

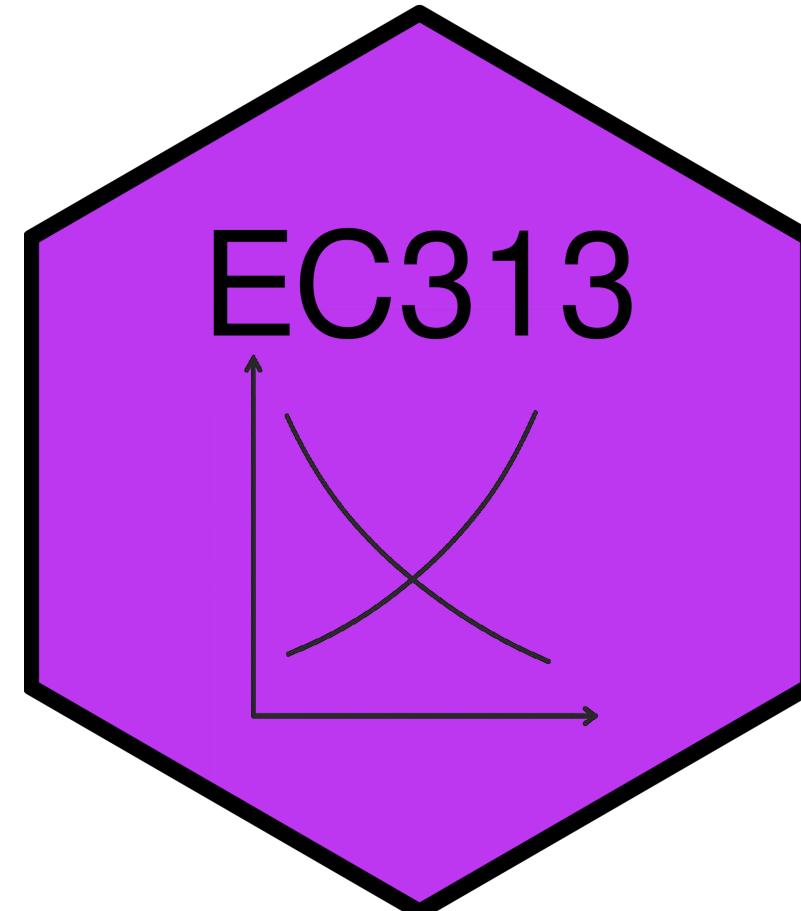
Personal Taxation and Behaviour

EC313 - Public Economics: Taxation

Justin Smith

Wilfrid Laurier University

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Goals of This Section



Goals of This Section

- 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

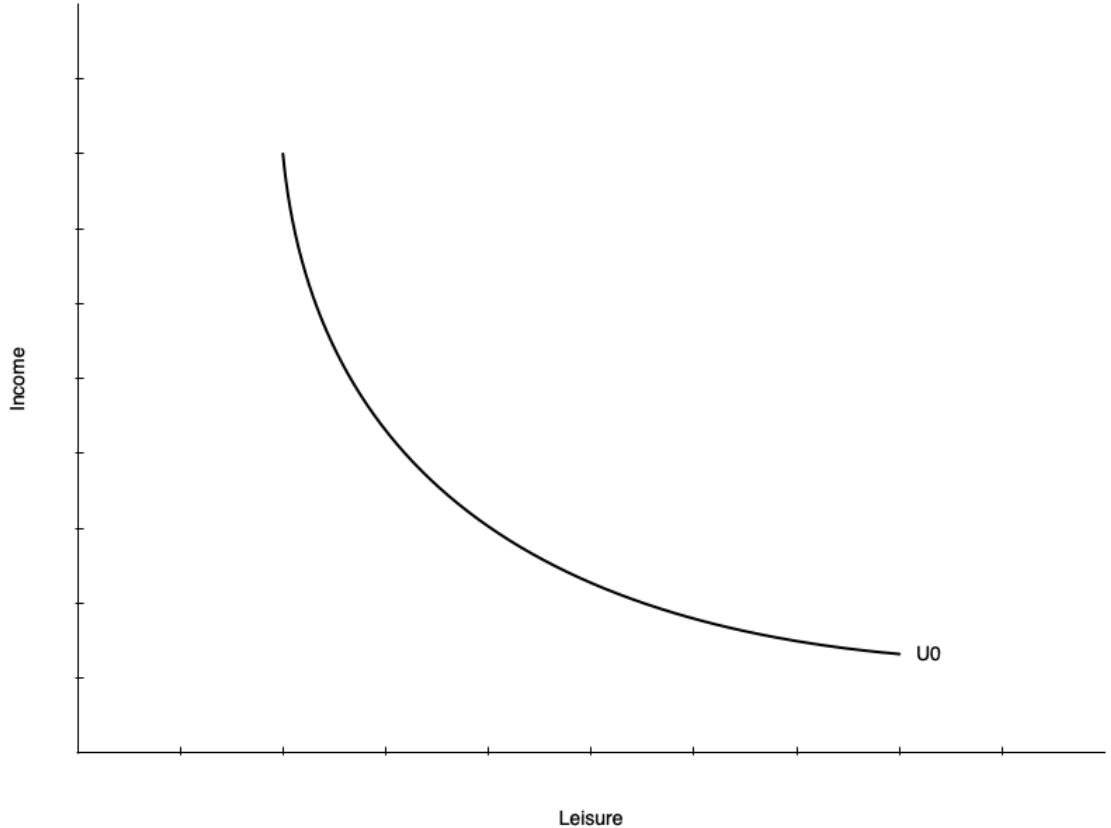


Preferences

- 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



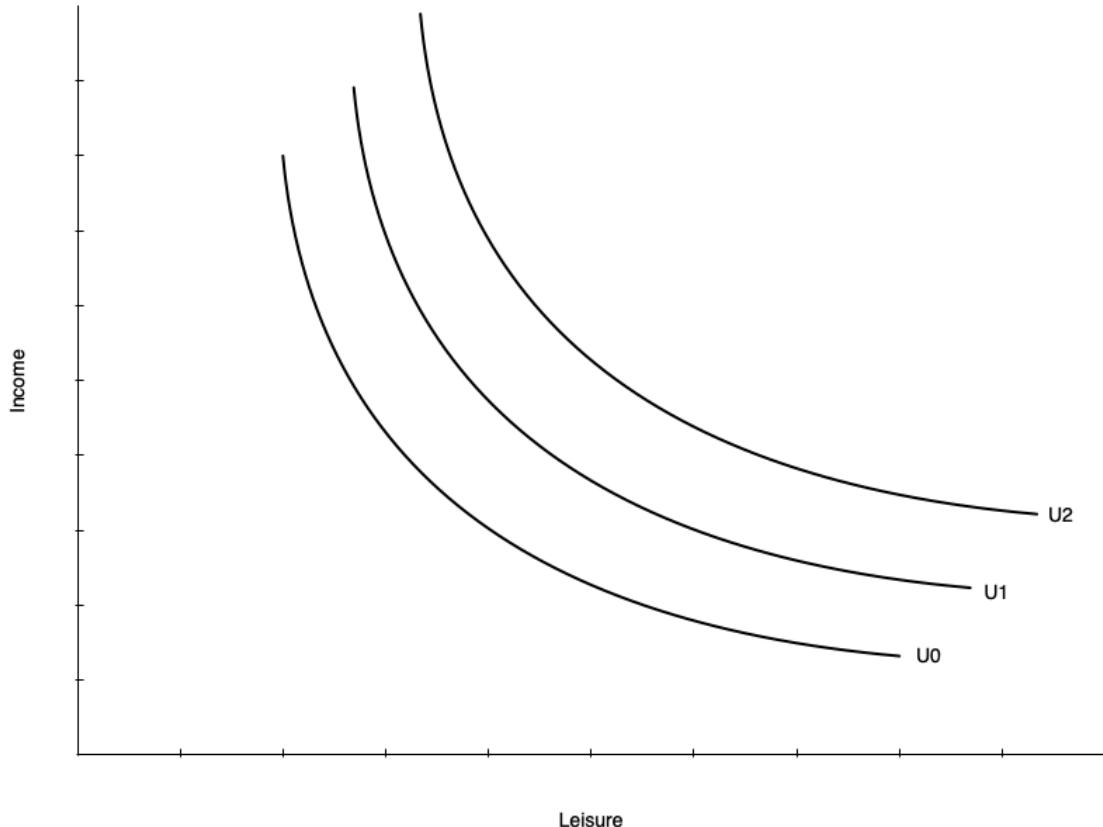
- On the left is a single indifference curve
- Any point represents equal utility (U_0)
- **Marginal Rate of Substitution (MRS):** the rate at which a person is willing to trade income for leisure while remaining equally happy
- The MRS is the slope of the indifference curve at a point
- Individuals 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



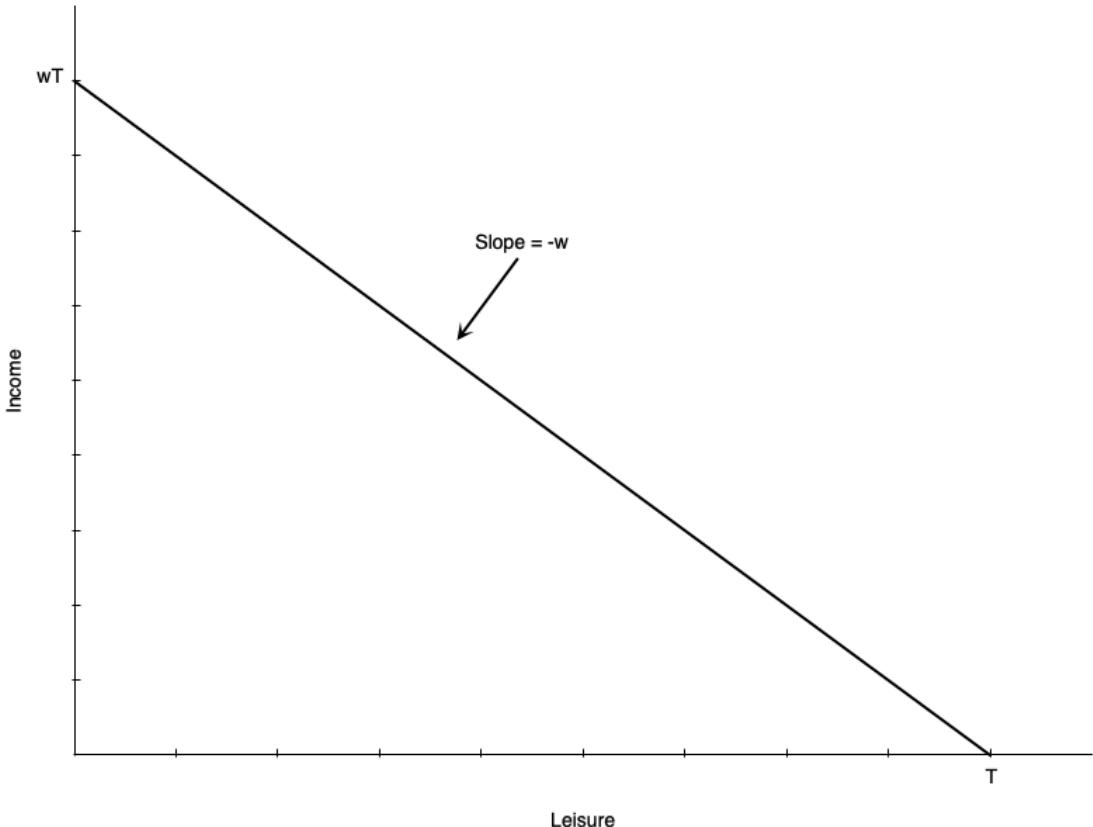
- Utility increases with curves further from the origin
 - $U_2 > U_1 > U_0$

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

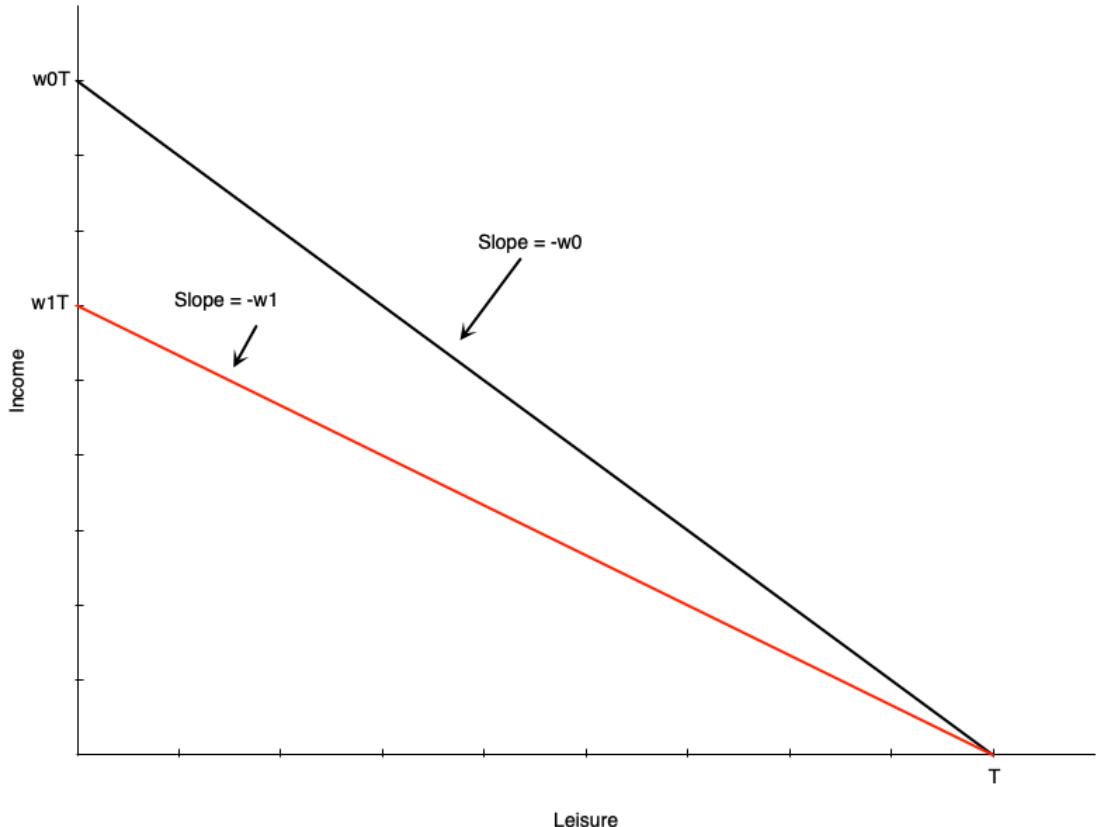
- Mathematically, the budget constraint is

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

- 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

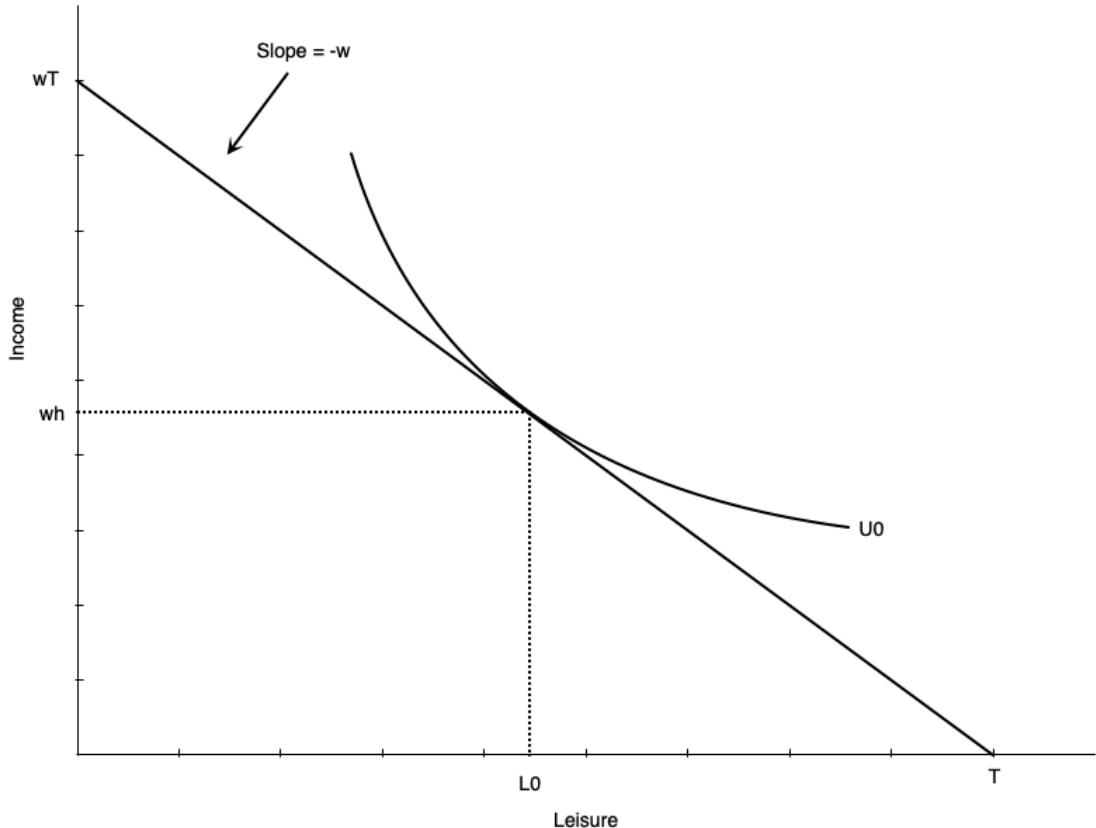


- Slope is the negative of the wage rate w
- A lower wage means shallower slope
 - If $w_1 < w_0$, the budget line swivels down
 - They intersect at leisure = T because there are no work hours
- Lower wage also means full income is lower
 - Working all hours leads to less total labour earnings

Consumer Optimum

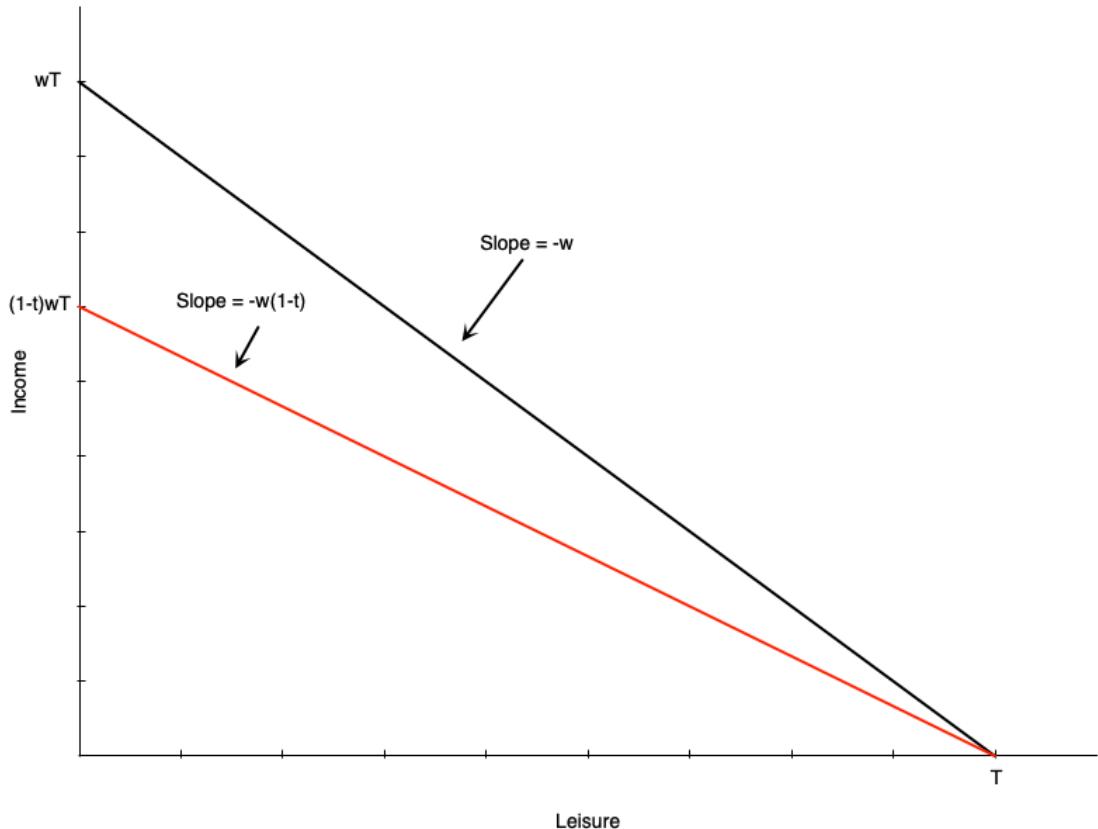
- Work hours are chosen using the combination of preferences and constraints
- The consumer optimum is the point that maximizes utility subject to the budget constraint
- The optimum occurs where the budget constraint is tangent to an indifference curve
- There are two possibilities for the optimum
 - 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, $MRS = \text{wage rate}$
 - 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



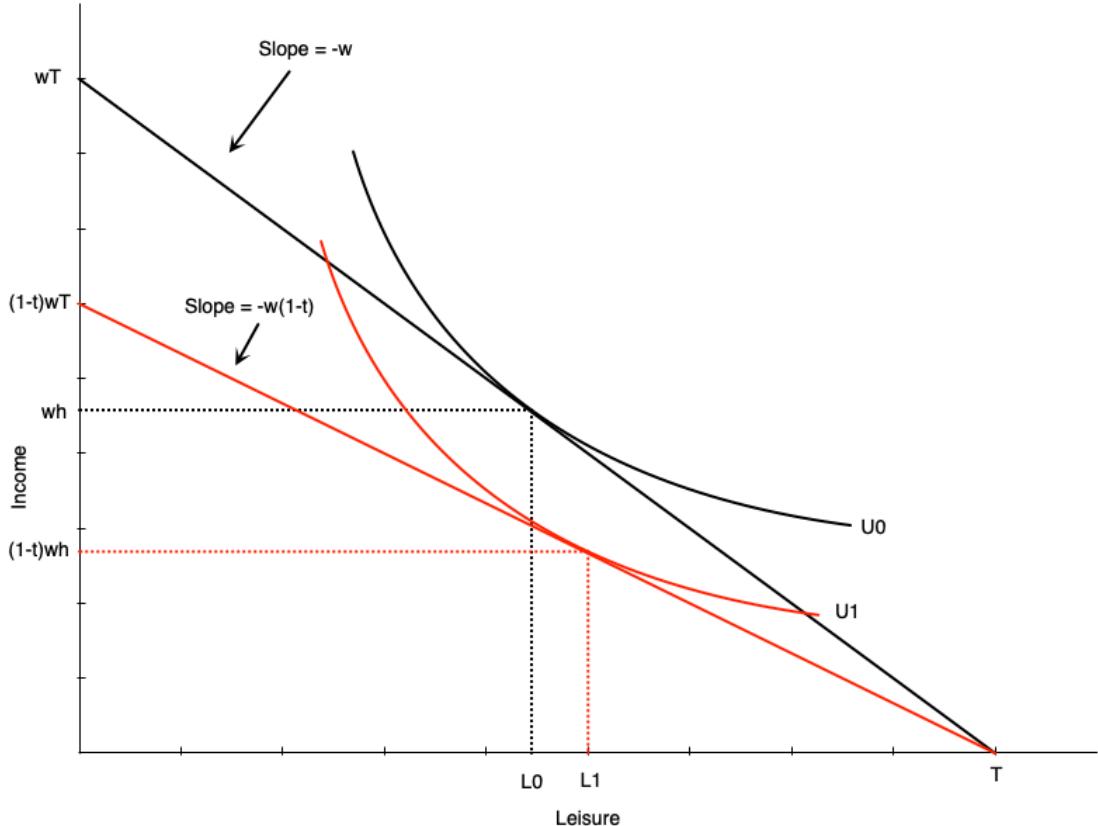
- The personal income tax affects the budget constraint
- Suppose a proportional income tax at rate t is introduced
 - The after-tax wage is now $w(1 - t)$
 - Tax causes the budget constraint to pivot inward
 - Slope is now $-w(1 - t)$
 - Full income is now $w(1 - t)T$

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

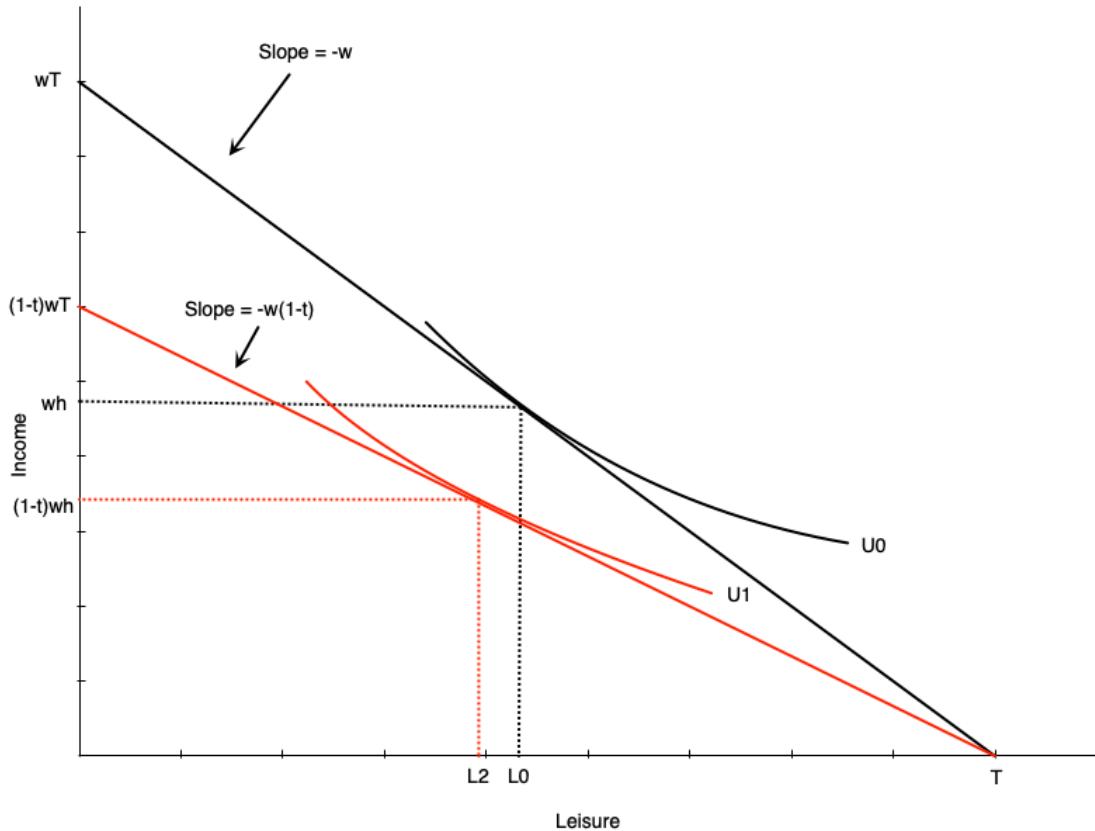


Personal Income Tax



- 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



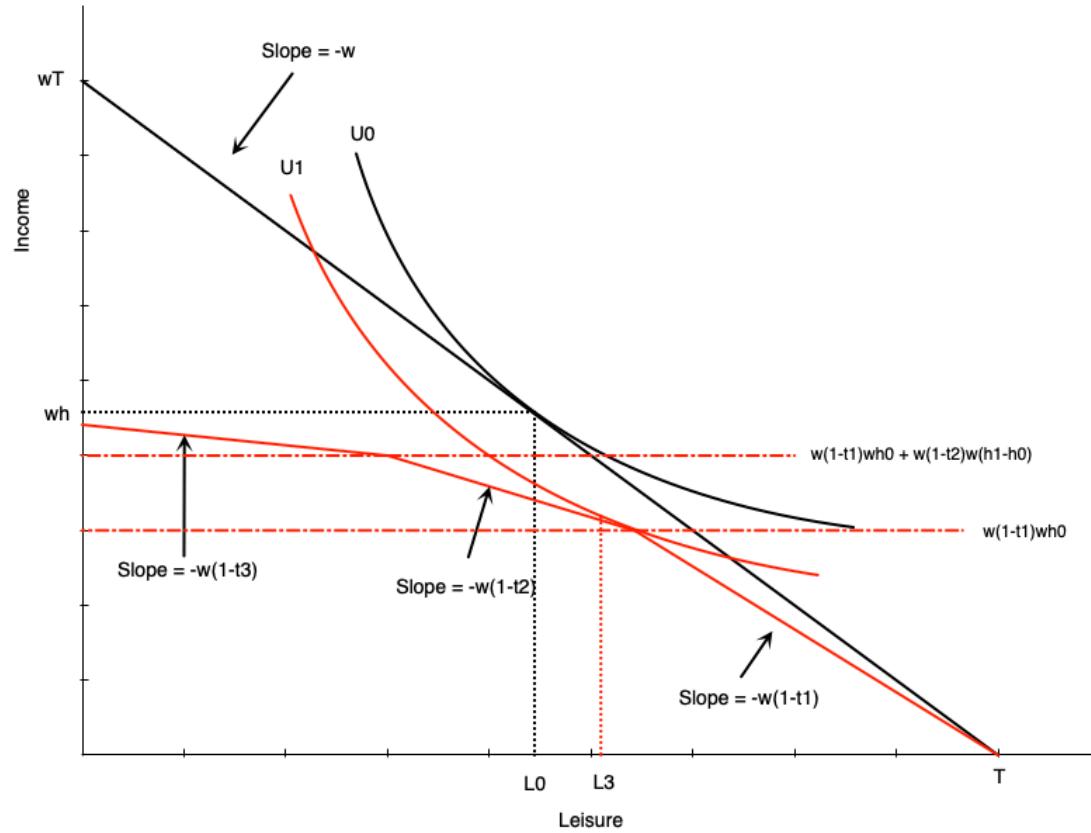
- Graph shows when income effect > substitution effect
 - Budget swivels down
 - Person optimizes at lower indifference curve
 - Leisure decreases from L_0 to L_2
 - Work hours increase from h_0 to h_2
- Happens when people are less willing to trade income for leisure

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
- The 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

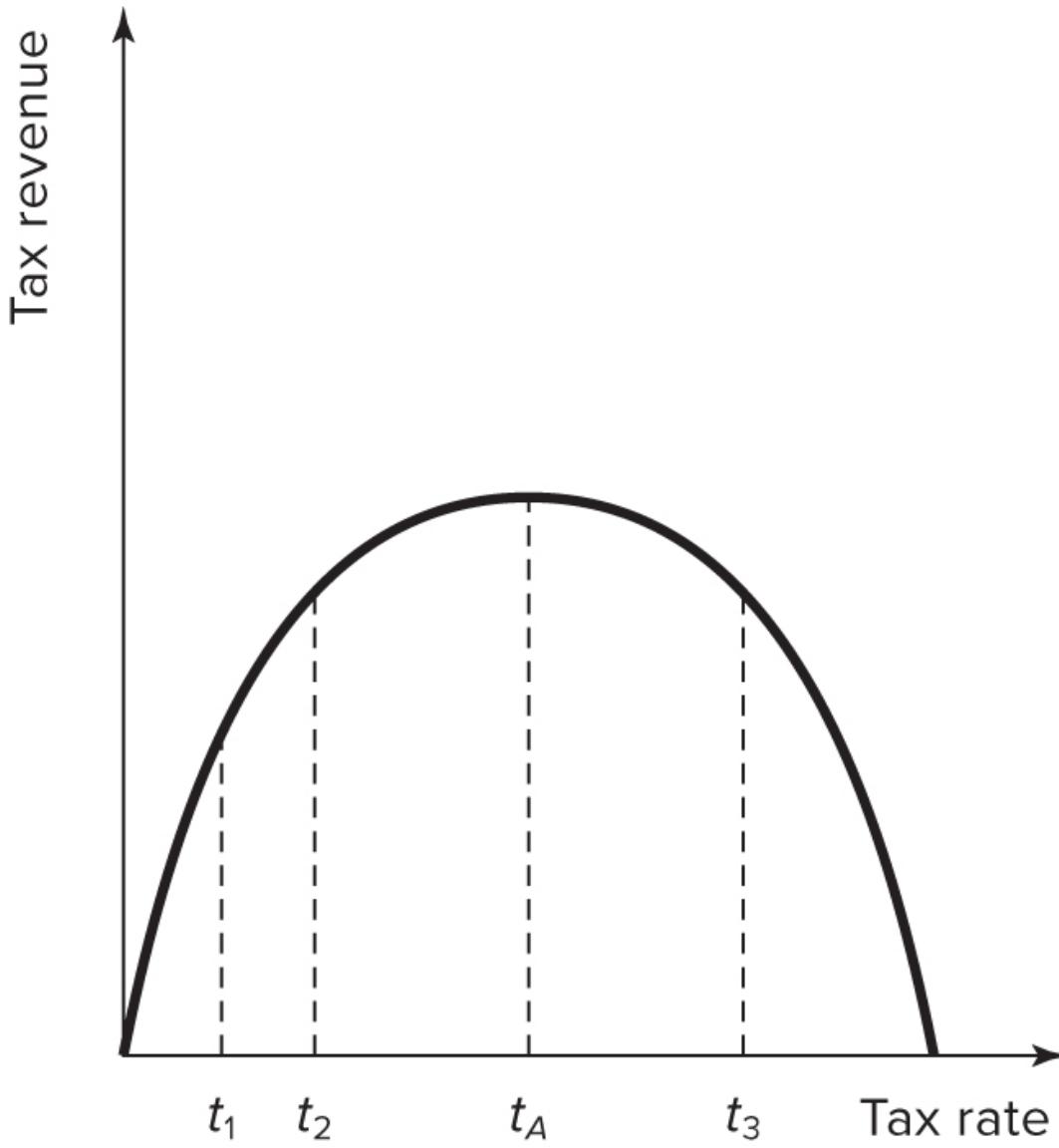
- As just noted, governments tax labour income to raise revenue
- The tax revenue collected from this exercise is the tax rate times the tax base
 - Tax base is the amount of income earned
 - Which in our model is $w \times h$
- So the tax revenue is $R = t \times w \times h$
- As we saw, if the substitution 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

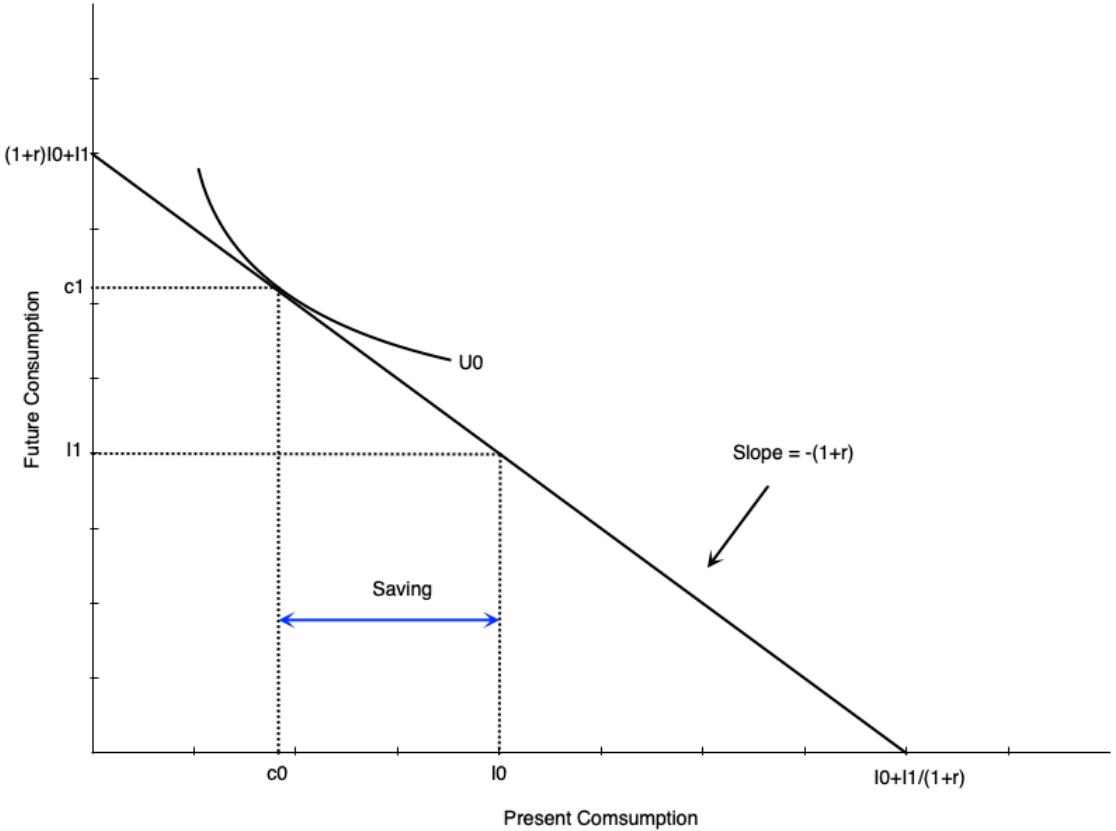
- You can plot this on a graph with c_0 on the x-axis and c_1 on the y-axis
- Rearrange to get c_1 on left side

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

- 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

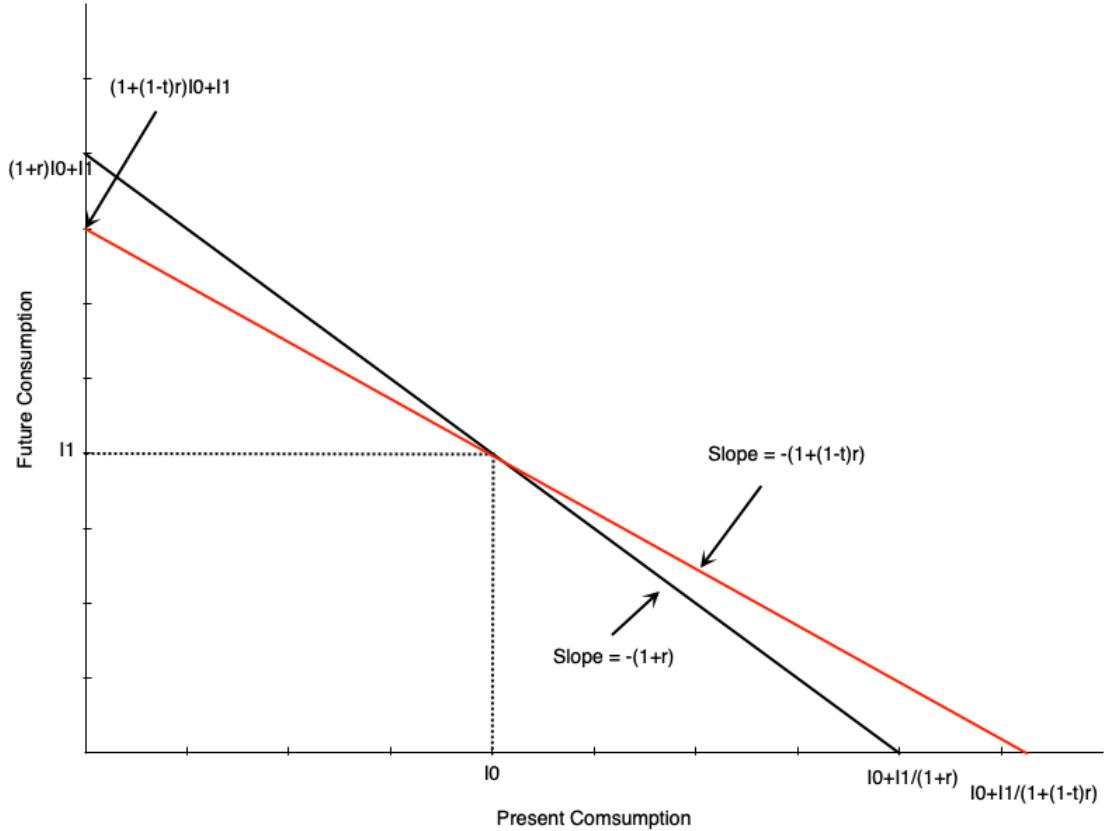
- Now suppose there is a tax on interest income at rate t
- A person who saves \$1 in period 0 receives interest $r - rt$ in period 1
 - Because the interest earned is taxed they must pay rt on the interest
 - This lowers the return
- Means that foregoing \$1 in period 0 leads to consuming $\$1 + r -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



Tax on Interest Income with Deductible Interest

- A person who 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

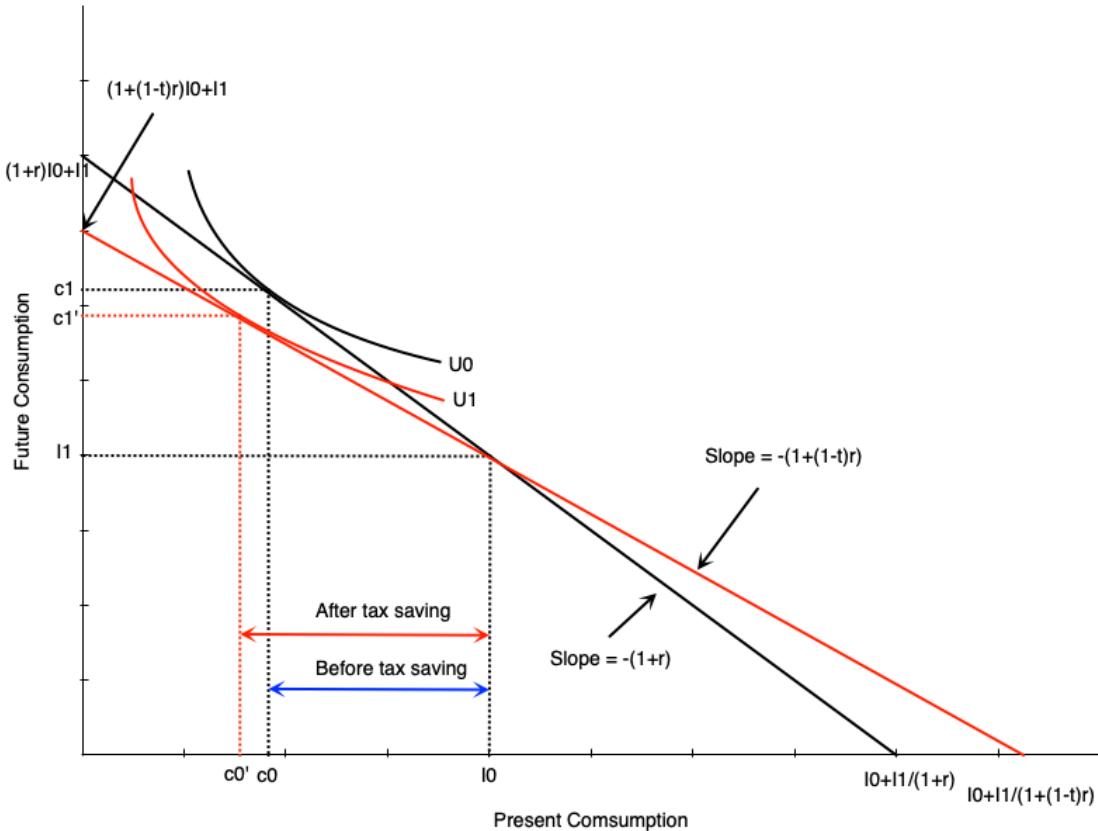
Tax on Interest Income with Deductible Interest



- 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

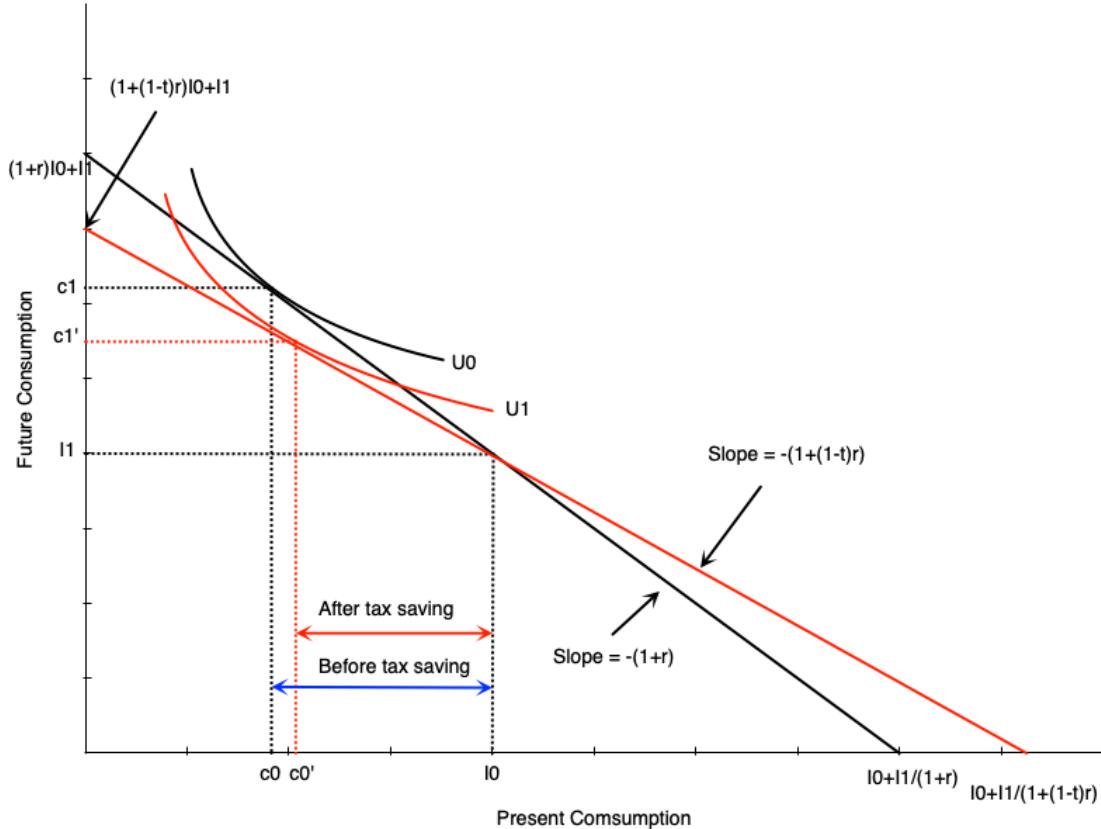
Tax on Interest Income with Deductible Interest

- 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

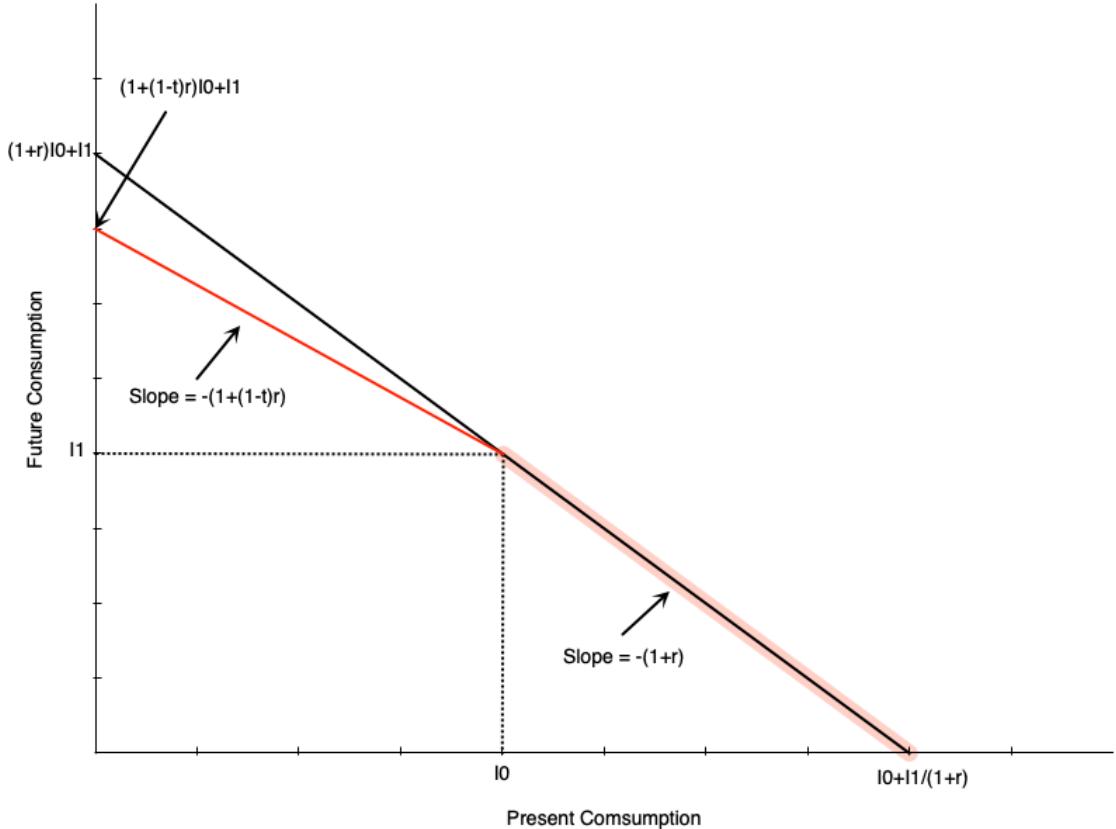


Tax on Interest Income with Nondeductible Interest

- 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 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 treatment 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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- Gruber, Jonathan. Public Finance and Public Policy. 7th edition. Worth Publishers, 2022.

