# *Seminar on Public Finance*

Lecture #1: January 16

Introduction, Current U.S. Tax System, and Review of Welfare Economics

# Course Details

Contact Info:
Jason DeBacker
jason.debacker@mtsu.edu
615-898-2528

Course Website:
http://mtweb.mtsu.edu/jdebacker/PubFin.html

Office hours:
Tuesday, 9am-11am
Thursday, 11am-1pm

# Course Details (2)

Graded course elements:

- Three problem sets (15%)
- Three short papers (45%)
- Midterm exam (March 6th) (20%)
- Final exam (May 8th) (20%)

It is also expected that students will be active participants in class.

All work to be turned in for a grade must reflect individual effort. Collaborative homework and exams are not allowed.

# Course Details (3)

Textbook: *Taxing Ourselves: A Citizen's Guide to the Debate over Taxes* - Fourth Edition, by Joel Slemrod and Jon Bakija
Optional: *The Economics of Taxation*, by Bernard Salanié

There will be additional reading assignments that are available via the web.

Some are publicly available (often hyperlinked in course reading list) and others via an MTSU subscription

# Course Details (4)

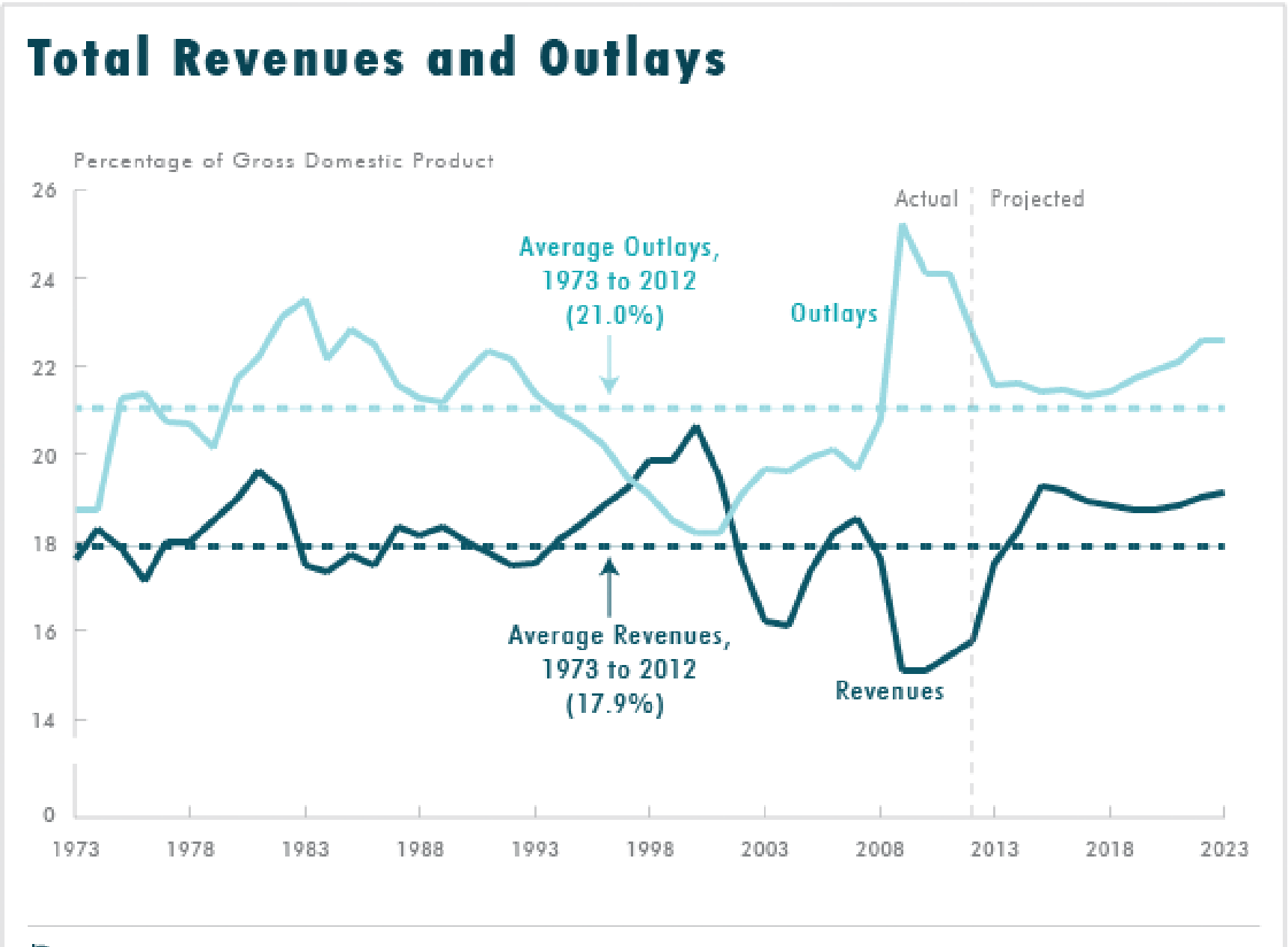
Tentative schedule:

1. Introduction and Review (today)
2. Theory of Taxation (3 weeks)
3. Tax Policy in Practice (1 week)
4. Empirical Public Finance (5 weeks)
5. Study of Tax Reform Alternatives (3 weeks)

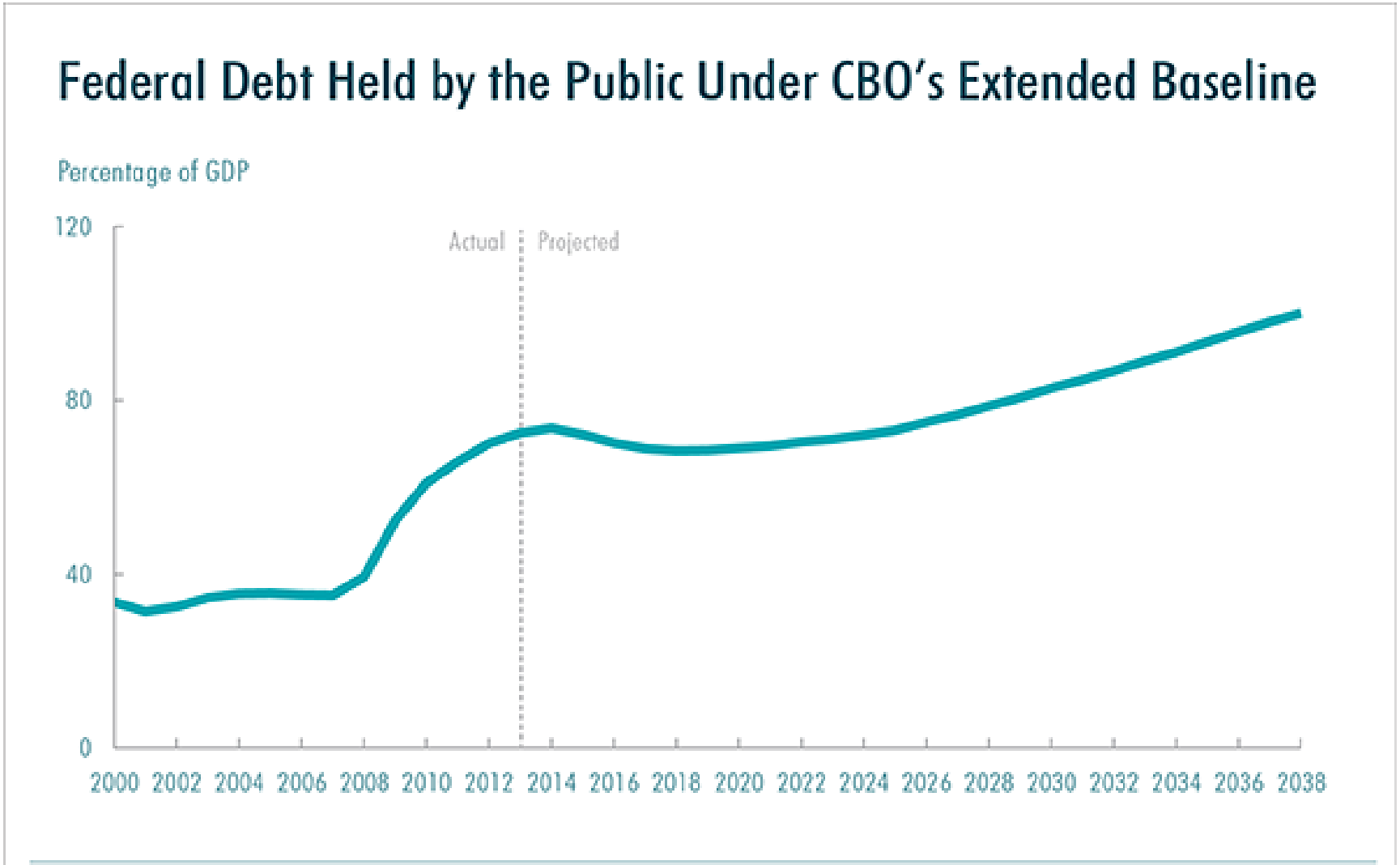
# Why Tax Reform and Why Now?

- Why is it a relevant time to study taxation and why focus on tax reform?
- Fiscal stress due to the retirement of the baby boomers and higher healthcare costs.
- Complex tax code that burdens economy
- Increasing income inequality affecting distributional aspects of tax policy

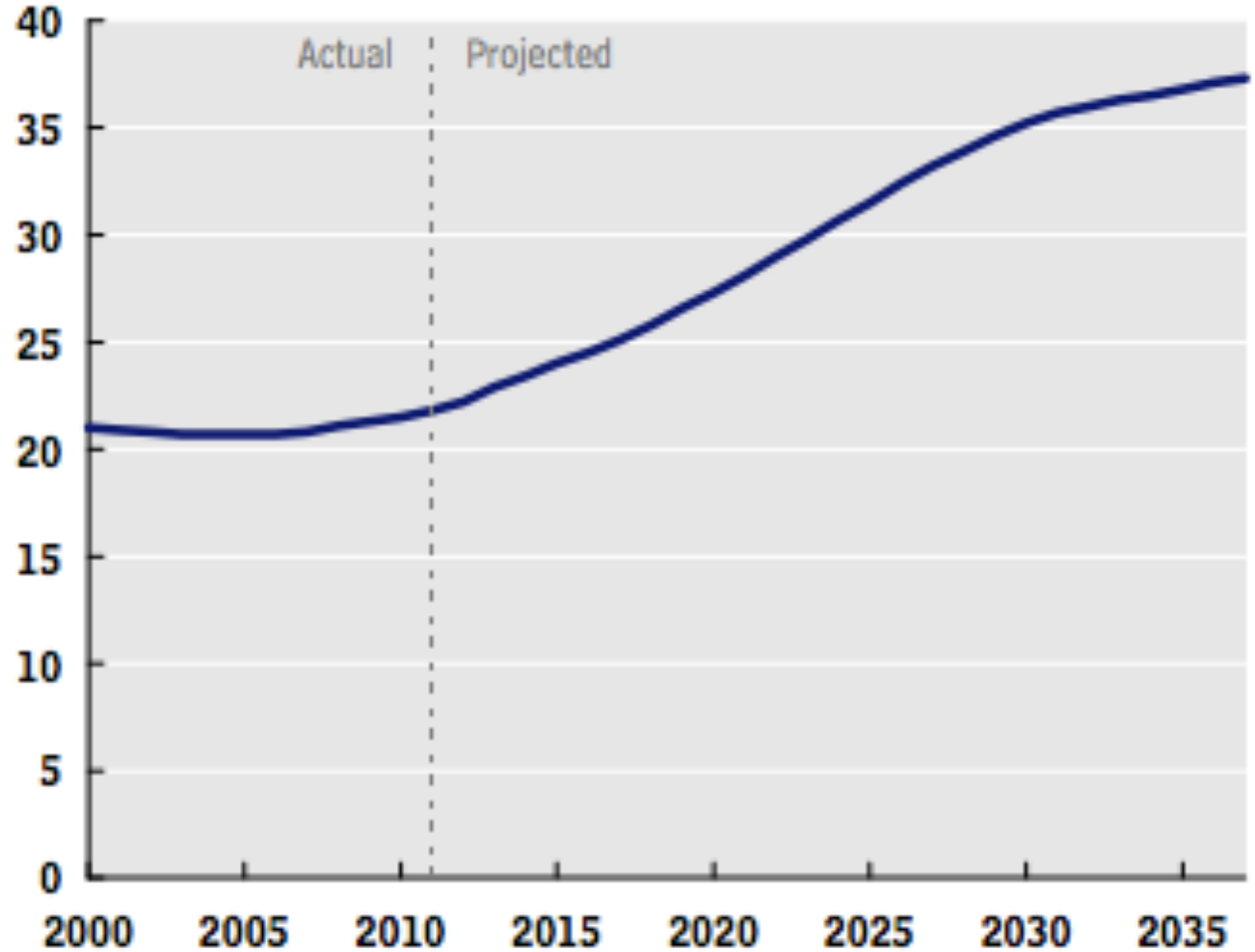
# CBO Baselines as a % of GDP



# Federal Debt Held by the Public as a Percentage of Gross Domestic Product Under CBOs Long-Term Budget Scenarios

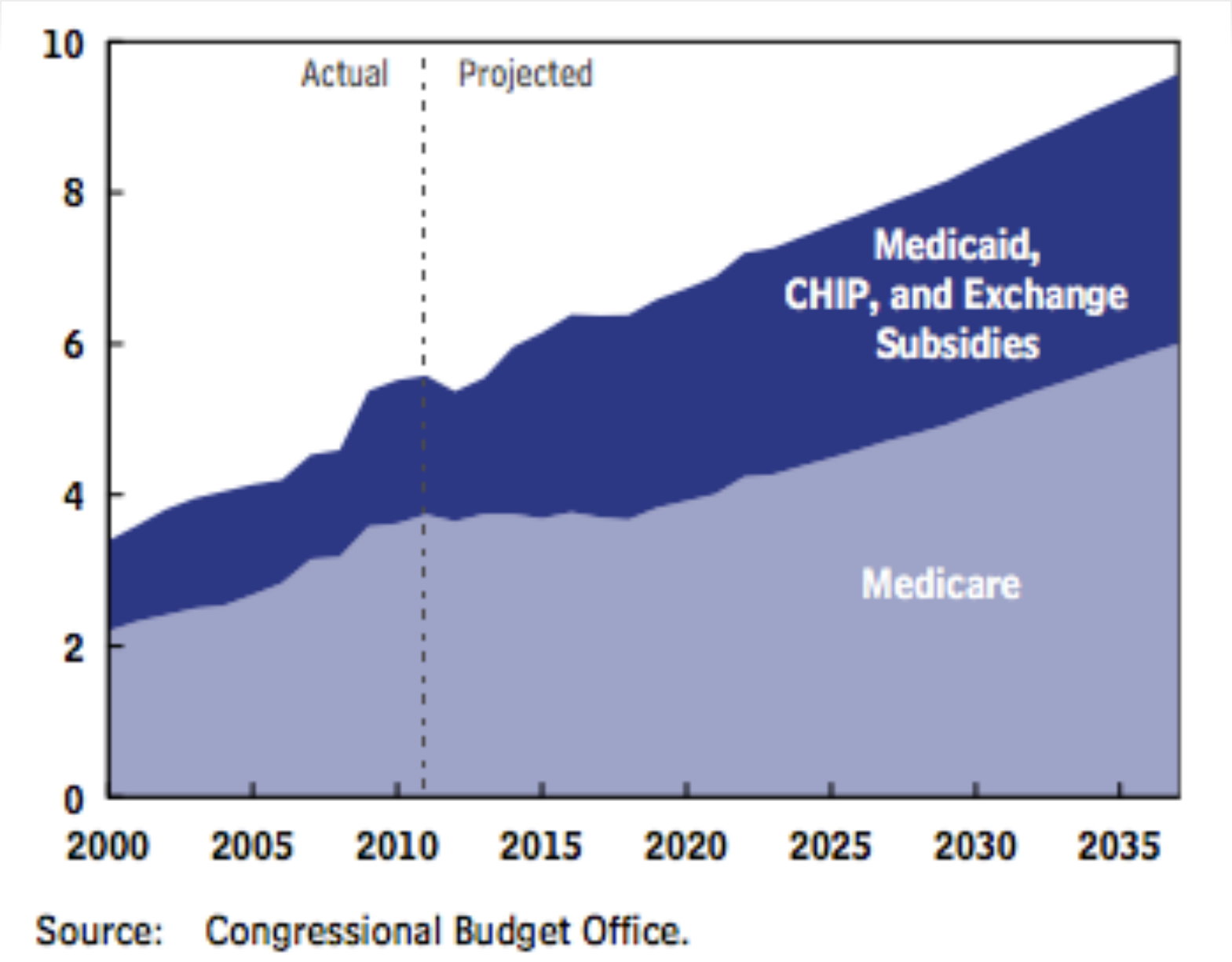


# The Population Age 65 or Older as a Percentage of the Population Ages 20 to 64




Source: Congressional Budget Office.

# Growth in Health Spending



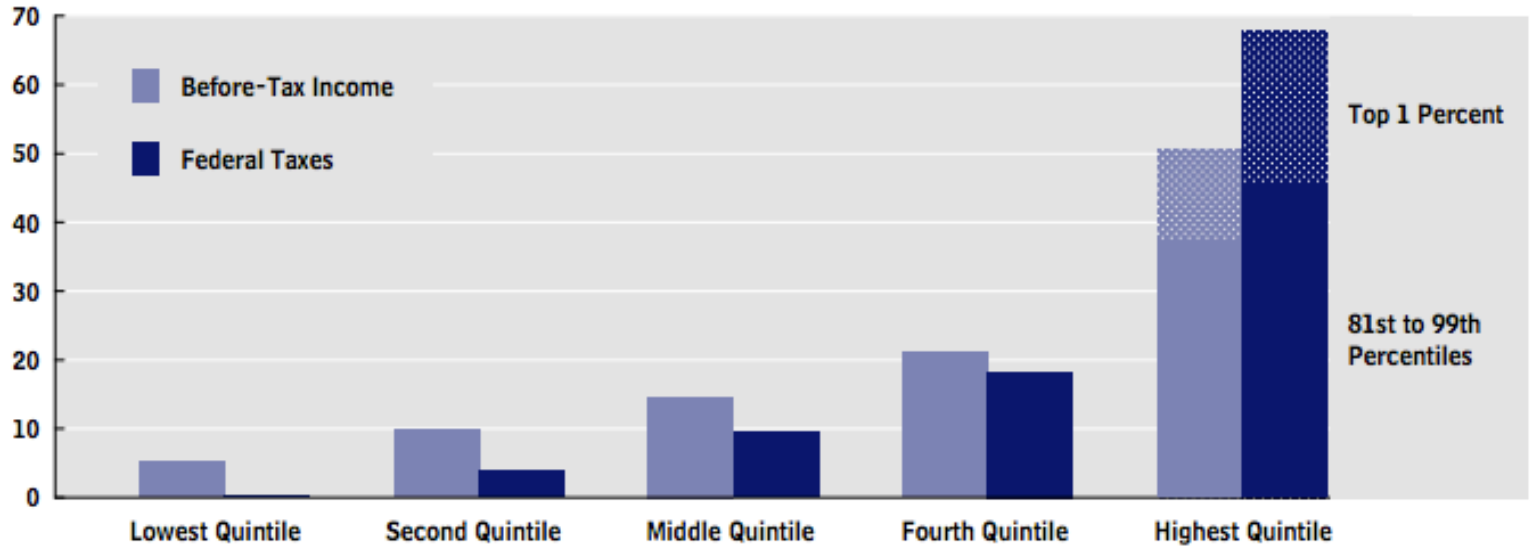

Source: Congressional Budget Office.

# Distribution of Taxes

**Figure 2.**

**Shares of Before-Tax Income and Federal Taxes, by Income Group, 2009**

(Percent)




Source: Congressional Budget Office.

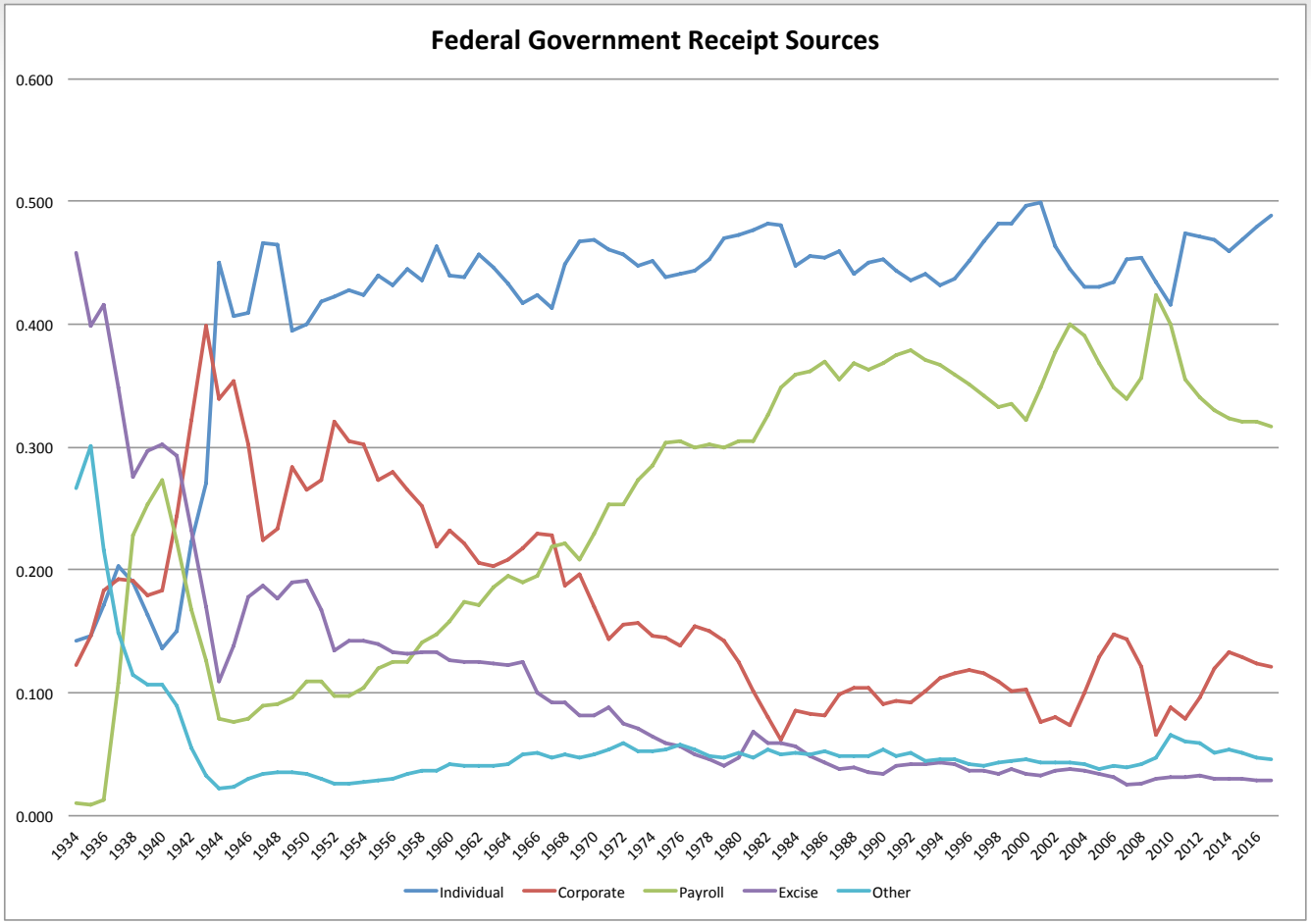


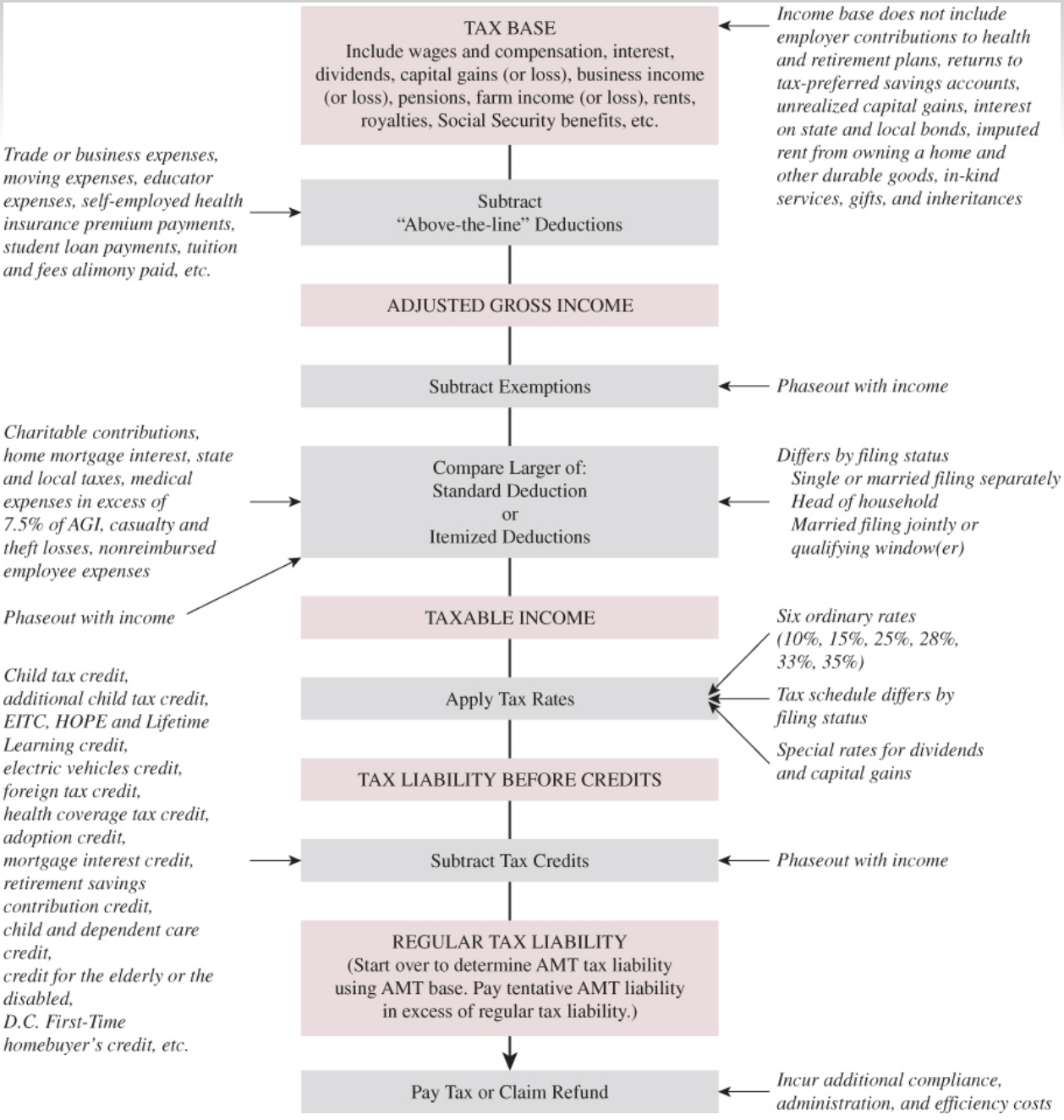

Figure : Historical Receipts Sources

# Current Income Tax System

- Income sources to Adjusted Gross Income (AGI)
  - What income is exempted?
- AGI to Taxable Income
  - What deductions are allowed?
- Determination of tax
  - Progressive rate schedule applied to taxable income
  - Credits subtracted from tax liability
    - Refundable vs non-refundable

# Personal Income Tax

- The US personal income tax system was implemented in 1913. In the early years, marginal rates were 1-7%, with most individuals at 4% or less.
- Basic personal income tax structure: Every April 15th, Americans file tax returns that compute liability on their previous years income.
- The first step is the computation of **adjusted gross income (AGI)**. AGI is total income from all taxable sources, less certain allowable costs incurred in earning that income.
- Sources of taxable income are primarily wages, dividends, interest, business and farm profits, rents, royalties and prizes, and can even include the proceeds from embezzlement.
- Note that **exemptions** and **deductions** decrease **taxable income**, not taxes owed. Tax credits decrease taxes owed, not taxable income. Therefore \$1 of **exemption** or **deduction** is worth less than \$1 of **tax credit**.


TAX BASE
Include wages and compensation, interest, dividends, capital gains (or loss), business income (or loss), pensions, farm income (or loss), rents, royalties, Social Security benefits, etc.
Income base does not include employer contributions to health and retirement plans, returns to tax-preferred savings accounts, unrealized capital gains, interest on state and local bonds, imputed rent from owning a home and other durable goods, in-kind services, gifts, and inheritances
Trade or business expenses, moving expenses, educator expenses, self-employed health insurance premium payments, student loan payments, tuition and fees alimony paid, etc.
Subtract "Above-the-line" Deductions
ADJUSTED GROSS INCOME
Subtract Exemptions
Phaseout with income
Charitable contributions, home mortgage interest, state and local taxes, medical expenses in excess of 7.5% of AGI, casualty and theft losses, nonreimbursed employee expenses
Compare Larger of: Standard Deduction or Itemized Deductions
Differs by filing status
Single or married filing separately
Head of household
Married filing jointly or qualifying window(er)
Phaseout with income
TAXABLE INCOME
Six ordinary rates (10%, 15%, 25%, 28%, 33%, 35%)
Child tax credit, additional child tax credit, EITC, HOPE and Lifetime Learning credit, electric vehicles credit, foreign tax credit, health coverage tax credit, adoption credit, mortgage interest credit, retirement savings contribution credit, child and dependent care credit, credit for the elderly or the disabled, D.C. First-Time homebuyer's credit, etc.
Apply Tax Rates
Tax schedule differs by filing status
Special rates for dividends and capital gains
TAX LIABILITY BEFORE CREDITS
Subtract Tax Credits
Phaseout with income
REGULAR TAX LIABILITY
(Start over to determine AMT tax liability using AMT base. Pay tentative AMT liability in excess of regular tax liability.)
Pay Tax or Claim Refund
Incur additional compliance, administration, and efficiency costs

# Definition of Income

- The legal standard: The constitutional amendment allowing an income tax in 1913 states "The Congress shall have power to lay and collect taxes on incomes, from whatever source derived." "from whatever source derived" does not specify a particularly clear standard for taxable and excluded income.
- Economists typically use the **Haig-Simons (H-S) criterion**: Income is the money value of the net increase in an individual's power to consume during a period.
- The H-S criterion includes all sources of potential consumption increases, regardless of whether and in what form the consumption takes place.
- Additionally, the H-S criterion requires that any decrease in an individual's potential to consume be subtracted in determining income. For example, if Sylvia freelances as a web designer and earns $35,000 in 2007, but the cost of hardware, software, and office materials to maintain her business in 2007 are $5000, then the H-S criterion says her actual 2007 income is $30,000.

# Excludable forms of income

- Interest on state and local bonds: Interest earned by taxpayers on bonds issued by state and local governments is tax exempt. There is no reason for this to be true under the H-S income definition. The justification for this exemption is that it helps state and local governments to borrow money.
- If $t$ is an investors marginal tax rate and $r$ is the rate of return on taxable investments, she is willing to purchase nontaxable bonds with rates of return $\geq (1-t)r$. This lets state and local governments **borrow money at lower rates**.
- Capital gains: Increases in the value of an asset are called **capital gains**, decreases in its value are **capital losses**. For example, if Bill owns \$10,000 in General Electric stock and the stock price goes up until Bill's stocks are worth \$12,500, then Bill has had a \$2,500 capital gain. If Bill then sells the stock, we call the gain **realized**. If he does not sell the stock it is **unrealized**.
- Similarly, if Adam owns \$10,000 in Enron stock, and its stock price drops until Adam's holdings are worth \$5, then Adam has had a capital loss of \$9,995. By the H-S criterion, this capital loss must be subtracted in determining his income.

# Capital Gains

The treatment of capital gains for income tax purposes differs in three ways from the H-S criterion:

1. Capital gains are taxed at preferential rates. While 2014 marginal tax rates on other income, like wages, go as high as 39.6%, the max marginal rate on capital gains goes only as high as 20%, as long as the asset was held at least 1 year.
2. Only realized gains are taxed; taxes are not paid on the appreciation of an asset until the asset is sold.
    - This may seem like a minor issue, but actually it's a big one in terms of the taxes it allows long-term investors to avoid.
3. There is a "**basis step-up**" at death.
    - Gains not realized at death: If Jonathan has an asset worth \$1,000 an it appreciates to \$1,200 and then he dies, the \$200 capital gain is not subject to income tax. Further, when his heir Cassandra sells the asset, her taxes are calculated as if she initially bought it for \$1,200.

# Capital Gains (2)

The treatment of capital gains is consistent with H-S in that:

- Capital losses can offset capital gains.
  - Suppose Adam had \$14,000 of capital gains from some Microsoft stock, but \$9,995 in losses from his Enron stock. He could offset gains with losses, yielding a net taxable capital gain of \$4,005.
  - This offset is consistent with the H-S criterion.

# Capital Gains: Realizations

If Anne purchases an asset for \$100,000 and it increases in value at 12% a year,

- after 1 year it's worth: $\$100,000 \times (1 + 0.12) = \$112,000$
- after 2 years it's worth:
  $\$112,000 \times (1 + 0.12) = \$100,000 \times (1 + 0.12)^2 = \$125,440$

Anne's pre-tax capital gain is \$25,440 if she sells after 2 years. If the capital gains tax rate is 20%, she pays \$25,440 x .20 = \$5,088 in taxes and has an after-tax gain of \$20,352.

If Anne purchased the same \$100,000 asset with the same 12% rate of return, but the gains were taxable as they occurred whether or not they were realized,

- after 1 year and the 1st year's tax it's worth:
  $\$100,000 \times (1+0.12) - (\$12,000 \times 0.20) = \$112,000 - \$2,400 = \$109,600$
- after 2 years and the 1st & 2nd years' taxes, it's worth:
  $\$100,000 \times (1 + r(1 - t))^2 = \$100,000 \times (1 + 0.096)^2 = \$120,122$

Anne in this case realizes a gain of only \$20,122.

The difference here seems small, but compounded annually over many years the difference in after-tax returns to investors can be very large. Over 20 years at 12% with an initial investment of \$100,000 the difference is more than \$150,000.

# Capital Gains: Realizations (2)

For the above reasons, a tax accountant's mantra is "taxes deferred are taxes saved".

- Economists have found evidence of a **lock-in effect** of the capital gains tax [eg Burman & Randolph 1993].
- "Lock-in" is where investors hold an asset longer than they otherwise would because they want to defer capital gains realizations

# Rationalizations for preferential treatment of capital income?

- Preferential treatment is needed to stimulate saving and risk taking by investors, which contributes to economic growth. (it is empirically unclear whether the preferential capital gains tax increases saving or risk taking.)
- The US tax system does not allow for the adjustment of asset values from nominal to real $s, causing inflation to lead to the over-taxing of capital assets. Preferential rates serve to offset the implicit taxation of capital through the failure of the tax system to index assets for inflation. (more on this later)
- Corporate income tax & "double taxation"

# Tax Favored Savings

Employers' contributions to employees' retirement funds, the interest on those funds and employer contributions to employees' medical insurance plans are untaxed.

Note that payments out of retirement funds when workers retire *are* usually taxed.

# Tax Favored Savings (2)

Some types of saving are tax-favored. They include:

- Individual Retirement Account (IRA), in which a worker without a pension at work can deposit up to $5000/yr. Single (married) workers with pensions and with AGIs less than $53,000 ($85,000) can also participate. Contributions are taken out of the AGI, and so are completely tax deductible. Interest in the accounts accrues untaxed, and account funds are only taxed when they are withdrawn at retirement.
- A Roth IRA is like an IRA, with a $5,000 permitted contribution. However, the contribution is not tax deductible. Singles (married couples) with annual incomes less than $101,000 (159,000) are fully eligible for the Roth IRA, and contributions grow untaxed. There is no tax on withdrawals at retirement.
- An employee (of a participating employer) can contribute up to $15,500 of pre-tax income to a 401(k) plan.
- Education IRAs and accounts in State 529 programs - like Roth IRAs except withdrawals used to pay for childrens higher education expenses.

# Exemptions and Deductions

- Exemptions: Families are allowed an exemption for each member. The exemption is $3,900 in 2013. Exemptions are phased out for very high income families.
  - Why are there exemptions?
    1. Exemptions adjust our measure of ability to pay for the presence of children.
    2. Exemptions make the US tax system more *progressive*.
- Deductions: The other subtraction from AGI is the family's **deduction**. Two sorts of deductions are allowed: the **itemized deduction** and the **standard deduction**. Taxpayers may take one or the other, not both.

# Itemized Deductions

- Unreimbursed medical expenses $>$ 7.5% AGI.
- State and local income and property taxes.
  - The argument is that these are nondiscretionary decreases in ability to consume. These can only be taken by itemizers. In some sense, this represents another subsidization of state & local governments in the tax code.
- Certain Interest Expenses.
  - Student loan interest
  - Mortgage interest for the purchase of up to 2 homes up to $1 million, interest on home equity loans up to $100,000
  - Interest on some loans to support the purchase of financial assets are deductible, with some limitations.
- Charitable contributions.
  - Individuals can deduct charitable contributions made to religious, charitable, educational, scientific or literary institutions of up to 50% of AGI.
- Theft and Casualty Losses
- Job Expenses

# Issues with Itemized Deductions

- Since the value of the deduction increases with your tax rate it also increases with income which makes them regressive.
- Itemized deductions are reduced by 2% of the amount by which AGI exceeds $166,800, up to a max of 80% of deductions. Clearly, this makes itemized deductions less regressive.

# Other itemized deduction issues:

- Deductibility and relative prices.
  - If expenditures on commodity $Z$ are deductible, then the after-tax price of $Z$ is $(1-t) * Z$'s market price, where $t$ is the taxpayer's marginal rate.
  - Suppose $Z$ costs \$10, but Luke's marginal tax rate is 31%. Then Luke's after-tax price of $Z$ is \$6.90. In general, if $Z$'s price is $Pz$, then allowing $Z$ to be deductible lowers its effective price for *itemizers* from $Pz$ to $(1-t)Pz$.
- **Tax arbitrage**. When taxpayers exploit facets of the tax code to increase their incomes, this is tax arbitrage.
  - One example: the combination of the deductibility of interest combined with the exemption of certain types of capital income from taxation.
    - Suppose Dennis has a marginal rate of 31% and can borrow money from the bank at a 15% interest rate.
    - As long as this interest satisfies deductibility criteria, Dennis's effective interest rate is 10.4%.
    - If the going rate of return on tax-exempt state & local bonds is 11%, then Dennis can borrow from the bank, invest in state and local bonds and make money.
    - Dennis has used the tax system as a money-making machine.

# Standard Deduction

- Standard deduction:
  - The standard deduction was introduced in 1944 to simplify the tax system.
  - It's a fixed deduction available to all taxpayers, and in 2013 it is $12,200 for couples and $6,100 for singles.
  - Its indexed to inflation
  - Taxpayers may either itemize or take the standard deduction.
  - About 2/3s of returns take the standard deduction.

# 2010 Individual Tax Rates

**If your filing status is Single**

| Taxable Income | | |
|---|---|---|
| Over --- | But not over --- | Marginal Rate |
| $0 | $8,375 | 10% |
| $8,375 | $34,000 | 15% |
| $34,000 | $82,400 | 25% |
| $82,400 | $171,850 | 28% |
| $171,850 | $373,650 | 33% |
| $373,650 | and over | 35% |

**If your filing status is Married filing jointly**

| Taxable Income | | |
|---|---|---|
| Over --- | But not over --- | Marginal Rate |
| $0 | $16,750 | 10% |
| $16,750 | $68,000 | 15% |
| $68,000 | $137,300 | 25% |
| $137,300 | $209,250 | 28% |
| $209,250 | $373,650 | 33% |
| $373,650 | and over | 35% |

# 2013 Individual Tax Rates

| Tax rate | Single filers | Married filing jointly or qualifying widow/widower | Married filing separately | Head of household |
|---|---|---|---|---|
| 10% | Up to $8,925 | Up to $17,850 | Up to $8,925 | Up to $12,750 |
| 15% | $8,936-$36,250 | $17,851-$72,500 | $8,936-$36,250 | $12,751-$48,600 |
| 25% | $36,251-$87,850 | $72,501-$146,400 | $36,251-$73,200 | $48,601-$125,450 |
| 28% | $87,851-$183,250 | $146,400-$223,050 | $73,201-$111,525 | $125,451-$203,150 |
| 33% | $183,251-$398,350 | $223,050-$398,350 | $111,526-$199,175 | $203,151-$398,350 |
| 35% | $398,351-$400,000 | $398,351-$450,000 | $199,176-$225,000 | $398,351-$425,000 |
| 39.6% | $400,001 or more | $450,001 or more | $225,001 or more | $425,001 or more |

# Tax Credits

- Foreign Tax Credit
- Child and Dependent Care
- Education Tax Credits (AOTC)
- Child Tax Credit
- General Business Credit
- Earned Income Tax Credit

# Taxes and Inflation

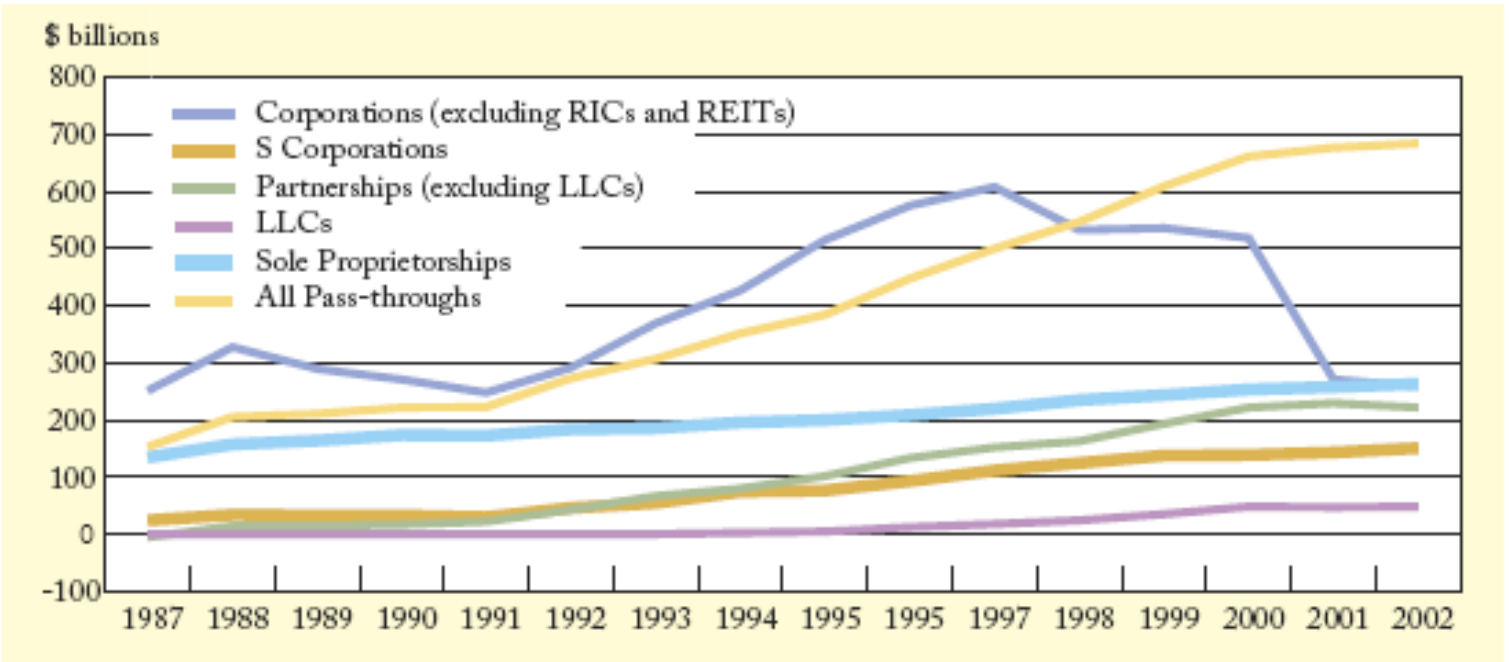
- Among the major changes in the 1986 tax reform was the indexation of most tax parameters for inflation as measured by the CPI.
- What would happen without indexation? For starters, we'd have the problem of **bracket creep**. If taxpayers' incomes increased at the same rate as the overall price level, then their **real incomes**, or purchasing power increases with a given year's earnings, would not have changed. Their **nominal incomes**, the number of $'s earned, would go up. If our tax system fixed income brackets in nominal terms, with no provision for them to respond to inflation, then bracket creep, in which the same income in real terms climbs into higher and higher tax brackets over time, would result.
    - Note that we still have "real" bracket creep.
- Exception to this rule is the AMT which was not indexed until 2013

# Current Tax System (2)

- Business tax
  - Corporate tax
  - Pass-Through entities
    - Schedule C (sole proprietors)
    - Schedule F (farms)
    - Partnerships
    - S corps
- Tax exempts
  - UBIT (Unrelated Business Income Tax)

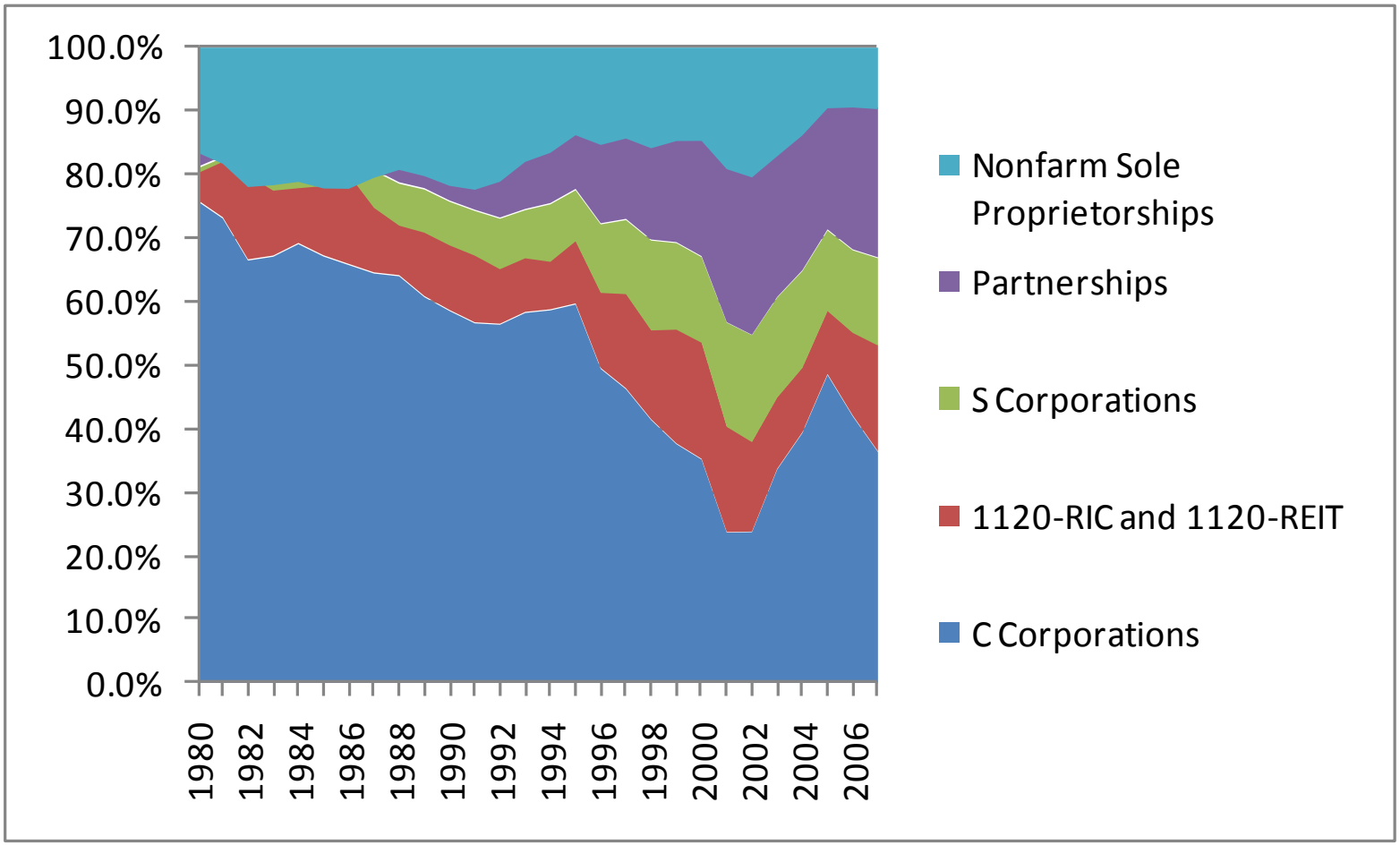
# Change in Business Organization

**Figure 5.12. Business Net Income by Legal Entity (1987-2002)**




Source: Internal Revenue Service, Office of Research, Analysis, and Statistics.

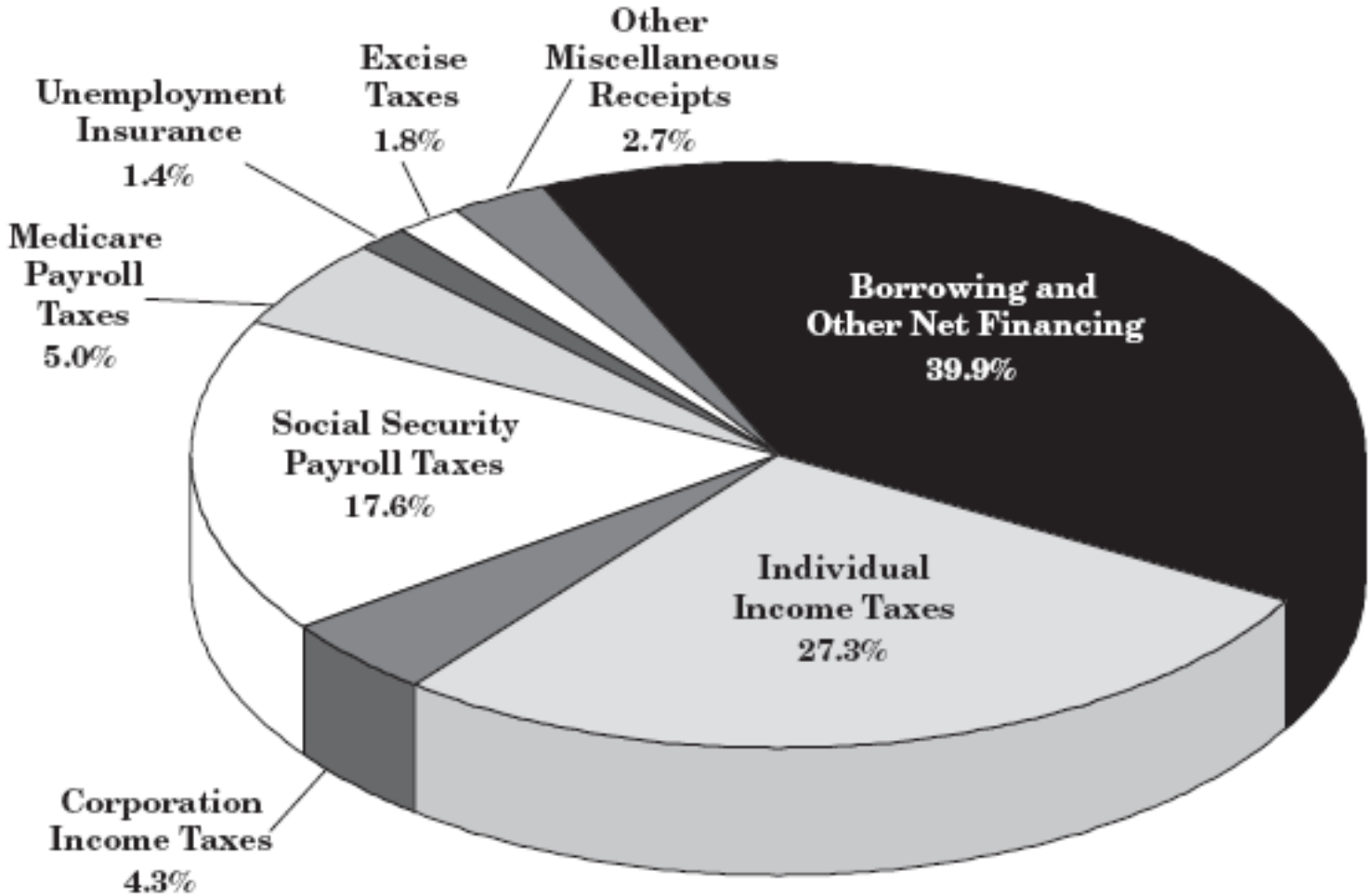
# Changes in Business Organization Shares of Net Income less Deficits (tabulated from SOI data)



# Current Tax System (3)

- Other taxes
  - Social insurance and retirement
    - Social Security's Old-Age, Survivors, and Disability Insurance (OASDI)
    - Medicare's Hospital Insurance (HI)
    - Unemployment Insurance (FUTA)
  - Excise taxes
  - Estate and gift taxes
  - Custom duties

# Policy Receipts by Source in 2010

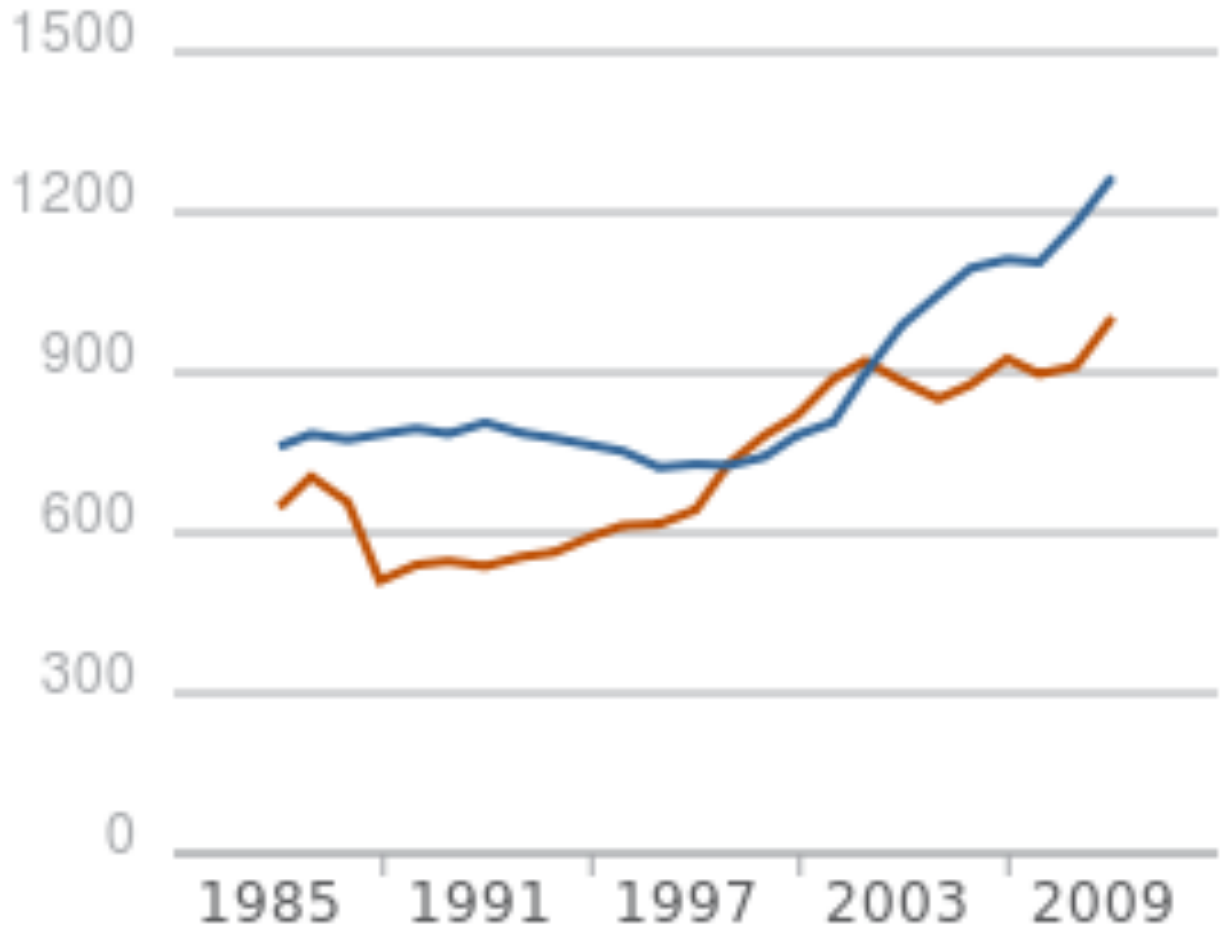


# Tax Expenditures

- Tax expenditures are ways to "spend money" through the tax code
- These provisions reduce the income tax liabilities of individuals or businesses that undertake certain types of activities.
- For instance, people who donate to charities often deduct their donations on their tax returns and thus reduce their income tax.
- The tax expenditure budget comprises the estimated revenue losses attributable to various exclusions, exemptions, deductions, nonrefundable credits, deferrals, and preferential rates in the tax code.
- The tax expenditure budget estimates the aggregate cost of this and other provisions. The Congressional Budget Act of 1974 requires that the budget include estimates for tax expenditures, but only for those provisions that affect the federal income taxes of individuals and corporations. The government could, but does not, formulate tax expenditure budgets for Social Security and other taxes.

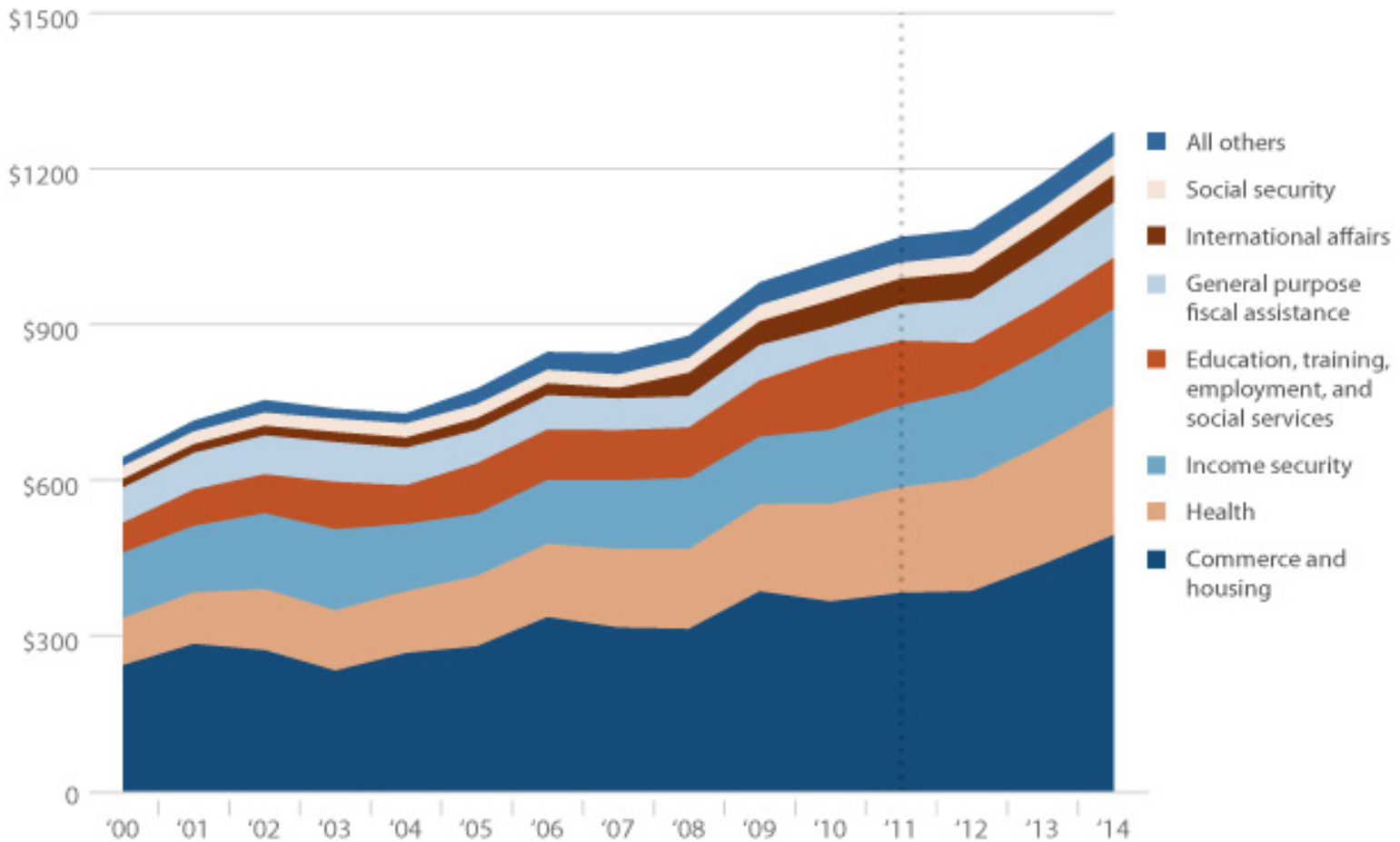
# Tax Expenditures (2)

Discretionary Outlays vs. Tax Expenditure Estimates in Constant Dollars($ billions) (blue line are tax expenditures)



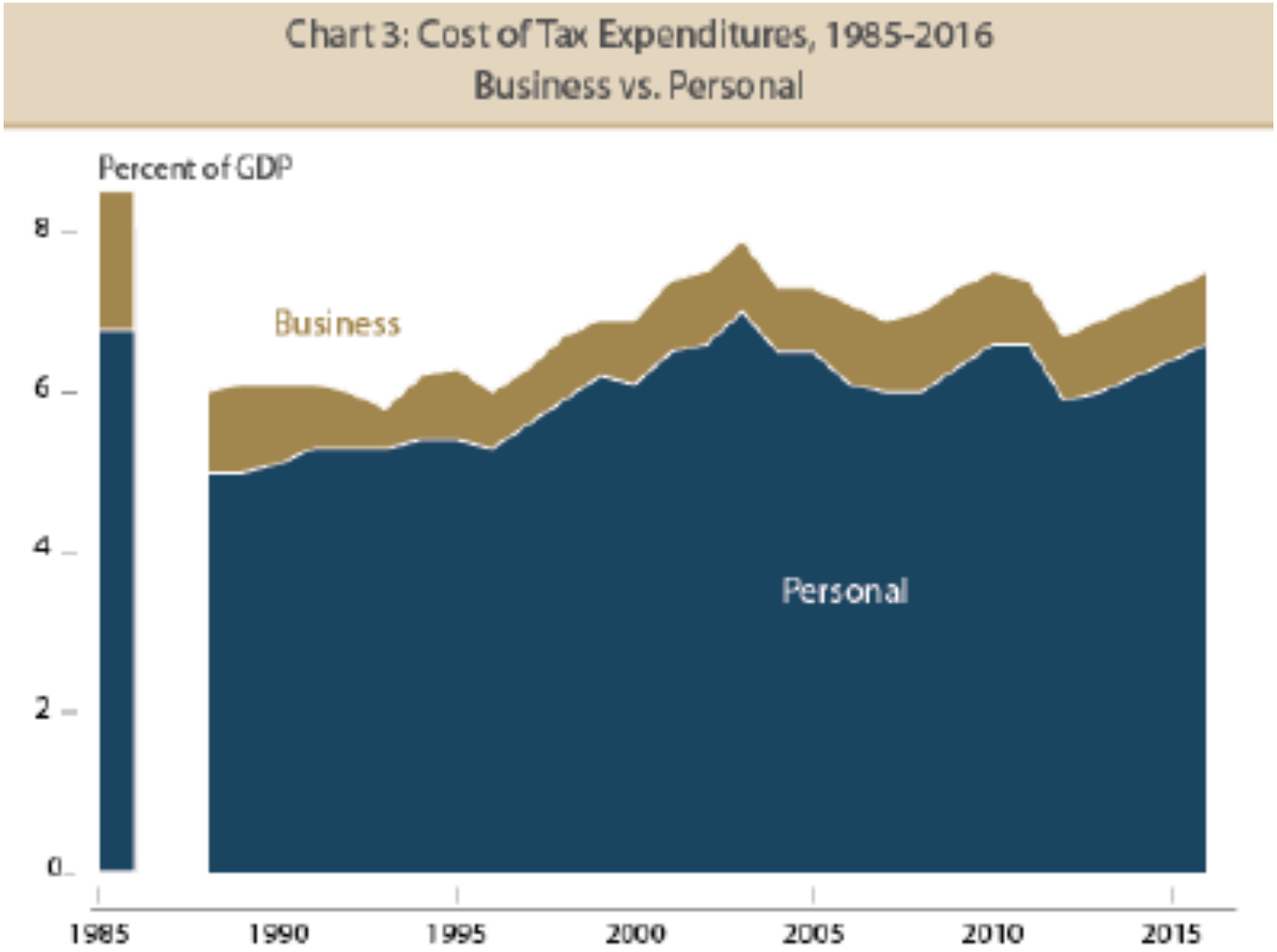
# Tax Expenditures (3)

Sum of Tax Expenditure Estimates ($ billions)



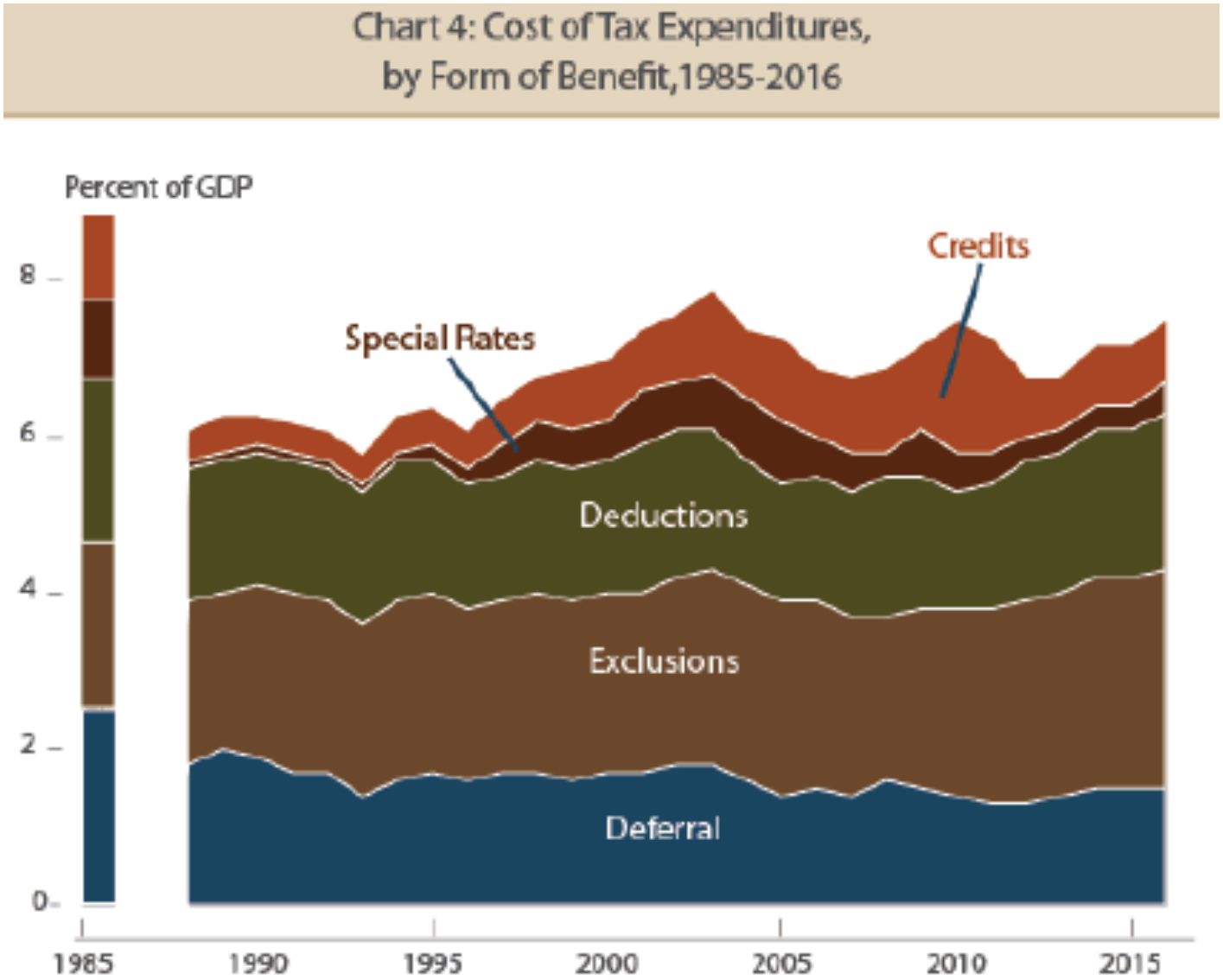
# Tax Expenditures, from TPC (4)

Treasury Estimates



# Tax Expenditures, from TPC (5)

Treasury Estimates



# Review of Welfare Economics

Recall what equilibrium looks like in a perfectly competitive world.

This is a world in which we make the following assumptions:

- Large numbers of buyers and sellers.
- No product differentiation.
- Perfect information.
- No barriers of entry or exit.

# Review of Welfare Economics (2)

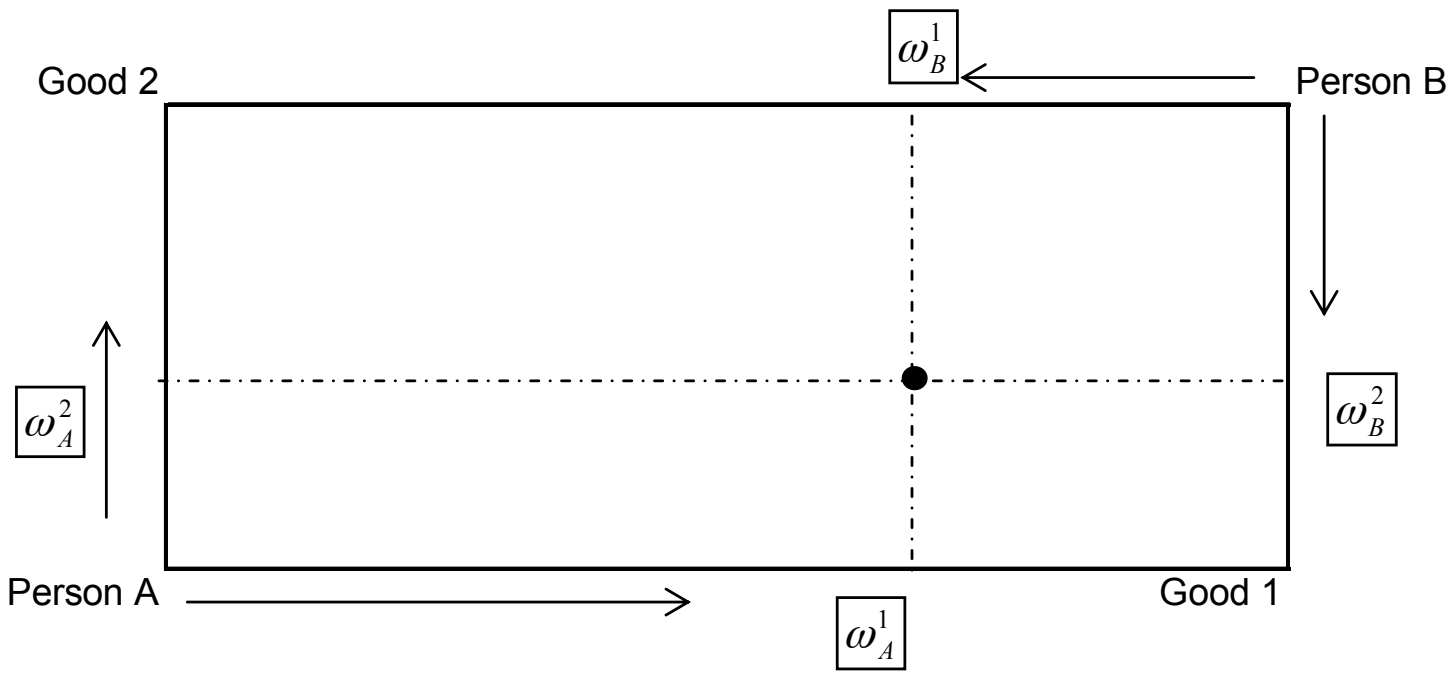
We also make the following technical assumptions:

- Preferences are convex and continuous.
- Consumption possibilities form a convex set.
- Non-satiation.
- Utility is a function of own consumption.
- Production depends only on own inputs.
- Aggregate production possibilities are convex.

# Review of Welfare Economics (3)

Taxation has implications for economic efficiency and resource (income) allocation - thus we start with general equilibrium analysis

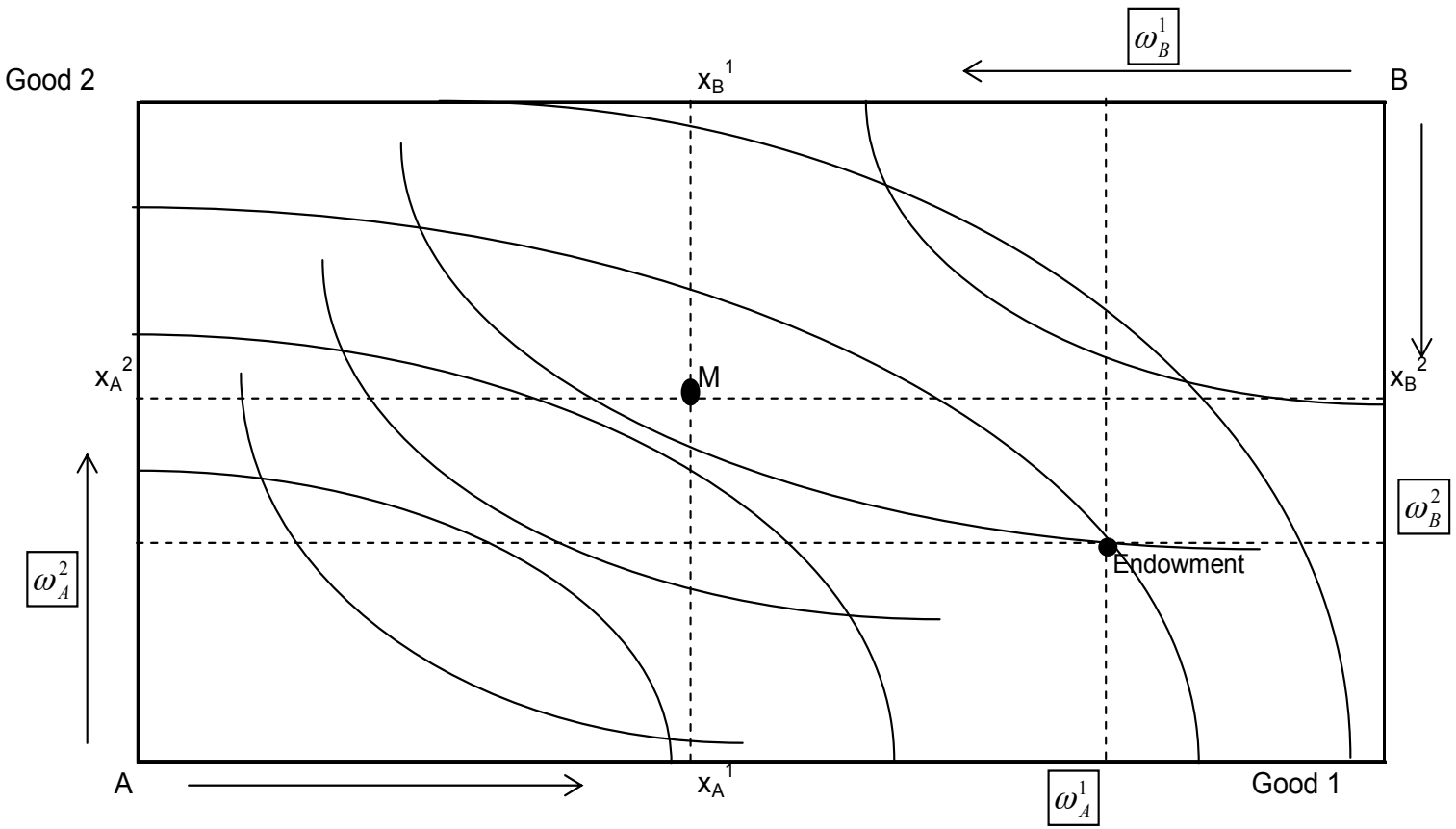
Edgeworth Box shows how 2 goods can be allocated between two individuals:



# Review of Welfare Economics (4)

Via trade the two individuals can try to each reach a higher indifference curve.

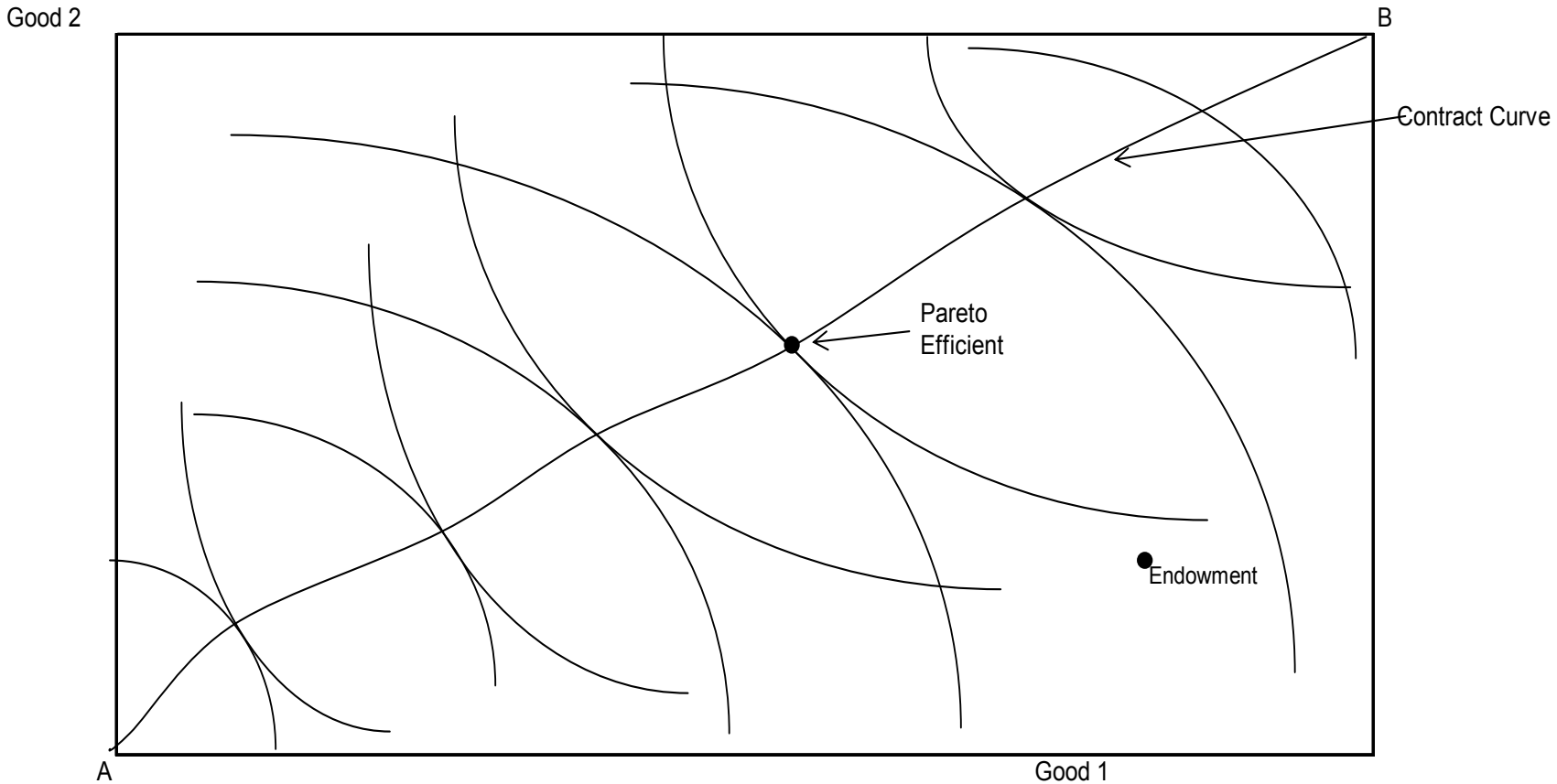
These trades are Pareto Improving in that they make everyone better off.



# Review of Welfare Economics (5)

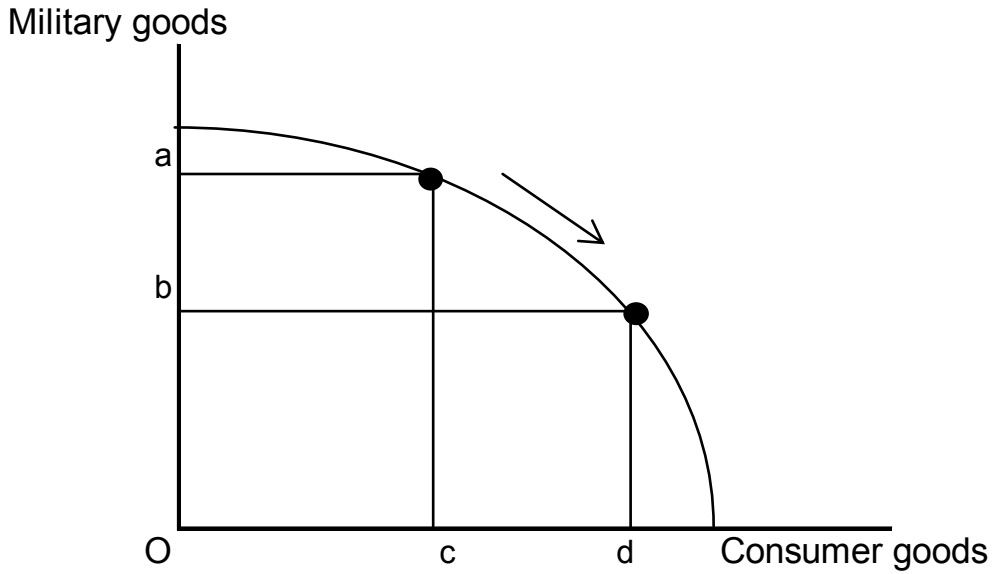
When there are no more potential trades we have a Pareto Efficient allocation on the contract curve.

The indifference curves are tangent: $MRS_A = MRS_B$



# Review of Welfare Economics (6)

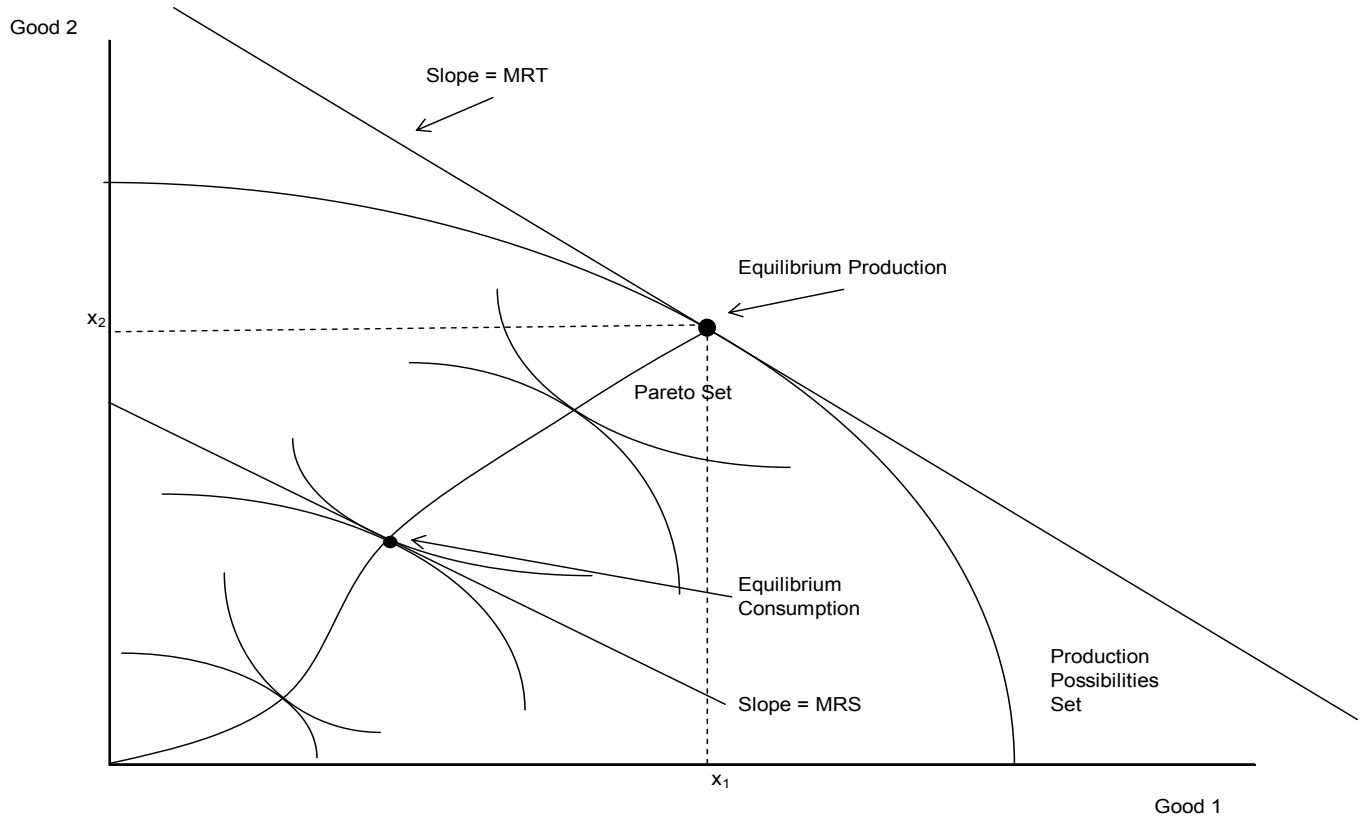
- Production Possibilities Frontier:
- To go from c to d you have to give up a-b; it is the opportunity cost
- Slope is the marginal rate of transformation: $MRT = MC_{cg}/MC_{mg}$




- Since resources are scarce there is a tradeoff in what goods can be produced.
- This tradeoff is shown with the production possibilities frontier.

# Review of Welfare Economics (7)

Putting consumption and production together shows the relationships that hold in general equilibrium (in a perfect world):



# Review of Welfare Economics (8)

- *First Fundamental Theorem of Welfare Economics*: a competitive market will exhaust all of the gains from trade.
  - An equilibrium allocation achieved by a set of competitive markets will necessarily be Pareto efficient.
  - Perfect competition "automatically" allocates resources efficiently.
  - Note that this says nothing about the distribution of resources.
- The implication is that if the market functions well enough to determine the competitive prices, all the consumer needs to know is prices of the goods, and he can determine his demands.
  - He doesnt need to know anything about how the goods are produced, or who owns what goods, or where the goods come from. An efficient outcome is ensured.

# Review of Welfare Economics (9)

- *Second Fundamental Theorem of Welfare Economics*: If all agents have convex preferences, then there will always be a set of prices such that each Pareto efficient allocation is a market equilibrium for an appropriate assignment of endowments.
  - The implication is that the problems of distribution and efficiency can be separated.
  - Prices play two roles in a market economy
    - An allocative role
    - A distributive role
  - The allocative role of prices is to indicate relative scarcity; the distributive role is to determine how much of different goods different agents can purchase.
  - So, the Second Welfare theorem says that these two roles can be separated: we can redistribute endowments of goods to determine how much wealth agents have, and then use prices to indicate relative scarcity.

# Review of Welfare Economics (10)

Implications for the study of taxation:

- Taxes change prices thus they can distort the allocative role of prices in a market economy
- Lump-sum taxes would not be distortionary (and only lump-sum taxation)
- Lump-sum redistributions (taxes and grants) could provide the second welfare theorem's reallocation of resources without harming market efficiency.

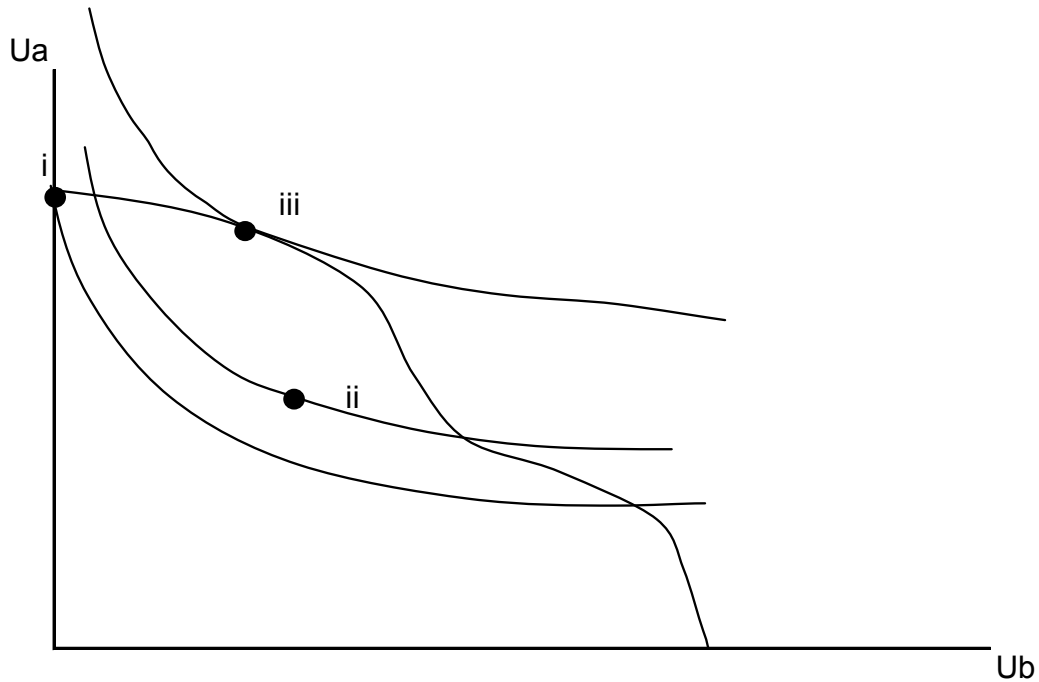
# Review of Welfare Economics (11)

Distribution of resources:

- What does Pareto efficiency have to say about the distribution of resources? *Nothing!*
  - It only says whether it is possible to reallocate in manner than everyone is made better off.
  - Redistribution of wealth is ruled out
- A Social Welfare Function is a statement of how a societys wellbeing related to the wellbeing of its members.
  - $W = f(U_A, U_B)$
  - It then allows one to derive social indifference curves

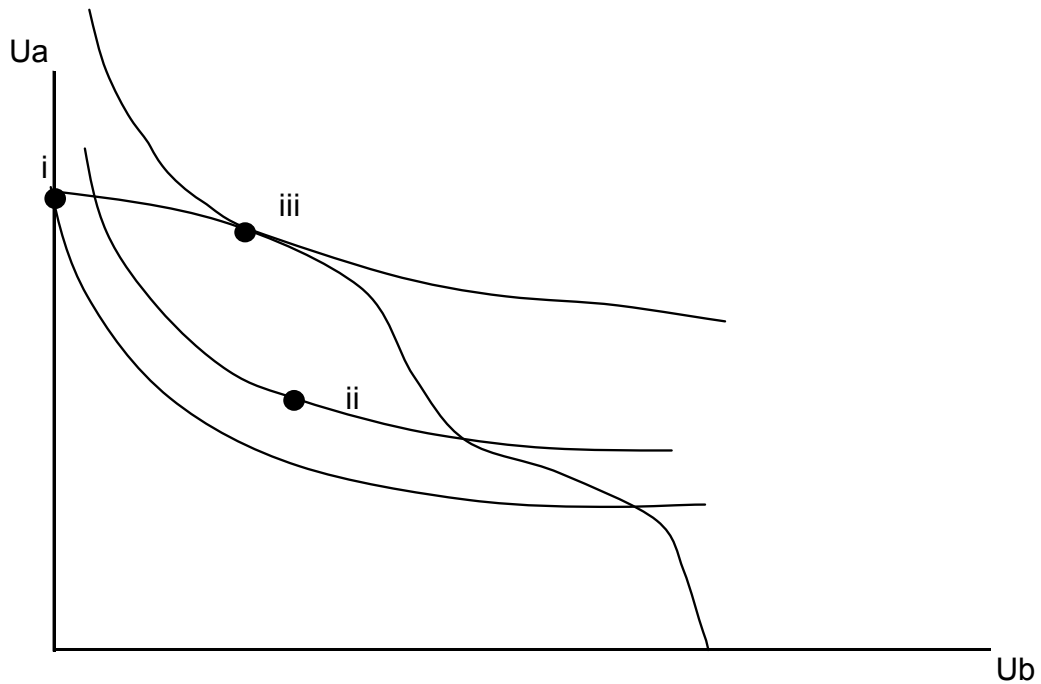
# Review of Welfare Economics (12)

- Utilities Possibility Frontier:
- A utility possibilities frontier describes the set of potential allocations (points on the contract curve) hence all are Pareto efficient but only one maximizes social welfare.



# Review of Welfare Economics (13)

- Utilities Possibility Frontier:
- Both points $i$ and $iii$ are efficient.
- However, Allocation $i < ii < iii$
- Note that allocation $ii$ is not on the utility possibilities frontier and therefore is not efficient. However, $ii$ is still valued more than allocation $i$ by the SWF.
- Allocation $iii$ is both efficient and "fair."



# Review of Welfare Economics (14)

- The First Welfare Theorem leads to some allocation on the utility possibilities curve. But this allocation may not maximize social welfare.
  - Thus, even if Pareto efficient, government intervention may be desirable.
  - Does this mean government must intervene in markets? *NO.* (Economists dont like to interfere with price ratios)
  - Again, as above with rearranging endowments, society need only redistribute income. Markets can to the rest.
  - However, not all markets are perfectly competitive.

# Review of Welfare Economics (15)

Theory of First and Second Best

- The first-best analysis is really the only way to analyze the particular allocation problems caused by breakdowns in the technical assumptions and market imperfections in and of themselves.
- If lump-sum redistributions/ taxes are feasible, then the problem of social welfare maximization dichotomizes into separate efficiency and distributional problems, exactly as discussed in the Second Welfare Theorem above.

# Review of Welfare Economics (16)

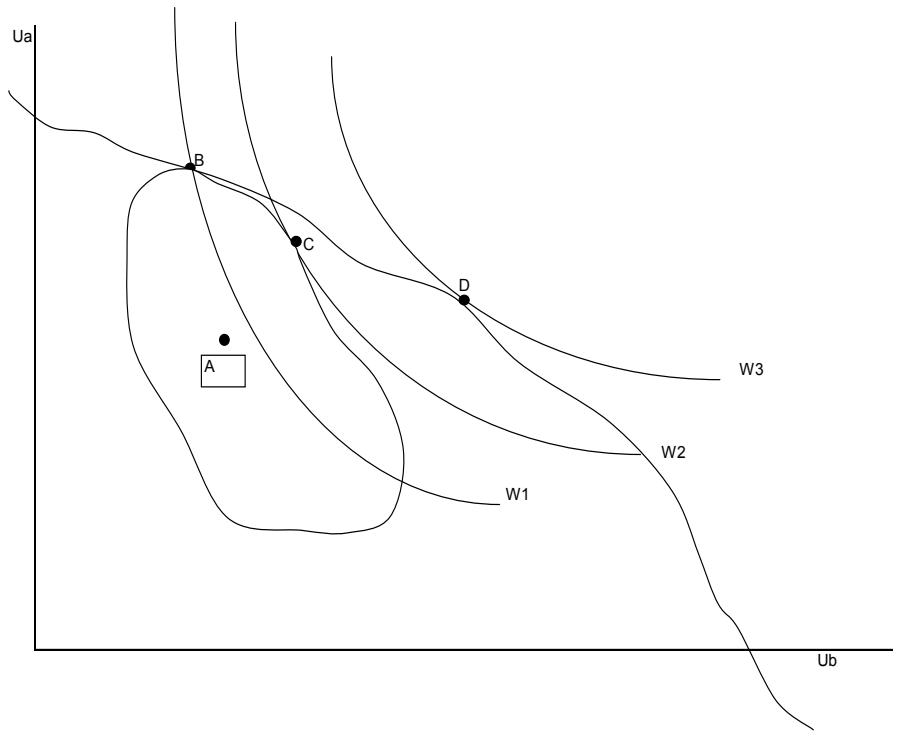
## Theory of the Second Best

- Realistically lump-sum taxes/transfers are not available to the government which changes the analysis drastically.
  - Suppose that the government chooses to redistribute income until social marginal utilities are equalized by using taxes and transfers that are not lump sum.
  - The redistribution necessarily introduces distortions into the economy because some consumers and/or producers now face different prices for the same good and/or factors.
  - Since consumers and producers equate relative prices to their marginal rates of substitution and transformation, and since Pareto optimality requires that $MRS = MRT$, some of the Pareto-optimal conditions no longer hold.
  - The redistribution forces the economy beneath its first-best utility-possibilities frontier.
- Implication is that the government shouldn't necessarily try to keep society on its first best utility possibilities frontier.
  - Other points may be superior; having higher social welfare.

# Review of Welfare Economics (17)

Suppose society is initially at point A:

1. If lump-sum redistributions were feasible and the world were otherwise first best, the government should design policies to restore full Pareto optimality and redistribute lump sum to achieve the bliss point, D.
2. In a second-best environment, without the ability to redistribute lump sum, the policy option that brings society to point B on the first-best frontier is dominated by another option that keeps society below the frontier, point C.
3. Point C is the maximum attainable level of social welfare given the restricted set of available options.
4. Point B is Pareto efficient, point C is not. But point C gives higher welfare.
5. Thus, in a second-best environment, society's efficiency and equity norms are completely interrelated. They cannot be pursued with separate policy tools, unlike in a first-best policy environment.



# Rational for Income Redistribution: Social Welfare Functions

- A social welfare function provides a way to "add together" different consumers' utilities.
- More generally, a welfare function provides a way to rank different distributions of utility among consumers.
- Just how do we "add together" the individual preferences to construct some kind of social preferences? In general we claim that utility is ordinal and hence not comparable across individuals but we still need some way to aggregate preferences.

# Rational for Income Redistribution: Social Welfare Functions (2)

Aggregation of Preferences

- Given two allocations (a description of what every individual gets of every good), X and Y, each individual i can say whether or not he or she prefers X to Y.
- If we then know individual rankings, we would like to be able to use this information to develop a social ranking of the various allocations.

# Rational for Income Redistribution: Social Welfare Functions (3)

**Method One: Voting**

- We could agree that X is "socially preferred" to Y if a majority of the individuals prefer X to Y.

| Person A | Person B | Person C |
|---|---|---|
| X | Y | Z |
| Y | Z | X |
| Z | X | Y |

One problem:

- A majority of people prefer X to Y
- A majority of people prefer Y to Z
- And a majority of people prefer Z to X.

  $\Rightarrow$ Voting doesn't work.

- Social preferences that result from voting arent well-behaved preferences, since they are not transitive.
- Since the preferences arent transitive, there will be no "best" alternative from the set of alternatives (X,Y, Z).
- Which outcome society chooses will depend on the order in which the vote was taken.

# Rational for Income Redistribution: Social Welfare Functions (4)

**Method Two: Rank-Order Voting**

- Each person ranks the goods according to his preferences and assigns a number that indicates its rank in his ordering.
  - For example, if 1 for the best, 2 for the second best, etc.
  - Then, we sum up the scores of each alternative and say that one outcome is socially preferred to another if it has a lower score.
- Suppose there are only two choices: X and Y.
  - Person 1 chooses X first, Y
  - Person 2 chooses Y first, X
  - Both X and Y have a score of 3 - - We are at a tie.
- Now, lets introduce a 3rd option, Z.
  - Person 1 chooses X first, Y second and Z third.
  - Person 2 chooses Y first, Z second, and X third.
  - Here, X has a total score of 4, Y has a total score of 3.
- **Here Y is preferred to X.**

# Rational for Income Redistribution: Social Welfare Functions (5)

- Neither solution is perfect.
- Majority voting can be manipulated by changing the order in which the vote occurs.
- Rank-order voting can be manipulated by introducing new alternatives that change the final ranks of the relevant alternatives.
- So, are there ways to "add up" preferences that don't have these undesirable properties?

# Rational for Income Redistribution: Social Welfare Functions (6)

- It turns out, there are three properties that a social decision mechanism must have.
  1. Given any set of complete (the consumer can make a choice between two bundles), reflexive (any bundle is at least as good as an identical bundle), and transitive (if X>Y and Y>Z, then X>Z) individual preferences, the social decision mechanism should result in social preferences that satisfy the same properties.
  2. If everybody prefers alternative X to alternative Y, then the social preferences should rank X ahead of Y.
  3. The preferences between X and Y should depend only on how people rank X versus Y, and not on how they rank alternatives.

# Rational for Income Redistribution: Social Welfare Functions (7)

**Arrows Impossibility Theorem:**

- **If a social decision mechanism satisfies properties 1, 2 and 3, then it must be a dictatorship: all social rankings are the rankings of one individual.**
- thus these three properties are inconsistent with a democracy.
- There is no perfect way to "aggregate" individual preferences to make one social preference.
- If we want to find a way to aggregate individual preferences to form social preferences, we will have to give up one of the properties of a social decision mechanism described in Arrow's theorem.

# Rational for Income Redistribution: Social Welfare Functions (8)

- If we drop property 3 - that the social preferences between two alternatives only depends on the ranking of those two alternatives - then certain kinds of rank-order voting become possibilities.
- Given the preferences of each individual $i$ over the allocations, we can construct utility functions, $u_i(X)$ , that summarize the individuals value judgments:
  - person $i$ prefers X to Y if and only if $u_i(X) > u_i(Y)$.
- These are just like all utility functions  they can be scaled in any way that preserves the underlying preference ordering.

# Rational for Income Redistribution: Social Welfare Functions (9)

- One way of getting social preferences from individuals' preferences is to add up the individual utilities and use the resulting number as a kind of social utility.
- We can say that allocation $X$ is socially preferred to allocation $Y$ if

$$\sum_{i=1}^{N} u_i(X) > \sum_{i=1}^{N} u_i(Y), \tag{1}$$

  where $N$ is the number of individuals in the society.
- This is called a "utilitarian" social welfare function (see Mill's *Utilitarianism*)
- This SWF, like any, is totally arbitrary. Our choice of utility representation is arbitrary, as is the choice of using the summation.

# Rational for Income Redistribution: Social Welfare Functions (10)

- One reasonable restriction that we might place on the "aggregating function" is that it be increasing in each individual's utility.
- That way we are assured that if everybody prefers X to Y, then the social preferences will prefer X to Y. This is a Social Welfare Function (SWF) something we introduced earlier. A social welfare function is just some function of the individual utility functions:

$$W(u_1(X), ..u_N(X)). \tag{2}$$

- It gives a way to rank different allocations that depends only on the individual preferences, and it is an increasing function of each individual's utility.

# Rational for Income Redistribution: Social Welfare Functions (11)

Examples:

1. One special case is the sum of the individual utility functions:

$$W(u_1, ..u_N) = \sum_{i=1}^{N} u_i. \tag{3}$$

   This is sometimes referred to as a classical utilitarian or Benthamite welfare function. Because its additive, increasing Social Utility without making anyone else worse off increases social welfare. Thus, government should redistribute such that $W$ increases.

# Rational for Income Redistribution: Social Welfare Functions (12)

2. A slight generalization of this form is the weighted-sum-of-utilities welfare function:

$$W(u_1, ..u_N) = \sum_{i=1}^{N} a_i u_i. \tag{4}$$

here, the weights, $a_1, ., a_N$ are supposed to be numbers indicating how important each agent's utility is to the overall social welfare function.

# Rational for Income Redistribution: Social Welfare Functions (13)

3. The Maximin Criterion.

$$W = min(u_1, u_2, ..., u_N) \tag{5}$$

   Social welfare depends on the person who has the lowest utility, called the Maximin Criterion, since the objective is to maximize the utility of the person with the lowest utility. Income distribution should be equal except to the extent that departures from equality benefits the worst off person. (see Rawls' *Theory of Justice*)
4. Pareto Efficient Income Distribution
   - Pareto Improvement - Change such that all individuals be at least as well off.