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Managing Private College Finances in an Environment in Which Spending and Revenues Grow at Different Rates

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Abstract

Recently, spending and fees at colleges and universities have been rising faster than family incomes. If this trend persists, increasing emphasis will be placed on endowments as a source of finance. This paper examines financial planning when growth rates for the sources and uses of funds differ. First we examine concepts of "intergenerational equity" in such an environment (i.e., what is an equitable growth in comprehensive fees?) and then we show how the different concepts relate to the long-run sustainability of the institution. With differences in growth rates, long-run sustainability is a dynamic programming problem where rules of thumb such as "spend the real return on the endowment," or "keep the endowment a constant multiple of spending," have little relevance. We illustrate these points with numerical simulations of the dynamic problem that can be implemented with Excel.

Introduction

Although educational expenses and tuition at the wealthiest colleges and universities have increased substantially over the past decade, the endowments at many of these same institutions have grown even more rapidly [Kaufman and Woglom (2005 and 2007), National Center for Education Statistics, and NACUBO (2206)]. This has generated a great deal of negative publicity and prompted the U.S. Senate Finance Committee to investigate why the wealthiest colleges and universities have chosen not to spend a greater portion of the appreciation in their endowments (Arenson, 2008).

In this paper we suggest one reason why trustees may be responding cautiously. Although traditional models often conclude that colleges and institutions should maintain the real value of their existing endowments by spending the long-run real rate of return on their endowments, we believe that a more nuanced approach needs to be taken when college spending and revenues grow at different rates. In a world in which tuition revenues consistently rise more quickly than family incomes, we argue that responsible trustees should choose to limit the growth of tuitions and rely more heavily on endowment income. In order for this to be sustainable, however, the optimal spending rule must be modified.

In the next section we summarize the generally accepted fiduciary responsibilities of a college's board of trustees. We then review James Tobin's classic rule of what these responsibilities imply about endowment spending and suggest what we believe are more reasonable (and, in many cases, more realistic) guidelines in today's environment. If, as we believe, the principal role of the trustees is to sustain the mission of the institution in perpetuity, we illustrate in section 2 how differences in the growth rates of total institutional spending, family incomes, and the relative importance of gifts affect the long-run sustainability of the institution and the implications for endowment spending. Although much of our analysis applies to both private and public colleges and universities, we focus on the former because public institutions rely more heavily on public appropriations, which we do not analyze, and they typically have smaller endowments per student.

I. The Fiduciary Responsibilities of Trustees and the Implications for Endowment Spending

According to the Council of Foundations (2008), the financial responsibilities of a trustee include "1) the review and approval of the foundation's annual budget; and 2) the review and approval on an annual basis of a spending policy for the foundation and an investment policy that fulfill the mission and goals of the foundation." The catalogues and other documents of many colleges and universities reflect these principles. At Princeton, for example, the Board of Trustees "has charge and control of the finances and funds of the University. It sets the operating and capital budgets and supervises the investment of the University's endowment…. The trustees exercise prior review and approval of substantial new claims on funds, on the allocation of any significant proportion of the University resources, and the setting of priorities for development… (and) the determination of tuition and fees (Princeton University, 2008)." At Stanford, the Board of Trustees "administers the invested funds, sets the annual budget, and determines policies for operation and control of the university (Stanford University, 2008)."

Among economists, James Tobin (1974) provided the most generally accepted view that the main financial obligation of the trustees of an endowed institution is to assume the institution is immortal and act to "preserve equity among generations." Although the principle of inter-generational equity is often-heard, both Tobin and subsequent authors [e.g., Hopkins and Massey (1981)] implicitly use a narrow definition when they argue for endowment-spending policies that preserve the purchasing power of the existing endowment indefinitely. Tobin was aware that the long-term sustainability of the institution as a whole was not necessarily equivalent to preserving the purchasing power of the endowment. He gave two explicit and one implicit reasons for focusing on the purchasing power of the existing endowment: Tobin believed that 1) student fees, the other major source of income for a college or university, and total spending were "endogenous," by which meant that the trustees could easily change fees or spending; 2) that gifts and grants for current use (viz., the "annual" fund) were uncertain with limited fungibility.   The third reason that we infer from his argument is that he viewed gifts to the endowment as even more uncertain with practically no fungibility.

We disagree with these 3 assumptions, at least from a 21st century perspective. We believe that educational institutions should use all of their current and expected future resources to provide excellent educational services in a way that promotes intergenerational equity among current and future generations of students. We also believe that student fees are a key determinant of fairness across generations. Therefore, planning on the appropriate level and rate of increase in student fees is an important trustee responsibility. We disagree with Tobin's second and third reasons because of the modern emergence of "advancement" offices and of the growing importance of quasi-endowment. (See Hansmann [1990], pp. 8-9, where he makes similar arguments over 25 years ago.) Therefore, we will follow Tobin's more general advice to study "…the use of endowment [as] the result of a comprehensive optimization."

Our discussions with and observations of trustees during our combined 65 years of teaching at Amherst, Boston College, M.I.T., Smith, Williams, and Yale have convinced us that most college and university trustees would agree with Bowdoin's stated policy in which, "trustees must serve as fiduciaries to protect the financial, physical and other assets of the College, balancing the needs of current and future generations of College constituents…. The Board "establishes annual tuition levels, endowment spending, annual budgeting, debt policy and human resources matters, in order to ensure the adequacy of financial resources for present and future generations of Bowdoin constituents. (Bowdoin, 2008)."

Consequently, we believe that it is the trustees' responsibility to: 1) Determine the equitable level and growth rate for total spending; 2) Determine the equitable level and growth rate of both the comprehensive fee and net student revenues (where the latter are equal to the comprehensive fee minus institutional and non-institutional grants); and 3) Devise a financial plan that ensures that the endowment will be sufficient to provide the long-run level of support that is required to balance the budget. This plan should explicitly incorporate both expected future gifts to the institution (both to the annual alumni fund and other gifts) as well as the long-run rate of return on the endowment.

Having made these 3 decisions, trustees then need to ask whether their institution's current endowment is sufficient to continue this plan indefinitely. If the answer is no, trustees need to experiment with how changes in these decisions can lead to sustainability. Regardless of how long-run sustainability is achieved, we will show that it is highly unlikely that the sustainable plan will involve either a constant spending rate from the endowment or a constant purchasing power for the endowment. In the following section we discuss in more detail the aspects of intergenerational equity. This discussion suggests that it is unlikely that student fees will grow at the same rate as total expenses. In section 3, we analyze how differences in the growth rates of total spending, family incomes and the relative importance of gifts affect the long-run sustainability of the institution.

II. Intergenerational Equity

In this section we suggest what we consider to be a reasonable procedure for formulating a long-term financial plan that ensures intergenerational equity. After describing recent trends in each of the critical variables we project future growth rates that we use in our simulations in Section III.

Maintaining the Amount and Quality of Educational Services

In order to determine the future path of spending, trustees first estimate the cost of purchasing the same amount of educational *inputs* (professors, blackboards, utilities, etc) over time. They must then determine whether and how much these physical inputs need to increase in the future in order to provide a comparable education for future generations of students and ensure intergenerational equity in the provision of educational services.

The costs of purchasing the same amount of educational inputs (as opposed to educational *output or services*) will, by definition, rise by the rate of inflation in higher education. Economists have constructed a price index for higher education, appropriately called the "higher education price index" or HEPI. [1] From 1961 (the earliest date for which the index exists) through June 30, 2006, HEPI increased an average of 5.2 percent per year. The consumer price index, or CPI, which measures the change in the cost of the typical urban consumer's purchases, rose by 4.3 percent per year over this period, or by about one percentage point less than HEPI. During the past twenty years (1986-2006), the growth rate of the CPI has also been one percentage point below the growth rate of HEPI.

Although technological change has allowed producers in many industries to reduce the amounts of inputs over time, most observers believe that technological change in college and university teaching, like theatrical arts, has proceeded less rapidly (Baumol and Bowen, 1965). As a result, educational inputs are likely to grow over time in order to maintain the same "quality" of educational services. As knowledge and interests expand, colleges may need to offer new courses or expand into new disciplines without curtailing existing offerings. In the past few decades, for example, most colleges have increased their offerings in neuroscience, astrophysics, women's studies, and Asian studies, among others.

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1 For many years this index was published by Research Associates of Washington, D.C. In 2005, however, the Commonfund Institute assumed responsibility for compiling and publishing the index (Commonfund Institute, 2006).

Expenses per student at most elite colleges have risen about one percentage point faster than HEPI (Kaufman and Woglom, 2005). Whether this increase in spending represents an improvement in the overall quality of educational services or merely a sustained level of services is difficult to determine. Expenditure increases have also been influenced by competitive pressures from peer institutions, some of which may not be directly related to the educational mission of the institution. In our baseline simulations, however, we shall assume that the level of educational spending required to provide a comparable education over time (and hence the level required to achieve intergenerational equity) will rise by 1 percentage point above HEPI inflation.

Educational spending will therefore rise by the sum of three terms: CPI inflation, the amount by which HEPI inflation exceeds CPI inflation (which we assume will continue to be 1 percentage point per year), and the amount by which educational inputs increase (which we also assume will be 1 percentage point per year). Looking ahead, the current expected long-term rate of CPI inflation is about 2.4%. This figure is both the current long-term rate of expected inflation that is implicit in indexed U.S. Treasury bonds (TIPS) and the 10-year forecast of CPI inflation according to the Federal Reserve Bank of Philadelphia's August, 2007 *Survey of Professional Forecasters.* Given these numbers, we expect educational spending to increase by 2.4 + 1.0 + 1.0 = 4.4% per year in the future.

The Comprehensive Fee and Net Tuition Revenue

If educational expenses are rising by 4.4% per year, revenue must also rise by 4.4% per year in order to maintain a balanced budget. To simplify matters, we assume that there are four sources of revenue: payments by full-paying students; payments by students on financial aid; the annual (Alumni) fund, and spending from endowment.[2] Each year investment returns and new gifts will increase the endowment, while spending from endowment will decrease it.

As the guiding principle in setting the comprehensive fee, we propose that the share of educational costs paid by families receiving no financial aid remain constant over time. This implies that the comprehensive fee rises at the same rate as educational spending, or by 4.4% per year. According to our calculations, this is slightly higher than the recent growth rate of incomes among families who do not receive financial aid from elite colleges and universities. Although these families may be asked to pay a slowly increasing portion of their incomes in tuition, it is important to remember that even full paying students are receiving a "subsidy" at most of the elite colleges because the comprehensive fee is less than total expenses per student. In addition, economic studies have indicated that the "value-added" of a college degree in terms of the rate of return to higher education has also risen during the past two decades (Goldin and Katz, 2007).

Turning to those families who do receive financial aid, we propose that they pay the same fraction of their incomes for their children's higher education over time. This does not mean that everyone pays the same fraction. Current financial aid formulae require a larger percentage contribution from a middle class family than from a poor family. Equal contribution over time implies that if a family in the 40th percentile of family income in 2005 ($45,021) is asked to contribute 10% of its income in student fees, a family in the 40th percentile of family income in 2015 would also be asked to

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2 Many larger institutions also derive a significant portion of their revenues from state and federal government grants to students, and public and private grants to the institution or its faculty.

contribute 10% of its family income. Median family income grew at slightly more than 3 per cent per year between 1995-2005. Consequently, we assume that both the incomes of families who receive financial aid and the net revenues they pay will also rise by about 3% per year in the future.

Total net student revenues will be a weighted average of the comprehensive fee for non-aid students and the net fee for those on financial aid. A simple average of the two growth rates yields a growth rate of total net student revenues of 3.7 per cent.[3] This growth rate, however, is likely to be too high for at least two reasons: 1) If the comprehensive fee continues to grow substantially faster than the growth in median family incomes, the percentage of the students on financial aid will increase; and 2) As elite colleges have reached out specifically to attract students from families with low incomes, the percentage of students on financial aid (and their support levels) may increase even more. Thus, we initially assume that total net student fees will grow by 3.5% per year.

Gifts to the Alumni Fund and the Endowment

As we stated earlier, Tobin did not think that future gifts to either the alumni fund or the endowment should be considered in determining either total current spending or current spending from endowment. "Current consumption should not benefit from the prospects of future gifts to endowment. Sustainable consumption rises to encompass an enlarged scope of activities when, but not before, capital gifts enlarge the endowment." (Tobin, 1974) Although he argued that tuition revenues were endogenous, we believe intergenerational equity should apply both to revenues and costs.

[3] At Amherst College, for example, about half of all students receive institutional aid.

Furthermore, we do not believe that gifts to the alumni fund and the endowment are as "uncertain" and "infungible" as they were in 1974. Colleges with which we have been associated have invested substantial resources in expanding their development and advancement offices and alumni relations. In our opinion maintaining the real value of the existing endowment and ignoring all future gifts yields the inequitable result that endowment income would benefit future generations more than current generations. At most colleges almost all gifts to the annual fund flow directly into the annual operating budget. Other gifts, however, are either spent on specific projects or placed in unrestricted endowment. While many donors seem to prefer to donate to "bricks and mortar" projects, we have observed a substantial degree of flexibility among donors and creative development officers.

At most institutions, a majority of gifts come from a relatively small minority of donors. If the incomes of families who do not receive financial aid grow by about 4 per cent per year, we think it is reasonable to assume that both gifts to the alumni fund and the endowment will grow by at least 3.5 percent per year, or at the same rate as net student fees.

Rate of Return on the Endowment

In our baseline simulations we assume that the rate of return on the endowment will be 9 per cent per year. With an expected rate of inflation of 2.4 percent, a 9 percent nominal return corresponds to a real rate of return of 6.6 per cent. This is approximately equal to the long-run real rate of return from a portfolio 80% of which is invested in the S&P 500 and 20% of which is invested in bonds. It is also less than the actual real rate of return on the endowments at most elite colleges and universities over the past decade. [NACUBO (2006)]). These colleges and universities have increased the portions of their endowments held in real estate, commodities, private equity, venture capital, hedge funds, and other "alternative" assets, which have enjoyed greater returns.

III. Budget Balance and Endowment Dynamics:

The following accounting identity shows the balance between sources and uses of funds:

(1) $$F + A + \sigma E = S\,,$$

Where F is net student fees, A is the annual fund, S is total spending and E is the value of the endowment at the end of the year. σ is the fraction of the endowment devoted to current spending, commonly known as the endowment spending rate. In what follows capital letters will stand for levels, small letters for respective growth rates between the beginning of this year and next, and Greek letters for ratios.

Assuming that spending from the endowment occurs at the end of the year, the change in the endowment during this year and its growth rate are given by[4]:

(2) $$\Delta E = rE + G - \sigma E; \qquad e \equiv \frac{\Delta E}{E} = r + \gamma - \sigma$$

where r is the total return on the endowment, G is gifts to the endowment (received at the end of the year, and γ is ratio of gifts to the beginning-of-year endowment.

[4] Because budgeting takes place over a year, one must specify the inter-year timing of the flow quantities: *F, S, G*. In the text, we assume that spending from the endowment comes out of the endowment at the end of the year; that fees are spent as soon as they are received, and that gifts are realized at the end of the year to keep the algebra simple. In our simulations, we assume that ½ of spending comes out at the beginning of the year and the second half comes out at mid-year. Similarly ½ of total gifts are assumed to come at the end of the year and half at mid-year.

Given these relationships it is interesting to see what the sources and uses of funds will look like in one year:

$$(3) \qquad \begin{aligned} &F_{+1} + A_{+1} + \sigma_{+1} E_{+1} = S_{+1} \\ &F(1+f) + A(1+a) + \sigma_{+1}(1+e) = S(1+s) \end{aligned}$$

In general, the small letters and σ that fulfill Equation (3) will change over time. There are however, some interesting special cases. The easiest special case is the unlikely case in which the value of σ and all of the growth rates remain unchanged over time. This can occur only when the sources and uses of funds are growing at the same rate; where $f = a = s$. With the spending and revenue streams growing at the same rate, if the endowment spending rate is set at r-s+γ, then by Equation (2), the rate of growth of the endowment e will also equal the growth in total spending. In this (very) special case, the goals of long-term sustainability of the institution will be consistent with a constant endowment spending rate. As we have argued previously, however, we believe that the growth in student fees is unlikely to keep pace with the growth in total spending, so that this special case is of limited relevance.

This special case is also ***not*** the Tobin special case. Tobin argued that the spending rate from the endowment should be set to preserve the purchasing power of the *existing* endowment, as opposed to the *total* endowment. As we have already argued, we believe that the growth in total spending and net tuition are far more important determinants of intergenerational equity than is the purchasing power of the endowment. Therefore, from a modern perspective we see no reason that the growth in spending and tuition that would result from the Tobin rule has any claim to intergenerational fairness.

Finally, let's look at the more interesting and relevant case introduced in Section II. In that section we argued that net student fees paid by students on financial aid should grow at the same rate as family incomes, which is assumed to be less than the growth in total spending needed to maintain constant educational quality. To keep matters as simple as possible we initially assume that the annual fund and gifts to the endowment also grow at the rate of net student fees (*f* = *a* = *g)*.

(4)

$$\sigma_{+1} \equiv \frac{S_{+1} - (F_{+1} + A_{+1})}{E_{+1}} = \frac{S(1+s) - (F+A)(1+f)}{E(1+e)};$$

$$\sigma_{+1}(1+e) = \frac{S(1+s) - (F+A)(1+s)}{E} + \frac{(F+A)(s-f)}{E};$$

$$\sigma_{+1}(1+e) = \sigma(1+s) + \frac{(F+A)(s-f)}{E};$$

$$\text{Note if } e = s, \sigma_{+1} = \sigma + \frac{(F+A)(s-f)}{E(1+s)}; \sigma_{+1} > \sigma$$

The problem with trying to preserve the purchasing power of the endowment is that the relative importance of the sources of finance is changing over time. In particular with expenses growing faster than non-endowment income (viz, *F+A*), endowment spending is becoming an increasingly important source of finance for total spending. Therefore, the long-run sustainability of the institution requires that the endowment grow faster than total spending (*e* > *s*). This is exactly what has occurred at most of the top liberal arts colleges and universities [Kaufman and Woglom (2005 and 2007), National Center for Education Statistics, and NACUBO (2206)].

There is a good side to this scenario: with endowment growing faster than expenses, the ratio of non-endowment income to the endowment $\left(\text{viz.}, \frac{F+A}{E}\right)$ is getting smaller over time. Therefore, the necessary excess growth of endowment over expenses is getting smaller over time. This effect tends to lower the sustainable endowment spending rate over time. Unfortunately, there is another effect that works in the opposite direction: growth in the endowment is relying more heavily on portfolio returns and less on gifts. Recall that

$$e = r + \gamma - \sigma \text{ and } \gamma = G/E.$$

(5) Thus, $\Delta\gamma$ is approximately equal to $\gamma(\Delta G/G - \Delta E/E)$

which, by assumption, is equal to $\gamma\,(f - e) < 0$

With gifts becoming relatively less important, the endowment spending rate must fall over time to achieve any given growth in the endowment.

Thus, in the general case in which $s > f$, there is no constant endowment spending rate that leads to long-run sustainability. Instead:

1) Long-run sustainability requires endowment growth in excess of growth in total spending (which, as we mentioned, has occurred); and

2) Long-run sustainability can require either:

a) a falling endowment spending rate over time as endowment income becomes a larger fraction of total income; or

b) a rising endowment spending rate as gifts to the endowment become a relatively less important source of growth in the endowment.

IV Determining Long-run Sustainability

The analytic solution to determining long-run sustainability is technically complicated, but is based on a simple intuitive idea: current sustainable spending from endowment leads to a sustainable level of endowment next year. The analytical complexity is due to the fact that we are defining sustainability recursively: next year's sustainable endowment will yield a sustainable endowment two years hence, and so forth. Dynamic programming techniques can be used in many cases to find (non-intuitive) solutions to this problem. The Solver function in Excel allows us to find a numerical solution that approximates the analytic solution.

To see how this is done consider the very long-run implications of our assumptions that growth in spending will exceed growth in all non-endowment sources of income ($s > f, a, g$). Eventually, in the very long run, student fees, the annual fund and gifts to the endowment will become a negligible portion of total spending. At this distant point, a constant spending rate that makes the endowment grow as fast as expenses is sustainable. The Excel Solver tool allows one to see whether current endowment is consistent with a convergence to this very long-run sustainability condition. In other words, given the desired level and growth of current spending and net student fees, along with projected portfolio returns, annual fund gifts and gifts to the endowment, the institution will converge to a constant endowment spending rate in the very long run.

Table 1 illustrates the outcome of a simulation for determining the current level of the endowment that is required for long-run sustainability. The numbers in italics, representing the growth rates of total spending and net tuition revenues, are assumed to be the result of the plan for intergenerational equity and have been selected along the principles described in Section II. All of the level variables are expressed relative to initial spending, which is set equal to 100. The initial relative levels of net student fees F, and total gifts to the endowment G and the annual fund A are approximately equal to the relative proportions at the wealthiest 6 liberal arts colleges (Kaufman and Woglom, 2005). While changes in the initial levels of these variables would obviously affect the numerical results of our simulations, our main conclusions would remain unchanged as long as revenue sources grow more slowly than expenses.

The growth rates of gifts to the annual fund and endowment, as well as the rate of return on the endowment are also taken from Section II. These numbers completely determine the future path of the numbers in the columns labeled *S* and *F* in Table 1. The numbers in bold face are the current level of gifts and their projected growth rates along with the projected nominal rate of return. These numbers directly determine all of the numbers in the *A* and *G* columns (except for the initial period) and along with the boldfaced numbers determine the growth in the endowment. Spending from the endowment (σE) is inferred from the *S, F* and *A* columns using equation (1). Then the growth in the endowment is determined by equation (2).[5] Given these numbers the Solver tool finds the value of the current endowment that will cause the endowment to grow at the same rate as spending in year 100. Year 100 is far enough in the future so that we

[5] As noted in footnote 1, the exact formulas are a bit more complicated to account for more realistic assumptions about the timings of spending and the receipt of gifts.

assume that financial sustainability is approximated by imposing the long-run condition that endowment must grow as fast as spending.[6]

Table 1: Base Line Long-run Sustainability

Year	*S*	*F*	A	G	s	f	a	g	r	E
0	100	44	**15**	**20**	4.40%	**3.50%**	**3.50%**	**3.50%**	**9.00%**	770
					σ	e	(F+A)/E	(F+A)/S	G/E	
1	104.4	45.5	16.1	817.9	5.3%	6.1%	7.5%	59.0%	2.5%	818
2	109.0	47.1	16.6	867.8	5.3%	6.1%	7.3%	58.5%	2.5%	868
3	113.8	48.8	17.2	920.5	5.3%	6.0%	7.2%	58.0%	2.4%	920
4	118.8	50.5	17.8	976.0	5.2%	6.0%	7.0%	57.5%	2.4%	976
5	124.0	52.3	18.4	1034.4	5.2%	5.9%	6.8%	57.0%	2.3%	1034
6	129.5	54.1	19.1	1095.9	5.2%	5.9%	6.7%	56.5%	2.2%	1096
7	135.2	56.0	19.8	1160.7	5.2%	5.9%	6.5%	56.0%	2.2%	1161
8	141.1	57.9	20.4	1229.0	5.2%	5.8%	6.4%	55.5%	2.1%	1229
9	147.3	60.0	21.2	1300.8	5.1%	5.8%	6.2%	55.1%	2.1%	1301
10	153.8	62.1	21.9	1376.4	5.1%	5.8%	6.1%	54.6%	2.0%	1376

It is important to note that Table 1 is not a "100 Year Plan." The planning period could be as long as seems appropriate, and a 10 year plan was assumed in Table 1. Sustainability of the plan is determined over what amounts to an indefinite horizon to allow the planner to answer the crucial question, "What does the endowment need to be at the end of the planning period for long-run sustainability?" The 100-year exercise provides an estimate of this level of the endowment. In the current example, the plan suggests that an initial endowment of $770 will lead to long-run sustainability. If things work according to plan, the endowment will increase by about 75% by the end of the planning period. Notice that the increase in the endowment over the 10-year period requires growth in the endowment of around 6%, which is in excess of the growth in spending. The chances that all of the assumptions of the plan will hold true are

[6] Under these assumptions, non-endowment sources of financing total spending fall from 59% (=(44+15)/100) in year 0 to less than 6% in year 100. Gifts as a fraction of the total endowment fall from over 2% (=20/915) in year 0 to under 1/2 of a percent in year 100.

negligible. In that case, the appropriate response is to redo the planning exercise with the new information.

If the current endowment is consistent with long-run sustainability, the institution can enact the desired plan. When the current endowment and plan do not lead to sustainability, a simulation can be used to find a sustainable plan. For example, suppose the planners in the same scenario as in Table 1 have a current endowment of only $700. Something in the plan has to change and the simulation can be used to find out how. For example, Table 2 shows how spending growth must be reduced over the 10 year period in order to make the current level of the endowment consistent with sustainability. To reflect the fact that the current endowment is a given we have put it in bold face and the variable chosen by Solver is the growth in total spending for the next 10 years (thereafter spending is assumed to grow at 4.4%). Restraining spending to grow at only 3.99% for the next 10 years will generate long-run sustainability. It might seem counterintuitive that the endowment in year 10 is less in Table 2 than it is in Table 1. Remember, however, that the slower growth in the endowment in years 1-10 implies that spending at every time period thereafter is less in the Table 2 scenario than the Table 1 scenario. Notice also that the initial spending rate from the endowment is higher in Table 2. This merely reflects the fact that with initial spending at the same level and a lower endowment in Table 2, the spending rate from the endowment initially has to be greater.

Table 2: Achieving Sustainability through Restrained Spending

Year	S	F	A	G	s	f	a	g	r	E
0	*100*	*44*	**15**	**20**	3.99%	*3.50%*	**3.50%**	**3.50%**	**9.00%**	**700**
					σ	e	(F+A)/E	(F+A)/S	G/E	
1	104.0	45.5	16.1	741.1	5.8%	5.9%	8.3%	59.2%	2.8%	741
2	108.1	47.1	16.6	784.5	5.7%	5.9%	8.1%	59.0%	2.7%	785
3	112.4	48.8	17.2	830.6	5.7%	5.9%	7.9%	58.7%	2.7%	831
4	116.9	50.5	17.8	879.4	5.6%	5.9%	7.8%	58.4%	2.6%	879
5	121.6	52.3	18.4	931.1	5.5%	5.9%	7.6%	58.1%	2.6%	931
6	126.4	54.1	19.1	985.8	5.5%	5.9%	7.4%	57.9%	2.5%	986
7	131.5	56.0	19.8	1043.9	5.4%	5.9%	7.3%	57.6%	2.4%	1044
8	136.7	57.9	20.4	1105.5	5.3%	5.9%	7.1%	57.3%	2.4%	1106
9	142.2	60.0	21.2	1170.9	5.3%	5.9%	6.9%	57.1%	2.3%	1171
10	147.8	62.1	21.9	1240.2	5.2%	5.9%	6.8%	56.8%	2.3%	1240

Another interesting exercise is to plan for a temporary deviation from the long run. For example, suppose a school that finds itself initially fulfilling long-run sustainability as in Table 1 is interested in increasing socio-economic diversity over the next ten years. As a result, the anticipated rate of growth of net tuition revenues might only be 1% over the next 10 years and then rise to the long-run rate of 3.5% thereafter. Table 3 shows the results for this scenario.

Table 3: Sustainability with Temporary Slow Growth in Fees

Year	S	F	A	G	s	f	a	g	r	E
0	*100*	*44*	**15**	**20**	*4.40%*	*1.00%*	**3.50%**	**3.50%**	**9.00%**	900
					σ	e	(F+A)/E	(F+A)/S	G/E	
1	104.4	44.4	16.1	959.2	4.6%	6.4%	6.3%	58.0%	2.2%	959
2	109.0	44.9	16.6	1020.7	4.7%	6.3%	6.0%	56.4%	2.1%	1021
3	113.8	45.3	17.2	1084.8	4.8%	6.1%	5.8%	55.0%	2.0%	1085
4	118.8	45.8	17.8	1151.4	4.8%	6.0%	5.5%	53.5%	2.0%	1151
5	124.0	46.2	18.4	1220.7	4.9%	5.9%	5.3%	52.2%	1.9%	1221
6	129.5	46.7	19.1	1292.8	5.0%	5.8%	5.1%	50.8%	1.9%	1293
7	135.2	47.2	19.8	1367.6	5.0%	5.7%	4.9%	49.5%	1.9%	1368
8	141.1	47.6	20.4	1445.2	5.1%	5.6%	4.7%	48.2%	1.8%	1445
9	147.3	48.1	21.2	1525.8	5.2%	5.5%	4.5%	47.0%	1.8%	1526

If the institution finds itself starting in the situation underlying Table 1 with an endowment of $770, then it will have to raise $130 more in the endowment (to reach a level of $900) to finance the planned slower growth in net student fees over the next 10 years.

Tables 1-3 illustrate that little can be said in the abstract about the significance of the level and rate of change in the spending rate from the endowment. The endowment spending rate in Table 1 is roughly constant because the effect of the falling relative importance of non-endowment income (viz., *(F+A)/S*) is roughly offsetting the decreasing relative importance of gifts. In Table 2 the endowment spending rate starts out higher than it does in Table 1and falls more rapidly over the ten year period. With a slower growth in spending, non-endowment income as a fraction of total spending falls less rapidly. In both Tables 1 and 2 non-endowment income as a fraction of total spending in year 0 is 59% (=(44+15)/100) and falls to 54.6% in Table 1 and only to 56.8% in Table 2. Finally, Table 3 shows rising endowment spending rates because the slow growth in fees causes the opposite effect. In Table 3 non-endowment income as a fraction of total spending falls all the way to 47% and the spending rate from the endowment has to rise to offset this.

The one common factor in the 3 tables is the slowing growth in the endowment over time. Our simulations are describing the transition to the long run, where the endowment will eventually grow at the same rate as the growth in total spending (4.4% in Tables 1-3). The endowment grows more rapidly initially and growth slows over time as part of this transition.

One last exercise may be useful in illustrating the difference between Tobin's approach to intergenerational equity and our approach of long-run sustainability.

Consider the effect of changes in the rate of return and the rate of cost increase in the two models. Under the rule of thumb, spend the real return, the implications are straightforward: a percentage point increase in the rate of return or a one percentage point decrease in the rate of cost increase should lead to a one percentage point increase in the spending rate. This relationship is more complicated in the case of long-run sustainability.

Starting from the baseline scenario in Table 1 a one percentage point increase in the rate of return lowers the sustainable level of current endowment to $699 (simulation not shown), which implies an initial spending rate from the endowment of 6.8%, an increase in one and one half percentage points percentage point from Table 1 and therefore not too far from the rule of thumb. A one percentage point drop in the rate of growth in spending from 4.4% to 3.4% has a more dramatic effect: the sustainable level of current endowment falls all the way to $365 (simulation not shown), which implies an initial endowment spending rate of over 11%, an increase of 6 percentage points.

Changes in the rate of growth of spending have a much more dramatic effect on the current sustainable endowment spending rate because they slow the whole transition to the long run. In Table 1, non-endowment income as a fraction of total spending falls by 5 percentage points over the ten-year period, and raising the rate of return on the endowment does not affect this result. A fall in the growth of spending, however, does. In the case described above the reduction in the growth in spending implies that non-endowment income relative to total spending actually rises slightly over the ten-year period.

V. Conclusion

Traditional rules regarding endowment spending, such as spend the real return, are based on the principle of maintaining the real value of the current endowment in order to achieve inter-generational equity. In this paper we argue that other concepts of inter-generational equity and other endowment spending rules may be more relevant today for several reasons. First, gifts to the annual fund and capital gifts are becoming more predictable and more fungible. Second, tuition and fees at most institutions of higher education are rising considerably faster than prices elsewhere in the economy. Finally, tuition and fees are also rising much faster than family incomes, creating greater burdens for successive generations of students and their families unless these additional burdens are offset by increases in financial aid. Consequently, the portion of higher education spending provided by college and university endowments has increased and will continue to do so. In order to finance this increase, endowments temporarily need to rise faster than educational spending. Substantial increases in world-wide equity markets, coupled with successful investments in alternative assets have allowed this transition to occur relatively painlessly at many of the wealthiest colleges and universities.

In light of these trends, we propose alternative definitions of inter-generational equity and a numerical simulation technique for planning for the long-run sustainability of the institution. In addition to helping schools plan, our proposals and simulations would help schools communicate more effectively with their stakeholders by providing a principled rationale for the rate of increase in tuition and fees. They would also allow institutions to determine and justify the level of endowment that is currently necessary for the school's educational needs. As a result, colleges and universities would be better able to explain to parents and alumni the reasons for their requests for ongoing financial support. Substantial increases in college and university endowments that are unmatched by comparable increases in spending from endowment need not be a cause for alarm, although the enormous disparity between these two at a few of the very wealthiest colleges and universities cannot be explained by our model. It remains to be seen how the trustees at these few institutions will respond to their institutions' windfall.

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