# Welfare Effects of R&D Support Policies

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# Innovation Policy Agreement and Disagreement

- Wide agreement that innovation drives economic growth and that governments should support innovation.

- Large differences of opinion as to innovation policy:

  - Josh Lerner (2009): basic research & education, neutral support of corporate R&D.

  - Mariana Mazzucato (2013): active, direct government involvement.

# Objective

- How well current R&D support policies (subsidies and tax credits) work?

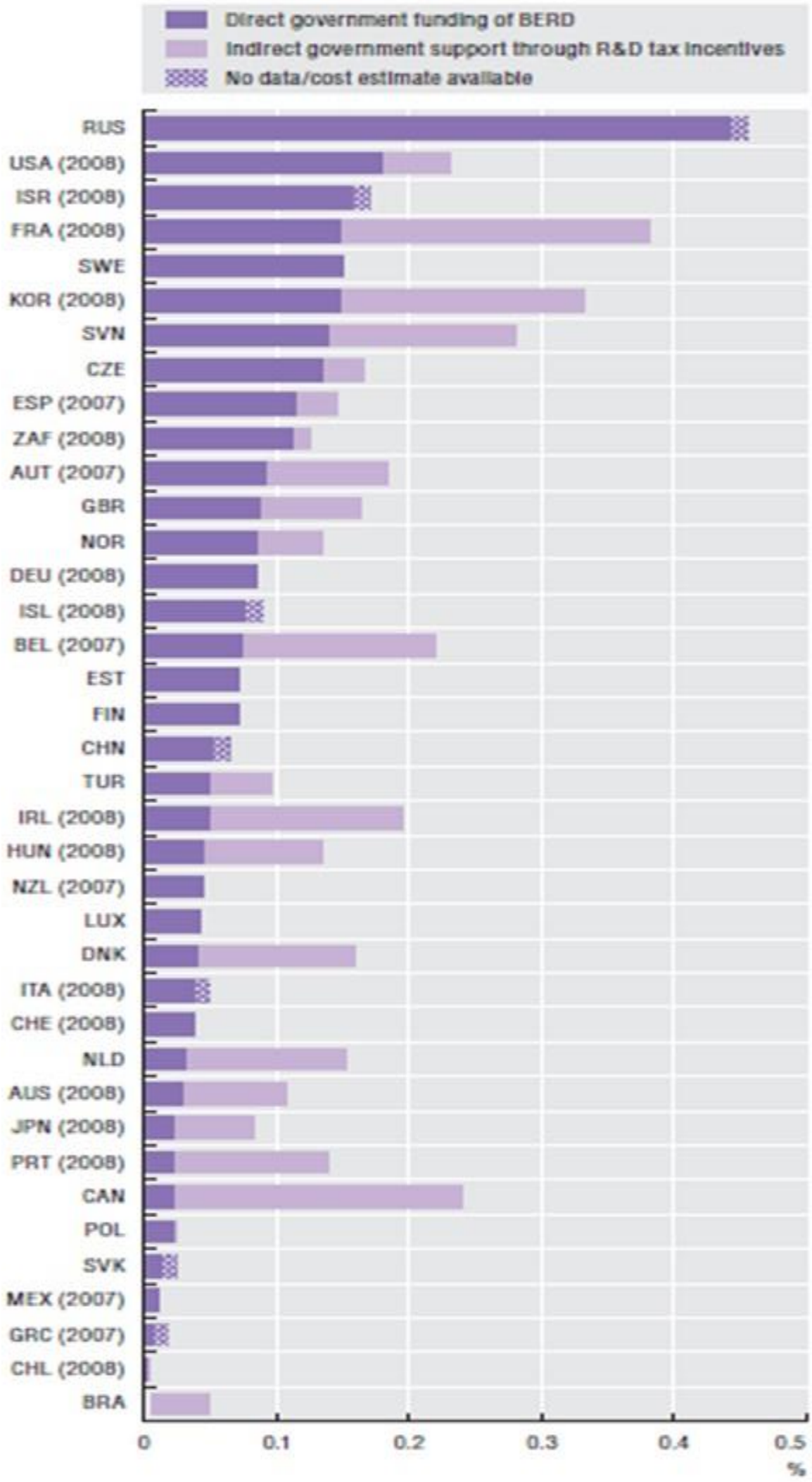
  - Both R&D tax credits and subsidies use tax payers' money to reduce the marginal cost of corporate R&D.

  $\Rightarrow$ increase R&D spending both on intensive and extensive margin.

  $\Rightarrow$ more spillovers, stronger productivity growth etc.

## Direct government funding of business R&D and tax incentives for R&D, 2009

*As a percentage of GDP*




*Source*: OECD, based on OECD R&D tax incentives questionnaires, January 2010 and June 2011; and OECD, Main Science and Technology Indicators Database, June 2011. See chapter notes.

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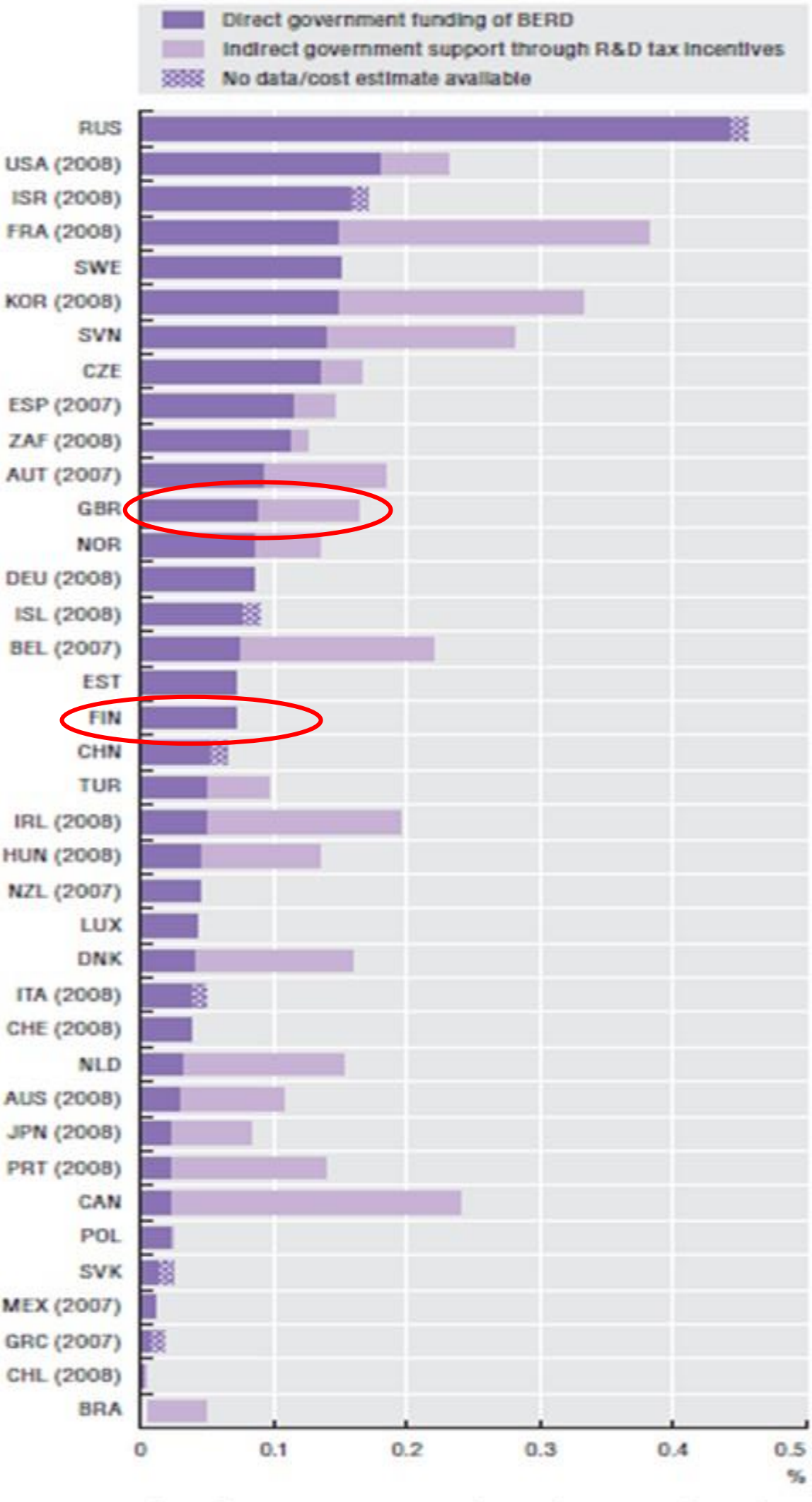


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# Objective

- How well current R&D support policies (subsidies and tax credits) work?
- Large literature on *additionality* of R&D subsidies and tax credits.
- The ultimate goal of an ex post policy evaluation: *Welfare.*
- How to measure welfare effects of R&D support policies?

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- Our framework builds on structural econometric modeling.

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  - Social externalities.
    - Consumers surplus and R&D spillovers.

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    - Consumer surplus and R&D spillovers.
  - Financial market imperfections.
  - Fixed cost of R&D.

# Welfare Analysis of the R&D Support Policies

- We estimate the model on R&D project-level data from Tekes, the Finnish Agency for allocating R&D subsidies.
  - Beyer (2017) applies the method for Germany, Czarnitzki et al. (on-going) for Spain, Netherlands, and Belgium.

# Welfare Analysis of the R&D Support Policies

- We estimate the model on R&D project-level data from Tekes, the Finnish Agency for allocating R&D subsidies.

- We use the estimated parameters for counterfactual welfare analysis E.g,
  - Tekes' R&D subsidy policy.
  - Finnish R&D tax credit of 2013-2014.
  - Optimal tax credit.

# Our Method: Basic Idea

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3. **Estimation** of the key parameters of the model from the data.

4. **Counterfactuals:** We change the policy regime, and use the model and estimated parameters to predict what would happen.

# Structural Model

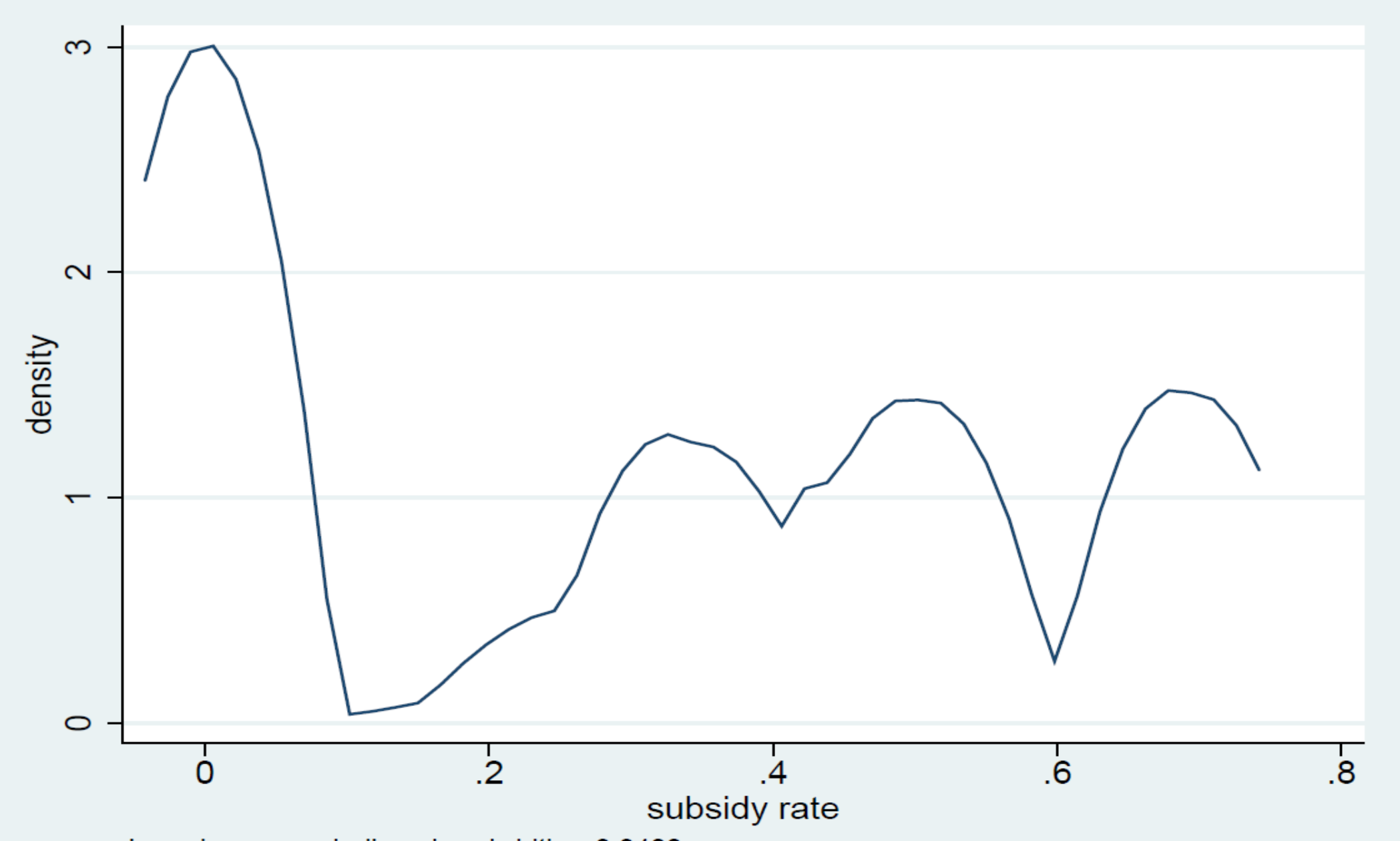
- Captures some key features of data:
  - Some firms do not invest in R&D.
  - Some firms investing in R&D do not apply for subsidies.
  - Some applications are rejected.
  - R&D project sizes vary.
  - Similar looking firms make different decisions.
  - Imperfect financial markets.

# Data

- Tekes: Subsidy applications + decisions + subsequent R&D investments 2000 – 2008.

- Statistics Finland: R&D survey data on firm level R&D & firm characteristics (including the cost of external finance).

# Data



# Estimation

- Revealed prefence approach:
  - Firms' decisions to launch an R&D project reveal fixed costs of R&D.
  - Firms' R&D investment levels reveal the profitability of R&D.
  - Firms' decisions to apply for subsidies reveal application costs.
  - Tekes's decisions on subsidies reveal the value of R&D to the government.

# Policies

- For today:

1. The Finnish R&D subsidy policy.

   - The optimal tax credit and the Finnish tax credit of 2013-2014 behave similarly.

2. No government support (”laissez-faire”).

3. First best (”benevolent & omnipotent gov.”).

# Outcomes

For today:

1. R&D investments.
2. Firms' profits.
3. Spillovers (=social externalities).
4. Welfare.

# R&D Investment Levels

| | All firms | | Conditional on R&D>0 | |
|---|---|---|---|---|
| Regime | Mean (€) | Ratio | Mean (€) | Ratio |
| Laissez-faire | 125 000 | 1 | 193 000 | 1 |
| 1st best | 292 000 | 2.3 | 479 000 | 2.5 |
| Subsidies | 177 000 | 1.4 | 268 000 | 1.4 |
| Subsidies I s > 0 | | | 437 000 | 2.3 |

# Profits

| Regime | Mean (€) | Ratio |
|---|---|---|
| Laissez-faire | 1 829 000 | 1 |
| 1st best | 1 755 000 | 0.96 |
| Subsidies | 1 860 000 | 1.02 |

# Spillovers

| Regime | Mean (€) | Ratio |
|---|---|---|
| Laissez-faire | 68 000 | 1 |
| 1st best | 176 000 | 2.57 |
| Subsidies | 100 000 | 1.47 |

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- Spillovers are only 4-10% of the profits.

# Welfare

| Regime | Mean (€) | Ratio |
|---|---|---|
| Laissez-faire | 1 898 000 | 1 |
| 1st best | 1 931 000 | 1.02 |
| Subsidies | 1 894 000 | 1 |

Welfare = firm profits + spillovers

- the costs of subsidy application and tax distortions in the subsidy regime.

# Summary of the Welfare Analysis

- R&D support policies increase R&D and spillovers by 40-50%.
- But they hardly increase welfare.
  - **Net** welfare effect of R&D support policies is approximately zero.

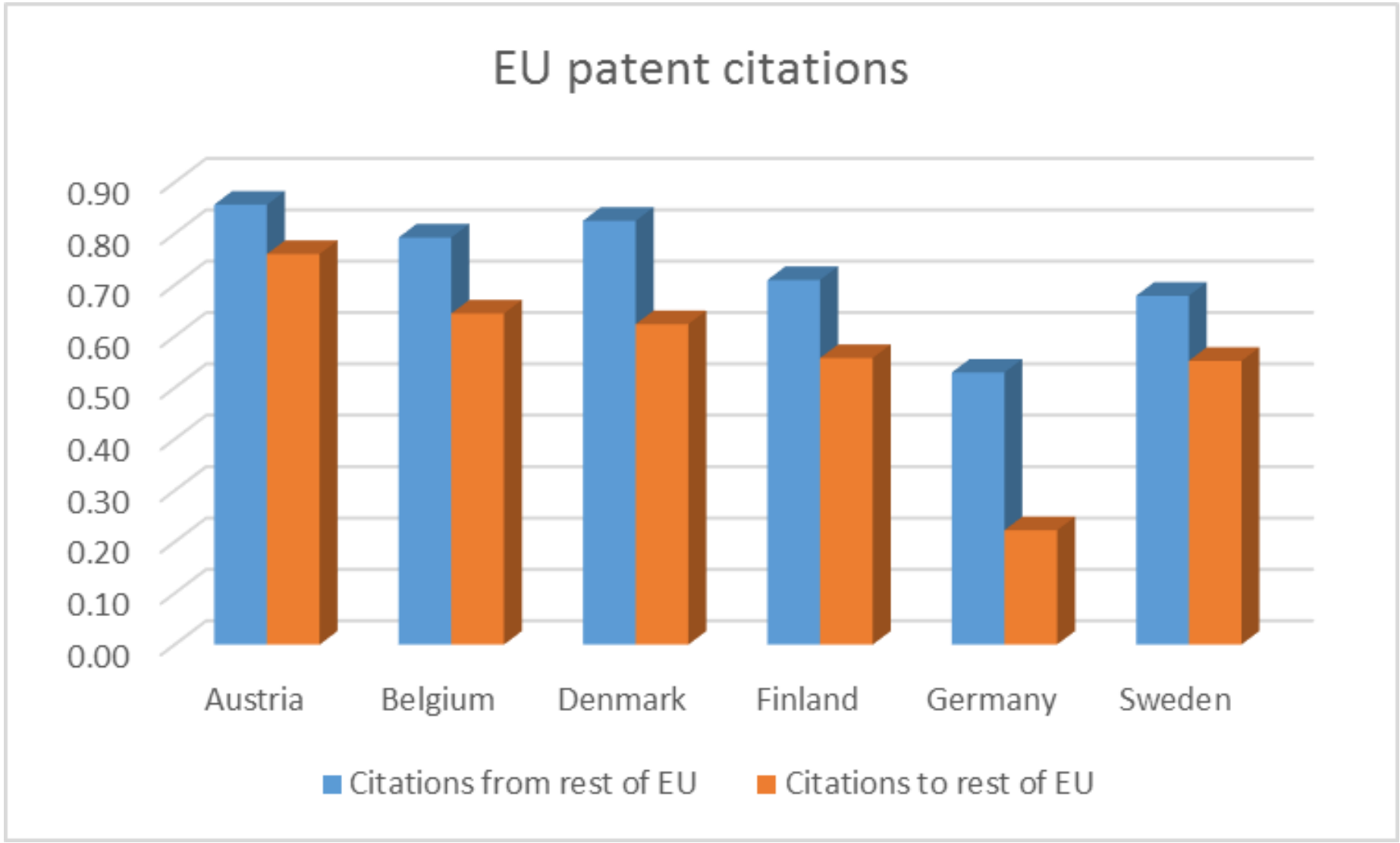
# Concluding Remarks

- Why is our estimate of the spillover/profit ratio ratio low?
  - Our model could be mispecified.
    - We assume spillovers are linear in R&D.
    - Tekes' budget constraint is not properly taken into account.
  - Tekes might not be efficient in picking right projects where the ratio of social to private returns is high.
  - Finland is a small open economy.

# The (Small) Open Economy Angle

- The innovation policy literature takes a large country or a global perspective.

- Rationales for a national innovation policy.
  - Domestic consumer surplus.
  - Domestic spillovers.
  - Incoming spillovers.




Huub Meijers & Boris Le Hir, EPO patent data / NEMESIS. Czarnitzki et al 2015 / SIMPATIC

# The (Small) Open Economy Angle

- Different innovation policies for a (small) open economy?
- A need to coordinate innovation policies at the EU level?