

Data Appendix: Postwar European Growth

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Abstract

This appendix documents the data.

1 Introduction

This appendix documents the database. Uses the accounting model described in the paper.

2 Basic Variables

The following variables are taken directly from the sources. The sources are:

- WDI: World Development Indicators, 2004.
- Maddison (1995, 1996)
- Liesner (1989)
- Mitchell
- CJJ
- PWT: Penn World Table 6.2
- Groningen Total Economy Database

Combining data from different sources: Since each source covers only a limited number of years, it is typically necessary to combine at least two sources in order to construct a variable. This involves the following steps:

1. Given two series representing the same variable, but obtained from two sources. Denote them x_t and y_t .
2. Scale y_t to match the mean of x_t : $\hat{y}_t = y_t / \bar{y} \cdot \bar{x}$.
3. For the overlapping period of years, compute the deviation

$$d = \bar{x}^{-1} \sum_t |y_t - x_t|$$

4. If d is above a threshold (typically 0.05), discard the y_t data. Otherwise, replace missing years in x_t with \hat{y}_t values.

Given this method, the sequencing of sources matters. Below, this sequence is indicated by the order in which sources are mentioned.

2.1 NIPA Variables

2.1.1 Real GDP (Y)

$$Y = Y/Q \times Q.$$

Y/Q : The data are combined in sequence from the following sources:

1. PWT: RGDPCH
2. WDI [GDP per capita, PPP (constant 1995 international \$)].
3. Maddison (1995) T. D-1a.

2.1.2 Investment share in GDP

The appropriate measure of investment is net fixed non-residential capital formation. Only gross capital formation is available. A depreciation rate of 0.05 is used. The data sources used are PWT [IYc, current international prices] and WDI [Gross capital formation (% of GDP)]. The two series usually coincide well. For some countries, PWT lacks data in the 1950s. Mitchell [Gross capital formation (% of GDP)] data are used to fill in the gaps.

For expenditure shares: current price shares are used. Since the relative price of I falls over time, constant price series for I/Y generally have an upward trend. The current price series for the U.S. is roughly constant over time.

2.1.3 Government spending share in GDP

The sources are the same as for investment share data (for reasons of consistency). For most countries, WDI [General government final consumption expenditure (% of GDP)] and PWT [GYc] data are used. Occasionally, Mitchell data (Total central government expenditures) fill in missing observations. Unfortunately, Mitchell's data appear to include transfer payments.

For NLD, the three sources have substantially different figures over the entire period.

2.1.4 Consumption share in GDP

The sources are the same as for the investment share data, except that Liesner instead of Mitchell is used to fill in missing observations (Mitchell does not report aggregate consumption expenditures).

2.1.5 Capital stock

Capital stock figures are constructed from cumulative investment: $K_{t+1} = (1 - \delta) K_t + I_t$. However, for purposes of comparison and in order to obtain estimates for the capital stock in 1950, capital stock data from Maddison (1995, 1996) are used. The data refer to fixed, non-residential capital.

For calculations that only require the growth rate of the capital-output ratio we also use CJJ data.

2.2 Labor Variables

2.2.1 Population (Q)

Population data are taken from PWT, WDI and Maddison (1995) T. A-3a. The 1961 value for CAN in Maddison (1995) is incorrect and has been replaced by interpolation. Population figures from different sources are typically very similar.

2.2.2 Employment (N)

Employment is computed as a $N = (N/Q) \times N$. Sources are Groningen and Liesner. Groningen data are spotty between 1950 and 1960. The agreement between both sources is generally close.

Special cases:

- SWE 1950: Based on Gunnarsson and Lindh (2001), the Groningen figure is used for 1950 and the years between 1950 and 1960 are linearly interpolated.
- ITA 1950: The Groningen figure is much lower than those of Maddison (1995), Liesner, or CJJ. I therefore replace the 1950 figure with that of Maddison (1995).
- For Germany: West Germany before 1991.

Since the ratio of employment to population is generally smooth, missing values are linearly interpolated.

2.2.3 Aggregate hours worked

$$H = (H/Q) \times Q.$$

H/Q : The main data sources are Groningen and Liesner. Groningen data are typically missing between 1950 and 1960. CJJ data are used to fill in these gaps. Any remaining gaps are filled in using Liesner data, even though these are often not directly comparable. This affects only a few countries. In each case, it is verified that Liesner data are similar to other data for overlapping years. Any missing observations are linearly interpolated.

2.2.4 Education

Average years of schooling are taken from Barro and Lee (2000). Data are linearly interpolated between years with observations. Data are set constant before the first observation. [All of this needs change+++].

Labor efficiency: $e(s)$. s : avg years of schooling.

$e(s) = \exp(\phi(s))$, where $\phi(s)$ is taken from Hall and Jones (1999). We will set $e(s) = 1$.

Labor input: $L = H e(s)$.

2.2.5 Work time / time endowment

Time endowment: $N\lambda$, where λ is endowment per person, in hours per year.

λ : [fraction of population of working age] x [full hours per year].

Full hours per year = 365 * 14.

Fraction of working age:

If model has variable time endowment: Population fraction aged 15-64. WDI and Liesner (1989).

If model has fixed time endowment: Average fraction of population aged 15-64 across all countries/years.

In the theory: take as given the sequences N_t and $\lambda_t e(s_t)$. Households choose $h = H / (N\lambda)$.

2.3 Fiscal Variables

Consistent series on tax revenues are available only after 1965. Our analysis therefore splices these data together with data from Mitchell and Liesner.

WDI: These only cover central government revenues, but the definition of central government appears to vary across countries. The data are usually similar to Mitchell's.

Country notes:

- JPN: Jump in total revenues in 1991. At the same time SS contributions jump from 0 to more than 20% of revenue. Drop data after 1990.

Mitchell: Mitchell's data only cover central government revenues. As a result, the USA has no sales tax revenues. These are taken from Liesner.

Liesner: Revenues are imported as fractions of GDP.

Levels of government captured:

- Includes all levels of government for UK, USA, CAN, DEU (except Gemeinden).
- Includes only central government only for ITA, JPN, SWE
- AUS, FRA: Not clear whether revenues are for all levels of government or for central government.

Revenues typically add up to only a fraction of total government receipts (JPN, USA, AUS, CAN, ITA). Most receipts are accounted for in the cases of FRA, DEU, SWE.

Country notes.

- ITA: Data are not usable because VAT is included in taxes on companies.

2.3.1 Government total revenues

WDI: Country notes:

- JPN: Jump in revenues/GDP from 14% to 22% in 1991. At the same time, social security taxes go from 0 to 22% of revenue. Presumably a classification change.

Liesner: AUS: Apparently only tax revenues.

2.3.2 Consumption tax revenues

The data are taken from WDI, Mitchell, Liesner. For countries where Liesner covers all levels of government, her data are given priority.

WDI: Consumption tax revenues are calculated as the sum of taxes on international trade and on goods and services.

Consumption tax revenues for the U.S. are very small (also in Mitchell). The likely reason is that sales taxes are collected by the states and not measured. Liesner data are used for the U.S.

Mitchell: Consumption tax revenues are calculated as the sum of sales taxes, excise taxes, taxes on monopolies, and taxes on specific goods.

For NLD, Mitchell's data differ substantially from WDI data.

ITA: Data are not usable. VAT comes in 1974. It probably was around before. Reported revenues are not close to the sum of individual tax revenues before 1973.

Liesner: Consumption tax revenues are calculated as the sum of customs and excise tax revenues and sales tax revenues. Country notes:

- GBR: Customs & excise and sales taxes are lumped together.
- ITA: Data are not usable because VAT is included in taxes on companies.
- SWE: No sales tax revenues are reported, except for automobiles. But reported revenues nearly add up to total receipts. It is therefore presumed that sales tax revenues are included in customs & excise taxes.

2.3.3 Income tax revenues

The data are taken from WDI, Mitchell, Liesner. Income tax revenues include Social Security contributions. For countries where Liesner covers all levels of government, her data are given priority.

Liesner: Income tax revenues are calculated as the sum of taxes on personal incomes and taxes on companies. It is not clear whether taxes on personal incomes include social security contributions.

Country notes:

- AUS, JPN: Revenues are virtually identical to WDI revenues with SS taxes included.
- For other countries, WDI data revenues are larger when SS taxes are included, but smaller otherwise.
- For DEU, FRA, SWE Liesner data are very similar to Mitchell data.

2.3.4 Social Security contributions

WDI: Available for all countries.

Country notes:

- JPN: Reports 0 contributions for most years, but then contributions jump up to more than 20% of revenue in 1991.

Liesner: Reported only for UK. Included in income tax revenues for AUS, JPN.

2.3.5 Government receipts

Liesner: Government receipts include nontax revenues for GBR, USA, CAN, FRA, ITA, JPN, SWE. They do not include nontax receipts for AUS, DEU.

2.3.6 Tax rates

Tax rates for consumption, labor, and capital income are taken from Mendoza et al. (1994). Coverage typically starts in the late 1960s. Carey and Rabesona (2002) extend the data to the year to 2000. We use their series based on the Mendoza et al. methodology (tables 1, 2, and 5).

3 Constructed Variables

3.1 Capital stock

Capital stocks are calculated from investment using a perpetual inventory method: $K_{t+1} = (1 - \delta) K_t + I_t$. How the initial condition, K_1/Y_1 is obtained, depends on the data available.

For countries with capital stock data for at least 10 years after 1950: Let $\gamma_t = (K_t/Y_t) / (K_1/Y_1)$ and

$$S_t = \sum_{s=1}^{t-1} (1 - \delta)^{t-s} I_s \quad (1)$$

This is the addition to the capital stock due to investment since date 1. Note that $(1 - \delta)^{t-1} K_1 = K_t - S_t$. Therefore,

$$(1 - \delta)^{t-1} K_1/Y_1 = \gamma_t (K_1/Y_1)(Y_t/Y_1) - S_t/Y_1. \quad (2)$$

This equation can be used to calculate K_1/Y_1 from data on I_t/Y_t and two observation for K_t/Y_t . Note that this method only requires the growth rate of K/Y over a sufficiently long period after 1950.

For countries without capital stock data: If investment data are available for at least 20 years prior to 1950, I set $K/Y = 2$ for the first year with data and use a perpetual inventory method to derive K_t/Y_t for subsequent years. A caveat: No attempt is made to account for war destruction.

3.2 Consumption tax rates (old)

Mendoza et al.'s (1994) estimated tax rates start in 1965 or later. For earlier years, if tax revenue data are available, solve $\tau_c (C - T_c) = T_c$ for the tax rate, where T_c is consumption tax revenue.

3.3 Income tax rates (old)

Tax rates on capital and labor incomes are imputed using data on revenues from direct taxes.

In the model: $\tau_w (1 - \alpha) Y + \tau_k (\alpha Y - \delta K) = TR$ is total income tax revenue. Then

$$\tau_w = \frac{TR/Y}{1 - \alpha + \tau_k/\tau_w (\alpha - \delta K/Y)}$$

Assuming that τ_k/τ_w is constant over time for each country, this equation can be used to estimate τ_w . The ratio τ_k/τ_w is set to the average of the Mendoza et al. (1994) estimates for each country. The resulting tax series are scaled to match the means of the Mendoza et al. series.

For most countries, Mendoza's labor income tax rates closely follow the ratio of income tax revenues to GDP. The exception is the USA. This suggests that the extrapolation used here offers a reasonable approximation. The correlation between capital income tax rates and income tax revenues is less close.

4 Tables

References

- [1] Christensen, Cummings, Jorgenson 1995, ch. 4, "Economic growth, 1947-73: An international comparison."
- [2] Gunnarsson, Gudmundur; Thomas Lindh (2001). "Swedish Employment in the 1950s - How to Fill the Lacuna." *Journal of Official Statistics* 17(1): 163-86.
- [3] Liesner, Thelma (1989). *One hundred years of economic statistics. United Kingdom, United States of America, Australia, Canada, France, Germany, Italy, Japan, Sweden*. New York: Facts on File.
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- [5] Maddison, Angus (1996). "Macroeconomic accounts for European countries." In: *Quantitative aspects of European economic growth*, eds. Bart van Ark and Nicholas Crafts. Cambridge University Press.
- [6] Mitchell, Bryan R. (1993). *International Historical Statistics, 1750-1993* (3 vol.). New York: Stockton Press.

5 Table Counters

Only counters for tables and figures are inserted here. The actual tables and figures will be in a separate document.

Algorithm 1 *Sample table*

6 Figure Counters

Conjecture 2 *Figure sample*