# Should CBA in the public sector include tax distortions?

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CENTER FOR
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# Introduction

- Should CBA in the public sector include tax distortion costs?
- Government expenditures ⇒ need to raise revenue ⇒ effects on economic efficiency (tax distortions)?
- Marginal cost of public funds (MCF), skatteforvridningsfaktor, forvridningstillæg…
- Previous official CBA guidelines: MCF = 1,2 reduced to MCF = 1,1 in 2017
  MCF = 1,1 ⇒ costs DKK 1,1 to raise DKK 1 in revenue because of tax distortion costs
- New official CBA guideline: MCF = 1,0 (no tax distortion costs)

# Overview

- Traditional Public Finance literature

  why we **need to** account for tax distortions

- Modern Public Finance literature

  why we **should not** include tax distortions

- Conclusion and some final thoughts

# Traditional approach

## The Samuelson rule (Samuelson 1954)

Should we make the following public project?

Total private benefits: $\sum$ MPB = 55+55 = 110

Total costs: 100

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Samuelson: 110>100 $\Rightarrow$ **YES**

# Traditional approach

## The modified Samuelson rule

Should we make the following public project?

Total private benefits: $\sum$ MPB = 55+55 = 110

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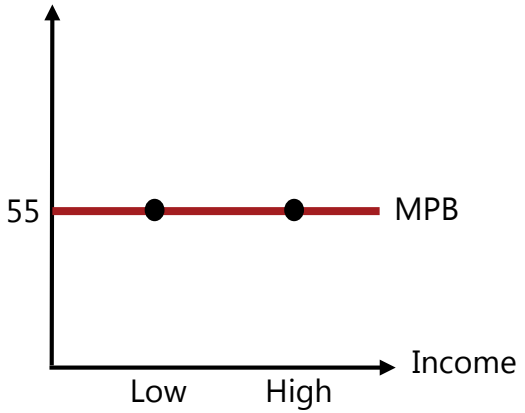
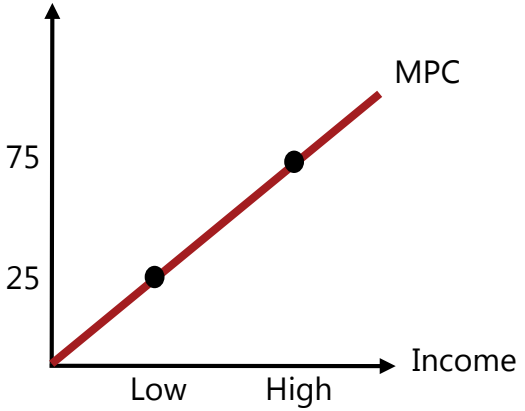
Financed through a tax on income $\Rightarrow$

**A. Distribution of benefits/price willingness**
Effect of expenditures on private welfare




**B. Distribution of costs:**
Effect of proportional tax on private welfare



# Traditional approach

## The modified Samuelson rule

Should we make the following public project?

Total private benefits: $\sum$ MPB = 55+55 = 110

Total costs: 100

Financed through a tax on income $\Rightarrow$

Total private costs: $\sum$ MPC = 25+75 = 100

Samuelson: 110>100 $\Rightarrow$ **YES**

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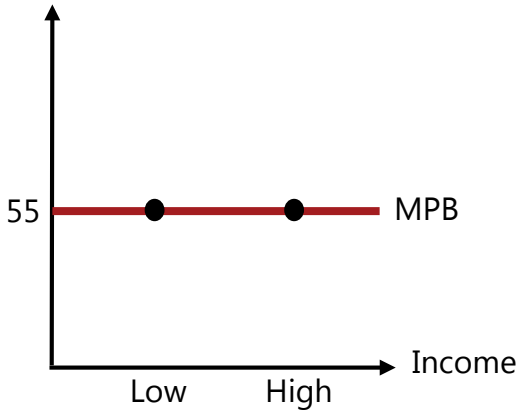


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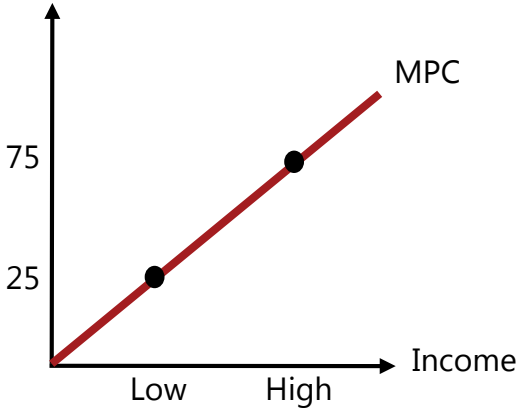

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**BUT tax distortion**

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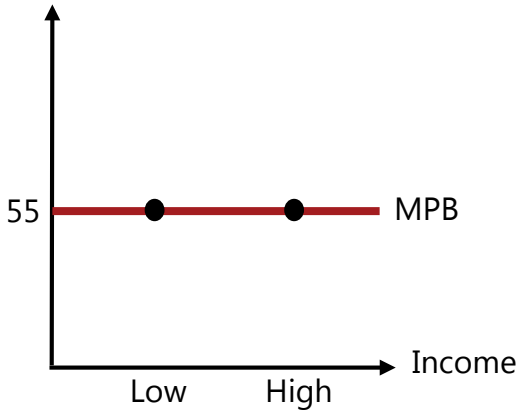


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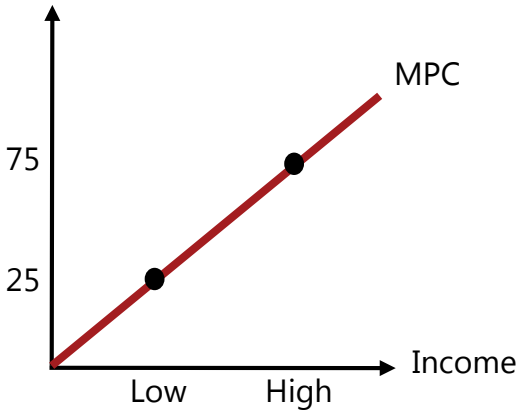

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**BUT tax distortion** $\Rightarrow$ MCF = 1.2

Total costs: $\sum$ MPC $\times$ MCF = 100×1,2 = 120

**Modified Samuelson**: 110<120 $\Rightarrow$ **NO**

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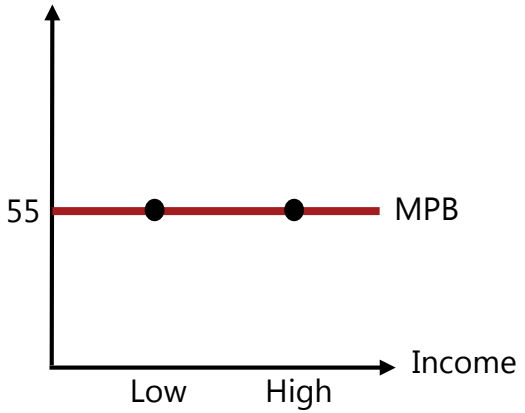


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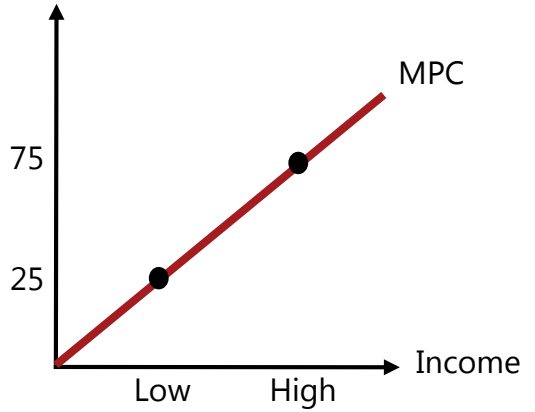

# Traditional approach

## The modified Samuelson rule

## Conclusion: We need to account for tax distortions

Size of MCF / tax distortions? $$\text{MCF} = \frac{1}{1 - \frac{m}{1-m}\varepsilon}$$

(Stiglitz and Dasgupta 1971, Atkinson and Stern 1974, Browning, 1976)

With $m$=50% and $\varepsilon$=0,1, we get MCF = 1,1

With $m$=60% and $\varepsilon$=0,1, we get MCF = 1,2

# Traditional approach

## The modified Samuelson rule

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### Problems

- Includes social costs of proportional taxation (distortion), but not social benefits (redistribution) ⇒ tax system is inoptimal within the model
- No reason to finance uniform benefits with proportional taxes ⇒ may reject Pareto improvements

# Traditional approach

**Accounting for inequality, progressive taxation, effect of expenditures on labor supply...**

Further research (Dahlby 1998, Slemrod and Yitzhaki 2001, Gahvari 2006, Kleven and Kreiner 2006) $\Rightarrow$

**Proposition**

*A marginal expansion of a public good is desirable iff*

$$\frac{\int_n \omega(n) MRS_{cg} f(n) dn}{1 - \int_n m \frac{\partial z}{\partial g} f(n) dn} \geq \frac{\int_n \omega(n) s(n) f(n) dn}{\int_n \left(1 - \frac{m}{1-m}\left(\Phi \cdot \varepsilon^c - \eta\right)\right) s(n) f(n) dn}$$

*where $\varepsilon^c$ is the compensated elasticity of taxable income w.r.t. to $1-m$ and $\eta$ is the income elasticity.*

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*where $\varepsilon^c$ is the compensated elasticity of taxable income w.r.t. to $1-m$ and $\eta$ is the income elasticity.*

**Problems**

- Relies on subjective weighting of interpersonal comparisons
- Close to useless in practise

# Traditional approach

**Accounting for inequality, progressive taxation, effect of expenditures on labor supply…**

What then?

# Traditional approach

**Accounting for inequality, progressive taxation, effect of expenditures on labor supply…**

What then?

Impose additional assumptions:

- Same social weights on all individuals, $w(n) = 1$ for all n
- Proportional tax system
- No effect of government consumption on labor supply, homogeneous elasticities…

Then we obtain $$\mathrm{MCF} = \frac{1}{1 - \frac{m}{1-m}\varepsilon}$$

Can be applied in practise … but relies on ridiculous assumptions!

# Modern approach

Hylland and Zeckhauser 1979, Christiansen 1981, Boadway and Keen 1993, Kaplow 1996, 2004, Kreiner and Verdelin 2012, Jacobs 2018

Two ways forward

I. Tax reform method

Adjust taxes to keep inequality unchanged ⇒ Is it possible to make everyone better off (Pareto improvement)?

II. Optimal tax method

Set taxes optimally ⇒ distortionary costs of taxation are balanced against inequality concerns (reason to have distortionary taxation within the model)

# Modern approach

## Adjust taxes to keep inequality unchanged

Should we make the public project?

Private benefits: $\sum$ MPC = 55+55 = 110

Use the same income profile for costs as for benefits when financing gov. expenditures $\Rightarrow$

Private costs: $\sum$ MPC = 50+50 = 100

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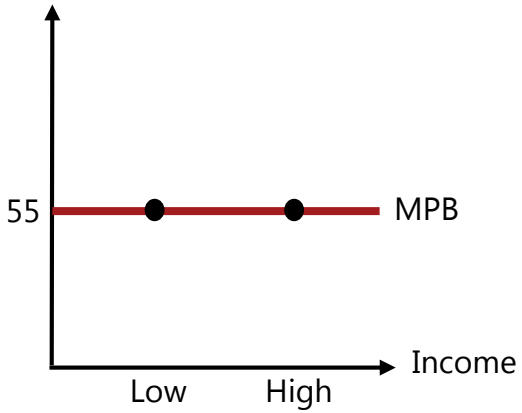


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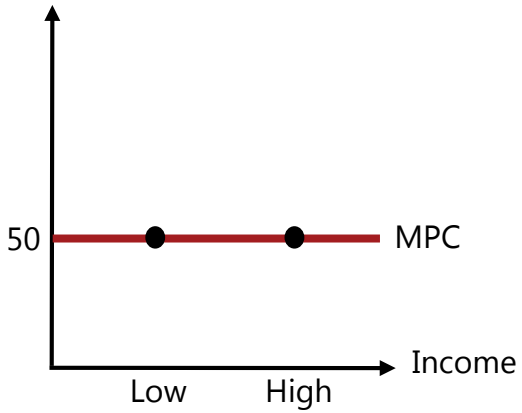

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Tax distortion: MCF = 1

Total costs: $\sum$ MPC $\times$ MCF = 100

Back to Samuelson: 110>100 $\Rightarrow$ **YES**

**This is a Pareto improvement!**

Rejected by the traditional approach!

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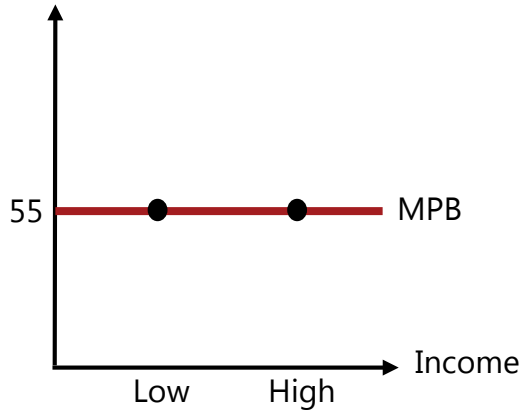


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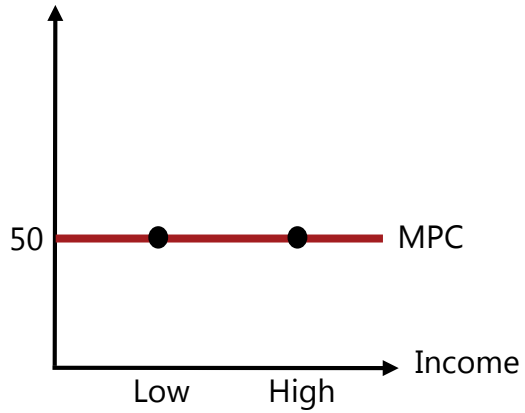

# Modern approach

## Adjust taxes to keep inequality unchanged

What if benefits are increasing with income?

Private benefits: $\sum$ MPC = 30+80 = 110

Private costs: $\sum$ MPC = 25+75 = 100

Tax distortion?

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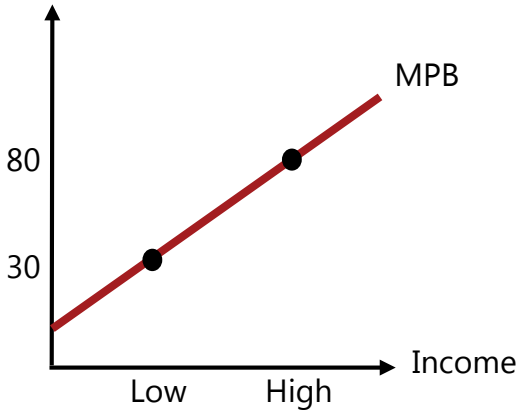


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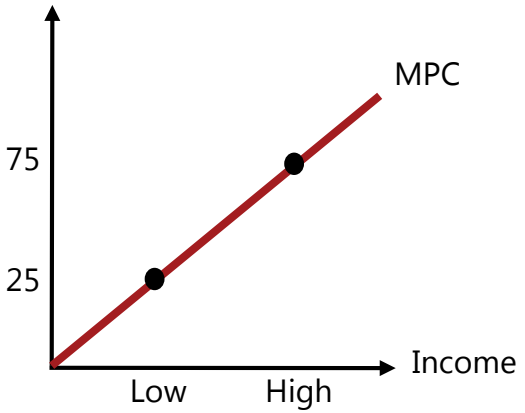

# Modern approach

## Adjust taxes to keep inequality unchanged

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Tax distortion?

Higher MC from working because of tax increase, but also higher MB because the expenditures are valued more by high-income people

**Should not include tax distortions**

Back to Samuelson: 110>100 $\Rightarrow$ **YES**

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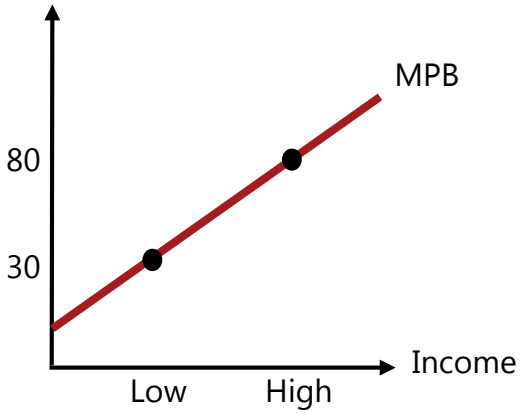


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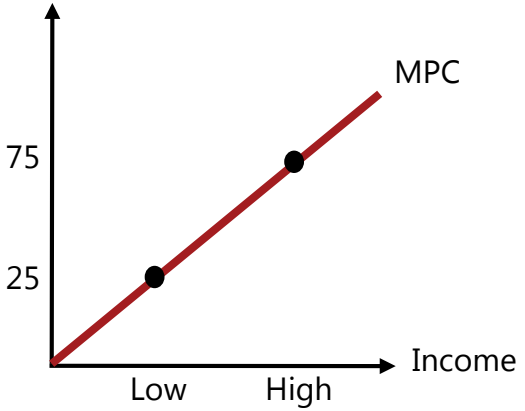

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## Optimal tax method

In an optimal tax system, the marginal social costs of tax distortions equals the marginal social benefits of redistribution $\Rightarrow$

$$SMC_{\text{Tax distortion}} = SMB_{\text{Redistribution}}$$

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Should we make the public project?

Direct benefits of project: $\sum$ MPB = 110

Direct costs of project: 100

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Make the project iff $110 + SMB_{\text{Redistribution}} > 100 + SMC_{\text{Tax distortion}}$

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Direct benefits of project: $\sum$ MPB = 110

Direct costs of project: 100

Make the project iff $110 + \cancel{SMB_{\text{Redistribution}}} > 100 + \cancel{SMC_{\text{Tax distortion}}}$

**Should not include tax distortions** social cost of distortionary tax offset by distributional gains

Back to Samuelson: 110>100 $\Rightarrow$ **YES**

# Modern approach

## Aber dabei

Corlett-Hague 1953, Kreiner and Verdelin 2012

We should deviate from the basic Samuelson rule if there is a correlation between ability, conditional on income, and the marginal willingness to pay for the public good

- If high-ability persons, conditional on income, put (lower) higher value on a certain public good then MCF>1 (MCF<1)
- Given ignorance about the relevant correlations, the Samuelson rule seems to be the natural benchmark for policy evaluation (same argument normal used for homogenous commodity taxation) $\Rightarrow$ Should not include tax distortions

# Conclusion and some final thoughts

According to the modern public finance literature cost-benefit analysis in the public sector should not include tax distortions unless strong prior on correlation between ability and the marginal willingness to pay for the public good conditional on income

Revival of the old Musgrave view on government: "redistributive and allocative branches of government can be dealt with separately" (Musgrave 1959)

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According to the modern public finance literature cost-benefit analysis in the public sector should not include tax distortions unless strong prior on correlation between ability and the marginal willingness to pay for the public good conditional on income

Revival of the old Musgrave view on government: "redistributive and allocative branches of government can be dealt with separately" (Musgrave 1959)

Other potential reasons to deviate from the simple Samuelson rule?

- Tax administration
- Horizontal equity / preference heterogeneity
- No price system to allocate public expenditures $\Rightarrow$ efficiency loss

# References


- Atkinson, A.B. and Stern, N.H. (1974), Pigou, Taxation, and Public Goods, Review of Economic Studies 41, 119.28.
- Ballard, C.L. and Fullerton, D. (1992), Distortionary Taxes and the Provision of Public Goods, Journal of Economic Perspectives 6, 117.31.
- Boadway, R. and Keen, M. (1993), Public Goods, Self-Selection and Optimal Income Taxation, International Economic Review 34, 463.478.
- Browning, E.K. (1987), On the Marginal Welfare Cost of Taxation, American Economic Review 77, 11.23.
- Christiansen, V. (1981), Evaluation of Public Projects under Optimal Taxation, Review of Economic Studies 48, 447.57.
- Dahlby, B. (1998), Progressive Taxation and the Social Marginal Cost of Public Funds, Journal of Public Economics 67, 105.22.

# References


- Hylland, A. and Zeckhauser, R. (1979), Distributional Objectives Should Affect Taxes But Not Program Choice or Design, Scandinavian Journal of Economics 81, 264.84.
- Kaplow, L. (1996), The Optimal Supply of Public Goods and the Distortionary Cost of Taxation, National Tax Journal 49, 513.33.
- Kaplow, L. (2004), On the (Ir)Relevance of Distribution and Labor Supply Distortion to Government Policy, Journal of Economic Perspectives 18, 159.75.
- Kleven. H. J. and Kreiner, C. T. (2006), The Marginal Cost of Public Funds: Hours of Work Versus Labor Force Participation, Journal of Public Economics 90, 1955.73.
- Kreiner, C.T. and N. Verdelin (2012), Optimal Provision of Public Goods: A Synthesis, Scandinavian Journal of Economics 114, 2012, 384–408.
- Musgrave, R.A. (1959). The Theory of Public Finance, New York: McGraw Hill.
- Samuelson, P. (1954), The Pure Theory of Public Expenditure, Review of Economics and Statistics 36, 387.89.
- Stiglitz, J.E. and Dasgupta, P. (1971), Differential Taxation, Public Goods and Economic Efficiency, Review of Economic Studies 38, 151.174.