Income taxes in the United States

Definition – money taken yearly on earned income, such as salaries, wages, tips, commission, and unearned income, like dividends and interest. Business and other income is also taxed.

Source: apps.irs.gov/app/understandingTaxes/student/glossary.jsp

Intuition – All countries collect federal taxes to pay for goods and services that benefit society. In the United States, taxes flow to the Department of Treasury, where the Internal Revenue Service (IRS) collects tax revenue and enforces tax law in the US. The congress and president decide how much to collect. US income taxes are progressive, so that higher income earners pay higher and higher rates. Low income individuals pay 10 to 12%, while those earning more that $510,300 pay 37% on every additional dollar of income.

Mathematical / Technical –

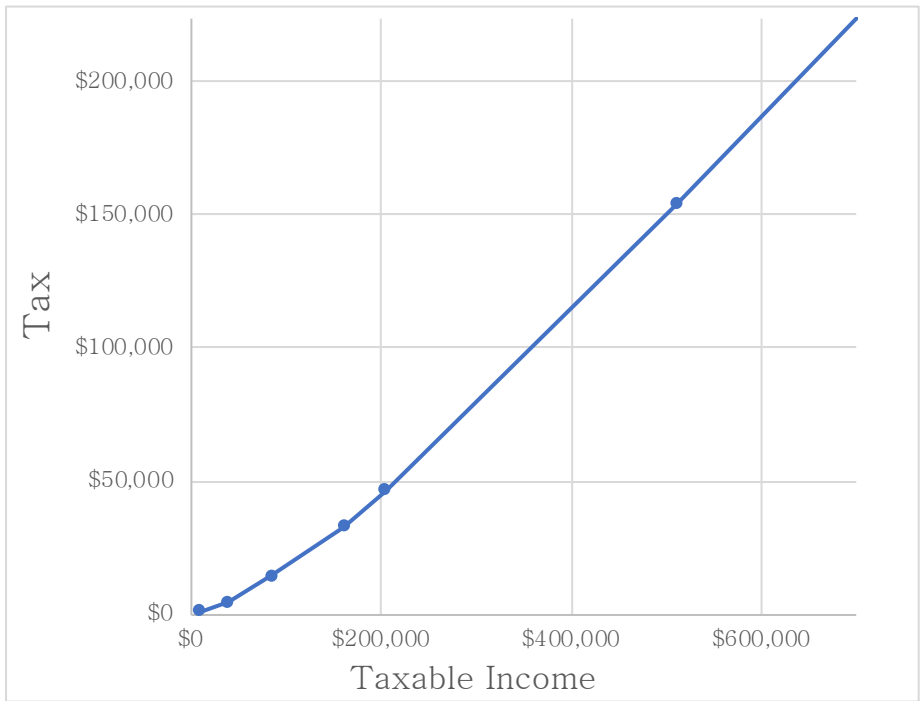
- An individual's income has several possible adjustments before it is the "taxable" amount.
- Two important types of adjustments are itemized and standardized deductions. **Itemized** deductions occur when a taxpayer accounts for separate expenses such as gifts, charitable giving, and mortgage interest. A **standardized** deduction is a fixed amount determined by the government, and is the more common choice.
- **Taxable income (TI)** is difference of original income less the deductions.
- The **marginal tax rate** is the percentage that is paid in taxes on each additional dollar earned.
- The marginal tax rates grow for each of the **seven tax brackets**. These progressive rates ensure higher income earners pay a larger percentage.
- A piecewise function determines how much an individual pays in taxes. The 2020 values are

$$\boldsymbol{tax} = \begin{cases} 0.10\ (\text{TI}) \ if\ TI \leq \$9{,}700 \\ 970 + 0.12\ (TI - 9700)\ if\ \$9{,}700 < TI \leq \$39{,}475 \\ 4{,}543 + 0.22(TI - 39{,}475)\ if\ \$39{,}475 < TI \leq \$84{,}200 \\ 14{,}382.5 + 0.24(TI - 84{,}200)\ if\ \$84{,}200 < TI \leq \$160{,}725 \\ 32{,}748.5 + 0.32(TI - 160{,}725)\ if\ \$160{,}725 < TI \leq \$204{,}100 \\ 46{,}628.5 + 0.35(TI - 204{,}100)\ if\ \$204{,}100 < TI \leq \$510{,}300 \\ 153{,}798.5 + 0.37(TI - 510{,}300)\ if\ \$510{,}300 < TI \end{cases}$$

Real-world aspects – Revenue collected from income taxes are used to supply federal services and programs. Examples are Medicare, The Food and Drug Administration (FDA), and bank regulations. These and other government programs are funded by taxing income earners and benefit the entire population, directly or indirectly, including those who do not work. The US also redistributes tax income to states through grants. In addition, most states levy income taxes; these programs vary – some have a flat tax rate, others have progressive taxes. Yet, a few states, such as Washington and Nevada, do not have income taxes.[a] 2020 was unique for individual income taxes in the US due to the coronavirus pandemic: the IRS pushed the filing deadline from April 15th to July 15th, and offered further reliefs those affected.[b]

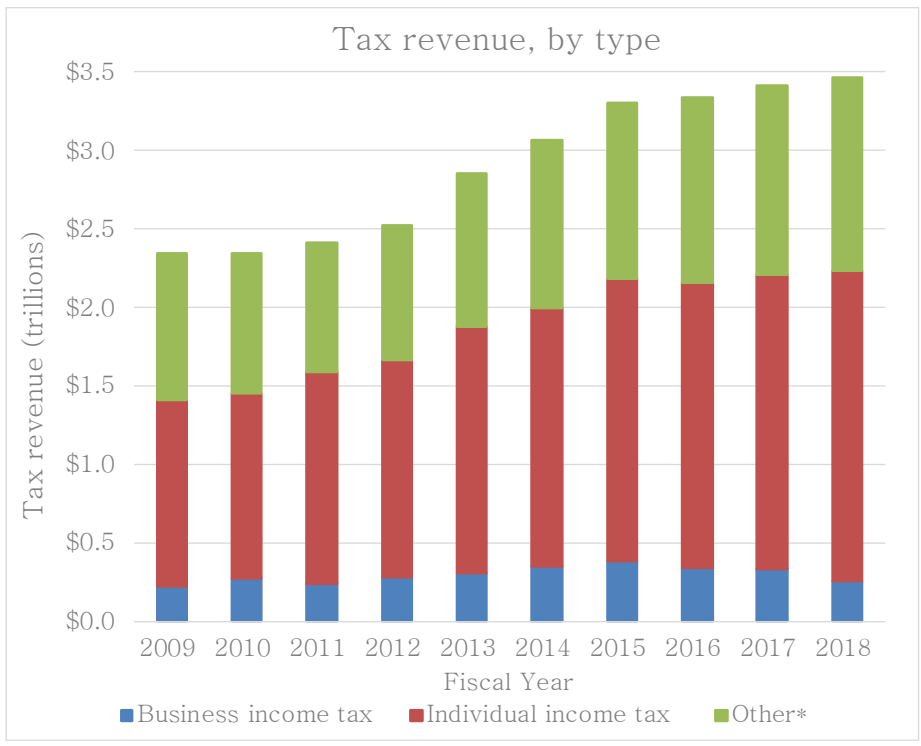
Sources: [a] https://tinyurl.com/ya6ekzcg, [b] https://tinyurl.com/yx8cw423

Graphical – Taxable income & tax paid



Notice the slight increase in slope between each blue dot. The slopes match each tax bracket, the marginal tax rates in yellow of the piecewise function. Calculating taxes is tedious; the IRS provides a tax table, that is many pages long, for individuals to look up their taxes.

Source: https://tinyurl.com/rqj8ueq



Federal revenue generated by different types of taxes. The individual income tax is the largest source of revenue, and growing.

*Other: Includes employment, estate and gift, and excise taxes.

Source: https://www.irs.gov/statistics/soi-tax-stats-irs-data-book

Practice questions

1. What is the amount of tax that an individual pays if their taxable income (TI) is $157,000? Explain why this is higher than someone whose TI is $75,000.
2. Give a definition of progressive taxation. Using the piecewise tax formula, explain in words the 2nd and 4th brackets. Then, explain why we might choose progressive taxation, as a society.
3. If tax rates have been fairly constant, why is tax revenue growing through time? In other words, what are some reasons total income is growing?
4. If average tax rate (R_{ave}) is $R_{ave} = \frac{tax}{TI}$, what is the R_{ave} for the first individual in Question 1? Why is this different from all the marginal tax rates?
5. What government agency enforces tax law in the United States? In which department is this agency?

Numerical solutions: **1.** $31,854.50 ; **4.** 20.29%