

# 32. Ratio, Proportion and Rates of Change

Using GDP data to compare economic growth rates across the world.

You are completing an internship at a bank and your first project is to research economic growth in various cities and countries around the world. You learn that economic growth is typically measured in changes in gross domestic product (GDP), which refers to the financial value of goods and services produced by an economy. Additionally, your manager explains that you should also consider GDP per capita, which is calculated by dividing an economy's GDP by its population, in order to better understand the average economic output of each individual person within an economy.

1. The GDP of Sweden was \$496 billion in 2010, and it increased to \$547 billion in 2020. During the same period, the GDP of Israel increased from \$238 billion to \$413 billion.
  - a. By how much did total GDP increase over this period in Sweden and Israel?

- b. What are the compound annual growth rates of GDP in Sweden and Israel?

A faint, light blue outline of a globe showing the continents of North and South America, centered within the answer box.

- c. You learn that in 2020 the population of Israel was 10% smaller than the population of Sweden. Which country has the higher GDP per capita?

2. The population of New York City was 8,190,000 in 2010 and by 2022 it had increased to 8,773,000.

- a. If the population of Chicago was 2,697,000 in 2010 and grew at the same rate as New York City between 2010 and 2022, estimate what the population of Chicago was in 2022.

- b. If Chicago and New York City each grew at a constant rate between 2010 and 2022, use your answers to Question 2a to estimate the populations of Chicago in 2013 and New York City in 2018.



- c. If the GDP of New York City was \$1.5 trillion in 2022, what would the GDP per capita of Chicago need to be in order for Chicago to have the same GDP as New York City in 2022?

3. You are asked to compare economic growth in Indonesia and the Netherlands. In 2021, both countries had similar sized economies, with Indonesian GDP at \$1.186 trillion and Dutch GDP at \$1.013 trillion. Meanwhile, Indonesian GDP was \$755 billion in 2010. As your team is correcting the 2010 Dutch GDP data you only have the 2015 Dutch GDP figure, which was \$765 billion.

- a. Based on the available data, which country has the higher annual average growth rate?

- b. Is this a fair comparison? Provide reasons for your answer.

A faint, light green watermark of a globe showing the continents of Asia and Australia is centered behind the answer box.

- c. The population of Indonesia was 273.8 million in 2021 and 244 million in 2010. Calculate Indonesian GDP per capita in 2010 and 2021.

4. The GDP of Poland was \$475 billion in 2010 and increased to \$599 billion in 2020. During the same period, the GDP of the Czech Republic increased from \$209 billion to \$246 billion.

- a. What was the annual compound growth rate of each country's GDP?

- b. What was the ratio of the GDP growth rates of Poland to the Czech Republic?

- c. The Polish population decreased from 38.1 million in 2010 to 37.9 million in 2020. Comment on how this may have impacted Poland's GDP per capita.

