

Social Optimal Model and Efficiency of Market Outcomes

ECO 305: Intermediate Macroeconomics

Goals

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- Use utility maximization model to describe labor supply behavior
- Use the profit maximization model to describe labor demand behavior
- Use equilibrium in the labor market and the production function to predict outcomes for aggregate employment and real GDP
- Identify socially optimal outcomes for consumption, leisure, and real GDP
- Identify cases when free market outcomes are socially optimal, and when they are not
- Describe efficiencies of tax policies
- Predict changes in general equilibrium outcomes from changes in government policies and productivity

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Reading and Exercises

2 / 26

- Williamson, Chapter 5, pp. 142-150:
Socially optimal allocations of consumption and leisure
- Williamson, Chapter 5, pp. 150-155
Pareto optimality of the competitive equilibrium
- Williamson, Chapter 5, pp. 155-164
Optimal responses of the economy to government expenditures and technology shocks
- **Canvas Quiz due Wednesday 11:59 PM.**
Multiple-choice, 10 questions, unlimited attempts allowed, only best score counts
- **Homework/In-class Exercise due Friday 11:59 PM.** We will work together in class on Thursday

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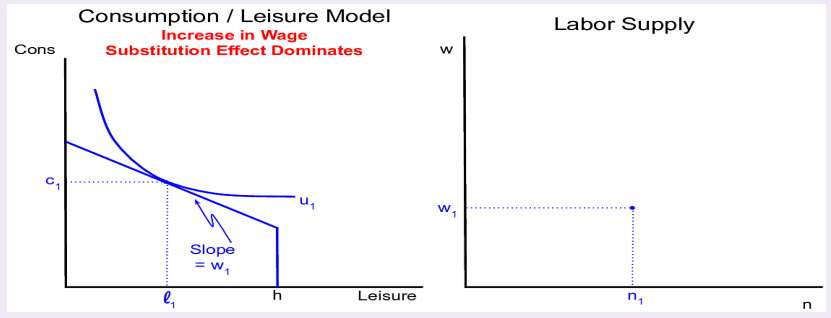
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Leisure Decision

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Utility Maximization



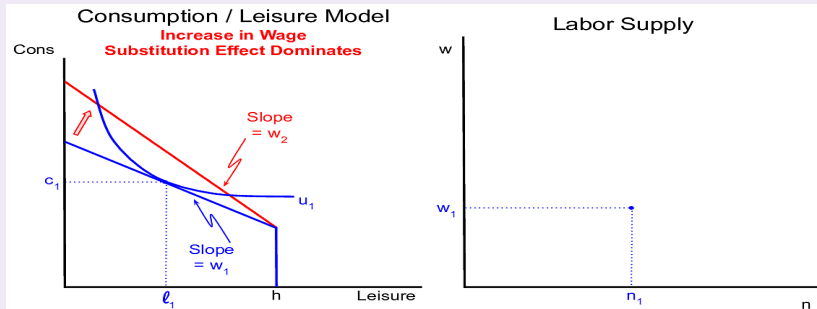
Outcome

Utility maximization choices for leisure determine labor supply

$$\frac{MU_l}{MU_c} = w$$

Leisure Decision

Utility Maximization



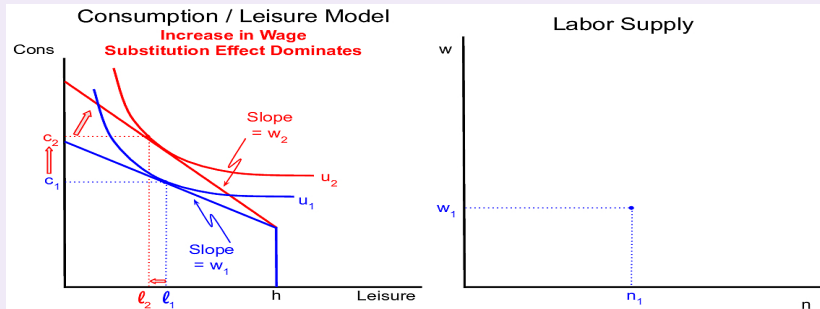
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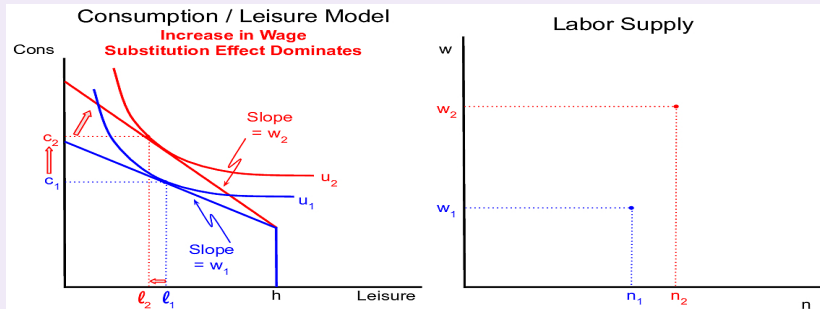
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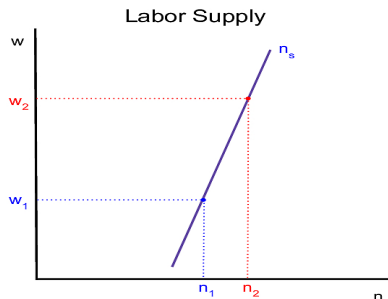
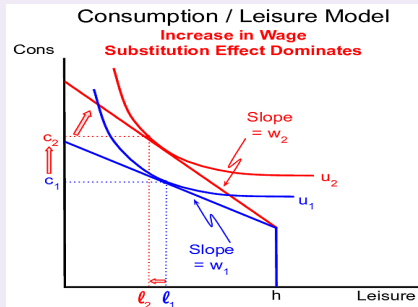
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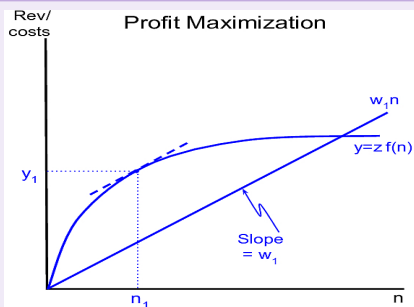
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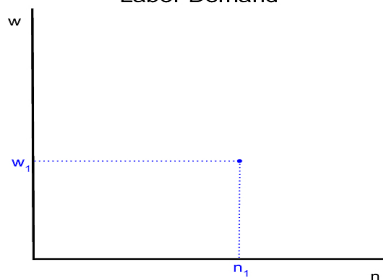
Labor Demand Decision

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Profit Maximization



Labor Demand



Outcome

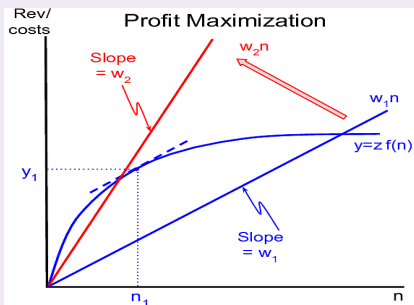
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Profit max results in $w = MP_n \rightarrow$

The labor demand curve is the marginal product of labor curve

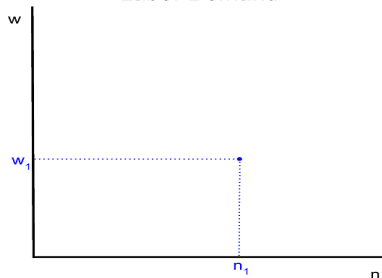
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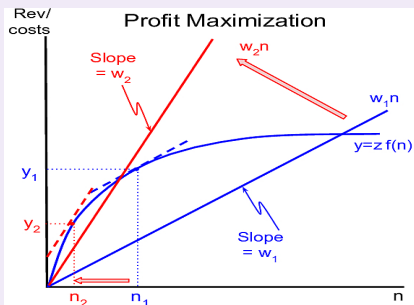
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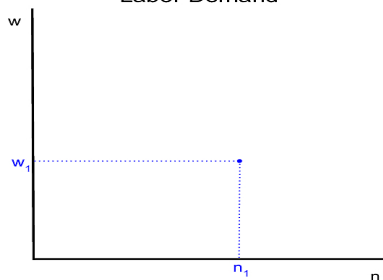
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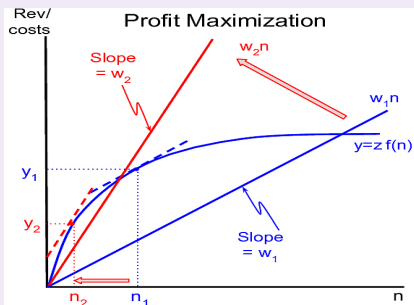
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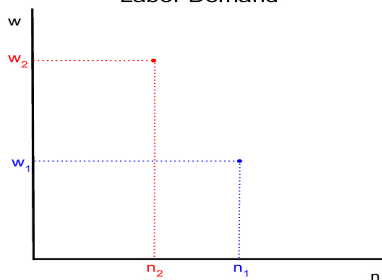
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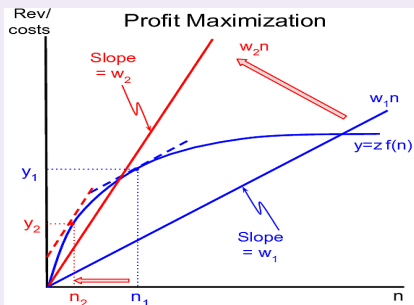
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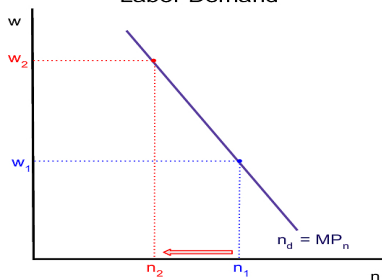
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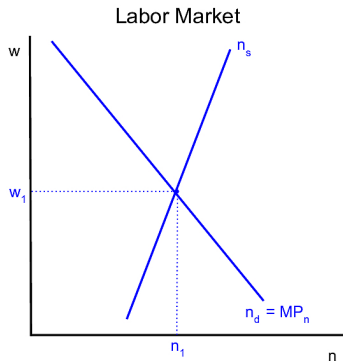
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1 - Labor Supply

- Utility maximization determines labor supply
- Anything *besides wage* that affects leisure decisions shifts labor supply
- Optimal condition:

$$\frac{MU_l}{MU_c} = w$$

Labor Market Equilibrium



Equilibrium

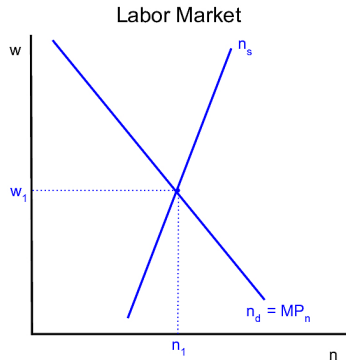
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2 - Labor Demand

- Profit maximization determines labor demand
- Anything *besides wage* that affects labor decisions shifts labor demand
- Optimal condition:

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Labor Market Equilibrium



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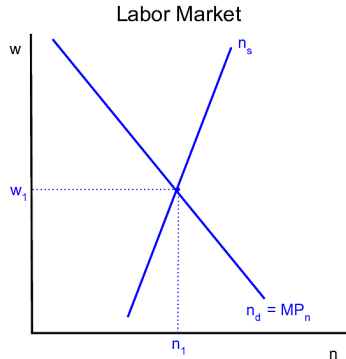
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3 - Equilibrium

- Equilibrium in labor market determines outcomes for employment and wages
- Combining optimal conditions:

$$\frac{MU_I}{MU_C} = MP_n$$

Labor Market Equilibrium

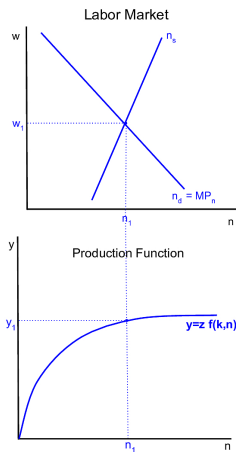


Market Clearing

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Market Clearing

- Labor market employment + production function determines equilibrium real GDP
- Government budget constraint: $g = t$
- Market clearing:
 $y = c + g$



Social Planner Problem

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Objective

- Forget about markets, buyers, and sellers
- Figure out *production possibilities* for *consumption* and *leisure*, taken as given existing productive capabilities determined by z and k
- Figure out what combination of consumption and leisure on the frontier of possibilities lead to the most utility
- Compare that to private market outcomes

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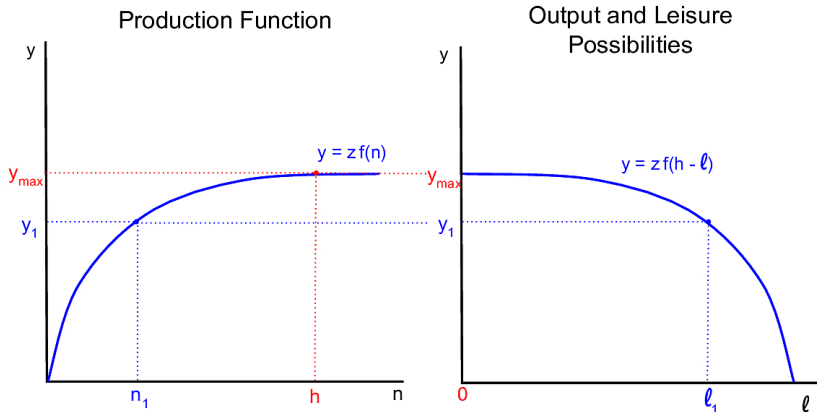
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Possibilities for Leisure and Production

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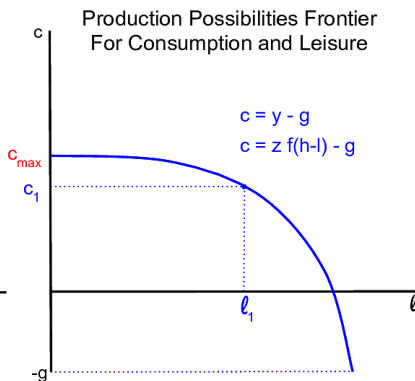
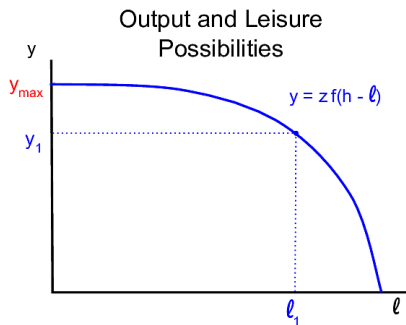
Recognizing that $l = h - n$, convert production function to equivalent function with leisure



Possibilities for Leisure and Consumption

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Recognizing that $c = y - g$, convert possibilities function to equivalent function with consumption

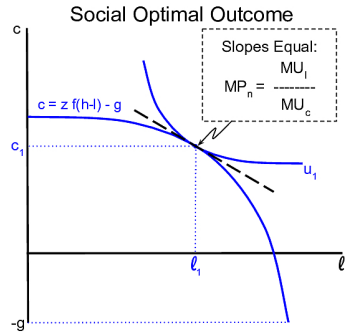


Socially Optimal Outcome

10 / 26

Maximize Utility

- Find highest indifference curve that the PPF touches
- Socially optimal outcomes for consumption and leisure are where the indifference curve is *tangent* to the production possibilities frontier

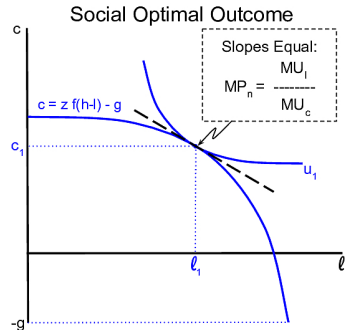


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Comparing Market and Socially Optimal Outcomes

11 / 26

Market Outcome

Consumers maximizing utility:

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Producers maximizing profit:

$$MP_n = w$$

Equilibrium:

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Socially Optimal Outcome

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Market Efficiency

- The private market outcome is socially optimal
- We made a lot of assumptions to get here!

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Assumptions for Market Efficiency

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Diminishing marginal product

- Absolutely essential.
- If there are increasing returns at low levels of labor or capital, can get multiple equilibria, some of which are suboptimal.
- Increasing returns may be common for new businesses, new industries, lesser developed economies

Diminishing marginal utility

Absolutely essential. At an aggregate level, arguably a safe assumption.

Flexible prices and wages

- That is, wages in the model assumed always immediately go to equilibrium levels.
- In reality, this takes time. Recessions, unemployment, overheating, or labor shortages, can lead to suboptimal result away from the equilibrium.

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More Assumptions for Market Efficiency

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Perfect and Symmetric Information

- Consumers know exactly how much utility a consumption unit will deliver (i.e. MU_I , MU_C known with accuracy before decisions)
- Producers know exactly how productive labor will be, what demand for output will be.
- Inefficiencies and opportunities for welfare-improving government intervention can occur when information is imperfect **and asymmetric**.

No Externalities

- **Positive externality:** When the social benefit of consuming a good exceeds consumers' private marginal utilities, or when the social benefits of producing a good exceeds businesses' marginal revenues
 - Example: vaccines, research and developing into new technologies
- **Negative externality:** When the social costs of consuming a good exceeds the price consumers pay, or when the social costs of producing a good exceeds businesses' marginal costs
 - Example: production or consumption that causes pollution

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Example: Pollution or congestion

More Assumptions for Market Efficiency

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Perfect and Symmetric Information

- Consumers know exactly how much utility a consumption unit will deliver (i.e. MU_I , MU_C known with accuracy before decisions)
- Producers know exactly how productive labor will be, what demand for output will be.
- Inefficiencies and opportunities for welfare-improving government intervention can occur when information is imperfect **and asymmetric**.

No Externalities

- **Positive externality:** When the social benefit of consuming a good exceeds consumers' private marginal utilities, or when the social benefits of producing a good exceeds businesses' marginal revenues
 - Examples: vaccines, research and developing into new technologies
- **Negative externality:** When the social costs of consuming a good exceeds the price consumers pay, or when the social costs of producing a good exceeds businesses' marginal costs
 - Examples: Production or consumption that causes pollution

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Even More Assumptions for Market Efficiency

14 / 26

Public Goods and Commons Goods

- Government expenditures cover the socially desired and necessary level of **public goods**.
- **Public goods**: Goods and services where consumers cannot be excluded (non-excludable), and one person's use does not diminish another person's use (non-rival).
 - Examples: national defense, law enforcement, roads, parks, libraries
- **Commons goods** do not exist. Commons goods are goods that are non-excludable, but rival. Anyone can use it, and one person's use diminishes others' use.
 - Examples: hunting, fishing, recreational use of natural resources

Government Expenditures and Taxes

- The model allows for government expenditures funded by taxes. Assumes the level of government expenditures is itself optimal.
- Non-distortionary taxes: Tax policies do not alter the consumers decision, $\frac{MU_x}{MU_y} = w$, nor the producer decision, $MP_n = w$.

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Distortionary vs Non-Distortionary Tax Policies

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Distortionary vs. Non-Distortionary

Non-distortionary tax policies lead to socially optimal outcomes and do not alter the consumers decision, $\frac{MU_I}{MU_C} = w$, nor the producer decision, $MP_n = w$.

Distortionary tax policies lead to less-than-optimal outcomes and result in consumers decisions different than, $\frac{MU_I}{MU_C} = w$, or producer decisions different than, $MP_n = w$.

Example: Lump-Sum Taxes

- Take the same dollar amount from every consumer, regardless of income
- We saw this still leads to $\frac{MU_I}{MU_C} = w$
- **Non-distortionary!** Yay!
- Totally impractical and infeasible! Oh no!

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Labor Income Taxes

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Labor Income Taxes

- Take a *percentage* of labor income to pay in taxes
- Let $\tau \in (0, 1)$ be the labor income tax rate
- Example, $\tau = 0.25$ means 25% of labor income is collected in taxes
- Take home wage: $(1 - \tau)w$

Labor Income Tax Result

- Budget constraint:

$$c + (1 - \tau)wl = (1 - \tau)wh + \pi$$

- Utility optimization:

$$\frac{MU_l}{MU_c} = (1 - \tau)w$$

- **Distortionary!** Oh no!
- Practical, fair, and if labor supply is relatively inelastic, distortions are small.
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Consumer Sales Taxes

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Consumer Sales Taxes

- Add on a *percentage* of sales to collect in tax revenue
- Let $\tau \in (0, 1)$ be the sales tax rate
- Example, $\tau = 0.05$ means 5% sales tax
- After tax price for consumption goods: $(1 + \tau)$

Consumer Sales Result

- Budget constraint:

$$(1 + \tau)c + wl = wh + \pi$$

- Utility optimization:

$$\frac{MU_l}{MU_c} = \frac{w}{1 + \tau}$$

- **Distortionary!** Oh no!
- Elastic consumption demand, more distortionary
- **Regressive tax:** Consumption (and therefore sales tax) is a larger percentage of income for people with lower incomes. Boo!

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$$\frac{MU_l}{MU_c} = \frac{w}{1 + \tau}$$

- **Distortionary!** Oh no!
- Elastic consumption demand, more distortionary
- **Regressive tax:** Consumption (and therefore sales tax) is a larger percentage of income for people with lower incomes. Boo!

Consumer Sales Taxes

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Consumer Sales Taxes

- Add on a *percentage* of sales to collect in tax revenue
- Let $\tau \in (0, 1)$ be the sales tax rate
- Example, $\tau = 0.05$ means 5% sales tax
- After tax price for consumption goods: $(1 + \tau)$

Consumer Sales Result

- Budget constraint:

$$(1 + \tau)c + wl = wh + \pi$$

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Corporate Income Taxes: Tax Based on Revenue

18 / 26

Corporate Revenue Taxes

- Add on a *percentage* of total revenue to collect in taxes
- Let $\tau \in (0, 1)$ be the corporate revenue tax rate
- Example, $\tau = 0.10$ means 10% corporate revenue tax
- Total revenue: $(1 - \tau)zf(k, n)$

Corporate Revenue Tax Result

- Profit function:

$$\pi = (1 - \tau)zf(k, n) - wn$$

- Profit maximization:

$$(1 - \tau)MP_n = w$$

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Making Predictions using the Social Planner Model 20 / 26

Using the Model

- Despite its shortcomings, the social planner model can be a useful tool for analyzing dynamics of market economy
- Unless a market failure is an essential feature of an industry or economic situation

Scenarios:

- Impact of an increase in government expenditures on consumption, leisure, and output
- Impact of an improvement in total factor productivity on consumption, leisure, and output

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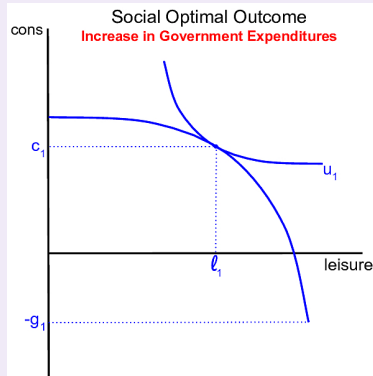
Increase in Government Expenditures

21 / 26

Market Outcome

- Start with socially optimal outcome
- Shift PPF *down* by the amount of the *increase* in government expenditures
- Draw new indifference curve, label new outcome
- Pure income effects: consumption and leisure decrease
- Employment increases
- Consumer welfare decreases

Graphical Model



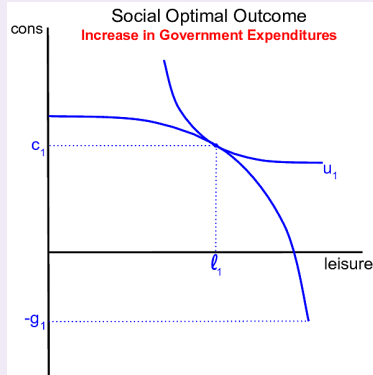
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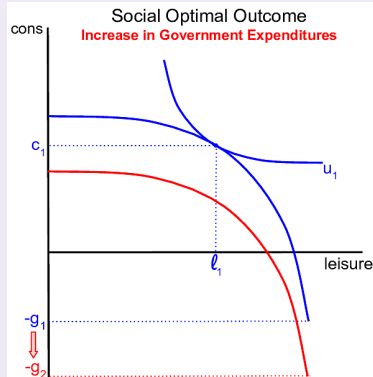
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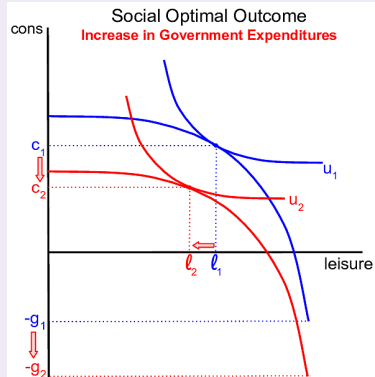
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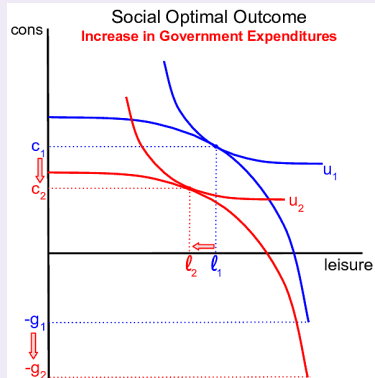
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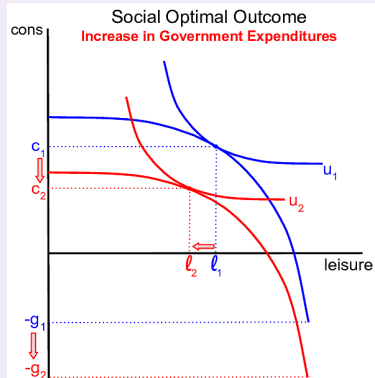
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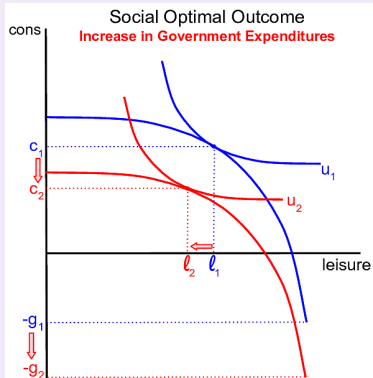
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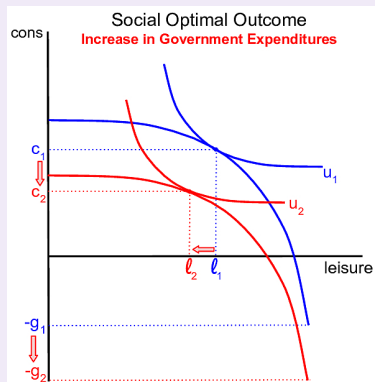


Increase in Government Expenditures (Continued)

Market Outcome

- New and original socially optimal outcomes for consumption and leisure labeled
- Identify drop in consumption
- Identify increase in government expenditures
- Since $|\Delta g| > |\Delta c|$, government expenditure effect dominates, real GDP increases
- Also, employment increases, so given $y = zf(n, k)$, $\uparrow n \rightarrow \uparrow y$.

Graphical Model



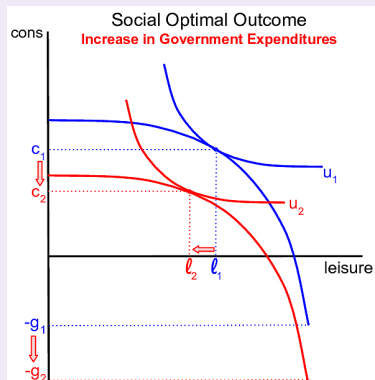
Increase in Government Expenditures (Continued)

22 / 26

Market Outcome

- New and original socially optimal outcomes for consumption and leisure labeled
- Identify drop in consumption
- Identify increase in government expenditures
- Since $|\Delta g| > |\Delta c|$, government expenditure effect dominates, real GDP increases
- Also, employment increases, so given $y = zf(n, k)$, $\uparrow n \rightarrow \uparrow y$.

Graphical Model

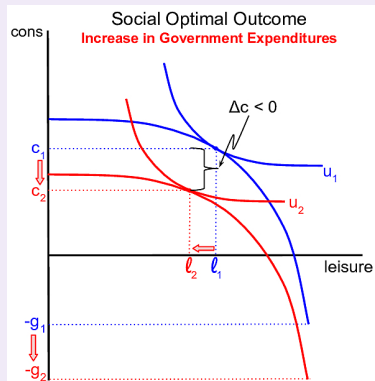


Increase in Government Expenditures (Continued)

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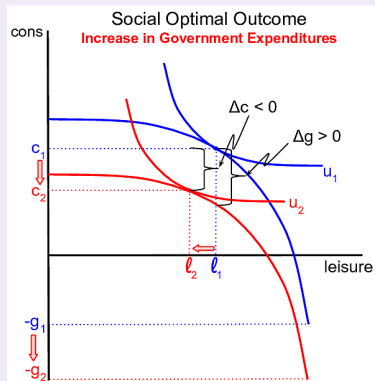


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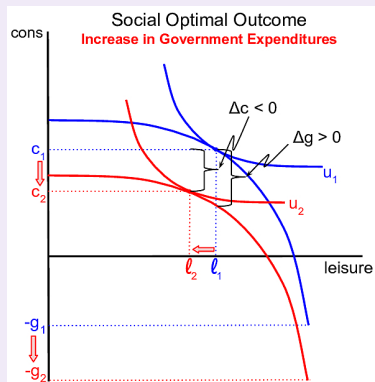
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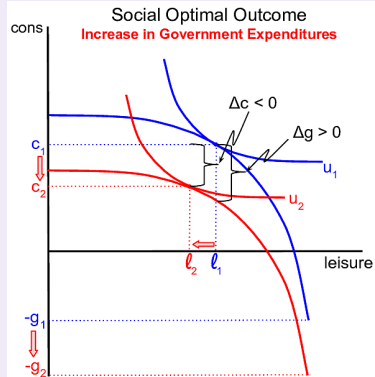


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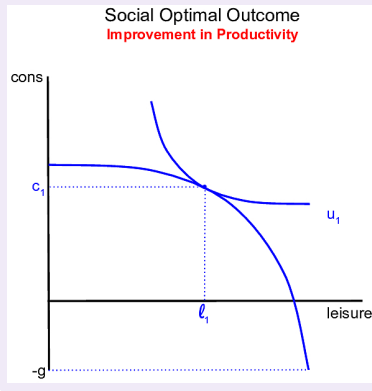
Increase in Total Factor Productivity

23 / 26

Market Outcome

- Start with socially optimal outcome
- Pivot PPF *upward* with increase in z
- Draw new indifference curve, label new outcome
- Substitution and income effects: consumption increases, leisure indeterminate
- Employment indeterminate
- Consumer welfare increases

Graphical Model



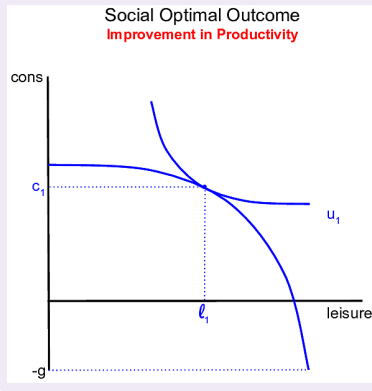
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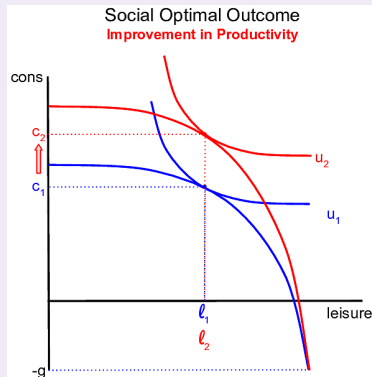
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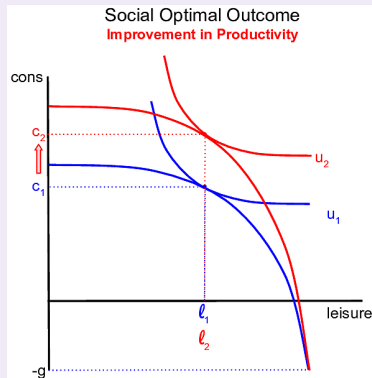
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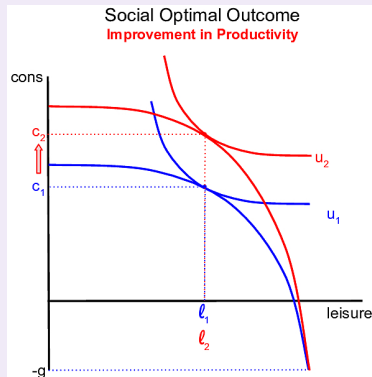
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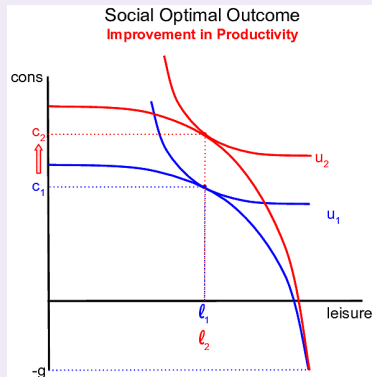
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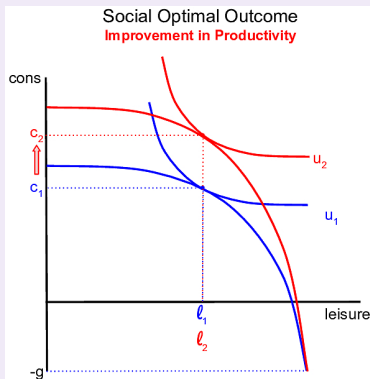
Increase in Total Factor Productivity (Continued)

24 / 26

Market Outcome

- New and original socially optimal outcomes for consumption and leisure labeled
- Identify original real GDP with $y_1 = c_1 + g$
- Identify new real GDP with $y_2 = c_2 + g$
- Real GDP increases

Graphical Model



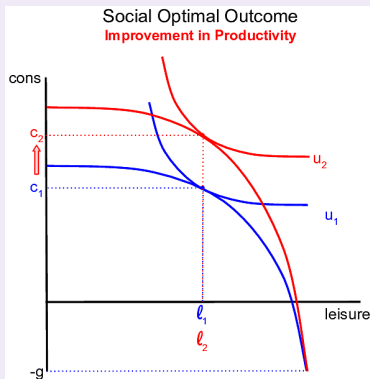
Increase in Total Factor Productivity (Continued)

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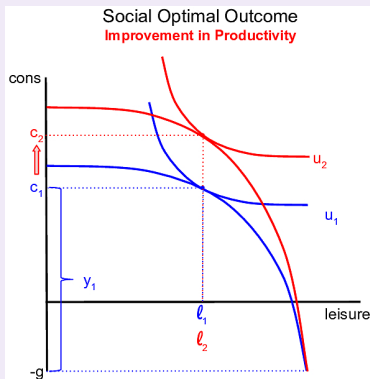
Increase in Total Factor Productivity (Continued)

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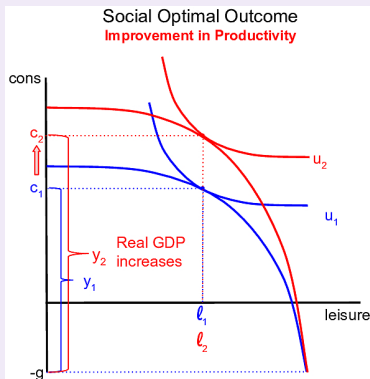
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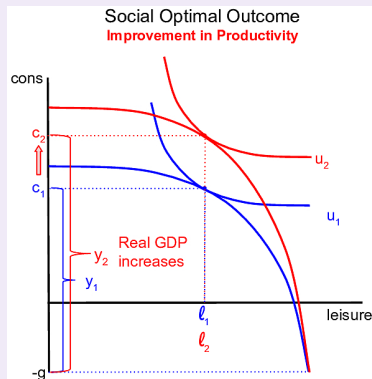
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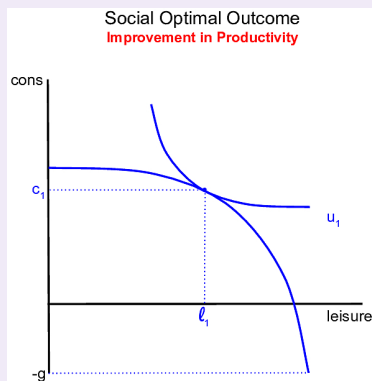
Increase in TFP: Substitution Effects Dominate

25 / 26

Market Outcome

- Start with original outcome
- Pivot PPF upward
- Identify new outcome where leisure decreases
- Emphasizes the effect of the steeper slope
- Employment increases

Graphical Model



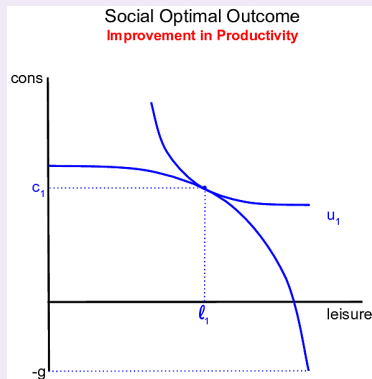
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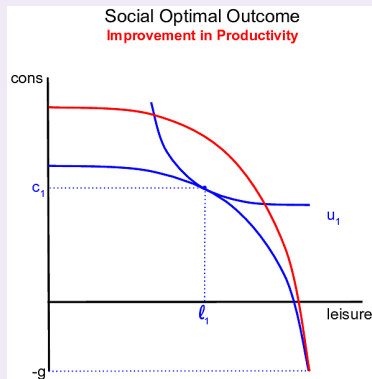
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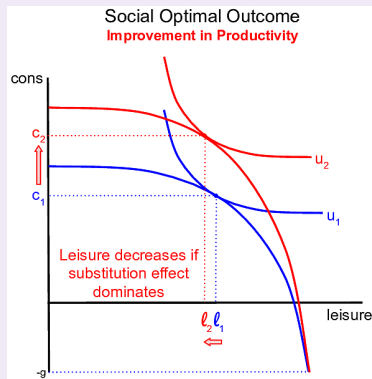
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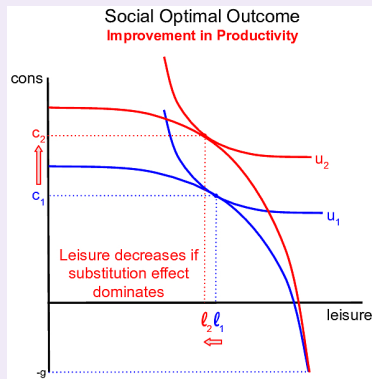
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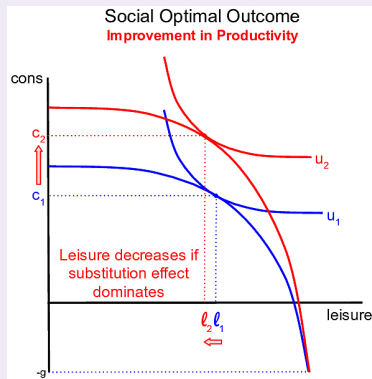
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Reading and Exercises

26 / 26

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Socially optimal allocations of consumption and leisure
- Williamson, Chapter 5, pp. 150-155
Pareto optimality of the competitive equilibrium
- Williamson, Chapter 5, pp. 155-164
Optimal responses of the economy to government expenditures and technology shocks
- **Canvas Quiz due Wednesday 11:59 PM.**
Multiple-choice, 10 questions, unlimited attempts allowed, only best score counts
- **Homework/In-class Exercise due Friday 11:59 PM.** We will work together in class on Thursday

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