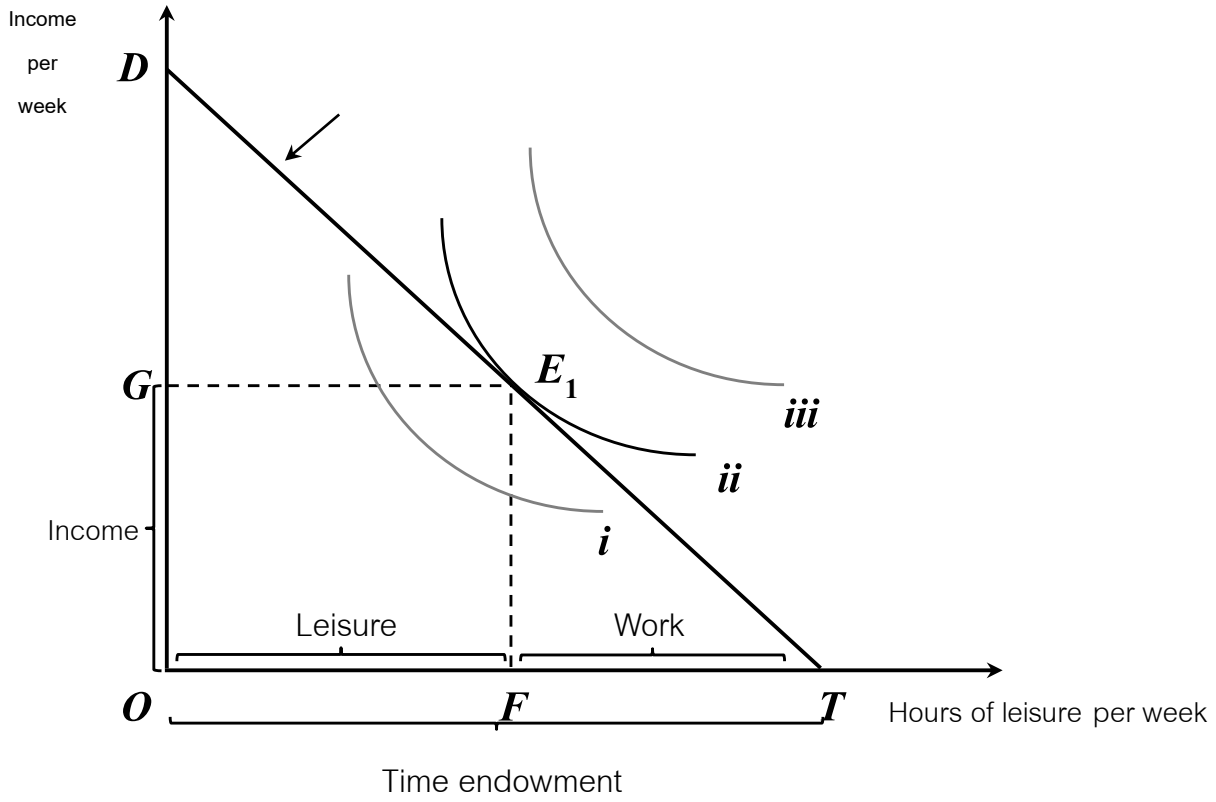
EE 442
Economics of Public Revenue

Topic 9
The Effect of Personal Income Tax on Behavior

Assist.Prof.Dr.Duangmanee Laovakul
Faculty of Economics
Thammasat University

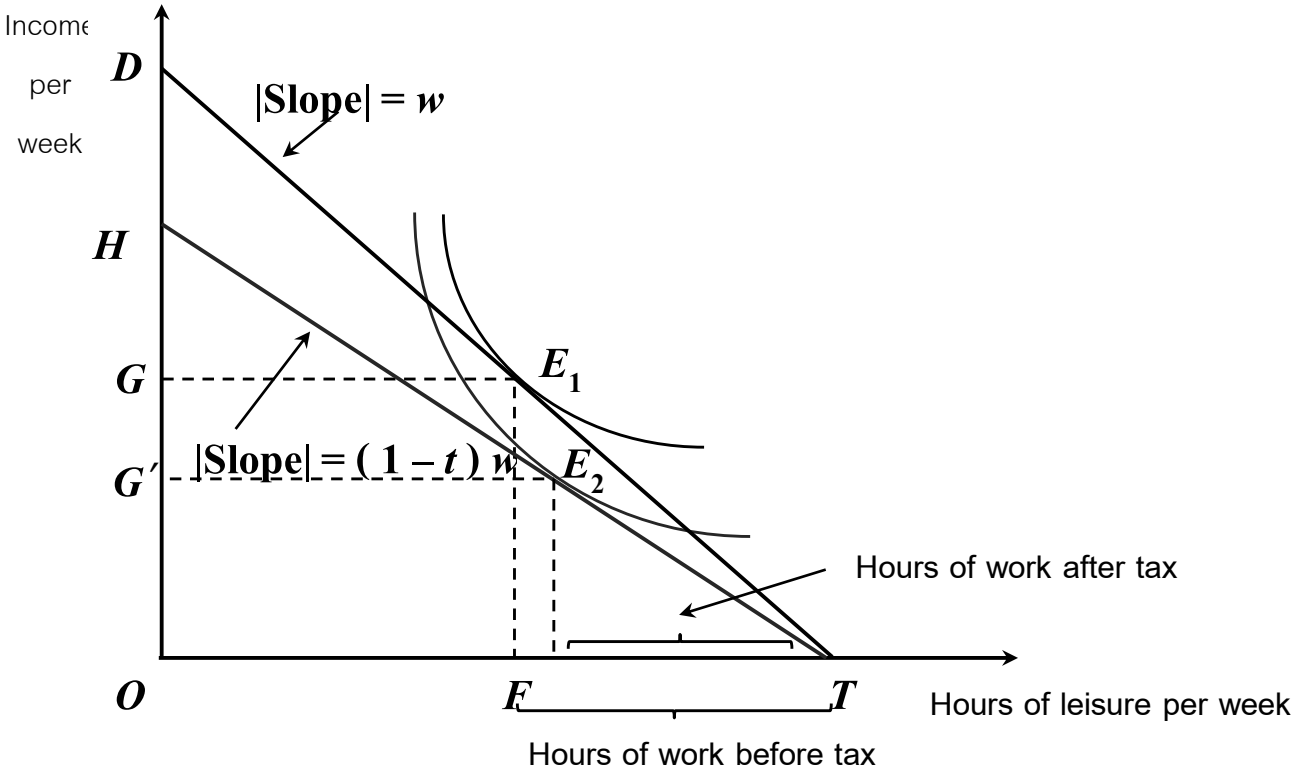
Personal Income Tax and Labour Supply

Utility-maximizing choice of leisure and income



- "Time endowment" is the number of hours available for market work and nonmarket uses (leisure). ⟶ OT
- OT = W (hours of market work) + L (hours of leisure)
- The budget constraint shows the combinations of leisure and income available to an individual given his or her wage rate.
- If Mr. A's wage rate is w baht per hour ⟶ the slope of his budget line (TD) is in absolute value of w.
- Mr. A maximizes his utility at pt. E_1 where he devotes OF hours to leisure, works FT hours, and earns income OG.

Proportional income tax

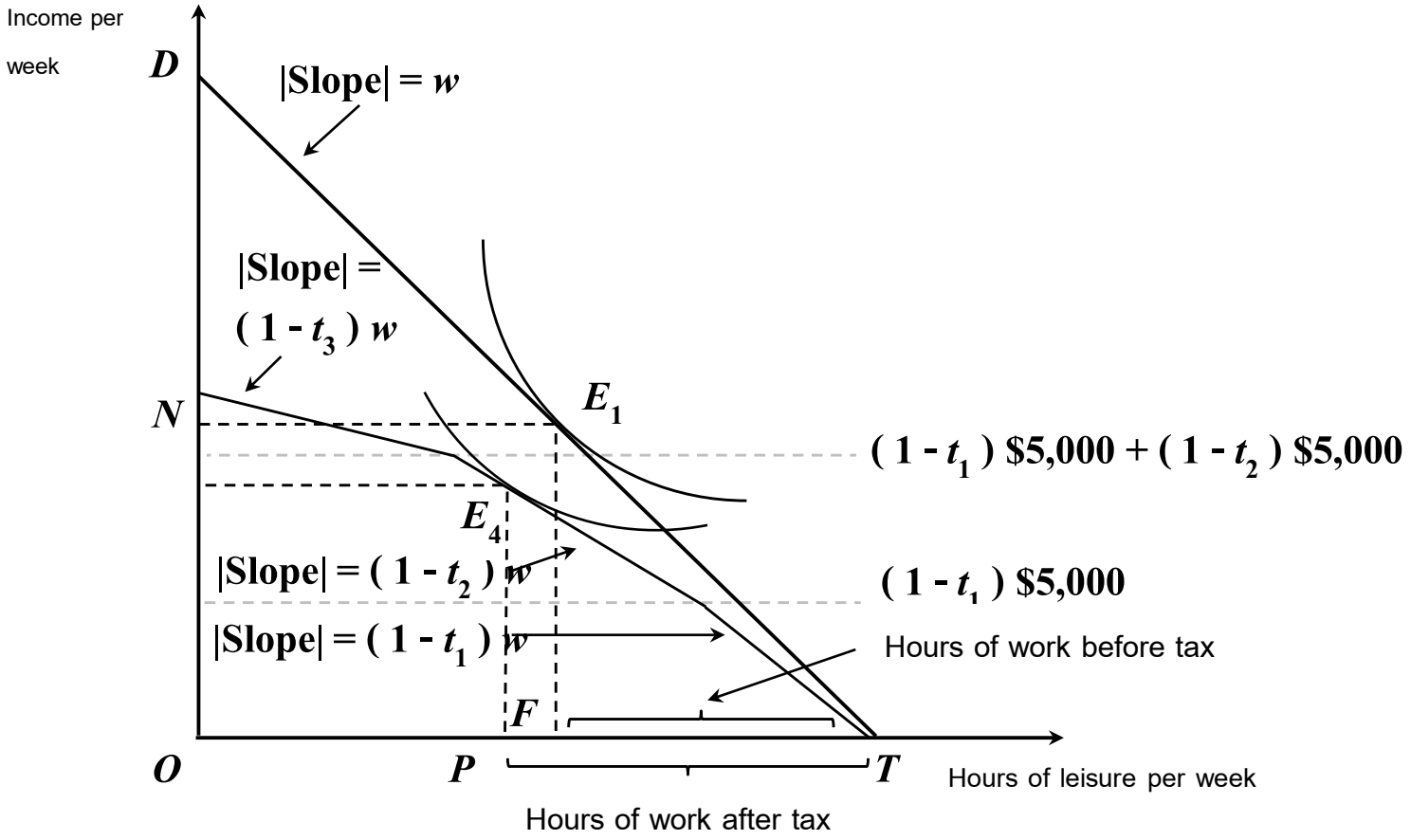


- Suppose that the government levies a tax on earnings at rate t. W ↓ ⟶ (1-t)w baht
- The budget constraint changed from TD ⟶ TH (flatter).
- The slope of TH is |(1-t)w |.
- Mr. A will choose pt. $E_{2.}$ ⟶ Mr. A consumes OI hours of leisure, works IT hours, and has an after-tax income of OG'.
- Q: Can we conclude that a 'rational' individual always reduces labour supply in response to a proportional tax?
- A: Depending on a person's tastes, he may want to work more, less, or the same amount after a tax is imposed.
- The source of the ambiguity is the conflict between 2 effects.

1. When the tax reduces the take-home wage , the opportunity cost of leisure ↓⟶ substitute leisure for work ⟶ work ↓ ⟶ substitution effect (S.E.) ⟶ ↓ labour supply.

2. For any number of hours worked, the tax ⟶ ↓ the individual's income. Assuming that leisure is a normal good, income ↓ ⟶ ↓ leisure ⟶ ↑ labour supply ⟶ income effect (I.E.)

Progressive income tax



- Before tax: The budget constraint is TD.
- After tax: The budget constraint is TLMN.
- Up to 5,000 baht of before tax income, the opportunity cost of an hour of leisure is $(1-t_1)w$ (slope of TL). At pt. L, Mr. A's income is $(1-t_1)$ x 5,000 baht.
- When before tax income is 5,000 – 10,000 baht ⟶ the budget constraint is ML (slope is $|(1-t_2)w|$; $t_2 > t_1$). At pt. M, after-tax income is $(1-t_1)$ x 5,000 + $(1-t_2)$ x 5,000.
- When before tax income is more than 10,000 baht ⟶ the budget constraint is MN (slope is $|(1-t_3)w|$).
- Mr. A can end up anywhere on TLMN.
- From the previous figure, Mr. A maximizes utility at E_4 where he works PT hours.

Some Caveats

Demand-side considerations

- Suppose that taxes on married women were lowered in such a way that their net wages increased by 10%.

  If labour supply elasticity is 0.4, their hours of work will ↑ by 4%.

  If firms could absorb all of these hours at the new net wage ⟶ no problems.

  More typically, ↑ in labour supply lowers his before-tax wage. ⟶ mitigates the original ↑ in the after-tax wage ⟶ the final ↑ in hours of work is < the original.

- If major changes in work decisions could influence consumption patterns in other markets.

- EX: If married women ↑ their hours of work ⟶ the demand for child care would probably ↑. ⟶ To the extent this ↑ the price of child care. ⟶ it might discourage some parents of small children from working, at least in the S-R.

- It is complicated to do a "general equilibrium" analysis that traces through the implications for all markets.

Individual VS Group Effects

- How much an individual works under alternative tax regimes?
- When the tax schedule changes ⟶ incentives change differently for different people.
- EX: In a move from a proportional to a progressive tax, low-income workers may find themselves facing lower marginal tax rates while just the opposite is true for those with high incomes. The labour supply of the 2 groups may move in opposite directions, making the overall outcome difficult to predict.

Human Capital

- A highly educated healthy, well-motivated worker presumably is more productive than a counterpart who lacks these qualities, even if they both work the same number of hours.
- Q: Do taxes induce people to invest too little in the acquisition of skills?
- Miss D is entering an on-the-job training program.
- Suppose that over her lifetime, the program ↑ her earnings by an amount whose present value is B baht.
- Participation in the program ↓ the time currently available to Miss D for income-producing activity, which costs her C in forgone wages.
- Miss D makes her decision using the investment criterion and enters the program only if the benefits > the cost:

$$B - C > 0$$

- If Miss D's earnings are taxed at a proportional rate t.
- Assume that the moment after the tax Miss D continues to work the same number of hours as she did before.
- The tax does indeed ↓ the training program's benefits from B to (1-t)B baht.
- But at the same time, it ↓ the costs (the foregone wages). Because these wages would have been taxed, Miss D gives up not C, but only (1-t)C.
- The decision to enter the program is based on whether after-tax benefits exceed after-tax costs:

$$(1-t)B - (1-t)C = (1-t)(B - C) > 0$$

- In this model, a proportional earnings tax reduces benefits and cost in the same proportion ⟶ has no effect on human capital investment.
- We assume here that labour supply is constant after the tax is imposed.
- But if Miss D increases her supply of labour. (The I.E. dominates.) ⟶ The tax leads to an ↑ in human accumulation. In effect, labour supply is the utilization rate of the human capital accumulation. The more hours a person works, the greater the payoff to an ↑ in the wage rate from a given human capital investment. ⟶ If the tax induces more work, it makes human capital investments more attractive, other things being the same.
- Conversely, if the S.E. predominates so that labour supply ↓ ⟶ human capital accumulation is discouraged.

The compensation package

- Earnings: including income in kind (non wage income.)

  Most of the non wage component of compensation is not taxed. When marginal tax rate ↓ ⟶ the relative attractiveness of untaxed forms of income ↓, and vice versa.

  Changes in taxes might affect the composition of the compensation package.

- EX: According to Gruber and Lettau (2004), for each 10% ↑ in the tax subsidy to health insurance, the number of firms offering insurance coverage ↑ by about 3%.

The expenditure side

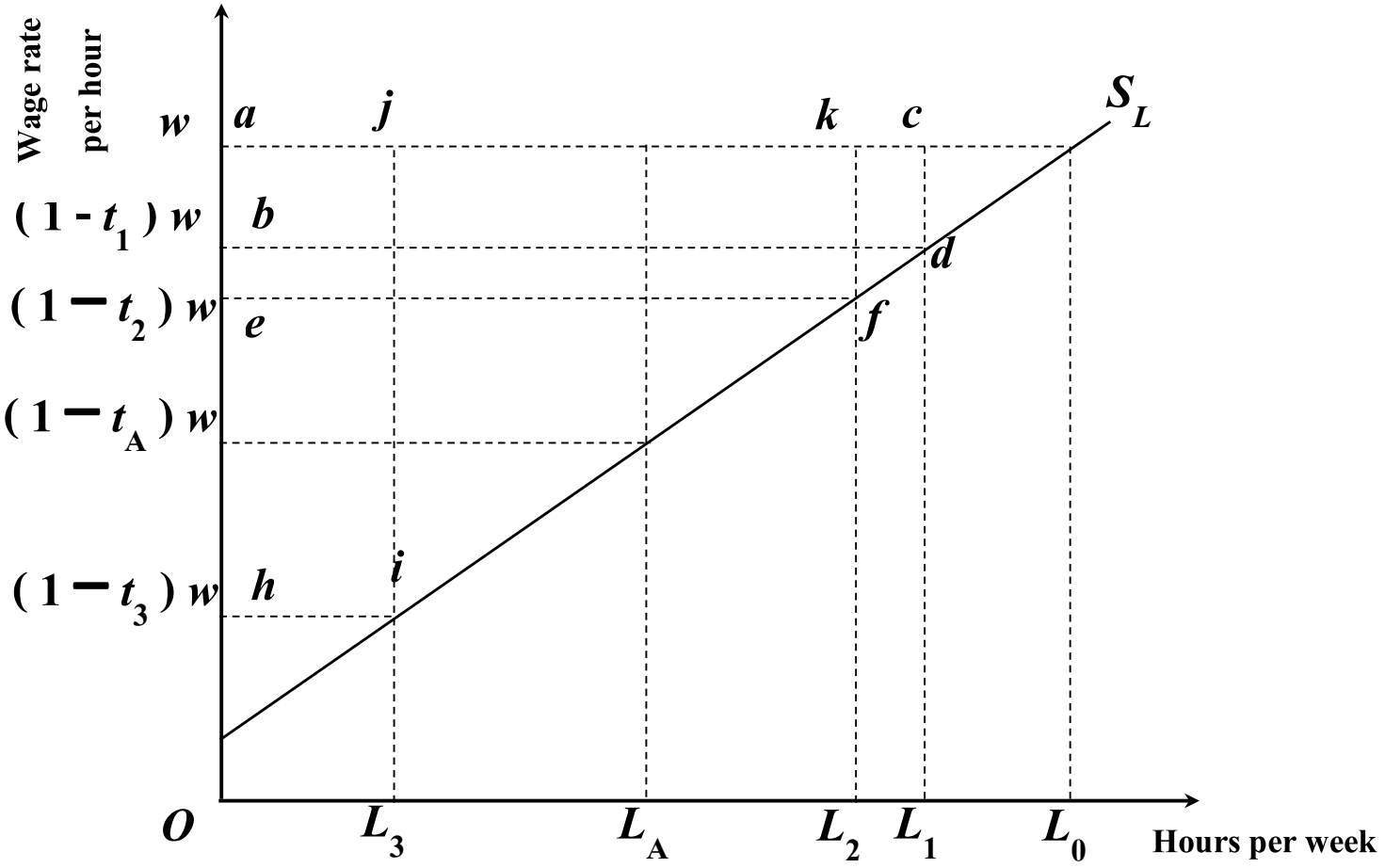
- Some of the revenues are used to purchase public goods, the availability of which can affect work decisions.

  If the tax money is used to provide recreational facilities such as national parks, we expect the demand for leisure to ↑, other things being the same.

  If expenditure on child care facilities for working parents ⟶ might ↑ labour supply.

- Thus, we should examine the labour supply consequences of the entire budget, not just the tax side.
- EX: Rogerson (2007) observes that even though tax rates are higher in Scandinavia countries than in the rest of Europe, labour supply is also higher. The reason is that Scandinavian governments spend relatively more on items such as family services.

Labour supply and tax revenues

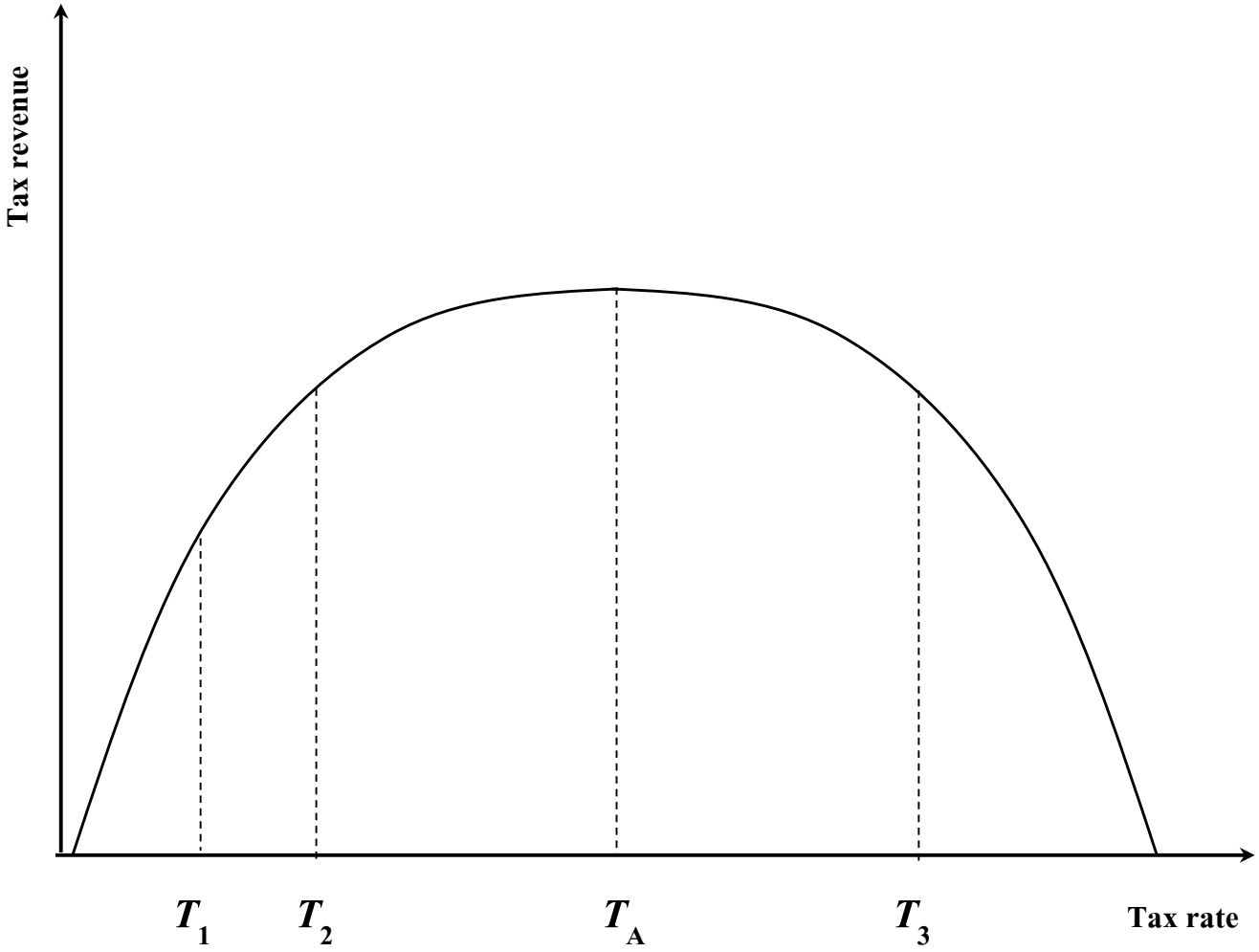


- The before–tax wage, w, is associated with L_0 hours of work.
- When the tax rate is 0 ⟶ no revenue is collected.
- Suppose a proportional tax at rate t_1 is imposed. ⟶
  - The net wage is $(1-t_1)w$ baht.
  - Labour supply is L_1 hours.
  - Tax collections are equal to the tax per hour worked (ab) x the number of hours worked (ac) = area of the rectangle abdc.
- If the tax rate were ↑ to t_2 ⟶ tax revenue would be area of the rectangle aefk which is > area of the rectangle abdc. ⟶ A higher tax rate leads to greater revenue collections.

- Q: Do government revenues always ↑ when the tax rate ↑?
- A: No.
- EX: At tax rate t_3 ⟶ revenue ahij < revenue aefk (with a lower rate). Although the tax collected per hour is very high at t_3, the number of hours falls so much that the product of the tax rate and hours is fairly low.

  If the tax rate approaches 100% ⟶ people stop working altogether and tax revenues fall to 0.

Tax rates VS tax revenue



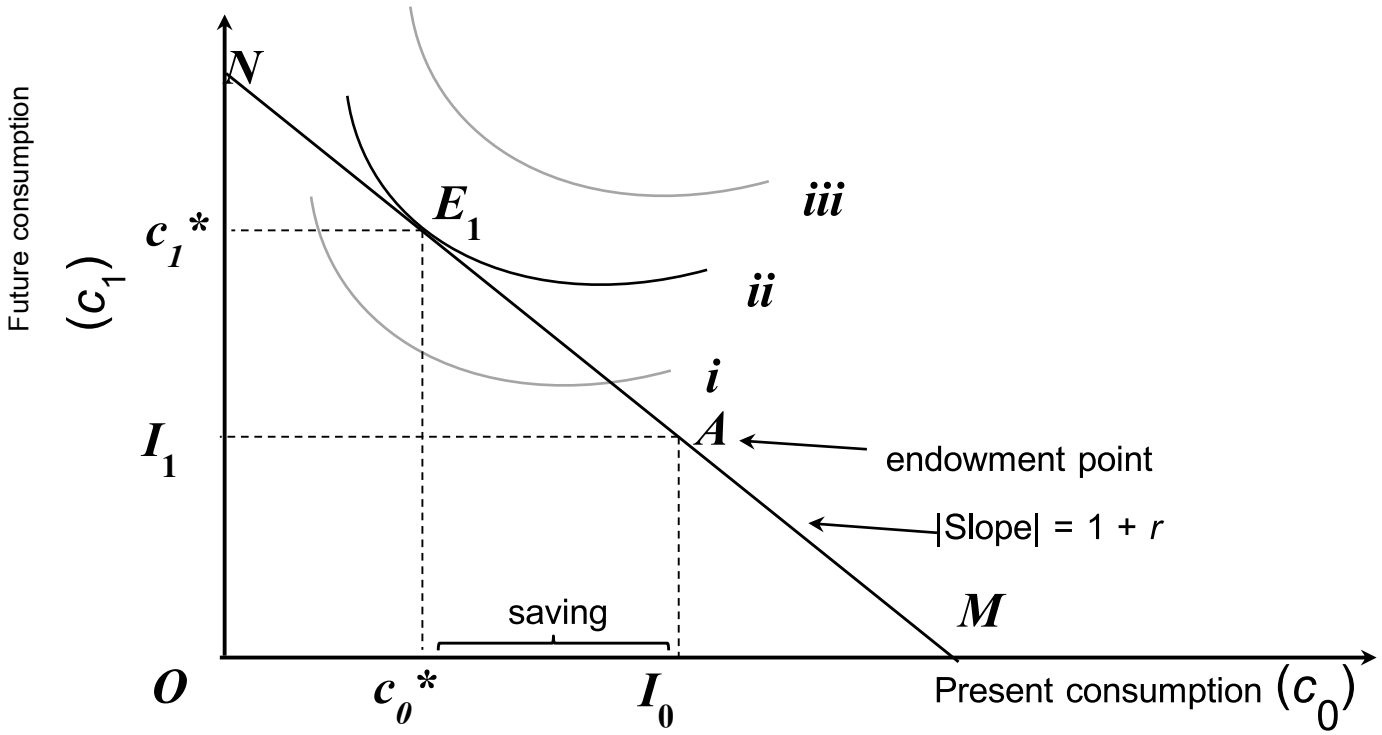
- At very low tax rate ⟶ revenue collections are low.
- As tax rate increases ⟶ revenues increase.
- Reaching a maximum at rate t_A.
- For rates exceeding t_A ⟶ revenues begin to fall, eventually diminishing to 0.
- It has no reasons for government to impose any tax rate exceeding t_A because tax rates could be reduced without the government losing any revenue.
- The tax rate-tax revenue relationship is known as the Laffer curve. The idea of Supply side economics.

Personal income tax and saving

- Based on the Life Cycle Model: LCM
- Individuals' consumption and saving decisions during a given year are the result of a planning process that considers their lifetime economic circumstances.
- We will use the LCM to explore the impact of taxes on saving decisions.
- Suppose that Mr. A expects to live 2 periods: "now" (period 0) and the "future" (period 1).
- Mr. A has an income = I_0 baht now and knows that his income will be I_1 baht in the future. (I_0 is labour earnings, I_1 is fixed pension income.)
- His problem is to decide how much to consume. When he decides how much to consume, he simultaneously decides how much to save or borrow.
- If his consumption this period > his current income ⟶ he must borrow. If his consumption < his current income ⟶ he saves.

- The first step in analyzing the saving decision is to depict the possible combinations of present consumption (C_0) and future consumption (C_1) available to Mr. A ⟶ his intertemporal budget constraint.

Utility maximizing choice for present and future consumption

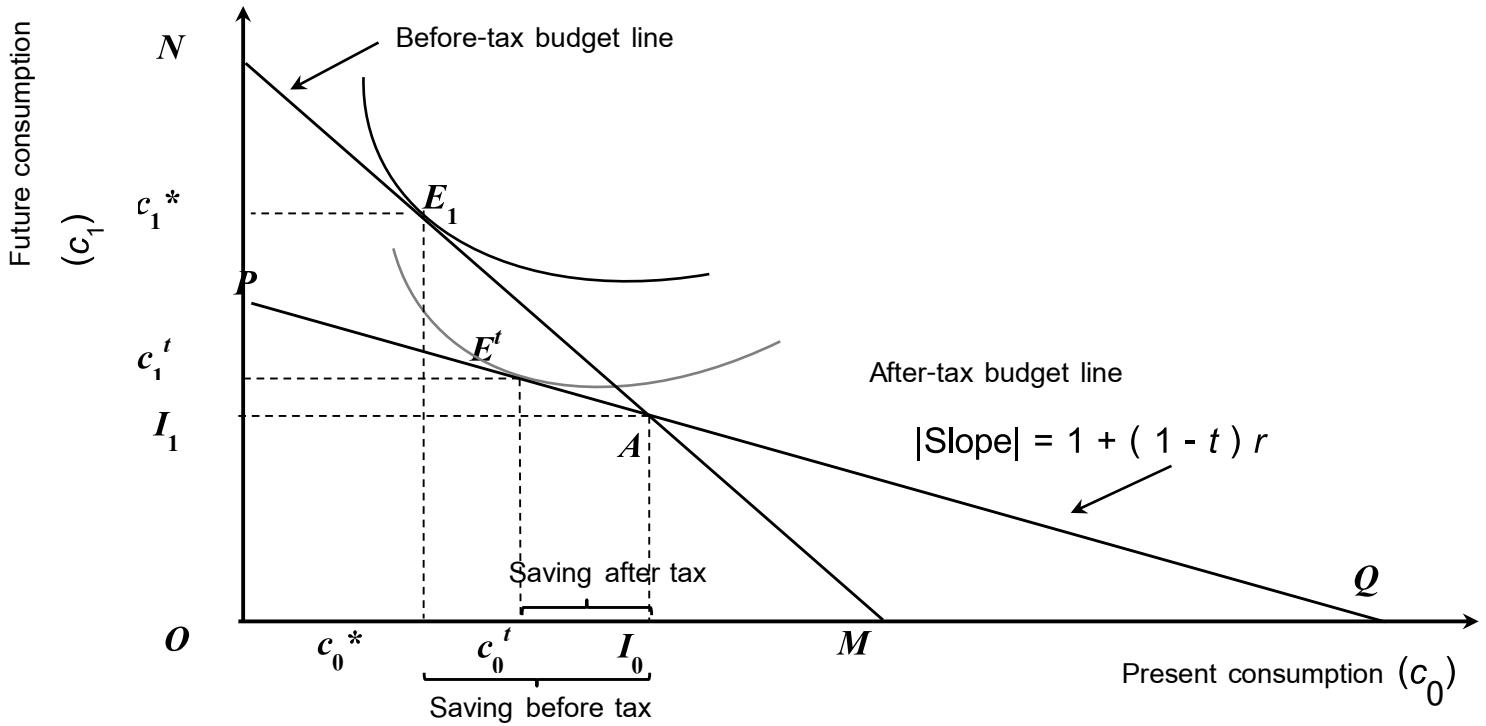


- One option available to Mr. A is to consume all of his income just as it comes in – to consume I_0 in the present and I_1 in the future. This bundle is called the endowment point. The intertemporal budget constraint must pass through the endowment point.
- Provided that the individual can borrow and lend at an interest rate of r, the constraint is a straight line whose slope in absolute value is 1+r. ⟶ Mr. A's budget constraint is MN and it runs through the endowment point, A.
- To determine the choice along MN, we introduce Mr. A's preference between future and present consumption ⟶ IC.

- Subject to budget constraint MN, Mr. A maximizes utility at point E_1 $\longrightarrow$ he consumes C^*_0 in the present and C^*_1 in the future.
- Present income (I_0) > present consumption (C^*_0) $\longrightarrow$ saving = $I_0 - C^*_0$. It does not prove that it is always rational to save.
- If the highest feasible IC had been tangent to the budget line below point A, present consumption > income (I_0) $\longrightarrow$ borrow.

How the amount of saving changes when a proportional tax on interest income is introduced?

Interest receipts taxed and interest payments deductible: saving decreases



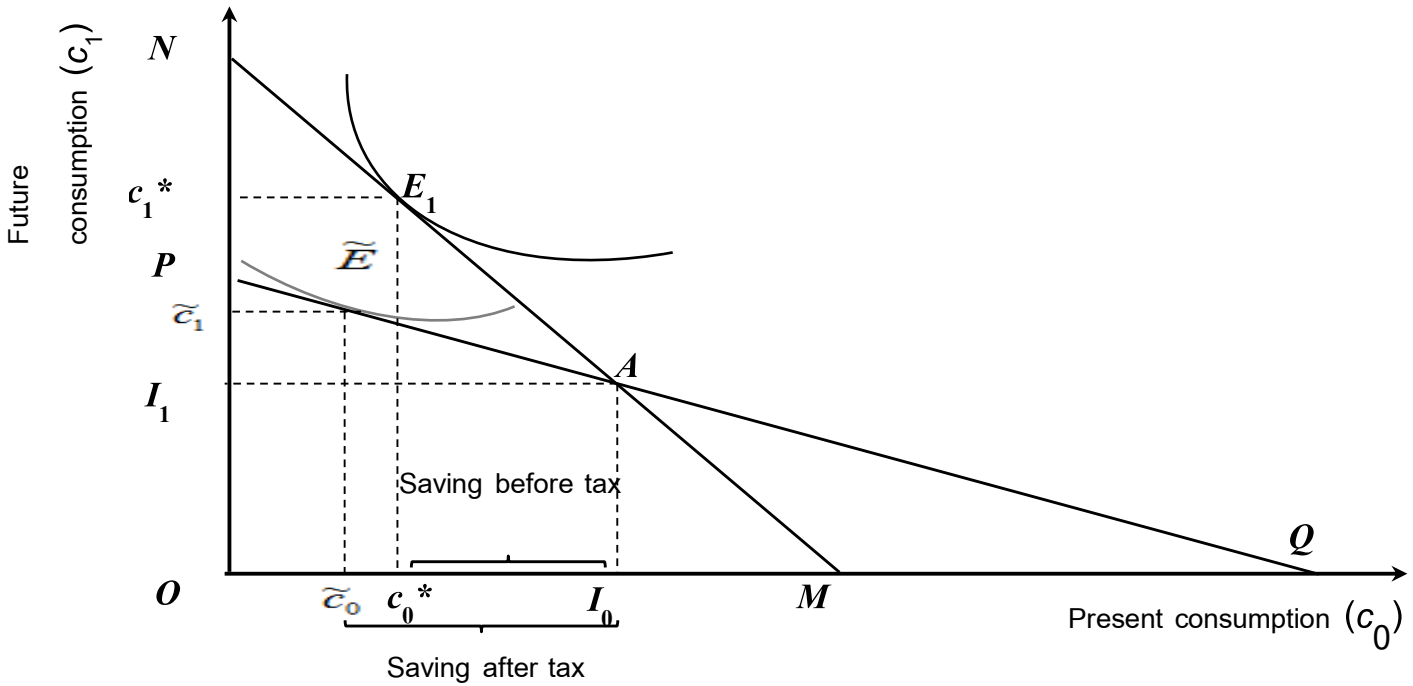
Case 1: Interest receipts taxed and interest payments deductible: saving decreases

- When interest is subject to a proportional tax at rate t, and interest payments by borrowers are deductible. ⟶ The after-tax budget constraint must also pass through the endowment point (I_0, I_1).
- Interest tax or no interest tax, Mr. A always has the option of neither borrowing nor lending.

- The tax reduces the rate of interest received by savers from r to (1-t)r ⟶ the opportunity cost of consuming a baht in the present is only [1+(1-t)r] baht in the future.
- For each baht of interest Mr. A pays, he can deduct 1 baht from taxable income. ⟶ This is worth t baht to him in lower taxes.
- The effective tax rate for borrowing is (1-t)r ⟶ the cost of increasing current consumption by 1 baht, in term of future consumption, is only [1+(1-t)r] baht.
- The after-tax budget line has a slope of [1+(1-t)r]. ⟶ PQ
- As long as the tax rate is positive, PQ is flatter than the pretax budget line MN.

- After drawing the IC, the new optimum is at E^t.
- Present consumption is C^t_0.
- Future consumption is C^t_1.
- Saving is $C^t_0 I_0$, where $C^t_0 I_0 < C^*_0 I_0 \longrightarrow$ The interest tax lowers saving by $C^*_0 C^t_0$.

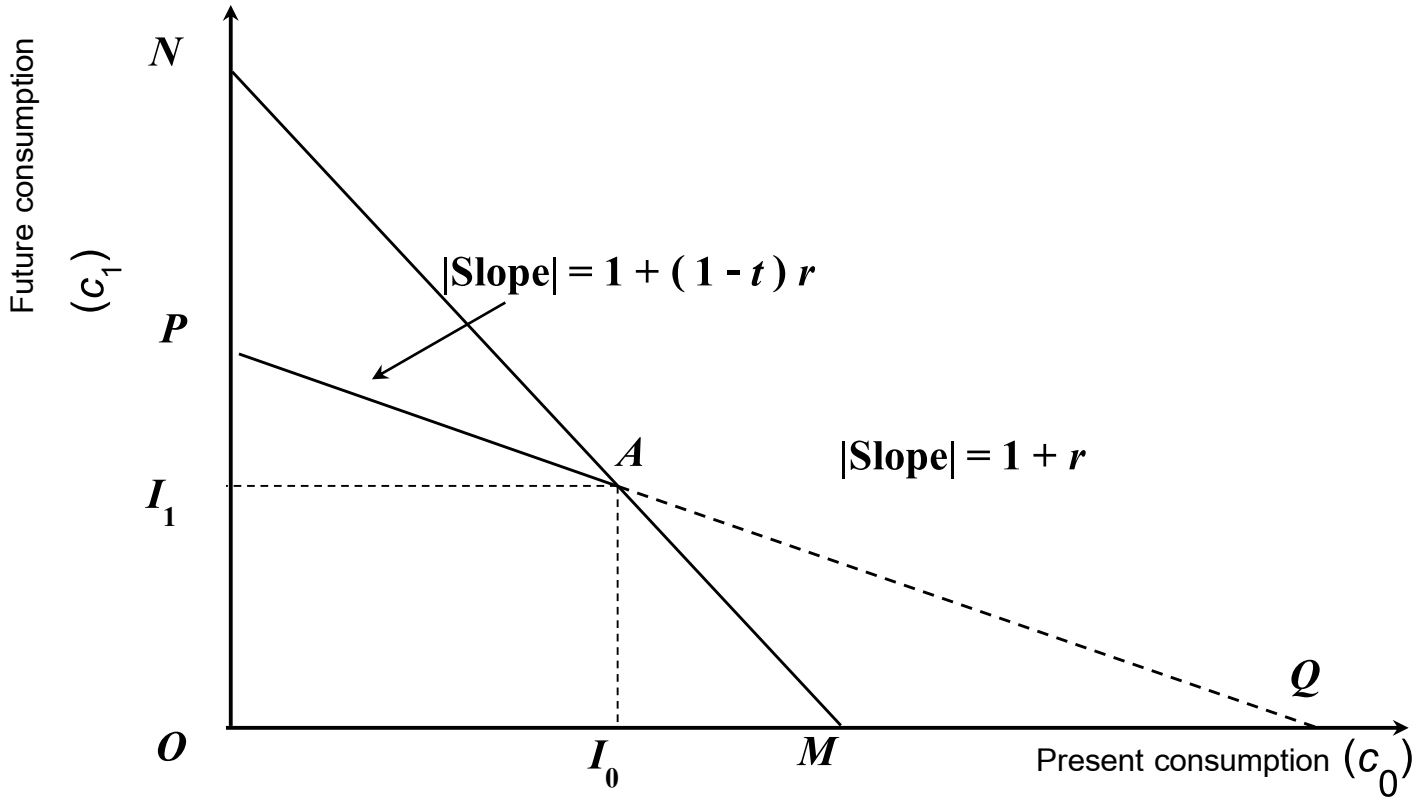
Case 2: Interest receipts taxed and interest payments deductible: savings increase.



- Saving does not always fall.
- The before- and after-tax budget lines are identical to the previous case.
- The new tangency occurs at point E', to the left of E_1.
- Present consumption is C'_0.
- Future consumption is C'_1.
- In this case, a tax on interest actually increases saving, from $C^*_0 I_0$ to $C'_0 I_0$.

- The ambiguity arises because of the conflict between 2 different effects.
  - Taxing interest $\longrightarrow \downarrow$ the opportunity cost of present consumption $\longrightarrow \uparrow C_0$ and $\downarrow$ saving. $\longrightarrow$ S.E. (the tax changes the price of C_0 in term of C_1)
  - Taxing interest $\longrightarrow$ makes it harder for a lender to achieve any future consumption goal. Taxing interest $\longrightarrow \downarrow$ real income. If present consumption is a normal good, $\downarrow$ in income $\longrightarrow \downarrow C_0$ and $\uparrow$ saving $\longrightarrow$ I.E.

Case 3: Interest receipts taxed and interest payments nondeductible



Case 3: Nondeductible interest payments and taxable interest receipts

- The interest is taxed at rate t.
- The before-tax budget constraint is MN.
- The after-tax budget constraint must include the endowment point (I_0, I_1).
- Starting at the endowment point.
- Suppose Mr. A decides to save 1 baht, that is, move 1 baht to the left of point A. Because interest is taxed ⟶ this allows him to ↑ his consumption next period by [1+(1-t)r] baht. To the left of pt. A ⟶ the opportunity cost of increasing present consumption by 1 baht is [1+(1-t)r] baht of future consumption. ⟶ The absolute value of the slope of the budget constraint to the left of pt. A is [1+(1-t)r] which is PA (after-tax budget constraint).

- Suppose that starting at the endowment point, Mr. A decides to borrow 1 baht, that is, move 1 baht to the right of pt. A.
- Interest is nondeductible.
- The tax system does not affect the cost of borrowing.
- The cost to Mr. A of borrowing the 1 baht now is (1+r) baht of future consumption, just as it was before the interest tax.
- To the right of pt. A, the opportunity cost of increasing present consumption by 1 baht is (1+r) baht. ⟶ AM of the before-tax budget constraint MN.

Summary

- When interest receipts are taxable but interest payments are nondeductible ⟶ the intertemporal budget constraint has a kink at the endowment point. To the left of the endowment point, the absolute value of the slope is [1+(1-t)r]; to the right, it is (1+r).

- What is the impact on saving?
- If Mr. A was a borrower before the tax was imposed, he is not affected. That is, if Mr. A maximized utility along segment AM before the tax was imposed, he also does so after.
- If Mr. A was a saver before the tax, his choice between present and future consumption must change, because points on segment NA are no longer available to him.
- We cannot predict whether Mr. A will save more or less. It depends on the relative strengths of the I.E. and S.E.

Some additional considerations

This simple 2-period model ignores some important real-world complications:

- The analysis is couched in real terms – it is the real net rate of return that governs behavior. ⟶ have to correct the nominal rates of return observed in the market for inflation.
- In the model there is one asset for saving, and the returns to saving are taxed at a single rate. In reality, there are many assets, each with its own before-tax rate of return. Moreover, the returns to different assets are taxed at different rates. It is therefore an oversimplification to speak of how changes in "the" after-tax rate of return influence saving.

- The model focuses on private saving. For many purposes, the important variable is social saving (government and private saving). For example, if the government were to save a sufficiently high proportion of tax receipts from an interest tax, social saving could ↑ even if private saving ↓.
- Some investigators have questioned the validity of the life-cycle model itself. The life-cycle hypothesis posits that people are myopic. The life-cycle model also assumes that people can borrow and lend freely at the going rate of interest.
- Critics: Many people are not able to borrow. Of course, neither the proponents of the life-cycle view nor its detractors need to be 100% correct. At any given time, some families' saving behavior may be explained by the model, while others' saving behavior may be myopic or constrained.

Empirical Evidence

- The dependent variable: the quantity of saving.
- The independent variable: the after-tax rate of return to saving, disposable income, and other variables (which can affect saving).
- If the coefficient on the rate of return is positive ⟶ increases in taxes depress saving, and vice versa.

- Unfortunately, this approach faces many challenges.
- For example, it is likely that changes in the rate of return are correlated with changes in people's expectations about future economic conditions, which are not easy to measure.
- However, changes in expected economic conditions could very well exert an independent effect on the amount people save.
- Any relationship in the data between saving and the after-tax rate of return might be driven by expectations about future economic activity, and not really tell us anything about the impact of taxes.

- Another problem with observational studies relates to the measurement of the rate of return variable. People are motivated by the real rate of return. Computing the real market return therefore requires subtracting the expected inflation rate from the observed nominal market rate.
- Presumable, people's expectations are based on past experience plus anticipation of the future, but no one knows exactly how expectations are formed.
- Studies using alternative methods for computing expected inflation rates can come to different conclusions.

These and other problems have prevented economists from reaching a firm consensus on how taxes affect saving.

Joint Committee on Taxation (2005) suggests that a reasonable estimate of the long-run savings elasticity is about 0.29.

Tax-Preferred Savings Accounts

- Q:
  - Should people be allowed to save more in tax-preferred accounts?
  - Whether contributions to these accounts represent new saving, or whether people simply deposit money that otherwise would have been saved in some other form.
- A: Different investigators have come to very different conclusions on this issue.
- The basic problem is that it is hard to determine whether differences in people's saving behavior are due to differences in tastes or due to the presence of tax-preferred saving accounts.

- EX: Over time we observe that some people increase both their tax-preferred assets and their other assets.

One investigator might say, 'This proves that tax-preferred accounts represent new saving, because tax preferred assets grew without diminishing other assets."

Another investigator could respond, "Nope. All that is going on is that these people have a strong taste for saving, and over time they increase their holdings of all kinds of assets."

While the empirical literature is mixed, a study by Benjamin (2003) suggests that tax-favored saving options stimulate at least some new saving.

Taxes and the capital shortage

- The taxation of capital income is a major political issue. Much of the debate centers on the proposition that by discouraging saving, the tax system has led to a capital shortage insufficient capital to meet our national "needs."
- A major problem: It is not at all obvious that taxation reduces the supply of saving.

- Assume that saving ↓ because of taxes.
- As long as the capital market is competitive ⟶ ↓ in saving does not create a gap between demand for investment funds and their supply. Instead, the interest rate adjusts to equate quantities supplied and demanded.
- However, it its true that the new equilibrium will, other things being equal, involve a lower rate of investment, possibly leading to lower productivity growth.

- But to look only at these issues is misleading.
- Taxation of any factor may ↓ the equilibrium quantity.
- The important efficiency question is whether taxation of capital income leads to larger excess burdens than other ways of raising tax revenues.
- We note that there is no reason a high rate investment alone is a desirable objective.
- In a utilitarian framework, at least, capital accumulation is a means of enhancing individual welfare, not an end in itself.

- Finally, the entire argument that saving incentives can increase the capital stock rests on the premise that investment in the economy depends on its own rate of saving.
- All national saving is channeled into national investment.
- This is true in an economy that is closed to international trade.

- In an open economy ⟶ domestic saving can be invested abroad.
- This means that tax policy designed to stimulate saving may not lead to more domestic investment.
- To the extent that saving flows freely across national boundaries to whatever investment opportunities seem most attractive, the ability of tax policy to stimulate investment through saving is greatly diminished.

- Empirical evidence:

  Countries with high domestic investment, and vice versa.

  Saving may not flow into and out of the economy as freely as one would expect in a completely integrated world capital market (Kho et al., 2006)

  As long as saving and domestic investment are correlated, tax policy that affects saving can generally be expected to affect investment. The size of the effect, however, is smaller than one would find in a totally closed economy.

Housing decisions

- A tax code can have significant affect on the allocation of saving across different types of investment.
- How the tax code favors investment in housing?
- EX: Miss B owns a house and decides to rent it out.
- What is her net income?
- She receives rent from her tenants, but also has to incur some operating expenses such as making repairs.

R = rent - operating expenses

- Suppose that Miss B took out a mortgage to buy the house, and her yearly interest payments are I.
- Suppose that the house increase in value during the course of the year by ΔV (capital gain, a component of income).
- Miss B's net income as a landlord, R_{net} is:

$$R_{net} = R - I + \Delta V$$

- R_{net} is added into Miss B's taxable income.

- Now suppose that instead of renting the house, Miss B moves into it herself.
- By living in the house, she receive a benefit equal to the market rental value of the house, while still incurring the operating expenses and mortgage interest payments and getting the capital gain,
- She receive an imputed net rent on the home equal to R_{net}.
- Whether she lives in the house or not, she receives a net benefit of R_{net}.
- The only difference is that when she rent out the house she explicitly receive the rent in cash, while if she lives in the house she effectively pay it to herself. But it is still income, and under a Haig-Simons income tax, it should be taxed. (but Thai law, it is not included in the tax base and has no housing capital gain tax.)
- By excluding imputed rent from homeownership from the tax base, the tax system in effect subsidizes owner-occupied housing.

- However, the deductibility of mortgage interest and property taxes is not the fundamental source of the subsidy to homeownership.
- Indeed, if imputed rent were included in the tax base, then mortgage interest and property taxes would be legitimate deductions, because they would be construed as expenses of earning this rental income.
- The basic issue is the failure to include imputed rent in the tax base in the first place.

- By excluding net imputed rent from taxation, in effect the tax code lowers the price of owning a home and increases the demand for owner-occupied housing.
- The implicit subsidy affects not only how much housing people purchase but also whether they become owners or renters in the first place.
- Many studies indicate that tax considerations have played an important part in the growth of homeownership (Gervais, 2002).

Portfolio composition

- Tax may affect not only the total amount of wealth that people accumulate but the assets in which that wealth is held as well.
- A popular argument is that low taxes (especially on capital gains) encourage investment in risky assets.
- In Tobin's model, individuals make their decisions about whether to invest in an asset on the basis of 2 characteristics- the expected return on the asset, and how risky that return is.
  - Other things being the same, investors prefer assets that are expected to yield high returns.
  - At the same time, investors dislike risk; other things being the same, investors prefer safer assets.

- Suppose there are 2 assets.
- 1. Perfectly safe but it yields a zero rate of return.
- 2. A bond that on average yields a positive rate of return, but it is risky – there is some chance that the price will go down, in which case the investor incurs a loss.
- The investor can adjust the return and risk on the entire portfolio by holding different combinations of the 2 assets.
  - In one extreme case he or she could hold only the safe asset – there is no return, but no risk.
  - On the other hand, the investor could hold only the risky asset – his or her expected return rises, but so does the risk involved.
  - The typical investor holds a combination of both the risky and safe assets to suit tastes concerning risk and return.

- Assume that a proportional tax is levied on the return to capital assets.
- Assume also the tax allows for full loss offset – individuals can deduct all loses from taxable income.
- Safe asset has a yield of zero, the tax has no effect on its rate of return – the return is still zero.
- In contrast, the risky asset has a positive expected rate of return, which is lowered by the presence of the tax.
- The tax seems to reduce the attractiveness of the risky asset compared to the safe asset.

- When the tax lowers the return to the risky asset, it lowers its riskiness as well.
- Why?
- In effect, introduction of the tax turns the government into the investor's silent partner. If the investor wins (receive a positive return) ⟶ the government shares in the gain.
- But the loss-offset provision, if the individual loses, the government also shares in the loss.
- In short, introduction of the tax tightens the dispersion of returns – the highs are less high and the lows are less low – and hence, reduces the risk.

- Although, the tax makes the risky asset less attractive by reducing its expected return, its simultaneously makes it more attractive by decreasing its risk. If the second effect dominates, taxation can on balance make the risky asset more desirable.
- Poterba and Samwifk (2003) found that other things being the same including total wealth, people in higher tax brackets have a higher probability of holding common stock, which is quite risky. This finding lends at least tentative support to the notion that taxation increases risk taking.