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1

Is College Worth the Cost?

Appendix Skills: Arithmetic

OVERVIEW

We first react to the question, gauging our emotional response and recording the various ways it can be interpreted. After settling on an economic analysis, we identify the data we need, gather them, and compare college versus no college. In brief, we have the following steps:[1]

1 *Frame the question: here we decide to decide it on financial grounds, noting how this may be insufficient for many purposes.*
2 *Identify the costs and benefits of college, i.e. tuition and fees versus a good future income. Do the same for nongraduates.*
3 *Research the expenses and typical salaries of college graduates and nongraduates; discuss reliability of sources and limitations of the data we find.*
4 *Add up lifetime benefits of college versus no college, explicitly cataloging assumptions needed to use the information we could find. (One never has perfect data.)*
5 *We find a large lifetime benefit of college versus no college, leading us confidently to answer the question in the affirmative. We note that we have not decided the question of private college versus state school.*

Framing the Question

Gut Reaction

Is college worth it? Most families face this question explicitly or implicitly. What's your gut reaction?

> *Is college worth it?*
>
> *Think of your response and jot it down.*

Like many of the questions in this book, the topic is an emotional one. It may be difficult to give a clear-headed analysis after you and your family have been anguishing over the issue for years. Maybe you have been pressured to go to college

[1] The section headings in this chapter correspond to the template described in the introduction.

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so that you can earn a decent living. Maybe your grandmother who takes care of you has been struggling lately, and you don't want to burden her with the tremendous expense. Maybe your friend went to a public university and his mother gave him a car with the money she saved versus private school. Maybe some of your friends aren't going to college, and just the thought of being away from them tugs at your heartstrings. Maybe your father expects you to attend his alma mater. Maybe your sister didn't go to college and she's doing fine – or maybe she struggled mightily.

Usually, some combination of these and other questions makes the college decision fraught with emotion. We can see that these emotions may fly in all different directions. That's okay; we're human – but we should be mindful not to let our opinions drive the analysis. For example, if you are taking this course in college, you have already made a choice and may be tempted to tip the scales in favor of your decision. Being aware of our emotions and potential biases will help insulate us from being swayed by them.

Clarifying the Question

Maybe you have no interest in money but simply love poetry. For you, it's not really a question of economics – the emotional "cost" of not studying poetry in college would be enormous.

To be concrete, let's decide that we are talking about the *financial* cost of college. This leaves open the question of *which* college. It becomes clear that there are too many colleges to answer the question specifically for each individual. We could do a separate analysis for each college and take some kind of average, or we could do a case study – a single, representative analysis for one particular college – then repeat it with different colleges/numbers as needed. Since this text emerged from a course designed for students at Northwestern University, we will select that college (in the year 2015) for our case study, clarifying the question to mean

Financially speaking, is it worth it to attend Northwestern University in 2015?

(Students from other schools will want to consider their own institutions instead of Northwestern.) This doesn't nail down the question completely – worth it for whom? Circumstances are different for different students, and not all have the same college costs. For example, some receive scholarships or grants.

We will encounter further questions along the way, but we now have a more clear conception of the question.

Remark 1.1 In fact, the driving question of our chapter lies at the heart of the field of *microeconomics*: an individual is presented with a choice and must weigh the different options so as to choose the "best" one. What is best will vary from person to person. Each choice also presents an *opportunity cost*, meaning the value of the best alternative: if you go to the movies on Friday night, it may be great fun, but you'll miss out on going anywhere else, e.g., to the symphony. ▲

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Envisioning an Answer

Now that we know the question, do we have an equally clear conception of the answer? Are we looking for a yes/no response, an up/down vote on the decision to matriculate? Or are we looking for an estimation of the net cost or benefit of attending Northwestern? Either way, we'll have to run the numbers, arrive at a figure, and then answer the question, so let's say that we'll go after the net cost/benefit of attending NU.

Now it is clear that if you live in the wilderness for four years versus paying hundreds of thousands of dollars for college, you will emerge in better financial shape after your four years of soul searching off the grid than a college grad who has plunked down many thousands in tuition – even if you do incur some expenses. However, the expectation is that a college education will land you a decent job that will pay off *down the road*. So we probably want to give an answer that tallies the costs versus benefits of attending Northwestern over the course of your lifetime.

Specifically, we will answer the question by giving a number representing the lifetime benefit, in dollars, of attending Northwestern. The number will be derived by adding up the benefits (such as the extra income conferred by a high-paying job) and subtracting expenses (e.g., tuition). Note that if benefits minus costs is a positive number, then college is worth the price.[2] But that's not all; we will compare with a similar analysis for the no-college option.

A cost/benefit analysis is a basic component of economic theory. In a sense, all decisions can be approached from this viewpoint: we compare the expected net gains of the different choices.

Building the Model

What Factors Will We Explore?

With this clearer view of the problem and the kind of response we wish to generate, let's start the brainstorming session. What factors will our analysis include?

What comes to mind?

Think of your response and jot it down.

What else?

Think of your response and jot it down.

Think some more. Reading my list is too passive. Creation is *active*.

Write at least one more thing.

Here's my list, with the symbols + indicating revenues, − indicating costs, and ± for unknown.

[2] We could tabulate costs minus benefits, but then a negative value would mean an affirmative answer to the question, and that just seemed wrong.

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− Tuition
− Room and board
− Books
+ Income, e.g., salary from job
− Lost income by not working throughout college ("opportunity cost")
+ Networking opportunities?
− Other hidden costs
± Overlooked/unknown factors

Your list and mine might differ. It's hard to guarantee that we've covered all the bases.

Data

Okay, now we need to do some research and find out the actual cost of tuition, room and board, etc. This will take some time: we will have a few rabbit holes to explore. This is our first chapter, so we need to give due consideration to each issue that arises.

In many cases, this is the hardest part of the process. Sometimes data are a proprietary secret (for instance, how much does Quaker pay each year to settle lawsuits from people who have chipped their teeth on hard raisins in granola cereals?) or simply too hard to find out (how many people does the government of North Korea employ to guard their Dear Leader?) or not available at all (how many hours each day did the average Aztec warrior spend on grooming?).

We will browse various sources for data, accepting only figures that are deemed *reliable, representative, and unbiased*. That is, we need our facts to be accurate, to pertain to our question, and to be free of prejudice.

This chapter would not be complete if I did not do this data gathering for you, but in the real world (or in the Exercises and Projects sections), you will be on your own. Students reading this chapter who attend other schools should try to find the analogous information for their own institutions (see Exercise 2).

In this case, a short Internet search reveals Northwestern's admissions website,[3] which details the costs for the 2015–16 academic year. The site reveals some of the other hidden costs that we didn't think of above. Still, our preparation has given us a good guide. Here is what the Northwestern site tallies:

- Tuition: $48,624
- Room and Board: $14,936
- Books and Supplies: $1,620
- Fees (health $200, student government $174, athletic $49, loan fee $35): $458
- Personal Expenses: $2,457
- Transportation: Varies
- Total Cost: $68,095

[3] The figures for 2015–16 are no longer available online. Figures as of this writing are available at http://admissions.northwestern.edu/tuition-aid/index.html.

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Should we believe these values? Certainly, there is variation among students. For example, according to the website, commuting students have an estimated total cost about $12,000 less per year. So here we must clarify what kind of student we're talking about. Since most students who attend Northwestern are not commuters, we will not assume that the student is a commuter. Alternatively, we could have made a more complicated model, taking into account different contingencies: commuter or not, history major or engineer, pay tuition in full or take out loans.

Should we trust the numbers that Northwestern provides? As far as I know, colleges have not been known to misreport their own expense data. Some colleges – a handful – distort admissions data to *U.S. News and World Report*, which compiles a yearly ranking of schools. This does not appear to be commonplace, and the skewed figures involved were not as straightforward as standard fees. We will therefore consider these self-reported numbers as reliable.

With costs wrapped up, we turn to benefits. This will be trickier. Let's collect some data.

- Income. Note that attending college doesn't mean graduating, and of course not all graduates get a job, let alone earn equal pay. So we will have to take some sort of average value to build a simple model.[4]

  Here are some data one can find by following one's nose. The 2013 Salary Survey of the National Association of Colleges and Employers reports that the average starting salary of a four-year college graduate was $45,000. (*Forbes* carried the story.) So that's one number – but all colleges are different, and we are interested in Northwestern. Let's look some more.

  The company PayScale reports on its website that early career graduates of Northwestern University earn about $54,000 per year. These data are compiled from NU alumni who took the survey. Are they reliable? Maybe the high earners are more likely to want to take such a survey. With no way of knowing, we should worry that the respondents might not represent NU grads in general. This is what is known as *selection bias*: members of your sample may be predisposed toward a conclusion, such as if you go to Wisconsin to ask people whether or not they like brats. Furthermore, the whole PayScale survey involved 664 people, of whom 272 were early career (less than five years' experience). We should ask, *Is this a large enough sample for reliable data?*[5]

  A third source, the National Center for Education Statistics (the NCES is a government entity dedicated to collecting and analyzing data related to education), reported a median income of $48,500 for college graduates aged 25–34 in 2015.[6] This seems like good data from a reliable source, but the data are not special to Northwestern. In short, the (good) data we have are not quite the data we want,

[4] Different notions of averaging are discussed in Appendices 8.1 and 8.2.
[5] At this early stage of the course, we will not explore the issue of "small n" any further – see, e.g., Appendix 8.6.
[6] The site shows data for the current year: https://nces.ed.gov/fastfacts/display.asp?id=77.

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but at least we have a few numbers from which to build a model – and the numbers are fairly close to one another.

We will wind up taking the NCES figure, since it is a government source (reliable, unbiased) and still in line with the other sources, which may be more specific.

- Lost income/opportunity cost. *Opportunity cost* refers to money not earned by choosing an alternate path. By going to college rather than working (if working were the alternative), a person fails to earn some amount of money, and this money can be interpreted as a further "cost" of attending college relative to another option. We will use the data collected here to evaluate the net benefit of not attending college, so that we may compare.

  So how much would you have earned had you not attended college? The naïve thing to do would be to look up the average salary of US workers and use that figure. But we must be more careful. We're not talking about a mid-career lawyer, we're talking about a recent high school graduate, so we must try to narrow our search to reflect the correct demographic.

  How do we search? No doubt any reader will just begin by Internet searches with the obvious keywords. This will pull up all sorts of sites making all sorts of claims, and way too many pop-up ads (a sign: commercial interests might mean a biased party). Beware: most of these sites did not collect the data they are reporting. However, even the only marginally responsible ones will report the source of the data. Click through to the source: you may find that many different media outlets/blogs/sites link to a common origin, and this is likely to be more reliable. ("All roads lead to Rome.") In this case, after a little browsing, I came upon the US Bureau of Labor Statistics (www.bls.gov), a neutral and reliable entity dedicated to gathering just the information I was seeking. At the site, I searched for "salary of high school graduates" and found a 2014 chart titled "Earnings and Unemployment Rates by Educational Attainment."[7] The data gave me more than I bargained for, but under "high school diploma" are a couple of key figures: high school graduates have median weekly earnings of $668. A quick conversion (see Appendix 5) yields the equivalent annual income:

$$\$668/\text{wk} = \$668/\text{wk} \times 50\text{wk/yr} = \$33{,}400/\text{yr},$$

  where we have assumed 50 working weeks in a year. This chart also reported that high school graduate workers have an unemployment rate of 6.0%, while only 3.5% of workers with a bachelor's degree are unemployed. There was also a note:– "data are for persons age 25 and over" – as well as a link to another valued source, the US Census Bureau (www.census.gov). To get a better figure, at BLS, I searched for "recent high school graduates" and found a useful chart about how many of them had entered the workforce (but not their salaries). I found the following paragraph:

[7] www.bls.gov/emp/ep_chart_001.htm.

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> Recent high school graduates not enrolled in college in the fall of 2013 were more likely than enrolled graduates to be in the labor force (74.2 percent compared with 34.1 percent). The unemployment rate for high school graduates not enrolled in college was 30.9 percent, compared with 20.2 percent for graduates enrolled in college.

These unemployment figures mean that any assumption of full employment will introduce errors, in particular skewing the non–college graduates more.

According to the National Center for Education Statistics again, the median annual income of full-time workers age 25–34 with only a high school degree was $30,000 in 2013. This is quite close to the BLS number, which we found to be $33,400/yr. It is possibly lower due to the fact that the NCES only considered workers aged 25–34, but there is no need to speculate at this stage.

Happy I had enough for now, I bookmarked the site and moved to the next task.

- Income through networking. Do college graduates make money through connections they made while in college? Do these connections translate into more income compared to the connections that non–college graduates make in their lives? Such connections are often pejoratively called the "Old Boy Network," and rightfully so. But let's face it, we all have friends, and most of us listen to them, no matter if we're old, or boys, or stand to profit from their help. We needn't moralize here (though we should note any biases we carry), as we're more interested in the question of how we can measure the effects of networking.

  If I search for "measuring the benefits of the old boys network," an academic article from 2011 comes up first.[8] It's about the pay gap (about 30%) between male and female executives' salaries. According to the first page (I didn't pursue it too deeply), "We find that executive men's salaries are an increasing function of the number of such individuals they have encountered in the past while women's are not. Controlling for this discrepancy, there is no longer a significant gender gap among executives." Is this interesting? Yes! First of all, women get paid less than men, an important fact that needs to be explored and not dismissed. Second of all, there is indication that the difference could be attributed to networking differences between the sexes – so this, too, must be understood. Questions of access, opportunity and fairness arise and deserve careful investigation – and these would make an excellent project for this course!

  That said, we should return to the question at hand.[9] Is this new information useful for us now? Maybe. It does tell of an impact of networking on pay, but not between high school versus college graduates. I also searched for "benefits old boys network on income" and found a paper measuring the differential benefits

[8] The Old Boy Network: Gender differences in the impact of social networks on remuneration in top executive jobs, by Marie Lalanne and Paul Seabright, http://idei.fr/doc/wp/2011/gend_diff_top_executives.pdf.

[9] Or not. Maybe your academic explorations unearth a "drop-everything-now" discovery and you change the focus of your research. But we can't write a book that way!

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between white male networks and those among females or minority-member networks.[10] These papers suggest there is an effect of networking, but don't lead us any closer to measuring that effect, and don't tell us whether it favors high school graduates or college graduates. Unfortunately, we simply don't have data relevant to our question and will have to punt on this point for now.

Remark 1.2 When I went to my college reunion, I was quite surprised (based on cars, clothes, size of the class gift, etc.) at how much money everyone must have had. I've heard that wealth begets wealth, and it didn't seem that such opulence could be attributed entirely to the benefits of college. It may have come from other connections: family ties, friends in high places, etc. But despite our hunches, we cannot proceed without good data. ▲

- Other? It "feels" odd that the only financial benefits we have identified for not going to college are just saving money and getting an early start at work. What about all those Internet billionaires who dropped out? Is their only advantage that they started up their companies that much earlier? (That would fall under opportunity cost.) What about the environment of geniuses that they found in Silicon Valley? (That would fall under networking benefits, though we decided above that we did not know how to quantify this.) What about the freedom to roam and explore in thought and deed? To be intellectually free and not bound by traditional college compartmentalization? Are nongraduates *better* equipped? Maybe all of this is true – and if it is, I hope non–college students are also reading this book! – but we must hope that these benefits, if they exist, are measured in the income of non–college graduates as tracked by the Bureau of Labor Statistics. If they are somehow "dormant" or "intangible" benefits, we will not be considering them here. That's the decision we made when we decided how to interpret our central question.

  Still, there is always the chance that we may have missed something. We'll have to listen to the critics after publishing our results.

There are other data that we may need to collect down the road, but already we know that we plan on adding up the *lifetime* cost or benefit of college, so we'll have to figure out what a lifetime of work means. We won't assume that we work up until our life's end, but it will be useful to know what the life expectancy is to estimate our working life-span. I looked on Wikipedia and found a few lists of countries and life expectancies but wanted a better source, so I clicked through and found the CIA World Factbook,[11] which stated that the life expectancy in the US is about 79.5 years, so we might want to plan for retirement based on that age.

Of course, retirement age varies from person to person, and there are laws that factor into the decision. Social Security acts as a federal pension program, and if

[10] Steve McDonald, *What's in the "old boys" network? Accessing social capital in gendered and racialized networks,* Social Networks 33 (2011) 317–30, www.academia.edu/13356204/Whats_in_the_old_boys_network_Accessing_social_capital_in_gendered_and_racialized_networks.

[11] www.cia.gov/library/publications/the-world-factbook/rankorder/2102rank.html.

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you were born after 1960, you can collect retirement income without penalty from age 67.[12] Researchers have found that the average retirement age is 62 for women and 64 for men.[13] Will it still be 62 when today's female college graduates retire? Who knows? The average retirement age is rising, and there is pressure to raise the age at which one can collect Social Security so the coffers don't go empty. Here we will *assume* that the average retirement age when today's college students become more senior will be 67 years.

These rules and programs, and people's behavior, may change by the time someone entering college now is ready for retirement, but the best we can do is plan based on what we see today – so let us assume that retirement begins at age 67.

We will also have to say something about the age of the student. According to Northwestern's website, 86% of students graduate in four years and 92% graduate in five years. Note this represents a small but appreciable chance that a student won't graduate. Dropping out will lower your expenses, but you won't have the benefit of a graduate's higher salary. There were no data about age of students, so we will simply assume the student begins after high school at age 18. Of course, if you are building your own model, you may tailor all the numbers, using your own age and the expected number of years you plan to be in school. We will assume that students going to college will graduate, recognizing that another assumption introduces another source of error.

Now we can decide what to call a lifetime of working. If most college graduates graduate at age 22 and work until they retire at age 67, then a lifetime of postcollege work is 45 years – or 49 years for someone who forgoes four years of college.

Assumptions

We are almost in a position to construct a model of our answers. A naïve answer would just add up benefits and subtract costs, but we have realized it's not so simple. We must make some assumptions about the person attending college (a noncommuting student, we have decided) and whether we want to use the data about "average" salary or narrow our focus to a more specific demographic. So if we are a female student, should we focus on earnings among female high school graduates, for example?

We don't yet know how much of the information we have gathered will be used in our model, but for clarity, we record a concrete list of assumptions.

- We will use the Northwestern numbers for college expenses.
- For the salary of recent Northwestern graduates, we will take the data from NCES and assume a $48,500 starting salary. This is clearly a rough guess, since it does not represent any added benefit of going to Northwestern rather than a different school. However, it is within roughly 5% of the other two numbers we found (the

[12] www.ssa.gov/planners/retire/agereduction.html.
[13] Alicia Munnell, *What is the average retirement age?*, http://crr.bc.edu/wp-content/uploads/2011/08/IB_11-11-508.pdf and *The average retirement age – an update*, http://crr.bc.edu/wp-content/uploads/2015/03/IB_15-4_508_rev.pdf.

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higher of which we suspected to be an overestimate), so we can expect that this estimate introduces a margin of error into our result of $\pm 5\%$.

- We will use the NCES data for income of recent high school graduates and the BLS data on unemployment rates.
- We will assume 45 years of work for a college graduate and 49 years for one who does not attend college.
- We will use the Northwestern numbers concerning degree times and degree completion rates.

Constructing the Model

Okay, now how are we going to add things up?

We have the cost of college, but we know that if we can't pay the cost up front, then we'll have to take out a loan – and interest on that loan will be a hidden cost. (We will explore loans and interest in depth in Chapter 3.)

Adding up the salary is much harder, as it changes over a person's lifetime, and one simple figure probably won't do. A rough guess may be good for a blog post, while a precise estimate could be the content of a PhD thesis. We're not aiming for a PhD (yet!), so we'll be content with something in between, starting with a basic calculation.

A First Approximation

Let us run the numbers on a simple model. We will discuss improvements shortly afterward.

For college graduates, we can simply multiply our assumed income of \$48,500 per year times the number of years of working after college, assumed 45. Simple multiplication then gives a total earnings of \$2.18 million. Four years of college at Northwestern, we decided, costs $4 \times \$68{,}095$, or about \$272,000.[14] Subtracting the costs from the revenue gives a lifetime college benefit of $\$2{,}180{,}000 - \$272{,}000 \approx$ \$1.9 million.

For earnings by high school graduates, recall the NCES datum of \$30,000/yr. Someone who enters the workforce at age 18 and works for 49 years will then earn \$1.47 million.

So college graduates come out ahead by about \$1.9 million, while high school graduates come out ahead by \$1.5 million. This puts the value of a college education at about $\$0.4\,\text{M} = \$400{,}000$.

Remark 1.3 Ballpark it! Even with little or no research, we probably could have crudely estimated that college costs, say, \$250,000, and that graduates earn \$50,000

[14] In Appendix 5.3 we discuss how to decide how many digits to keep. Giving a number with the precision of \$68,095 when we have already acknowledged that this can be off by quite a bit is silly. Or, even if I know some number precisely, when I add it to another that I only know vaguely, I can't know the sum precisely. So we keep only a set number of significant digits. Put simply, we round.

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