The Efficiency of Large(r) Endowments: The Optimal Endowment is Bigger than you Might Think

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Abstract:

This study argues that endowments can be efficient, both for a finite-lived and infinitely-lived agent. When the lost utility from forgone consumption is less than the discounted utility brought by the cash flows paid throughout the endowment, endowments are utility-enhancing. Given that this can be utility enhancing for a finite-lived person, the direct connection can be made to an infinitely-lived agent who would receive utility enhancement through an endowment, such as a university. Given the recent political push to force well-endowed universities to spend down their endowments, displaying how an endowment's existence can be efficient is important for policy-makers.

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I. Introduction

The term endowment in economics has typically been used to describe what a person or country was endowed with (i.e. natural resources, technology, etc.). There is another form of an endowment that has been understudied; the creation of a financial endowment – a store of wealth where the principle amount is not touched and only the endowment gains are spent. This study analyzes when it is optimal to establish an endowment, both for a finite agent (a person) and an infinitely-lived agent (a non-profit organization).

Finite agents can use endowments throughout their lives, but only have a limited period of time that they can enjoy the benefits of their endowment payouts. Whereas an infinitely-lived agents can enjoy the advantages of an endowment in perpetuity, specifically for mission-based non-profit organizations (such as universities). In this study, I make the argument that endowments can be efficient for finite agents as a means of maximizing lifetime utility. Given this argument exists for a finite agent, it can be expanded to the use of infinitely-lived agents like the endowments at any non-profit.

There has been a recent policy change, in the 2017 Tax Cuts and Jobs Act (in the U.S. – as well as other similar proposals), that has placed a 1.4 percent tax on the net income of "well endowed" universities (those with endowment assets exceeding $500,000 per student, other than those assets which are used directly in carrying out the institution's exempt purpose). This policy is specifically designed to discourage current and future "well endowed" universities. This requirement argues that holding this money in an endowment is inefficient and would be better used today rather than over a longer period of time.

The focus of this research is on the efficiency of holding an endowment, not the allocation of holdings, spending, or intergenerational fairness (Tobin, 1974) of the endowment itself. When it is possible for a finite agent to find an endowment utility maximizing, it is also possible that the decision to donate money in a way consistent with their beliefs, through the use of an endowment, is also utility maximizing.[1]

II. Modeling Utility Maximization

A Finite-Lived Agent

Assume that a person gives up a given fraction of the current consumption, *c*, as savings, *s*. This savings rate of their current income decreases their current utility by the loss of this consumption in the current time period *t*. This is done with the expectation that their future consumption will increase and that this increase in consumption in period *t+1* will result in a higher utility than the lost utility in *t*.[2]

There are two main time periods: 1) the growth period where their savings grows beginning at time *t*, and 2) the endowed period, where the endowment is formed from the growth in *s* and the payouts can then be taken as a cash flow starting at time *t+1*.

To model the value of this lost consumption, $-c_t$, we have to formulate how the savings grows, s_t, and is worth more in time *t+1*.

$$-c_t = s_t = \frac{C_{t+1}}{(1+i_t)^n}$$

Thus,

$$s_t(1+i_t)^n = C_{t+1} = FV$$

[1] I use endowment as the funds functioning as endowments (see Enrenberg, 2009).
[2] This is modeled with a one period savings example, i.e. save everything needed during the first time period (year of work) then no more savings needed. See Merton (1971) for the analysis of utility maximizing over multiple years. However, it is possible that one large savings rate, which decreases over time, is utility-maximizing. This paper presents an extreme example of this and leaves the optimal savings path for future research. A simple numerical example is in the appendix.

Where i_t is the interest rate earned on the investment during the growth period. For this to be an endowment, there would have to be some cash flow, *CF*, that is paid out by the future value, *FV*, of this investment; which pays out per year every year, without using the principle amount.

Given inflations rates, to have the cash flow payout in constant dollars, there must also be a growth rate, *g*.

$$FV = \frac{CF_{t+1}}{i_{t+1} - g}$$

Therefore,

$$c_t(1+i)^{t+1} = FV = \frac{CF_{t+1}}{i_{t+1} - g}$$

And since the present value today, at time *t*, is the present discounted value of the future value and the current value of consumption loss:

$$s_T = PV = \frac{FV}{(1+i_t)^n}$$

Thus the current consumption is the discounted value of the cash flow payments received in the payout period (i.e. the endowed portion of life).

$$s_t = PV = \frac{{CF_{t+1}}/{i_{t+1} - g}}{(1+i_t)^n}$$

Therefore, the lost consumption today is a function of the investment returns gained during the growth period, i_t, and the investment returns gained during the endowed period, i_{t+1}.

Because the value of lost consumption is simply a function of the returns during both the growth and endowment periods, the value of lost consumption and gained cash flows is determined by the utility brought (lost) during the future (current) periods. In time t, there is lost utility due to a loss in consumption today, U_1.

$$U_1(C_t)$$

However, this lost utility today yields higher utility during the endowed phase of life, U_2. The cash flows received during the endowment period yield positive utility gains.

$$U_2(\sum_{n=t+1}^{N} CF_{t+1})$$

Where the utility gained during the endowment period is a sum of the cash flows received over this period, which begins in time period *n* and expires at death, *N*. However, the endowment period does not begin at the time consumption is lost, it happens in the future. So it must be discounted by *β*, yielding a current value of U_2 to be:

$$U_2 \frac{U_{t+1}(\sum_{n=t+1}^{N} CF_{t+1})}{(1+\beta)^{t+1}}$$

Which can then be directly compared to the lost utility in U_1, Resulting in three possible outcomes. First, U_2 exceeds U_1. When this occurs the utility gain by endowing life exceeds the lost utility by delaying consumption. This means the delayed consumption, and use of the endowment, is utility maximizing.

$$U_1(C_t) < \; U_2 \frac{U_{t+1}(\sum_{n=1}^{N} CF_{t+1})}{(1+\beta)^{t+1}}$$

Second, if U_1 exceeds U_2 then the lost consumption today exceeds the utility gained by the cash flows in the endowed period, and this person should consume today and not save for an endowment. Lastly, if the two are equal ($U_1 = U_2$), then the person is indifferent between current consumption and living and endowed life.

An Infinitely-Lived Agent

The extension to an infinitely lived agent is clear because there is no death of the agent. Thus the *N* becomes infinity.

$$U_2(\lim_{n\to\infty} \frac{U_{t+1}(\sum_{n=t+1}^{N} CF_{t+1})}{(1+\beta)^{t+1}})$$

Which magnifies the possibility that $U_2 > U_1$, and to the point where finite-lived agents exist where $U_2 > U_1$ magnifies the number of situations where this works in an infinitely-lived agent world. Thus, when dealing with non-profit institutions that intend to carry out their mission throughout generations of people, the use of an endowment to help many people over time, rather than a few people in one period of time, is efficient and maximizes utility for the donor.

Given that finite-lived agents invest in endowments, and extending that infinitely-lived agents (through non-profits), utility-maximization can occur through the creation or, or increase in size of, the endowments themselves – thus optimal endowment holdings are often much larger than most people think.

III. Applications and Conclusion

Endowments are not utility maximizing for everyone, but it is possible that a personal endowment is utility-maximizing for at least for some people. This raises the question: Can those that do not find endowments to be utility maximizing force other individuals, who do find them to be utility maximizing, to stop using them?

Policy

Given that endowments can lead to utility-maximizing worlds for finite-lived agents, this also means that endowments can lead to utility-maximizing worlds for infinitely-lived agents as well. Thus, when policies are proposed to force non-profit institutions who have endowments, or potential proposals to force individuals with endowments, to spend their money now, rather than over longer periods of time. This is a policy to promote individual preferences, not increase utility. Thus, these policies should not be implemented (and we should encourage endowment enhancing proposals).

Endowments for Infinitely-Lived Agents

Endowments should be increased for those that find them utility enhancing within non-profit organizations. Another built-in benefit of an endowment for colleges and universities is that when an endowment exists, it informs all students (past, current, and future) that this particular school has the financial resources to handle rough financial times – thus increasing the value of their degree.

Endowments for Finite Agents

For individuals, personal endowments have the ability to increase lifetime utility. Thus, the teaching of, and use of, personal endowments should increase to allow individuals to use this as a tool of utility maximization.

Works Cited

Ehrenberg, Ronald G. 2009. *Demystifying Endowments* [Electronic version]. New York, NY: TIAA-CREF.

Merton, Robert C. 1971. "Optimum Consumption and Portfolio Rules in a Continuous-Time Model." *Journal of Economic Theory* 3, 373-413.

Tobin, James. 1974. "What Is Permanent Endowment Income?" *American Economic Review* 64 (2), 427–432.

Appendix:

Assume a college graduate is 22 years old and has a starting salary of $50,000. If she works until she is 70, she will have a working life of 48 years. Also, assume they receive 3% raises per year (which is the national average in the United States).[3] Thus, in her last year of work she will be making $206,612.59.

Now that she is ready to retire, she is trying to figure out how much money she will need to do so. Given that she does not know her exact life expectancy, she decides an endowment is her best strategy because she cannot outlive the money. Financial planners say to expect your expenses to fall to 60-80% of your pre-retirement expenses (less commuting, travel during off-peak times, etc.). If she needs 70% of her pre-retirement income, she needs $144,628.82 per year, every year. She also needs to account for inflation, which averages 3.1% per year but has a real impact on consumers of 2% per year (due to the shift in consumption as prices rise). Thus,

$$FV = \frac{CF_{t+1}}{i_{t+1} - g} = \frac{\$144{,}628.82}{.05 - .02} = \$4{,}820{,}960.53$$

When the historical average risk-free rate is 5% and the needed growth rate is 2%, she needs an endowment of just over $4.8 million.[4] However, this is not needed until she is 70, so this needs to be discounted back to today using a risky rate of return, the historical average market return of 10%:

$$PV = \frac{FV}{(1 + i_t)^n} = \$49{,}691.80$$

[3] From the Social Security website: https://www.ssa.gov/oact/cola/awidevelop.html.

[4] Since the 1977 inception of the 30 year treasury note the average return on this note has been 6.8%. Even when dropping all months above 10%, the average is still well above 5% - at 5.9%. Although our current times have a low yield, the use of 5% for a risk-free return is accurate when using historical data.

She needs to save her first year's salary to endow her entire life throughout retirement. Although doing this in one year may not be feasible, this shows that her present value of future savings (i.e. forgone consumption) has to be equal to the value of her first year's salary.

On a utility comparison, we are then asking the question of forgoing one year's salary for an entirely endowed retirement. Hence the question again falls to the value of lost consumption in one year (U_1) to the gained utility throughout the entire endowed period (U_2).

This also ignores that fact that at N (when the endowment returns stop for the endowed person), there is still the principle of the endowment remaining which will lead to an increase in utility for someone else (either that person's heirs, to the government, or to a non-profit, possibly in the form of an endowment, for utility to continue to be received in perpetuity).