

TAXES, PUBLIC SPENDING AND ECONOMIC GROWTH IN OECD COUNTRIES

Review of structural features of taxes and spending

Samuelsonian rule for optimal amount of public good

Utilitarian principle

Neoclassical growth model

Optimal growth model

Overlapping generation model

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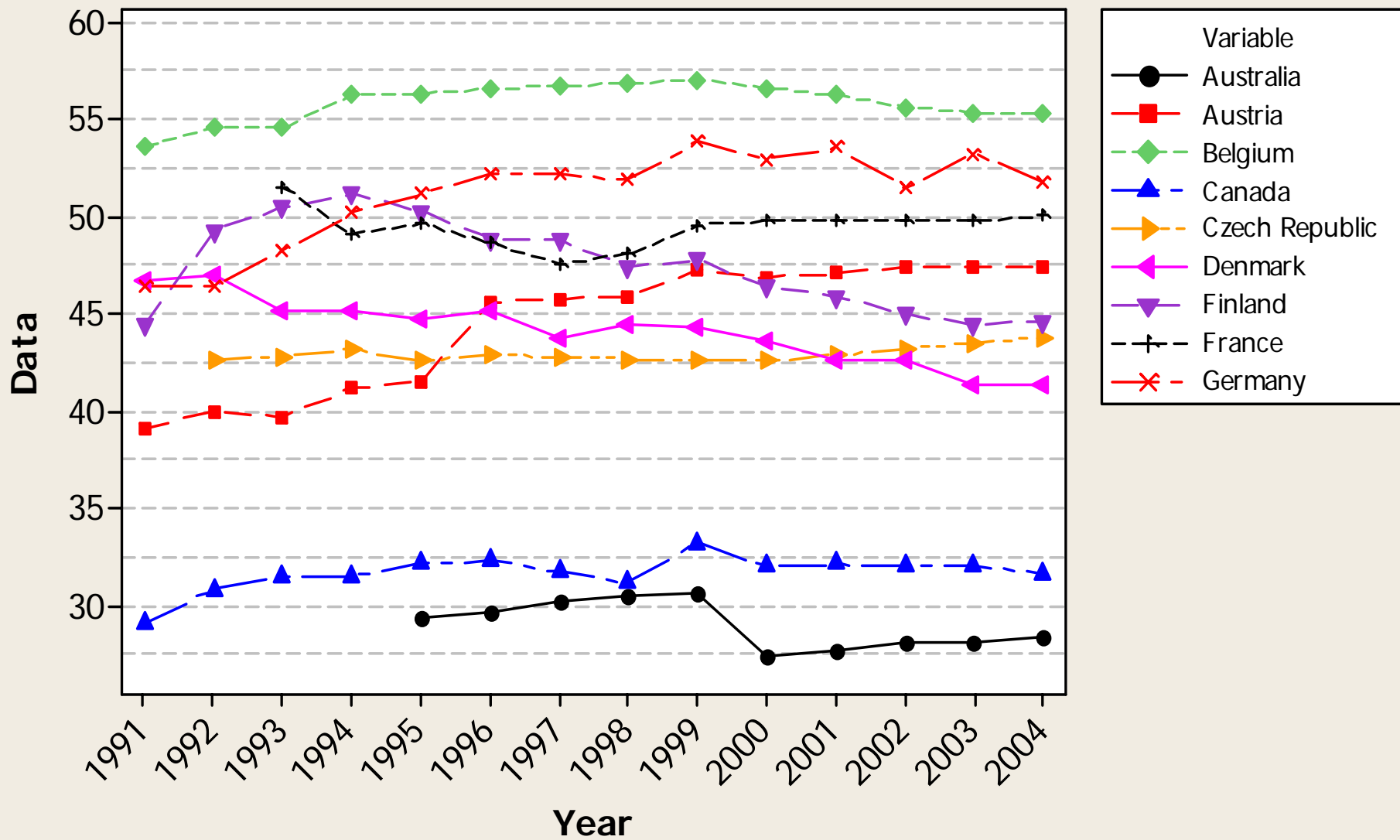
April 2007

Conclusion of the Paper

- OECD Countries with higher tax GDP ratio generally had lower growth rates of output compared to other countries with lower size of the public sector during 1994 to 2006.
- These differences have historical roots causing
 - variation in collective preferences,
 - constraints on choices public goods and services and
 - minimum standard of social insurance and willingness to pay for them.
- The degree of allocation efficiency of the private sector is affected by the size of public sector and its management.
- Impacts of taxes and spending on accumulation and growth are assessed theoretically
 - using neoclassical, optimal growth and overlapping generation models
 - with empirical support based on rank correlation analysis.

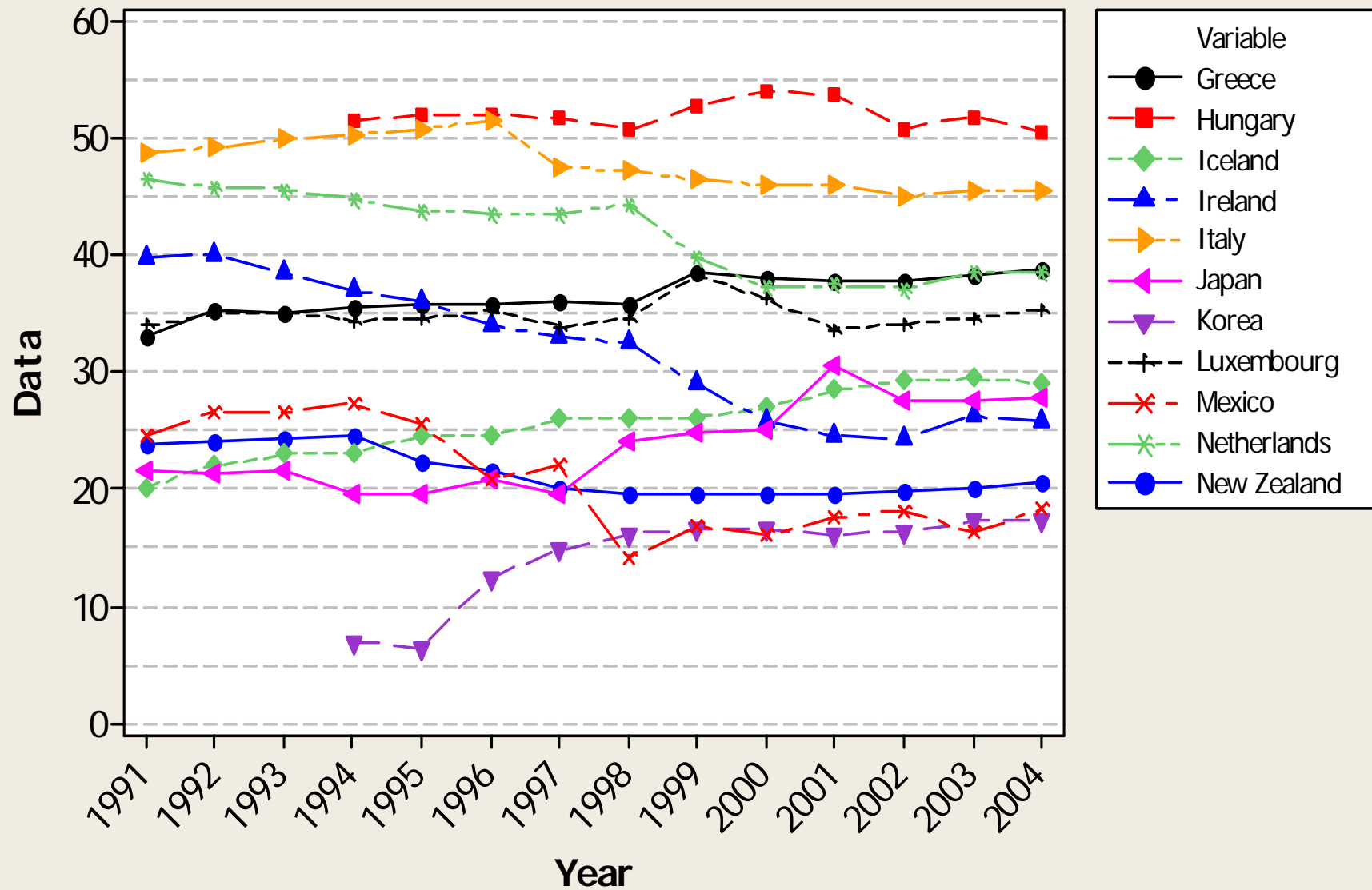
Average Tax Rate on Workers in OECD Countries

(Percent of Labour Cost)



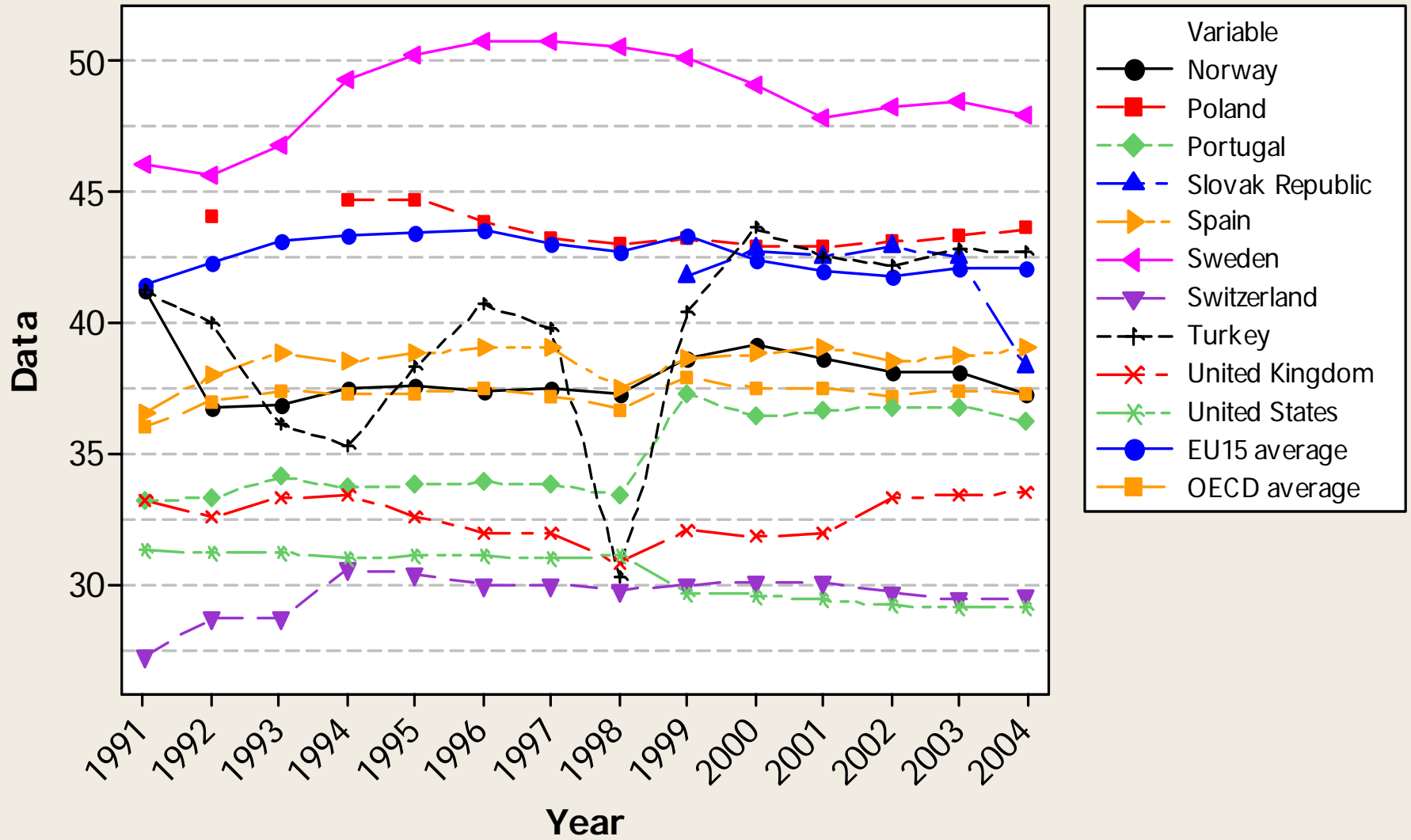
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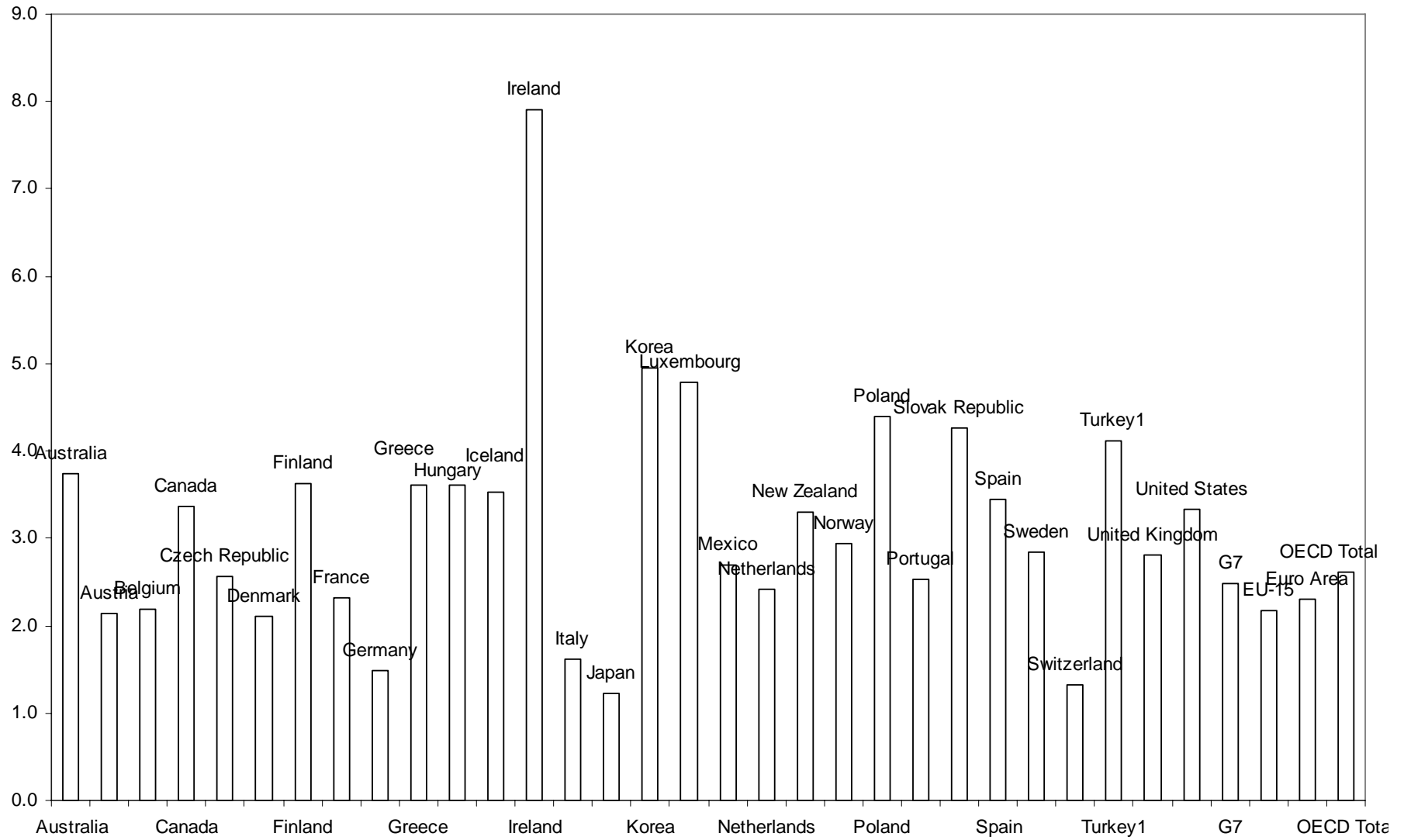


Average Tax Rate on Workers in OECD Countries

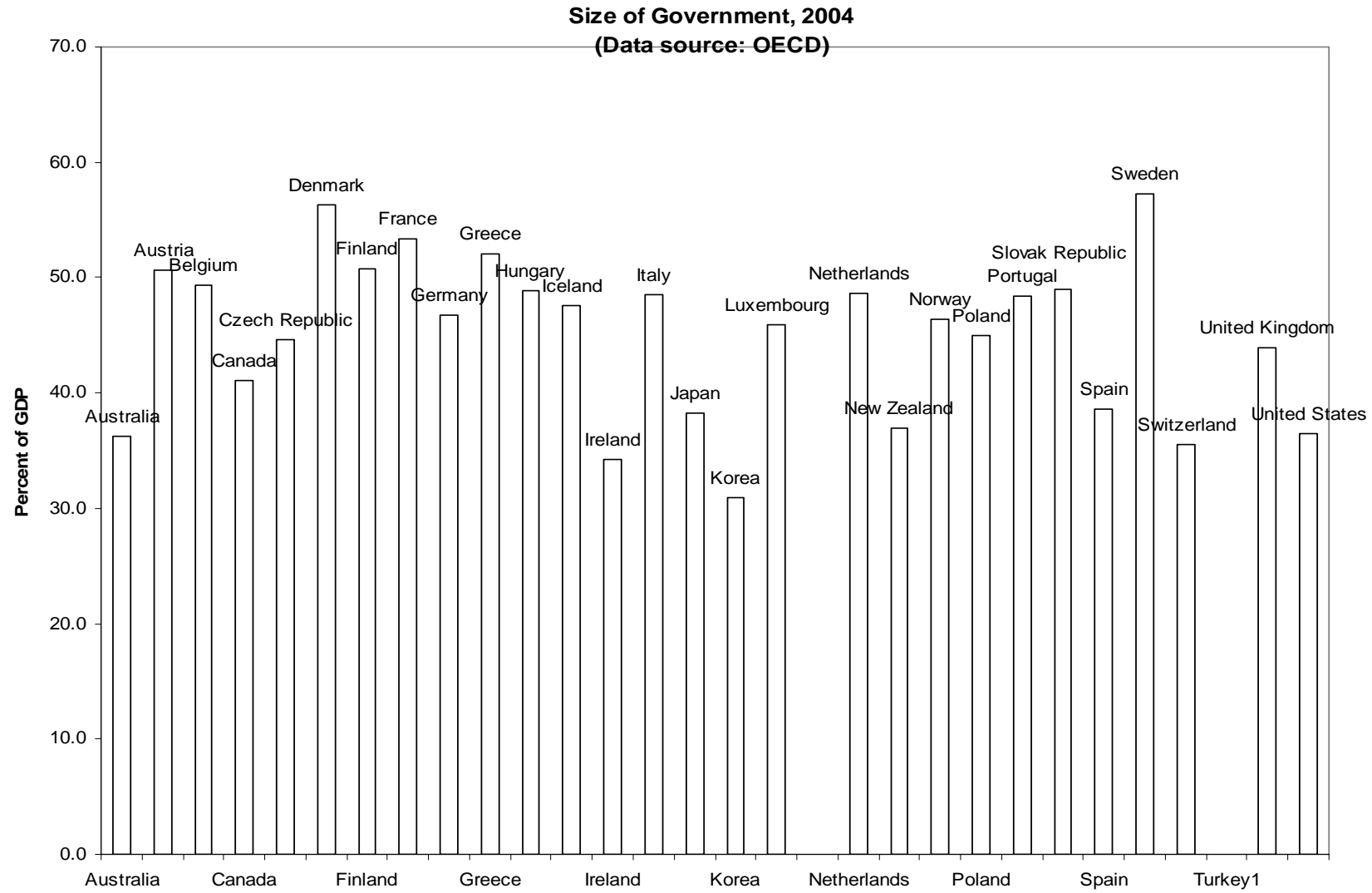
(Percent of Labour Cost)



Growth rates among OECD countries, 1994-2004
 (Data source: OECD)

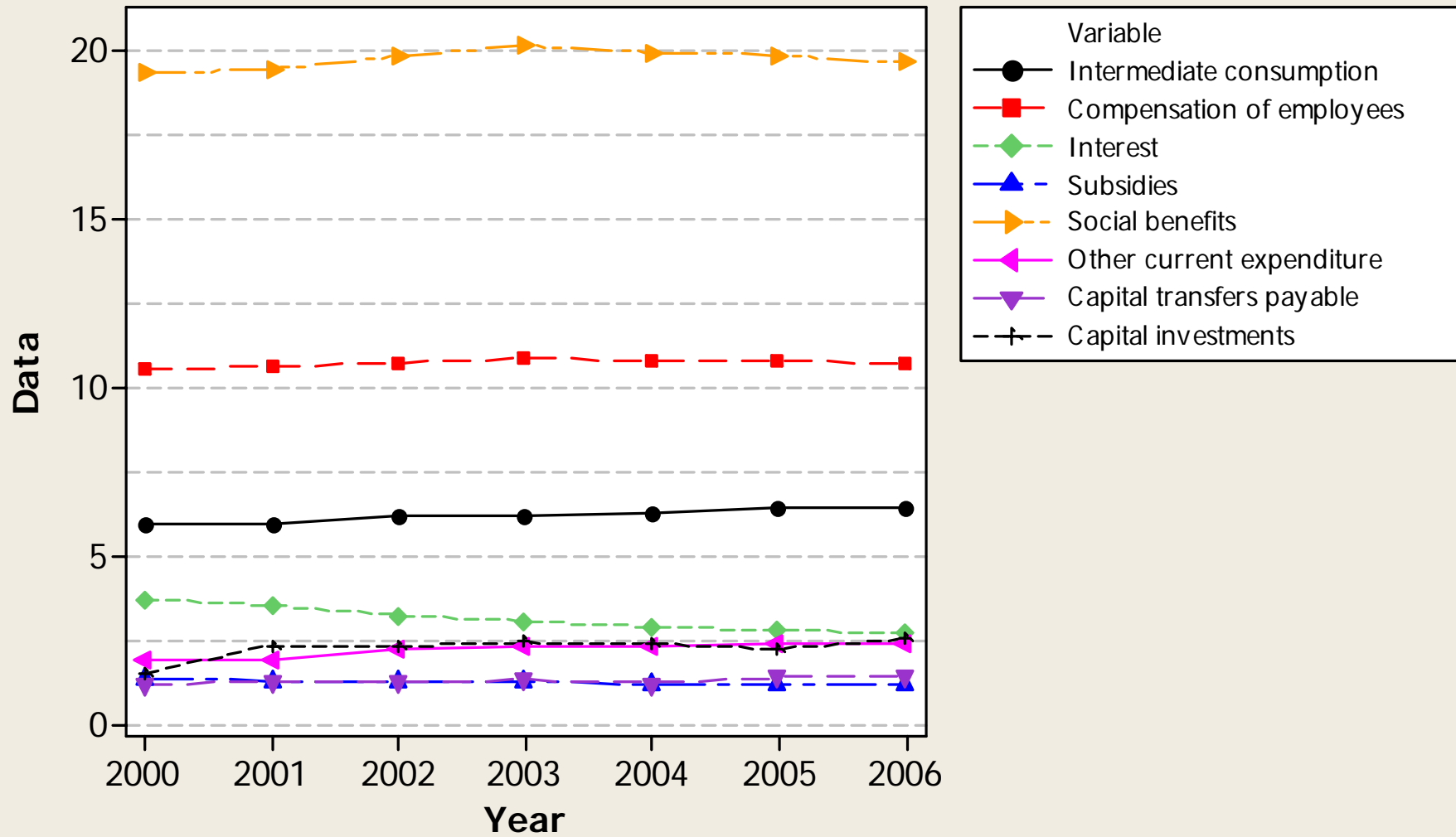


Ratio of public spending to GDP among OECD countries

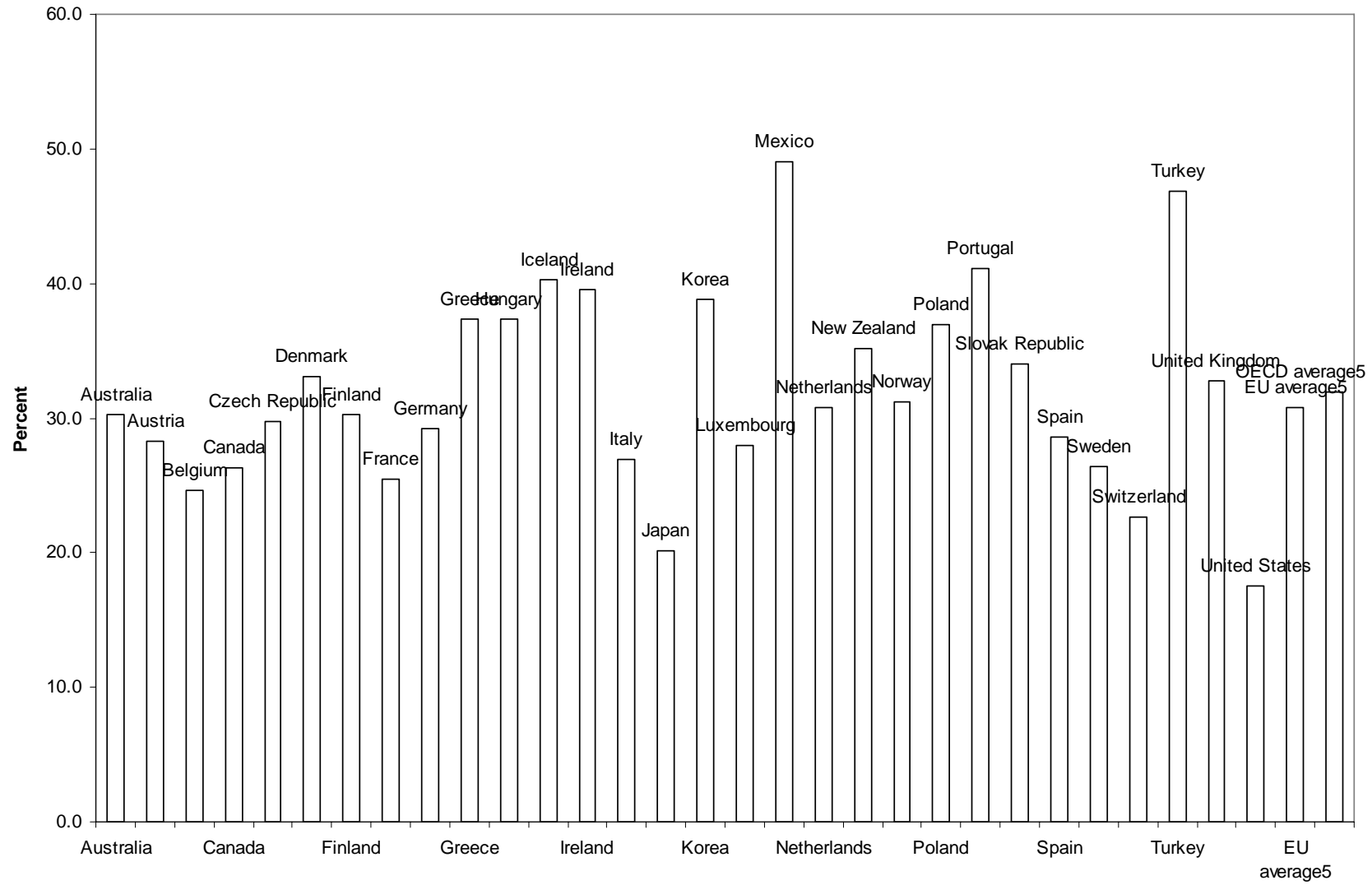


Public Expenditure in EU27

Percent of GDP

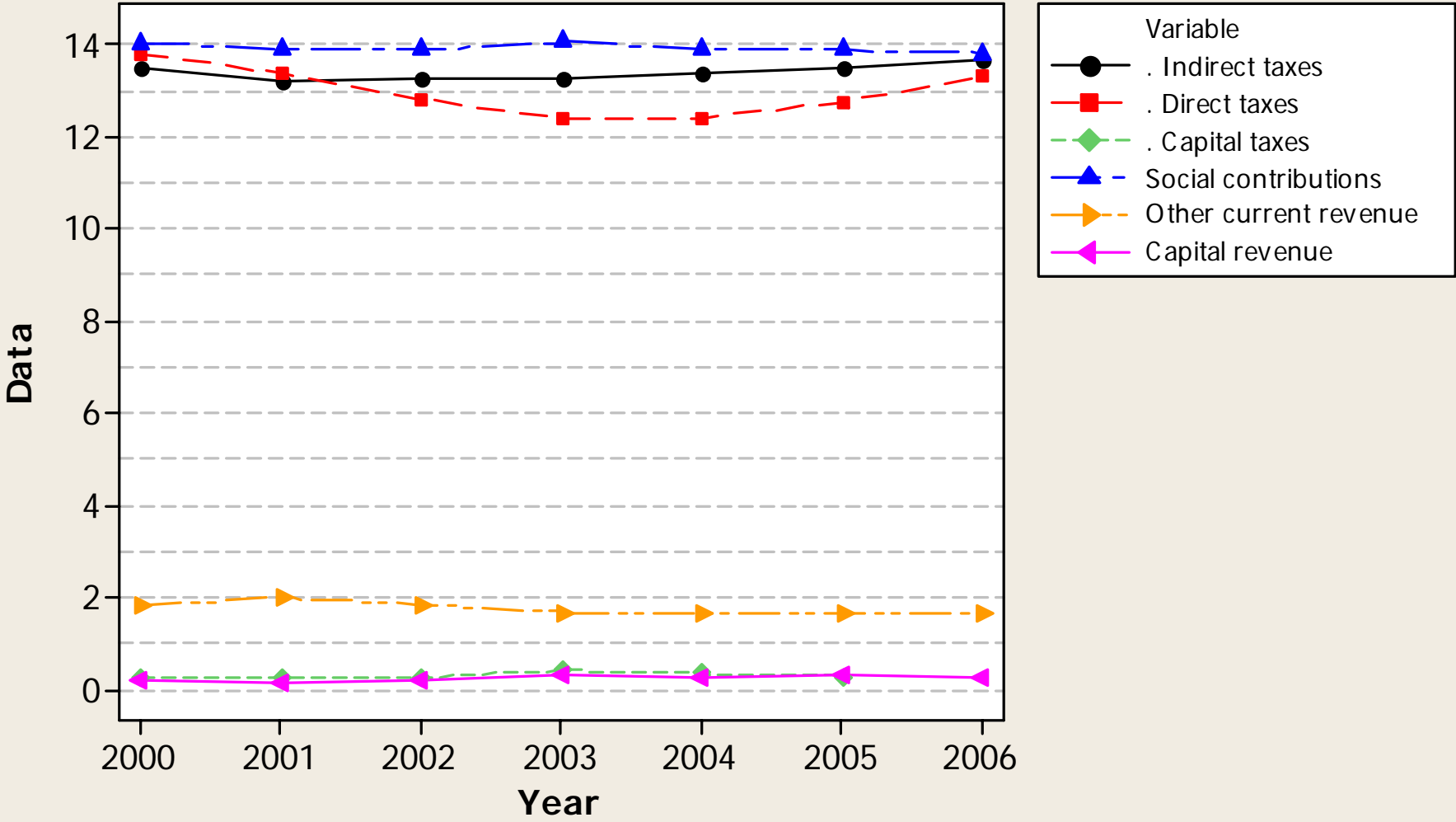


Share of indirect tax in total tax revenue in OECD Countries, 2004

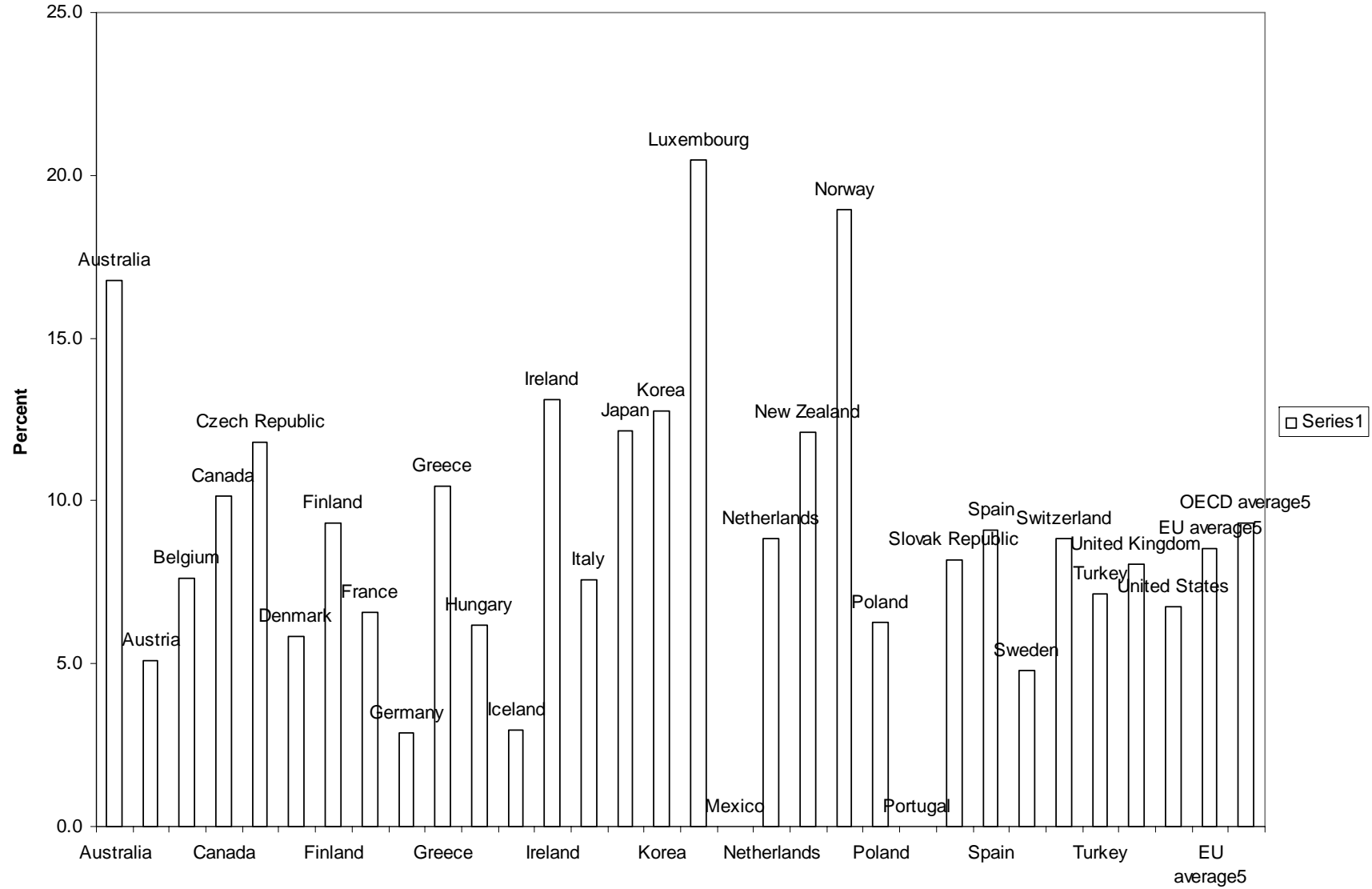


Sources of Revenue in EU27

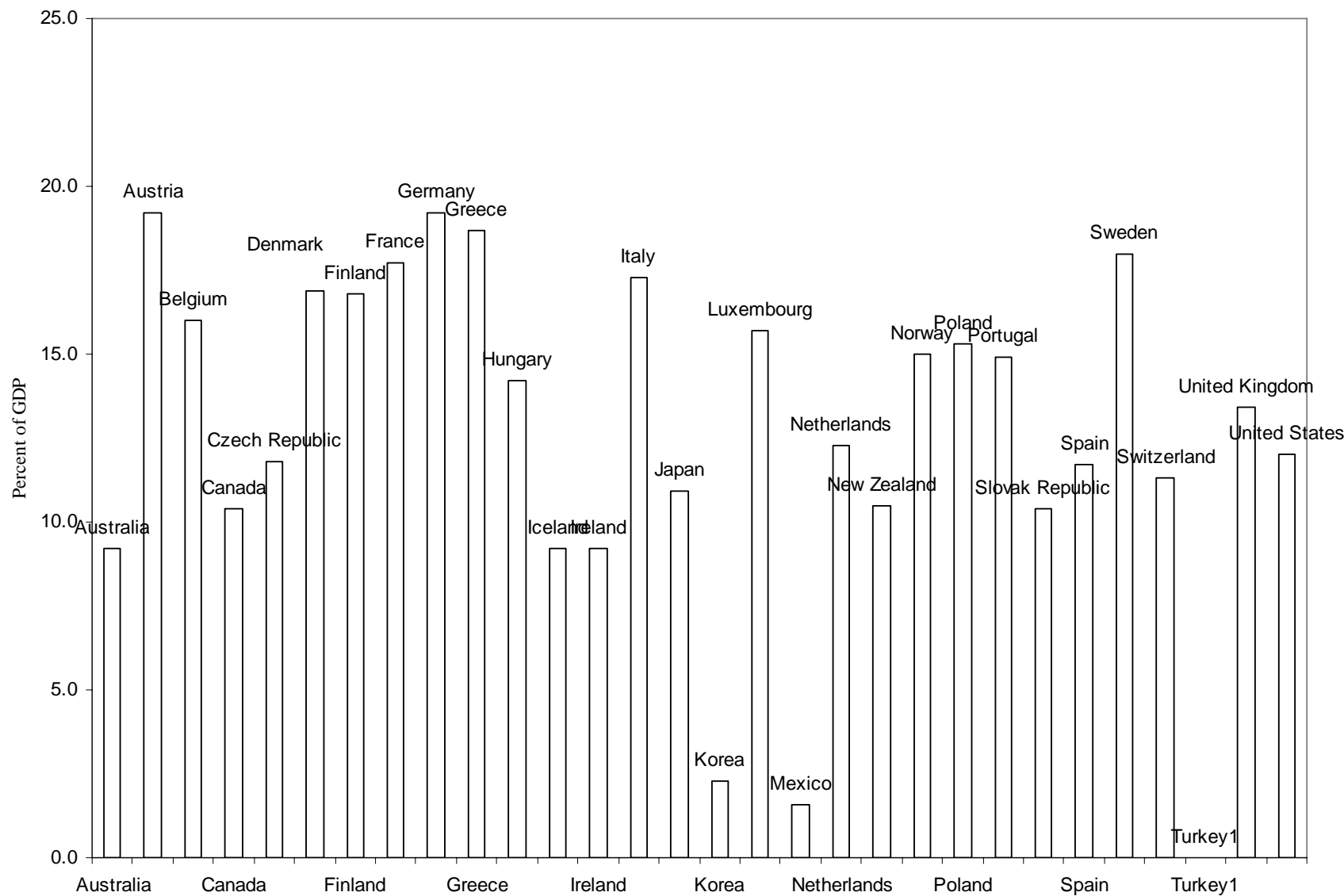
Percent of GDP



Share of corporation tax in total tax revenue in OECD Countries, 2004

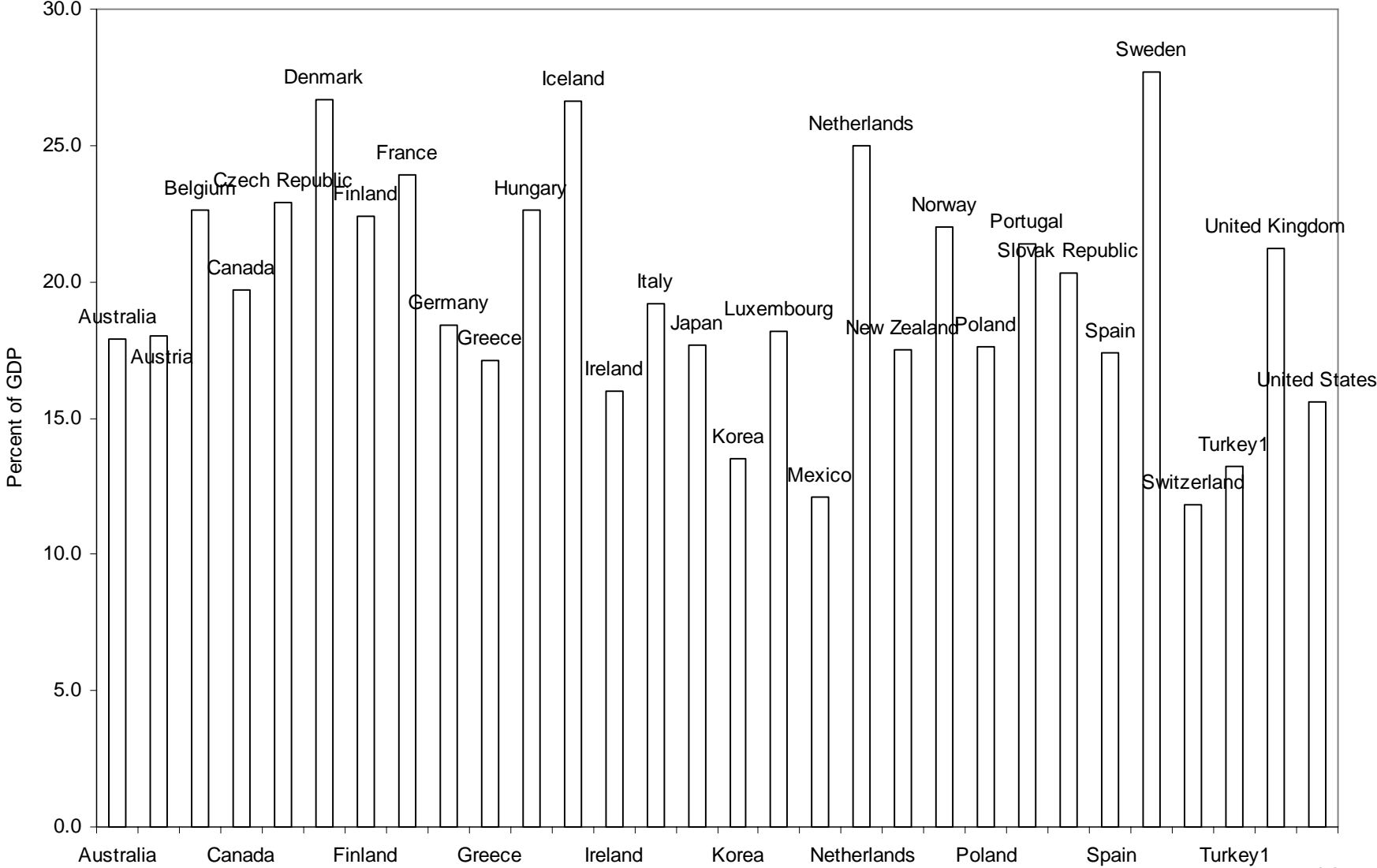


Social Security and Tansfers, 2004

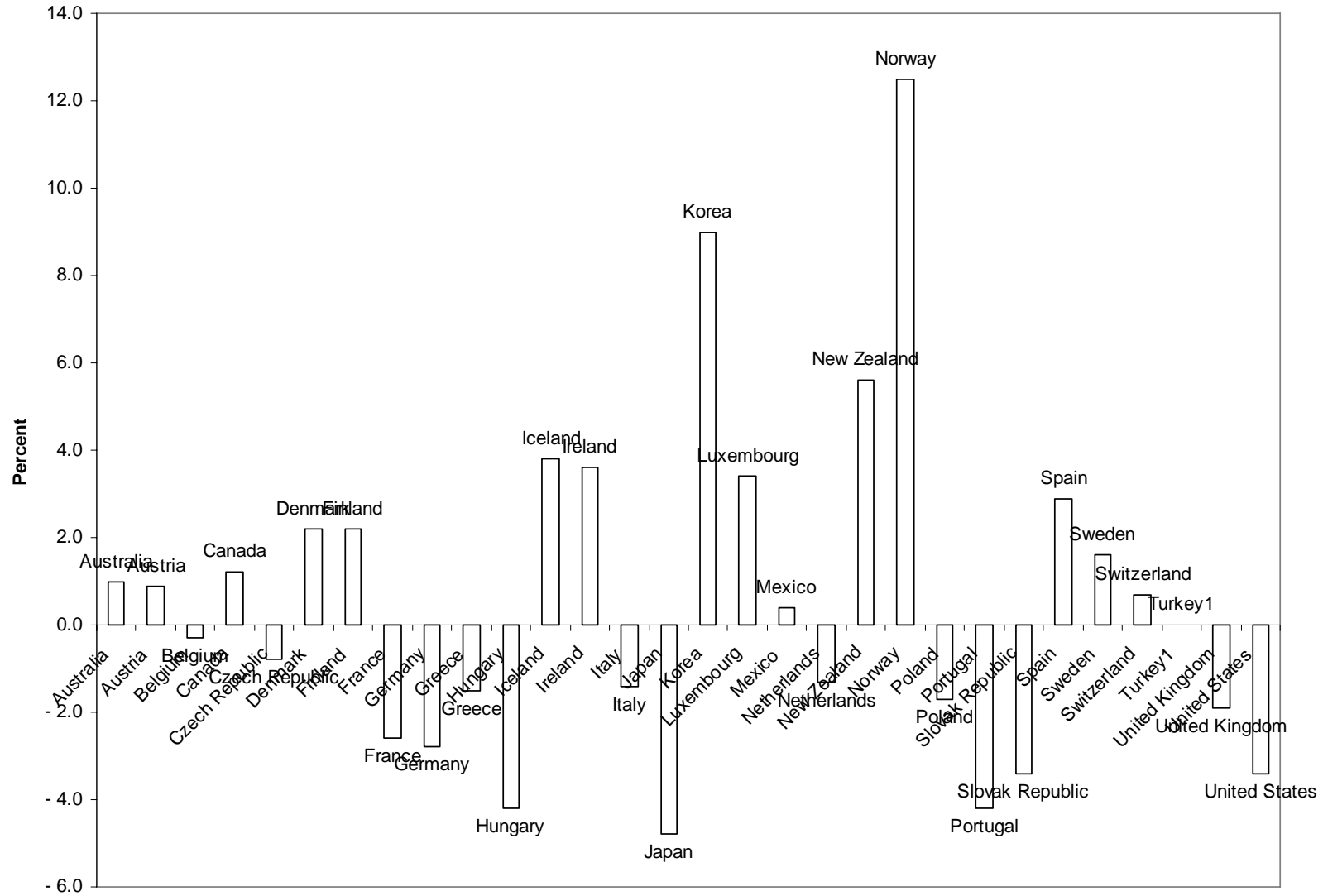


Goverenment Consumption, 2005

(Data source: OECD)



Suplus or Deficit as a percent of GDP, 2004



Ranking by growth rates of output and the ratios of Revenue and Spending to GDP
(OECD 2004)

	Growth rate 1994-2004	Revenue Ratio	Spending ratio	Rank on growth	Rank on Revenue	Rank on Spending
Ireland	7.9	35.6	34.2	28	3	2
Korea	4.9	31.3	30.9	27	1	1
Luxembourg	4.8	44.8	45.9	26	12	11
Poland	4.4	40.2	45	25	6	10
Slovak Republic	4.3	45.7	49	24	14	17
Australia	3.7	36.6	36.2	23	4	3
Finland	3.6	52.5	50.7	22	21	20
Greece	3.6	46	52	21	15	21
Hungary	3.6	44.6	48.9	20	11	16
Iceland	3.5	48.1	47.6	19	17	13
Spain	3.4	38.4	38.6	18	5	6
Canada	3.4	41.7	41.1	17	10	7
United States	3.3	31.9	36.5	16	2	4
New Zealand	3.3	41.2	37	15	8	5
Norway	2.9	57.9	46.4	14	22	12
Sweden	2.8	58.3	57.3	13	23	24
United Kingdom	2.8	40.8	43.9	12	7	8
OECD Total	2.6					
Czech Republic	2.6	41.5	44.6	10	9	9
Portugal	2.5	45.4	48.4	9	13	14
G7	2.5					
Netherlands	2.4	46.2	48.6	7	16	15
France	2.3	49.8	53.4	6	20	22
Euro Area	2.3					
Belgium	2.2	49.3	49.3	4	18	18
EU-15	2.2					
Austria	2.1	49.3	50.6	2	18	19
Denmark	2.1	58.9	56.3	1	24	23
Italy	1.6	45.4	48.5	4	16	18
Germany	1.5	43.2	46.8	3	13	15
Switzerland	1.3	35.6	35.5	2	4	3
Japan	1.2	30.3	38.2	1	1	7

Literature on Taxes, Spending and Growth

Pigou (1947), Samuelson (1954), Buchanan (1965), Atkinson and Stern (1974), Feldstein (1974), Whalley (1975), Boadway (1979), Summer (1980), Blomquist (1985), Bovenberg (1989), Benabou (2002) and Taveres (2004), Fullerton and Heutel (2007), Chen(2007))

Harberger (1962), Uzawa (1962), Cass (1965), Atkinson (1971), Goulder and Summers (1989), King and Rebelo (1993), Perroni (1995), Cummins, Hasset and Hubbard (1996), Rust and Phelan (1997), Dhillon, Perroni and Scharf(1999), Wagstaff (1999), Caucutt, Imrohoroglu and Kumar (2006), Krueckner (2006), Di Tella and MacCullock (2006)

Boadway (1984), Musgrave and Musgrave (1980) Atkinson and Stiglitz (1980), Myles (1995), Muller (1991), Shoven and Whalley (1992) and Hillman (2003)

Figure 1: Optimal size of the public sector

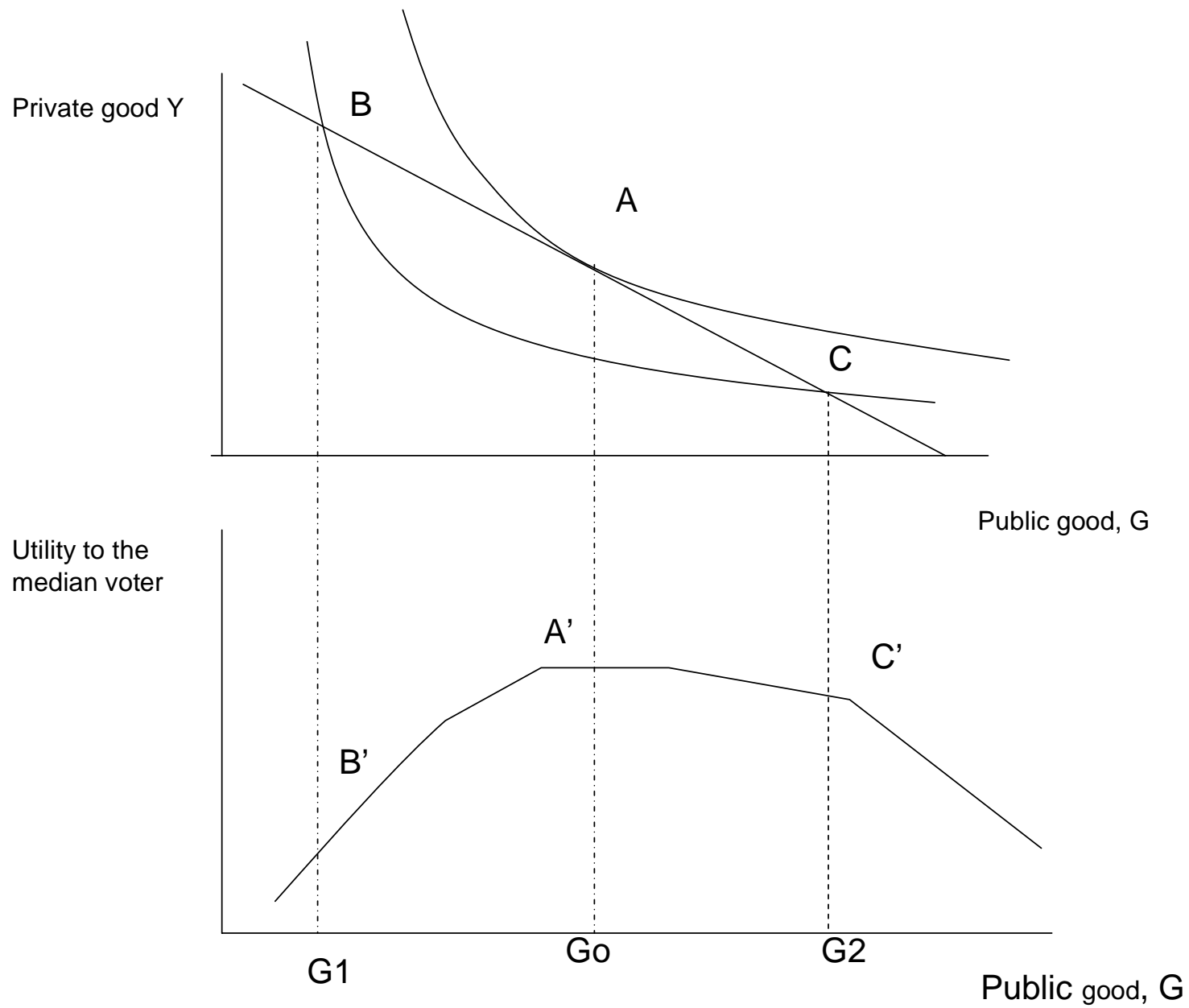
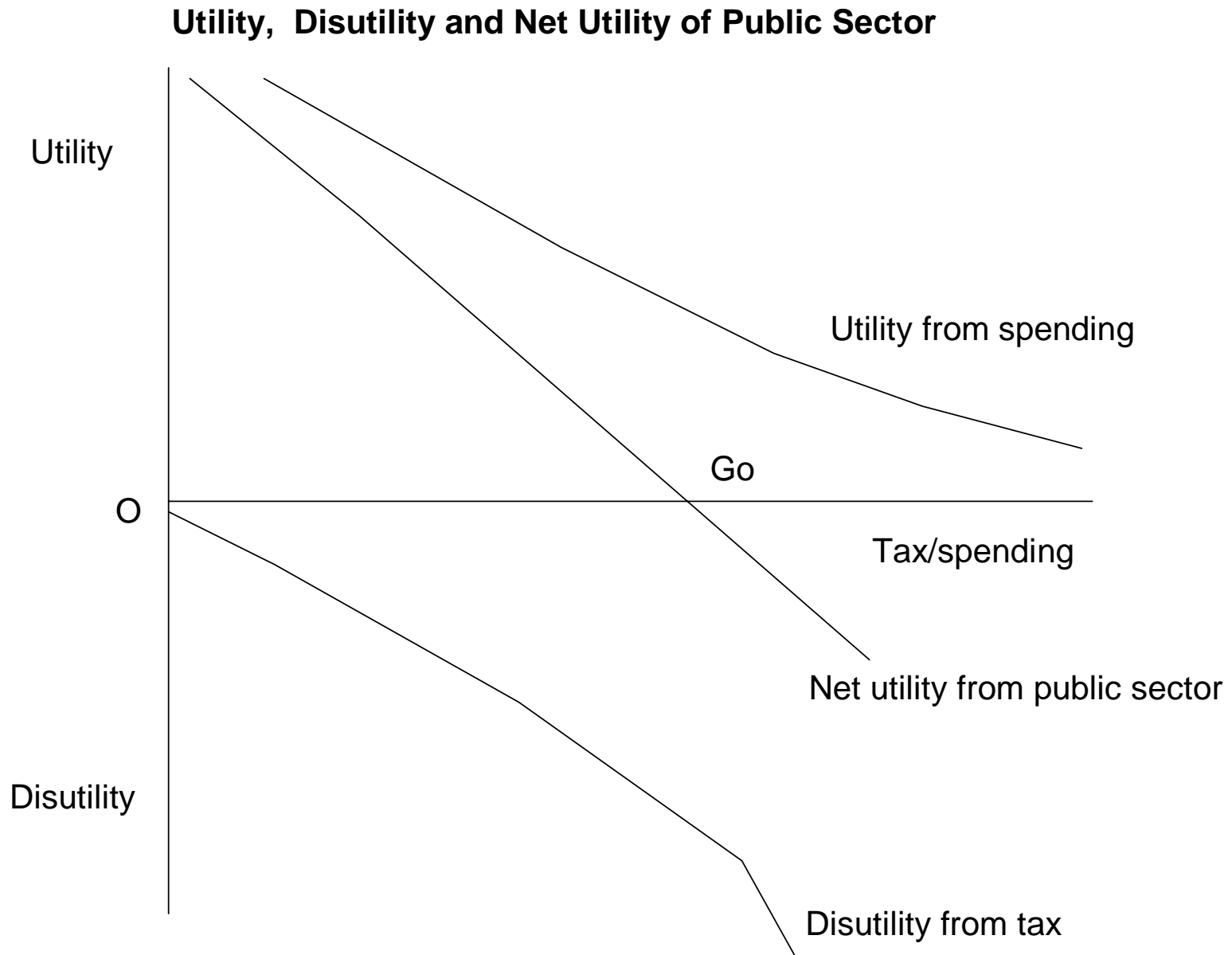


Figure 2: Costs and benefits from the public spending



Samuelsonian Theorem:

Sum of the marginal rate of substitution should equal marginal cost of providing public goods

$$\text{Max } u_1 = u_1(x_1, G)$$

$$\text{subject to } \begin{array}{l} 1) \bar{u}_2 = u_2(x_2, G) \\ 2) x_1 + x_2 + c(G) = w_1 + w_2 \end{array}$$

Lagrangian of the problem:

$$L = u_1(x_1, G) - \lambda(u_2(x_2, G) - \bar{u}_2) - \mu(x_1 + x_2 + c(G) - w_1 - w_2)$$

Three first order conditions:

$$1. \frac{\partial L}{\partial x_1} = \frac{\partial u_1(x_1, G)}{\partial x_1} - \mu = 0 \quad \text{or} \quad \mu = \frac{\partial u_1(x_1, G)}{\partial x_1}$$

$$2. \frac{\partial L}{\partial x_2} = -\lambda \frac{\partial u_2(x_2, G)}{\partial x_2} - \mu = 0 \quad \text{or} \quad -\frac{\partial u_2(x_2, G)}{\partial x_2} = \frac{\mu}{\lambda}$$

$$3. \frac{\partial L}{\partial G} = \frac{\partial u_1(x_1, G)}{\partial G} - \lambda \frac{\partial u_2(x_2, G)}{\partial G} - \mu \frac{\partial c(G)}{\partial G} = 0 \quad \text{or}$$

$$\frac{1}{\mu} \frac{\partial u_1(x_1, G)}{\partial G} - \frac{\lambda}{\mu} \frac{\partial u_2(x_2, G)}{\partial G} = \frac{\partial c(G)}{\partial G}$$

$$\frac{\frac{\partial u_1(x_1, G)}{\partial G}}{\frac{\partial u_1(x_1, G)}{\partial x_1}} + \frac{\frac{\partial u_2(x_2, G)}{\partial G}}{\frac{\partial u_2(x_2, G)}{\partial x_2}} = \frac{\partial c(G)}{\partial G} \quad \text{or} \quad MRS_1 + MRS_2 = MC(G) \quad \text{Q.E.D.}$$

If citizens value public goods highly they can bear higher costs of providing public goods.

Utilitarian approach to the optimal size of the state

$$\max U^h = (1 - \alpha) \ln(Y^h - T^h) + \alpha \ln G$$

subject to

$$P(Y^h - T^h) + G = I$$

$$L(Y^h, G) = (1 - \alpha) \ln(Y^h - T^h) + \alpha \ln G + \lambda [I - P(Y^h - T^h) - G]$$

$$\frac{\partial L(Y^h, G)}{\partial Y^h} = \frac{(1 - \alpha)}{(Y^h - T^h)} - \lambda P = 0 \quad \frac{\partial L(Y^h, G)}{\partial G} = \frac{\alpha}{G} - \lambda = 0$$

Marginal rate of substitution between public and private goods:

$$\frac{(1 - \alpha) G}{(Y^h - T^h) \alpha} = P \quad G = PT^h = PT$$

$$\frac{G}{P} = \alpha Y \quad (1 - \alpha)G = \alpha(Y - T)P = \alpha YP - \alpha TP = \alpha YP - \alpha G$$

a distribution of α

**How does larger public sector affect growth?
Neoclassical Model on tax and growth (Feldstein (1974))**

$$y = f(k)$$

$$f' = r(1+t)$$

$$dr = f'' dk(1+t)^{-1} - f'(1+t)^{-2} dt$$

$$y - kf' = w$$

$$y = c + i + g = c + tkf' + s$$

$$g = tkf'$$

$$s = nk$$

$$s = S_L(w)w + S_K(r)rk$$

How does larger public sector affect growth?

Neoclassical Model on tax and growth (Feldstein (1974))

$$nk = S_L(w)(f - kf') + S_K(r)kf'(1+t)^{-1} = S_L f - S_L kf' + S_K kf'(1+t)^{-1}$$

$$n.dk = fS'_L dr + S_L f' dk - S_L f' dk - S_L kf'' dk - kf' S'_L dr + S_K f'(1+t)^{-1} dk \\ + S_K k(1+t)^{-1} f'' dk - S_K kf'(1+t)^{-2} + kf'(1+t)^{-1} S'_K dr$$

$$n = S_L f k^{-1} - S_L f' + S_K f'(1+t)^{-1}$$

$$dr = f'' dk(1+t)^{-1} - f'(1+t)^{-2} dt$$

$$\begin{aligned} \cdot [S_L f k^{-1} - S_L f' + S_K f'(1+t)^{-1}] dk &= fS'_L [f'' dk(1+t)^{-1} - f'(1+t)^{-2} dt] + S_L f' dk \\ &- S_L f' dk - S_L kf'' dk - kf' S'_L [f'' dk(1+t)^{-1} - f'(1+t)^{-2} dt] \\ &+ S_K f'(1+t)^{-1} dk + S_K k(1+t)^{-1} f'' dk - S_K kf'(1+t)^{-2} dt + kf'(1+t)^{-1} S'_K [f'' dk(1+t)^{-1} - f'(1+t)^{-2} dt] \end{aligned}$$

$$\frac{dk}{dt} = \frac{-\left(fS'_L f'(1+t)^{-2} - kf'^2 S'_L (1+t)^{-2} + S_K kf'(1+t)^{-2} + kf'^2 S'_K (1+t)^{-3}\right)}{\left(\begin{array}{l} S_L f k^{-1} - S_L f' + S_K f'(1+t)^{-1} - fS'_L f''(1+t)^{-1} + S_L kf'' - kf' S'_L f''(1+t)^{-1} - S_K f'(1+t)^{-1} \\ - S_K kf''(1+t)^{-1} - kf'(1+t)^{-2} S'_K f'' \end{array}\right)}$$

How does larger public sector affect growth?

Optimal Ramsey Model with Public Good

$$U_0 = \sum_{t=0}^{\infty} \rho^t \ln(C_t) + \sum_{t=0}^{\infty} \gamma^t \ln(G_t)$$

$$Y_t = A_t K_t^\beta L_t^{1-\beta}$$

$$K_{t+1} = (1 - \delta)K_t + I_t$$

$$I_t = (g + \delta)K_t$$

$$r_t = \beta A_t K_t^{\beta-1} (1 - \delta) (1 - t_k)$$

$$G_t = \beta A_t K_t^{\beta-1} (1 - \delta) t_k K_t$$

How does larger public sector affect growth?

Optimal Ramsey Model with Public Good

$$C_t (1 + r_{t+1}) = C_{t+1} (1 + \rho)$$

$$G_t = Y_t - C_t - I_t$$

$$1 + r = 1 + \rho$$

$$U_0 = \sum_{t=0}^{\infty} \beta^t \ln \left(A_t K_t^\beta L_t^{1-\beta} - \beta A_t K_t^{\beta-1} (1-\delta) t_k K_t - K_{t+1} + (1-\delta) K_t \right) + \sum_{t=0}^{\infty} \gamma^t \ln \left(\beta A_t K_t^{\beta-1} (1-\delta) t_k K_t \right)$$

$$\left(A_t K_t^\beta L_t^{1-\beta} - \beta A_t K_t^{\beta-1} (1-\delta) t_k K_t - K_{t+1} + (1-\delta) K_t \right) (1 + r_{t+1}) =$$

$$\left(A_{t+1} K_{t+1}^\beta L_{t+1}^{1-\beta} - \beta A_{t+1} K_{t+1}^{\beta-1} (1-\delta) t_k K_{t+1} - K_{t+2} + (1-\delta) K_{t+1} \right) (1 + \beta)$$

$$r_t = \beta A_t K_t^{\beta-1} (1-\delta) (1 - t_k)$$

How does larger public sector affect growth?
Steady State and Transitions Dynamics in an Overlapping Generation model

Economy:

young and old generation

each of them is endowed by k_0 capital stock

aggregate capital stock is K_0 .

$$Y_t = A K_t^\beta L_t^{1-\beta}$$

$$y_t = A_t k_t^\beta$$

$$r_t = \frac{\partial y_t}{\partial k_t} = \beta A_t k_t^{\beta-1} (1 - t_k)$$

$$w_t = \frac{\partial y_t}{\partial L_t} = (1 - \beta) A_t k_t^\beta (1 - t_w)$$

$$K_{t+1} = (1 - \alpha) w_t (1 - t_w) = (1 - \alpha) (1 - \beta) A_t k_t^\beta (1 - t_w)$$

Individuals:

$$C_{y,t} = \alpha w_t$$

$(1 - \alpha)$ for old age

$$C_{y,t} + \frac{C_{o,t}}{(1 + r_{t+1})} = w_t (1 - t_w)$$

$$C_{o,t} = a_t (1 + r_t) (1 - t_k)$$

$$a_{t+1} = (1 - \alpha) w_t$$

Macro balance in Overlapping Generation Model

$$K_{t+1} = (1 - \alpha)w_t(1 - t_w) = (1 - \alpha)(1 - \beta)A_t k_t^\beta (1 - t_w)$$

$$S_t = Y_t - Nc_{yt} - Nc_{ot} - Ng_t$$

$$S_t = I_t$$

Taxes
Reduce capital accumulation
And
Output

$$I_t = K_{t+1} - K_t$$

$$G_t = R_t = (1 - \beta)A_t k_t^\beta t_w L_t + \beta A_t k_t^{\beta-1} t_k$$

Compare to endogenous like in Rebelo (1991)

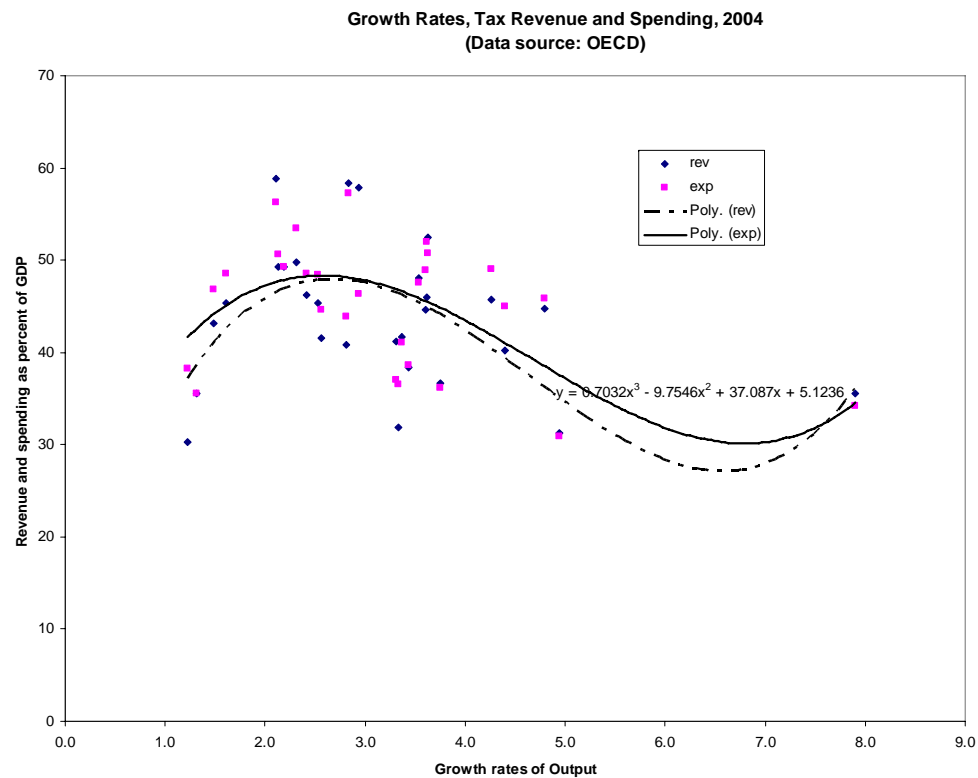
$$y = Ak$$

$$f' = A = r(1+t)$$

$$r = \frac{A}{(1+t)}$$

Table 1
Correlations between ranks of growth rates, revenue and spending

	<i>Rank-growth</i>	<i>Rank-Rev</i>	<i>Rank_Spend</i>
Rank-growth	1		
Rank-Rev	-0.19022	1	
Rank_Spend	-0.24028	0.900189	1



Why Taxes Reduce Growth?

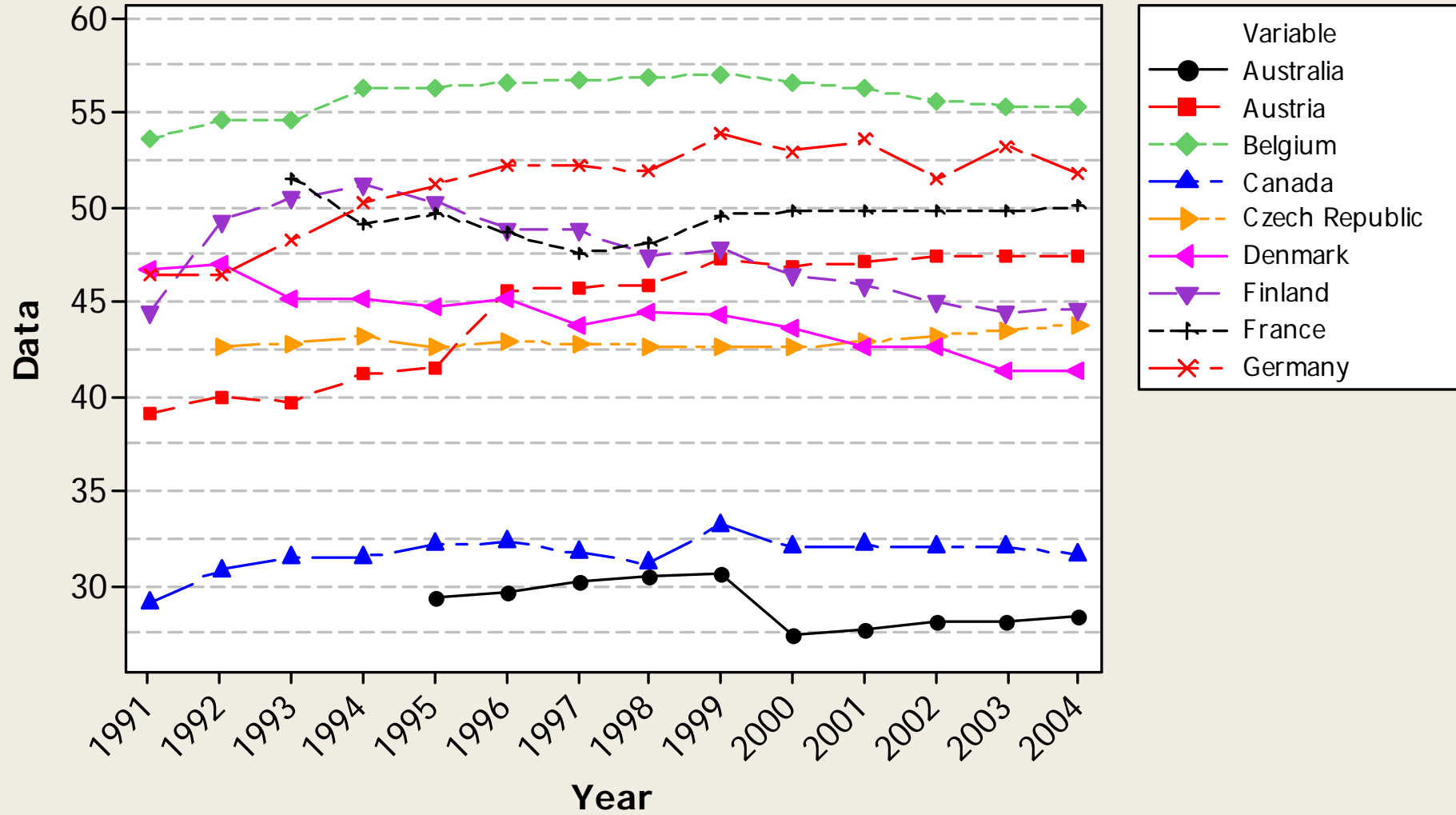
- Impact on consumption and Labour-Leisure Choices
- Distortions on saving
- Impact on relative prices of commodities
- Effects on redistribution and incentives
- Macro economic instability

Average Tax on Workers in OECD Countries

Graphical Presentation

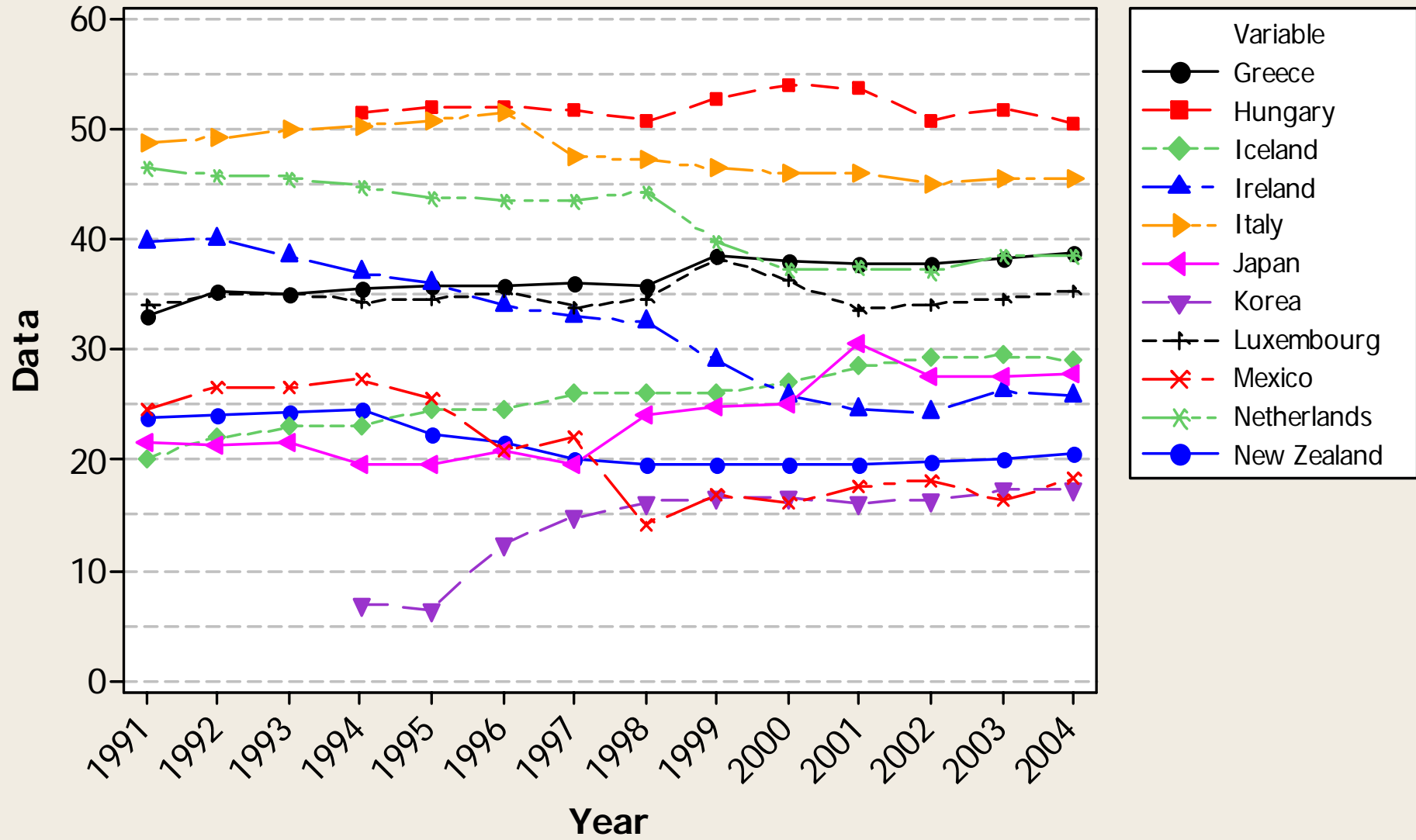
Average Tax Rate on Workers in OECD Countries

(Percent of Labour Cost)



Average Tax Rate on Workers in OECD Countries

(Percent of Labour Cost)



Average Tax Rate on Workers in OECD Countries (Percent of Labour Cost)

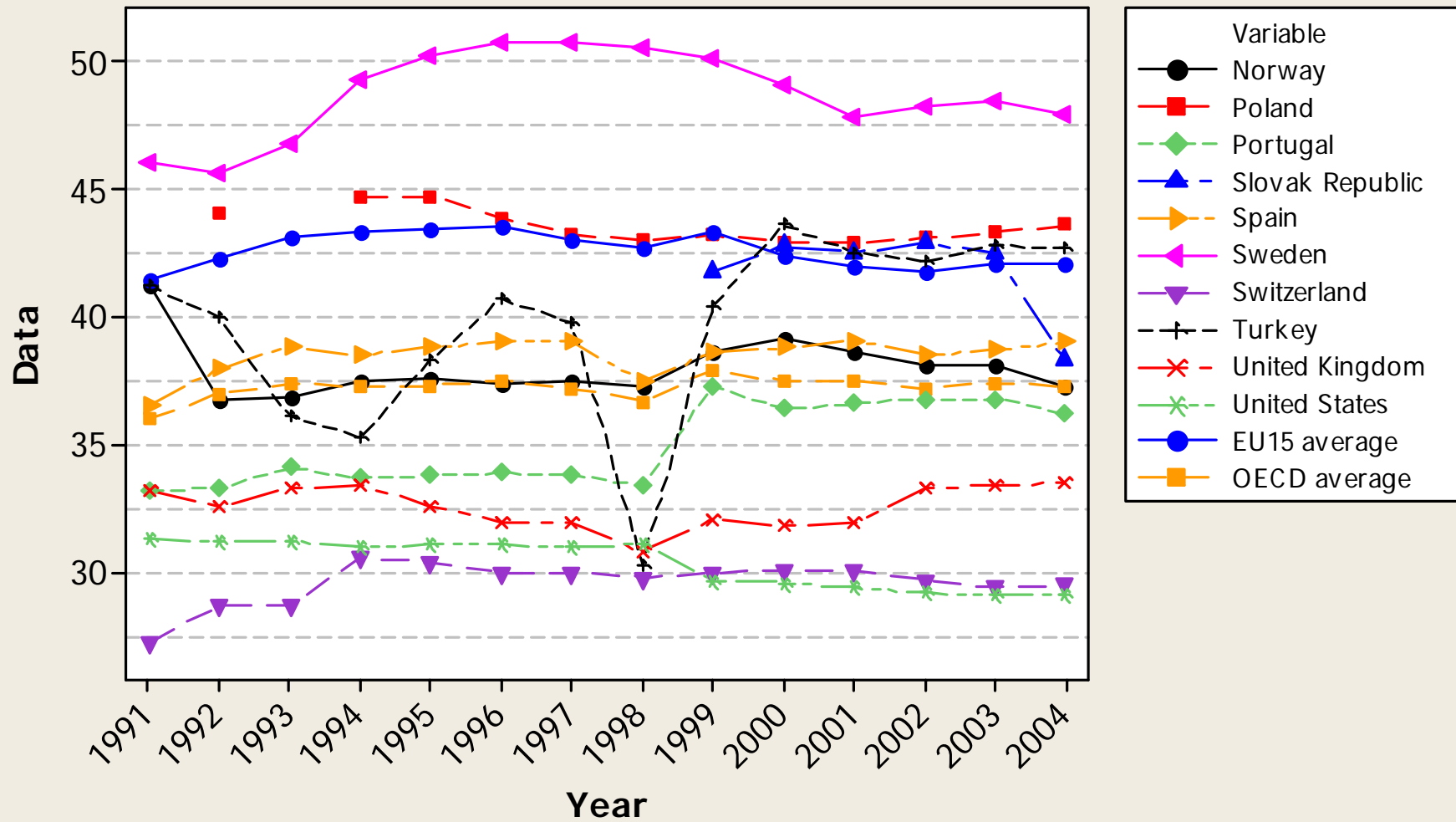


Figure 3: Macroeconomic Stabilisation Role of Tax and Spending

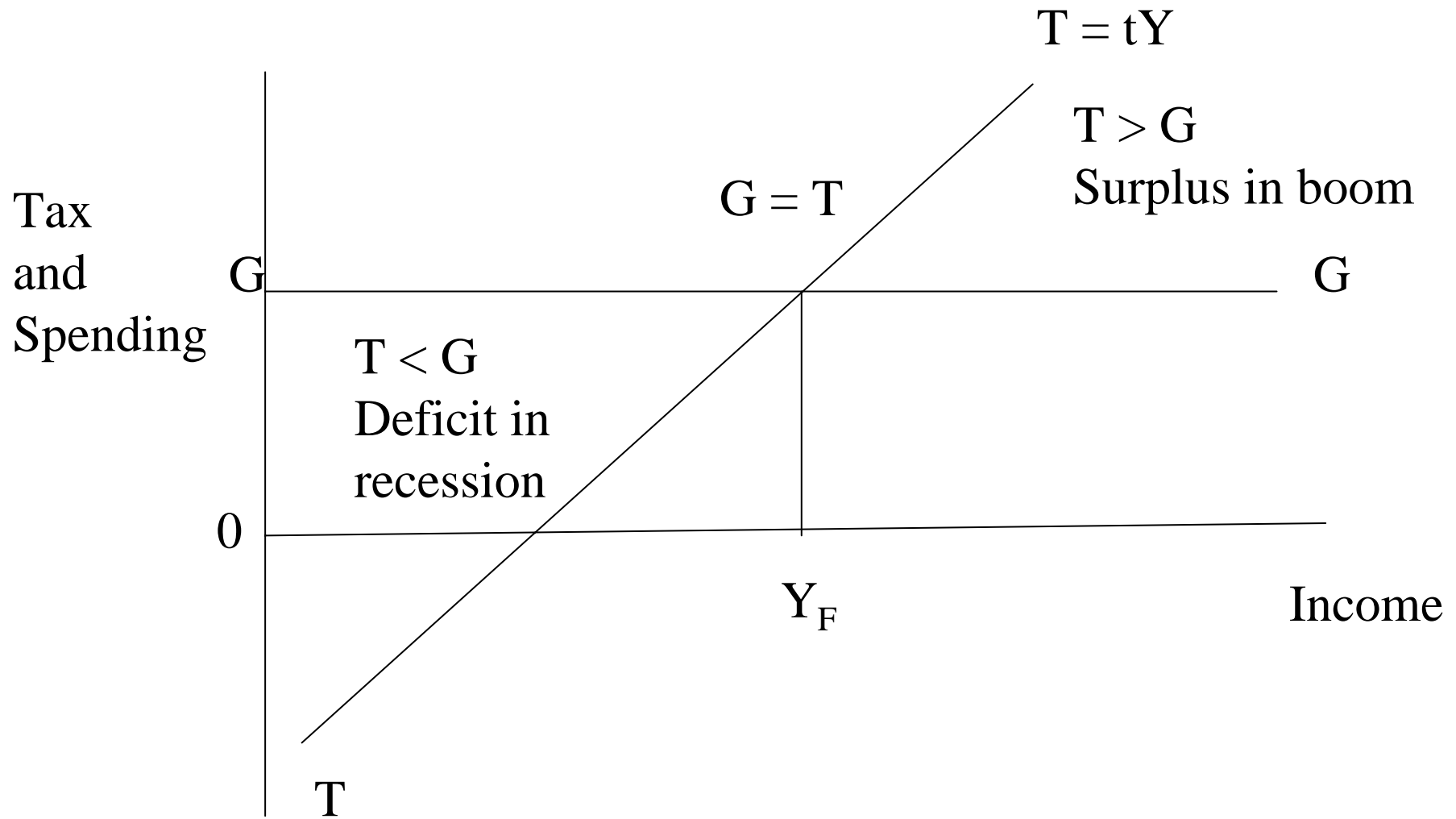
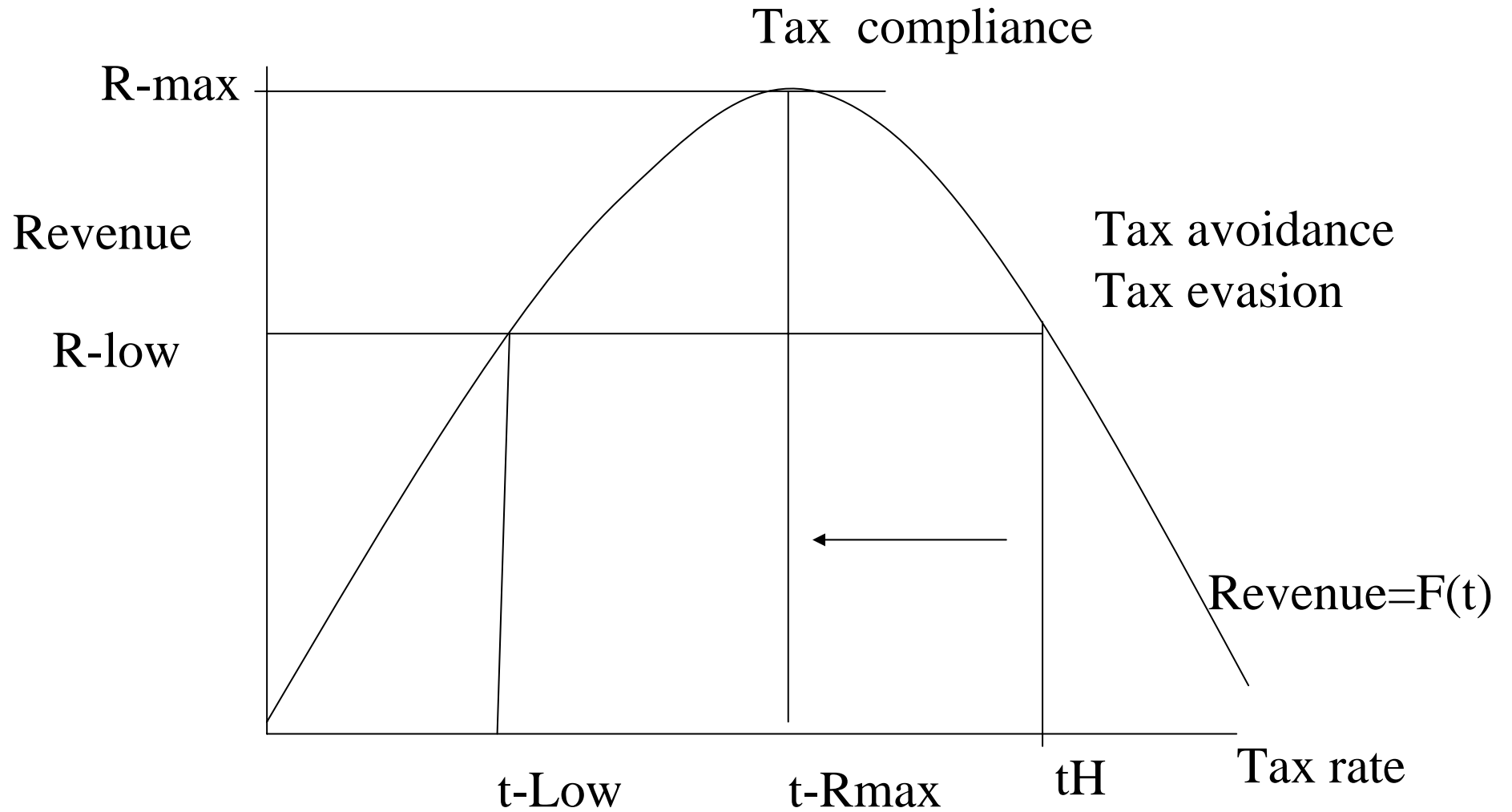
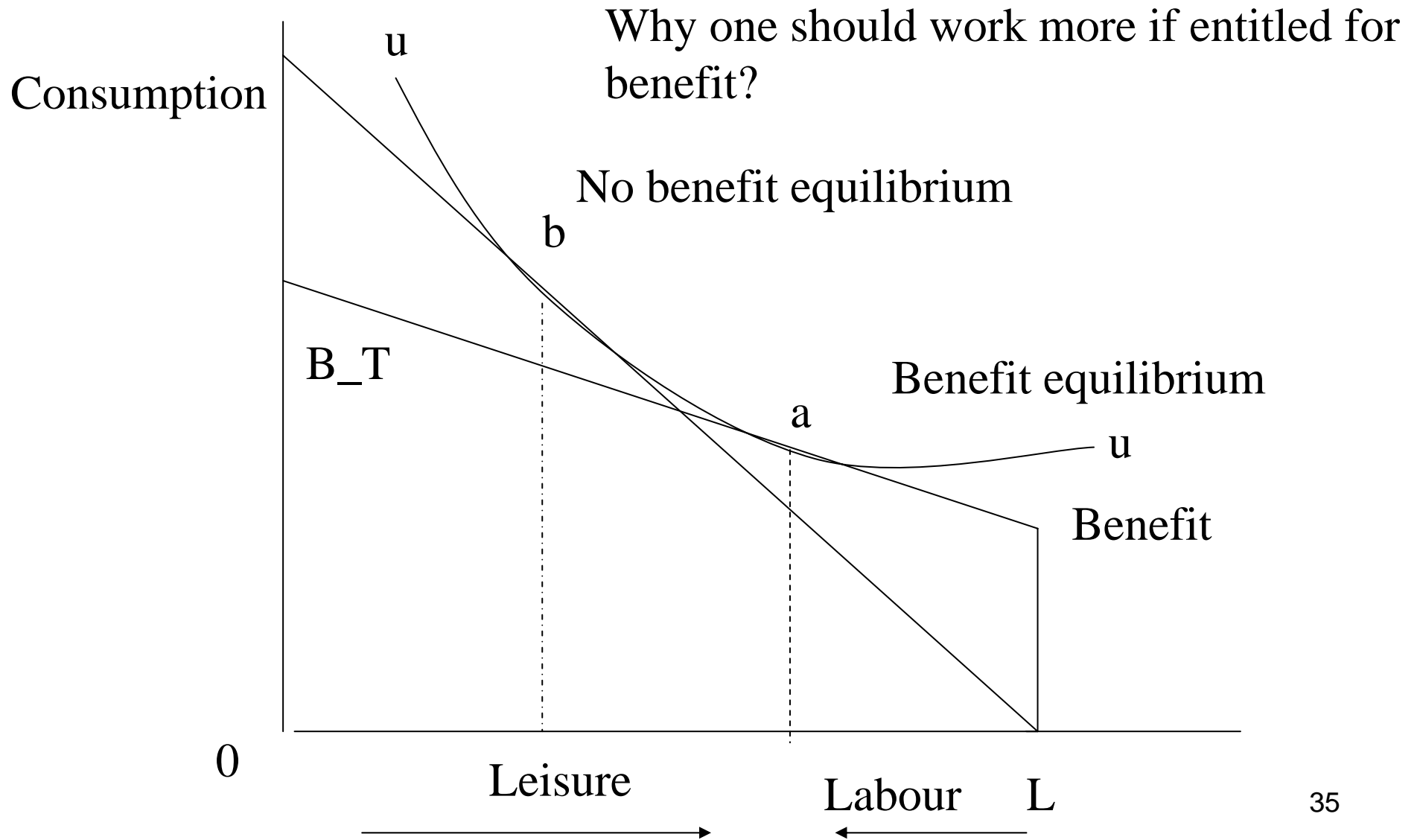


Figure 4: How much should be the tax rate to maximise the government revenue?

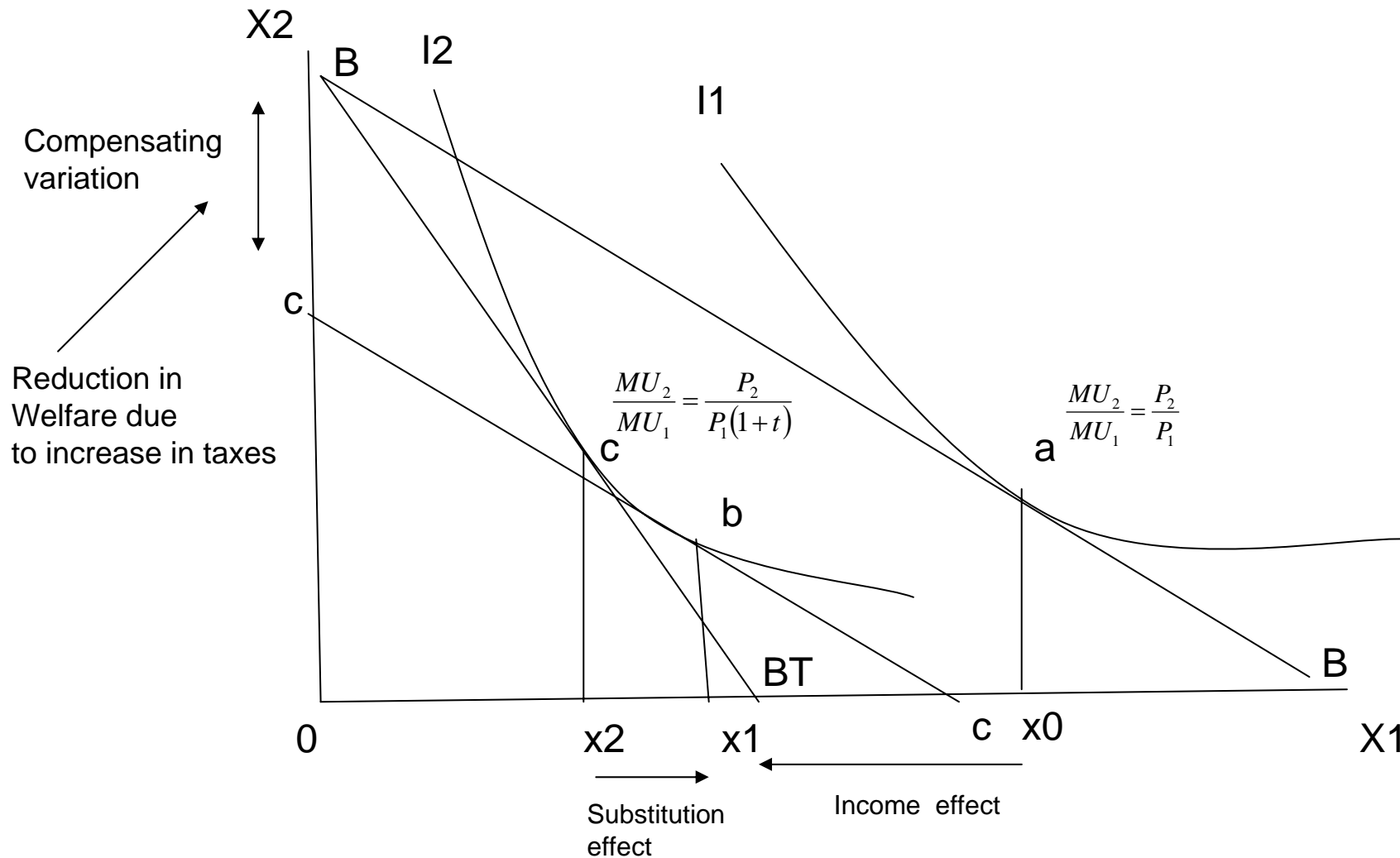


Impact of Taxes and Transfer on Labour Supply of Individuals



Impact of Increase in Taxes in Demand for a commodity

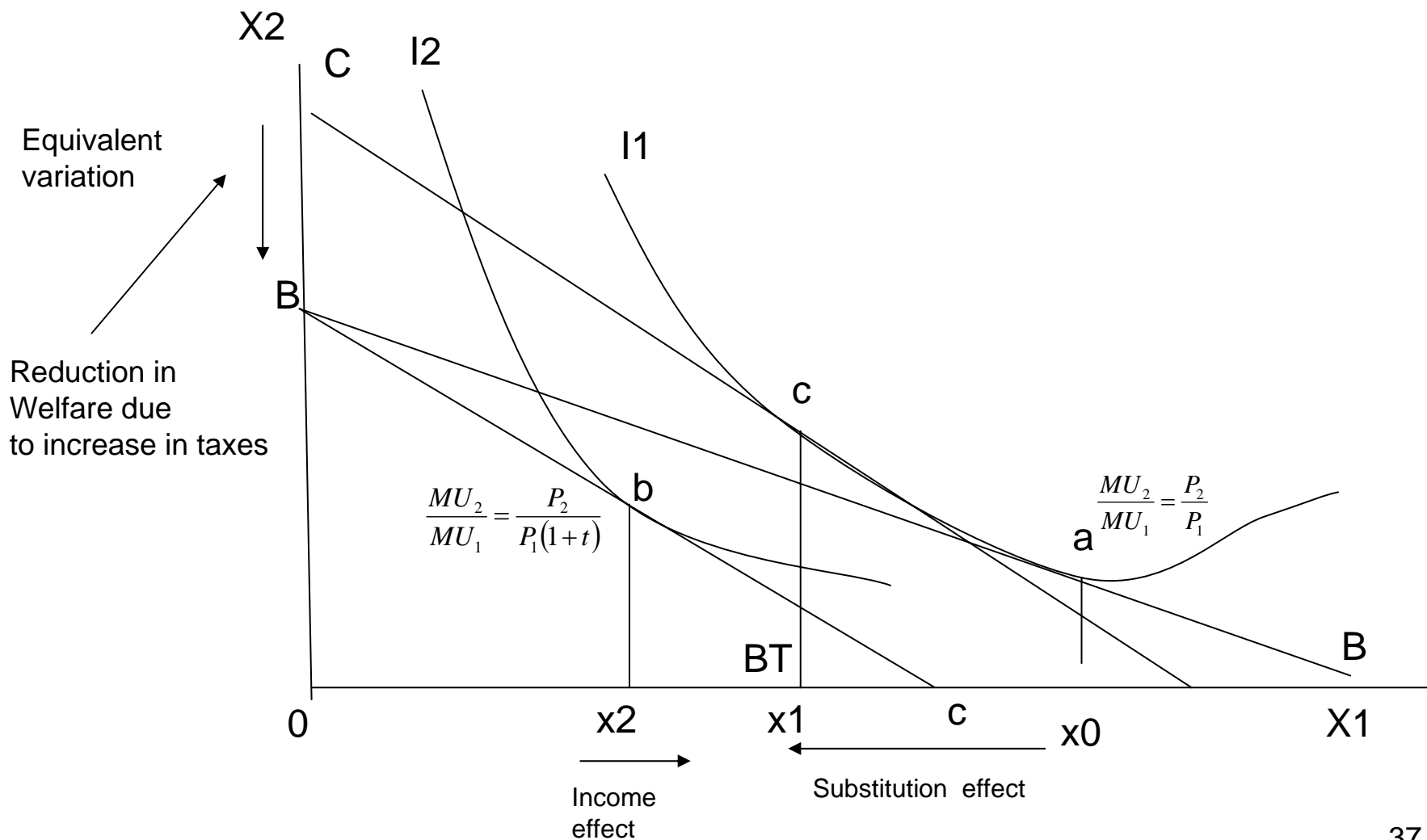
Income and Price Effects: Hicksian and Slutsky Decomposition Compensating Variation



Impact of Increase in Taxes in Demand for a commodity

Income and Price Effects: Hicksian and Slutsky Decomposition

Equivalent Variation



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