease in wage rates.

These factors will consequently also determine the proportion of individuals in the economy who will vote for a larger budget deficit. Under a majority rule system, a larger the proportion of such individuals will therefore lead to a larger budget deficit.

[2] The amount of capital that is crowded out by an additional unit of debt depends on the fraction of bequest-constrained individuals in the economy and on the extent to which they are constrained.

[3] It is realized that for small open economies, the issue of addition government debt will not lead to an increase in interest rates and thus no crowding out of capital will occur. This point will be reiterated in a later section when the regression results are analysis.

3.2 Major Implications :

Macroeconomic Conditions Conducive to Larger Deficits[4]

Based on the above three factors, Cukierman and Meltzer came up with the following economic conditions which tend to increase the size of the budget deficit[5] under a majority rule political system. These constitute the refutable hypotheses of their model.

Proposition :

Budgetary deficits are larger under majority rule[6],

a. the larger the expected rate of future growth of the economy,

b. the larger the fraction of individuals below a certain level of income and wealth[7],

c. the larger the fraction of individuals whose main source of income is NOT from wages[8],

d. the larger the spread of the distribution of income[8], and

e. the higher expected longevity

Explanation of Proposition :

a. All other things being equal, the higher the expected rate of future economic growth, the more the current generation will expect future generations to be relatively better off. This tends to increase not only the probability that the current generation will want to reallocate resources from the future to the present, but also increases the amount of resources that is likely to be transferred. As such, economic growth tends to increase the number of individuals with negative bequest motives and also increases the degree to which individuals are bequest constrained, thus leading to a larger budget deficit under majority rule.

b. Cukierman and Meltzer argue that individuals who are below a certain level of income and wealth will have not enough resources for a subsistence level of lifetime consumption. As such, these individuals would tend to want their descendents to aid them in achieving a higher level of lifetime consumption, thereby giving rise to negative bequest motives. Thus a

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[4] In their paper, Cukierman and Meltzer presented one proposition for the macroeconomic conditions which are conducive to larger debts and another proposition for the macroeconomic conditions which are conducive to larger deficits. Given that, debt equals deficits in their model (due to the assumption of one-period bonds), both propositions, in fact, are equivalent.

[5] Recall that since all of the budget deficit is assumed to be financed by the issuance of one-period bonds in the model, the size of the deficit in period *t* will exactly equal the amount of debt issued in period *t* which also equals the stock of debt in period *t*.

[6] Note that these conditions for larger deficits are not based on rigorous mathematical derivation. In fact, they are intuitive implications of the comparative statics that were derived in their mathematical model. For example, (e) suggests that a higher expected longevity, ceteris paribus, tends to increase the size of the budget deficits. However, we note that differences in longevity have not been incorporated into their two-period overlapping generations model.

[7] It will be explained below that with parts *b* and *c* of the Proposition, part *d* becomes redundant.

larger fraction of the population being poor, or at least under that certain level of income and wealth, tends to increase the fraction of the population that are bequest-constrained and this consequently leads to a larger budget deficit.

c. As argued above, wage rates tend to decrease with debt issuance. As such, individuals with labor income as their main source of income will tend not to favor a larger amount of debt issuance which is equivalent to a larger budget deficit. Thus, a larger fraction of the population that does not have wages as their main source of income tends to increase the level of the deficit that preferred by the median voter.

d. Cukierman and Meltzer argue that individuals with extreme amounts of income and wealth tend to favor more debt issuance. Individuals with low incomes will tend to be bequest constrained, while individuals with high incomes tend to have capital income as their main source of income. Both of these groups of individuals will vote for more debt financing, but for different reasons. Hence, the larger the spread of the distribution of income or total wealth, the larger the probability of having a larger budget deficit.

Further, note that part *d* of the proposition is in fact a combination of parts *b* and *c*. Part *b* accounts for the individuals with very small amounts of wealth and income, while part *c* accounts for individuals with very large amounts of wealth and income. Given this, parts *b* and *c* renders part *d* of the proposition redundant. However, suitable cross-country time series data that measure the aspects of the population mentioned in parts *b* and *c* is unavailable. As such, data on income distribution, relevant for part *d* of the Proposition, will be used in lieu of the unavailable data for parts *b* and *c*.

e. Higher expected longevity tends to increase the expected length of time an individual spends in retirement[8]. This tends to increase the required amount of resources necessary to sustain consumption in the retirement years. Thus a higher expected longevity will tend to increase the proportion of the population who prefer negative bequests and also the size of the negative bequest that is preferred. This, in turn, tends to lead to a larger budget deficit, ceteris paribus.

[8] Thus the case in which higher longevity increases the length of an individual's working life is not considered.

3.3 Negative Bequest Motive Regressors

1. *Expected per capita real GDP growth rate of the economy*

Recall that Cukierman and Meltzer postulated that as the expected real GDP growth rate increases, people would tend to expect future generations to be better off relative to the current generation. Thus, this tends to increase the share of bequest constrained in the population. In this light, expected per capita real GDP growth rate, rather than the expected growth rate in aggregate GDP, is more intuitively appealing as a proxy for the expected welfare of future generations. This was constructed as the slope coefficient of a "rolling regression" of the preceding 22 years' log of the real per capita GDP on a time trend. More specifically, the expected per capita real GDP growth rate of the economy in year *t* would be the slope coefficient obtained when the log of real per capita GDP for the years *t*-1 through *t*-22 is linearly regressed on a time trend[9].

2. *The distribution of income or total wealth.*

Data for Gini coefficients from Deininger and Squire (1996) are used. Only observations that are in the "accepted" category are used. Observations in this category are considered by Deininger and Squire to be relatively more consistent, more accurately measured, and reliable. However, the available data were irregularly spaced and relatively scarce. We note that the true gross income distributions tend to change very slowly and that there will be unavoidable inconsistencies in the measurement of the Gini coefficient, (both across countries and across time). In order to minimize the effect of extreme observations and to increase the number of annual observations, the available data were smoothed using locally weighted scatterplot smoothing and linear interpolation was performed using the new smoothed observations[10].

3. *Expected longevity*

The bequest motives model postulates that the longer the period of time an individual spends in retirement, the more likely he or she is likely to be bequest-constrained. As such, their Proposition

[9] The choice of using the past 22 years is somewhat arbitrary. A brief discussion further relating to the choice of using the past 22 years will be presented where the regression results are discussed.

[10] The smoothed values are obtained by running a regression of the original Gini coefficient data on time. Each smoothed value of the Gini coefficient is generated using the original Gini coefficient for that particular year and a small amount information of the actual Gini coefficients observed in the past and future years. In this method, the regression is weighted so that the central point, the Gini coefficient in year *t* ($gini_t$, $year_t$) gets the highest weight and points farther away (based on the distance $|gini_s - gini_t|$ receive less. The estimated regression is then used to predict the smoothed value $\hat{gini}_t$ based on $gini_t$ only. The procedure is repeated to obtain the remaining smoothed values, which means a separated weighted regression is estimated for every point in the data. A bandwidth of 0.5 was used, which implies that centered subsets of 50 per cent of the observations are used for calculating smoothed values for each point. The greater the bandwidth, the greater the smoothing.

indicates that an increase in expected longevity will lead to a larger budget deficit, under majority rule.

In view of the above, a very appropriate variable for use as a proxy for the expected time an individual expects to spend in retirement is life expectancy at age 65[11]. However, across the 87 countries included in the sample, there is a less than satisfactory number of observations for life expectancy at age 65. The problem of insufficient data is especially severe for the less developed countries, with some of them having as few as 3 observations out of the possible 45 years of data. On the other hand, data for life expectancy at birth is relatively more abundant with annual observations being available even for the less developed countries. A simple way to get around problem of having insufficient number of observations for "life expectancy at age 65" would have been to use "life expectancy at birth" as a proxy. However, in order to get a more accurate representation of the expected time an individual spends in retirement, a less crude technique was used. This technique involves the use of the available data on life expectancy at birth and at age 65 to make out of sample predictions for years in which data on life expectancy at birth is available but life expectancy at age 65 is not. Please refer to the data appendix for details.

4. The Tax Smoothing Approach to Budget Deficits

Another prominent model of public debt and budget deficits is the tax smoothing approach. In contrast to the theory of negative bequest motives, the tax smoothing approach argues that the dominant motive for the running of budget deficits and surpluses is to minimize the intertemporal deadweight loss or excess burden of taxation. The theory thus implies that in times of usually high levels of government expenditure or usually low levels of the output, the government will find it optimal to run budget deficits. On the other hand, when levels of government expenditures are usually low or when output is usually high, the government should run budget surpluses.

4.1 The Theoretical Framework

Assuming that Ricardian equivalence holds to a first-order approximation, Barro (1979) proposed and tested a tax-smoothing theory of public debt, which is based on society's attempt to minimize the excess burden of taxation over time. Although the amount of deadweight loss accrued due to taxation depends on the timing and composition of tax collections, Barro, in this paper, only focuses on the minimization of the deadweight loss of taxation due to the timing of tax collection.

[11] The expected additional number of years a person is expected to live, given that he or she has survived until age 65.

The Ricardian proposition implies that shifts between debt and tax finance for a given amount of public expenditure would have no first-order effects on real macroeconomic variables. The assumption that it holds excludes some of the typical features of public debt analysis, such as shifting of the tax burden to future generations and the crowding out of private investment, etc. As such, Barro's model abstracts from the intergenerational reallocation of resources as a reason for the issuance of public debt[12].

The theory focuses on a closed economy without capital in which a large national government that has jurisdiction over a population of given size, in which any effects of public debt policy on migration[13] is ignored. The government needs to finance a certain amount of expenditure in every period by means of current income taxation and public debt issue[14], with both the composition of taxes and the level of government expenditure being exogenously given[15]. Individuals are assumed to have perfect knowledge of all future exogenous variables, including the levels of government expenditure. Also assumed is that the real rate of return on public and private debts is a constant.

Due to costs for tax administration and enforcement, the collection of tax revenues results in some deadweight loss or excess burden. In accordance with public finance theory, Barro assumes that the deadweight loss for each period is directly proportional, with a positive second derivative, to the amount of tax revenue collected and inversely proportional to the available tax base. The government has an intertemporal budget constraint implying that the present value of spending must equal the present value of taxes.

The government's optimization problem is then to choose the amount of tax to be collected in each period such that the present value of deadweight loss is minimized, subject to the government's intertemporal budget constraint. It can be shown that the present value of the deadweight loss of tax collection is minimized when the (average) tax rate[16] is constant in every time period, with the level of the tax rate being determined by the intertemporal budget constraint.

Suppose that the United States federal government is initially running a balanced budget and then government expenditures increase unexpectedly due to, say, a sudden outbreak of war with Iraq. The balanced budget rule would advocate that taxes to be temporarily increased during the duration of the war, so that additional revenue can be collected to offset the additional military expenditures

[12]Such features of public debt analysis are considered in Cukierman and Meltzer (1989), as discussed in Section 3.
[13]This would be an important consideration for a local government.
[14]Note that currency issue as a method of financing government expenditure is not considered by Barro.
[15]Assuming that the level of government expenditure is exogenous implies that Barro's model does not deal with the determination of the size of the public sector.
[16]Barro defines the tax rate as the ratio of the amount of tax revenue collected to the available tax base.

that are incurred, and to revert back to the original level of tax collections once the war is over. However, note that since the tax base, at least in the short run, remains unchanged, tax rates would increase significantly during the war and then decrease significantly after the war.

The tax-smoothing approach will, instead, prescribe a near constant tax rate. That is, it will propose that taxes be increased by an infinitesimal amount at the onset of the war and then held constant thereafter (even after the war has ended). Thus, assuming that the tax base remains unchanged, a deficit would result during the war and a surplus after the war. The budget surplus will compensates for the deficit during the war, and therefore the inter-temporal budget constraint is not violated.

Note that compared to the tax smoothing policy, the balanced budget policy incurs a higher level of excess burden during the war, because of the higher tax rate, but a lower level of excess burden in the after the war due to the relatively lower tax rates. Overall however, the tax smoothing policy dominates because under the balanced budget policy, the additional tax distortions that are incurred during wartime exceed the additional welfare gains of the lower tax rates in postwar period. This is due to the assumption of the positive second order derivative of the deadweight loss function with respect to the level of tax revenues collected. It thus follows that under the tax smoothing policy, budget deficits and surpluses are used as a buffer, optimally to minimize the distortionary effects of taxation, given a certain path of spending. As such, when spending is temporarily high, it will be optimal for the government to run a budget deficit in order to keep the tax rate constant and budget surpluses when spending is temporarily low.

An important extension of this principle concerns the fluctuations of tax revenues due to the business cycle. Suppose the economy experiences a temporary recession, in which output is low in the first period and goes back to its normal level in the second time period. The tax-smoothing approach dictates that, because of constant tax rates, that tax collections be reduced during the recession, which would result in a budget deficit, given an unchanged level of government expenditure. On the other hand, when an economic boom occurs, it would be optimal for the level of tax revenue collected to be proportionately increased, resulting in a budget surplus. As such, with regard to output fluctuations, the tax smoothing approach advocates a cyclically adjusted, balanced budget rule: the budget should be balanced over the business cycle, but not every fiscal year.

In summary, the tax-smoothing approach postulates governments run budget deficits and surpluses in an effort to minimize the deadweight loss of taxation by keeping the tax rate constant. It argues that governments will run budget deficits in the face of unanticipated shocks such as increases in government expenditures or decreases in output. Conversely, during periods of normal levels of

government expenditure and output, governments will be running budget surpluses. As such, the tax-smoothing approach postulates that there exists a positive relationship between unanticipated changes in government expenditure and the budget deficit, and a negative relationship between unanticipated changes in output and the budget deficit.

4.2 Tax-smoothing Regressors

A measure of expected level of per capita real government expenditure needs to be obtained before a measure of unanticipated changes in per capita government expenditure can be constructed. We will construct this expected level by using the average of the previous 3 years' annual growth rates of per capita real government expenditure and then applying that average growth rate to the level of the per capita real government expenditure of the previous year. Following to obtain a proxy for unanticipated changes, we shall use the percentage deviation of the current level from the expected level of per capita government expenditure or:

$$\frac{G_t - \overline{G}_t}{\overline{G}_t}$$

where

G_t is the level of real per capita government expenditure in year *t*

$\overline{G}_t$ is the expected level of per capita real government expenditure in year *t* constructed by projecting the level of per capita real government expenditure in year *t*-1 by using the average of the annual growth rates of the levels for the years *t*-1, *t*-2 and *t*-3

Similarly, to account for unanticipated changes in per capita output of the economy, we shall use the percentage deviation of the current level of real per capita GDP from the average or expected level of real per capita GDP or :

$$\frac{Y_t - \overline{Y}_t}{\overline{Y}_t}$$

where

Y_t is the level of real per capita GDP in year *t*

$\overline{Y_t}$ is the expected level of real per capita GDP in year *t* constructed by projecting the level of per capita real GDP in year *t*-1 by using the average of the annual growth rates of the levels for the years *t*-1, *t*-2 and *t*-3

5. Other Variables and the Budget Deficit

Before an empirical investigation into the issue of whether bequest constrained motives are significant driving forces behind the size of a country's budget deficit can be carried out, other structural and political variables that influence the size of the deficit must be first accounted for. There are three other main classes of variables that have been suggested in the literature to have significant effects on the size of the budget deficit of a country. They are

1. structural variables that determine or reflect the level of efficiency of the tax system in a country,
2. macroeconomic variables, and
3. political variables representing the level of political instability and political polarization in a country.

5.1 The Efficiency of the Tax System

The efficiency of the tax system has been emphasized by Edwards and Tabellini (1991) and Cukierman et al. (1992) as an important determinant of the size of the budget deficit. They noted that an economy with an inefficient tax system, holding other factors constant, cannot collect as large an amount of tax revenues as an economy with an efficient tax system. This is primarily because an inefficient tax system has higher costs of tax collection and administration, not to mention more widespread tax evasion. Because of this lower level of tax revenues, economies with inefficient tax systems tend to have larger (and more monetized) budget deficits as compared to economies with efficient tax systems for any given level of government expenditure.

Factors that tend to influence the efficiency of the tax system include :

1. *the size of the agriculture sector*: it is very difficult to tax
2. *the size of the manufacturing sector*: since it relative easy to tax due to its mainly corporate structure
3. *the size of the foreign trade sector*: import and export taxes are commonly regarded as a cheap tax base

4. *the size of the urban population share*: tax collection costs are likely to be smaller in urban areas than in rural areas

5.2 Macroeconomic Variables

a. Level of Economic Development

To control for the potential effects of economic development on the cross country differences in budget deficits, the log level of per capita real GDP will be used.

b. Accounting for Money Creation

The budget deficit can be defined as the sum of the different ways in which it can be financed. Typically, budget deficits can be financed either by borrowing from the public or by seigniorage[17], which implies that the budget deficit can be written as:

Budget Deficit = *Non-monetized Debt Issue* + *Money Creation*

The bequest motive theory of budget deficits hinges wholly on the assumption that the deficit is financed by public debt issuance. Therefore, if a country runs a large budget deficit and finances it by monetizing it, the bequest motive theory provides no explanation as to why the budget deficit should arise. This is because monetization of the deficit is equivalent to the imposition of an inflation tax, and this leads to a decrease in the real disposable income that should result in a increase the degree to which people are bequest-constrained. Thus, bequest-constrained individuals would not favor an increase in the budget deficit that is financed by money creation.

As such, when testing the bequest motive theory of budget deficits, it is necessary to control for the seigniorage financed portion of the deficit, leaving the component of budget deficit that has

[17]Note that there are countries for which the budget deficit is not equal to the sum of the debt issued or retired and the amount of money created. For example, Singapore has been generally running budget surpluses since the 1980s, however, its stock of government debt has been increasing. This implies that the Singapore government has chosen not to pay off debts that it owes to the public, even though it has the surpluses to do so. In fact, it has chosen to borrow even more, in spite of accumulating large government reserves due to the many years of budget surpluses. This interesting case of Singapore, which provides a contradiction to the above "identity", illustrates that it is not always the case that when a country runs a budget surplus, the stock of national debt should, ceteris paribus, decrease and vice versa, which is clearly assumed by Cukierman and Meltzer here and by many others in the literature. The above equation perhaps should be rewritten as :

Budget Deficit = Non-monetized Debt Issue + Money Creation - Change in Government Assets

We did not control for changes in government assets due to a lack of available data and because changes in government assets is in many ways similar to debt issue, within the framework of the negative bequest motive model. Bequest constrained individuals should be indifferent between budget deficits that are financed by public debt issue or by sale of government assets, since in both cases current consumption increases at the expense of future generations.

been financed by debt issuance to be explained by bequest-constrained motives[18]. Following Roubini (1991), we use the change in the monetary base (as a share of GDP) to control for seigniorage revenue.

c. Accounting for Interest Payments on Government Debt

Interest rates are an important factor in determining governments' costs of debt servicing. Naturally, the costs of debt servicing become more important in countries that have a large stock of government debt, such as Belgium, Ireland and Italy. We will use the measure of the budgetary costs of higher interest rates presented in Roubini and Sachs (1989b), which is the annual change of the difference between the real interest rate and the real growth rate, multiplied by lagged debt-GDP ratio.

5.3 Political Instability

Political instability has been found to play significant roles in the determination of the size of the budget deficits[19].

Edwards and Tabellini (1991) postulate that the more politically unstable a country is, the larger will be its budget deficit. Political instability will raise the frequency of government changes and lower the likelihood that a current policymaker will be reelected. Given this, consider a policymaker who is required to choose both the intertemporal profile of spending and taxes as well as how to allocate the resources acquired by issuing debt. Suppose that because of political instability in the country, the policymaker is aware that in the future he may be replaced by a policymaker or political majority with different preferences about some aspects of fiscal policy. Then he realizes that, whereas he is in control of how to allocate the proceeds of his borrowing, the allocation of the burden of repaying the debt in the future may not be under his control. This asymmetry may prevent the current policymaker from fully internalizing the costs of running a deficit, the more so the greater

[18]Roubini and Sachs (1989a) showed that there is some evidence that policymakers treat seigniorage and bond issues as alternative ways to finance a budget deficit. Thus if some countries are constrained in their use of seigniorage taxation, they would switch to debt issuance to finance a given level of level of budget deficit. It is clear that in such a case, even if the budget deficit is financed by public debt issue, the Cukierman-Meltzer model does not provide an explanation for such a component of the budget deficit.

Roubini and Sachs (1989a) argue that due to their commitment to peg to the Deutsche Mark, member countries of the European Monetary System (EMS) experienced a reduction in seigniorage collections as they induced a slowdown in inflation and they found evidence that the decrease in seigniorage financing was accompanied by a more rapid increase in public debt.

[19] See Cukierman *et al*. (1992), Edwards and Tabellini (1991), and Roubini (1991). These papers actually argue that both political instability and political polarization are significant determinants of the size of budget deficits. However, it is noted that a country that is politically polarized may not be politically unstable. For example, a country can have two very different or polarized political ideologies and yet be politically stable if the supporters of one of the political ideology form the vast majority of the voter population, assuming majority rule. For this reason we have decided to omit the concept of political polarization in our presentation of political instability as a significant determinant of budget deficits.

is the difference between his preferences and the expected preferences of the future majority. In simple terms, the policymaker may wish to borrow in excess of the optimum and let his successors "pay the bills". Thus, political instability and polarization tends to lead to a larger than optimal size of the budget deficit, even if the policymaker and the voters are rational and forward-looking.

This paper will use the frequency of government crises to proxy for political instability[20]. The number of government crises is defined as the number of major government crises, defined as any rapidly developing situation that threatens to bring the downfall of the present regime – excluding situations of revolt aimed at such overthrow.

5.4 Political Freedom

Recall that Cukierman and Meltzer rely on the majority rule or a democratic political system for their theory of budget deficits. Thus, it is important to control for time periods during which citizens of a country may not have the political freedom to vote, such as when a country is under a military dictatorship.

6. Testing Tax Smoothing and Negative Bequest Motives

This section focuses on using both the Cukierman-Meltzer theory of negative bequest motives and the equilibrium approach to explain cross-country as well as dynamic variations in the budget deficits of national governments. As such, the variables postulated by both theories to affect the budget deficit are included together with the structural variables and used as regressors in the fixed-effect panel regressions.

Table 6.1 presents the results of the country and time fixed effects panel regressions[21] for the years 1972–1992 where two alternative lengths of the time period are used for the construction of the bequest motive variable, the expected per capita growth rate. In Reg 1a and 1b, each observation for the expected per capita real GDP growth rate is equal to the slope coefficient when the log values of real GDP per capita of the previous 17 years are regressed on a time trend. The same methodology is applied to Reg 2a and 2b except that real GDP per capita for the previous 22 years were used. Since

[20] It was originally intended to follow Edwards and Tabellini (1991) and Roubini (1991) in using the frequency of government changes (both regular and irregular) as a measure of political instability. However, the data series for the frequency of government changes or total executive transfers obtained from Taylor (1985) is short, ending in 1983. As such, the number of government crises is used as a substitute. This alternative measure is crude since a government crisis does not necessarily lead to a change in the government. In addition, this measure excludes situations of revolt to overthrow the government, which should be included in a measure of political instability.

[21] All regressions have been estimated using White's correction for heteroscedasticity.

the purpose of this variable is to represent the expectations of the current generation about the standard of living of future generations, it is imperative that we use a long-run measure of the growth rate. For this reason, only relatively long time intervals were considered.

The panel regressions are constrained to the years 1972 through 1992, because of the lack of data on political rights beyond those years. Data on real GDP obtained from Summers and Heston (1991) are available beginning in 1950. As such, the longest possible time interval that can be used in the construction of the expected growth rate in 1972 would be an interval of the previous 22 years from 1950 to 1971. However, the use of such a long time interval is likely to result in the lack of sensitivity of the constructed expected growth rate figures to short run changes in GDP[22]. As such, an alternative slightly shorter time interval of 17 years was also arbitrary chosen for the expected growth rate construction and the regressions results of which are also presented for comparison. In addition, since tests of significance show that developed and developing countries are statistically different, separate panel regressions were run for developed and developing countries for each time interval. We see that for both developed and developing countries, the use of 17 previous years or 22 previous years does not affect the qualitative or quantitative results of the regressions.

Negative Bequest Motive Regressors

For the bequest motive variables, we see that regardless of the time interval used in its construction, the expected growth rate tends to decrease the budget surplus share in the developed countries and is statistically significant. For the developing countries, expected growth rate reveals a negative coefficient only on using 22-year time interval for its construction, and the coefficient does not exhibit statistical significance in either set of regressions. The Gini coefficient tends to decrease the budget surplus share only in developing countries but is not statistically significant in any of 4 regressions. The coefficients for estimated life expectancy at age 65 produced the theoretically expected negative sign in all of the 4 regressions, but are not significant.

At the first glance, it would seem that the theory of negative bequest motives is not well supported by the data. However, it is possible to provide an explanation for the statistically insignificant coefficients of the expected growth rate variable that is fully consistent with the negative bequest motive of budget deficits. Recall that Cukierman and Meltzer argue that high long run real per capita GDP growth rates tend to indicate that future generations are likely to be better off than the current generation and thus leading to larger number of bequest-constrained individuals

[22] While it is true that the expected growth rate variable is focused on capturing the effects of long-run economic growth on the budget deficit, we do not want to totally exclude the effects of short-run output fluctuations. This is because such transitory fluctuations is likely to have some effect on long –run expectations.

within the economy. This "intergenerational effect" of high long-term growth rates tends to decrease the budget surplus share. However, we argue that there exist a second side-effect of high long-run growth rates, which is to significantly raise the current standard of living, thereby decreasing the number of bequest constrained individuals in the economy. This "wealth effect" will tend to increase the budget surplus share of the economy. As such, the resultant effect of high long-term economic growth rates on the proportion of bequest-constrained individuals is indeterminate.

For the developed countries, the expected growth rates coefficients are negative and significant, which may be indicative that the intergenerational effect of high growth rates is significantly larger than the wealth effect. On the other hand, developing countries display a negative but insignificant expected growth rate coefficient, which may hint that the magnitudes of the intergenerational and wealth effects may be on approximately par with each other. Thus, an overall negligible effect on the budget surplus share is produced.

A similar approach can be also used to explain the statistical insignificance of the elderly life expectancy coefficients. Since life expectancy is another indicator of standard of living, the effects of an increase in elderly life expectancy can be again decomposed into two components. Firstly, as argued by Cukierman and Meltzer, there exists a "retirement" effect whereby individuals are concerned about the adequacy of resources for consumption during retirement. This effect tends to increase the population share of bequest-constrained individuals and is thereby expected to lead to a decrease in the budget surplus share. However, an increase in elderly life expectancy, implying that the standard of living has also increased, can also result in a "wealth" effect, which leads to a smaller population share of bequest constrained individuals, and hence a positive effect on the budget surplus. These two clashing effects can result in a statistically insignificant coefficient for elderly life expectancy even if the theory of negative bequest motives were to hold.

As for the Gini coefficient, one possible reason for its lack of statistical insignificance is that the theory of negative bequest motives is derived in a closed economy framework. For small open economies, interest rates will not increase with the issue of public debt due to an inflow of foreign capital. As such, individuals at the high end of the income distribution, who typically derive much of their income, will not have an incentive to vote for more debt issue. This implies that for small open economies with large degrees of income inequality may not experience larger budget deficits.

Tax-Smoothing Regressors

Under the tax-smoothing regime, the coefficients for unexpected changes in per capita real government expenditures are negative and highly significant in all 4 regressions, while highly

significant coefficients for unexpected changes in per capita real GDP are only displayed by the developing countries (Reg 1b and 2b). Thus, empirical support for the tax-smoothing motive for budget deficits appears to be relatively stronger in developing countries as compared to the developed countries. These regression results for the industrialized countries are in accord with Roubini and Sachs (1989b). On examining empirical data for the industrialized countries, Roubini and Sachs found that tax-smoothing behavior was not generally evident in the developed countries. Tax-smoothing behavior for budget deficits was only found to be apparent in the United States, United Kingdom and Finland.

The regressions where the expected growth rates are constructed using 22 previous years return adjusted R-squares which are marginally higher and F-statistics which significantly higher. As such, post regression analysis will be carried out using regressions where the expected growth rates are constructed using 22 previous years. In light of the V-shaped global trend in budget surpluses mentioned in Section 2, tests of structural breaks at the year 1983 were conducted. These tests indicate that only developed countries underwent a statistically significant structural break in 1983. As such, separate regressions were estimated for developed countries for the years 1973 to 1983 and for the years 1983 and after. The results of which, along with the Reg 2b are presented in Table 6.2. We see this split in the regression time period for the developed countries does not affect the results for tax-smoothing variables. Only the coefficients for the unanticipated changes in per capita government expenditure are of the correct sign and statistically significant, while the coefficients for unanticipated changes in per capita real GDP remain insignificant.

To summarize, we have shown here that fixed-effects panel regressions that incorporate both bequest motives and tax-smoothing variables provide relatively strong empirical evidence that tax-smoothing is a dominant motive behind the running of budget deficits and surpluses by central governments of developing countries and not developed countries. In contrast, empirical support for theory of negative bequest motives is not as strong. The panel regressions do reveal that the expected growth rate exerts a strong negative effect on the budget surplus for the developed countries, which is in accord with negative bequest motives. On the other hand, the expected growth rate for developing countries, Gini coefficient and elderly life expectancy either fail to return coefficients of the theoretically expected sign or are statistically insignificant.

6.2 Post Regression Analysis

To move beyond the statistical significance of coefficients, one wants to know which variables can explain a large share of the observed differences in budget deficits. This section

weighs the explanatory variables in terms of their contribution in accounting for actual changes in the budget surplus shares. That is, with "Surplus" as the share of central government surplus in GDP and the X_I's as the vector of explanatory variables, we can explain differences in surpluses between two setting with this decomposition :

$$\Delta \text{Surplus} \quad = \quad \sum b_i \Delta X_i \; + \quad \Delta \text{ prediction error}$$

Each $\sum b_i \Delta X_i$ term is the difference in surplus predicted, or explained, by the differences in the i^{th} explanatory variable.

6.2.1 Differences Over Time

The accounting of intertemporal differences in budget deficits over time will be conducted separately for developed (Table 6.3) and developing countries (Table 6.4). For the two country categories, the intertemporal accounting will be further broken into two parts, one for each of the two time periods, namely 1973 to 1983 and 1983 to 1992. Recall from Section 2[23] that during these periods, countries underwent distinctly different trends in their budgets.

Developed Countries

Table 6.3 shows changes in the budget surplus that are due to actual changes in the explanatory variables used in the panel regressions for the developed countries. Column (2) of the table presents the actual changes in the global average values of the explanatory variables from 1973 to 1983. For example, the change in the log of real GDP per capita is calculated as the difference between the industrialized country average of real GDP per capita in 1983 and that in 1973. Column (3) shows the estimated coefficients obtained from Reg 2ai. The fourth column shows the estimated change of the budget surplus due to the change in the explanatory variable. It is derived as the product of the values in columns (2) and (3). The derivation of the actual change in the budget surplus share is identical to that of the actual changes in the explanatory variables.

The total estimated change in the budget surplus share is simply the sum of the estimated changes in column (4). The total effects for the tax-smoothing and bequest motives variables are the sum of the values in the respective rows in column (4). The contribution of the tax-smoothing or bequest motives variables is the ratio of the respective total effects to the actual change of the global average budget surplus share. Values pertaining to the period 1983 to 1992 are similarly arranged and calculated. The estimated coefficients from Reg 2aii are used for 1983-1992 time period.

[23] Insufficient data prevented the inclusion of any analysis before 1972.

First note that for the period 1973 to 1983, when the actual average industrialized country budget surplus share fell by 4.7 percentage points, the regression specification predicted an estimate of a decrease of 1.7 percentage points. For the period 1983 to 1992, the regression specification made an over-prediction an increase of 5.2 percentage points, relative to the actual increase of 1.95 percentage points. Thus all explanatory variables together account for 36.0 percent of the 1973-1983 dive into deficits and 267.1 percent of the 1983-1992 deficit reduction. The control variables, those that are neither tax-smoothing nor bequest motives variables, explain 59.6 percent of the 1973-83 dive into deficits and 292.5 percent of the 1983-1992 recovery from deficits.

For the 1973-83 period, only the tax-smoothing variables correctly predicted that the budget surplus share would fall. However, it could only account for 4.6 percent of the decline in budget surplus share. For the period 1983 to 1992, both the tax-smoothing and bequest motive variables incorrectly predicted that the average developed country budget surplus would fall.

Casual inspection of column (4) reveal that political rights and urban population share were two dominant reasons for the dive into large budget deficits in the 1973-83 period. An improvement in political rights can account for about 40 percent of the increase in deficit share, while an increase in the urban population share can account for 55 percent. The large role of political rights suggests that the preferences of the general public are important in the determination of the level of budget deficits, and thus lend strong support to the negative bequest theory. Another dominant factor of the budget surplus is the level of per capita GDP. From the table, we see that increases in per capita GDP tends to increase the budget deficit share significantly. This was the case in both the 1973-83 and the 1983-92 time period. However, in the former time period, the positive effect of the increase in per capita real GDP was not sufficiently large to offset the negative effects of the increase in political rights and increase in urban population share. As such a large decrease in the budget surplus share resulted for the developed countries. In contrast, the developed countries the 1983-92 period did not experience a large improvement in political rights, but they did see a large increase in per capita GDP which lead to the large increase in budget surplus shares.

Developing Countries

The construction of Table 6.4 is identical to that of Table 6.3. The estimated coefficients for both time periods are obtained from Reg 2b. Relative to that of the developed countries, the panel regression was able to provide more accurate estimates of the change in budget surplus share. For the period 1973 to 1983, the actual average developing country budget surplus share fell by 1.9 percentage points, the regression specification predicted a very close estimate of a decrease of 1.5

percentage points. For the period 1983 to 1992, the regression specification predicted an increase of 1.6 percentage points, relative to the actual increase of 2.5 percentage points. The regression can thus account for 77.8 percent of the 1973-1983 dive into deficits and 64.1 percent of the 1983-1992 deficit reduction. The control variables can account for 45.5 percent of the 1973-83 increase in deficits and 73.2 percent of the 1983-1992 recovery from deficits.

Both the bequest motives and the tax-smoothing variables performed better at predicting the movement in the budget surplus shares of the developing countries, as compared to the case of the industrialized countries. For the 1973-83 period, the variables of both theories correctly predicted the budget surplus share would decrease. The tax-smoothing variables accounted for 22.7 percent of the actual decrease, while the bequest motive variables accounted for 9.7 percent of the decrease. For the period 1983 to 1992, only the bequest motive variables correctly predicted that the average developing country budget surplus would rise, and they account for nearly 18 percent of the actual increase.

6.2.2 Differences Between Countries

This section explores how well the bequest motives and tax smoothing variables account for cross-country differences in budget surplus shares. First a number of countries are arbitrarily selected. Then using actual differences in the values of the explanatory variables between the selected countries and a pre-assigned benchmark country, the contributions of the explanatory variables in accounting for the cross-country differences in budget surplus shares were derived. For the developed countries, Japan, the United Kingdom and Australia were arbitrarily selected and compared to the United States, while Brazil, Sri Lanka and Malaysia were selected and compared to South Korea. Comparisons were performed for the year 1985, which was again arbitrarily selected. The results of which are presented in Table 6.5.

Each of the rows in Table 6.5 shows the product of the actual difference of the variable in that row between the country in that column and their respective benchmark country in 1985, with the relevant regression coefficient. The regression coefficients are obtained from Reg 2aii (in the case of a developed country), or Reg 2b (in the case of a developing country). Values for the estimated total change in budget surplus share, total effects and contributions of the tax-smoothing and bequest motive variables are calculated as in Tables 6.3 and 6.4.

For the developed countries, we see that the regression specification tends to produce estimates that are massively different in direction than the actual differences of the budget surplus share between the selected countries and the United States. For example, Japan’s actual budget

surplus share was a 0.29 percentage point larger than that of the United States in 1985. However, the regression predicted that Japan's budget surplus share to be 11 percentage points smaller than that of the United States. In sharp contrast, the predictions for the selected developing countries were much more accurate. For all of the selected developing countries, the regression correctly predicted the direction of the difference between their respective budget surplus shares and that of South Korea. In 1985, Brazil had a budget surplus share that was 10 percentage points smaller than that of South Korea. The regression specification predicted that Brazil's budget surplus share would be smaller by 6 percentage points.

Compared to entire regression specification, the negative bequest motive variables perform well in predicting the differences in budget surplus shares for both developed and developing countries. Out of the 6 countries, only one prediction had an incorrect sign. For countries with estimates of the differences in budget surplus shares with the correct signs, the estimates ranged from an over-prediction of 304 percent to an under-prediction of 0.5 percent. As such, the bequest motive variables are generally able to predict whether one country's budget deficit is larger or smaller than another country's budget deficit, but is not to precise in estimating the size of the difference.

The tax-smoothing variables perform even better than the bequest motive variables in predicting cross-country differences in budget surplus shares. Predictions for all of the 6 countries are of the correct sign, one only one over-prediction of 185 percent. The rest of the countries' predictions constantly account for about 15 to 30 percent of the differences in budget surplus shares.

7. Conclusion

This paper has attempted to explain intertemporal and cross-country differences in budget deficits for the years 1960 to 1992 by using two prominent theories of budget deficits, namely the still untested Cukierman-Meltzer (1989) model of negative bequest motives and the Barro (1979) tax-smoothing approach to budget deficits.

The tax-smoothing or equilibrium approach to budget deficits postulates that governments will run budget deficits in the face of unanticipated shocks such as increases in government expenditures or decreases in output. Conversely, during periods of normal levels of government expenditure and output, governments will be running budget surpluses. As such, the equilibrium approach postulates that there exists a positive relationship between unanticipated changes in government expenditure and the budget deficit, and a negative relationship between unanticipated changes in output and the budget deficit. Country and time fixed-effects panel regressions show that

the tax-smoothing variables always return coefficients of the theoretically expected signs. However, while unanticipated changes in government expenditure have coefficients that are highly significant for both developed and developing countries, unanticipated changes in per capita output have significant coefficients only for the developing countries. As such, the tax-smoothing approach to budget deficits is strongly supported empirical support from developing countries but not by empirical evidence from the developed countries.

The bequest motives model postulates that, other things being equal, increases in the expected economic growth rate, the Gini coefficient or life expectancy of the elderly will tend to increase the budget deficit. Evidence from cross-section and fixed-effect panel regressions however, indicate that only the expected economic growth rate significantly deepens the budget deficit as predicted, and only occurs for the industrialized countries. An increase in elderly life expectancy tends to decrease the budget surplus share but the effect is not statistically significant. Gini coefficients have an indeterminate effect on budget surpluses.

However, there exists a possibility that the lack of significant coefficients with the theoretically expected signs may not indicate that the theory of negative bequest motives does not hold. This is because the effects of an increase in the expected growth rate or elderly life expectancy does not necessarily lead to an increase in the population share of bequest constrained persons as postulated by Cukierman and Meltzer. We argue that increases in the expected growth rate or elderly life expectancy could lead to decreases in the share of the population that is bequest constrained, even within the negative bequest motive framework. This could occur since people can experience "wealth effects" due to the increase in the expected growth rate or expected longevity. These "wealth effects" tends to decreases the likelihood that a person is bequest-constrained. As such, the resultant effect on budget deficits due to increases in the expected growth rate or expected longevity would depend on the relative magnitudes of the "wealth effects" and the original effects that were postulated by Cukierman and Meltzer. Thus, the empirical evidence is, at best, inconclusive as to the support of the theory of negative bequest motives.

Post regression results show that both theories have relatively weak prediction power over the intertemporal movements of the budget surplus shares of the developed countries. The theories, however, are able to predict time series movements in budget surplus shares for the developing countries to some extend. In sharp contrast, both theories perform fairly well in predicting country differences in budget surplus shares.

Data Appendix

A.1 Description of Data

The intended coverage of the regression is from 1950 to 1995 and covers 87 countries. The 87 countries included in the sample are:

Algeria, Argentina, Australia, Austria, Bahrain, Bangladesh, Barbados, Belgium, Bhutan, Bolivia, Botswana, Brazil, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, Colombia, Cote d'Ivoire, Costa Rica, Cyprus, Denmark, Dominican Republic, Ecuador, Egypt, Fiji, Finland, France, Gabon, Ghana, Greece, Guatemala, Guinea, Honduras, Hungary, Iceland, India, Indonesia, Iran, Ireland, Italy, Israel, Jamaica, Japan, Jordan, Kenya, South Korea, Kuwait, Luxembourg, Malawi, Malaysia, Maldives, Malta, Mauritius, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Philippines, Portugal, Romania, Seychelles, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Tunisia, Turkey, Great Britain, United States, Uruguay, Venezuela, Zambia, Zimbabwe.

Table A1 presents the sources and definitions of all raw data collected.

A. 2 How the Variables are Constructed

Dependent Variable

The fiscal surplus of the central government as a share of GDP in year *t* is defined as the ratio of central government budget surplus or deficit (-) in year *t* to nominal GDP in year *t*.

Independent Variables

Structural Regressors (control variables)

1. *Index of political rights in year t.* The index runs from "1" to "7", with "1" denoting the highest level political rights or most political freedom.

2. *Agricultural share in year t* = ratio of the value added in the agricultural sector in year *t* to nominal GDP in year *t*.

3. *Manufacturing share in year t* = ratio of the value added in the manufacturing sector in year *t* to nominal GDP in year *t*.

6 *Trade share in year t* = ratio of the sum of imports and exports in year *t* to nominal GDP in year *t*.

7 Urban population share in year t

8 *Political instability in year t* = number of government crises in year *t*.

9 Development variable : *per capita real GDP in year t*

The measurement of per capita real GDP needs to be comparable across countries. For this reason, data for this variable was obtained from the Heston-Summers data set "Penn World Tables Mark 5.6" (Heston and Summers, 1991)[24]. The measure of real GDP used in this paper will be real GDP per capita measured in constant dollars that has been adjusted for changes in the terms of trade, using 1985 international prices for domestic absorption (consumption, investment and government purchases) and current international prices for exports and imports. This measured was devised to take account of changes in the value of the country's output arising from changes in its terms of trade as well as changes in its production. The domestic absorption part is calculated using 1985 international prices. However, the net foreign balance is valued in current prices instead of 1985 prices. This is to allow for the part of the country's increased well being that results form lower prices paid for imports or higher prices received for exports.

10 *Seigniorage share in year t* = the ratio of the difference in the stock of reserve money between year *t* and year *t*-1 to that of nominal GDP in year *t*.

[24] The Penn World Tables display a set of national accounts economic time series covering a large number of countries. Its unique feature is that its expenditure entries are denominated in a common set of prices in a common currency so that real international quantity comparisons can be made both countries and over time. For more information, please refer to Summers and Heston (1991).

11 *Measure of cost of debt servicing* = annual change of the difference between the real interest rate and the real GDP growth rate, multiplied by lagged debt-GDP ratio, where the real interest rate is defined as

$$\text{Real Interest Rate} = \left[(1 + \text{Deposit Interest Rate in year t}) * \frac{\text{GDP Deflator in year t - 1}}{\text{GDP Deflator in year t}} \right] - 1$$

Construction of Estimates of Life Expectancy at age of 65

The Cukierman-Meltzer model postulates that the longer the period of time an individual spends in retirement, the more likely he or she is likely to be bequest-constrained. As such, their Proposition 3 indicates that an increase in expected longevity will lead to a larger budget deficit, under majority rule.

In view of the above, a very appropriate variable for use as a proxy for the expected time an individual expects to spend in retirement is life expectancy at age 65. However, across the 87 countries included in the sample, there is a less than satisfactory number of observations for life expectancy at age 65. The problem of insufficient data is especially severe for the less developed countries, with some of them having as few as three observations out of the 45 years for which the rest of the data set spans.

On the other hand, data for life expectancy at birth is relatively more abundant with annual observations being available even for the less developed countries. A simple way to get around problem of having insufficient number of observations for "life expectancy at age 65" would have been to use "life expectancy at birth" as a proxy. However, in order to get a more accurate representation of the expected time an individual spends in retirement, a less crude technique was used. This technique involves the use of the available data on life expectancy at birth and at age 65 to make out of sample predictions for years in which data on life expectancy at birth is available but life expectancy at age 65 is not.

Since plots of life expectancy at birth and life expectancy at age 65 show that their relationship is approximately quadratic in form, life expectancy at age 65 is regressed against life expectancy at birth and the square of life expectancy at birth. To account for differences across countries and across decades, with country fixed effects and decade dummy variables were used for the intercepts as well as for both slope coefficients. The results of which are presented in Table A1.

In order to provide an idea of the goodness of fit of the regression for each individual decade, regressions were estimated separately for each decade, the results of which are shown in Table A2[25].

[25] We realize that Reg A1 is not equivalent to the combination of Reg 2a to 2e since the decade dummies in Reg A1 was not interacted with the country fixed effects.

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Figure 2.1
Central Government Surpluses as a Share of GDP
Averages of Several Countries, 1950-1996.

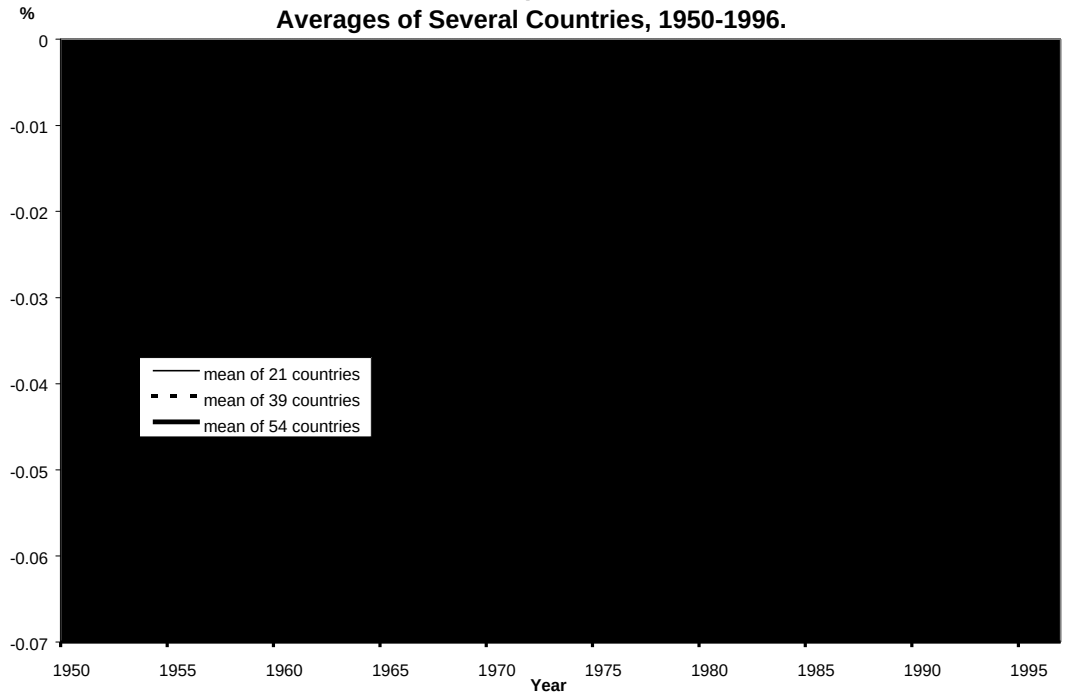

Figure 2.2
Ratios of Central Government Debt to GDP
Several Countries, 1954-1995

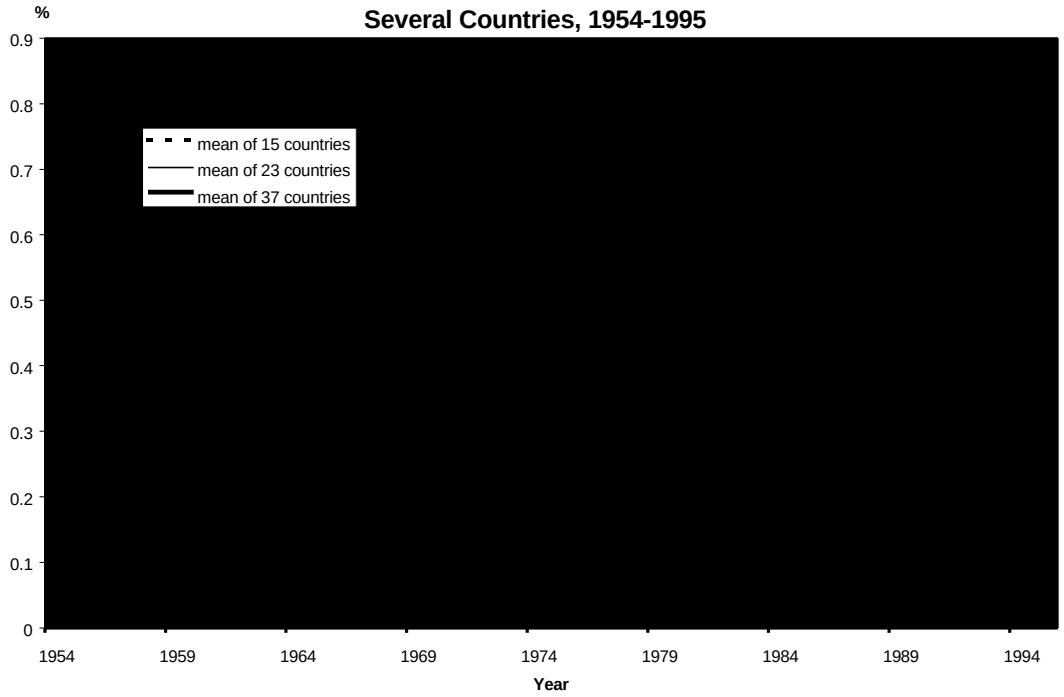

Table 6.1
Fixed (Country & Time) Effects Panel Regressions
Specifications with Variations in the Length of Time Period used for Construction of Expected Growth Rate Variable

Dependent Variable : Central Government Budget Surplus Share Years : 1972 -1992	Expected Growth Rate constructed using previous			
	17 years		22 years	
	Developed Reg 1a	Developing Reg 1b	Developed Reg 2a	Developing Reg 2b
Control Variables				
Dependent Variable Lag 1	0.7135***	0.6978***	0.7202***	0.6987***
	(0.0813)	(0.0852)	(0.0806)	(0.0918)
Index of Political Rights	0.0167**	0.0028	0.0166**	0.0031
	(0.0071)	(0.0023)	(0.0071)	(0.0024)
Agricultural Share (-)	-0.1811	-0.0786	-0.1882	-0.0859
	(0.2546)	(0.0685)	(0.2510)	(0.0846)
Manufacturing Share (+)	-0.024	-0.1734	-0.0051	-0.1905
	(0.1473)	(0.1113)	(0.1455)	(0.1223)
Trade Share (+)	0.0566	0.0214	0.0562	0.005
	(0.0388)	(0.017)	(0.0381)	(0.0337)
Urban Population Share (+)	-0.0105***	-0.0001	-0.009***	-0.0005
	(0.0034)	(0.0015)	(0.0031)	(0.0017)
Log of per capita real GDP (+)	0.1568***	0.0124	0.1442***	0.0264
	(0.0380)	(0.0224)	(0.0388)	(0.0261)
Government Crises (-)	-0.0015	-0.0008	-0.0017	-0.0024
	(0.0016)	(0.0021)	(0.0016)	(0.0021)
Cost of Debt Servicing (-)	0.0143	-0.0008	0.0154	0.0019
	(0.0732)	(0.0323)	(0.0735)	(0.0355)
Seigniorage (-)	-0.2225	-0.2467**	-0.2243	-0.2496**
	(0.1825)	(0.1168)	(0.1802)	(0.1243)
Tax-Smoothing Variables				
Unanticipated changes in real per capita govt expenditure (-)	-0.0905***	-0.0938***	-0.0928***	-0.0918***
	(0.0221)	(0.0186)	(0.0220)	(0.0211)
Unanticipated changes in per capita real GDP (+)	0.0125	0.1104***	0.0243	0.111***
	(0.0466)	(0.0372)	(0.0469)	(0.0388)
Bequest-Motives Variables				
Expected per capita real GDP Growth Rate (-)	-0.7772**	0.1731	-0.8577**	-0.213
	(0.3309)	(0.3222)	(0.3494)	(0.4723)
Gini Coefficient (-) (adjusted, smoothed)	0.0009	-0.0004	0.0006	-0.0007
	(0.0008)	(0.0019)	(0.0008)	(0.0024)
Life Expectancy at age 65 (-) (smoothed, estimated)	-0.013	-0.0001	-0.0067	-0.0006
	(0.0097)	(0.0098)	(0.0087)	(0.0113)
constant	-0.6687*	-0.0575	-0.719*	-0.1158
	(0.3731)	(0.1517)	(0.3827)	(0.2888)
R-squared	0.9280	0.8597	0.9287	0.8648
Adjusted R-squared	0.9036	0.8042	0.9046	0.8054
F-Statistic	990.92	230.50	1161.22	87309.64
F-Stat df 1	48	52	48	51
F-Stat df 2	145	144	145	123
Number of Countries	17	25	17	24
Number of Observations	195	202	195	178

Standard Errors are in parentheses.

*, **, *** denotes significance at the 90, 95 and 99 percent confidence level respectively

Robust standard errors obtained using White's correction for heteroscedasticity.

Table 6.2
Fixed (Country & Time) Effects Panel Regressions

Dependent Variable : Central Government Budget Surplus Share Years : 1972 -1992	Developed Countries 1973-1983 Reg 2ai	Developed Countries 1983-1992 Reg 2aii	Developing Countries 1972-1992 Reg 2b
Control Variables			
Dependent Variable Lag 1	0.7984***	0.6126***	0.6987***
	(0.1248)	(0.1368)	(0.0918)
Index of Political Rights	0.0267***	0.0132	0.0031
	(0.0088)	(0.0164)	(0.0024)
Agricultural Share (-)	-0.3639	0.2984	-0.0859
	(0.2872)	(0.6103)	(0.0846)
Manufacturing Share (+)	-0.1668	-0.1386	-0.1905
	(0.2581)	(0.3947)	(0.1223)
Trade Share (+)	0.102*	-0.0607	0.005
	(0.0588)	(0.0697)	(0.0337)
Urban Population Share (+)	-0.0106**	-0.0134	-0.0005
	(0.0048)	(0.0130)	(0.0017)
Log of per capita real GDP	0.2381***	0.2157***	0.0264
	(0.0787)	(0.0688)	(0.0261)
Government Crises (-)	-0.0024	-0.0029	-0.0024
	(0.0020)	(0.0047)	(0.0021)
Cost of Debt Servicing (-)	-0.0973	0.1149	0.0019
	(0.0985)	(0.1602)	(0.0355)
Seigniorage (-)	0.0024	-0.1922	-0.2496**
	(0.1820)	(0.1493)	(0.1243)
Tax-Smoothing Variables			
Unanticipated changes in real per capita govt expenditure (-)	-0.0736***	-0.1304***	-0.0918***
	(0.0256)	(0.0407)	(0.0211)
Unanticipated changes in per capita real GDP (+)	-0.0065	0.0612	0.111***
	(0.0622)	(0.0891)	(0.0388)
Bequest-Motives Variables			
Expected per capita real GDP Growth Rate (-) (22 previous years)	-1.2968**	0.5291	-0.213
	(0.6219)	(1.0523)	(0.4723)
Gini Coefficient (-) (adjusted, smoothed)	0.0027*	-0.0016	-0.0007
	(0.0016)	(0.0018)	(0.0024)
Life Expectancy at age 65 (-) (smoothed, estimated)	-0.002	-0.0033	-0.0006
	(0.0164)	(0.0284)	(0.0113)
constant	-1.6142	-0.5957	-0.1158
	(0.7509)	(1.5148)	(0.2888)
R-squared	0.9323	0.9577	0.8648
Adjusted R-squared	0.8941	0.9299	0.8054
F-Statistic	57.76	1084.44	87309.64
F-Stat df 1	40	34	51
F-Stat df 2	71	55	123
Number of Observations	112	92	178

Standard Errors are in parentheses.

*, **, *** denotes significance at the 90, 95 and 99 percent confidence level respectively

Robust standard errors obtained using White's correction for heteroscedasticity.

Table 6.3
Accounting for Differences in Budget Surplus Shares of GDP
Changes Over Time, Average over Several Developed Countries

Explanatory Variables	Actual Change 1973 - 1983 (2)	Estimated Coefficient 1973 - 1983 (3)	Estimated Change in Budget Surplus Share 1973 - 1983 (4)	Actual Change 1983 - 1992 (5)	Estimated Coefficient 1983 - 1992 (6)	Estimated Change in Budget Surplus Share 1983 - 1992 (7)
Control Variables						
Lagged Dependent Variable	-0.0475	0.7984	-0.037953	0.0245	0.6126	0.015035
Political Rights	-0.7273	0.0267	-0.019427	-0.0455	0.0132	-0.000601
Agricultural Share	-0.0237	-0.3639	0.008642	-0.0151	0.2984	-0.004510
Manufacturing Share	-0.0493	-0.1668	0.008215	-0.0212	-0.1386	0.002934
Trade Share	0.0844	0.1020	0.008608	-0.0628	-0.0607	0.003817
Urban Population Share	2.4717	-0.0106	-0.026107	1.3264	-0.0134	-0.017756
Log of per capita Real GDP	0.1163	0.2381	0.027704	0.2540	0.2157	0.054800
No. of Government Crises	-0.8095	-0.0024	0.001939	-0.2857	-0.0029	0.000830
Cost of Debt Servicing	-0.0012	-0.0973	0.000114	0.0059	0.1149	0.000676
Seignorage	-0.0018	0.0024	-0.000004	-0.0098	-0.1922	0.001885
Tax-Smoothing (Barro) Variables						
Unanticipated changes in real per capita govt expenditure	0.0302	-0.0736	-0.002220	0.0068	-0.1304	-0.000882
Unanticipated changes in per capita real GDP	-0.0066	-0.0065	0.000043	-0.0218	0.0612	-0.001334
Bequest Motives (CM) Variables						
Expected per capita Growth Rate (22 previous years)	-0.0140	-1.2968	0.018117	-0.0062	0.5291	-0.003285
Gini Coefficient	-0.8887	0.0027	-0.002442	-2.1899	-0.0016	0.003531
Life Expectancy at age 65	1.1652	-0.0020	-0.002282	0.8967	-0.0033	-0.002985
Actual Change in Budget Surplus Share	-0.0474			0.0195		
Total Estimated Change in Budget Surplus Share			-0.0171			0.0522
Ratio of Estimated to Actual Budget Surplus Share (%)			35.97			267.14
Tax-Smoothing : Total Effect			-0.0022			-0.0022
Tax-Smoothing : Contribution (%)			4.59			-11.35
Bequest Motives : Total Effect			0.0134			-0.0027
Bequest Motives : Contribution (%)			-28.24			-14.03

Table 6.4
Accounting for Differences in Budget Surplus Shares of GDP
Changes Over Time, Average over Several Developing Countries

Explanatory Variables	Actual Change 1973 - 1983 (2)	Estimated Coefficient 1973 - 1983 (3)	Estimated Change in Budget Surplus Share 1973 - 1983 (4)	Actual Change 1983 - 1992 (5)	Estimated Coefficient 1983 - 1992 (6)	Estimated Change in Budget Surplus Share 1983 - 1992 (7)
Control Variables						
Lagged Dependent Variable	-0.0258	0.6987	-0.018028	0.0296	0.6987	0.020673
Political Rights	-0.2531	0.0031	-0.000792	-0.4769	0.0031	-0.001492
Agricultural Share	-0.0412	-0.0859	0.003535	-0.0196	-0.0859	0.001682
Manufacturing Share	-0.0009	-0.1905	0.000167	0.0088	-0.1905	-0.001678
Trade Share	0.0489	0.0050	0.000243	0.0285	0.0050	0.000142
Urban Population Share	6.0095	-0.0005	-0.002836	5.6314	-0.0005	-0.002657
Log of per capita Real GDP	0.2440	0.0264	0.006450	-0.0269	0.0264	-0.000710
No. of Government Crises	-0.9558	-0.0024	0.002318	0.0000	-0.0024	0.000000
Cost of Debt Servicing	0.0094	0.0019	0.000017	0.0266	0.0019	0.000050
Seignorage	-0.0005	-0.2496	0.000121	-0.0097	-0.2496	0.002414
Tax-Smoothing (Barro) Variables						
Unanticipated changes in real per capita govt expenditure	0.0138	-0.0918	-0.001264	0.0893	-0.0918	-0.008199
Unanticipated changes in per capita real GDP	-0.0281	0.1110	-0.003121	0.0126	0.1110	0.001394
Bequest Motives (CM) Variables						
Expected per capita Growth Rate (22 previous years)	0.0054	-0.2130	-0.001149	-0.0256	-0.2130	0.005455
Gini Coefficient	0.4464	-0.0007	-0.000322	-0.0319	-0.0007	0.000023
Life Expectancy at age 65	0.6815	-0.0006	-0.000401	1.6130	-0.0006	-0.000950
Actual Change in Budget Surplus Share	-0.0194			0.0252		
Total Estimated Change in Budget Surplus Share			-0.0151			0.0161
Ratio of Estimated to Actual Budget Surplus Share (%)			77.84			64.14
Tax-Smoothing : Total Effect			-0.0044			-0.0068
Tax-Smoothing : Contribution (%)			22.66			-27.03
Bequest Motives : Total Effect			-0.0019			0.0045
Bequest Motives : Contribution (%)			9.68			17.99

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Table 6.5
Accounting for Differences in Budget Surplus Shares of GDP Changes Between Countries, in 1985

	Estimated Effect on the Difference in Budget Surplus Shares					
	Developed Countries			Developing Countries		
	Japan	United Kingdom	Australia	Brazil	Sri Lanka	Malaysia
Control Variables						
Lagged Dependent Variable	-0.0047	0.0111	0.0079	-0.0260	-0.0396	-0.0340
Political Rights	0.0000	0.0000	0.0000	-0.0031	-0.0031	-0.0031
Agricultural Share	0.0034	-0.0010	0.0058	0.0017	-0.0110	-0.0059
Manufacturing Share	-0.0142	-0.0031	0.0030	-0.0026	0.0302	0.0207
Trade Share	-0.0056	-0.0194	-0.0092	-0.0023	-0.0006	0.0012
Urban Population Share	-0.0293	-0.1929	-0.1469	-0.0027	0.0207	0.0090
Log Real GDP per capita	-0.0738	-0.0838	-0.0429	-0.0013	-0.0191	-0.0004
Number of Govt Crises	0.0000	0.0000	0.0000	0.0121	0.0121	0.0121
Cost of Debt Servicing	-0.0012	-0.0002	-0.0005	0.0000	0.0002	0.0002
Seignorage	0.0003	0.0005	-0.0002	-0.0065	-0.0056	-0.0020
Tax-Smoothing Variables						
Unanticipated changes in real per capita govt expenditure	0.0043	0.0058	0.0051	-0.0285	-0.0155	-0.0040
Unanticipated changes in per capita real GDP	0.0011	0.0003	-0.0004	0.0094	0.0011	-0.0091
Bequest Motives Variables						
Expected per capita Growth Rate	0.0091	0.0019	0.0004	0.0057	0.0070	0.0010
Gini Coefficient	0.0018	0.0152	-0.0031	-0.0164	-0.0069	-0.0097
Life Expectancy at age 65 (22 previous years)	-0.0020	0.0033	0.0005	0.0001	-0.0006	0.0025
Actual Difference in the Budget Surplus Share	0.0029	0.0228	0.0233	-0.1001	-0.0853	-0.0454
Total Estimated Difference in Budget Surplus Share	-0.1109	-0.2623	-0.1804	-0.0605	-0.0309	-0.0217
Ratio of Predicted to Actual Budget Surplus Share (%)	-3791.83	-1148.87	-774.41	60.42	36.18	47.74
Tax-Smoothing : Total Effect	0.0054	0.0061	0.0047	-0.0190	-0.0145	-0.0132
Tax-Smoothing : Contribution (%)	185.19	26.81	20.13	19.02	16.95	29.00
Bequest Motives : Total Effect	0.00891	0.02035	-0.00218	-0.01058	-0.00043	-0.00628
Bequest Motives : Contribution (%)	304.61	89.13	-9.35	10.56	0.50	13.84

Table A1: Description of Raw Data

Variable	Definition	Frequency	Source
Surplus or deficit (-)	Overall budget surplus of the central government	Annual	IFS, WB, WDI
Debt	Total nominal debt issued by the central government	Annual	IFS, WDI
Current revenue	All government revenue from taxes and nonrepayable receipts except grants	Annual	WDI
Current expenditure	All government expenditure excluding payments for capital assets or goods and services to be used in the production of capital assets	Annual	WDI
Nominal GDP	Nominal Gross Domestic Product at market prices	Annual	IFS, WB, WDI
Agriculture	Value added in the agricultural sector	Annual	WB, WDI
Manufacturing	Value added in the manufacturing sector	Annual	WB, WDI
Imports	Merchandise imports c.i.f. (US$)	Annual	IFS, WB, WDI
Exports	Total mechandise exports f.o.b. (US$)	Annual	IFS, WB, WDI
Exchange rate	Units of national currency per US dollar (Annual Average)	Annual	IFS, WB, WDI
Urban population share	The ratio of the urban population over the total population multiplied by 100	Annual	WB, WDI
Number of government crises	The number of major government crisis, defined as any rapidly developing situation that threatens to bring the downfall of the present regime - excluding situations of revolt aimed at such overthrow	Decade Average	Easterly (1997)
Political rights	Index from 1 to 7. A "1" represents the highest level of political rights while a "7" represents the lowest.	Annual	Gastil (1973-1989), (1990)
Per capita real GDP	Measured in constant dollars. Adjusted for changes in the terms of trade, using 1985 international prices for domestic absorption and current prices for exports and imports.	Annual	Heston and Summers (1991)
Deposit interest rates	The rate paid by commercial or similar banks for demand, time, or savings deposits.	Annual	IFS, WDI
GDP deflator	GDP deflator (Base=1990)	Annual	WB, WDI
Reserve money	Monetary base	Annual	IFS
Income Distribution	Gini Coefficient	Annual	Deininger and Squire (1996)
Elderly population	Number of persons aged 65 and above	Every 5 years	WDI
Total population	Total number of persons in the population	Annual	WDI, IFS
Elderly life expectancy	Life expectancy at age 65	Annual	Demographic Yearbook
Life expectancy at birth	Life expectancy at age 0	Annual	WB, WDI

WB = World Bank (1983)
WDI = World Bank (1997), (1999)
IFS = International Monetary Fund (1998), (1999)
Demographic Yearbook (various issues)

Table A2
Country Fixed Effects Panel Regressions for Estimating Life Expectancy at Age 65

Dependent Variable : Life Expectancy at Age 65	All Years Reg A1
1960-69 Dummy	-32.0383**
	(5.7500)
1970-79 Dummy	-30.6066**
	(5.8010)
1980-89 Dummy	-1.0008
	(5.1343)
1990-97 Dummy	4.8138
	(5.0827)
Life expectancy at birth	-0.8949***
	(0.1900)
Life expectancy at birth with 1960-69 Dummy	0.9905***
	(0.1682)
Life expectancy at birth with 1970-79 Dummy	0.9364***
	(0.1753)
Life expectancy at birth with 1980-89 Dummy	-0.0221
	(0.1615)
Life expectancy at birth with 1990-97 Dummy	-0.2284
	(0.1543)
$(\text{Life expectancy at birth})^2$	0.0085***
	(0.0014)
$(\text{Life expectancy at birth})^2$ with 1960-69 Dummy	-0.0077***
	(0.0012)
$(\text{Life expectancy at birth})^2$ with 1970-79 Dummy	-0.0072***
	(0.0013)
$(\text{Life expectancy at birth})^2$ with 1980-89 Dummy	0.0004
	(0.0013)
$(\text{Life expectancy at birth})^2$ with 1990-97 Dummy	0.0021*
	(0.0012)
constant	35.3192***
	(6.7272)
R-squared	0.9987
Adjusted R-squared	0.9986
F-Statistic	7915.81
F-Stat df 1	82
F-Stat df 2	843
Number of Countries	68
Number of Observations	925

Standard Errors are in parentheses.

*, **, *** denotes significance at the 90, 95 and 99 percent confidence level respectively

Table A3
Country Fixed Effects Panel Regressions for Estimating Life Expectancy at Age 65

Dependent Variable : Life Expectancy at Age 65	All Years Reg A2	1950-1959 Reg A2a	1960-1969 Reg A2b	1970-1979 Reg A2c	1980-1989 Reg A2d	1990-1997 Reg A2e
Life expectancy at birth	-0.4588***	0.0726	-0.2282	-1.2951***	-2.5373***	-1.6056***
	(0.0416)	(0.0945)	(0.1958)	(0.2451)	(0.2284)	(0.3455)
(Life expectancy at birth)^2	0.0057***	0.0006	0.0034**	0.012***	0.0207***	0.0119***
	(0.0003)	(0.0008)	(0.0017)	(0.0018)	(0.0016)	(0.0024)
constant	18.5044***	5.4809*	13.3506**	44.5264***	89.8128***	70.7872***
	(1.4977)	(2.8067)	(5.8005)	(7.2739)	(8.0691)	(12.288)
R-squared	0.8857	0.9772	0.9572	0.9616	0.9820	0.9876
Adjusted R-squared	0.8765	0.9707	0.9448	0.9499	0.9772	0.9812
F-Statistic	96.02	151.52	77.25	82.02	205.46	155.42
F-Stat df 1	69	41	42	44	48	44
F-Stat df 2	855	145	145	144	181	86
Number of Countries	68	40	41	43	47	43
Number of Observations	925	187	188	189	230	131

Standard Errors are in parentheses.

*, **, *** denotes significance at the 90, 95 and 99 percent confidence level respectively