Discussion Paper No. 22
Williams Project on the Economics of Higher Education
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Williamstown, MA 01267

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Global Accounts, Fund Accounting, and Rules of THumb

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December 1993
DP-22

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January, 1991
(rev. November, 1993)

MAINTAINING COLLEGIATE WEALTH:
Global Accounts, Fund Accounting, and Rules of Thumb

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Most colleges and universities with even modest endowments accept the idea that protection of their real wealth is a basic fiduciary responsibility. And virtually all of them follow a rule of thumb that monitors operating budgets and "endowment payout rates" as the way to see if they're doing it. [1] Yet those tools are adequate to the task only for very restricted -- and generally outdated -- financial behavior. The existence of inflation, of a significant amount of collegiate borrowing, of current spending that often doesn't appear in the operating budget, of radically undervalued physical assets, and the sheer complexity of college accounting with its many funds, internal transfers -- mandatory and non-mandatory -- make it impossible to know whether real wealth is or isn't being protected simply on the basis of balanced budgets and disciplined payout rates.

This paper uses global accounting to examine the conditions under which information on budgets-and-payout-rates is adequate to monitor and protect real wealth. Global accounts, as described in detail elsewhere (Winston, 1992), depart from the fund accounting tradition by bringing the whole of the college's economic performance together to be accounted as a single entity -- they report total income, total spending, and total saving, hence the total change in real wealth. They acknowledge the college's financial wealth and its physical wealth. So a global description of the college accounts for *all* real wealth and all the events that change real

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1 **60% of the 3300 colleges and universities in the US have some endowment wealth according to 1987-88 HEGIS data. Semi-independent "foundations" often hold additional endowment wealth for state supported institutions (Warren, 1992). And virtually all institutions have at least some net wealth in the form of physical capital. The best discussion of performance criteria for non-profit institutions -- from which the importance of real wealth maintenance emerges clearly -- is that of the American Economic Association (Tobin, 1974). See, too, Massy (1992) and Hansmann (1990).**

wealth over time. It shows, among other things, when budgets and payout rates do, and when they don't accurately reveal the state of the college's real wealth. That is the subject of this paper.

I. GLOBAL ACCOUNTS AND FUND ACCOUNTS

This section lays out the algebra that describes the global accounts for a college and three elemental fund accounts that would appropriately balkanize the same information. The emphasis here is on making explicit the relationship of global accounts to conventional college fund accounting and on using that relationship to look carefully at a quite central aspect of college economic management -- the monitoring of changes in the college's real wealth and the adequacy of conventional rules of thumb to that task.

A. Global Accounts

A Global Income Statement -- an accounting of the yearly economic flows for a college -- can be represented as

$$r(E+F) + G + T + AUX_R = E\&G + AUX_X + O_X + K_X + SF, \quad (1)$$

where

r = the rate of total return on financial assets
E = the value of the endowment
F = the value of non-endowment financial assets
G = gift and grant income
T = tuition and fee income
AUX_R = auxiliary income
E&G = current educational and general expenditures
AUX_X = current auxiliary expenditures
O_X = other current spending, including the current costs of any debt
Kx = spending on the capital account (plant and equipment)
SF = financial saving.

In the broad categories of the global accounts, r(E+F) is total asset income, G is total gift and grant income (including overhead cost recovery), and T + AUXR is the total of student charges (ignoring for now other sources of auxiliary income).

The Global Balance Sheet simply describes the college's net worth as the value of its total assets, less its liabilities

$$(2) \quad NW = E + F - L + K - DM$$

where

L = the value of outstanding liabilities.

K = the replacement value of the physical capital stock, and

DM = accumulated past deferred maintenance.

Since these are all stock variables, it is often useful to date them.

Finally, the dynamic stock-flow relationship required of any set of accounts holds, tautologically, that net worth at the beginning of a period plus saving equals net worth at the end of the period,

$$(3) \quad NW_t + Skn + SF = NW_{t+1},$$

where t and t+ 1 are the dates on which stocks are valued (usually June 30) in two succeeding years; all flow variables are measured between those dates. S_{kn} is net physical capital saving; it will be described in some detail in section IV, below.

Recognizing the traditional college emphasis on endowment wealth -- or, more generally, on financial assets -- it is useful to isolate a narrower analog to net worth that describes net financial wealth (or "financial net worth, " if you prefer) as

$$(4) \quad NFW = E + F - L$$

with the resulting stock-flow requirement such that

(5) $NFW_t + SF = NFW_{t+1}$.

B. Fund Accounts

Within those global activities, three minimal funds can be seen to describe (exhaustively) (1) current income and spending in a Current Fund, (2) a physical capital (land, plant and equipment) account in a Plant Fund, and (3) endowment in an Endowment Fund. Colleges typically have eight or more different funds. These three, however, capture the essence of fund accounting without needless complication. Each fund, separately in the tradition of Fund Accounting, generates an Income Statement and a Balance Sheet describing the Fund's net worth (with, potentially, net financial wealth) and for each, separately, the tautological stock-flow relationship must hold over time.[2] These fund accounts are constructed here to reflect established conventions like assigning all tuition income to the Current Fund but assigning gift income ass appropriate to donors' preferences to any of the three funds. "The Operating Budget" is here synonymous with the Current Fund Income Statement and "the Capital Budget" is synonymous with the Plant Fund Income Statement.[3]

In disaggregating from Global to Fund Accounts, it is necessary to assign income, expenditures, assets, and liabilities among the individual funds, assignments that are here guided by practice and tradition. So the global quantities that are assigned to more than one fund are broken down into

$$G = G_C + G_K + G_E$$
$$F = F_C + F_K$$
$$L = L_C + L_K$$
$$0 = TRF_C + TRF_K + TRF_E$$

2 See, for instance, Garner (1991) and Harried, et al (1983).

3 What these three funds leave out are (1) the distinction between restricted and unrestricted Current Fund, (2) Student Loan and Life Income Funds, and (3) three Plant Funds that include sinking funds for debt service.

where subscripts identify the funds -- current, capital (k), and endowment -- and TRF are inter-fund transfers. In the equations for each fund, below, the prefix indicates the fund while the equation number parallels that of the global account. All endowment assets are financial and are assigned to the Endowment Fund; all physical capital assets and deferred maintenance are assigned to the Plant Fund;[4] gift income assignments reflect donors' preferences; and interfund transfers must be recorded in each fund, though in total they cancel out. Tuition income and auxiliary income and expenditures and current spending are all assigned to the Current Fund.

1. The Current Fund

The Income Statement for the Current Fund (the operating budget) is, most generally,

$$(c1)\ aE + rF_C + G_C + T + AUX_R = E\&G + AUX_X + O_X + TRF_C + S_C$$

where

aE = is the amount of asset income availed -- allocated to current spending -- expressed as a proportion, a, of the endowment's value,

F_C = that part of the college's non-endowment financial assets that have been assigned to the Current Fund

TRF_C = internal transfers to (+) or from (-) other funds, and

S_C = any operating budget surplus (+) or deficit (-).

The Current Fund Balance Sheet is

$$(c2)\ NW_C = F_C - L_C$$

where L_C describes those liabilities assigned to the Current Fund (typically accounts payable). Since no physical capital is held by the Current Fund, an equation (c4) -- a fund-level equivalent to the College's global net financial wealth -- would be the same as (c2).

4 Except for inventories which are often assigned to the Current Fund.

2. The Plant Fund

Income Statements and Balance Sheets are similar for the other two funds. The "capital budget," describing income and expenditure flows of the Plant Fund, is

(k1) $rF_k + G_k + TRF_k = K_x$

where

F_k = non-endowment financial assets assigned to the Plant Fund
TRF_k = any transfers to (-) or from (+) other funds.

The structure of the balance sheet for the Plant Fund looks much like that of the global accounts since this fund typically includes physical and financial assets and liabilities, defining for the fund both a net worth[5] and a net financial wealth,

(k2) $NW_k = K - DM + F_k - L_k$

and

(k4) $NFW_k = Fk - Lk.$

3. The Endowment Fund

The Endowment Fund describes what is, in essence, a residual financial savings budget with a fund Income Statement

(el) (r-a)E + GE + TRFE = SF - Sc

5 Deferred maintenance, DM, is not reported in conventional fund accounts nor is physical capital reported in replacement values. The first of these differences is discussed in Section IV below; the second is forced on the Global Accounts by the need to add over all assets and liabilities which in turn requires that all items be valued in the same, current, dollars.

where

TRF_E = any transfers to (-) or from (+) other funds

and a Balance Sheet that conventionally includes only endowment and quasi-endowment financial assets and no liabilities so that it becomes

(e2) $NW_E = E = NFW_E$.

4. Double Counting and Transfers

The individual fund accounts -- both in Income Statements and in Balance Sheets -- here add up to the global accounts: the sum of equations (c1), (k1), and (e1) is equation (1); the sum of equations (c2), (k2) and (e2) is equation (2).

But while such straightforward aggregation is both logical and desirable, it won't in fact happen that way in fund accounts unless they have first been purged of their traditional double counting. Implicit in the requirement that each Fund be treated as a separate accounting identity is that interfund transactions are always included in each fund, since they're no different -- in fund accounting -- from transactions with the rest of the world outside the college. So until such double counting is eliminated from the account of each fund, some of their totals will be greater than the global accounts' total for the institution. The Endowment Fund, for instance, will report as an asset any promissory note it holds that was issued by the Plant Fund. The reported *net* worth of the individual funds will correctly add up to the net worth of the global accounts since the overstatement of assets (in the Endowment Fund in this example) will be offset by an equal overstatement of liabilities (in the Plant Fund). But the components of net worth -- total college assets and total college liabilities -- will both be inflated unless an adjustment to individual fund balance sheets has been made. [6]

6 In fact, among four colleges I looked at closely over 1985-98 -- Carleton, Wellesley, Swarthmore, and Williams -- those that add up the individual balance sheets to report total assets or liabilities for the college tend to recognize this needed adjustment. Wellesley does it thoroughly; Carleton apparently adjusts assets to net out interfund obligations, but not liabilities. Williams does neither, but neither does it report total assets, liabilities or net worth. Swarthmore neglected the adjustment for interfund transfers in its aggregation at the beginning of the period, but not at the end.

In the Income Statements of the individual funds, interfund transactions have been more directly captured as transfers -- the TRF's that appear in the Income Statements of the individual Funds, but disappear in the global Income Statement because for every dollar transferred out of one fund a dollar is transferred into another.

Some transfers are simply reassignments of current resources from one fund to another that affect only their Income Statements -- as when a routine transfer is made from the Current Fund to the Plant Fund (in some measure recognizing real economic depreciation) -- while others are treated as loans or their repayment, carrying with them IOUs or their extinction that show up in the individual funds' Balance Sheets. It has been assumed here, for simplicity, that all of the TRF's are simple income transfers that leave Balance Sheets unchanged, but the point about double counting assets and liabilities made above depends on such interfund obligations having been issued in the past.

A concomitant of the way Global and Fund Accounts nest is that, even in this simplified version, they describe both assignment of current income flows among funds and the reassignment of assets or liabilities between accounts, all the while keeping clear and explicit track of the effects (or more often, lack of them) these movements have on the college's global economy. So, for instance, a decision to sell financial assets from the endowment in order to build a building will show up as a decrease in E, hence negative global financial saving, SF, with an equal increase in K_X, hence positive physical saving. If such an asset transfer were large enough, global financial savings could be negative. But, of course, total global saving won't be affected since what's happening is simply a portfolio shift in which one type of asset is being exchanged, dollar for dollar, for another. [7]

7 This does, though, confront the strange fact of college accounting that since physical capital isn't recognized as generating a flow of valued services -- only financial capital is seen to do that -- next-period income will be reduced by this portfolio adjustment as rE' of endowment income is removed with no compensating return from the K' =E' of increased capital services. For a fuller discussion of capital costs, see Winston (1993b).

II. Protecting the Real Value of Wealth: Global Accounts and Endowment Spending Policies -- the Simple Case

The second objective of this paper is to describe the economic behavior necessary to protect the value of the college's real wealth -- from overspending, inflation, and physical deterioration. That objective comes as close as any we've encountered to defining a universally accepted measure of a college's fiduciary responsibility: leaving real principle untouched. Achieving and monitoring that goal is usually entrusted to policies on endowment spending rates, but in reporting total wealth explicitly as net worth, the global accounts give an explicit description of real wealth that lets us ask when those endowment spending policies actually serve the objective of maintaining the value of wealth and when they don't. Too, since the global accounts include both financial and physical wealth, they make it possible to show what needs to be done to protect all of the college's wealth.

Our concern is, then, with a college's total wealth, but in this section and the next, the focus will be on financial wealth only -- we'll be assuming, effectively, that somewhere in the background something assures us that enough of spending is going toward maintenance of physical capital to protect its real value. This is unrealistic, of course, but it is justified both because protection of physical wealth introduces a quite different set of analytical and monitoring issues from the protection of financial wealth -- issues that need more careful development -- and because the conventional measures of "wealth protection" don't pretend to include physical wealth -- a major shortcoming. So in section V below we will return to examine what must be done to keep physical wealth intact so that we can then show, in section VI, how the global accounts reveal the protection, or lack of it, of total wealth.

As noted at the outset, there is wide agreement that a college should maintain the real value of its wealth. That objective is an important constraint on the college's economic management since it is then judged imprudent to draw down the real value of the endowment to support current spending. An endowment generates income that allows a greater wedge to be driven between current revenues and current spending, but a given level of spending is compatible with a sustainable equilibrium only if the value of a college's wealth is not eroded by such spending. Eating into principle will reduce future asset income. This is the crux of, inter alia, the widely utilized Stanford "financial equilibrium model" of college economic

performance (Hopkins-Massy , 198 1).

If there were no inflation, the matter would be simple; the school would maintain the value of its wealth simply by avoiding "dissaving" -- financial saving would be zero or greater. But when inflation erodes the real value of financial wealth -- its purchasing power -- some positive saving is necessary just to stand still: the Red Queen problem.

Furthermore, the qualification is often added to a description of wealth-protecting behavior that since some current gifts, G_E, are intended by donors to expand wealth -- the endowment -- prudent protection of its real value in face of inflation requires saving that is additional to such gifts: the point is sometimes made by saying that the objective of maintaining the real value of the existing wealth is to assure continued support of existing programs while new gifts are to be depended on for support of any new or expanded programs.

This more conservative criterion will be used here: the objective then is taken to be protection of the real value of the college's wealth, net of new gifts to support expanded activities. It can be called a "prudence" goal. The global accounts make explicit whether it is being accomplished. The question in this section, then, is the conditions under which conventional performance criteria are adequate proxies for maintenance of real financial wealth. Those conventional measures used to monitor and guide a school's performance toward wealth protection are two: a balanced operating budget and a prudent endowment spending formula from wealth-generated income.[8] So the issue to be addressed is the conditions under which these two policies will, in fact, achieve the goal of maintaining the value of real financial wealth and, implicitly, whether these conditions are normally observed.

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8 If revenues were fungible, this would be a non-sequitur since the assignment of part of total income to meet operating expenses could not be traced to asset income any more than to gift income or student fees. But the traditions of income assignment are such that only asset income is seen to be freely assignable at the discretion of the Board -- the college is assumed to accept the traditional allocation of all student fees to current spending and the discretion of donors on the assignments of gift income. This view does, of course, ignore considerable scope for discretion, both at the level of influencing donor's behavior and in exercising judgment in accounting for various funds. Bierman and Hofstedt (1973) found that among Ivy League schools, Yale assigned 19% of its total gift income for 1970-71 to current revenue while Columbia assigned 61% and Cornell 60% -- differences that might possibly be explained by donors' wishes, but probably aren't.

The endowment spending (or avail) formula is most simply described as

aE

which specifies the amount of asset income assigned to the operating budget, expressed as a proportion, **a,** of the market value of the endowment. It may be expressed simply as a payout rate, **a.** In practice, more complicated spending formulas are used (Massy, 1990, Ch. 2) in order to smooth fluctuations in endowment value, but aE is the appropriate equilibrium description.

When the prudence goal is stated as "maintaining the real value of the endowment in support of existing programs, " it translates into the requirement that any year's endowment value be at least equal to the inflated value of the previous year's endowment plus new gifts to the endowment,

(6) $E_{t+1} \geq (1+i)E_t + G_E$

where i is the rate of inflation9·

Nothing is lost if we ignore the assignment of net worth among the separate funds, so we can deal with global F, L, and K. The college is initially assumed to hold only insignificant non-endowment financial assets, F=O, and to have issued only insignificant liabilities, L=O -- which would in fact be the case if F and L were primarily transactions balances. Then net financial wealth would approximate the endowment, E, and global accounts equations (5), describing net financial wealth, would combine with (6) to restate the performance goal as

(7) $S_F - G_E \geq iE_t$ or $S_F - G_E - iE_t$ 2 0 .

Prudent management requires that global financial saving in any period, net of new gifts to the

9 Most appropriately from the Higher Education Price Index (HEPI), but availability of data usually recommends use of the Consumer Price Index (CPI). Stanford generates its own inflation rate as the CPI plus an internal "real cost-rise, " but few colleges have the resources to generate a local measure.

endowment, be at least big enough to cover the loss in real value of the endowment due to inflation.

The question, then, is the conditions under which the prudent behavior described by the inequality (7) can be assured by the conventional choice of an appropriate endowment spending formula, aE.

If equation (1) is solved for global financial saving and a balanced operating budget is subtracted off -- so Sc = 0 in (cl) -- then, since $TRF_C = TRF_k$, global saving is simply

(8) $S_F = (r-a)E + GE.$

Substituting that into (7) and rearranging, gives an expression in which the requirement for prudent behavior is described both in terms of global saving and in terms of the conventional endowment spending formula,

(9) $S_F - GE - iE = (r-a-i)E \geq 0$

so that the amount of asset income that can prudently be used for current spending, as a percent of the endowment, is

(10) $a \leq r - i.$

This last expression is useful if not novel. It says, simply, that

> if the real value of the endowment is to be protected, the spending rate, a, in the endowment spending formula, aE, must be such that given the total rate of return on financial assets, r, and rate of inflation, i, enough income has to be held back from current spending to cover the effect of inflation in eroding the real value of the endowment. Note, importantly, that r and i are exogenous -- outside the control of the college -- so only a is a decision variable to the college's management. In these terms, the selection of an appropriate value of a, then, is the determinant of prudent management.

Take some examples: with a total return of, say, 10% in an environment of 6% inflation, a spending formula that allocates asset income to current spending in an amount that's no more than 4% of the value of the endowment will protect its real value. With a total return of 14% and inflation of 5 % , the avail rate built into the spending formula could be as high as 9 % and still satisfy the prudence requirement: inflation at 6 % with a total return of 8 % would reduce the permissible avail rate to 2 % . And so on.

III. PROTECTING THE REAL VALUE OF COLLEGE WEALTH: GLOBAL ACCOUNTS AND ENDOWMENT SPENDING POLICIES -- THE COMPLICATIONS

On the basis of the preceding discussion, the appeal of the simple conventional endowment avail rate as the primary performance measure is obvious and its logic is unassailable -- so long as the assumed conditions are met. If they are, it doesn't matter whether the college directly measures global saving or indirectly monitors its behavior through the spending formula. The global accounts have the advantage of putting an explicit dollar value on whether or not the college is protecting the real value of its wealth -- they describe how near or far is that goal -- but on the other hand, the selection of an appropriate endowment spending rate has the advantage of both simplicity and familiarity.

But the conditions that are necessary in order that both global saving and conventional avail policy tell the same story would appear to be fairly demanding. The most critical are four:

- that there are negligible non-endowment financial assets;
- that all current spending is in fact included in the operating budget;
- that there are negligible liabilities; and
- that the operating budget is typically in balance.

A. Endowment Avail Policy when Debt and Non-Endowment Assets are Significant

Achievement of the prudence objective is complicated, in principle, by the existence of significant levels of both non-endowment financial assets (F) and long term debt (L). For Williams, non-endowment assets have recently been $25 million or so while liabilities are a bit

more than $50 million, relative to roughly $100 million of yearly income: since these proportions are not atypical in modern colleges, their complications can't be avoided. How do these more realistic portfolios modify the avail rate that will keep real wealth intact?

The objective of real wealth protection is achieved now when

(11) $$SF - GE - i(E+F-L) \geq 0.$$

The global accounts equation (1) implies total financial saving of

(12) $$SF = r(E+F-L) + G + T + AUX_R - E\&G - AUX_X - O'_X - K_X$$

when the interest cost of indebtedness, rL, has been separated out from "other" current spending, O_X, as

$$O'_X = O_X - rL$$

and treated as an adjustment to global asset income. Subtracting a balanced operating[10] budget as before, the criterion for maintaining the real value of financial wealth is now

(13) $$SF - GE - i(E+F-L) = (r-i)(E+F-L) - aE \geq 0:$$

global financial saving, less the contribution made by new gifts to the endowment, GE, has to be greater than the erosion of wealth through inflation, i(E+F-L).

Once again, an inequality in (13) defines the permissible -- prudent, equilibrium, sustainable -- spending formula, aE, as that in which the rate of avail is no greater than

(14) $$a \leq (r-i)(1+F/E-L/E).$$

Introduction of liabilities reduces the value of the avail rate, a, that will adequately protect the real value of the endowment. The proportion of the endowment that can be used

10 **The operating budget will be somewhat different from that in the section above since debt costs, rL, no longer appear as a current expenditure, but are netted out of asset income.**

for current spending is lower because of the need to pay the costs of debt, **rL,** and the greater is the debt/endowment ratio, the smaller is the proportion of the endowment that can be availed to current spending. Non-endowment financial assets work the other way, adding to asset earnings and increasing the amount that can safely be availed, the more so the greater they are relative to endowment.

But much of the significant debt issued by colleges in the past two decades has been motivated -- at least in well-endowed colleges -- by the opportunity to earn income through the interest arbitrage offered as states have made income from college bonds tax free, hence salable at a less than market interest rate. By this indirect subsidy, states lose tax revenues and colleges get loans with roughly equivalent savings in interest costs. Simultaneously holding a dollar of financial assets that earns rA and issuing a dollar of debt that costs rL earns income for the college when rA > rL Whatever one might think of this method of public subsidy of higher education [11] it has had the effect of inducing indebtedness where it might otherwise have been more appealing to the college to use its own financial assets to finance new buildings. The College's net worth is unaffected, of course, by simultaneously lending and borrowing but the composition of that net worth will change -- to the extent that a dollar of borrowing allows the college to retain a dollar of endowment assets, endowment wealth is increased.

The fact that the interest rate on asset earning, rA, is different from that on liabilities, rL, does modify the prudent spending formula aE since it is necessary, now, that the spending rate be

(15) $a \leq$ **(rA-i)(l +** (F/E)) - (rL-i)L/E.

This will clearly allow greater current spending, aE, the greater is the difference between interest earned on assets and that paid on liabilities. Which makes sense. In the extreme, if liabilities were costless, they would have no effect on the prudent spending formula: if they

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11 A thin veil lies over these transactions since the tax-free bonds have typically been justified as financing college building. But for well-endowed institutions, the alternative to borrowing in order to build buildings has **always been the use of their own endowment wealth. So the opportunity to increase income through the interest arbitrage that such public policy allows -- an effective transfer from taxpayers to higher education -- has been the apparent motive. Some boards have worried that the policy has induced the building of less-than-essential projects since they were necessary to gain access to the low rate loans; but this is not an issue here.**

were very small relative to endowment, they'd have virtually no affect on the spending formula.

The relationship between the inflation and borrowing rates plays a key role in the effect that arbitrage has on the prudent avail rate. If the borrowing rate, r_L, is less than inflation, i, r_L-i becomes negative and the college is effectively being paid in real terms, to borrow money: so the avail rate can be larger on that account. It doesn't follow, of course, that the college is better off with a high rather than low inflation rate since higher inflation also reduces the value of real assets by more, requiring that saving be increased, which leaves less for spending. [12]

B. The Effect of Off-Budget Current Spending and Operating Budget Deficits

The other major change in college behavior that threatens the neat association between spending formulas and protection of the college's real wealth comes from the removal, in a number of colleges, of some of current spending from the operating budget. At Williams, the last half of the '80s saw off-budget current spending increase from around $500,000 to more than $6 million. While a good deal of that was interest on debt -- which is better captured by reducing asset income by $r_L L$ -- about $2 m. of it wasn't. At Carleton in the same period, the current costs of the Development Office that ran about $1 million a year appeared in the Endowment Fund. The temptations of such accounting judgments are obvious -- even if a college has an exuberant rate of growth of current spending with its threat of budget deficits, that fact can be obscured with no reduction in actual spending if significant parts of that current spending can be taken out of the budget. The complexity of fund accounts may have its own appeal because of the freedom it allows for such creative interpretation (a fact noted some years ago by Bierman and Hofstedt (1973)).

Although moving some of current spending out of the operating budget to another fund may effectively hide actual current spending and its growth from view, it also hides an erosion of the real value of the college's wealth. When there is $O"_X$ of off-budget spending that's not included in a "balanced operating budget," the maximum prudent equilibrium spending rate has to be reduced to

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[12] The partial derivative of (15) with respect to i is -(1+F/E-L/E), which is negative.

(16) $a \leq a' - O''_X/E,$

where

$$a' = (r_A - i)(1 + F/E) - (r_L - i)L/E.$$

So, as one would expect, in a sustainable equilibrium, less can be availed to operating revenues if some of actual operating expenses won't be met by those revenues; the reduction in the prudent avail rate will depend on how much of current spending is moved to off-budget spending.

Operating budget deficits have the same effect. If, in addition to off-budget current spending, there is a deficit in the operating budget of S'_C, then

(17) $a \leq a' - O_X/E - S'_C/E,$

further reducing the maximum prudent avail rate. It might be argued that since deficits are rarely planned, an ex ante spending rate would not be affected by them. But even if that were always true, there is interest, too, in historical avail rates where the relevance of budget deficits is clear. Equation (16) might be identified as an appropriate ex ante -- planning -- equilibrium avail rate and (17) an appropriate historical avail rate (unless there were planned deficits). (16) also applies, of course, to ex post surpluses in the operating budget which would justify a larger spending rate.

IV. PROTECTING THE VALUE OF PHYSICAL CAPITAL WEALTH

To this point, the focus has been on protection of the real value of financial wealth under the assumption that maintenance spending in the capital budget was adequate, always, so that real physical wealth was protected from erosion. In this section we drop that assumption in order to examine the prudent behavior that's necessary to protect, too, the real value of that important component of a college's wealth. To do so, we have to rely on the global accounts alone since the conventional rule of thumb based on avail policy addresses only prudence with respect to financial wealth.

Quite basic differences lie between financial assets and physical assets, differences that are compounded by the way capital stocks are treated in college financial accounting and planning. Nonetheless, if a college is concerned with maintaining the real value of its wealth, it has to consider all its wealth, including its physical assets. For even the best endowed colleges, physical assets appear to represent about half of total wealth -- they're about as great in value as all financial assets (Hansmann, 1990). For Williams, the replacement value of physical assets was estimated at about $300 million in 1987, roughly equal to the value of its endowment then. For less well endowed schools, the fraction of wealth represented by physical assets would be greater.

A characteristic of physical capital wealth that makes its role so different from that of financial wealth is its deterioration -- its loss of value -- with time and use. Buildings and equipment, and even grounds, lose real value over time unless expenditures are made on their maintenance. Left alone, the value of physical capital shrinks. This, of course, is real depreciation, but the term has been given such different meaning in tax law and accounting that "deterioration" seems more descriptive here. Inaction, then, reduces the value of physical wealth while spending, on maintenance, protects it. The contrast this generates with the erosion of financial wealth is interestingly fundamental and sharp:

- the real value ***of financial*** wealth lies in what it will buy so it is eroded by inflation and must be protected by saving,
- the real value of ***physical*** capital lies in what it will do -- in the capital services it will render -- so it is eroded by physical deterioration and must be protected by capital spending.

Financial wealth, then, is protected from the erosion of inflation by saving enough; physical wealth is protected from deterioration with time and use by spending enough on maintenance. Assume that economic depreciation of a physical capital stock is a constant proportion, h, of its replacement value,[13] then yearly maintenance spending of hK will have to be done if its real value is to be maintained. h = 2 % is often used with the rough

13 Though **constancy is not likely to be accurate in the short run -- when recent construction or renovation would reduce immediate maintenance requirements, given the inherent lumpiness of such projects -- it gives a reasonable target for longer term expenditure levels against which to judge performance and explain significant departures. Too, with physical capital stocks of very different composition, the relationship between required maintenance and total value of capital would likely be very different.**

justification that it's reasonable to expect, on the average, to spend the initial real cost of capital again over a 50 year period.

Maintenance spending is, of course, physical capital saving; it is indistinguishable in its effect on real wealth from saving the form of new plant and equipment -- both are included in K_X in (1).[14]

Then net saving in the form of physical capital will be

$$(18) \quad S_{kn} = K_X - hK = I - (hK - m)$$

since both new physical investment, I, and maintenance spending, m, are included in capital spending, K_X.

Equation (18) says, simply, that the year's net saving in the form of capital stock, S_{kn}, is made up of total additions to the capital stock, I, less any deficiency in current maintenance spending, $(hK-m)$ that allows existing capital wealth to deteriorate. That deficiency, hK-m, is the year's deferred maintenance.

The criterion for prudent management of the physical capital wealth over the year, then, is that *net* new capital saving not be negative,

$$(19) \quad S_{kn} = K_X - hK = I - (hK-m) \geq 0.$$

At any time, t, past accumulations of deferred maintenance,

$$DM_t = \sum_{T=-\infty}^{t} (hK_T - m_T)$$

have the effect of a physical capital liability that makes the net worth of the physical capital stock less than its replacement value, K, so at t, net capital wealth is

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14 So when spending on renovation and adaption maintenance is found in current spending, it should be subtracted off as physical capital saving.

$$NKW_t = K_t - DM_t.$$

This is reflected in equation (2) above.

V. PROTECTING THE REAL VALUE OF TOTAL WEALTH

We come, fmally, to the full expression of a policy intended prudently to protect the real value of a college's total wealth.

It's clear that global net worth, in equation (3), will be increased (decreased) from one year to the next by net saving (dissaving),

$$(20)\quad NW_{t+1} = NW_t + S_F + S_{kn} = NW_t + S_T,$$

where total saving is

$$S_T = S_F + S_{kn}.$$

Substituting the more specific expressions we've developed in the preceding discussion -- equations (12) and (18) -- total saving becomes

$$(21)\quad ST = CI - CX - hK$$

where CI is the year's global income,

$$CI = r(E+F-L) + G + AUXR + T,$$

and

$$CX = AUX_X + E\&G + O$$

is the year's current spending.

The immediate sense of equation (21) may not be obvious -- it may seem odd, after all this effort, that capital accumulation seems to have disappeared as an explicit part of saving -- but (21) describes the total resources left over from current income after current spending, CI-CX, less any dissaving in the form of depreciation, hK These are resources that can be used to increase financial or physical net worth, or both.

Total saving in equation (21) describes the nominal increase in net worth; prudence requires that real total wealth be maintained against the erosion of inflation and we've been at some pains to acknowledge the more stringent form of wealth protection that excludes new gifts intended to expand the endowment and physical capital. So, finally, prudent management requires that

(22) $CI - CX - hK - GE - G_K - i(E+F-L) \geq 0.$

To protect the real value of the college's existing wealth, total saving must be large enough to offset not only the effects of inflation, but the effects of physical deterioration and it must do that without using any of the gifts that were intended to expand the college's wealth, financial or physical. [15]

VI. CONCLUSION

The main contributions of this paper are these: (1) conventional fund accounts (albeit in a stylized form) are carefully related to a college's overall economic performance and the global accounts that describe it. This allows both (2) an examination of the economic behavior necessary to maintain the real value of the college's wealth -- a widely accepted criterion of

[15] An interesting complication is added by the fact that the capital stock is valued in current dollars so inflation will increase the current replacement value of the extant capital stock by i(K - DM). In strict conformity to the logic of accounting, we should show this physical capital appreciation as an addition to college income in equation (1) and therefore an addition to total saving: that is the route by which inflation affects the measured size of capital wealth and hence net worth. But since all such "income" goes directly to saving and then to capital value, it seems permissible to shortcut the process -- thereby avoiding the introduction of a quite unfamiliar element in the global accounts -- by arbitrarily adjusting the value of capital and net worth for inflation. Its explicit inclusion throughout would leave the inequality (22) unchanged. For full consistency, see Winston (1992b).

prudent management -- and (3) an understanding of the circumstances under which conventional rules of thumb based on fund accounts -- mainly the use of a balanced operating budget and prudent endowment current spending (avail) rate -- will in fact achieve that objective. (4) An especially useful contribution may prove to be the global accounts' ability to incorporate physical capital wealth into the evaluation of institutional performance -- recognizing the need to protect that form of wealth, too, from erosion by the college's spending policies and providing a framework to monitor the achievement of that goal by giving an explicit place in the accounts to accumulated deferred maintenance as a defacto offset to the replacement value of physical capital assets. The main difficulties with the conventional rules of thumb appear to be their insensitivity to off-budget spending and their inability either to reflect the importance of the physical capital wealth or to monitor its deferred maintenance.

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APPENDIX

A SUMMARY OF RELATIONSHIPS:
GLOBALACCOUNTS
FUND ACCOUNTS

GLOBAL ACCOUNTS

(1) $r(E+F) + G + T + AUX_R = E\&G + AUX_X + O_X + K_X + S_F$,

(2) $NW = E + F - L + K - DM$

(3) $NW_t + Skn + SF = NW_{t+1}$,

(4) $NFW = E + F - L$

(5) $NFW_t + SF = NFW_{t+1}$.

FUND ACCOUNTS

(c1) $aE + rF_C + G_C + T + AUX_R = E\&G + AUX_X + O_X + TRF_C + S_C$

(c2) $NW_C = F_C - L_C$

(k1) $rF_K + G_K + TRF_K = K_X$

(k2) $NW_K = K - DM + F_K - L_K$

(k4) $NFW_K = Fk - Lk$.

(e2) $NW_E = E = NFW_E$.

PROTECTION OF WEALTH:

Financial Wealth:

(6) $E_{t+1} \geq (1+i)Et + GE$

(7) $SF-GE \geq iE_t$ or $S_F - G_E - iE_t \geq 0$.

(8) $SF = (r-a)E + G_E$.

(9) $SF - GE - iE = (r-a-i)E \geq 0$

(10) $a \leq r - i$.

Positive Debt

(11) $SF-GE- i(E+F-L) \geq 0$.

(12) $SF = r(E+F-L) + G + T + AUX_R - E\&G - AUX_X - O'_X - K_X$

$O'_X = O_X - rL$

(13) $SF - GE - i(E+F-L) = (r-i)(E+F-L) - aE \geq 0$:

(14) $a \leq (r-i)(1 + F/E - L/E)$.

Off-budget spending

(15) $a \leq (r_A - i)(1 + (F/E)) - (r_L - i)L/E$.

(16) $a \leq a' - O''_x/E$,

$a' = (r_A - i)(1 + F/E) - (r_L - i)L/E$.

(17) $a \leq a' - O_x/E - s'_c/E$,

Physical Wealth

(18) $S_{kn} = K_x - hK$

$= I - (@K - m)$

(19) $S_{kn} = K_x - hK = I - (hK - m) \geq 0$.

$$DM = \sum_{T=-\infty}^{t} (hK_T - m_T)$$

$NKW_t = K_t - DM$.

Total Wealth Protection

(20) $NW_{t+1} = NW_t + SF + S_{kn}$

$= NW_t + ST$,

$ST = SF + S_{kn}$.

(21) $ST = CI - CX - hK$

$CI = r(E+F-L) + G + AUX_R + T$,

$CX = AUX_X + E\&G + O$

(22) $CI - CX - hK - GE - GK - i(E+F-L) \geq 0$.