Personal Taxation and Behaviour

EC313 - Public Economics: Taxation

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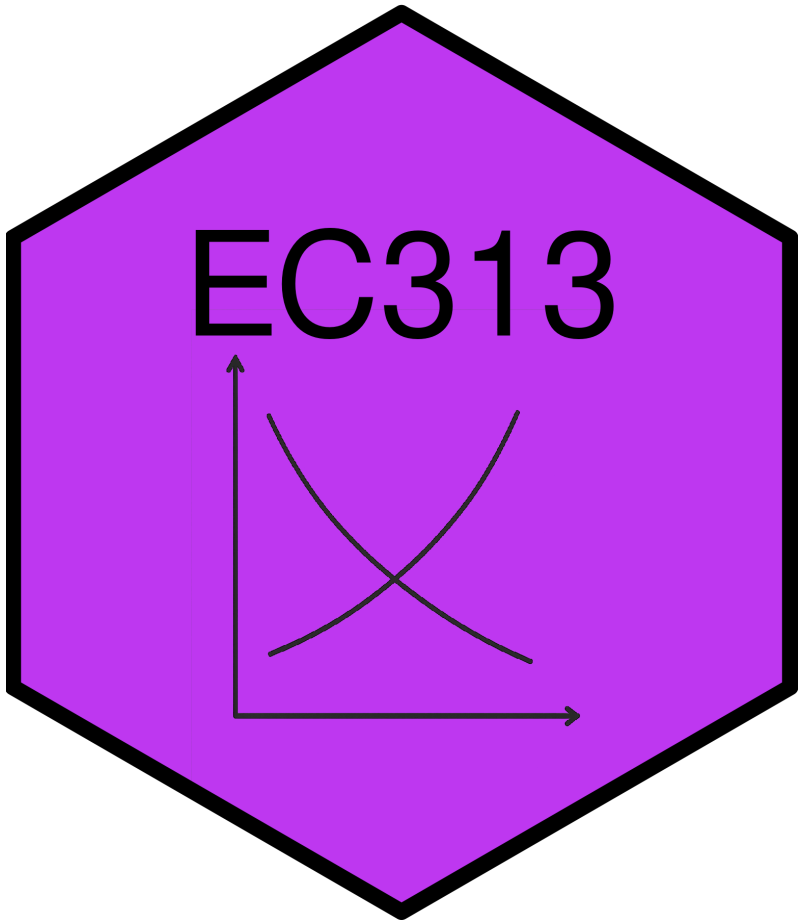

Goals of This Section

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- Examine the effect of income taxation on labour supply
- Analyze how labour supply is related to tax revenues with the Laffer Curve
- Look at how taxation affects saving behaviour
- Discuss the preferential tax treatment of primary residences in Canada
- Examine taxation and portfolio allocation

Taxation and Labour Supply

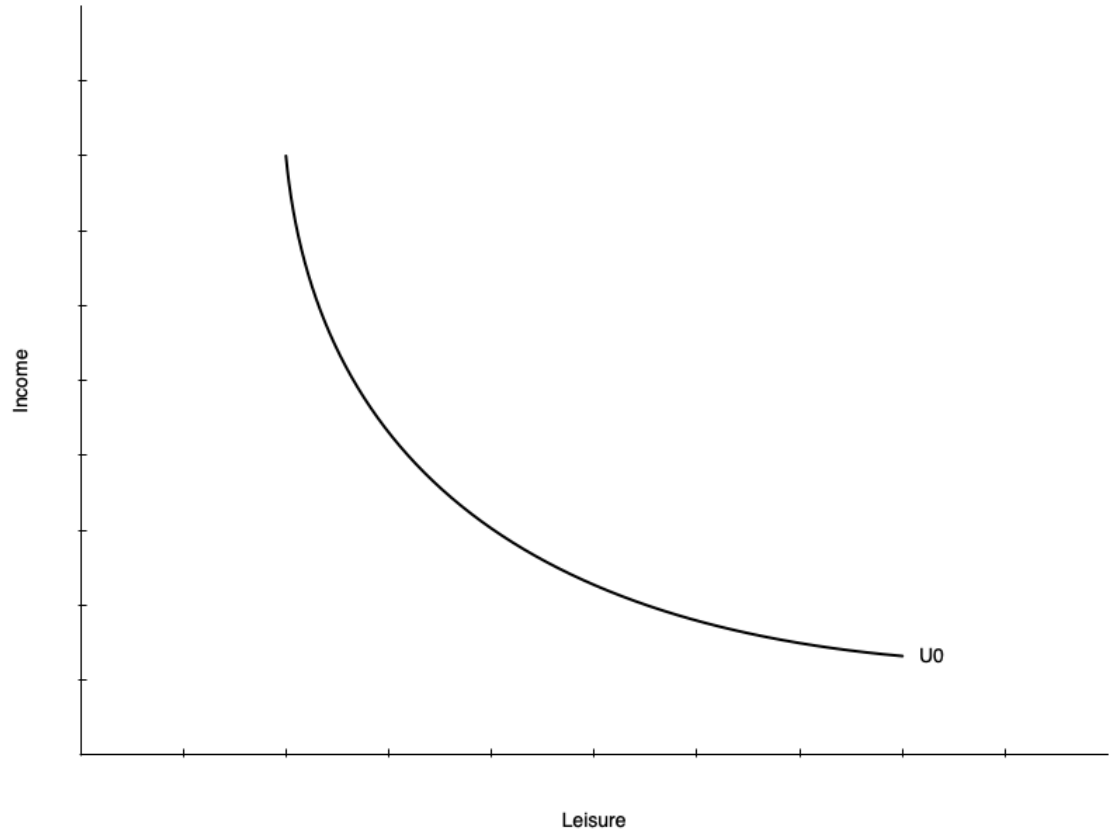
Introduction

- In this section we introduce a model we use throughout the course
- The model helps us understand how individuals make decisions about work
- Individual choose between two goods
  - Income
  - Leisure
- Choices are constrained by time and wage rate
- There are a few wrinkles that make this market unique

Preferences

- Individuals have preferences over Income (I) and leisure (L)
  - People like having income to consume goods/services
  - Also like having non-work time
    - Includes fun activities but also non-work tasks like chores, education, etc.
- The tradeoffs people are willing to make between I and L are represented by indifference curves
  - At every point along the curve the individual is equally happy
  - Curves further from the origin represent higher levels of utility

Preferences

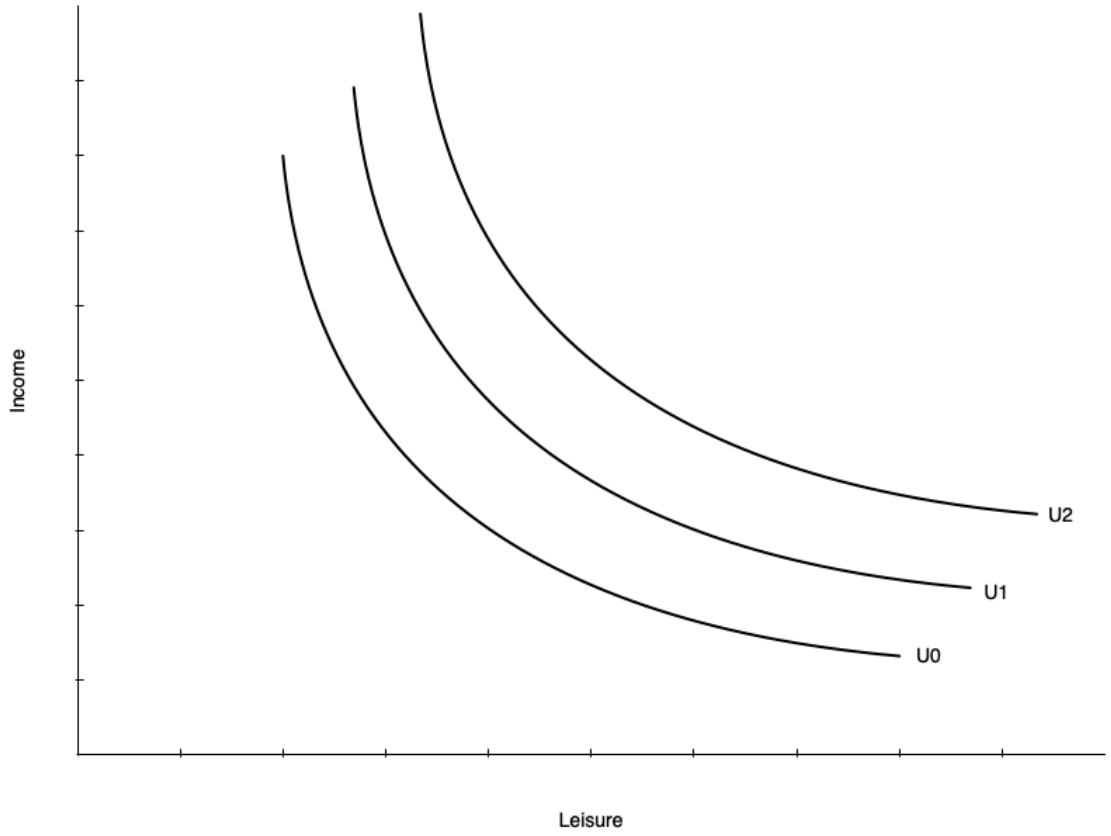


- On the left is a single indifference curve
- Any point represents equal utility (U_0)
- **Marginal Rate of Substitution (MRS)**: the rate at which a person is willing to trade income for leisure while remaining equally happy
- The MRS is the slope of the indifference curve at a point
- Individuals have diminishing MRS
  - Willing to give up less income for additional leisure the more leisure they already have
  - Slope gets shallower with more leisure

Preferences

- Indifference curves do not have to be smooth curves like the one shown
- Could be straight lines
  - Means the tradeoff between income and leisure is constant
  - Willingness to trade away leisure for income does not depend on leisure
- Could be “L” shaped
  - Income and leisure must be consumed in fixed proportions
- Mostly we will deal with smooth preferences

Preferences

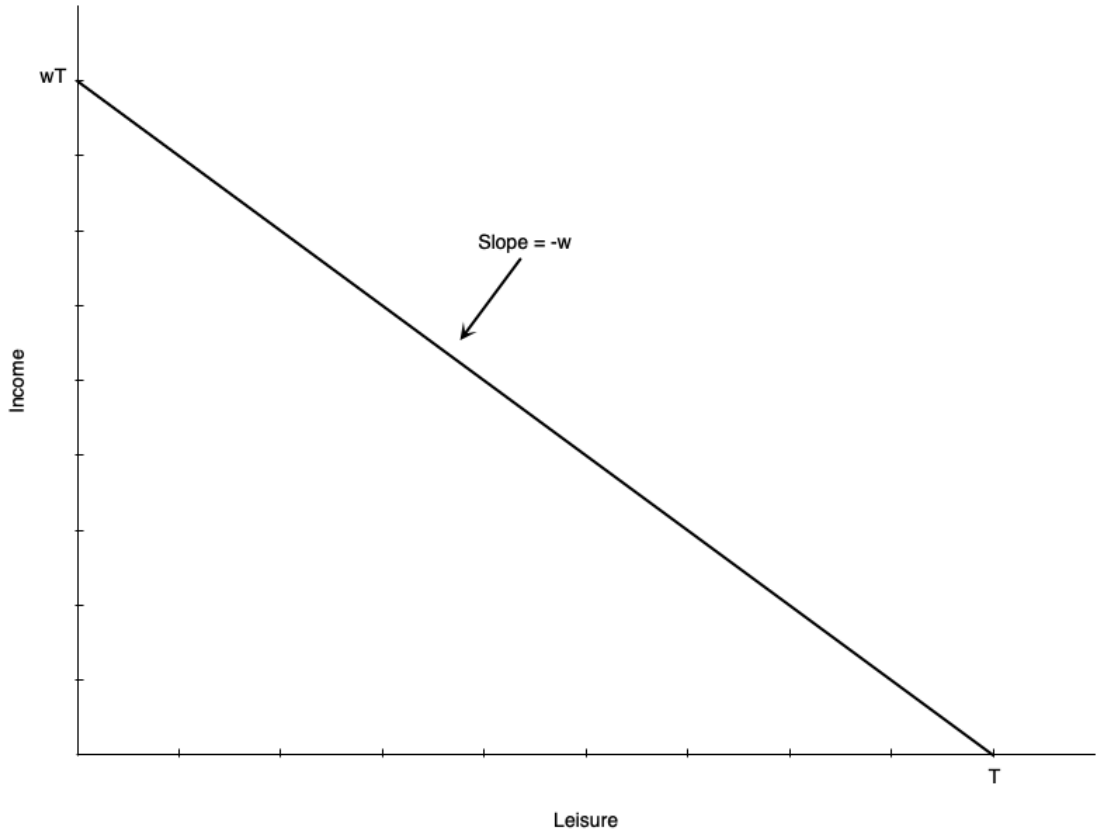


- Utility increases with curves further from the origin
  - $U_2 > U_1 > U_0$

Constraints

- Individuals do not choose income and leisure bundles on preference alone
- They are constrained by
  - The wage rate
  - Total number of hours available
- Budget constraint is also called
  - Potential income constraint
  - Full income constraint

Constraints



- Graph shows a linear budget constraint
- There are T total hours to allocate to work or leisure
- Each hour worked gets wage of w
- Person working T hours (no leisure) earns wT income
  - Called “full income”

Constraints

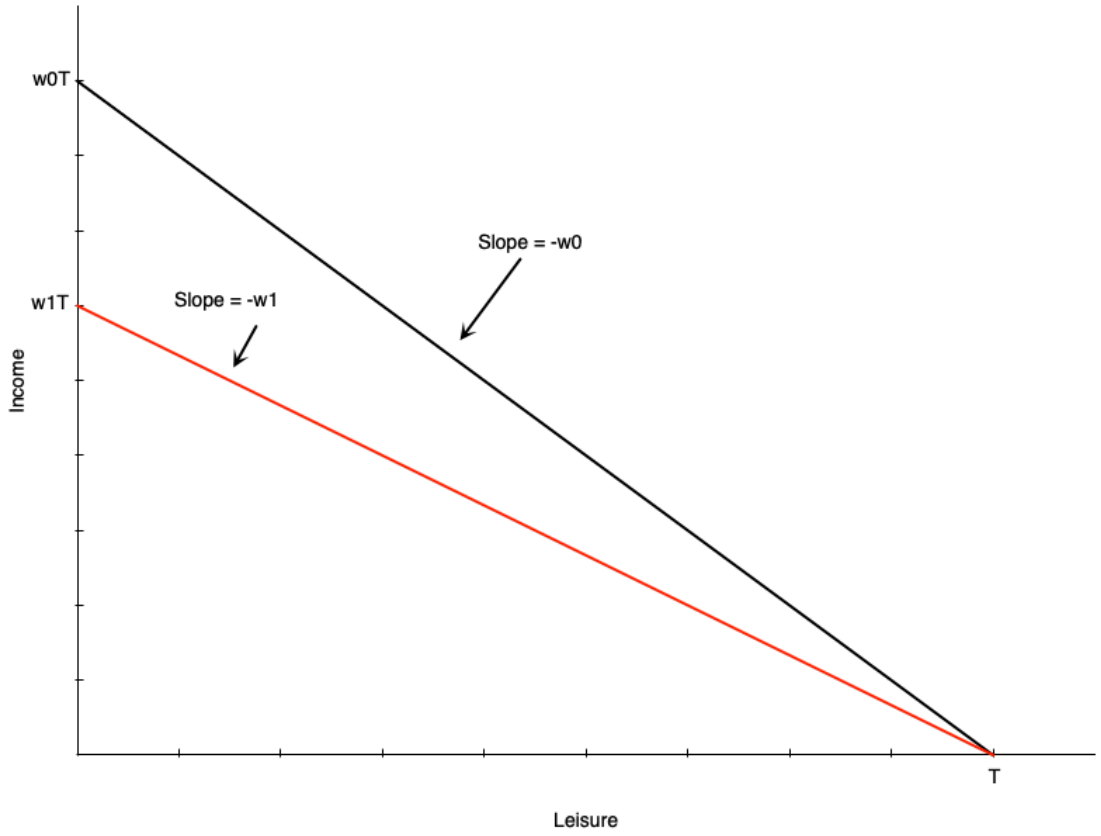
- Mathematically, the budget constraint is

$$I = w(T - L)$$

- Income is equal to income from working $(w(T - L))$

- The slope of the budget constraint is $-w$
  - The opportunity cost of leisure is the wage rate
  - Each hour of leisure means one less hour worked, which means w less income
- Someone who works zero hours has T leisure hours and no income
- Someone who works T hours has zero leisure hours and wT income

Constraints

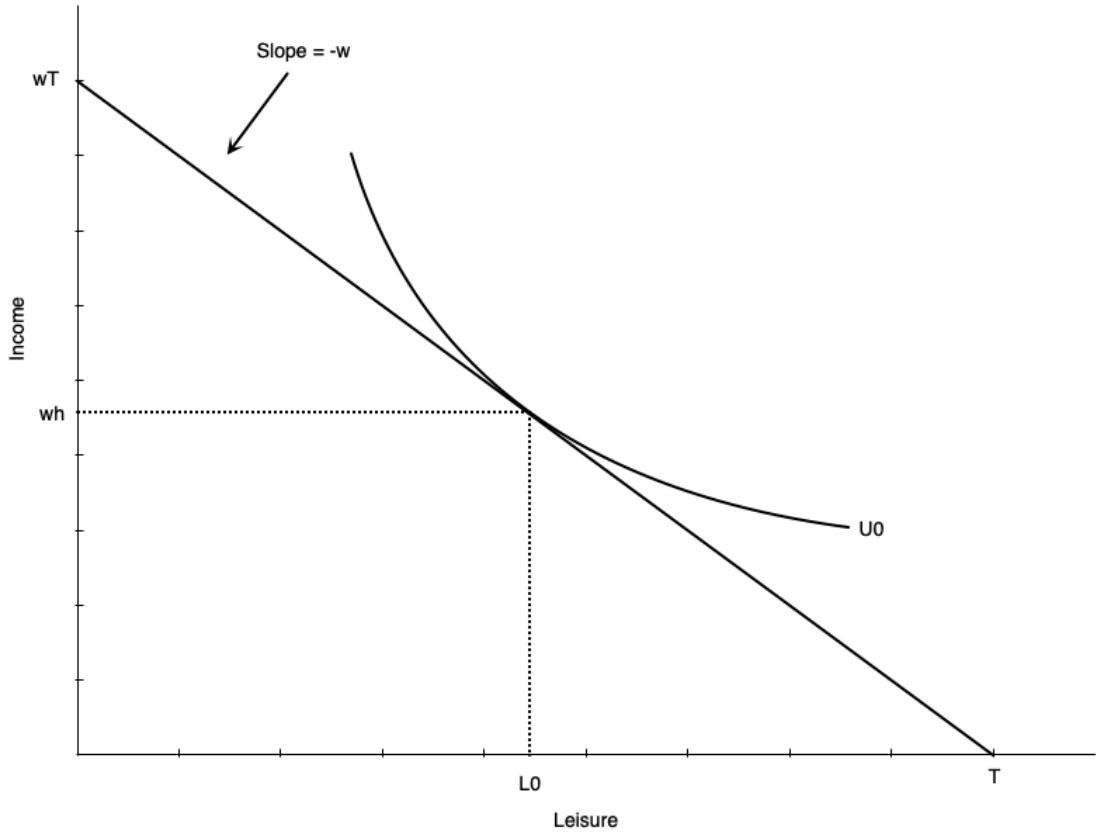


- Slope is the negative of the wage rate w
- A lower wage means shallower slope
  - If $w_1 < w_0$, the budget line swivels down
  - They intersect at leisure = T because there are no work hours
- Lower wage also means full income is lower
  - Working all hours leads to less total labour earnings

Consumer Optimum

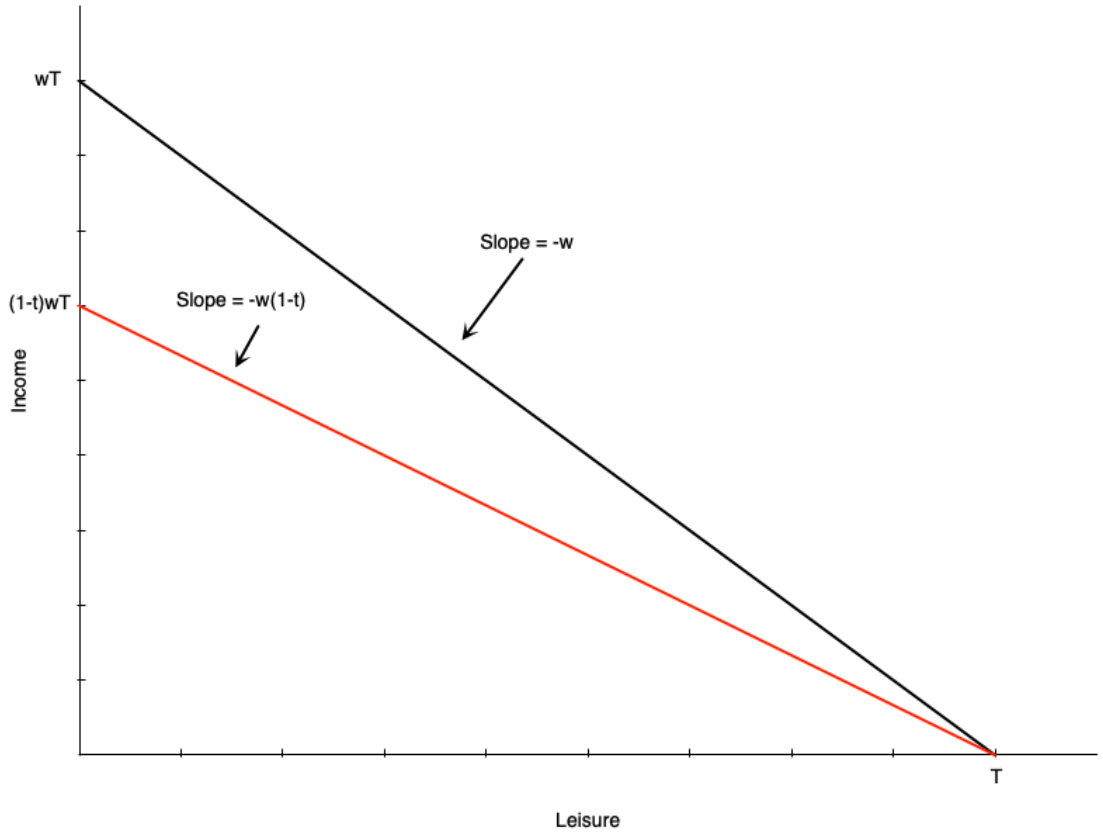
- Work hours are chosen using the combination of preferences and constraints
- The consumer optimum is the point that maximizes utility subject to the budget constraint
- The optimum occurs where the budget constraint is tangent to an indifference curve
- There are two possibilities for the optimum
  - Non-participation: optimum occurs at the end of the budget constraint (full leisure)
  - Participation: optimum occurs at an interior point (some leisure, some work)

Consumer Optimum



- Graph shows an optimum with participation
- Optimum is where indifference curve is tangent to budget constraint
- At the optimum, MRS = wage rate
  - Willingness to trade leisure for income (MRS) equals ability to trade them (wage)
- Optimal work hours are $h_0 = T - L_0$
- Optimal consumption is $I_0 = W_0 h_0$

Personal Income Tax

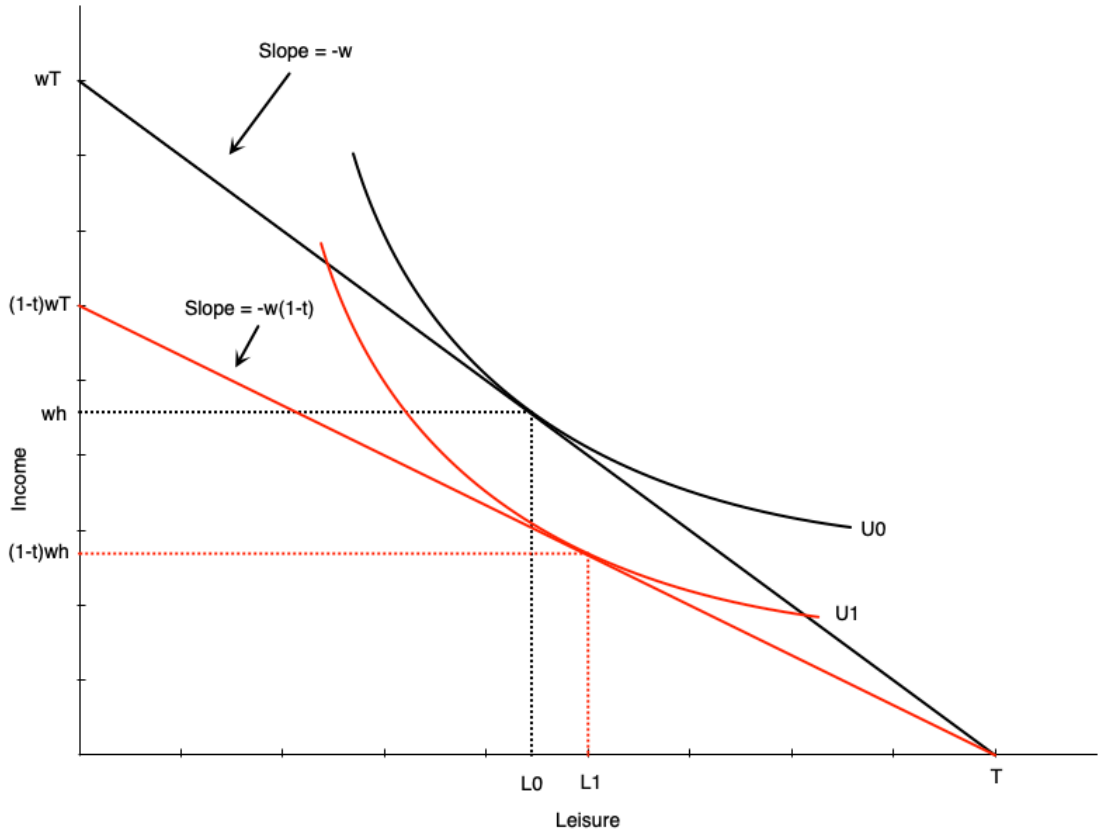


- The personal income tax affects the budget constraint
- Suppose a proportional income tax at rate t is introduced
- The after-tax wage is now $w(1-t)$
- Tax causes the budget constraint to pivot inward
  - Slope is now $-w(1-t)$
  - Full income is now $w(1-t)T$

Personal Income Tax

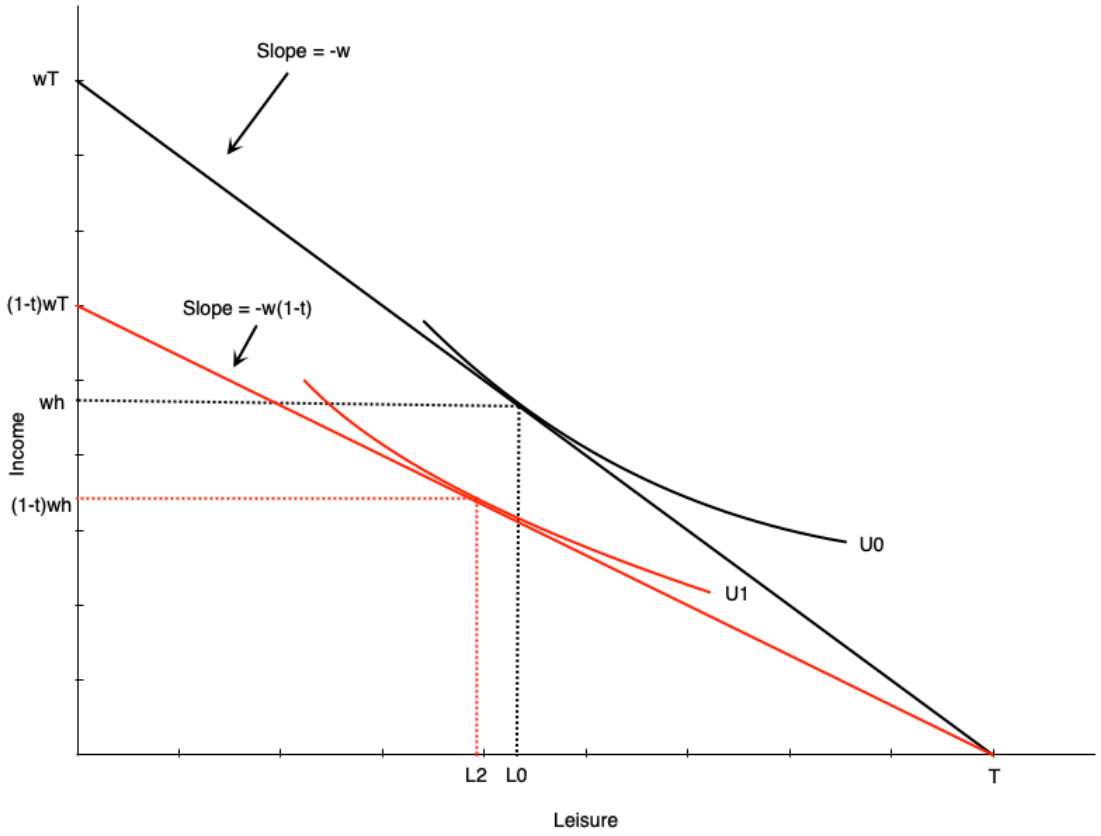
- When the budget constraint changes, so does the optimum
- Suppose there is a proportional income tax at rate t
- There are two effects of the tax on labour supply
  - **Substitution effect**: leisure is relatively cheaper, so people want more leisure (work less)
  - **Income effect**: people are poorer, so they want less leisure (work more)
- The effect on labour supply is therefore ambiguous
  - If substitution effect > income effect, labour supply decreases
  - If income effect > substitution effect, labour supply increases

Personal Income Tax



- Graph shows when substitution effect > income effect
  - Budget swivels down
  - Person optimizes at lower indifference curve
  - Leisure increases from L_0 to L_1
  - Work hours decrease from h_0 to h_1
- Happens when people are more willing to trade income for leisure

Personal Income Tax

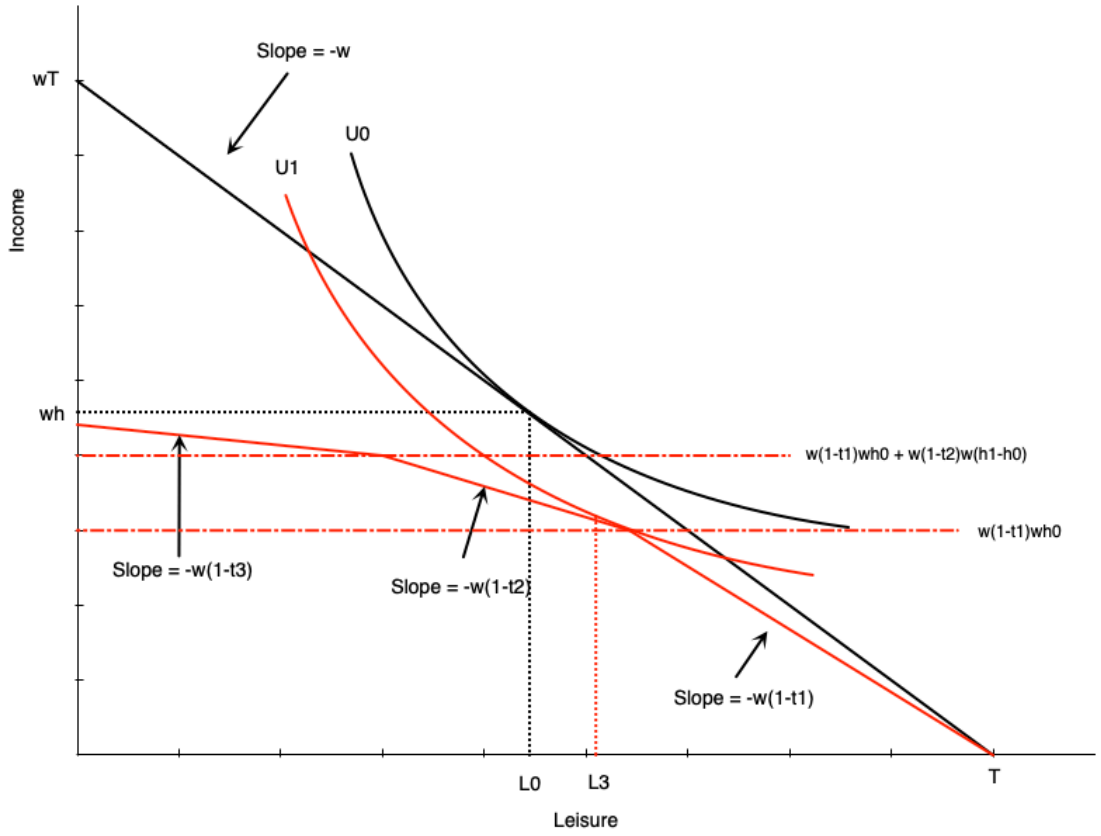


- Graph shows when income effect > substitution effect
  - Budget swivels down
  - Person optimizes at lower indifference curve
  - Leisure decreases from L_0 to L_2
  - Work hours increase from h_0 to h_2
- Happens when people are less willing to trade income for leisure

Personal Income Tax

- In reality taxes are not flat
  - Canada has a progressive income tax system
  - Higher income is taxed at higher rates
- This implies that the budget constraint becomes kinked
  - As income goes up, the tax rate increases
  - When the tax rate changes, the slope changes
- The basic principles are the same
  - Substitution and income effects still apply
  - Labour supply effect is still ambiguous

Personal Income Tax



- Graph shows a proportional income tax with three brackets
- Tax rates are $t_3 > t_2 > t_1$
- Slope changes at each kink
  - First kink happens with work hours h_0
  - Second kink happens with work hours h_1
- Graph shows increased leisure, but effect is ambiguous

Evidence on Labour Supply

- The theory discusses effect of tax *holding all else equal**
- In statistical work, this is not easy to do
  - Many factors affect labour supply
  - Isolating the effect of taxes is difficult
- Studies show that
  - Elasticity of hours worked for working age men is between -0.2 and 0.2
  - For women is is between -0.2 and 0.5
- Means that a reduction in wage based on income tax has a small effect on work hours
- Effect on labour force participation is larger

Caveats on Taxation and Labour Supply

Individual vs Group Effects

- We simplified the discussion by analyzing one specific type of person
- But tax changes affect many types of people differently
- A change from a flat to progressive tax might
  - Increase the tax rate for some people
  - Decrease the tax rate for others
- They way they react will be different and for policy analysis we need to consider the group effects

Human Capital

- Taxes can affect decisions about education and training
- We saw that taxes affect an individual's optimal labour supply at each wage
- If a tax increases the optimum hours at each wage, it would increase the desire to get education/training
  - This would make the worker more productive, and increase their wage
  - Could lead to further increases in supply
- The reverse would happen if tax decreases optimum hours at each wage

Total Compensation

- Wages are not the only part of compensation
  - There are non-wage benefits like health insurance, retirement contributions, etc.
- If taxes rise, firms may switch to non-taxed forms of compensation
- The effect of the tax may be muted if firms can do this easily

Expenditures

- Governments use tax revenues to fund public services
- That spending may itself affect labour supply
  - Spending on child care would increase supply
  - If spent on recreational facilities, parks, etc., may decrease supply
- Need to think about this from a general equilibrium lens

Labour Supply and Tax Revenues

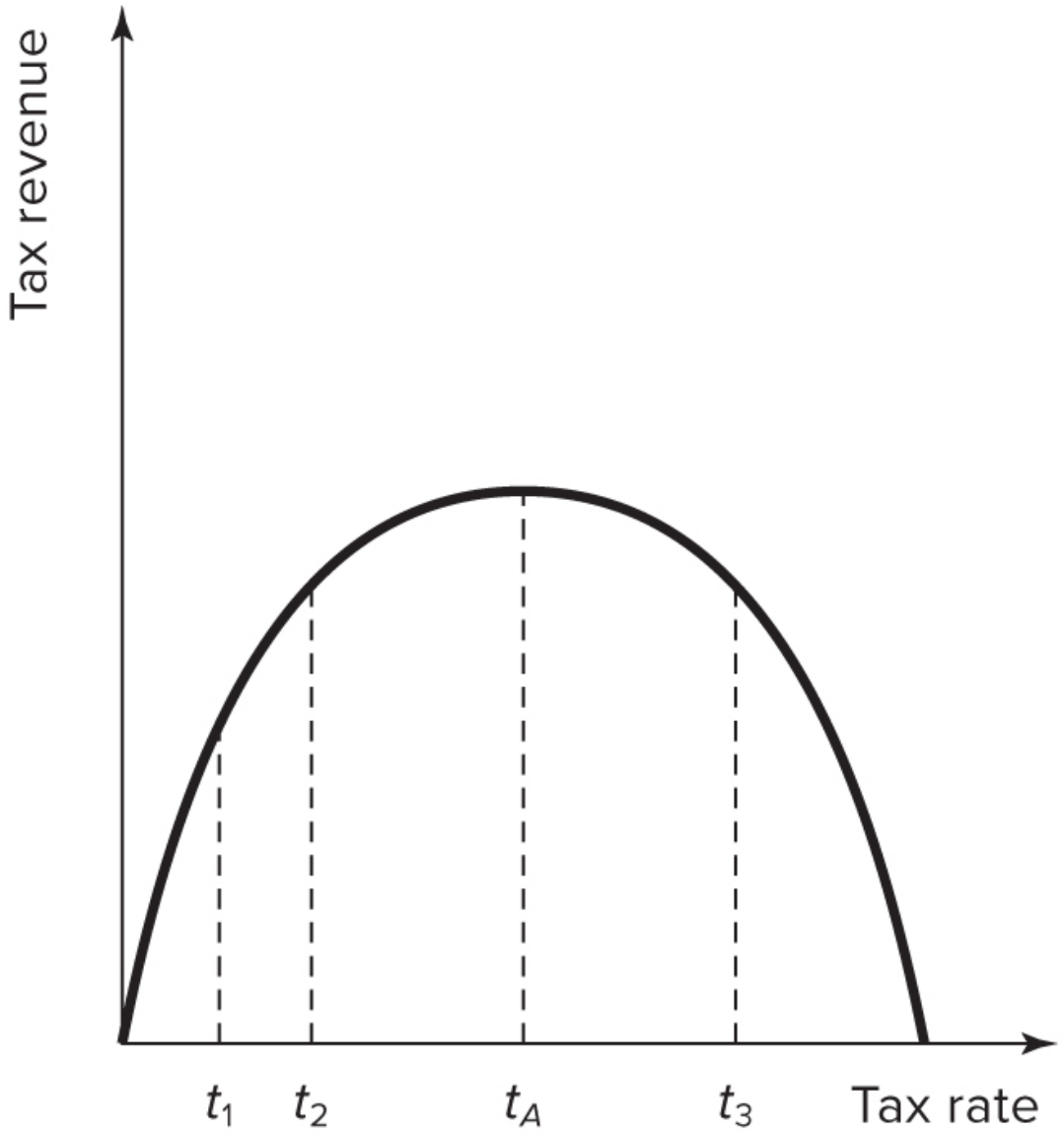
Introduction

- As just noted, governments tax labour income to raise revenue
- The tax revenue collected from this exercise is the tax rate times the tax base
  - Tax base is the amount of income earned
  - Which in our model is $w \times h$
- So the tax revenue is $R = t \times w \times h$
- As we saw, if the substitution effect is larger than the income effect, higher tax rates reduce labour supply
- Means that as t increases, wh decreases

Laffer Curve

- The fact that higher tax rates may reduce labour supply has implications for tax revenue
- The relationship between tax rates and tax revenue is called the **Laffer Curve**
- The Laffer Curve shows that tax revenue is zero at both 0% and 100% tax rates
- Initially as tax rates rise, revenue rises
- But at some point, further increases in tax rates reduce revenue
  - Because the reduction in labour supply is large enough that the tax base shrinks significantly

Laffer Curve



Laffer Curve

- The Laffer Curve suggests there is an optimal tax rate when it comes to revenues
  - At the peak of the curve where additional increases in tax rates do not increase revenue
- Also suggests that when tax rates are too high, reducing them could increase revenue
- However, determining the optimal tax rate is difficult in practice
  - Depends on how responsive labour supply is to tax changes
  - Empirical estimates suggest we are not near the peak of the Laffer Curve for labour income taxes in Canada

Saving

Introduction

- In addition to labour supply, taxes affect saving
- Saving is important because it funds investment
  - Investment leads to capital accumulation
  - Capital accumulation leads to economic growth
- Taxes affect saving through reductions in the return
  - Interest earned through saving counts as income
  - That income is taxable
- In this section we will look at how taxes affect saving behaviour in a life-cycle model

Life-Cycle Model

- The life-cycle model assumes individuals plan their consumption and saving over their lifetime
- To keep things simple, we consider two time periods
  - Present and future
- Individuals have preferences for consumption in both periods
  - Represented by indifference curves
- They also have a budget constraint based on their income in both periods
  - Says that the present value of consumption equals the present value of income

Life-Cycle Model

- Algebraically, the budget constraint is

$$c_0 + \frac{c_1}{1+r} = I_0 + \frac{I_1}{1+r}$$

- Where
  - c_0 = consumption in present period
  - c_1 = consumption in future period
  - I_0 = income in present period
  - I_1 = income in future period
  - r = real interest rate

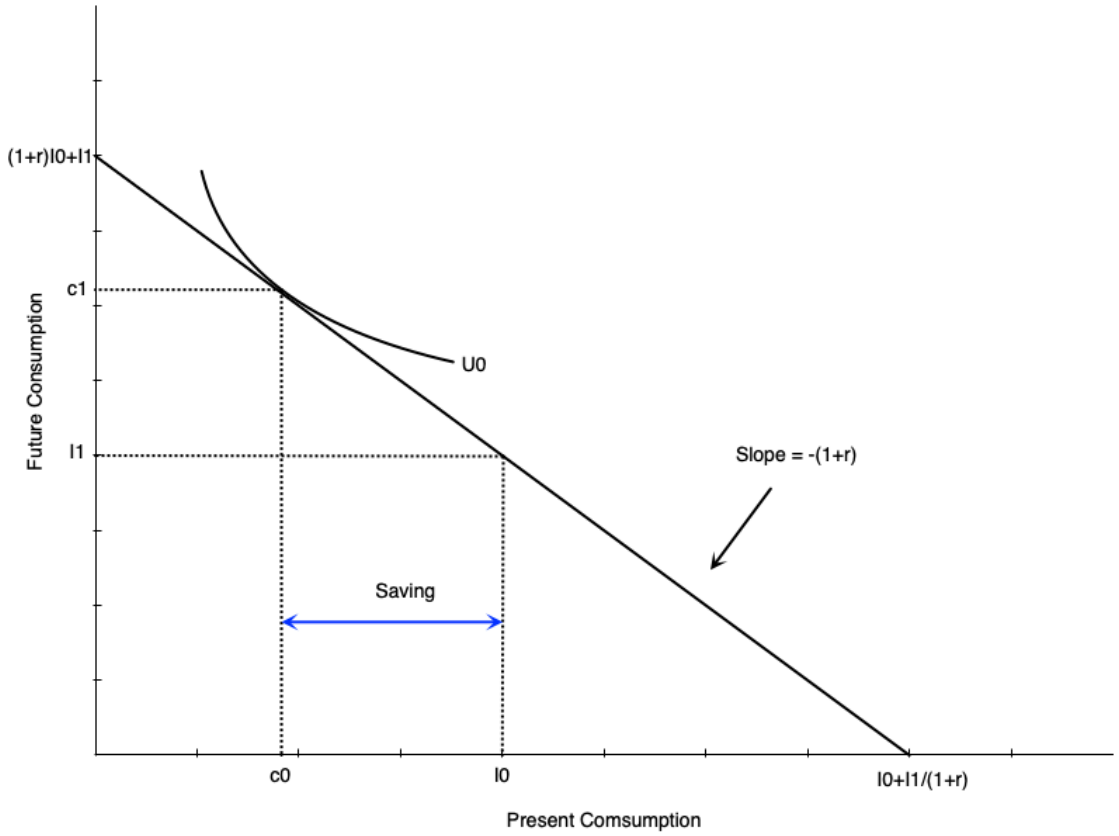
Life-Cycle Model

- You can plot this on a graph with c_0 on the x-axis and c_1 on the y-axis
- Rearrange to get c_1 on left side

$$c_1 = (1 + r)(I_0 - c_0) + I_1$$

- Slope of budget constraint is $-(1 + r)$
  - Consuming a dollar today means giving up $(1 + r)$ dollars tomorrow
- When a person consumes I_0 today, they consume I_1 tomorrow
  - The budget line passes through (I_0, I_1)

Life-Cycle Model



- Graph shows intertemporal budget constraint
- Slope is $-(1+r)$
- Optimal consumption occurs where budget constraint is tangent to indifference curve
- In this case, the person saves in period 0 to consume more in period 1
  - Saving is the difference between income and consumption in period 0

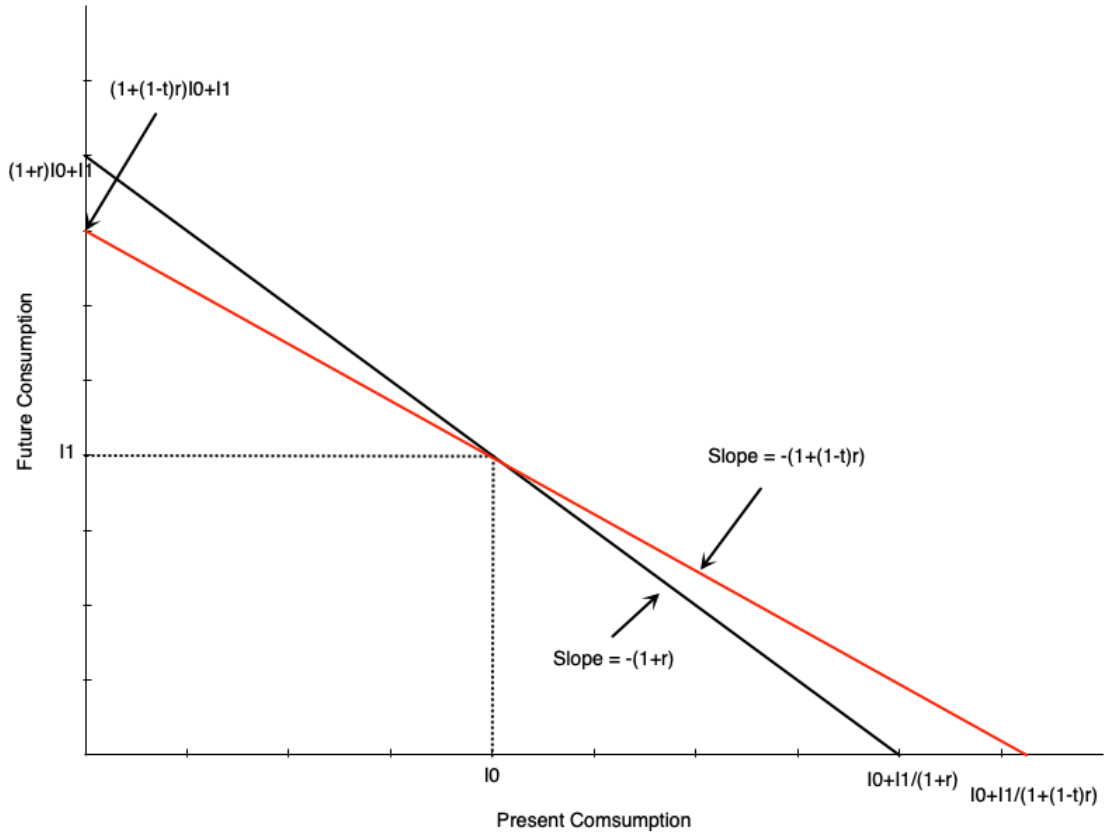
Tax on Interest Income with Deductible Interest

- Now suppose there is a tax on interest income at rate t
- A person what saves \$1 in period 0 receives interest $r - rt$ in period 1
  - Because the interest earned is taxed they must pay rt on the interest
  - This lowers the return
- Means that foregoing \$1 in period 0 leads to consuming \$1 + r - rt = 1+(1-t)r \$ in period 1
  - The after-tax interest rate is $r(1 - t)$

Tax on Interest Income with Deductible Interest

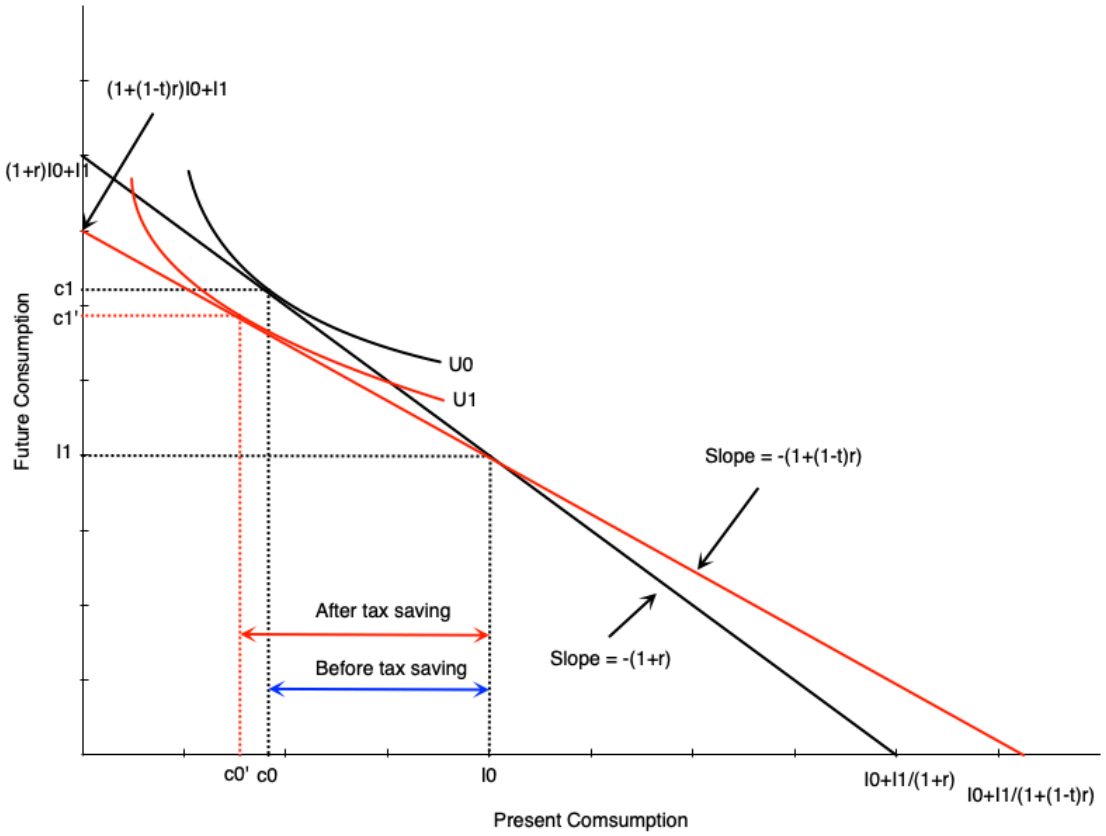
- A person what borrows \$1 in period 0 will need to pay interest $r - rt$ in period 1
  - They pay interest r
  - But because it is *tax deductible* they save rt on taxes
  - Means that total interest paid is $r - rt$
- Means that borrowing \$1 in period 0 leads to foregoing \$1 + r - rt = 1+(1-t)r \$ of consumption in period 1
  - The after-tax interest rate is $r(1 - t)$
- So whether saving or borrowing, the after-tax interest rate is the same

Tax on Interest Income with Deductible Interest



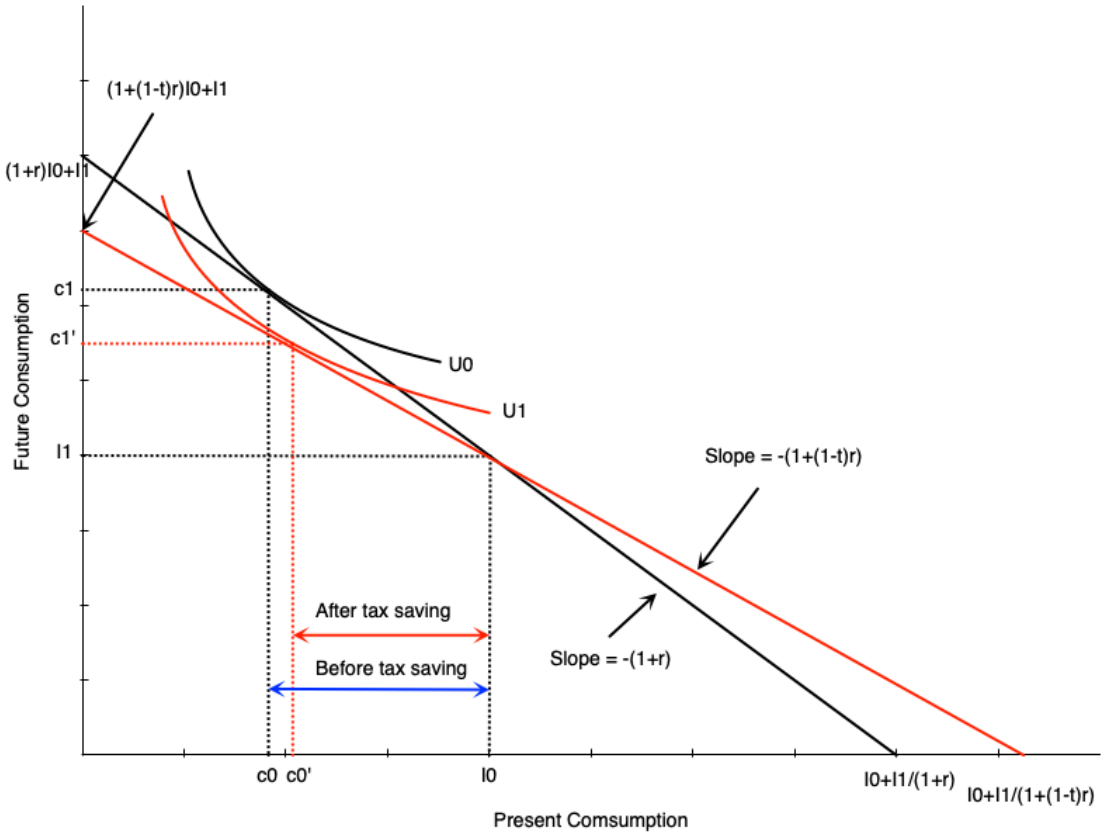
- Graph shows effect of tax on interest income on optimum
- Tax rotates budget constraint around (I_0, I_1)
  - Slope falls from $-(1+r)$ to $-(1+r(1-t))$
  - Passes through (I_0, I_1) because no tax paid if no saving/borrowing
- Two effects of taxation
  - Substitution effect: opportunity cost of consumption today is lower, so consume more today (save less)
  - Income effect: lower real income, so consume less in both periods (save more)
- Total effect is ambiguous

Tax on Interest Income with Deductible Interest



- Graph shows case when saving increases
  - Income effect > substitution effect
- Saving increases today
- But consumption in both periods falls

Tax on Interest Income with Deductible Interest

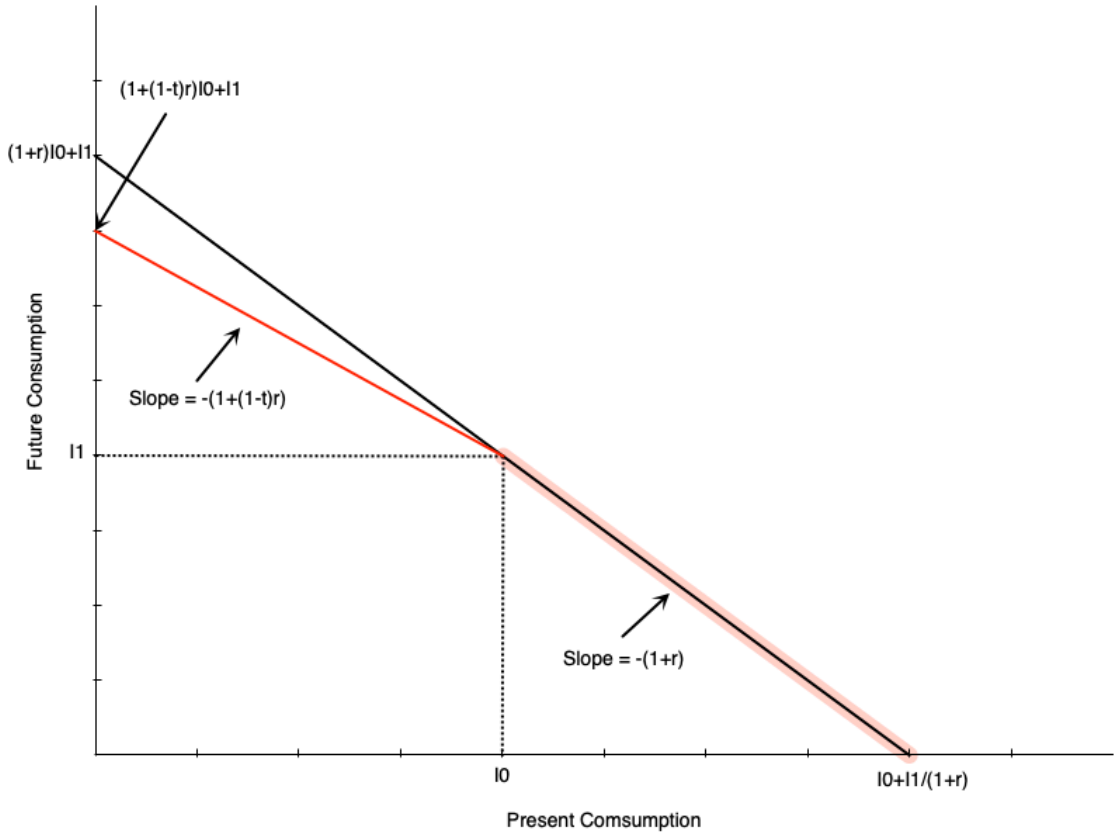


- Graph shows case when saving decreases
  - Substitution effect > income effect
- Saving falls today
- Consumption increases today, but falls in the future

Tax on Interest Income with Nondeductible Interest

- The deductibility of interest payments is important
  - It made the cost of borrowing the same as the return to saving
- Without deductibility, the after-tax interest rate for savers and borrowers differs
  - A saver who saves \$1 in period 0 receives interest $r - rt$ in period 1
  - A borrower who borrows \$1 in period 0 must pay interest r in period 1
- This creates a kink in the budget constraint at the point where consumption in both periods equals income

Tax on Interest Income with Nondeductible Interest



- Graph shows the budget constraint without deductible interest
- When the person saves ($c_0 < I_0$), the slope is $-(1 + r(1 - t))$
- When they borrow ($c_0 > I_0$), it is $-(1 + r)$
- The budget constraint is kinked at (I_0, I_1)
  - Pivots downward to the left of that point
  - Stays the same to the right

Tax on Interest Income with Nondeductible Interest

- For savers prior to the tax, the effects are the same as with deductible interest
  - Substitution effect: consume more today (save less)
  - Income effect: consume less in both periods (save more)
- For borrowers prior to the tax, there is no effect
  - The after-tax interest rate is unchanged at r
  - No substitution or income effect

Additional Considerations

- Models are intentionally simplifications of reality to help us understand key mechanisms
- The analysis is based on real interest rates, but most saving is done with nominal rates
  - Inflation and indexation can affect the real return after tax
- There is more than one interest rate in the economy
  - Different types of saving have different tax treatments and returns
- Life cycle model may not be a very good representation of how people behave
  - Some people are not able to borrow the optimal level
  - Others are not good at saving

Evidence on Saving

- Researchers have analyzed the effect of taxation on saving
- Results show that the response to taxation is small
  - Interest elasticity of saving (responsiveness of saving to interest rate changes) is around 0.5
  - Varies by by demographics, including age
- Generally a hard econometric analysis
  - Many factors affect saving behaviour
  - Isolating the effect of taxes is difficult

Savings Vehicles in Canada

- Canada has several ways to save
  - Registered Pension Plans (RPPs)
    - Tax deductible contributions, taxed withdrawals
  - Registered Retirement Savings Plans (RRSPs)
    - Tax deductible contributions, taxed withdrawals
  - Tax-Free Savings Accounts (TFSAs)
    - Non-deductible contributions, tax-free withdrawals
- Other specialty ones like RESP, FHSA, etc.

Savings Vehicles in Canada

- One way to encourage saving is to increase limits on these vehicles
- Not clear that this would encourage new saving
  - People may just shift existing saving into these vehicles
  - Existence of other savings methods means people can substitute
- Empirical work gives mixed results
  - Tax deferred savings plans increased savings in the 1970s
  - More recently, increasing RRSP limit had little effect on total saving

Capital Taxation

- Taxing capital lowers the real return to investment
- As such, it may reduce the incentive to invest, and therefore capital accumulation and productivity
- Some argue that we should not tax capital income for this reason
- Debate is ongoing, but some things to keep in mind
  - Empirical studies show saving not that responsive to returns
  - In an open economy, domestic saving is used to fund domestic investment, but it may instead flow abroad
  - For economic efficiency, should tax factors that create the least excess burden

Housing

Housing and Saving

- When we think of capital, it is usually machines
  - Used to produce goods in manufacturing
- Housing is also part of capital
  - Used to produce housing services
  - Generates income for some households
- In Canada, housing is subject to preferential tax treatment
  - No tax on imputed rent for owner-occupied housing
  - No capital gains tax on primary residences
- Leads to distortions in saving behaviour by encouraging investment in housing over other assets

Housing and Saving

- To see the effect, consider a household choosing between housing and other assets
- If they invest K dollars in another asset (say, a stock)
  - They earn R' dollars in money income
  - Also earn C' in capital gains
  - These are taxed, so overall return is $\frac{(1-t)(R'+C')}{K}$
- Now consider investing K in housing
  - They earn R dollars in imputed rent (an in-kind return)
  - Also earn C in capital gains
  - These are not taxed, so overall return is $\frac{R+C}{K}$
- Tax treament favours housing

Housing and Saving

- What would the pre-tax return on the stock have to be to equalize after-tax returns?
  - Set after-tax returns equal:

$$\frac{(1-t)(R'+C')}{K} = \frac{R+C}{K}$$

- Rearranging gives:

$$\frac{\frac{(R'+C')}{K}}{\frac{R+C}{K}} = \frac{1}{(1-t)}$$

- Pre-tax stock return has to be $\frac{1}{(1-t)}$ times the housing return to be equally attractive
  - If $t = 0.25$, stock return has to be $\frac{1}{0.75} = 1.33$ times housing return

Housing and Saving

- Estimated foregone government revenue from non-taxation of capital gains on housing is around $10 billion per year
- No estimates from non-taxation of imputed rent, but it would be higher
- Preferential tax treatment distorts saving behaviour
  - Encourages investment in housing over other assets
  - Funds may not flow to their most productive uses
- There are also some policies that affect rental prices of housing, which distort behaviour

Changes in Tax Treatment of Housing

- Should we tax imputed rent?
  - Would increase government revenue
  - But would be difficult to administer
  - Could reduce homeownership rates
  - Politically not feasible
- Principal residence exemption to capital gains is an ongoing debate
  - Since 2016 Canadians must declare a principal residence and its purchase price
  - Also report the disposition (sale)

Portfolio Composition

Introduction

- People invest in different types of assets
  - Stocks, bonds, mutual funds, real estate, etc.
- These assets have different returns and risk profiles
- May also have different tax treatment
- By changing the real return, taxes will alter the portfolio composition

Portfolio Composition

- Imagine a simplified world with two assets
  - Cash: safe, but no return
  - Bond: positive return on average, but some risk of loss
- Prior to taxes, an investor decides on how much to hold of each
- Suppose then the government levies a tax on bond returns
  - Collects taxes if there is a positive return
  - Allows losses to be deducted from other income
- Two effects
  - Average return: because the tax reduces what the investor keeps, it reduces the return
  - Risk: because losses can be deducted, it reduces the risk of holding the bond

Portfolio Composition

- Lower return makes the bond less attractive
- Lower risk makes the bond more attractive
- Overall the effect is ambiguous
  - Without loss deduction, likely it would be less attractive to hold bonds
- Thus taxes affect portfolio composition, but effect can be complicated

Summary

Summary

- Income taxation affects labour supply through substitution and income effects
- The Laffer Curve shows the relationship between tax rates and tax revenues
- Taxes on interest income affect saving behaviour through substitution and income effects
- Preferential tax treatment of housing distorts saving behaviour towards housing
- Taxes affect portfolio composition by changing the return and risk of different assets

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