

Human Capital 1

- Stylized Facts
- The present value of schooling investment
 - Is college worth it?
- Two-period model: borrowing constraints

Introduction

- We study how wages differ because of differences in the characteristics of workers.
- Workers differ in their stock of productive skills and technical knowledge: *human capital*.
- Differences in the stock of human capital arise because of differences in *investment* in human capital.
 - Like any type of investment, investment in human capital involves a cost today, and benefits that will be reaped in the future.
- This chapter: why are there differences in investment in human capital?

- Different types of investment in human capital
 - Early childhood.
 - High school and college
 - On the job training
- Huge literature on the economics of education.
 - The effects of school quality, school inputs, peer effects, incentives, etc.
 - Parenting
- Enough material to fill one whole course...
- Instead, focus on young adults' investment and investments after the completion of compulsory schooling.

- Differences in educational attainment by demographic groups.

TABLE 6-1 Educational Attainment of U.S. Population, 2007 (Persons Aged 25 and over)

Source: U.S. Bureau of Labor Statistics, *Annual Demographic Supplement of the Current Population Surveys*, March 2007.

Group	Highest Grade Completed (Percentage of Population in Education Category)					
	Less Than High School	High School Graduates	Some College	Associate Degree	Bachelor's Degree	Advanced Degree
All Persons	12.7%	33.2%	16.7%	8.6%	18.9%	9.9%
Gender:						
Male	13.3	33.4	16.1	7.7	18.7	10.8
Female	12.2	33.0	17.3	9.5	19.0	9.0
Race/ethnicity:						
White	8.3	33.4	17.4	9.1	20.8	11.1
Black	15.0	38.6	18.9	8.8	13.1	5.7
Hispanic	36.6	31.4	13.0	6.2	9.4	3.3

- Females slightly more educated (difference is larger among younger cohorts)
- Large racial and ethnic gaps.

TABLE 6-2 Labor Market Characteristics, by Education Group, 2007 (Persons Aged 25–64)Sources: U.S. Bureau of Labor Statistics, *Annual Demographic Supplement of the Current Population Surveys*, March 2007.

		Less Than High School	High School Graduates	Some College	College Graduates
All workers:	Labor force participation rate	62.9	76.0	81.3	85.9
	Unemployment rate	8.6	4.9	3.7	1.8
	Annual earnings (in \$1,000)	22.8	33.0	39.3	68.2
Gender: Men	Labor force participation rate	75.6	83.6	87.4	92.5
	Unemployment rate	8.4	5.6	3.9	1.9
	Annual earnings (in \$1,000)	26.2	39.6	47.2	84.8
Women	Labor force participation rate	48.1	68.1	76.1	79.7
	Unemployment rate	8.8	3.9	3.5	1.8
	Annual earnings (in \$1,000)	16.8	25.0	31.9	50.6
Race/ethnicity: White	Labor force participation rate	57.7	76.6	81.2	86.2
	Unemployment rate	8.8	4.4	3.2	1.7
	Annual earnings (in \$1,000)	26.1	35.2	49.9	70.7
Black	Labor force participation rate	53.7	71.8	80.9	88.2
	Unemployment rate	14.9	7.8	5.6	2.4
	Annual earnings (in \$1,000)	19.3	28.0	34.3	55.3
Hispanic	Labor force participation rate	69.8	79.1	82.9	85.7
	Unemployment rate	7.3	3.9	4.4	2.1
	Annual earnings (in \$1,000)	21.6	28.8	35.2	55.7

- Very large differences in labor market outcomes by education, across all demographic groups.
- Also health, marriage rates, divorce rates, likelihood of voting.

- *Investment* involves a tradeoff between present costs and future benefits.
- When is an investment desirable?
- If the Net Present Value (NPV) is positive:

$$NPV = \sum_{t=0}^T \frac{B_t - C_t}{(1+r)^t} > 0.$$

- Net present value formula assumes perfect capital markets, ability to borrow and lend any amount at interest rate r .

- Alternative, equivalent approach: invest if the Internal Rate of Return (*IRR*) of the investment is greater than the market interest rate r .
- IRR is the value r^* such that:

$$\sum_{t=0}^T \frac{B_t - C_t}{(1 + r^*)^t} = 0.$$

- Investment decision is the same using NPV or IRR method.

Investment in Schooling

- What are the costs and benefits associated with additional schooling?
- Costs:
 - tuition and fees
 - books, supplies.
 - foregone earnings (!!!)
 - non-pecuniary costs (exams, home-works due tomorrow at 8am and that you haven't started yet)
- Benefits
 - increased earnings in the future (also: lower unemployment, better working conditions, etc.)
 - social benefits (networks, friends, spouses...)
 - nonpecuniary benefits (the joy of learning, college is fun...)

Problems with the simple present value approach

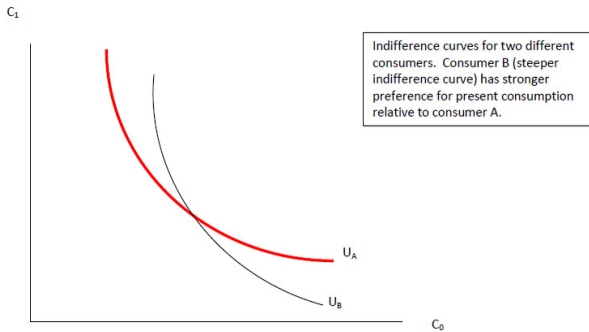
- Doesn't consider the possibility of dropping out.
- Doesn't consider borrowing constraints.
- Doesn't consider heterogeneity in returns to schooling
 - (Steve Jobs, Bill Gates and Mark Zuckerberg didn't complete college).
- Past returns do not predict future returns.
- Is the estimated earnings gap really a causal effect?

The two period model

- Model that helps us better understand the factors affecting the decision to attend college, and specifically:
 - liquidity constraints
 - intertemporal preferences

Setup

- Individual lives two periods: 0 (“the present”) and 1 (“the future”), derives utility from an aggregate consumption good in both periods.
- Utility: $U(C_0, C_1)$
- Indifference curves have the usual shape and properties: downward sloping and convex.



Intertemporal preferences

- Special case: time-separable utility function:

$$U(C_0, C_1) = u(C_0) + \frac{1}{1+\rho} u(C_1)$$

- The parameter ρ is called the rate of time preference, or the *subjective* discount rate. Higher ρ means stronger preference for present consumption relative to future consumption.
- Marginal rate of substitution between present and future consumption:

$$MRS = \frac{u'(C_0)}{\frac{1}{1+\rho} u'(C_1)} = (1+\rho) \frac{u'(C_0)}{u'(C_1)}$$

- If $C_0 = C_1$ (along the 45-degree line), $MRS = 1 + \rho$. That's why ρ represents the rate of time preference.

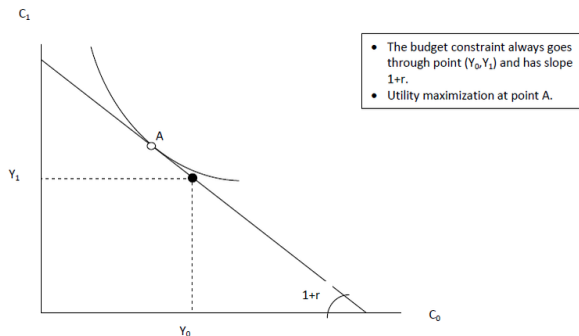
Budget Constraint

- Individual receives income Y_0 in period 0, and Y_1 in period 1.
- **Perfect capital markets:** individual can borrow and lend any amount at interest rate r .
- Budget constraint:

$$C_0 + \frac{C_1}{1+r} = Y_0 + \frac{Y_1}{1+r}.$$

- Meaning: the present value of current and future consumption must equal the present value of current and future income stream.

Utility maximization



- Consumer maximizes utility by choosing point of tangency between indifference curve and budget constraint.

$$MRS = \frac{\partial U / \partial C_0}{\partial U / \partial C_1} = 1 + r$$

- With time-separable preferences:

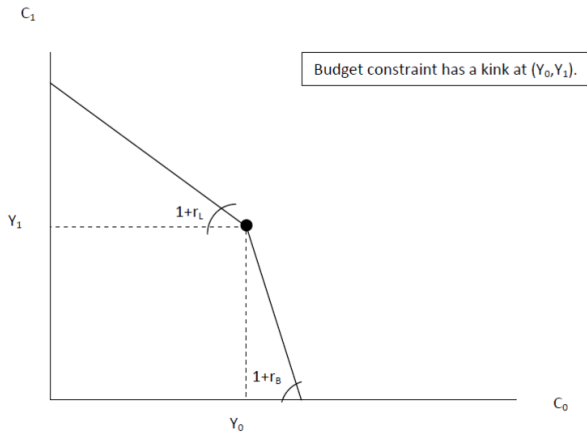
$$MRS = (1 + \rho) \frac{u'(C_0)}{u'(C_1)}$$

Therefore FOC reduces to

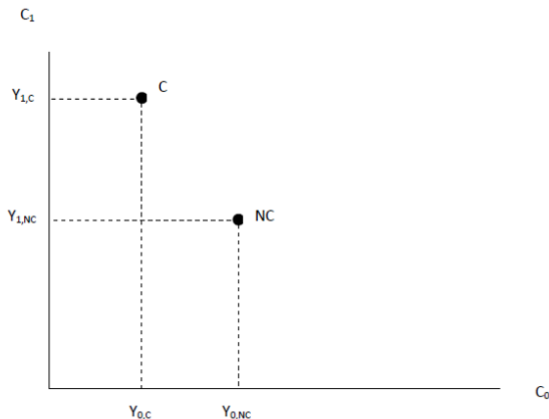
$$\frac{u'(C_0)}{u'(C_1)} = \frac{1 + r}{1 + \rho}$$

Imperfect capital markets

- Interest rate for borrowing r_B is higher than the interest rate for lending r_L .
- Fairly realistic assumption...
 - Interest rate on savings account: 0.5%.
 - Interest rate on credit card debt: 17%.



The decision to go to college



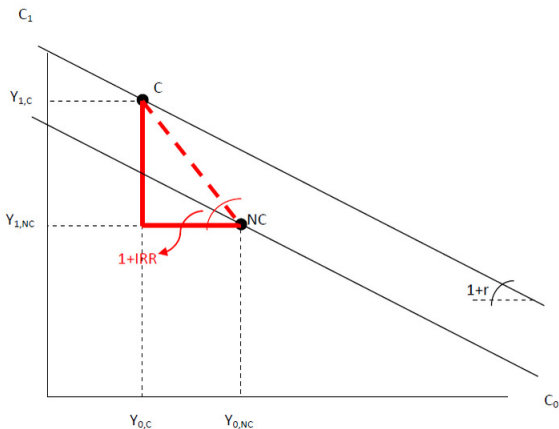
- Should one go to college given these alternative streams of income?
- Assume $Y_{0,NC}$, $Y_{1,NC}$, $Y_{0,C}$ and $Y_{1,C}$ given by the market

Case 1: Perfect capital markets ($r_B = r_L$).

- Decision depends only on the *internal rate of return* (IRR) of college investment.
 - alternatively, choose income stream with higher present discounted value.
- IRR is the rate of return that equalizes the present discounted value of the two income streams.

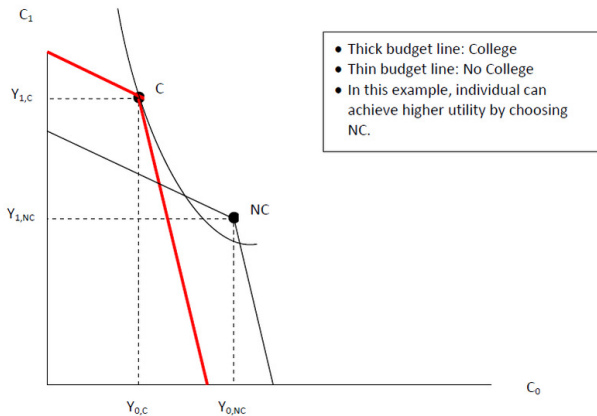
$$\begin{aligned} Y_{0,C} + \frac{Y_{1,C}}{1 + IRR} &= Y_{0,NC} + \frac{Y_{1,NC}}{1 + IRR} \\ \Rightarrow 1 + IRR &= \frac{(Y_{1,C} - Y_{1,NC})}{-(Y_{0,C} - Y_{0,NC})}. \end{aligned}$$

- If $IRR > r$, always go to college, regardless of preferences. Budget line is always shifted outwards.
- Intuition: rate of return to college investment is higher than rate of return in capital market.



- Independent of preferences, always achieve higher utility going to College.
- Opposite is true if $IRR < r$.

Case 2: Imperfect capital markets ($r_B > r_L$).



- With imperfect capital markets, the decision to go to college depends also on the shape of the indifference curves.
- The steeper the indifference curves (i.e., the stronger the preference for current consumption versus future consumption), the less likely is the individual to choose College.
- In the figure, individual chooses No College (but with a flatter indifference curve, individual chooses College)
- Therefore, college attendance is correlated with low discount rates. College educated people are more future-oriented.

- The two period model introduces conceptual clarity, separates between the market interest rate (used to derive the budget constraint), and the individual's subjective discount rate.
 - many textbooks make a mish-mash out of this.
- Two period model shows that with financial constraints, the subjective discount rate matters.
- More future-oriented people are more likely to go to college.
- Model might accommodate for lack of information (i.e., some individuals might underestimate $Y_{1,C}$)