The Balancing Act: Valuing Human Capital to Offset Student Loan Debt
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Introduction

Rising student loan debt levels and default rates, coupled with a vigorous policy debate about access and the affordability of higher education, have made student loans front-page news. While this media spotlight is rather recent, student loans have long drawn the attention of student financial aid professionals, policy makers, parents, and the students themselves. In the 2011-12 academic year, federal student loans totaled almost $105 billion, down about 4.8 percent from the previous year, but up about 18 percent from the 2008-09 academic year. For the 2011-12 academic year, private loans were estimated to be about $6 billion, about the same as the previous year but down 40 percent from the 2008-09 academic year and down 70 percent from the peak of private lending in 2007-08 (Baum and Payea, 2012). Aggregate student loan debt has grown from about $200 billion in 1997 to estimates between $956 billion and $1 trillion in 2012 – an implicit growth rate of approximately 23 percent per year (Consumer Financial Protection Bureau, 2012; Haughwout, Lee, and van der Klaauw, 2012; Kantrowitcz, 2012). This growth happened during a time when the U.S. outstanding consumer debt declined overall from its peak in mid-2008.

At a more micro level, among students graduating with a bachelor's degree from four-year public institutions, 43 percent had no student loan debt. Of those with debt, the average amount borrowed was $23,800 (Baum and Payea, 2012). A concern is that some consumers – and the media – are asking "Is it worth it?" calling into question the value of investing in education. In a 2011 Pew survey, 57 percent of Americans said that the "higher education system in the United States fails to provide students with good value for the money." Even

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more, 75 percent said that "college is too expensive for most Americans to afford" (Pew Research Center, 2011). However, in the same survey, college graduates estimated that they earn about $20,000 more per year than their high-school graduate counterparts, an amount that is in line with Census estimates of $19,500 (U.S. Census Bureau, 2002 and 2005). Others cite to a lifetime earnings differential of $1 million between high school and college graduates (Neal et al., 2012).

Education, Balance Sheets, and Our Objective

While student loan debt appears on the liability side of the household balance sheet, there is no compensating value on the asset side for the additional earning power the debt has enabled. If a household's net worth is used as a metric for that household's financial capability and capacity for resilience, then accounting for human capital on the asset side of the balance sheet becomes critical for monitoring household financial stability and security. The goal of this study is to derive a measure of the present value of additional earning power from education beyond high school that can be added on the asset side of the household balance sheet. We use data from the March 2012 Current Population Survey (U.S. Census) to develop the "earning power/asset" measure and the Federal Reserve Board's 2010 Survey of Consumer Finances public data set to estimate balance sheet impacts.

Background and Previous Studies

While this paper is not an explicit exploration of returns to education, but rather an exploration of education as an asset in regards to human capital, it is important to reflect back on the seminal work from the fields of labor and education economics. The rate of return to education, estimated in numerous papers, has been examined as a single rate of return, as a rate of return that varies heterogeneously across demographic groups, and as a nonlinear or 'lumpy' return that accumulates around degrees and credentials, just to name a few variations.

Schultz (1961) noted that "Much of what we call consumption constitutes investment in human capital. … Earnings foregone by mature students attending school and by workers acquiring on-the-job training are equally clear examples. Yet nowhere do these enter into our national accounts." Becker (1962, 1981) explored human capital investment in the context of, and with the goal of, attempting to understand income inequality, both across society and within

the division of family labor. Like Shultz, Becker was interested in human capital development through job training as well as higher education.

The return on investment in education has been the topic of numerous studies. Some authors have focused on calculating rates of return (see Ashenfelter and Krueger, 1994; Blundell et al., 2000; Harmon, Oosterbeek, and Walker, 2003; Heckman, Lochner, and Todd, 2008; Rouse, 1999). Several of these studies estimate the increase in earnings from additional education, but these estimates vary widely, from a low of 10 percent to a high of 39 percent. Many of these studies point out the problems and pitfalls in addressing the issue of returns to education, including selectivity problems, adequately accounting for opportunity costs and foregone earnings, problems with omitted variables, the dynamic decision framework that individuals face while in training and college (the issue of attending versus completing a certification or degree), and changing majors and career paths.

Other research has focused on specific variables that impact returns. For example, Andersson (2009) found lower average rates of return for women than for men, all else equal. Exploring this field of study, Walker and Zhu (2011) found no differences in returns for women, but found differentials for men in the fields of law, economics, and management. Kambourov and Manovsk (2009) found that rate of return varied by occupational tenure, but not by tenure within a particular industry or with a particular employer. Similarly, work by Card (1999) showed that the effects of education are separable from the effects of experience on earnings. Using the National Longitudinal Surveys of Youth, Park (2011) found variation in wage profiles with people who changed jobs with an intervening period of education reinvestment. Henderson, Polachek and Wang (2009) found differences by race (blacks had higher returns to education than whites), immigration status (natives had higher rates of return than immigrants), and age (younger workers had higher rates of return than older workers). Goldin and Katz (2009) explored the role that technological change, *vis a vis* education, has played in evolving wage differentials.

And still others have explored cross-cultural and multi-national studies on differences in rates of return to human capital investment. Psacharopoulos and Patrinos (2004) found higher returns to education for low- and middle-income countries than for high-income developed countries. Trostell (2005) reported a highly non-linear relationship in returns to education in a

12-country study, with higher returns for early years of education (up to 12 years) but lower (although still positive) returns for education beyond then.

Quantifying the value of human capital has long been done by employers. While no one method or algorithm stands out for this process, Abowd, Lengermann, and McKinney (2002) use employee valuation to show the income gap between low-skilled and high-skilled workers. Their findings support the notion that it is the income gap that is increasing, not necessarily the total salary of college graduates. Although use of the same formulas to calculate the net present value of increases in human capital due to higher education is not directly applicable, their results provide insights on the notion of wage and salary analysis as a link to human capital.

In summary, we are interested in taking a closer look at the importance of education as a building block to an individual's human capital. Through the use of various 'case studies' we hope to show the relevance of viewing education as an 'asset' on an individual's balance sheet. This is particularly relevant today when the costs, or liabilities, of an education are being explored so heavily. With questions such as 'Is College Worth It?' (Pew, 2011) making headlines, having a deeper understanding of how the costs of education are balanced by the returns to human capital it important. Essentially, this exploration should begin to open the door to future research that 'marries' the assets gained from increased human capital with the debt incurred to obtain it.

Analysis and Results

Education and Income

It is important to acknowledge up front that the process for estimating the value of human capital as an asset is fraught with difficulties. As indicated above, there are issues of selectivity problems, adequately accounting for opportunity costs and foregone earnings, problems with omitted variables, the dynamic decision framework that individuals face while in training and college (the issue of attending versus completing a certification or degree), and changing majors and career paths. The human capital of a social work degree is very different from that of a petroleum engineering degree; the person who completes a bachelor-master-PhD sequence between ages 18 to 25 will have a different earnings pattern than one who completes a bachelor's degree, works a few years, then returns for the graduate degrees. In addition, length of worklife can vary substantially – manual laborers may not be able to work much beyond their mid-60s,

while professionals may be able to work well into their 70s. We have made some simplifying assumptions throughout the process. Further research can explore these assumptions, relax them, change them, or revise them.

First, we used the March 2012 Current Population Survey (CPS) data to estimate the effects of education on annual income at the individual (versus household) level. We used age, experience (age-squared), and a series of education and occupation/industry dummy variables in an OLS regression:

$$\text{Income} = a_0 + b_1(\text{age}) + b_2(\text{age}^2) + B_3\ (\text{education dummies}) + B_4\ (\text{occupation dummies})$$

where the dummies for education were some college with no degree or vocational training, associate's degree, bachelor's degree, master's degree, and doctorate or professional degree; high school degree or less was the excluded category. The dummies for occupation/industry were taken from the grouping in the CPS and included professional and related, service occupations, sales, office and administrative support, farming/fishing/forestry, construction and extraction, installation/maintenance/repair, production, transportation and material moving, and armed forces; managers and executives was the excluded category. These results are presented in Appendix Table 1.

Because returns to education and experience vary across the life cycle, we broke down this simple regression by age groups to allow for differences in both cohort (which can also proxy technology changes) and education:

$$\text{Income by age group} = a_0 + B_1(\text{education dummies}) + B_2\ (\text{occupation dummies})$$

As might be expected, the coefficients for some college/vocational training and associate's degrees peak in the 35-44 age category and are insignificant after age 65, while the coefficients from college degrees (bachelor, master, doctorate/professional) peak in the 45-54 age category and remain significant through the age 70+ category (Table 1).

Table 1. OLS Regression on Income by Age (standard errors in parens)

	Ages 16-24	Ages 25-34	Ages 35-44	Ages 45-54	Ages 55-64	Ages 65-69	Ages 70+
Constant	20018	39462	55159	64198	64078	58320	45199
	(19.105)	(43.926)	(44.059)	(51.565)	(36.153)	(14.944)	(13.818)
Education (High school or less as base)							
Some college (with no degree) or vocational training	2235	5961	7494	7265	4510	118	-2530
	(5.162)	(8.501)	(6.869)	(6.450)	(2.799)	(0.033)	(-0.729)
Associate's degree	6972	7451	10394	8020	5749	-474	-234
	(6.274)	(6.493)	(6.094)	(4.495)	(2.209)	(-0.072)	(-0.036)
Bachelor's degree	13168	17913	27097	27362	19142	11184	10578
	(17.364)	(23.360)	(22.930)	(22.321)	(10.906)	(2.781)	(2.825)
Master's degree	15202	25513	39650	43127	34666	24063	26502
	(5.674)	(22.179)	(25.435)	(25.691)	(15.174)	(4.911)	(5.385)
Doctorate or professional degree	35482	51998	84442	93068	89803	70949	41526
	(4.714)	(30.271)	(36.159)	(38.527)	(28.136)	(11.829)	(7.605)
Occupation/Industry (managers and executives as base)							
Professional and related	-7178	-10875	-22725	-29510	-21413	-25554	-6923
	(-6.208)	(-12.036)	(-18.175)	(-22.301)	(-11.475)	(-6.144)	(-1.674)
Service occupations	-12102	-21856	-34996	-42319	-43562	-42142	-31118
	(-11.296)	(-22.473)	(-24.539)	(-28.646)	(-20.438)	(-9.199)	(-7.587)
Sales	-12912	-13866	-12102	-20709	-24574	-22709	-24346
	(-11.694)	(-12.542)	(-7.469)	(-12.311)	(-10.212)	(-4.575)	(-5.494)
Office and administrative support	-10643	-17641	-31695	-37687	-34640	-35428	-24813
	(-9.422)	(-17.009)	(-20.839)	(-24.498)	(-16.123)	(-7.207)	(-5.564)
Farming/fishing/forestry	-11091	-20117	-31559	-42549	-43105	-41404	-28164
	(-6.040)	(-7.432)	(-7.187)	(-8.505)	(-5.892)	(-2.830)	(-2.025)
Construction and extraction	3034	-7778	-20408	-26488	-22435	-25819	-18950
	(2.137)	(-5.995)	(-10.607)	(-13.233)	(-7.197)	(-3.019)	(-2.428)

Installation/maintenance/repair	-2709	-4287	-16182	-21242	-21669	-27280	-18964
	(-1.693)	(-2.704)	(-6.962)	(-8.722)	(-6.086)	(-2.964)	(-2.125)
Production	-5958	-12834	-24827	-30831	-31411	-28498	-18911
	(-4.417)	(-9.678)	(-13.019)	(-16.284)	(-11.501)	(-4.208)	(-2.815)
Transportation and material moving	-9274	-12699	-22500	-30111	-31030	-34130	-23773
	(-7.331)	(-9.419)	(-11.388)	(-15.546)	(-11.031)	(-5.652)	(-4.366)
Armed forces	21522	-5317	1205	-16490	25532	19837	0
	(4.737)	(-0.743)	(0.067)	(-0.847)	(0.810)	(0.429)	(.)
Model statistics*							
N	11926	21134	23465	23079	14656	2539	1923
R^2							
F ratio							

* Model fit statistics will be added in future drafts

Projections of Lifetime Gains from Additional Earning Capacity

Next, we created simulations of worklife income flows based on these estimates and discounted the additional earnings to the present; in the process, we tested several different discount rates (see Table 2). In the simplest projection, we use the following assumptions:

For those with some college (no degree) or vocational training and those with an associate's degree, we assume they start work at age 18 and reap the benefits of their additional training starting at age 20. They work until they are age 67 (the full retirement age for persons born in 1960 or later).

For those with a bachelor's degree, we assume they start work at age 22 and work until they are age 70.

For those with a master's degree, we assume they start work at age 22, work for 2 years with a BS, then obtain their master's degree and work until age 70.

For those with a doctorate or professional degree, we assume they start work at age 22, work for 2 years with a BS, work for 2 years with an MS, then obtain their doctorate and work until age 70.

We assume a longer worklife for those with college degrees for several reasons: we continue to see positive returns to education in the regression for persons age 70 and over; labor force participation rates are higher for persons with college degrees (Bureau of Labor Statistics, 2012); and labor force participation rates for persons over age 65 are predicted to rise between now and 2020[2] (Toossi, 2012). It is important to note that we do not include the additions to retirement income that higher earnings and an extended worklife imply; this analysis could be expanded in the future to capture these added resources.

[2] The labor force participation rate (LFPR) for 65-69 year olds in 2010 was 31.5 and is projected to rise to 37.8 by 2020; the LFPR for 70-74 years olds in 2010 was 18.0, projected to rise to 22.8 in 2020; the LFPR for 75-79 year olds was 10.9 in 2010, and projected to rise to 15.2 in 2020.

Table 2. Present Value Projections of Gains from Additional Earning Capacity across Workspan at age 18 (point of comparison is persons with high school education or less)[3]

Education Level	Assumptions	Present Value of Projected Gains Relative to High School		
		Discount rate = 2%	Discount rate = 4%	Discount rate = 6%
Some college (no degree) for vocational training	Worklife is age 18-19 same as high school, then age 20-66 with earnings based on additional training (retire at age 67 with full Social Security)	$162,607	$106,187	$72,986
Associate's degree	Worklife is age 18-19 same as high school, then age 20-66 with earnings based on additional training (retire at age 67 with full Social Security)	$223,554	$151,386	$108,159
Bachelor's degree	Worklife is age 22-70	$649,576	$441,065	$317,170
Master's degree	Worklife is age 22-23 with Bachelor's degree, then age 24-70 with Master's degree	$997,227	$658,160	$461,585
Doctorate or professional degree	Worklife is age 22-23 with Bachelor's degree, then age 24-25 with Master's degree, then age 26-70 with doctorate/professional degree	$2,150,163	$1,372,445	$931,378

Household Net Worth

To the extent that these additional earnings are a reflection of human capital, we now have a technique to measure human capital, which in turn can added to the asset side of household balance sheets. For this section, we turned to the Federal Reserve Board's 2010 Survey of Consumer Finances (SCF, see Bricker et al., 2012 for additional information on the SCF). The SCF is normally a triennial interview survey of U.S. families sponsored by the Board of Governors of the Federal Reserve System with the cooperation of the U.S. Department of the Treasury. Since 1992, data for the SCF have been collected by NORC, a research organization at

[3] A sample calculation is included in Appendix Table 2; this is a live spreadsheet in which the reader can change the discount rate to obtain other simulations. The full set of spreadsheet worksheets is available from the authors.

the University of Chicago, roughly between May and December of each survey year. A main goal of the SCF is to collect data on household balance sheets.

The need to measure financial characteristics imposes special requirements on the sample design for the survey. The SCF is expected to provide reliable information both on attributes that are broadly distributed in the population (such as homeownership) and on those that are highly concentrated in a relatively small part of the population (such as closely held businesses). To address this requirement, the SCF employs a sample design, essentially unchanged since 1989, consisting of two parts: a standard geographically based random sample and a special oversample of relatively wealthy families. Weights are used to combine information from the two samples to make estimates for the full population. In the 2010 survey, 6,492 families were interviewed.

To explore the impact of additional earnings/human capital on net worth, we created several "case studies" for different education levels and different household types. We used the SCF to determine the benchmark range, mean, and median net worth for these different case studies. The mean and medians reported in Table 3 are based on weighted data; the number of unweighted observations is included to provide the reader with some sense of how robust these estimates are – those based on a smaller number are subject to higher variability. Because of the relatively low frequencies for those under age 25 (those with the most recent student loans), we show these results separately but also include them in the under age 35 group.

It is not surprising that households with only a high school education generally have the lowest median net worth values for their age categories – the one exception is in the age 65-69 category, which has fairly a small cell size and may be an anomaly. As expected, net worth increases with age and generally with education. By age 55-64, for example, households with a person with a master's degree have a median net worth of $1 million or more (again, the cell sizes are small in these cases).

Admittedly, our case studies are not exhaustive, but we see large ranges in net worth across all ages and education categories. Negative net worth is not just a feature of young households with college loans – it is present in every age category, including age 70 and over. Similarly, every age category has someone with $1 million or more in net worth. The data in Table 3 also point to the skewed distribution of net worth across the age/education categories;

Table 3. Benchmark Net Worth for Selected Case Studies
(grey numbers should be interpreted with caution, as there are fewer than 90 observations in these cells)

Case study description	Range		Mean	Median	Number of observations
	Minimum	Maximum			
Age less than 25					
Single with high school or less	-$73,650	$2,351,000	$34,158	$1,650	130
Single with associate's degree	-$14,200	$43,201	$9,803	$8,320	12
Single with BS degree	-$58,129	$87,300	$10,104	$5,800	17
Age less than 35					
Single with high school or less	-$222,090	$2,351,000	$26,791	$3,500	353
Single with associate's degree	-$30,650	$435,000	$40,767	$11,620	35
Single with BS degree	-$286,800	$3,611,360	$80,502	$17,400	117
Head of a married couple household where both have high school or less	-$222,090	$31,400,000	$28,909	$5,000	619
Head of a married couple household where head has an associates degree and spouse has high school or less	-$30,650	$429,500	$42,810	$11,680	52
Head of a married couple household where both have BS degrees	-$165,900	$8,372,000	$152,937	$39,200	66
Age 35-44					
married couple household where both have high school or less	-$252,070	$5,929,950	$63,618	$14,500	471
married couple household where head has an associates degree and spouse is high school or less	-$146,400	$656,700	$65,768	$36,000	57
married couple household where both have BS degrees	-$67,050	$432,000,000	$769,659	$257,800	93
married couple household where head has a MS/MA/MBA and spouse has a BS	-$37,790	$25,700,000	$819,976	$233,750	33
Age 45-54					
married couple household where both have high school or less	$6,932,400	$106,000,000	$184,304	$39,410	567
married couple household where head has an associates degree and spouse is high school or less	-$24,680	$13,200,000	$247,686	$96,500	52

married couple household where both have BS degrees	-$22,630	$581,000,000	$1,105,496	$566,250	120
married couple household where head has a MS/MA/MBA and spouse has a BS	-$35,700	$482,000,000	$1,773,615	$602,240	55
Age 55-64					
married couple household where both have high school or less	-$215,130	$298,000,000	$277,513	$72,700	475
married couple household where head has an associates degree and spouse is high school or less	-$78,190	$20,900,000	$355,846	$201,170	59
married couple household where both have BS degrees	-$294,200	$270,000,000	$2,024,896	$718,000	98
married couple household where head has a MS/MA/MBA and spouse has a BS	-$66,550	$573,000,000	$2,884,670	$1,371,140	48
Age 65-69					
married couple household where both have high school or less	-$53,930	$325,000,000	$321,474	$127,510	176
married couple household where head has an associates degree and spouse is high school or less	-$9,990	$2,703,600	$300,457	$79,200	12
married couple household where both have BS degrees	+$43,600	$47,900,000	$1,317,627	$418,200	22
married couple household where head has a MS/MA/MBA and spouse has a BS	+$47,510	$102,000,000	$2,335,530	$1,056,800	18
Age 70 and over					
married couple household where both have high school or less	-$114,679	$922,000,000	$302,663	$125,450	412
married couple household where head has an associates degree and spouse is high school or less	+$10	$16,700,000	$698,284	$342,200	20
married couple household where both have BS degrees	+$97,400	$588,000,000	$3,190,927	$844,190	29
married couple household where head has a MS/MA/MBA and spouse has a BS	+$140,200	$716,000,000	$5,726,786	$2,134,700	23

the differences between the mean and median values (especially for those cases with more than 90 observations) provides some general evidence of this skewing.

Adding Human Capital to the Balance Sheet

We assume that all projected income is an asset; future research could relax this assumption and provide for some proportioned consumption out of the additional earnings. However, this assumption is not too much of a stretch – s a household ages it realizes more of the gains from human capital and higher wages are transformed into debts paid down and the additional financial and real assets that show up on household balance sheets.

Thus, in Table 4, we see that adding in the value of human capital (using a 2 percent discount rate) to the balance sheet of an under 35-year old with an bachelor's degree increases net worth 39-fold, but the impacts diminish over time. For those with bachelor's degrees, the effect is 4-fold in the age 35-44 category, about 2-fold by ages 45-54, and about 1.3-fold by ages 55-64. By age 70, the value added of a bachelor's degree is virtually zero – the human capital has been realized across the lifespan. Higher degrees (masters, doctorate, and professional degrees) may have higher and longer payback periods, but it is difficult to provide robust estimates given the small numbers of observations. We chose to use a 2 percent discount rate; using higher rates diminishes the impact of adding human capital to the balance sheet, although the impact is still positive.

We chose to add the present value projections of gains from additional earning capacity to the median net worth amounts to provide a ball-park estimate of the impacts. Adding these estimates to the mean net worth figures is another strategy, although it may exacerbate the skewing of the data. At the individual level for households with negative net worth (for example, the under 35-year old with a Bachelor's degree and a net worth of negative $286,800 in Table 3), the effect would be to turn a negative net worth into a positive one. However, as returns diminish over time, the value of human capital may not be able to completely overcome negative net worth (see in Table 3, for example, the case of the age 55-64 household where both have bachelor's degrees but they have a net worth of negative $294,200; human capital projections in this case are valued at $212, 386 – not enough to overcome the deficit in this household).

Table 4. Effects of Adding Human Capital as an Asset to the Balance sheet
(grey numbers should be interpreted with caution, as there are fewer than 90 observations in these cells)

Case study description	Mean net worth	Median net worth	Number of observa-tions	Present value, additional earning capacity	Revised net worth estimate at the median	Change in net worth
Age less than 25						
Single with high school or less (baseline)	$34,158	$1,650	130	0	$1,650	0%
Single with associate's degree	$9,803	$8,320	12	$223,554	$231,874	2,786%
Single with BS degree	$10,104	$5,800	17	$649,567	$655,367	11,299%
Age less than 35						
Single with high school or less (baseline)	$26,791	$3,500	353	0	$3,500	0%
Single with associate's degree	$40,767	$11,620	35	$223,554	$235,174	2,023%
Single with BS degree	$80,502	$17,400	117	$649,567	$666,967	3,933%
Head of a married couple household where both have high school or less (baseline)	$28,909	$5,000	619	0	$5,000	0%
Head of a married couple household where head has an associates degree and spouse has high school or less	$42,810	$11,680	52	$223,554	$235,234	2,013%
Head of a married couple household where both have BS degrees	$152,937	$39,200	66	$1,299,134	$1,338,334	3,414%
Age 35-44						
married couple household where both have high school or less (baseline)	$63,618	$14,500	471	0	$14,500	0%
married couple household where the head has an associates degree and the spouse is high school or less	$65,768	$36,000	57	$133,702	$169,702	471%
married couple household where both have BS degrees	$769,659	$257,800	93	$919,954	$1,177,754	456%
married couple household where head has a MS/MA/MBA and spouse has a BS	$819,976	$233,750	33	$1,201,408	$1,435,158	613%
Age 45-54						
married couple household where both have high school or less (baseline)	$184,304	$39,410	567	0	$39,410	0%

married couple household where the head has an associates degree and the spouse is high school or less	$247,686	$96,500	52	$67,024	$163,523	169%
married couple household where both have BS degrees	$1,105,496	$566,250	120	$543,640	$1,109,890	196%
married couple household where head has a MS/MA/MBA and spouse has a BS	$1,773,615	$602,240	55	$737,928	$1,340,168	122%
Age 55-64						
married couple household where both have high school or less (baseline)	$277,513	$72,700	475	0	$72,700	0%
married couple household where the head has an associates degree and the spouse is high school or less	$355,846	$201,170	59	$24,819	$225,989	112%
married couple household where both have BS degrees	$2,024,896	$718,000	98	$212, 386	$930,386	129%
married couple household where head has a MS/MA/MBA and spouse has a BS	$2,884,670	$1,371,140	48	$326,634	$1,697,774	123%
Age 65-69						
married couple household where both have high school or less (baseline)	$321,474	$127,510	176	0	$127,510	0%
married couple household where the head has an associates degree and the spouse is high school or less	$300,457	$79,200	12	0	$79,200	0%
married couple household where both have BS degrees	$1,317,627	$418,200	22	$43,724	$461,924	110%
married couple household where head has a MS/MA/MBA and spouse has a BS	$2,335,530	$1,056,800	18	$80,309	$1,137,109	107%
Age 70 and over						
married couple household where both have high school or less	$302,663	$125,450	412	0	$125,450	0%
married couple household where the head has an associates degree and the spouse is high school or less	$698,284	$342,200	20	0	$342,200	0%
married couple household where both have BS degrees	$3,190,927	$844,190	29	$8,016	$852,206	101%
married couple household where head has a MS/MA/MBA and spouse has a BS	$5,726,786	$2,134,700	23	$14,051	$2,148,751	101%

On the other hand, for those with already high net worth, the value-added of increased earnings is quite limited. For example, the case of the person under 35 with a $3.6 million net worth, the impact of adding $649,500 in future earnings is small (about a 17 percent increase in net worth).

Discussion

Arithmetically, the present value of earnings capacity will always be positive and thus will always increase net worth when added into the balance sheet, so as a number-crunching exercise this is not a surprise. What may be of interest is the relative magnitude of the value of earnings capacity and the degree to which this can offset negative net worth values. The impacts are clearly larger for younger households than for older ones.

From a public policy perspective, there are several implications. One has to do with the importance of investing in education as an asset. In an era when state and federal funding of public university systems is diminishing, the public goods aspect of higher education cannot be overlooked (National Science Board, 2012). A second, and related, implication is that of maintaining an affordable, quality student loan program. Loans provide important leverage for people who want to invest in their human capital and can be an appropriate tool to help people achieve certifications and degrees. To the extent that education and training are investments, and investments may require advice, appropriate and quality advice on choice of program, school, and funding options is also needed. Another policy issue is how to encourage individuals to seek education and training opportunities and invest in themselves. Efforts to promote children's savings accounts to stimulate planning for higher education hold some promise here (see Zhan and Sherraden, 2003 for one example).

For financial markets, this study may shed some light on underwriting criteria and how to assess ability to pay. While the specific numbers may vary (see the sensitivity analysis in Table 2), the general order of magnitude of the valuation of human capital may provide some insights. As the model is further refined in the future, the ability to account for human capital will improve.

Limitations

As noted throughout this paper, the process for estimating the value of human capital as an asset is fraught with difficulties. First, these calculations are based on the income regressions in Table 1, and while we controlled for industry/occupation and age in these regressions, in the future we would want to control for other correlates of income – for example, race/ethnicity, gender, and possibly region.

Second, we acknowledge that we have made some heroic assumptions about discount rates, earnings profiles, timing of education, and length of worklife to name a few. Furthermore, we have not accounted for additions to retirement assets that higher earnings and an extended worklife imply. These are two areas were analysis could be expanded in the future to estimate and capture the potentially added resources.

Third, we only explored a select set of case studies to assess the impact of valuing human capital on the balance sheet. We have not attempted to apply the valuation formula to a more general population data set or to estimate aggregate impacts.

Nonetheless, we believe this exercise in generating human capital estimates can be helpful to individuals, policy makers, and financial markets in grappling with important investment decisions. And we hope that future work on these estimations leads to refinements that will make quantification of these human capital assets more meaningful and more useful.

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Appendix

Appendix Table 1. OLS Regression on Income

Variable	Coefficient	Standard error
Constant	-17758	-11.297
Age	3144	44.265
Age^2	-31	-38.489
Education (high school or less as base)		
Some college (with no degree) or vocational training	5026	11.138
Associate's degree	6963	8.775
Bachelor's degree	21669	40.600
Master's degree	35173	46.930
Doctorate or professional degree	79025	72.915
Occupation/Industry (managers and executives as base)		
Professional and related	-21808	-36.486
Service occupations	-33439	-51.804
Sales	-19967	-27.708
Office and administrative support	-30063	-43.856
Farming/fishing/forestry	-31314	-16.567
Construction and extraction	-19403	-21.451
Installation/maintenance/repair	-16473	-15.167
Production	-25005	-28.780
Transportation and material moving	-24552	-28.171
Armed forces	-31043	-11.297
Model statistics*		
N	98922	
R^2		
F ratio		

*Model fit statistics will be added in future drafts

Appendix Table 2. Sample worksheet of present value calculations (click on spreadsheet to open for calculations)

Present value calculations -- regressions by age cohort

interest rate ("I" in calculati **0.02**

some college (no degree) or vocational training

worklife is age 18-67, 49 years

Present Value = **162,607.07**

age assumption	year ("t" in calculation)	amount, based on regression coefficients	1+i	(1+i)^t	amt/(i+i)^t	cumulative
18	1	0	1.02	1.0200	0.00	0.00
19	2	0	1.02	1.0404	0.00	0.00
20	3	2235	1.02	1.0612	2106.09	2106.09
21	4	2235	1.02	1.0824	2064.79	4170.88
22	5	2235	1.02	1.1041	2024.31	6195.19
23	6	2235	1.02	1.1262	1984.62	8179.81
24	7	2235	1.02	1.1487	1945.70	10125.51
25	8	5961	1.02	1.1717	5087.66	15213.17
26	9	5961	1.02	1.1951	4987.90	20201.07
27	10	5961	1.02	1.2190	4890.10	25091.16
28	11	5961	1.02	1.2434	4794.21	29885.37
29	12	5961	1.02	1.2682	4700.21	34585.58
30	13	5961	1.02	1.2936	4608.05	39193.63
31	14	5961	1.02	1.3195	4517.69	43711.32
32	15	5961	1.02	1.3459	4429.11	48140.43
33	16	5961	1.02	1.3728	4342.27	52482.70
34	17	5961	1.02	1.4002	4257.12	56739.82
35	18	7494	1.02	1.4282	5246.99	61986.82
36	19	7494	1.02	1.4568	5144.11	67130.93
37	20	7494	1.02	1.4859	5043.25	72174.17
38	21	7494	1.02	1.5157	4944.36	77118.53
39	22	7494	1.02	1.5460	4847.41	81965.95
40	23	7494	1.02	1.5769	4752.36	86718.31
41	24	7494	1.02	1.6084	4659.18	91377.49
42	25	7494	1.02	1.6406	4567.82	95945.32
43	26	7494	1.02	1.6734	4478.26	100423.57
44	27	7494	1.02	1.7069	4390.45	104814.03
45	28	7265	1.02	1.7410	4172.83	108986.86
46	29	7265	1.02	1.7758	4091.01	113077.87
47	30	7265	1.02	1.8114	4010.80	117088.66