

## Intermediate Microeconomics

### Chapter 5 *The Household as Supplier*

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## Labor, leisure and income

- Until now, income was fixed – but it actually depends on the labor provided by the household
- Labor ( $l$ ) is a *bad*, the corresponding good is *leisure* ( $n$ )
- The budget constraint is now determined by the *time endowment* ( $T$ ) of the individual
- Individual considers the choice of leisure/work versus consumption of all other goods ( $c$ ), given the ongoing *real wage rate* ( $w$ )
- Real wage = price of consumption is \$1

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## Budget constraint

- Time endowment:

$$T = n + l$$

- Budget constraint:

$$c = w \times l = w \times (T - n)$$

or:

$$c + w \times n = w \times T$$

- *Value of time endowment* ( $w \times T$ ) = the amount of money the individual would have if he worked every available hour

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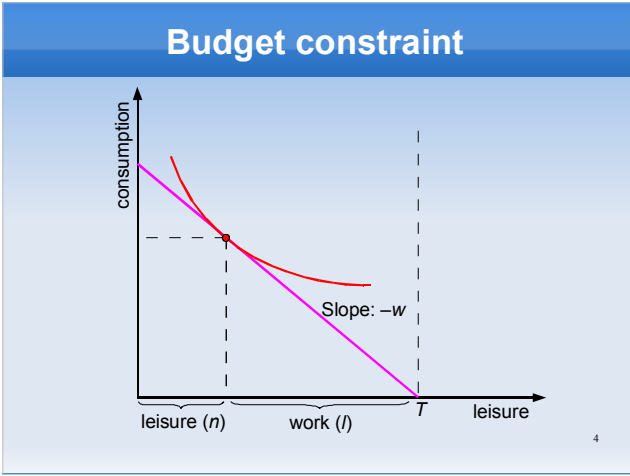
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- ### Comparative statics
- When wage rate falls, two effects:
    - substitution effect = leisure is "less expensive", so consume more leisure and work less
    - income effect = income is (literally) lower, so need to work more to be able to afford consumption  $\Rightarrow$  work more (less leisure)
  - If leisure is a normal good, income and substitution effect work in *opposite* directions (compare to chapter 3!) – you "sell" labor
  - Which effect dominates? Theory does not provide a definite answer

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- ### Labor supply
- *Labor supply curve* = schedule showing the relationship between the quantity of labor supplied and the wage rate, *ceteris paribus*
  - If substitution effect always dominates income effect, then labor supply slopes upward
  - If income effect always dominates substitution effect, then labor supply slopes downward
  - More realistic case: labor supply curve bends back (substitution effect dominates at low wage rates and income effect dominates at high wage rates)

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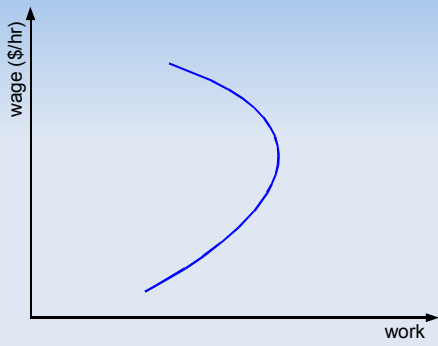
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## Bending labor supply



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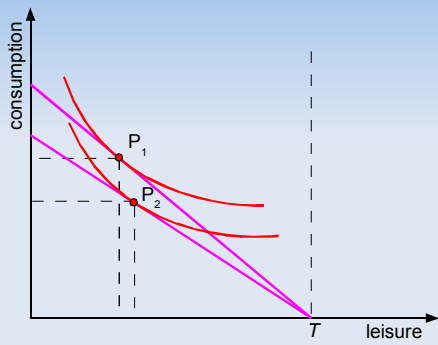
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## Labor supply



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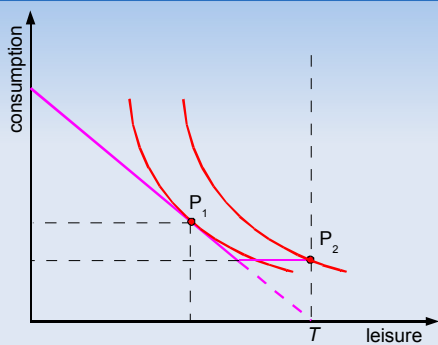
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## Labor supply decision with AFDC



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## Producer surplus

- *Producer surplus* = amount of income an individual receives in excess of what he would require to supply a given number of units of a factor
- Geometrically, it is the area above the supply curve and below the wage rate

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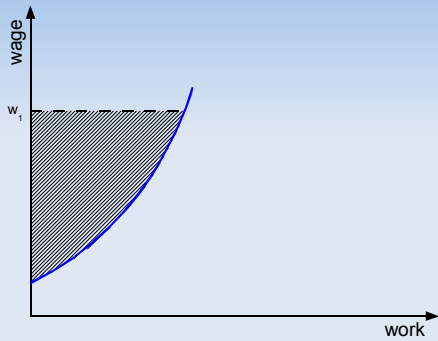
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## Producer surplus



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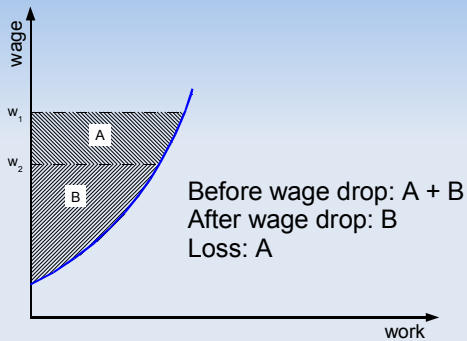
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## Producer surplus after wage falls



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## Capital

- Firms use two main factors of production: labor and capital
- *Real capital* = physical aids to production (e.g., buildings)
- *Financial capital* = money lent to firms to purchase or rent real capital
- Where does financial capital come from? Why do people save?

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## A two-period model

- Until now, we assumed people only care about the present
- Now suppose people care about consumption today ( $c_0$ ) versus tomorrow ( $c_1$ )
- *Life-cycle model* = a model where people's decisions at a point in time are made taking into account the economic circumstances over that person's entire lifetime
- Thus, we assume people only live for two periods

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## Endowment

- *Endowment point* = feasible consumption bundle if the individual makes no trades with the market (or does not save/borrow)
- *Present value of endowment* = maximum level of current consumption that can be obtained, given the endowment
- Hence, the "income" of the consumer is the present value of her endowment

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## Present value

- *Present value* = maximum amount of money you would be willing to pay today for the right to receive a given amount at a specified date in the future
- The opposite of "compounding interest" (interest rate is  $i$ ):
  - if you deposit  $\$x$  today, in  $n$  years you'll get  $x(1+i)^n$
  - if  $n$  years from today you get  $\$y$ , how much should you have deposited today?

$$x = \frac{y}{(1+i)^n}$$

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## More on present value

- *Discount rate* = interest rate used in the calculation of present value
- Payments further into the future have lower value today (because of discounting)
- What if you have annual payments of  $\$M_0, \$M_1, \$M_2, \dots, \$M_n$  instead of one payment after  $n$  years?

$$x = M_0 + \frac{M_1}{(1+i)} + \frac{M_2}{(1+i)^2} + \dots + \frac{M_n}{(1+i)^n}$$

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## Intertemporal budget constraint

- Suppose individual has income  $I_0$  today and  $I_1$  tomorrow  $\Rightarrow$  present value of endowment is

$$PV = I_0 + \frac{I_1}{(1+i)}$$

- *Borrower* = individual for whom  $c_0 > I_0 \Rightarrow$  loan =  $c_0 - I_0$
- *Saver* = individual for whom  $c_0 < I_0 \Rightarrow$  savings =  $I_0 - c_0$

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## Intertemporal budget constraint

- Net savings are  $S = I_0 - c_0$ 
  - if  $S > 0$ , then individual is saver (lender)
  - if  $S < 0$ , then individual is borrower
- "Today's budget constraint":  $c_0 + S = I_0$
- "Tomorrow's BC":  $c_1 = I_1 + S \cdot (1 + i)$
- Combine them to get intertemporal budget constraint:

$$c_0 + \frac{c_1}{(1+i)} = I_0 + \frac{I_1}{(1+i)}$$

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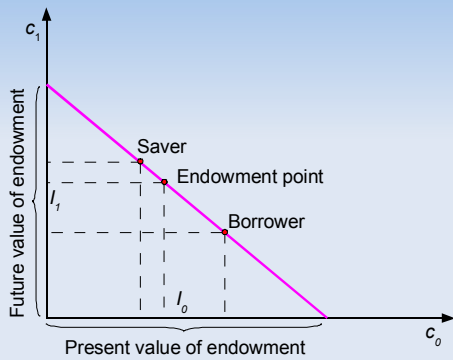
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## Intertemporal budget constraint



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## Indifference maps

- Indifference curves show preference for present consumption versus future consumption
- Marginal rate of time preference* = marginal rate of substitution between present and future consumption (slope of indifference curve)
- "Impatient" people have steep indifference curves ( $- \text{slope} > 1$ ) around the 45 degree line
- Optimal consumption choice: tangency point of indifference curves and budget line

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## Comparative statics

- The "price" of future consumption is the inverse of the interest rate  $\Rightarrow$  an increase in the interest rate is equivalent to a fall in price
  - substitution effect: shift consumption more to the future (save more)
  - income effect:
    - borrower: need to repay more in the future, so it is as if income fell  $\Rightarrow$  consume less of *both* goods
    - saver: will get back more in the future, so it is as if income increased  $\Rightarrow$  consume more of *both* goods

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## The effect of a higher interest rate on savings

- Borrower:
  - substitution effect: increase savings
  - income effect: increase savings
- Saver:
  - substitution effect: increase savings
  - income effect: decrease savings

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