DAT565/DIT407 Assignment 1

Giacomo Guidotto
gusguigi@student.gu.se

Leong Jia Yi, Janna
gusleoji@student.gu.se

2024-09-05

1 Problem 1

1.1 Part I: Dependency Ratio

Below in Figure 1, we see a line graph displaying the dependency ratio of Sweden from 1860 to 2022.

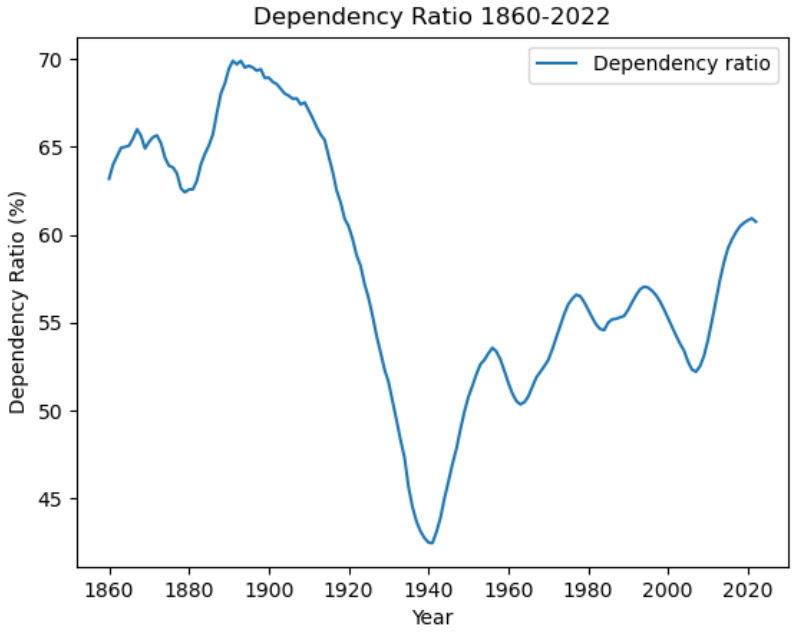

Figure 1: Dependency ratio of Sweden from 1860 to 2022.

1.2 Part II: Population Fractions

Below in Figure 2, we see a line graph displaying the fraction of the children, the elderly and the total dependent population of the total Swedish population from 1860 to 2022.

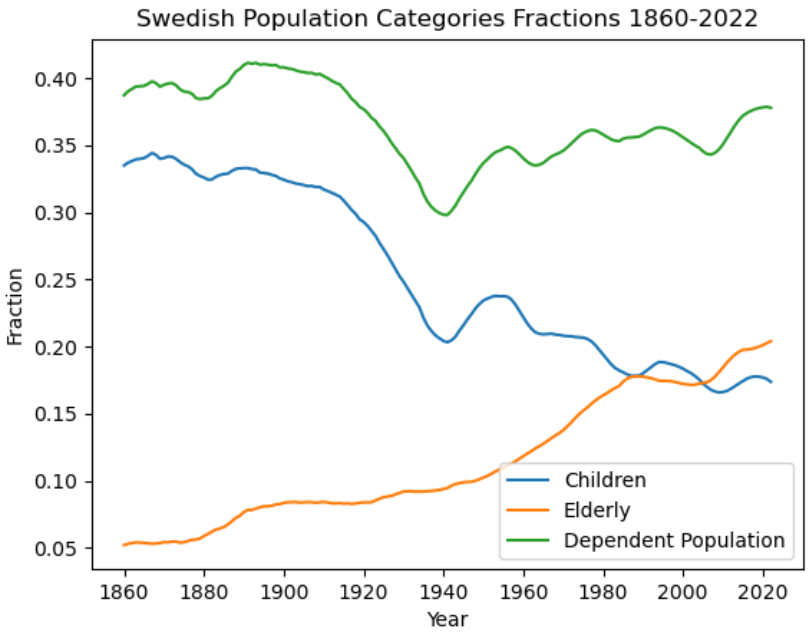

Figure 2: Fraction of the children, the elderly and the total dependent population from 1860 to 2022.

1.3 Part III: Discussion

After the above analysis of the data on the Swedish population, provided by the SCB [1], we were able to identify some observations about the development of the Swedish population.

Firstly, from figure 1, we observe that there is an overall significant decrease in the dependency ratio in Swedish society from 1860 to 2022. This can be caused either by an increase in labor force or a decrease in the dependent population. But by looking at figure 2, we can see that the amount of dependent population remained relatively stable over the years. This means that the main cause of the decreasing trend in the dependency ratio was an increase in labor force which consequently helped reduce pressure on the Swedish economy. We can observe this same trend in other industrialised countries such as Switzerland. According to a case study done by the University of Leeds [2], Switzerland also experienced a decrease in dependency ratio in a similar period, from 1861 to 1997.

Next, from figure 1 we can see that the dependency ratio was at an all time low in 1940. We believe one factor contributing to this was a 20th century phenomenon of rapid growth of the middle age population that took place across industrialised countries, as explained in a paper from 2010 [3]. In Sweden specifically, they experienced an increasing labor force population from 1870 to 1970 [3], explaining the fall in dependency ratio during this period.

Lastly, after inspecting figure 2 we can observe that the fraction of elderly

increases drastically over the years. This indicates that Sweden has an aging population, which is supported by this 2023 article by ISPI [4]. This trend also tells us that the majority of dependent people is made up by elderly. This is consistent with the trend we observed with other industrialised countries who also face an aging population.

References

[1] Statistiska centralbyrån. *Folkmängden efter ålder och kön. År 1860 - 2022.* Retrieved 2023-10-20. 2023. URL: https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BE__BE0101__BE0101A/BefolkningR1860N/.

[2] Reichle Kupiszewski Schuler. *Internal Migration and Regional Population Dynamics in Europe: Switzerland Case Study.* Retrieved 2023-9-08. 2000. URL: https://eprints.whiterose.ac.uk/5026/.

[3] Sommestad Malmberg. *The Hidden Pulse of History: Age Transition and Economic Change in Sweden, 1820-2000.* Retrieved 2023-9-08. 2010. URL: https://www.tandfonline.com/doi/abs/10.1080/03468750050115636.

[4] Andreas Motel-Klingebiel, Annika Heuer, and Indre Genelyte. *Sweden, Almost a Country for Old Men.* 2023. URL: https://www.ispionline.it/en/publication/sweden-almost-a-country-for-old-men-106929 (visited on 09/05/2024).

A Code

Following is the Python code that we use to extract and visualized the information presented in this report:

A.1 Problem 1

```
# importing libraries and reading the dataset

import pandas as pd
import matplotlib.pyplot as plt

df =
pd.read_csv("../data/swedish_population_by_year_and_sex_1860-2022.csv")

# creating a new dataframe containing
# the number of people of a specific age for a specific year:
age_df = df.drop(columns='sex').groupby("age").sum()

# generating a support vector with all the ages
# in the dataset:
age = pd.to_numeric(age_df.index.str.replace("+", ""))

# calculating the number of children by summing
# every age under 15 years old:
```

```
children_count = age_df[age <= 14].sum()

# doing the same thing for the elderly:
elderly_count = age_df[age >= 65].sum()

# and for the labor force:
labor_count = age_df[(age >= 15) & (age <= 64)].sum()

# Calculating the dependency ratio:
dependent_count = children_count + elderly_count
dependency_ratio = (dependent_count / labor_count)*100

# plotting the ratio:
_, ax = plt.subplots()
ax.plot(dependency_ratio, label="Dependency ratio")
ax.set_title('Dependency Ratio 1860-2022')
ax.set_xlabel('Year')
ax.set_ylabel('Dependency Ratio (%)')
ax.set_xticks(range(0, len(dependency_ratio), 20))
ax.legend()

plt.savefig("dependency_ratio.png")

# calculating the total amount of a particular
# age group relative to the total population:
total_count = age_df.sum()
children_fraction = children_count / total_count
elderly_fraction = elderly_count / total_count
dependent_fraction = dependent_count / total_count

# plotting the fractions:
_, ax = plt.subplots()
ax.plot(children_fraction, label="Children")
ax.plot(elderly_fraction, label="Elderly")
ax.plot(dependent_fraction, label="Dependent Population")
ax.set_title('Swedish Population Categories Fractions 1860-2022')
ax.set_xlabel('Year')
ax.set_ylabel('Fraction')
ax.set_xticks(range(0, len(children_fraction), 20))
ax.legend(loc='lower right')

plt.savefig("population_fractions.png")
```