Session 6: Fiscal Policy

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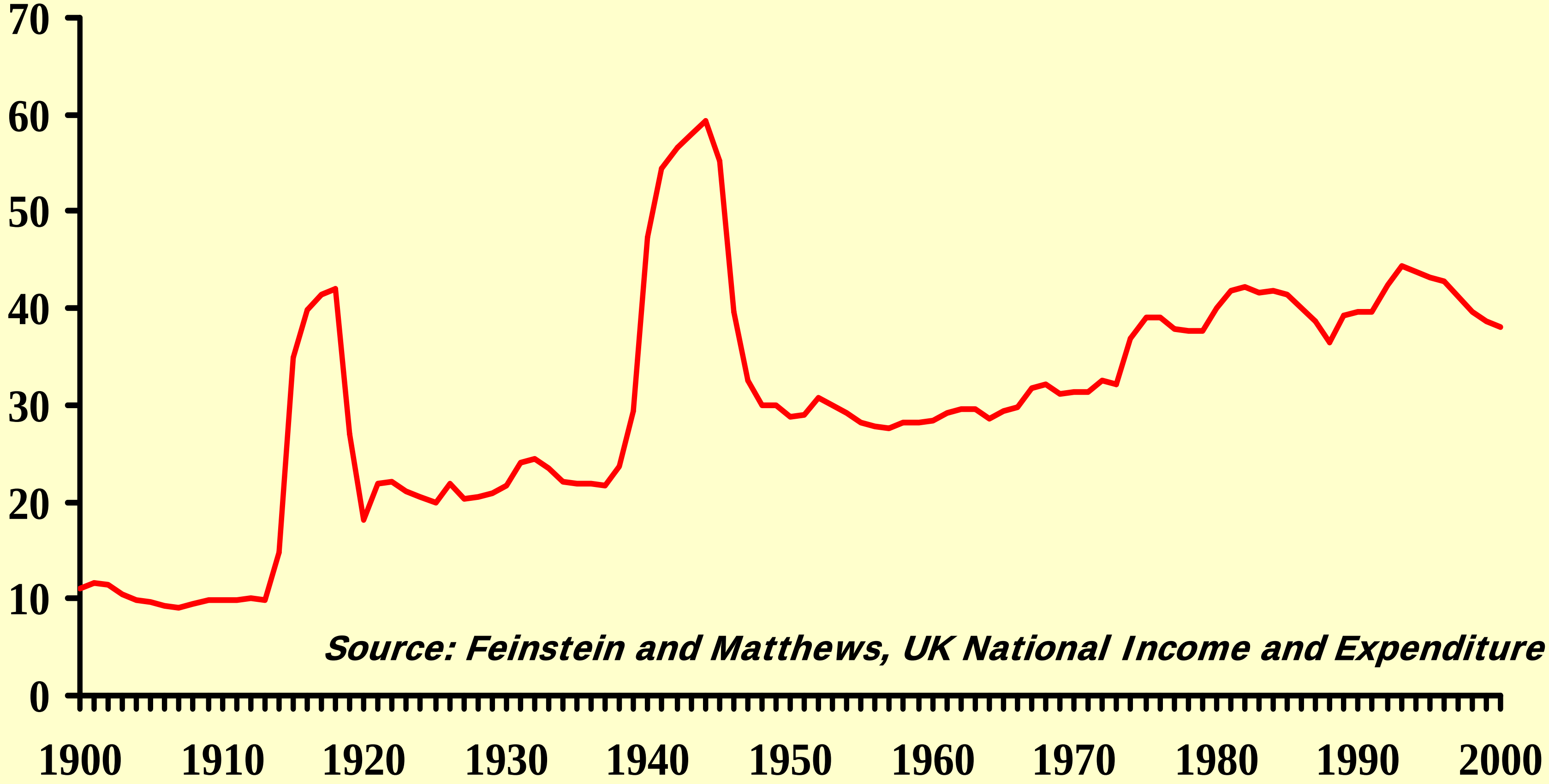
Government Spending

- Principal role of the government is to provide public goods and services.
- Government spending different from redistribution (from rich to poor, from employed to unemployed, from young to old). Transfers do not enter in government spending strictly speaking, since no net expenditures.
- Expenditures are paid either:
  - with taxation
  - by borrowing (issuing debt to the public)
  - by printing money (borrowing from the central bank)
- In reality all three are forms of taxation: issuing debt is deferred taxation, and printing money is inflation tax.

Public Goods

- Ignoring the issue of social equity, which has to do with transfers, which goods and services should be supplied by government?
- Public goods:
  - Non excludable (defense, the legal system, environmental protection, roads). Non-excludability creates free riding problems.
  - Efficiency argument - because of economies of scale, e.g. (education, health, some forms of transfers). But more controversial

UK public spending, 1900-2000
(current expenditure, % of GDP)



Upward trend over time with major increases during war time

Government spending
% of GDP

	France	Germany	Japan	Netherlands	UK	US
1913	8.9	17.7	14.2	8.2	13.3	8
1938	23.2	42.4	30.3	21.7	28.8	19.8
1950	27.6	30.4	19.8	26.8	34.2	21.4
1974	39.3	44.6	24.5	47.9	44.8	32.1
2001	48.6	45.9	36.9	41.7	38.3	30.4

Common International Pattern

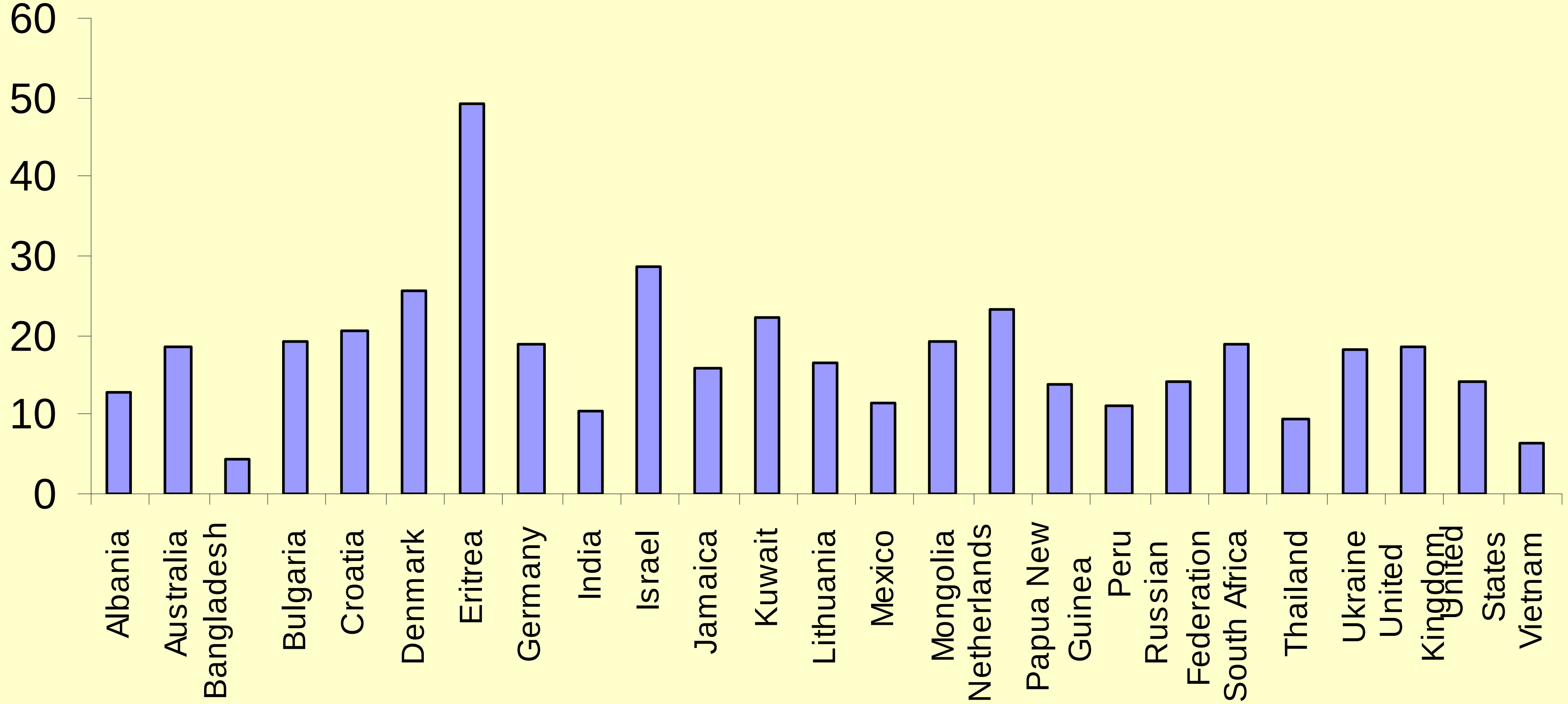
Source: Maddison (1991) updated from OECD

Government spending in major economies, 1998 (% of GDP)

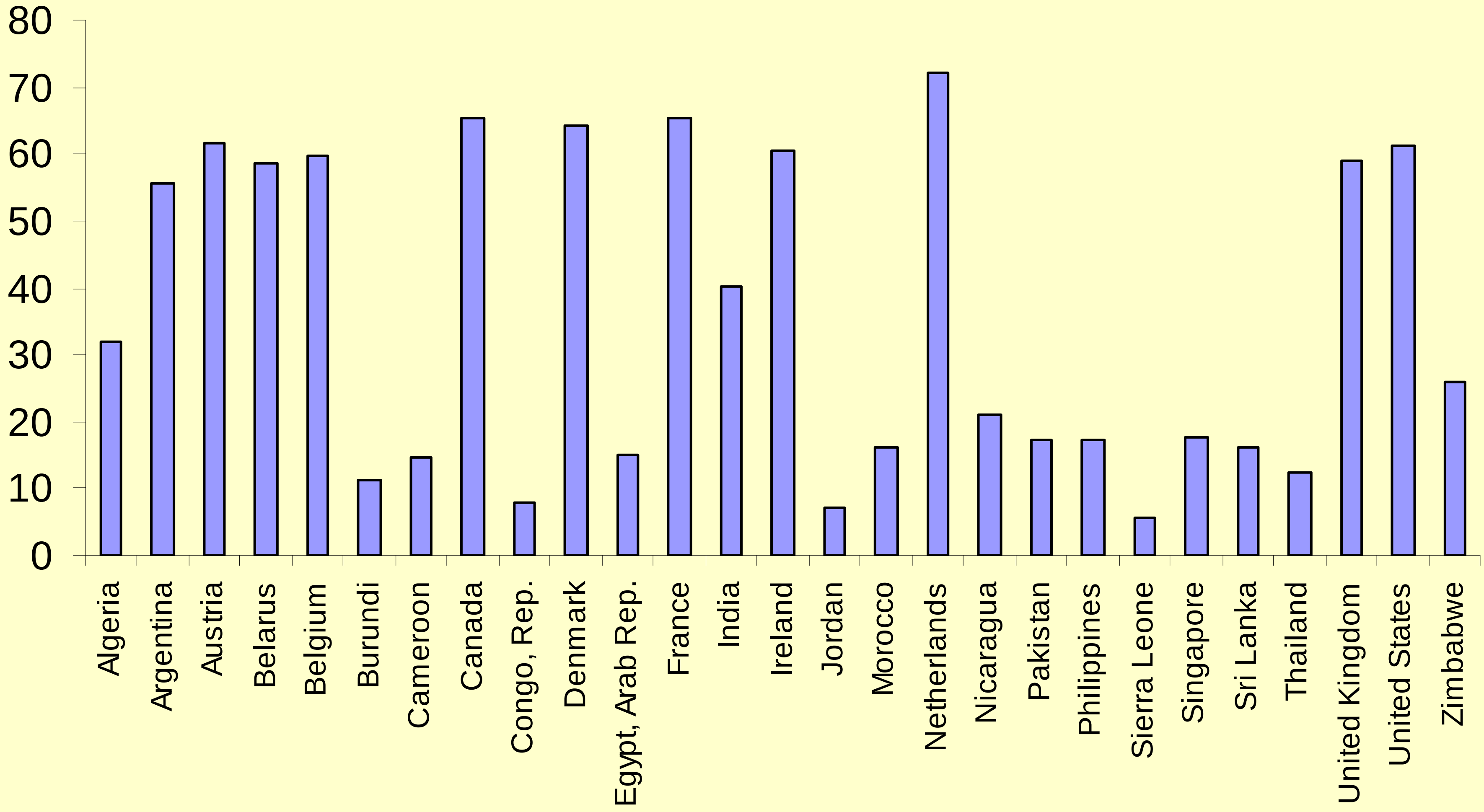
	Goods and services	Social security	Debt interest	TOTAL
Italy	18.1	17.1	8.0	48.6
France	23.6	17.9	3.6	52.4
Canada	22.6	12.6	8.4	42.6
Germany	19.0	18.6	3.6	47.3
UK	18.3	13.9	3.4	40.1
US	14.4	11	4.2	30.5
Japan	10.1	14.5	3.8	36.9

Source: OECD

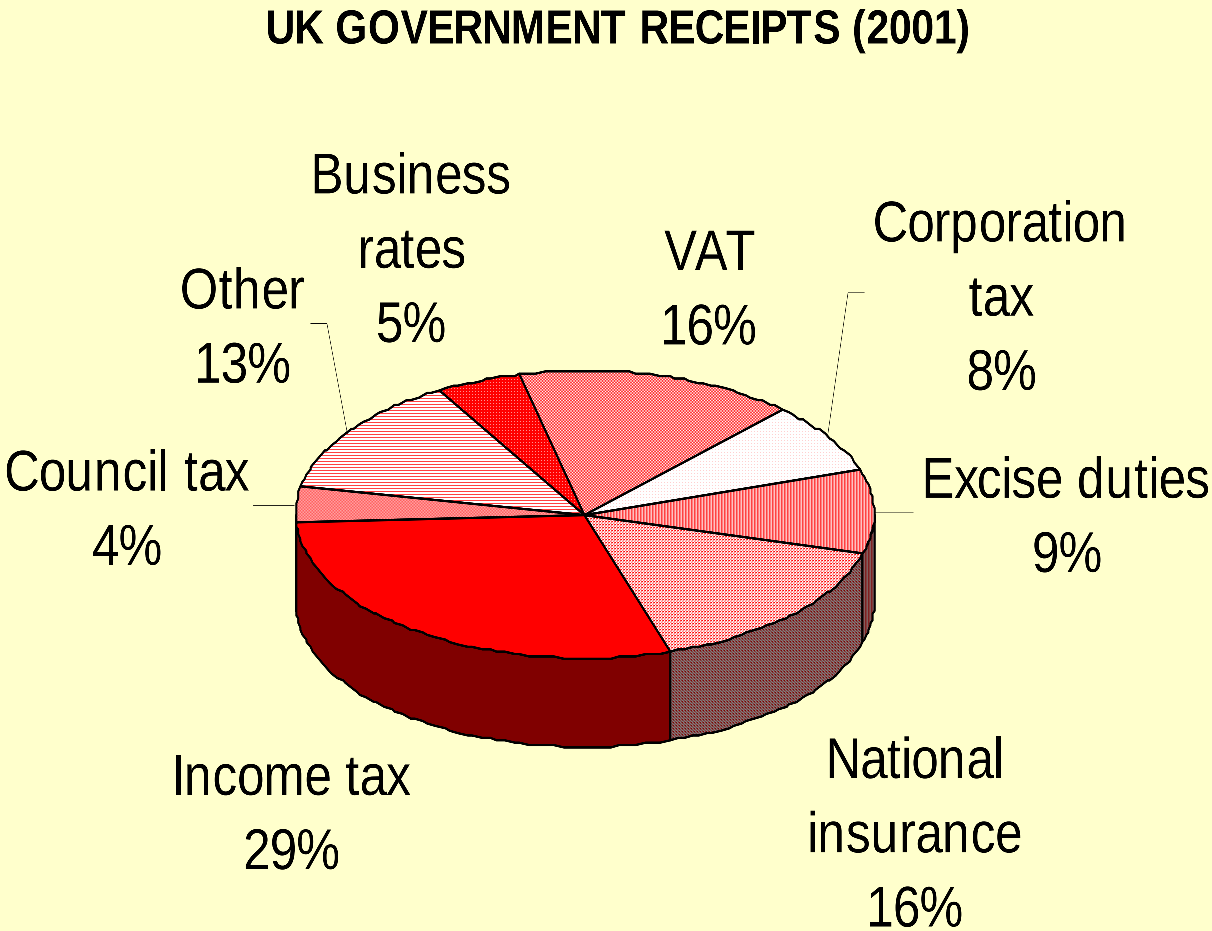
General government final consumption expenditure (% of GDP) 2001



Transfers as % of Government Expenditure (2001)

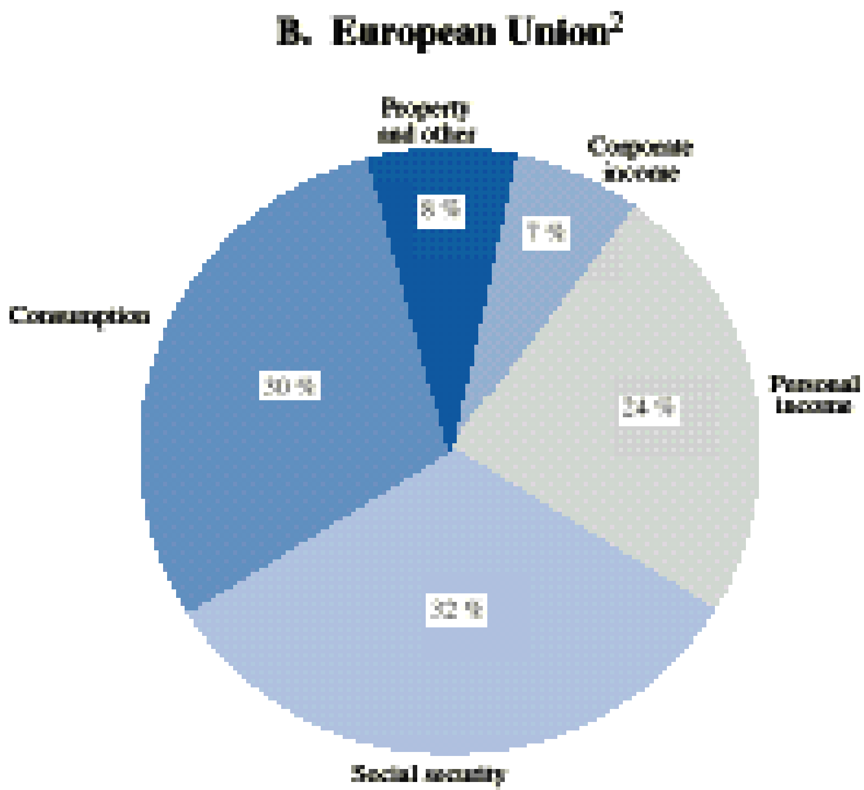


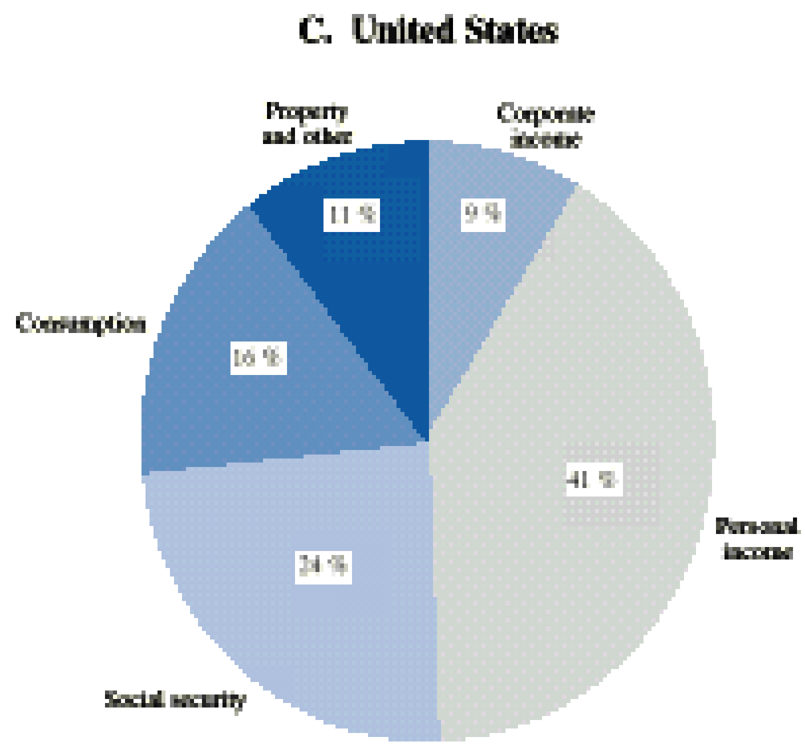
How governments raise money



Source: Her Majesty's Treasury

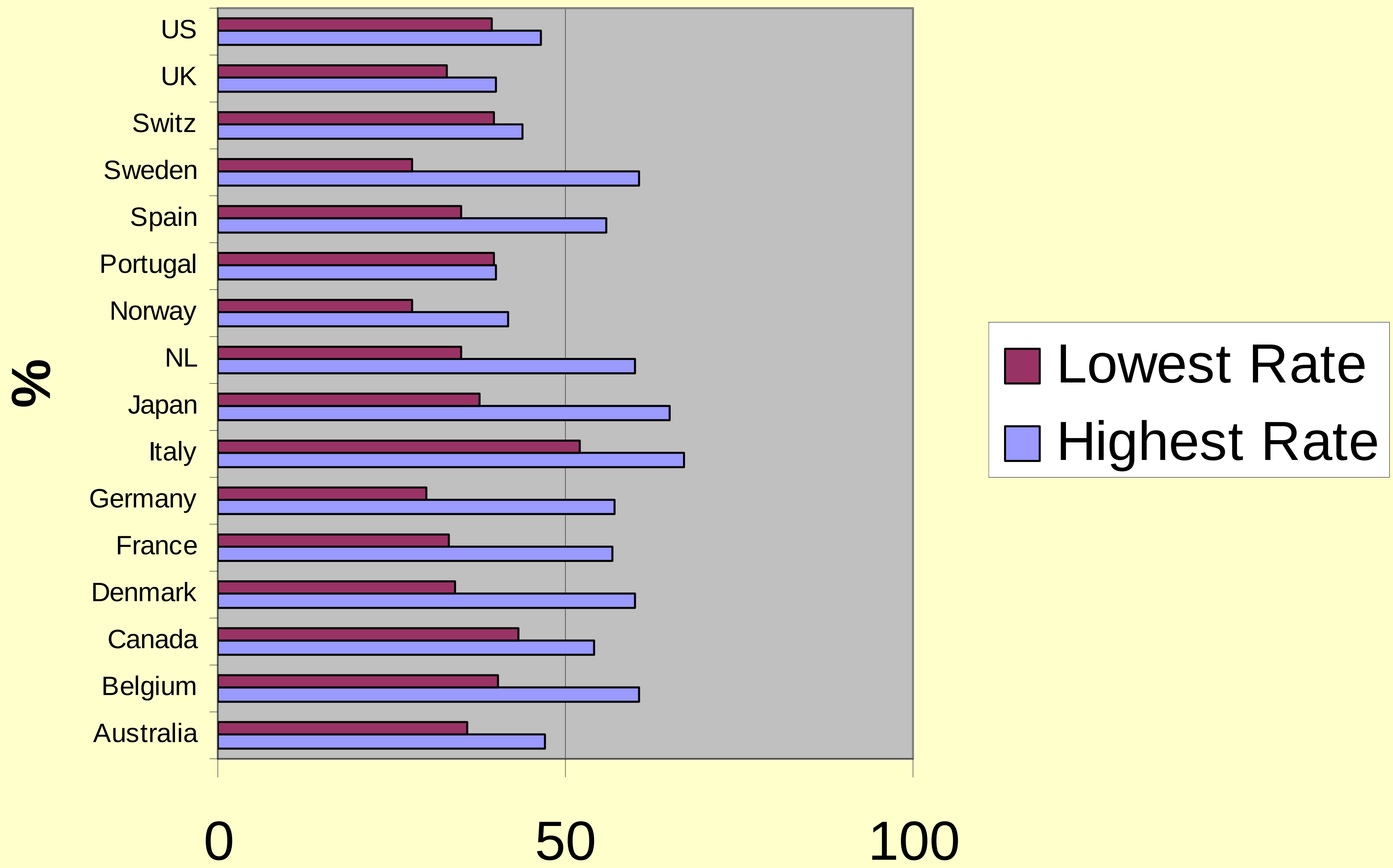
Europe uses consumption and social security taxes more and income tax less



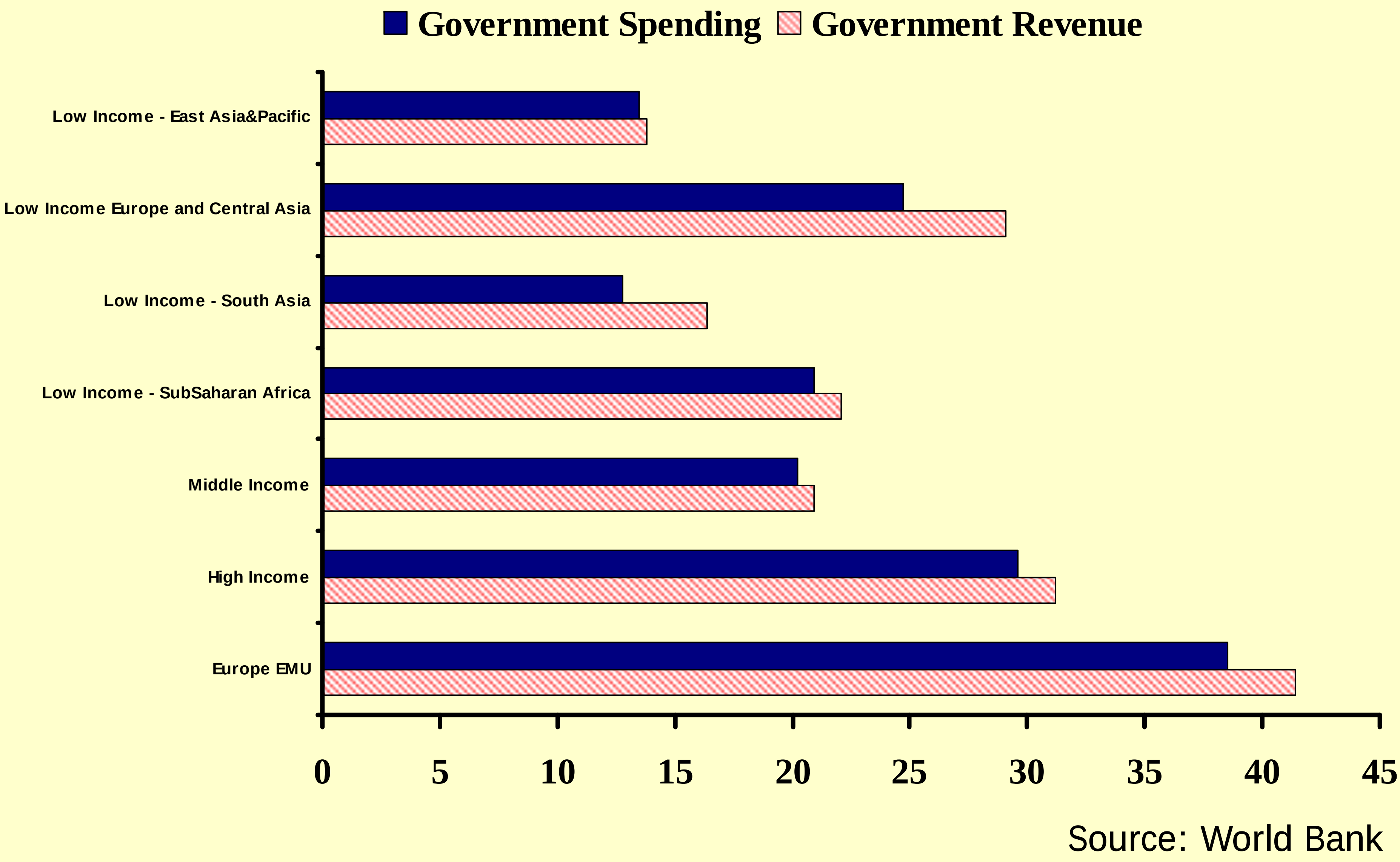


Source: IMF

Personal Income Tax Rates 1998 (including social security)

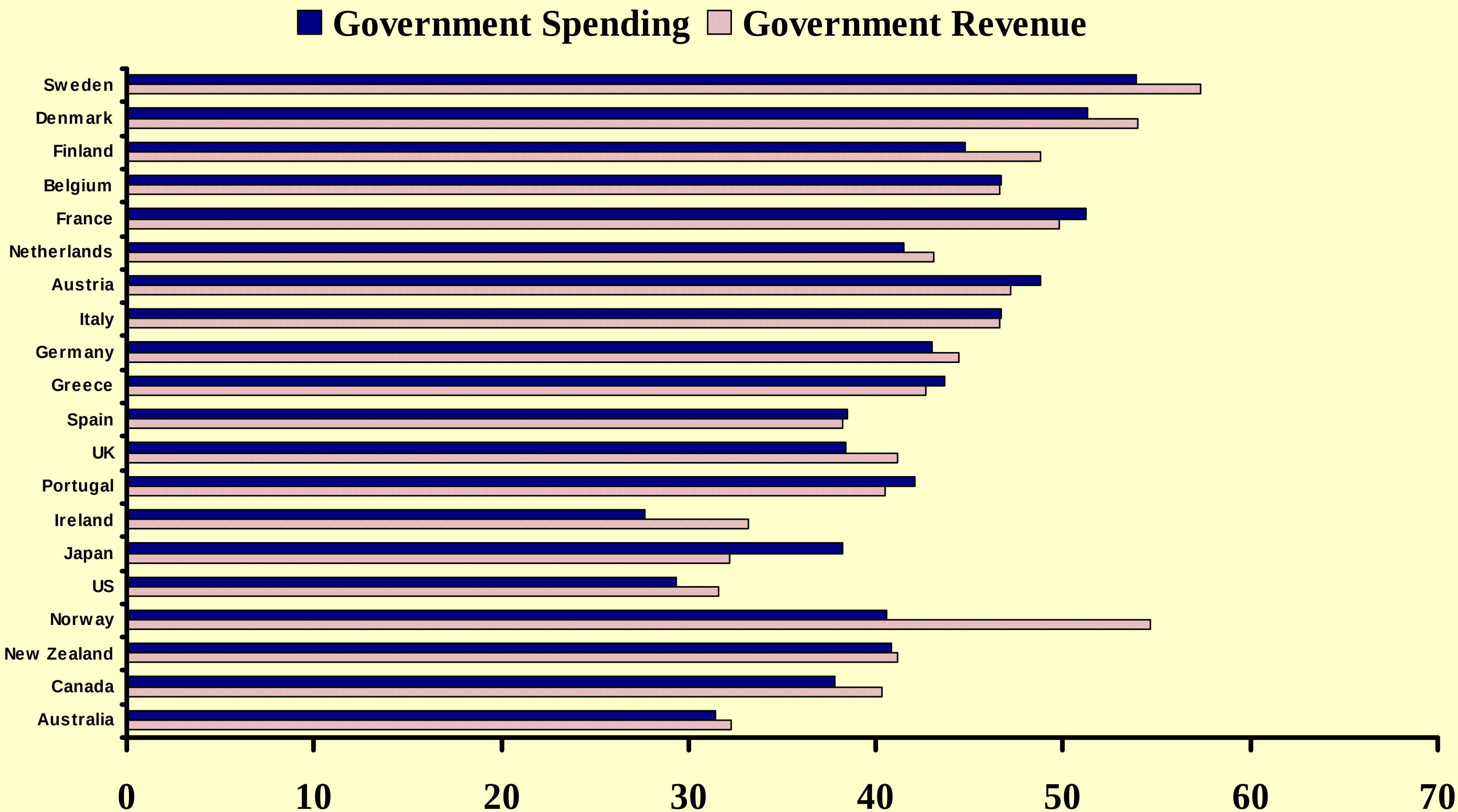


Source: OECD



Central Government behaviour 1997 – Rich spend more

Europe spends and taxes more
(% of GDP, 2000)



Source: OECD Economic Outlook

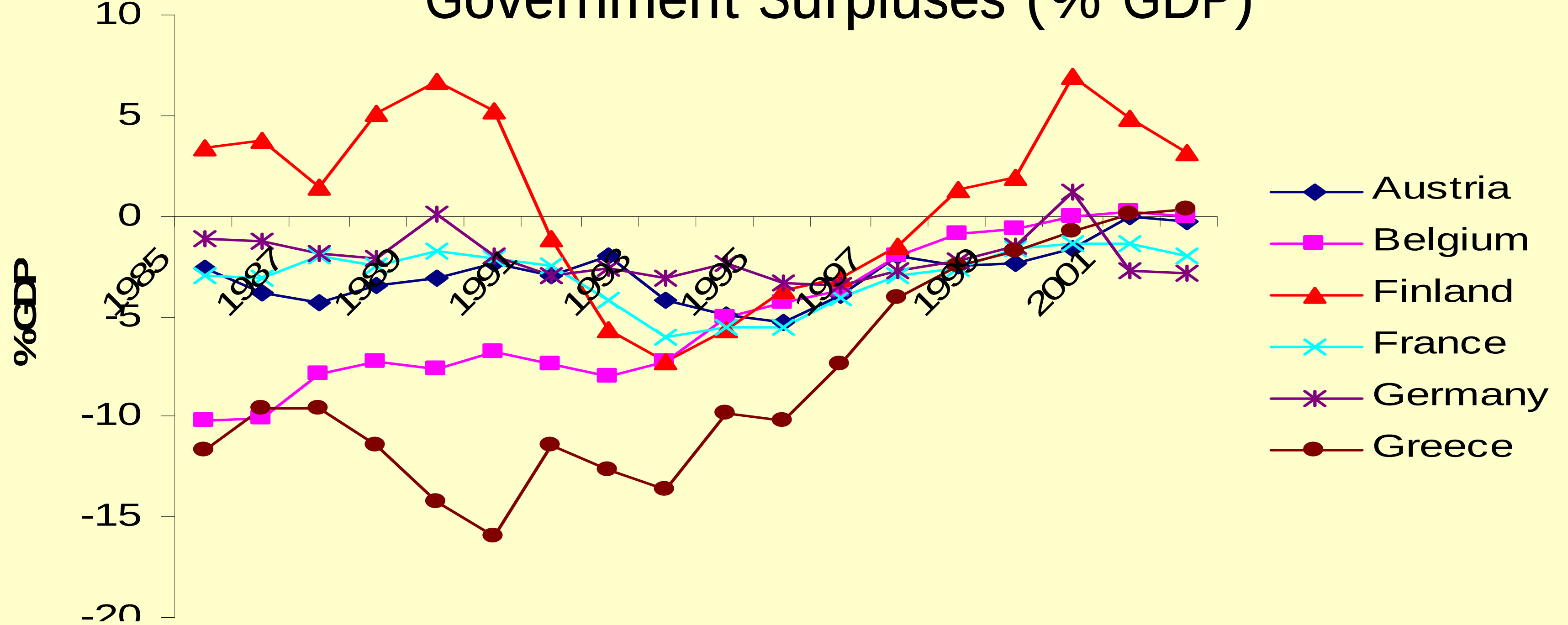
Budget Deficits:

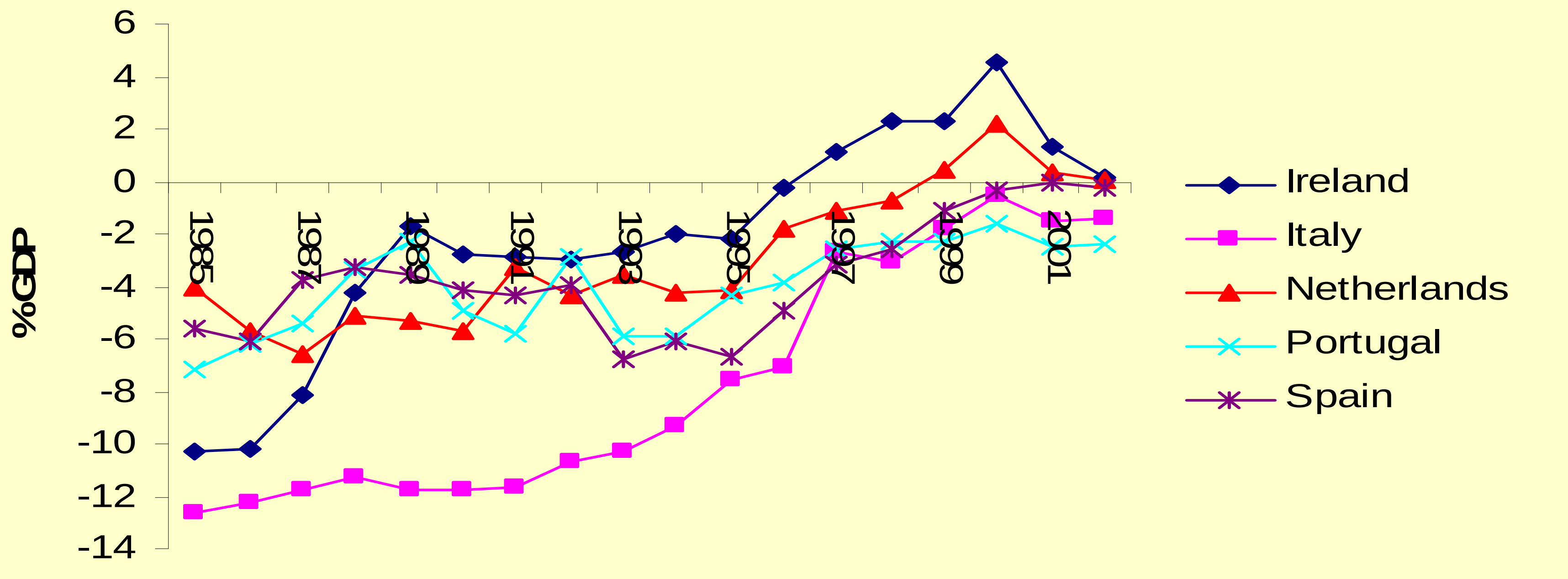
Prior to 1945 governments only tended to run deficits and increase their debt substantially during periods of war or conflict

Since 1945 government expenditure has been on a rising trend and has grown faster than revenue

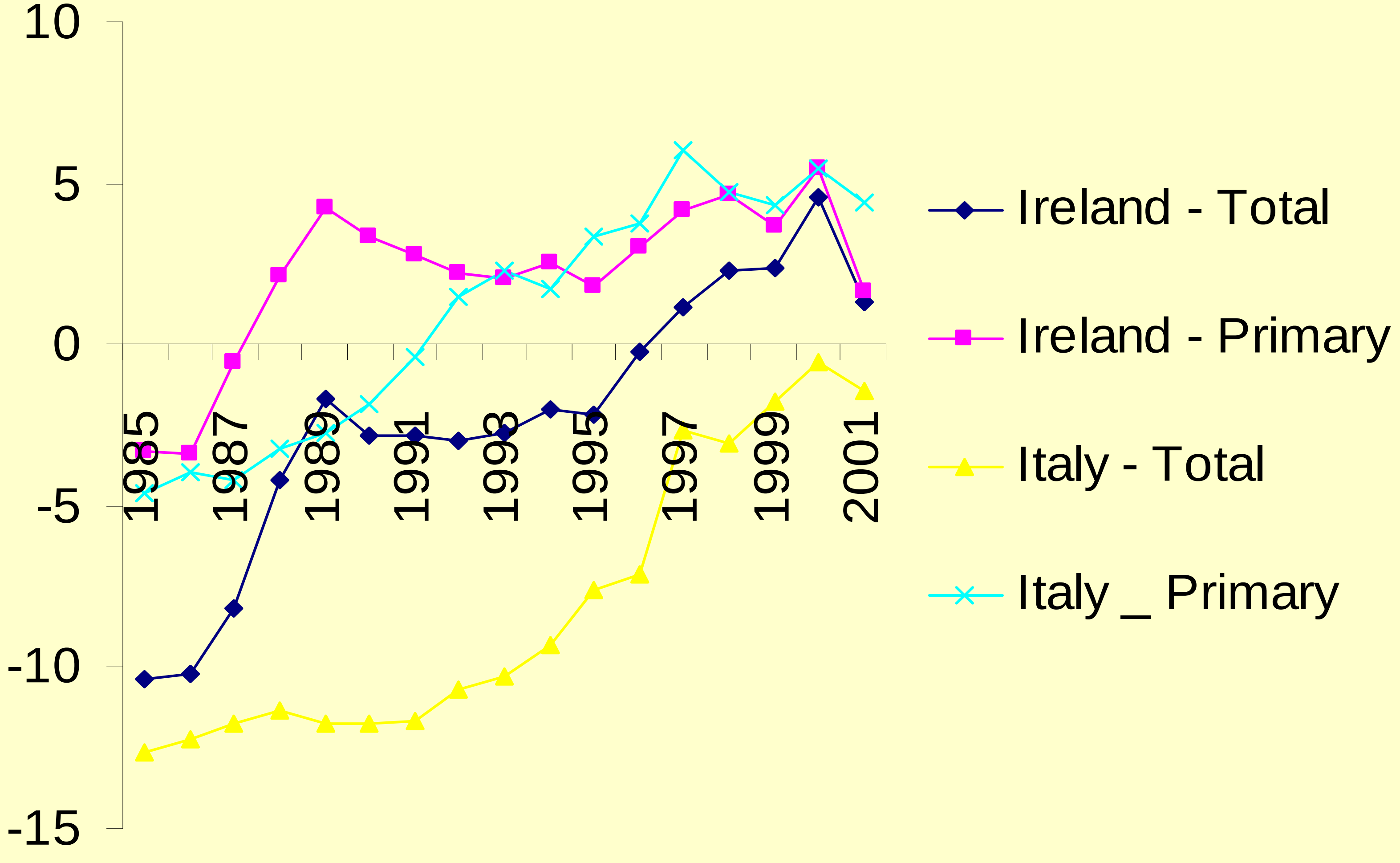
The result is that surplus is not the rule anymore

Government Surpluses (% GDP)



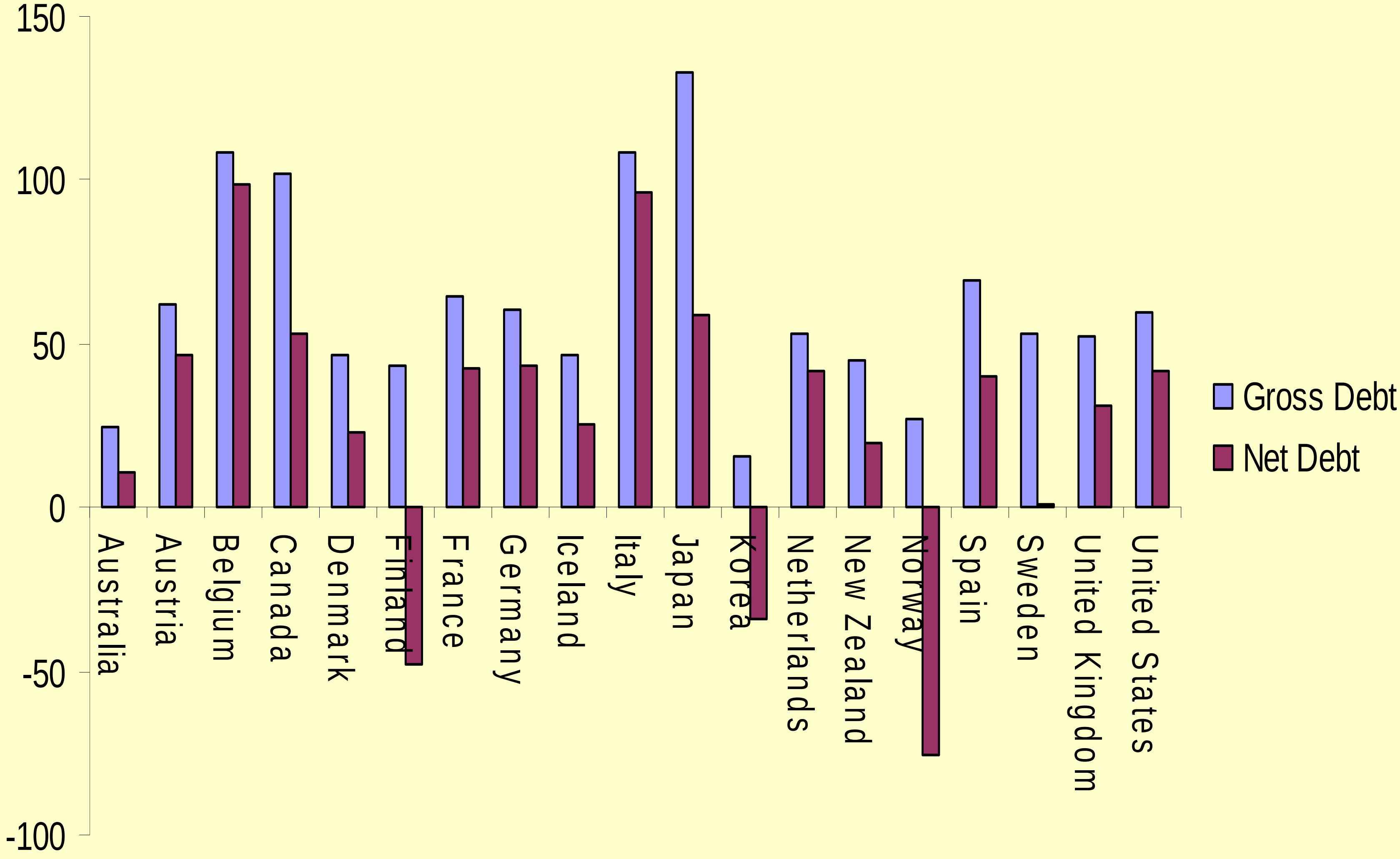


Total and Primary Surpluses (% GDP)



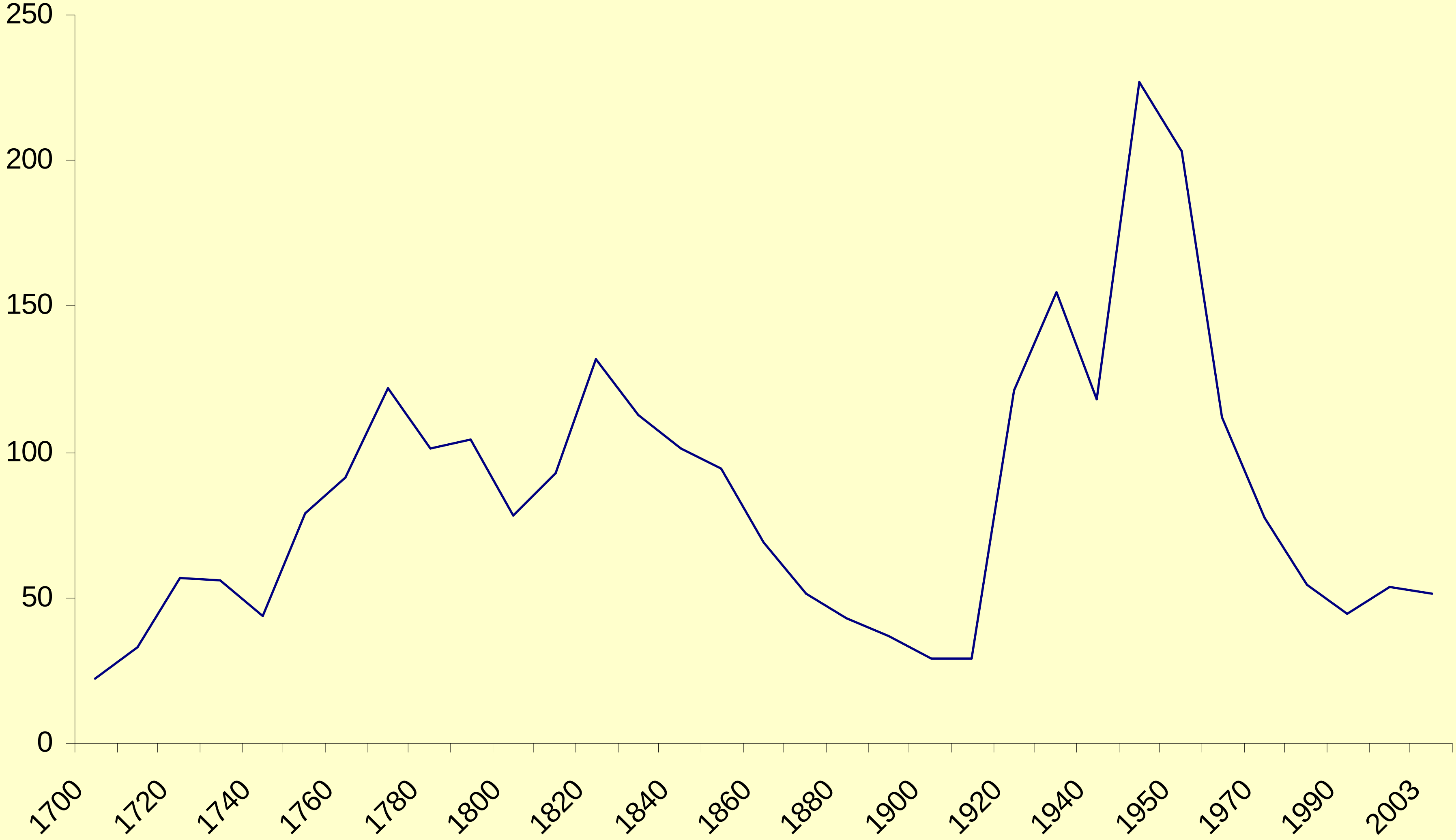
High interest payments force Italy to run a ‘tight’ primary fiscal policy, but total deficit huge. Current Interest payments are inherited from past fiscal positions, i.e. from current debt. An important link between previous and current fiscal decisions

Government Debt 2001 (% GDP)



Source: OECD Economic Outlook

U.K Government Debt as % GDP (1700- 2003)



The government budget constraint

- We first write the budget constraint in nominal terms:

$$P_t g_t + P_t h_t + B_t^G = P_t^B B_{t+1}^G + \Delta M_{t+1} + P_t T_t$$

  where g_t is real government expenditures, h_t are real transfers to households, T_t are total real taxes and M_t is the stock of nominal money.
- Now suppose the government issues one-period bonds with value at maturity equal to 1. Then B_t^G is the value at maturity of the stock of nominal government debt held by the public during period $t-1$. At the start of period t, the government issues B_{t+1}^G new bonds at the price P_t^B. As a result it borrows $P_t^B B_{t+1}^G$.
- Now the price of bonds can be written

$$P_t^B = \frac{1}{1+R_t}$$

  where R_t is the nominal interest rate on government debt.

The Real government budget constraint

- The constraint rewrites:

$$
\begin{aligned}
g_t + h_t + b_t^G &= \frac{P_{t+1}}{P_t}\frac{1}{1+R_t}b_{t+1}^G + \frac{1}{P_t}\Delta M_{t+1} + T_t \\
&= \frac{1+\pi_{t+1}}{1+R_t}b_{t+1}^G + \left(1+\pi_{t+1}\right)m_{t+1} - m_t + T_t \\
&= \frac{1}{1+r_{t+1}}b_{t+1}^G + \left(1+\pi_{t+1}\right)\Delta m_{t+1} \\
&\quad +\pi_{t+1}m_t + T_t
\end{aligned}
$$

where $b_t^G = \frac{B_t^G}{P_t}$, $m_t = \frac{M_t}{P_t}$ and $1 + r_{t+1} = \frac{1+R_t}{1+\pi_{t+1}}$.

- $\pi_{t+1}m_t$ corresponds to seignorage income

An Alternative Representation

- Change slightly notation so that interest payments on debt enter explicitly. In particular, let $B_t^G = (1 + R_t)B_t$ and $P_t^B B_{t+1}^G = B_{t+1}$. The nominal budget constraint becomes

$$P_t g_t + P_t h_t + (1 + R_t)B_t = B_{t+1} + \Delta M_{t+1} + P_t T_t$$

- And in real terms:

$$g_t + h_t + (1 + R_t)b_t = T_t + (1 + \pi_{t+1})(b_{t+1} + m_{t+1}) - m_t$$

where $b_t = \frac{B_t}{P_t}$. This is the expression we'll use throughout.

Tax and Debt Finance

- We abstract from printing money as a source of income, and focus on tax and/or debt finance.
- Consider a permanent increase in g at time t, financed by an increase in lump-sum taxes T at time t. Notice that then $b_t = b_{t-1}$. Then we have:

$$\begin{aligned} t-1 &: \quad g_{t-1} + R_t b_t = T_{t-1} \\ t &: \quad g_t + \Delta g_t + R_t b_t = T_{t-1} + \Delta T_t \\ t+1 &: \quad g_t + \Delta g_t + R_t b_t = T_{t-1} + \Delta T_t \end{aligned}$$

with zero inflation and zero money growth.

- To increase permanently government spending by Δg_t, taxes must be increased permanently by ΔT_t.

Tax Finance - Real Effects

- Recall we saw in the Consumption lecture that (under relatively general conditions) households consume out of their permanent income, i.e.

$$c_t = \frac{R}{1+R}\left[\sum_{s=0}^{\infty}\frac{x_{t+s}-T_{t+s}}{(1+R)^s}+(1+R)b_t\right]$$

  where x_t was (exogenous) income before taxes
- Now for constant taxes $T_{t+s} = T_t$, and assuming constant income flow $x_{t+s} = x_t$,

$$c_t = x_t - T_t + Rb_t$$

Tax Finance - Real Effects

- So a permanent increase in T will simply mean:

$$\begin{aligned} c_t &= x_t - (T_t + \Delta T_t) + Rb_t \\ &= c_{t-1} - \Delta T_t \\ &= c_{t-1} - \Delta g_t \end{aligned}$$

  A permanent increase in government expenditures is completely offset by a reduction in private consumption, because permanent income falls with the extra taxes.

- Effect on output similar. Since there is no investment here:

$$y_{t-1} = c_{t-1} + g_{t-1}$$

  Then

$$\begin{aligned} y_t &= c_{t-1} - \Delta T_t + g_{t-1} + \Delta g_t \\ &= y_{t-1} \end{aligned}$$

  since $\Delta c_t = \Delta g_t$.

The Keynesian Multiplier

- The fall in consumption offsets exactly the increase in government spending. The fiscal stimulus has been totally ineffective, as the increase in expenditures is completely crowded out by the increase in taxes.
- So what is different with the Keynesian result that fiscal stimuli have an effect on consumption and output?
- The Keynesian function assumes (a priori) consumption is a *proportion* $\mu < 1$ of total income, so that we have

$$c_t = \mu \left(x_t - T_t + Rb_t \right)$$

- Then

$$\begin{aligned} y_t &= \mu \left(x_t - T_t - \Delta T_t + Rb_t \right) + g_{t-1} + \Delta g_t \\ &= y_{t-1} + (1 - \mu) \Delta g_t > y_{t-1} \end{aligned}$$

Bond/Debt Finance - Real Effects

- Now the permanent increase in g is financed through an increase in debt. The government budget constraints at times $t-1$, t and $t+1$ write:

$$
\begin{aligned}
t-1 &: \quad g_{t-1} + Rb_t = T_{t-1} \\
t &: \quad g_{t-1} + \Delta g_t + Rb_t = T_{t-1} + \Delta b_{t+1} \\
t+1 &: \quad g_{t-1} + \Delta g_t + R\left(b_t + \Delta b_{t+1}\right) = T_{t-1} + \Delta b_{t+2} \\
&\quad \ldots \\
t+n-1 &: \quad g_{t-1} + \Delta g_t + Rb_t + R\sum_{s=1}^{n-1} \Delta b_{t+s} = T_{t-1} + \Delta b_{t+n}
\end{aligned}
$$

Bond/Debt Finance - Real Effects

- Each period sees the debt burden grow, by exactly Δg_t. So in the limit,

$$\Delta b_{t+n} = (1+R)^{n-1}\,\Delta g_t$$

- This clearly violates a transversality condition, since it implies that

$$\lim_{n\to\infty}\frac{\Delta b_{t+n}}{(1+R)^n} = (1+R)\,\Delta g_t > 0$$

  In other words, a bond-financed permanent increase in government expenditures is not sustainable.

Debt Finance and TEMPORARY increases in g

- Suppose now that g only increases temporarily:

$$
\begin{aligned}
t-1 &: \quad g_{t-1} + Rb_t = T_{t-1} \\
t &: \quad g_t + \Delta g_t + Rb_t = T_{t-1} + \Delta b_{t+1} \\
t+1 &: \quad g_t + \Delta g_t + R\left(b_t + \Delta b_{t+1}\right) = T_{t-1} + \Delta b_{t+2} \\
& \quad \dots \\
t+n-1 &: \quad g_t + \Delta g_t + Rb_t + R\sum_{s=1}^{n-1} \Delta b_{t+s} = T_{t-1} + \Delta b_{t+n}
\end{aligned}
$$

But now

$$
\begin{aligned}
\Delta b_{t+1} &= \Delta g_t \\
\Delta b_{t+2} &= R\Delta g_t \\
\Delta b_{t+3} &= R(1+R)\Delta g_t \\
& \dots \\
\Delta b_{t+n} &= R(1+R)^{n-2}\Delta g_t
\end{aligned}
$$

Debt Finance and TEMPORARY increases in g

- So in the limit:

$$\lim_{n \to \infty} \frac{\Delta b_{t+n}}{(1+R)^n} = R(1+R)^2 \Delta g_t > 0$$

- That policy is still unsustainable.
- Except if Δg_t is EXPECTED to be zero. Then, the transversality condition may hold in expectation - i.e. on average. A temporary increase in government spending is sustainable if it is unexpected, i.e. expected to be zero on average.
- This is similar to saying it is sustainable to debt-finance some deficit in recessions, while paying it back in expansions. On average, the increase in government spending is zero. It is expected to be zero.

Ricardian Equivalence

- Suppose the government wants ot provide a temporary stimulus. One possibility is to cut taxes today, finance this by borrowing today, and since the stimulus is temporary, to restore tax revenues tomorrow. This is clearly sustainable. But what real effects does it have?
- Let a tax cut occur in t, and assume that by period $t+2$, the government budget constraint of $t-1$ is restored.

$$
\begin{aligned}
t-1 &: \quad g_{t-1} + Rb_t = T_{t-1} \\
t &: \quad g_{t-1} + Rb_t = T_{t-1} + \Delta T_t + \Delta b_{t+1} \\
t+1 &: \quad g_{t-1} + R\left(b_t + \Delta b_{t+1}\right) = T_{t-1} + \Delta T_{t+1} + \Delta b_{t+2} \\
t+2 &: \quad g_{t-1} + Rb_t = T_{t-1}
\end{aligned}
$$

where a tax cut means $\Delta T_t < 0$.

Ricardian Equivalence

- So we have:

$$\begin{aligned}\Delta b_{t+1} &= -\Delta T_t \\ \Delta b_{t+2} &= -\Delta b_{t+1} \\ \Delta T_{t+1} &= -(1+R)\Delta T_t\end{aligned}$$

- The first equation holds because the tax cut is debt-financed
- The second one holds because we assume the initial budget constraint must be restored at $t+2$
- The third one reflects that taxes must be raised eventually to cover the tax cut + interest payments over one period.

Ricardian Equivalence

- Now permanent income in $t-1$ is given by

$$\begin{aligned} w_t &= \sum_{s=0}^{\infty} \frac{x_{t+s} - T_{t+s}}{(1+R)^s} + (1+R)b_t \\ &= x_t + \Delta T_t + \frac{x_{t+1} - (1+R)\Delta T_t}{1+R} \\ &\quad + \sum_{s=2}^{\infty} \frac{x_{t+s} - T_{t+s}}{(1+R)^s} + (1+R)b_t \end{aligned}$$

The two tax policy changes cancel each other exactly. So wealth remains unchanged - and so does consumption.

Ricardian Equivalence

- The key to Ricardian equivalence is that consumption is forward looking.
- A policy move like a cut in taxes must revert at some point in the future. In present value, this reversal cancels out any effects on permanent income - and thus on consumption.
- The Keynesian model of a multiplier effect of tax cuts assumes that future tax increases have no effect on current consumption.
- This requires either that households are short-sighted, or perhaps liquidity constrained.

Ricardian Equivalence

- Can show the result obtains in conventional representative agent model. Suppose objective function is:

$$Max \sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\sigma}}{1-\sigma}$$

subject to a budget constraint

$$B_{t+1} + K_{t+1} = (1+r)(B_t + K_t) + w - C_t - T_t$$

where w denotes wage income, B_t are bond holdings, K_t is capital and T_t are lump sum taxes.

- There is a government budget constraint:

$$B_{t+1} = rB_t + G_t - T_t$$

- Can show that neither B nor T nor G will enter the equilibrium Euler equation in this case. Do it as an exercise.

Problems of Time Consistency in Fiscal Policy

- The optimal tax scheme is to levy a tax on capital once and for all, and provide public goods off the interest, forever after.
- This will minimize the distortions created by a (non lump sum) distortionary tax, on capital or on labor.
- But the problem is that this is time inconsistent. Why? Government taxes once, and then pledges not to tax again. As a result, capital owners install some capital again - i.e. invest. But as soon as there is capital installed the government has an incentive to tax again...
- Illustrate this in a simple two-period framework.

Time Inconsistency

- Consumers maximize:

$$U = \frac{C_1^{1-\sigma}}{1-\sigma} + \frac{C_2^{1-\sigma}}{1-\sigma} + g$$

Notice the discount rate is assumed to be 1. g denotes the public good financed by the government. To finance this, the government levies a (distortionary) tax τ on capital:

$$C_2 = (w - C_1)(r - \tau)$$

with w wage income.

- The government budget constraint requires that

$$g = \tau(w - C_1)$$

Time Inconsistency

- Optimality implies:

$$C_1^{-\sigma} = (r - \tau)\left[(w - C_1)(r - \tau)\right]^{-\sigma}$$

i.e.

$$C_1 = \frac{w(r - \tau)^{\frac{1-\sigma}{\sigma}}}{1 + (r - \tau)^{\frac{1-\sigma}{\sigma}}}$$

Time Inconsistency

- Now what does the government do? It wants to maximize households' welfare, in full knowledge of their individual optimizing behavior. So:

$$
\begin{aligned}
& Max_\tau \frac{1}{1-\sigma}\left[\frac{w(r-\tau)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau)^{\frac{1-\sigma}{\sigma}}}\right]^{1-\sigma} \\
& +\frac{1}{1-\sigma}\left[(r-\tau)\left(w-\frac{w(r-\tau)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau)^{\frac{1-\sigma}{\sigma}}}\right)\right]^{1-\sigma} \\
& +\tau\left[w-\frac{w(r-\tau)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau)^{\frac{1-\sigma}{\sigma}}}\right]
\end{aligned}
$$

Time Inconsistency

- Now this (messy) maximization implies some optimal tax rate chosen by the government - say τ^*.
- Agents expect the government is benevolent - i.e. they expect the government to implement τ^*. They will decide of their consumption plans with τ^* in mind, i.e.

$$C_1 = \frac{w\left(r - \tau^*\right)^{\frac{1-\sigma}{\sigma}}}{1 + \left(r - \tau^*\right)^{\frac{1-\sigma}{\sigma}}}$$

- In other words, they will decide on their consumption and savings and investment decisions in anticipation that τ^* wil prevail.
- Will it??

Time Consistency Issues

- The answer is: not necessarily. Once agents have chosen an optimal C_1, thinking τ^* will prevail, the government has suddenly an incentive to tax differently. In particular, it then maximizes:

$$Max_{\tau} \frac{1}{1-\sigma}\left[(r-\tau)\left(w-\frac{w(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}\right)\right]^{1-\sigma}$$
$$+\tau\left[w-\frac{w(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}\right]$$

Time Consistency Issues

- Notice this is taking C_1 as given - since that is already chosen at that stage. But the government has still an option to tax at τ at the beginning of the second period, even though it is expected to tax at τ^*.
- The bottomline is that there is no reason why that second maximization problem should yield τ^*. In fact, in general it won't.
- The government has an incentive to renege on its initial announcement of τ^*, which is therefore not credible.

Time Consistency in Fiscal Policy

- Which announcement of a tax rate is credible then? The one on which the government has no incentive to renege.
- I.e. it's the tax rate such that both maximization problems have the same solution. Consider the second (simpler) problem. A FOC writes:

$$\begin{aligned} & \left[(r-\tau)\left(w-\frac{w(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}\right)\right]^{-\sigma} \\ & \cdot\left(w-\frac{w(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}\right) \\ = \quad & \left[w-\frac{w(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}{1+(r-\tau^*)^{\frac{1-\sigma}{\sigma}}}\right] \end{aligned}$$

Time Consistency in Fiscal Policy

- This yields

$$t = r - \frac{1}{w - \frac{w\left(r-\tau^*\right)^{\frac{1-\sigma}{\sigma}}}{1+\left(r-\tau^*\right)^{\frac{1-\sigma}{\sigma}}}}$$

- The time consistent tax rate is the one that verifies $t = \tau^*$.
- It's simple to find

$$t = r - \frac{1}{w}$$

- This is the ONLY tax announcement that will be believed by the private sector. In particular, announcing zero tax in the future is not credible. A distortion is inevitable because of a time consistency problem.