A calculation that finds the optimal income tax in a simple model: Gruber and Saez (2002).

Description of the model. This is a special case of a Mirrlees model. There are 4 different types of workers (households) with different productivity levels. All workers have the same utility function over income. The government can choose varying marginal income tax rates on different income levels. The same tax policy applies to all types of workers with a given income level. Workers can vary their income by choosing how hard or how many hours they work, taking into account the tax rate.

High marginal tax rates lead workers to choose to work less. That is a reason for the government to try to reduce marginal tax rates. On the other hand, the government is trying to maximize the expected utility for a worker who doesn’t know beforehand what productivity she will have. This would tend to increase marginal tax rates.

Methodology. Gruber and Saez consider various cases that differ by the difference in the value of an additional dollar to the poor and to the rich. Thus, they consider different utility functions. Given a utility function, they calculate the optimal tax schedule that raises a given amount of tax revenue. This is a constrained optimization problem - maximize expected utility subject to the constraints that workers choose their incomes (by choosing effort levels) optimally given their ability level and the tax policy.

Conclusions. When a dollar to the poorest is worth four dollars to the richest, optimally there is a transfer of $11,000 of income to everyone, and optimal marginal tax rates vary from 68% on the lowest incomes to 49% on the highest incomes. These marginal tax rates are taxes on earnings of the workers - they do not tax the 11,000 transfer. For example, a household with 10,000 in earned income pays 68% of that, but they get 11,000, so their after-tax income is 14,200 = 3,200 + 11,000. Their average tax rate is -42%.

A household with 100,000 of earned income has a marginal tax rate on additional income on 49%, but they paid more than that on some of their income. They get the lump-sum transfer of 11,000, but they pay 57,650 in taxes on their earnings. Their net tax is 46,650, so their average tax rate is 46.7%.

These marginal tax rates are much higher than the US federal income tax. If the study had taken into account the fact that there are other taxes (local and state), they probably would have found lower optimal marginal income tax rates.

Chapter 20.4

Tax-benefit linkages and the financing of social insurance programs
This section examines the effect of the ties between taxes and benefits on the equity and efficiency of a tax. It focuses on the role of payroll taxes in financing social insurance programs (unemployment insurance, Social Security, Medicare).

As an illustration, consider a worker’s compensation program that is financed by a payroll tax. Initially there is no worker’s compensation program. The labor market is in equilibrium. Then the government implements a worker’s compensation program financed by a payroll tax on employers. As a cost to employers, the tax causes employers’ demand curve to shift down by the amount of the tax per unit - they demand less labor at all wage levels. There is deadweight loss: There are workers who would be willing to work at prices that firms would accept if there were no tax. the deadweight loss measures the value of mutually beneficial trades that do not take place because of the tax.

But the tax also has an effect on the supply of labor. Worker’s compensation provides insurance to workers against loss of wages and medical expenses due to injury or sickness on the job. Without worker’s compensation, workers in dangerous jobs would require to be paid compensating differentials (a higher wage due to the unpleasant nature of the job). With worker’s compensation, some of these compensating differentials would not have to be paid. Therefore the supply of labor curve shifts down when worker’s compensation is offered: workers are willing to work the same amount for lower wages.

The deadweight loss triangle measures the inefficiency due to mutually beneficial trades that are not taking place due to the worker’s compensation program. It can be shown graphically as the difference between social surplus when there is no worker’s compensation and social surplus when there is worker’s compensation. It is the area between the original demand and supply curves from the quantity at the new equilibrium point to the quantity at the old equilibrium point.

If the quantity at the new equilibrium point equals the quantity at the old equilibrium point, the deadweight loss is zero, in other words, there is no efficiency loss due to the program, as there is no reduction in the number of trades taking place. This is true if workers fully value the benefit of the worker’s compensation insurance at its cost to the employer. Then the labor supply curve shifts down by the same amount as the labor demand curve, leading to no change in quantity. Equilibrium wages fall by the amount of the tax. So the cost of the worker’s compensation is fully shifted to the workers in the form of lower wages.

Workers, however, are most likely better off due to the program. This is because they are most likely risk averse, so they value insurance.

Why doesn’t the employer provide worker’s compensation without government involvement? It would allow them to reduce wages in exchange for insurance whose expected value is less than the reduction in wages.

Adverse selection prevents companies from offering worker’s compensation. They may be afraid that clumsy workers or those who don’t like to work will prefer
to work for a company that offers more worker’s compensation.

Chapter 21.1
Theory of taxation and labor supply.
It is convenient to separate income effects and substitution effects on labor supply. Income effects are the effects of getting a lump-sum transfer without any change in prices or after-tax wage rate. Normally, the effect of an income transfer is to reduce labor supply and pre-tax income. When a person gets more money for free, they generally choose to take more leisure.

Substitution effects. Consider the following situation. Start with some initial tax rate. You increase the marginal tax rate (so the after-tax wage rate falls), but you give the worker enough income in a lump-sum transfer to make the worker exactly as well off as before (they need not have the same income, as they could be working less and getting more leisure). The change in labor supply from the initial labor supply to the post-change labor supply is the substitution effect.

Section 21.2 Taxation and labor supply - evidence
To figure out what the optimal marginal income taxes are, Gruber and Saez had to use estimates of the change in pre-tax income or labor supply due to changes in marginal income tax rates. For these estimates, they used other studies.
Terminology. Primary earners are the main source of income in a household. Secondary earners are other workers in the household. Traditionally primary earners were husbands and secondary earners were wives.

Conclusions from the literature: Primary earners have low elasticity of labor supply in response to wage changes (like those caused by tax changes). For every 10% reduction in after-tax wages, primary earners work on average 1% fewer hours. Elasticity of labor supply with respect to after-tax wages is 0.1. Secondary workers have higher elasticities of labor supply, with elasticity of labor supply to after-tax wages ranging from 0.5 to 1. Each 1% rise in after-tax wages led to an average increase in labor supply of 0.5% to 1%. Most of the response is due to the decision to work at all, less of it comes from the decision to work more hours. Historical context: Men traditionally had production-sector jobs for which there were important hour constraints. Women traditionally held service-sector jobs with more flexible work hours.

Limitations of the studies. Distinction between primary and secondary workers has become smaller. Percentage of married women working has risen from 50% in 1970 to 60% in 2004. In 46% of married couples in US men and women work about the same number of hours each year. In 30% of married couples, woman works more hours than man. So it is more difficult to decide who is the primary earner.

Studies have focused mainly on labor force participation and work hours, but there are other ways to measure labor supply that might respond more to taxa-
Savings is the difference between a person’s income and their consumption. In the traditional theory of savings, the role of savings is consumption smoothing. Individuals prefer to smooth consumption over time because of diminishing marginal utility of consumption - more equal amounts of consumption over time periods are preferred. Savings does this by carrying over consumption from high-income periods to low-income periods.

The amount a society saves can be an important determinant of economic growth. In normal times, more savings tends to lead to more investment in physical and intangible (human, research and development) capital, which raises productivity of labor. Because of this relationship between savings and growth, the capital income taxation rate - the taxation of the returns from savings - is subject to major debate.

The after-tax rate of return on savings. Suppose someone saves $1000 for a year. They buy a bond with 3% interest or put it in the bank. They get 3% interest on this savings, $30. Suppose the marginal income tax rate is 30% on income from saving (capital income), and their other savings and income doesn’t move them out of that bracket. 30% of $30 is $9, so they only get $21 as return on saving. Their after-tax rate of return is 2.1%.

Income and substitution effects of saving for consumption smoothing

A higher after-tax rate of return on savings means more income. That tends to make a person consume more and save less now. They can spend more now and still have higher consumption in the future. On the other hand, the higher after-tax rate of return on savings makes future consumption cheaper relative to current consumption. One dollar now buys you more future consumption than before. This tends to make a person consume less now and save more. So the income and substitution effects go in opposite directions. Corresponding to this theoretical ambiguity, the empirical studies don’t get much effect of the after-tax rate of return on saving, with a wide range of estimates.

The model used to study savings choice is called the intertemporal choice model. Savings is the difference between income and current consumption. So we can draw an intertemporal budget line that shows, given current income and the interest rate, what are the possible consumptions in two periods - present and future.

Suppose a person lives for two periods. In period 1, he works and earns income. In period two he is retired and does not earn any income. He can save the income earned in period 1 that he does not consume. This savings (S) earns interest so that if he saves S in period 1, he has \((1 + r)S\) to consume in period 2, where \(r\) is the interest rate. His problem is therefore to maximize his lifetime
utility subject to the budget constraint \( C_1 + \frac{C_2}{1+r} = I \). So the slope of the budget line is \(-(1 + r)\). Intuitively, this is because the opportunity cost of a dollar of period 1 consumption is \(1 + r\) dollars of period 2 consumption (since by saving that dollar one could get \(1 + r\) dollars of consumption in period 2).

When the government taxes interest payments on savings, the amount that can be bought in period 2 with a dollar of savings decreases, so the budget line becomes less steep. Suppose that initially there is no tax and an interest rate of \(r\). Then the government imposes a tax on interest income. The tax rate is \(\tau\). This means that the government takes \(r \times \tau\) in taxes from every \(r\) that is earned as interest on savings. So the after-tax rate of return on savings, which was \((1 + r)\) before, becomes \(1 + r \times (1 - \tau)\) now. The opportunity cost of consuming now rather than later has fallen.

There are two effects of this change in the opportunity cost of consuming now. The substitution effect tends to make people save less and consume more now, because the returns to savings are less. The income effect tends to make people consume less now because they are poorer at every level of savings, and save more. Depending on the person’s intertemporal preferences, it is possible that either the savings effect or the income effect dominates. Studies have found varying results. Hall (1988) found that there is little impact of the after-tax interest rate on savings. Attanasio and Weber (1995) and Gruber (2006) found that consumption is significantly affected by the after-tax interest rate.

Inflation and the Taxation of Savings

Suppose that Robin is going to save $100 at a nominal 10% interest rate and spends all her money on Skittles, at $1 per bag. Initially there is no tax on interest earnings. She earns $10 in interest, and her after-tax resources are $110, enabling her to buy 110 bags. Then a capital income tax of 50% is introduced, so her after-tax resources are $105 - she buys 105 bags. Now suppose there is inflation of 10%. A bag of Skittles costs $1.10 in the second year. with $110 in resources, she can only buy 100 bags of Skittles. With a tax rate of 50% on capital income, she is still taxed on the $10 of nominal interest income she made, leaving her with $105, but she can only get 95.5 bags of Skittles.

However, inflation also causes the nominal interest rate to rise. In general banks and corporations raise nominal interest rates to keep real rates the same. The relationship between the real interest rate \((r)\), the nominal interest rate \((i)\) and the inflation rate \((\pi)\) is

\[
r = \frac{1+i}{1+\pi} - 1.
\]

If inflation is 10%, banks will pay a nominal interest rate of 21% to give the same 10% real return as before the inflation (\(\frac{121}{1.1} = 110\) bags of Skittles, so the real return is the same). But taxes are still on nominal interest earnings. If she gets a nominal return of $21 in interest, she must pay $10.5 of that as tax. This leaves her with $110.5, with which she can only buy 100.5 bags of Skittles - less than before the inflation.
Alternative models of saving besides consumption smoothing

Recent research suggests other factors than consumption smoothing might be important determinants of savings. They suggest that the after-tax rate of return on savings might be less important than in the consumption-smoothing model. For instance precautionary saving. This is saving to smooth consumption over states of the world, rather than over time. It shifts income from states of the world where income is high to states where income is low, such as financial emergencies. When people were asked about their reasons for saving, the most frequent answer along with saving for retirement was saving for emergencies - unemployment or health problems. People are thus using savings to insure themselves against risk. You don’t spend the savings if the bad event doesn’t happen in a period, and you do spend them if the bad event happens in that period.

In the precautionary savings model, people face the risk of adverse events happening in the future (adverse health events, unemployment, divorce, low income). They may be unable to borrow in such an event due to liquidity constraints - a bank may refuse to lend to someone who has just lost a job. Thus, they want to have savings in case such an event occurs.

The substitution and income effects of higher after-tax rate of return to savings are pretty much the same in this model as in the consumption-smoothing model.

Insurance is a form of precautionary saving. But there are contingencies for which limited insurance is available (unemployment insurance is limited). There could be situations where the type of saving is actually affected by the after-tax rate of return. If people are trying to insure themselves against income loss, having investments where the return is negatively correlated with future other income becomes valuable. Such as stocks that perform well in recessions (shares in companies that sell cheap products).

In support of the precautionary savings theory, studies have shown that more uncertainty leads to more savings, and that expansions of social insurance programs that lower income uncertainty also lower savings.

Target saving - another reason for saving is to try to reach a certain amount to spend it on a particular thing, like a down payment for a house. This is different from other kinds of savings because with the other kinds (retirement and precautionary) there is an ambiguity about the effect of after-tax rate of return changes. For target saving, if the after-tax rate of return increases, the income effect makes people save less and it dominates the substitution effect. When the after-tax rate of return is high, they don’t need to save as much to reach the target.

Self control models

There is some experimental evidence that people may not be completely rational, or their short-run preferences may conflict with their long-run preferences.
The short-run preferences may lead to consuming more now, even if the long-run preferences would lead to consumption smoothing across their lives. In this type of model, a determinant of how much individuals save is whether they can find ways to commit themselves to save. This can justify policies that give incentives for saving.

Tax incentives for retirement saving

Some economists argue that the United States saves too little and that as a result growth is less. The US government has implemented various tax subsidies to encourage retirement savings.

Tax subsidy to employer-provided pensions. Defined contribution pension plans - employers set aside a proportion of a worker’s earnings in an investment account, the worker receives these earnings and investment earnings when he retires. The contributions that employers make to pension plans are not taxed as income to employees (not counted as taxable income). Interest that accumulates on these pension savings is also not taxed as it accrues. Employees’ pension savings are taxed as regular income when it is withdrawn.

401(k) accounts. This is the most rapidly growing form of retirement savings. It is offered by employers. A typical 401(k) option at a firm allows employees to contribute up to 10% of income to a retirement account. The contributions are not counted as taxable income. The employer matches some percentage of employee contributions, say 5%. There is a limit on contributions of 16,500 per year, but firms may set a lower limit. Account balances are taxed as ordinary income when withdrawn.

The Individual Retirement Account (IRA) program was introduced by Congress in 1974 in an attempt to get people to save more. IRAs function as follows:

Almost any form of asset (stocks, bonds, gold) can be put in an IRA.

People can contribute up to $5000 tax-free each year if they are under 50. For people above 50 it is $6000 per year. The amount they contribute is deducted from their taxable income.

Interest, capital gains and dividends earned on IRA contributions are untaxed (not counted as income for tax purposes).

IRA balances can’t be withdrawn until age 59.5.

When IRA balances are withdrawn, it is taxed as regular income.

Keogh accounts

For the self-employed. They can save up to 49,000 or 20% of income (whichever is smaller) per year tax-free. Taxed upon withdrawal.

Why do tax subsidies raise the return to savings?

How is this a tax subsidy if the savings are taxed when withdrawn? It is a subsidy because tax payment on the savings is deferred until withdrawal.
There is also a deferral of tax on any accumulated income (interest earned). Tax payments in the future are less costly than tax payments today because you earn interest on the tax payments avoided today. With tax-preferred retirement savings, you earn interest on money that would otherwise have been paid in taxes.

Substitution and income effects of tax subsidies for retirement savings

IRA provides an income effect on savings for people who would have saved more than the limit for retirement without the IRA. For such people, there is no substitution effect due to the IRA, because the rate of return on additional saving past the limit is the same as it would have been without the IRA (because past the limit, saving is still taxed). But there is an income effect, because the part of saving up to the limit is untaxed - this gives the individual more income, which causes more consumption spending and less saving.

For people who would not have saved as much as the limit, IRA provides both a substitution effect and an income effect. So the effect of IRAs is ambiguous. Empirical studies show that it does expand total savings a little bit. But this effect may not be worth the total cost in forgone tax revenue to the government.

Roth IRA

Established in 1997 by Congress. Individuals are taxed on their contributions to a Roth IRA and are not taxed upon withdrawal of their Roth IRA funds. Never required to make withdrawals from a Roth IRA (whereas as required to begin to withdraw from traditional IRA by age 70).

Senate has proposed to expand Roth IRA. Currently, individuals with incomes below 100,000 can close their traditional IRAs, pay taxes on the proceeds and put the proceeds in a Roth IRA. Senate proposed to eliminate this 100,000 limit. Higher income households would like this. Shifting amounts to a timing change in when individual pays taxes. Funds in the Roth IRA are allowed to accumulate tax-free, even when withdrawn. Households who expect their tax rate to be higher in retirement (e.g. if they will get large payouts from pension plans) can lower lifetime taxes by paying them now rather than later.